SURVEY OF HEARING LOSS IN THE

COAL MINING INDUSTRY

Prepared by the Noise Section of the
Physical Agents Effects Branch

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
Division of Biomedical and Behavioral Science
Cincinnati, Ohio
June 1976

Mention of trade names or commercial products does not constitute endorsement or recommendation by the National Institute for Occupational Safety and Health.

HEW Publication No. (NIOSH) 76-172

BIBLIOGRAPHIC DATA SHEET	1. Report No. NIOSH-76-172	2.	3. Recipient's Accession No. PB-271 811
4. Title and Subtitle Survey of Hearing Loss in the Coal Mining Industry			5. Report Date June 1976 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address National Institute for Occupational Safety and Health 4676 Columbia Pkwy. Cincinnati, Ohio 45226			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Same			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstracts

Results are presented of a study of hearing loss in the underground coal mining industry. Hearing tests are given to 1,500 miners by NIOSH at eleven randomly selected coal mines in Kentucky, Pennsylvania, and West Virginia. Noise Surveys are performed at the same mines by personnel of the Mining Enforcement and Safety Administration (previously of the U.S. Bureau of Mines). Hearing data are presented in groups based on noise exposure and job category. The data are also analyzed with respect to selected factors including recreational use of firearms and suspected otoscopic abnormalities. Statistical accuracy versus group sample size is discussed in an Appendix. Underground coal miners are found to have measureably worse hearing than the national average, but the degree of hearing loss is not as severe as among some other occupational groups. In light of the Bureau of Mines noise survey data, the hearing test results do not lend support to the notion that coal mine noise is inherently less hazardous than predicted from noise surveys because of its intermittent nature. Coal miners are found to have a higher than normal incidence of otoscopically observable ear abnormalities. Individual audiometric data are tabulated in an Appendix.

17. Key Words and Document Analysis. 17a. Descriptors

Acoustic measurement
Hazards
Auditory defects
Noise
Small arms
Statistical analysis
Audiometry
Coal mining
Exposure

17b. Identifiers/Open-Ended Terms

Otoscopic abnormalities
Noise levels

17c. COSATI Field/Group 6J

18. Availability Statement Release Unlimited	19. Security Class (This Report) UNCLASSIFIED	21.
	20. Security Class (This Page) UNCLASSIFIED	22. Price PC A07-A01

PORTIONS OF THIS REPORT ARE NOT LEGIBLE.

HOWEVER, IT IS THE BEST REPRODUCTION

AVAILABLE FROM THE COPY SENT TO NTIS.

ABSTRACT

Results are presented of a study of hearing loss in the underground coal mining industry. Hearing tests were given to 1,500 miners by NIOSH at eleven randomly selected coal mines in Kentucky, Pennsylvania, and West Virginia. Noise surveys were performed at the same mines by personnel of the Mining Enforcement and Safety Administration (previously of the U.S. Bureau of Mines). Hearing data are presented in groups based on noise exposure and job category. The data are also analyzed with respect to selected factors including recreational use of firearms and suspected otoscopic abnormalities. Statistical accuracy versus group sample size is discussed in an Appendix. Underground coal miners are found to have measureably worse hearing than the national average, but the degree of hearing loss is not as severe as among some other occupational groups. In light of the Bureau of Mines noise survey data, the hearing test results do not lend support to the notion that coal mine noise is inherently less hazardous than predicted from noise surveys because of its intermittent nature. Coal miners were found to have a higher than normal incidence of otoscopically observable ear abnormalities. Individual audiometric data are tabulated in an Appendix.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

INTRODUCTION

In recent years, extensive research effort has been devoted to the effects of prolonged exposure to continuous high-intensity noise. As a result of these investigations, sufficient data exist to establish that continuous, high-intensity, occupational noise exposures are capable of producing hearing loss.[1,2] At this time a clearer picture is emerging of the correlation between continuous noise exposures and the resulting temporary and permanent changes in hearing acuity.[3] Considerably less progress has been made in documenting the relative hazard of intermittent noises and those noises that fluctuate in intensity. Such temporal variations in intensity are characteristic of daily noise exposure patterns in the coal mining industry.[4]

A review of the existing literature reveals that only a few articles have been published concerning the hazardous effects of occupational noise exposure on the hearing of coal miners, particularly as regards coal mining operations in the United States. Results of these previous efforts clearly indicate the need for additional data concerning the hearing levels and prevalence of hearing impairment among coal miners. To obtain the data necessary for determining these factors, the National Institute for Occupational Safety and Health (NIOSH) initiated a study in which the main objective was to test the hearing of miners engaged in underground coal mining operations. In conjunction with this study, personnel of the Mining Enforcement and Safety Administration (MESA) performed noise exposure surveys at the selected mines. (These MESA personnel were previously with the U.S. Bureau of Mines, and the noise surveys were actually completed just before MESA was formed. Later references to MESA in this report refer to those people who were involved in conducting the noise surveys.)

This study proposal was developed under the direction of Herbert H. Jones, then Chief of the Physical Agents Branch (PAB). Much of the preliminary planning was done by Steve Cordle, who also arranged and supervised the initial hearing surveys. For most of the field investigations, Dr. Derek Dunn headed the research team in collecting data on the hearing of coal miners. Preparation of this final report was a joint effort by all members of the Noise Section of the PAB under the editorial supervision of Dr. T. L. Henderson. NIOSH staff members who participated in the study were: Engineers - H. Jones, Dr. T. L. Henderson, S. Cordle, R. Fleming, B. Lempert, P. Froelich, T. Warren; Audiologists - Dr. D. Dunn, M. Layne; Industrial Hygienist - R. Willson; Technicians - D. Barber, J. Taylor. Personnel with MESA who participated in the parallel noise survey were directed by Joe Lamonica, then Chief of the Noise Group at the Pittsburg Technical Support Center, and included: Engineer - T. Bobick; Technicians - R. Kellner, J. Antel.

Review of Existing Literature

Past attempts to evaluate the hazardous effects of noise exposures in the mining industry have yielded some informative, though occasionally contradictory, data. The apparent inconsistencies in the data on hearing loss of miners might possibly be due to an inability to assess the relative importance of inter-study dissimilarities in survey procedures employed and mining noise environments encountered, such as for longwall versus room-and-pillar operations. It has been estimated that mining operations cause 20% to 30% of all miners to be exposed to noise that is potentially hazardous to their hearing.[5,6] There is, however, disagreement on the incidence rates and degree of hearing loss produced by these exposures to mining noise. The following discussion relates the principal findings of previous research conducted on the auditory effects of exposure to mining noise:

Begov[7] performed extensive audiometric testing on 100 miners. The tests included air conduction and bone conduction threshold testing, speech reception evaluation, selected-tone-in-noise, and localization testing. Begov concluded that the miners, in addition to exhibiting peripheral sensory deterioration, displayed signs of central auditory nervous system disorders.

Jirak administered audiometric tests to 1340 coal miners whose occupational noise exposures were documented. Of that sample 341 were selected because they "had worked solely in a specific, noise-endangered place and never anywhere else in a plant or on (another) site with a high noise level." (Ref. 8, p. 2) None of the miners selected had a history of ear infection or auditory disorders. In this "screened" population, over 9% of the miners were found to suffer a hearing loss that was attributed to their occupational noise exposures. These data were corrected for the expected loss of hearing due to presbycusis.

Sataloff et. al.[6] examined 187 iron miners who were screened on the basis of otological examination and previous medical history. Approximately 22% of the miners tested showed hearing losses. After evaluating the relationship between noise exposures and hearing losses of miners, Sataloff concluded that the intermittency of the mining noise reduced its potential to damage hearing. He suggested that the nature of noise intermittency in the mining environment resulted in average daily mining noise levels being equivalent in hazard to continuous daily noise levels that are 20 dB lower in intensity.

Lumio[5] conducted a survey on the effects of occupational noise on the hearing of 10,374 workers in the mining, textile, paper and metal industries. In the mining industry 21% of the workers

had severe hearing losses. Of those miners who had severe hearing losses, he concluded that 29% had losses solely due to their occupational noise exposure. Despite the number of miners with noise-induced hearing losses, the mining industry had a lower incidence of occupational noise-induced hearing loss than did the textile, paper, or metal industries.

Schwetz and Stahl[9] surveyed 44,343 workers from the mining, stone, paper, textile, transportation, and woodworking industries; 2,056 workers were found to have hearing losses. Unlike Lumio, however, Schwetz found that the percentage of workers with hearing losses was highest among those who worked in the mining industry. Approximately 8% of the miners had moderate or severe hearing losses. This compared with about 5% prevalence of such hearing loss in the other worker groups.

The aforementioned studies do not reflect a complete agreement in the assessments made of the prevalence and degree of hearing loss that results from occupational exposure to mining noise. There is, however, a consensus that prolonged exposure to mining noise does result in a loss of hearing.

The Coal Mine Environment

Coal mining technology has changed significantly in this century, mostly with advances in machinery technology. For decades coal was mined with a pick and shovel. Eventually this practice was replaced by widespread use of explosives. Coal was thus blasted loose and subsequently loaded by a variety of means into small hopper cars or onto conveyor belts.

Perhaps the most significant development in coal mining machinery is the "continuous miner" which "chews" the coal out of a seam (vein) by means of rotating cylinders studded with carbide-tipped teeth. The continuous miner allows greater coal production since it literally eats its way through coal at a rate of five to nine tons per minute, cutting a swath up to eleven feet wide per pass. Continuous miners and the related loaders or shuttle cars that attend them are electrically powered machines, as low as 24 inches high, in which the operator sits in a partially reclining position. New designs offer remote controls which permit the operator to run the miner from a 30 foot distance, thus permitting safer operation. The area of a mine from which the coal is being extracted at any given moment is called the "face." From the face a variety of equipment moves the coal to the surface where it is washed and graded.

Although the use of continuous miners is growing, there are still many areas where "conventional" mining is practiced, and sometimes conventional and continuous mining take place in the same mine. The type of coal, extent of seams and condition of the "roof" (overlying rock strata) determine which method of mining is safer and more economical for use. Coal mines are designated as "high coal" or "low coal" mines depending on the thickness (height) of coal seams. High coal seams are typically on the order of 48 inches or more in thickness while low coal seams may be as thin as 24 inches. An individual coal seam may extend horizontally over many square miles, even though it forms a layer that is rarely over a few feet thick. Coal seams little more than 26 inches high can be mined economically with continuous miners.

Continuous mining is accomplished by crews of men performing a variety of jobs which allow the continuous miner to advance through a coal seam or "lift" safely. The major operations include roof bolting and timber or jack setting, operation of the continuous miner, coal loading via shuttle cars or conveyor systems, and properly closing off sections that have been mined out.

A typical continuous mining crew might consist of the following:[10]

1 section foreman
2 roof drill operators
1 continuous miner operator
1 continuous miner helper
1 electrician
1 bridge-carrier operator or shuttle car operator
1 conveyor belt and general utility man

After the continuous miner advances through a coal seam for a sufficient distance, it is pulled out and sent to another working face area. The roof over the previous seam is made safer by the installation of temporary roof supports and permanent roof bolts. Temporary roof supports consisting of roof jacks or bracing timbers are installed soon after the continuous miner pulls out of the seam. Holes are then drilled into the roof approximately every four feet, and long bolts are inserted to hold load bearing plates. Sometimes the roof-bolt drill is an integral part of the continuous miner and the operation is performed as the miner advances. Brattice curtains are set up to within ten feet of the face, but no closer than the mining equipment will allow, and portable exhaust fans are positioned to provide at least 3000 cubic feet per minute of air movement away from the face. Bridge carriers and bridge

conveyor belt systems are repositioned to accept the coal either directly from the continuous miner or from a loader which is used to ferry the coal from the continuous miner to the conveyor system. The continuous miner then returns to this seam to advance another 35 feet or so, after which the roof bolting operation is repeated. Such an operation may advance over 100 feet in an eight hour shift, bringing 400-500 tons of coal to the surface. Other jobs include the spraying of "rock dust" on the walls to minimize explosion hazards, maintenance and electrical work, and transporting men and supplies from one place to another in the mine.

The noise environment underground is highly variable and intermittent due to the nature of mining operations. Noise exposures in the mining industry are frequently short, with subsequent periods of silence. Both high and low coal face areas are reverberant spaces which cause high noise levels to build up while machinery is running. Conversely, when equipment is shut down the background noise level can be very low. Due to this intermittency it is difficult to accurately predict the effect that mining noise has on the hearing of miners.

Noise in mining[4] is generated by cutting coal with the continuous miner (87 - 107 dBA), roof drilling and bolting (93 - 119 dBA), loading coal from continuous miner to shuttle cars (85 - 108 dBA), shuttling coal to conveyor systems (84 - 98 dBA), making cuts at the face for placement of explosives, and general "tramming" or moving of mining equipment (84 - 98 dBA). Most of the noises just mentioned usually last only from a few seconds to four or five minutes at a time, followed by several seconds or minutes of waiting time during which the environment may be relatively quiet. The machinery operators are generally exposed to the greatest amount of noise, while the utility men and other laborers usually spend only part of the work shift in noisy areas.

Another factor which obscures any study of the effect of noise on hearing of coal miners is the amount of job changing which takes place. Miners compete for higher paying jobs on the basis of seniority, and thus may experience a great variety of daily noise exposure patterns within their working lifetime.

One recent development which is altering the intermittent nature of noise in mines is the more extensive use of ventilation equipment. Regulations requiring increased ventilation at the "face" area (to lower the respirable dust concentrations) are being met by the installation of various kinds of fans, many of which are noisy. Therefore, the background noise levels

between periods of equipment usage are increasing to the extent that the intermittent noise pattern is becoming more continuous. Such changes in noise exposure patterns and intensity (due to a different machinery and mining procedures) during the working life of a miner create additional factors of uncertainty in relating hearing loss to noise exposure in the coal mining industry.

In addition to the underground activities, coal mining operations also include above ground operations such as coal cleaning and preparation, sorting and crushing, machinery maintenance, and transportation of men and materials. In most respects the above ground activities are an extension of the underground mining operation. Moreover, many of the workers are former underground workers or work part time underground. Even the supervisory or office personnel are likely to have worked many years in mining operations prior to their current job. For these reasons all mine employees at the site were included in the hearing study, and are generically referenced as "coal miners" throughout this report. It should be noted that the vast majority (80%) did work full time underground.

SELECTION OF THE MINE SAMPLE

The population of coal mines considered in this study included only mines associated with the United Mine Workers of America (UMWA). Only mines east of the Mississippi River were included due to the difficulty of conducting a nation-wide survey from a single base location in Cincinnati, Ohio. Coal mines were selected by a statistical procedure in order to obtain a representative sample of the entire population. The expected number of miners to be examined over the course of the study was 2000, consisting of 1600 working miners and 400 non-working or retired miners.

Mines were chosen using a stratified random sampling procedure in which 461 mines were arranged in order by estimates of coal production. Based on the average number of miners per mine, the expected number of miners to be tested, and the possibility of not being able to survey some of the mines, it was determined that fifteen (15) mines from this population should be selected. The ordered list of mines was divided into fifteen groups, of approximately equal size, and a mine was selected from each group. A mine was randomly selected from the first group, and subsequent selections were made by adding a constant incremental number to the mine sequence number in the previous group. This sampling procedure insured a sample that included coal mines having all levels of production. Figure 1 shows the fifteen selected mines (indicated with circles) in their relative positions with other mines based on estimated production levels.

During the course of the study, five of the originally selected mines were not surveyed, as indicated by the solid circles in Figure 1. Four mines were not operating at the time of the study, and one mine refused to permit the survey. To compensate for the reduction in sample size another mine was selected (indicated by a triangle in Figure 1) which had an estimated production level similar to that of one of the lost mines. Locations of the final eleven mines contained in the sample are shown in Figure 2. The black dots represent the sites of the surveyed mines, and the distribution of coal fields in the United States is represented by the gray areas.

Original estimates of production levels were discovered to be markedly different from those obtained during the noise survey, as illustrated in Figure 3. Circles indicate the originally estimated levels, and squares indicate the estimates made at the time of the noise survey. Despite these changes, the eleven mines in the study still represent the range of coal production encountered in the industry. Figure 3

also illustrates the correllation of increased production with increased number of workers. Deviations from this linear relationship are most likely due to the type of mining operation used. Of the eleven mines surveyed in this study, nine employed continuous mining equipment and two used only conventional techniques. In many of the mines surveyed, both conventional and continuous mining techniques were used, depending on the coal and rock conditions at a given point in the mining operation.

The cooperation and assistance of the UMWA Welfare and Retirement Fund was essential for including retired miners in the study. Lists were obtained of former miners who lived near the mines that were to be surveyed. No sample selection procedure was used because the number of names was never more than was needed for the study.

SURVEY PROCEDURES AND EQUIPMENT

Contacting Mines

Initial contact with a selected mine was coordinated with MESA, UMWA, and the Bituminous Coal Operators Association (BCOA). The support and assistance of the UMWA, through the office of Dr. Lorin Kerr, was provided in the early stages of this project to increase the likelihood of acceptance and participation by the miners. Contact was maintained with the UMWA so that district and local union personnel would be notified of the surveys through news releases, letters, and oral communications. BCOA provided names and telephone numbers of Association mine managers at those mines selected for participation and agreed to send letters to the mine offices. Operating procedure called for MESA to visit the mine and perform a noise survey of the current daily noise exposures of the miners before NIOSH contacted the mine. This arrangement enhanced the acceptance of the program by mine management. However, in some cases a time lag developed between the MESA visit and the NIOSH contact which tended to lessen the advantages gained by the initial acceptance. The delay was a result of the longer task of organizing and administering a hearing survey as compared to a noise survey.

The study plan was explained in a NIOSH letter to each mine followed approximately one week later by a telephone call. The purpose of the call was to arrange a meeting time for a more detailed discussion of the study. During the initial telephone communications reluctance was sometimes expressed by the mine manager; however, only one mine refused to cooperate in the survey. Although permission was secured via the telephone contact, the vital support of management for encouraging the miners to participate had to be gained during the subsequent site visit.

Preliminary Site Visit

Two NIOSH staff members, usually an audiologist and an industrial hygiene engineer, made the preliminary visit to present the study plan, arrange survey details, and locate an acceptable testing site for the audiometric van. Personnel present often included the mine manager (owner in some cases), foremen, and union representatives; however, sometimes only the manager was available.

NIOSH personnel usually opened the discussion by giving a brief description of how the mines were selected. In presenting the study plan, the following areas were covered: purpose of the study, participants, information to be collected, and mechanisms of the survey. All working coal miners were to be encouraged to participate on a voluntary basis, and a limited number of retired miners who still lived in the vicinity of the mine would be invited to participate. Data were to be collected through a questionnaire (OMB No. 68-R1269), an otoscopic examination, and a hearing test. Handling of acquired information and the scheduling of hearing tests were given special attention. A copy of the questionnaire was given to the mine manager and each item was reviewed. The questionnaire form is presented in Appendix A. Of particular importance were the following items:

(1) The miner is informed that by signing his name he is volunteering to fill out the questionnaire, have his ears examined, and take a hearing test. If at any time and for any reason he wishes to withdraw, he may do so.

(2) The information received from his participation in the study is held in confidence. In the event he would want his survey information released to a doctor, he could provide the doctor's name and address and sign a consent form.

It was explained that all testing would be conducted before the workshift for three reasons: (1) to avoid contamination of hearing level data with temporary threshold shifts due to recent noise exposure, (2) to avoid interruption of mining operations, and (3) to take advantage of the fact that many miners typically arrived quite early for their shift. Scheduled arrival times were either 45 minutes or 75 minutes before the shift to provide sufficient time for late arrivals or retests and for miners to change into their work clothes.

Dates for the survey were agreed upon, and details for filling in the schedule sheets were discussed. The mine foremen were usually made responsible for posting the schedule sheets in the change room and for encouraging the miners to sign up for a convenient hearing test time. (These schedule sheets were collected within two weeks and sent to NIOSH. If changes were necessary because of shift rotation, new sheets were filled out; however, these changes did not substantially alter the survey planning.) Finally, a suitable testing site was selected to afford low ambient noise levels and accessibility to the miners. Since the mobile audiometric test van was equipped with a remote electric power plant, access to electric power receptacles was not required.

Hearing Survey Routine

All testing and acquisition of information from the miners were accomplished in the audiometric van. The van contains a conference room, a control room, and a testing room as illustrated in Figure 4. The conference room was used for answering the questionnaire and conducting the otoscopic examination. Six Tracor ARJ 4A self-recording audiometers, which were calibrated re ANSI S3.6 1969-"Specifications for Audiometers," were housed in the control room. The testing room was acoustically isolated from the rest of the van and consisted of an audiometric chamber (Industrial Acoustics Co. Series 400-A) installed on vibration isolation rails inside the body of the van. Retractable drapes were used to partition the chamber into compartments for testing six people at one time.

Several precautions were taken to insure that ambient noise would not affect the hearing tests. The TDH-39 earphones (with MX-41/AR ear cushions) used for presenting test tones were enclosed in Rudmose Model RA-125 Otocups to minimize the possibility of masking by ambient noise. The gasoline-powered generator which supplied electricity for the van was mounted in the bed of a pickup truck, and a 100 foot electrical cable was used to physically separate the generator from the testing room. It was always possible to point the muffler of the generator away from the van, and usually a barrier was available in the form of a building, behind which the generator could be positioned.

Lastly, a sound level meter was used to check the background noise levels in the testing room to insure that the levels were less than the background noise limits for audiometric test rooms given in the American National Standards Institute (ANSI) S3.1-1960 standard. Additional discussion of background noise in the test environment is presented in Appendix B.

With the van and generator suitably positioned, instrumental and biological checks were carried out to verify the calibration of the audiometers. Equipment used for checking calibration included the following: Bruel & Kjaer (B & K) sound level meter (Type 2203) with a B & K octave band filter set (Type 1613), Monsanto frequency counter (Model 150A), B & K artificial ear (Type 4152), and a test stand. The system is illustrated in Figure 5. Measurements were made of coupler sound pressure levels, tone frequency, and interstep spacing (linearity) according to the specifications in the ANSI S3.6-1969 standard. All six audiometers were checked for levels and frequency, but only one audiometer was selected (randomly) at each testing site for the

linearity check. Deviations from standard audiometer output levels were later used in adjusting the hearing threshold data. Members of the field survey team with normal hearing performed biological checks on the audiometers to verify smooth, noise-free operation. Other comments on calibration of audiometers are made in Appendix B.

To keep the miners aware of their hearing test appointments, schedules were posted in the clothing change rooms at least one day in advance. The schedule sheets not only provided a visual reminder of test times, but also helped encourage miner participation by showing names of fellow miners who were to be or had been tested.

The scheduling of each survey was patterned around a mine's workday which usually consisted of three eight-hour shifts. Two groups of twelve miners each were scheduled for testing before each shift, so that a maximum of 72 working miners could be tested in one day. Due to uneven distributions of miners over the three shifts, a survey at a single mine usually required at least three days of testing, and sometimes extended into a second week. For efficiency, six of the miners in each group were given a hearing test while the other six filled out a questionnaire and had their ears examined otoscopically by an audiologist. After approximately fifteen minutes, the miners moved from the testing room to the conference room, or vice versa, to complete their session. Regardless of whether the miners initially had their hearing tested or filled out the questionnaire, they were first informed about the nature of the survey, assured of the confidentiality of the information to be obtained, and asked to sign a voluntary consent statement if they agreed to participate.

The questionnaire and otoscopic examination were designed for data analysis, categorization, and screening purposes. As such, the following types of information were sought: name, sex, age, address, job history, military service, non-occupational noise exposure, last notable noise exposure, relevant medical history, and otoscopically observable ear abnormalities. Names and addresses were requested so that each miner could be sent the results of his hearing test. Age and job history were needed to classify miners into particular groups for analyses of hearing data. Military service questions were designed to uncover the degree of exposure to heavy vehicle or gun fire noise. Likewise, questions about non-occupational noise exposure were asked to determine if a miner had a significant degree of noise exposure from recreational use of firearms or other specific activities. Although the hearing tests were conducted before the workshift to prevent contamination by temporary

threshold shift (TTS) due to recent noise exposure (see Appendix B), to further assure the absence of TTS a series of questions were asked pertaining to possible noise exposures after the miner had left his job the previous day. Other questions asked of the miners covered eight specific ear-related medical problems, with brief elaborations requested for "yes" responses. Finally, an otoscopic check was performed to determine the presence of visible irregularities that might affect the hearing test or indicate the need for medical attention. As each miner was tested, he was assigned a number to be used instead of his name during data handling and analysis, thereby assuring the confidentiality of his test results.

In addition to the working miners, a relatively small number of retired miners were also tested. These men were usually tested after the working miners, during the first two hours of the morning or afternoon shift. With this arrangement there was ample time for individual attention where required.

The hearing tests consisted of pure-tone, air conduction threshold measurements at six audiometric test frequencies. Six miners (maximum) were randomly assigned seats in the testing room and asked to listen to instructions telling them about the test, what to listen for, and how to respond by depressing and releasing their push-button hand switches. A typical instruction lecture used in this study is given below.

> "Behind each of you are a set of headphones and a hand switch. Please take them off of the hooks and hold them in your hands. In this hearing test, which will take about seven minutes, different sounds will be heard, first in your left ear and then in your right ear. When you hear the sound, press the switch button (show the switch button) and hold it down until the sound fades away. As soon as you no longer hear the sound, release the button. The instant the sound reappears, press the button again until the sound fades. Continue to press the button when you hear the sound and release the button when you cannot hear the sound until we tell you the test is over. Are there any questions? (Pause. Ask those wearing glasses or hats to remove them and those having hair over their ears to pull the hair behind their ears.) Place the red earphone on the right ear and the blue earphone on the left ear. (Check to make sure that the earphones are correctly placed over the ears to form an adequate seal against the subject's head.) There will be a short practice period, and if everything is okay the test will begin. Remember: when you hear the sound press the button, and when it goes away release the button."

With the miners' audiogram cards in their respective audiometers, all hearing tests were started simultaneously. A practice period was effectuated by placing all audiometers on "hold" at the 500 Hertz (Hz) test frequency until all subjects responded correctly. Instructions were repeated to individuals when necessary. With everything operating satisfactorily, the testing room door was closed and all audiometers were switched to "test" position. Using the button switches, miners controlled the tone intensity so as to oscillate about their hearing thresholds with all such oscillations being automatically recorded on the audiogram cards. Tones were presented for 30 seconds at test frequencies of 500, 1000, 2000, 3000, 4000, and 6000 Hz for the left and right ears. The audiometers were constantly monitored to detect peculiar occurrences which might require immediate action or subsequent retest, such as wide and inconsistent pen excursions or machine malfunctions. A sample audiogram is shown in Figure 6. Each change in direction of the pen tracing represents the subject's decision of "just beginning to hear" or "no longer hearing" the sound. All audiometers were permanently held (using special clamps) in the attenuator control position that allows testing of hearing levels between -10 dB and 90 dB.

Questions from miners about any phase of the survey were answered as opportunity presented, and inquiries about test findings were briefly discussed, including possible recommendations to see a physician. In those cases when an observation indicated that the miner should be informed immediately of a possible hearing disorder, the miner was told in private before leaving the audiometric van. The usual mechanism for handling individual findings was to mail the results to the miner and/or the doctor specified by the miner.

Upon completion of the testing, arrangements were made with the mine manager for later communication in the event additional information was needed. Occasionally ages, job categories, or addresses of tested miners were found to be missing from the questionnaires. In some instances the ages of the miners <u>not</u> tested were sought to help clarify factors affecting voluntary participation.

GENERAL DESCRIPTION OF THE ACQUIRED DATA BASE

Table 1 presents a summary tabulation of the makeup of the final survey sample including daily coal production level, number of miners at the mine, number of miners tested, percent tested, number in the selectively screened sample, and percent of tested miners who were retained in the screened sample. Production level estimates obtained during the MESA noise surveys range between 750 and 7200 tons per day as illustrated earlier in Figure 1. These estimates were used to divide the mine sample into high and low production groups for a comparative analysis of hearing levels which will be described later. The total number of miners tested (not including retired miners) was 1349, thus comprising 55% of the total number of miners (2456) at the mines.

The overall age distribution of the miners actually tested is shown in Figure 7. Nearly half of the sample consists of working miners who are between 45 and 65 years of age. Of the 150 former or retired miners tested, the majority were at least 65 years old; however, only five working miners (0.4%) were over age 64. A few retired miners fell in the 45 to 54 year age group. The line graphs in Figure 8 show the age distributions for all miners on the payroll at each of the eleven mines in the sample, as well as the composite age distribution for all mines. The mines are arranged in order from the lowest to highest production mine and show considerable variation. Age distributions of the four lowest production mines and the three highest production mines have been consolidated, and the results are shown in Figure 9. Also plotted is the age distribution from an originally selected mine with a low production level, which shut down before this study was started. A good match between the low production group and the unsurveyed mine suggests that no bias due to age distribution resulted from not being able to survey the originally selected mine.

Percent-participation versus age is plotted in Figure 10. The percentages represent the ratio of working miners who voluntarily participated in the study to the total number of miners on the payrolls at the eleven surveyed mines. Besides overall participation percentages, the percentages for the groups of low production and high production mines are also plotted. The figure shows that older miners participated more readily than the younger miners. Furthermore, consistently more participation was achieved in low production mines than in high production mines.

Perhaps another factor influencing participation is revealed by plotting percentage of miners tested versus number of miners on the payroll at the mine, as in Figure 11. Smaller mines (fewer miners) had higher participation rates. (This result is compatible with Figure 10 since smaller mines generally have lower production). Possible explanations for such differences in participation rates are that (1) communication within smaller mines is easier and (2) extended on-site testing (a week or more), required for mines having large working populations, loses appeal to voluntary subjects.

Occupational codes (based on current job descriptions) were assigned to most of the miners who participated in the study. Some of the miners could not be matched with codes because their names were not included in the MESA noise survey data and the job descriptions on the questionnaires were not specific enough. A list of job descriptions, occupational codes, and numbers of miners matched with the codes is given in Table 2. The occupational code information was supplied by MESA and was current as of April 19, 1972. The codes are divided into five main categories: Section Worker (Face), General Underground (Non-Face), Underground Transportation (Non-Face), Above Ground, and Supervisory and Staff. Of all miners matched with codes (1065), 52% had jobs at the face and 27% had jobs underground but away from the face. In a later section of this report, these occupational codes are used to select groups of miners for an analysis of high versus low noise exposure.

Exclusion Criteria for Screening the Sample

To develop valid statistical relationships for comparing coal miners to other samples of noise exposed workers and for relating hearing loss to daily noise exposure, the hearing data were screened using a set of exclusion criteria. In this report the term "exclusion" indicates deletion of test data, and the remaining data represent the "screened sample." However, data that were thus eliminated were not discarded, but were retained for inclusion in gross statistical analyses of unscreened data. The numbers given in Table 1 for the screened sample indicate the large amount of excluding that was necessary. Two basic criteria were used to exclude data: (1) uncertainty as to noise exposure history or validity of audiogram and (2) evidence that hearing loss might have been caused by some factor other than occupational noise exposure. The specific evaluation procedures are given below:

1. Data were excluded if a subject's previous job history included two or more years of other work assignments in a noisy job.

2. A military history for each subject was obtained to include number of years in the service, number of years in combat, type of job performed, and weapon firing history. Exclusions were based upon: (a) exposure to weapons-type noise for a total of 100 days or more, (b) one or more years of actual combat experience, or (c) routine daily exposure to non-weapon type noise, e.g., noise from aircraft engines or armored vehicles for two years or more. However, those few workers who wore ear protection were not necessarily eliminated in the screening process.

3. Consideration was given to non-occupational noise exposure, including the extent of recreational use of firearms and the frequency and duration of participation in such activities as motorbike riding, mechanized farming, piloting an airplane, machine workshop activity, and sport or drag racing. Recreational firearm shooters who did not use hearing protectors and were exposed to (a) 1000 rounds per year for one or more years; (b) 500 rounds per year for five or more years; or (c) at least 2500 rounds over their lifetime, were also excluded. Any subject who participated in a very noisy off-job hobby (e.g. rock musician), other than shooting, was excluded if this participation was at least three times per week for one year or more.

4. Data were excluded if there was a history of severe head trauma, chronic ear infection, or hereditary deafness in the family. Exclusions were also predicated upon certain other conditions, e.g., Meniere's disease; use of ototoxic drugs; history of previous ear surgery; concurrent severe head colds; or tinnitus at the time of testing.

5. An otoscopic examination of the aural canal and ear drum was made by a trained audiologist to determine the presence of visible abnormalities. A subject's data were excluded if there existed any indication of (a) congenital or acquired ear malformations, (b) almost total occlusion of the ear canal by cerumen in combination with the appearance of abnormal low frequency hearing levels, (c) perforated or severely scarred tympanic membrane, or (d) active ear involvement, e.g., otitis media. (Miners who exhibited signs of ear pathology or abnormality were referred to their physician for subsequent evaluation or treatment.)

6. If the subject had not been out of the working environment for 14 hours or more or if he had significant noise exposure prior to taking the audiometric test, his data were excluded.

7. Exclusions based on audiometric irregularities included: (a) invalid audiogram because the subject could not respond correctly or the audiometer malfunctioned, (b) uninterpretable hearing levels at all frequencies characterized by strangely wandering tracing, and (c) hearing losses in one ear which were 40 dB greater than in the other ear at two or more test frequencies.

Whenever there were grounds for applying one of the above criteria, the worker was assigned an appropriate exclusion code. For each exclusion criterion, Table 3 lists the total number of miners who were excludable (i.e. they "failed" the criterion). Also, in the second column these numbers are expressed as fractions of all miners who were excludable for any reason, and in the last column as fractions of all miners whose hearing was tested (1349).

Presentation of Hearing Statistics

An analysis of hearing was performed to reveal the hearing loss and prevalence of impairment in both the screened (337), and unscreened (1349) sample of coal miners. Statistics from the National Health Survey (NHS) 1960 to 1962[11] and the NIOSH Occupational Noise and Hearing Survey (ONHS), 1968 to 1972[12] have been used for comparison. The individual hearing data of working coal miners used in this analysis appear in Appendix D without personal identifying information. Along with hearing data, several other types of information are presented: age, mine number (according to Table 1), job category (if known), information relating to exclusion criteria, and years of experience in coal mining. The hearing data have been adjusted for deviations in audiometer output which were measured during the calibration check procedure at each mine. The listed data are arranged in order by age.

Coal Miner Hearing Statistics: Unscreened Data

To display the hearing statistics of the unscreened sample of miners, median hearing levels were plotted against frequency for all miners and compared to the median NHS hearing levels (see Figure 12). The NHS data were collected from a broad cross section of residents of the United States and were not screened for noise exposure or other factors. The data are separated into 5 age groups, with median hearing level for the "better ear"* as the parameter. The number of miners within each age group, for each data analysis, is given by the "N" values

* The term "better ear" refers to use of the better hearing level (left or right) at each test frequency. (This definition was applied in the NHS report, reference 11.)

appearing on the graphs. The first two plots, representing ages 18-24 and 25-34, indicate that the hearing levels of the miners are essentially identical to the hearing levels of the NHS general population at the lower audiometric test frequencies. In the subsequent age groups, hearing of the miners is shown to become increasingly poorer than the NHS general population, especially in the high frequencies. For the middle-age groups there is a large divergence (about 25 dB) at the noise-susceptible frequency of 4000 Hz, and the gradual spread of hearing loss towards the lower (speech) frequencies is evident. Three age groups of retired miners are compared with the NHS general population in Figure 13. Although the sample sizes are small, there is some indication of greater losses at all test frequencies and the expected "tailing off" at 6000 Hertz due to aging effects is displayed. (One might suppose that this analysis could include only those audiograms with interpretable hearing levels at all test frequencies for both ears. Instead, each pair of hearing levels, left and right, for every test frequency was considered independently and collected with all other pairs from the same frequency. The summary analysis of hearing level distribution at one frequency may thus include a different number of data points than at another frequency. Whenever a hearing level was uninterpretable, then the number of data points at that frequency was reduced.)

The progression of hearing loss is illustrated in another way in Figure 14. Using the American Academy of Ophthalmology and Otolaryngology (AAOO) criteria for defining hearing impairment, curves are plotted to show the percentage of the coal miners evidencing hearing impairment versus age for all miners tested and the NHS population. According to the AAOO criteria, hearing loss becomes a handicap when the ability to hear conversational speech is impaired. One index often used for speech reception ability is the average of hearing levels at 500, 1000, and 2000 Hz. Using this index, AAOO defines a "fence" of 25 dB as the beginning of impairment, using "better ear"* data. Losses between 25 and 40 dB are considered "slight," and those between 40 and 55 dB are considered "mild" handicaps. According to the NHS data, by age 60 about 10% of the general population has "slight" hearing impairment, whereas the unscreened coal mine sample has the same incidence of "slight" handicap by age 40. Thereafter, the increase in incidence proceeds with advancing age at about the same rate for both coal miners and the NHS population. However, since they have gotten a head start, the incidence of impairment in middle-aged working miners (over 10% at age 40) is comparable to that

* AAOO uses the term "better ear" (left or right) to rate hearing handicap and is defined as the better average of the hearing levels at 500, 1000, and 2000 Hertz.

of the general population at retirement age. At age sixty, over three times as many coal miners have a "slight" handicap as do the NHS subjects. The incidence of middle-aged miners with "mild" handicap is far less than those with "slight" handicap; but, nonetheless, is three times that of the NHS sample in the same category. The sample of retired coal miners indicates an even higher incidence of both "slight" and "mild" handicaps but may not be representative due to the small sample sizes.

Coal Miner Hearing Statistics: Screened Data

After application of the exclusion criteria discussed earlier, the hearing data for the resulting screened group were subjected to a similar statistical analysis. It was decided that the NHS data would no longer represent a fair basis for comparison since those data were derived from an unscreened population. Instead, the statistical model for non-noise exposed workers developed by NIOSH from hearing data collected during a series of industrial surveys[2] was elected for use.* Bilateral threshold averages were used in the analysis, since noise induced hearing loss is generally regarded as occurring in both ears. Figure 15 includes five graphs, representing the same age ranges used earlier, that illustrate the magnitude of hearing loss incurred by the screened group of miners relative to that of the non-noise exposed population from ONHS. The solid and dashed lines describe the median hearing levels of the coal miner and ONHS groups, respectively. The vertical geometrical figures (polygons) are used to indicate the 10th, 25th, 75th, and 90th percentile points of the raw hearing level data. The polygons to the left of the data points represent the coal miner data, and the polygons to the right represent statistical distributions for the NIOSH (ONHS) non-noise-exposed workers.

Until age 35 is reached, the miners show only slightly elevated (poorer) high frequency threshold levels. In the 35 to 44 age group, there is a dramatic change for the worse in the high frequency (around 400 Hz) hearing ability of the miners, contrasted graphically by the lack of dramatic change in the NIOSH non-noise data. A comparison of hearing levels at 4000 Hz shows a median difference of less than 10 dB in the 25 to 34 age group, but grows to over 25 dB in the 35 to 44 age group. The spread of hearing loss to the lower frequencies is also noticeable in the middle age groups, with the high frequency deficit remaining.

The analysis of incidence of hearing impairment in the screened group differed somewhat from that used for the unscreened data. In recent

* The non-noise exposed model is described in detail in Appendix C.

years it has been suggested that the average hearing level at 500, 1000, and 2000 Hz is not the best indicator of a person's ability to understand and discriminate normal conversational speech under typical environmental conditions. NIOSH feels that more emphasis of high frequency components is needed, particularly when the goal is to assess the health impact of occupational hearing loss produced by borderline levels of noise exposure, and has suggested a hearing level index slightly different than that used by AAOO for identification of impairment.[3] This index, like the AAOO criteria, is generally used with a 25 dB fence; but instead of "better ear," uses the average of both ears for the frequencies of 1000, 2000, and 3000 Hz in evaluating hearing impairment for large, screened samples. (The index is not necessarily intended for evaluation of handicap in individual cases.) Using this index, percentage impairment vs. age is plotted in Figure 16. Coal miners show a greater percent of impairment for both the 25 and 40 dB fences than do the NIOSH non-noise group at each age level. Of the miners at age sixty, 70% have a hearing level index greater than the 25 dB fence, while only a third as many in the non-noise exposed group are so impaired. Although the percentages are smaller for those people exceeding a fence of 40 dB, the ratios of miners to the non-noise exposed groups are even greater than for the 25 dB fence.

Since the hearing statistics substantiate the previously suggested hazard of coal mine noise, it is interesting to see how the miners' hearing compares to workers in other industries with known noise exposures. From the ONHS data for noise exposed workers, median hearing levels for the average of both ears versus test frequency were obtained for workers with 90 and 95 dBA nominal workday noise exposures. These hearing levels are compared to corresponding hearing levels for the screened miner data in Figure 17. For the younger ages, the coal miner data fit closely with those of the 90 dBA noise exposed group. For the older ages, the miner data lie between that of the 90 and 95 dBA noise exposed groups, except at 4000 Hz where miner hearing levels closely approximate the 95 dBA noise exposed group.

The Effects of Screening Upon the Data Base

During the course of the coal miner study, considerable effort was expended toward being able to screen the sample to exclude those who might have incurred hearing loss for some reason other than exposure to mining noise. The effects of the screening are displayed in Figure 18, where the 10th, 25th, 50th, 75th, and 90th percentile average hearing levels for all tested miners versus the screened group of miners are plotted for the five age groups. At nearly every point on each curve the screened

miners exhibit better hearing threshold levels than the unscreened group. The largest differences are evident in the 75th and 90th percentiles, representing the most significantly impaired miners. These differences illustrate that there was, in fact, a reason to screen the sample (see, however, the discussion under the heading "The Use of Exclusion Criteria" in Appendix B) and that the procedure was successful in eliminating many of those whose hearing loss may have been caused by various factors in combination with mining noise.

Left-vs.-Right-Ear Comparisons

Graphs depicting distributions of hearing levels of left versus right ear were plotted for all miners (Figure 19) and the screened group of miners (Figure 20). The graphs show that left ears were poorer for both groups at all test frequencies. One possible explanation for the left-right differential lies in the sequence of test tone presentation. With the type of automatic audiometer used, the left ear was always tested first. It is possible that additional learning or familiarization effect could have occurred as the subject proceeded through the hearing test. However, the NHS results also indicate a tendency towards greater sensitivity in the right ear (above 1000 Hz) even though a procedure of alternating the test sequence from subject to subject was used.[11] In general this finding would tend to imply that right ears typically have greater sensitivity than left ears.

ANALYSES WITH RESPECT TO SELECTED FACTORS

Three factors were investigated to provide insight into their possible contributions to the decline of hearing among coal miners. The first investigation was based on the conjecture that differences in mining procedure between high and low production coal mines might have a relationship to the occupational noise environment and consequently the hearing of the miners.

The other two factors investigated were recreational use of firearms, and otoscopically observable ear abnormalities. Firearms usage was regarded as possibly important because it is a well known cause of hearing loss to which a large percentage of the coal miners were exposed. The impetus for an analysis with respect to the otoscopically observed abnormalities was the unusually high percentage (25%) of miners who demonstrated irregularities of the middle or external ear structures. Besides occupational noise exposure, these last two factors were suspected as being partially responsible for the differences in hearing levels between coal miners and other population samples.

High Versus Low Production

Based on the estimates of production available at the time of the noise survey, the four mines with the lowest daily coal production (1-4 in Table 1, 750-1600 tons/day) were classified as a "low production" group, Figure 21 shows a comparison of the hearing threshold levels between the high and low production groups using the "better ear" hearing level at each test frequency (see footnote on page 18). The analysis reveals that coal production was not a major correlative factor in the hearing levels of the miners. Those miners who worked in the high production coal mines exhibited slightly better hearing acuity on the average than the workers employed in low production mines.

Recreational Use of Firearms

Shooting of firearms represents a non-occupational noise exposure for coal miners that can cause hearing impairment. To evaluate such an effect, two groups of miners were selected to represent the extremes with respect to firearms use: (1) those miners who indicated that they had fired 500 rounds per year for at least six years or more than 1000 rounds per year for at least three years, were classified as "heavy shooters," and (2) the miners who indicated that they had never been exposed to firearm noise were classified as "non-shooters." Using these criteria,

17% of the total miner population (N=224) were classified as "heavy shooters" and 31% (N=424) were "non-shooters." The group of shooters was rather evenly distributed between all age groups. As shown in Figure 22 a comparison of the "heavy shooters" versus "non-shooters" suggests that recreational use of firearms caused the hearing thresholds of the younger shooters to be poorer than non-shooters of the same age group. However, by the time the subjects were 55 years old there was no difference between the auditory sensitivity of the heavy shooter and non-shooter groups. Thus one might tentatively conclude that, after prolonged exposure to the noise of the coal mines, heavy shooters and non-shooters exhibit similar hearing sensitivity.

Otoscopically Observable Abnormalities

In Figures 23, 24, and 25, "poorer ear" audiometric thresholds obtained from miners excludable for otoscopic reasons (334) were compared with the thresholds of all miners having no otoscopically observed irregularities (986). As shown in Figure 23, the most notable differences in audiometric thresholds were found in the 25-34 year age group. The miners excluded for otoscopically observed irregularities consistently showed more group-average hearing loss than those without such irregularities but the differences were seldom greater than 10 dB. Both of these groups included some miners who were excludable for reasons other than an otoscopic anomaly. Figure 24 shows the comparison between the hearing thresholds of miners who were excludable on otoscopic grounds only (96) and those who evidenced no cause whatever for exclusion (i.e. the screened population). The comparison of these groups reveals a greater difference in the hearing thresholds than noted in the aforementioned comparison. (Those miners excluded on otoscopic grounds had poorer hearing than the screened sample in nearly all age groups).

In Figure 25 the hearing levels are presented for the screened sample of miners and for the combination of the screened sample and those miners who were excludable for otoscopic reasons only (430). The addition of the "otoscopic exclusions" group to the screened sample does not change the median or percentile data by more than 2 dB. (Similar comparisons made using "better ear" data indicated even less of a difference between miners excludable for otoscopic reasons and those having no otoscopically observed irregularities.)

CORRELATION OF HEARING LOSS WITH NOISE EXPOSURE AND JOB CATEGORY

Although the main thrust of this study was to document hearing levels of coal miners, an effort was also made to correlate these data with job categories and with daily noise exposures based upon data supplied by MESA. Unfortunately, several restricting factors severely limited the accurate determination of a miner's noise exposure over his working lifetime: (1) miners changing jobs within a mine or transferring to other mines, (2) changes in mining machinery and procedures over the years, (3) highly intermittent nature of the noise exposure, (4) (Occasionally) use of hearing protectors, and (5) the inability of a single noise survey to adequately represent the noise exposure accrued over a period of years.

Indeed, the job mobility was so great that for most miners it was impossible to select one single job description as being representative of the miner's work history. Thus it is not surprising that attempts to correlate hearing loss with noise exposure or job category met with little success. The sections that follow present results of a comparison of the hearing levels of two job categories selected to represent the probable extremes of noise exposure, and the results of an attempt to perform a regression analysis of hearing loss versus daily noise dose.

High-Versus-Low-Noise Job Category

A "high noise" group of miners working at the face was selected, consisting of the following jobs: Continuous Miner Operators and Helpers, Loading Machine Operators and Helpers, and Roof Bolters (job codes 035, 036, 042, 043, 046, 048). The "low noise" group was defined for simplicity as all miners working away from the face (i.e., job codes 100 or greater) who had no more than two years of experience at noisy jobs other than their present job. Median audiometric thresholds from the high and low noise groups are compared in five age groups in Figure 26. For miners under age 35, the high noise group exhibited poorer thresholds than the low noise group, but the differences become less distinct at higher ages, probably due to the unreliability of single job descriptions to represent the working lifetime.

Summary of Noise Survey

In accordance with policy established at the outset of this research project, MESA personnel performed the noise surveys at the eleven mines included in this study. Noise levels and durations were recorded during the day shift for each type of operation in the mines. All miners who had jobs associated with a particular surveyed operation were assigned a daily noise dose which corresponded to that operation.

Daily noise dose (D) is a measure of noise exposure for the workday and is computed when there are two or more periods of noise exposure at different levels. The computation is performed by adding fractions which are represented by the symbol "C /T ," where C indicates the total time of exposure at a specified noise level and T_n indicates the total time of exposure permitted at that level. The permissible times of exposure for given noise levels are presented in Table 4 and are based on the current Federal noise limits of 90 dBA for 8 hours with an increase of 5 dB for each halving of time (e.g., 95 dBA is allowed for 4 hours). Daily noise dose is expressed in terms of percent, and if D is greater than 100% (1.00), the Federal limit has been exceeded. (Table 4 also lists permitted durations for two modified dose formulas D_e,D_p; these will be discussed later.)

Figure 27 presents histograms showing the distribution of daily noise dose, D, across the population of coal miners. The solid bars represent the histogram for 2049 miners who were employed at the mines when the noise surveys were performed by MESA. The other histogram shown in the same figure represents 1030 working miners whose hearing was tested by NIOSH. Clearly the distributions are comparable. (The similarity between the histograms confirms the fact that the noise exposures of the NIOSH sample population were representative of the coal mines included in the survey. A further discussion of this fact, including implications with respect to subject self-selection, is included in Appendix B.)

Almost one third of the miners had a daily noise dose (D) equal to zero based on noise measurements which were recorded for levels equal to or greater than 90 dBA (the "cutoff" for the Federal regulations). For nearly 50% of the miners, D was between 0 and 0.6. Only 12% had a D greater than 1.0; but some noise exposures far exceeded the maximum permissible levels. These extremely high values of D should not be taken as characteristic of coal mining noise, and may, in fact, represent an unusual situation on the day of the noise survey. (Noise exposure data are given in Appendix E.)

More stringent occupational noise exposure limits have been proposed by NIOSH (see "Criteria for a recommended standard...Occupational Exposure to Noise," Report No. HSM 73-11001, GPO # 1733 00007) and EPA (see "39 Federal Register, Dec. 18, 1974, p. 43802"). These and other proposals have considered the following three questions:

> What steady noise level (dBA) should produce a 100% dose in 8 hours; i.e., what should the permitted level be for an 8-hour exposure?
>
> Should the trading relationship between intensity and duration be 5 dB per halving of duration (as in the current Federal Standard) or 3 dB per halving of duration (the so called "equal energy rule")?

How far down should the rule extend; i.e., what lower "cutoff" level should be used in integrating dose?

In order to explore the effect of different answers to the second and third of these questions, while assuming an 8-hour limit of 90 dBA for the sake of argument, two modified formulas for dose were defined. "D_e" was defined to have an 85 dBA cutoff with a 3 dB-per-halving rule; and "D_p" was defined to have an 85 dBA cutoff with a 5 dB-per-halving rule. (Recall that "D" was defined with a 90 dBA cutoff and a 5 dB-per-halving rule.) The permitted duration limits corresponding to these two modified dose formulas are shown in the last two columns of Table 4. For comparison purposes, Figure 28 presents histograms of noise exposure for the 2049 miners covered by the MESA survey, shown for each of the three definitions of dose, D, D_e, D_p.

Regression Analysis

An analysis was attempted to determine the relationship between hearing loss and noise dose to achieve the following two purposes: First, to provide a quantitative evaluation of the significance of noise as a causal factor in the development of hearing loss; and second, to provide a means of comparing different formulas for noise dose; i.e., the best formula is the one that provides the most consistent correlation between noise exposure and hearing loss.

In view of the previously discussed difficulty in classifying the miners by noise exposure, it was anticipated that problems might be encountered. The average of hearing thresholds at 3000, 4000, and 6000 Hz was used as an indicator of noise induced hearing loss. These frequencies, which are the ones most sensitive to noise exposure, were selected in order to maximize the chances of success in correlating noise with hearing loss. Linear regression analyses were then performed for each of the noise dose definitions, D, D_e, and D_p, and for five age groups. The resulting correlations were so small that the results are not presented here. However, all correlations were positive; i.e., increasing noise was correlated with increasing hearing loss. It was impossible to conclude which of the defining formulas for noise dose was best.

It may be argued that direct linear regression is not appropriate; e.g. the use of the logarithm of noise dose might be more reasonable. However, before proceeding with any nonlinear analyses, the data were broken down into a succession of noise dose categories. When median audiograms were plotted as a function of noise dose category, no clear relationships were seen, and it was concluded that further attempts at nonlinear analysis would be futile.

There is some question as to whether the sample of noise exposure patterns reported by the MESA survey contained sufficient variety to distinguish between the various defining formulas for noise dose, even if a strong correlation had been found. This subject is described further in Appendix B, under the section "Optimizing the Formula for Daily Noise Dose."

CONCLUSIONS

Several conclusions can be drawn from the foregoing analyses:

1. The results of this study indicate that coal miners have measurably worse hearing than the national average. Moreover, when the data are screened to exclude irrelevant factors insofar as possible, the coal miners still show worse hearing on the average than workers not subjected to excessive occupational noise. The incidence of hearing impairment is greater, and the characteristics of the hearing test results are suggestive of noise-induced hearing loss.

2. The degree of hearing loss is not so severe as has been seen in some other occupational groups. Certainly not all coal miners have bad hearing; in fact it requires a statistical study of a large group of miners to reveal that their hearing is worse than the national average. The data presented in this report suggest that the impact of the coal mine noise exposure upon the average miner is roughly equivalent to that of working in a factory where the noise level is between 90 and 95 decibels (dBA). However, based on the rates of incidence of hearing impairment alone, the problem of hearing loss among coal miners is unquestionably serious enough to warrant attention and preventive action.

3. If one assumes that the data obtained by the Mining Enforcement and Safety Administration are generally representative of the severity of noise exposures during the last twenty years or more, then it appears that the hearing loss is somewhat greater than would be predicted using the current formula for assessing noise dose. An examination of the histogram for daily noise dose, D, (see Figure 28) suggests that for the vast majority of the working miners the "equivalent" single noise level might be only 85 to 90 dBA. The histogram also reveals a few instances of exposures to very intense noise, but if these are limited to a small fraction of the coal miner population their effect upon the hearing statistics should only amount to a shift of a few percentile points. Hence the hearing statistics are slightly worse than might have been predicted. However it may be true that most coal miners, at some point in their careers, are exposed to a very intense noise for a sufficient number of months to produce hearing loss, even though only a small fraction of miners are exposed to such noises at any given time. This could easily explain the additional hearing loss.

4. When combined with the MESA coal mine noise survey data, the results of the hearing study do <u>not</u> lend support to the notion that coal mine noise, because of it's being highly intermittent, is far less hazardous than predicted by noise survey data.

5. Insofar as identifying the hearing statistics of the population of coal miners as a whole, it is unlikely that a more extensive study would yield markedly different results from those presented here. For 90% confidence intervals the random error in determining the median hearing levels amounts to no more than a couple of decibels at most, and the probability of significant systematic errors is judged to be slight.

6. It is very difficult to find coal miners with uniform job/noise histories, and therefore almost impossible to classify them into homogenous noise exposure categories. Although it might be feasible to design a scientific study to examine only those miners who have worked at only one single job throughout their careers, such a group would be so uncharacteristic of the population that the chances for systematic error or bias might be significant.

7. For the reason described above, it will probably not be possible to perform a study of coal miners that will critically define the relationship between hearing loss and coal mine noise per se. Rather, standards for coal mine noise will of necessity rest heavily upon the results of scientific studies of other occupational groups, and upon controlled laboratory studies of animal and human subjects.

8. Preliminary evidence suggests that the incidence of otoscopically observable ear abnormalities is unusually high among coal miners. A research project is currently underway to confirm this evidence and, ultimately, suggest possible causes.

9. The results of this study reaffirm the need for effective hearing conservation practices, including quieting or replacement of particularly noisy machinery, periodic audiometric testing of the hearing of individual miners, use of personal ear protectors as appropriate, and education of the miners as to the degree of risk due to noise, as well as preventive methods. Furthermore, the study underscores the need for further research by means of controlled laboratory experiments simulating the coal mine environment, and by occupational hearing loss surveys where the noise exposures approximate those found in coal mines.

LIST OF REFERENCES

1. Robinson, D. W., Ed. Occupational Hearing Loss. Academic Press, London & New York. 1971.

2. Lempert, B. L., and T. L. Henderson. Occupational Noise and Hearing 1968-1972. HEW Publ No. (NIOSH) 74-116. U.S. Department of Health, Education, and Welfare, National Institute for Occupational Safety and Health. 1973.

3. Criteria for a Recommended Standard. . .Occupational Exposure to Noise. HSM 73-11001. U.S. Department of Health, Education, and Welfare, National Institute for Occupational Safety and Health. 1972.

4. Lamonica, J. A., R. L. Mundell, and T. L. Muldoon. Noise in Underground Coal Mines. Bureau of Mines, U.S. Department of the Interior, Washington, D.C. Report No. 7550.

5. Lumio, J. S. Noise and Hearing Ability. Industrial Medicine and Surgery, Vol. 34, pp. 404-406, 1965.

6. Sataloff, J., L. Vassallo, and H. Menduke. Hearing Loss from Exposure to Interrupted Noise. Archives of Environmental Health, Vol. 18, pp. 972-981, 1969.

7. Begov, A. The Location of Auditory Lesions Caused by Noise and Vibration. Transportni Medicinski Vesti, Vol. 14, No. 2, pp. 22-29, 1968.

8. Jirak, Z. Hearing Loss Caused by Noise in Miners in the Ostrava-Karvina Coal Field. Internationales Archiv Fur Arbeitsmedizin -- International Archives of Occupational Health, Vol. 28, No. 1, pp. 49-61, 1971.

9. Schwetz, F., and G. Stahl. The Relationship between Occupational Noise and Hearing Loss. Kampf Dem Larm, Vol. 16, No. 2, pp. 47-50, 1969.

10. Jewell Ridge Coal Corp. Applies Laser Instrumentation at an Underground Mine, Coal Age, June 1974, pp. 72-75.

11. Hearing Levels of Adults by Age and Sex, U.S.P.H.S. Publ. No. 1000 - Series 11, No. 11. National Center for Health Statistics, U.S. Department of Health, Education, and Welfare. 1965.

FIGURES

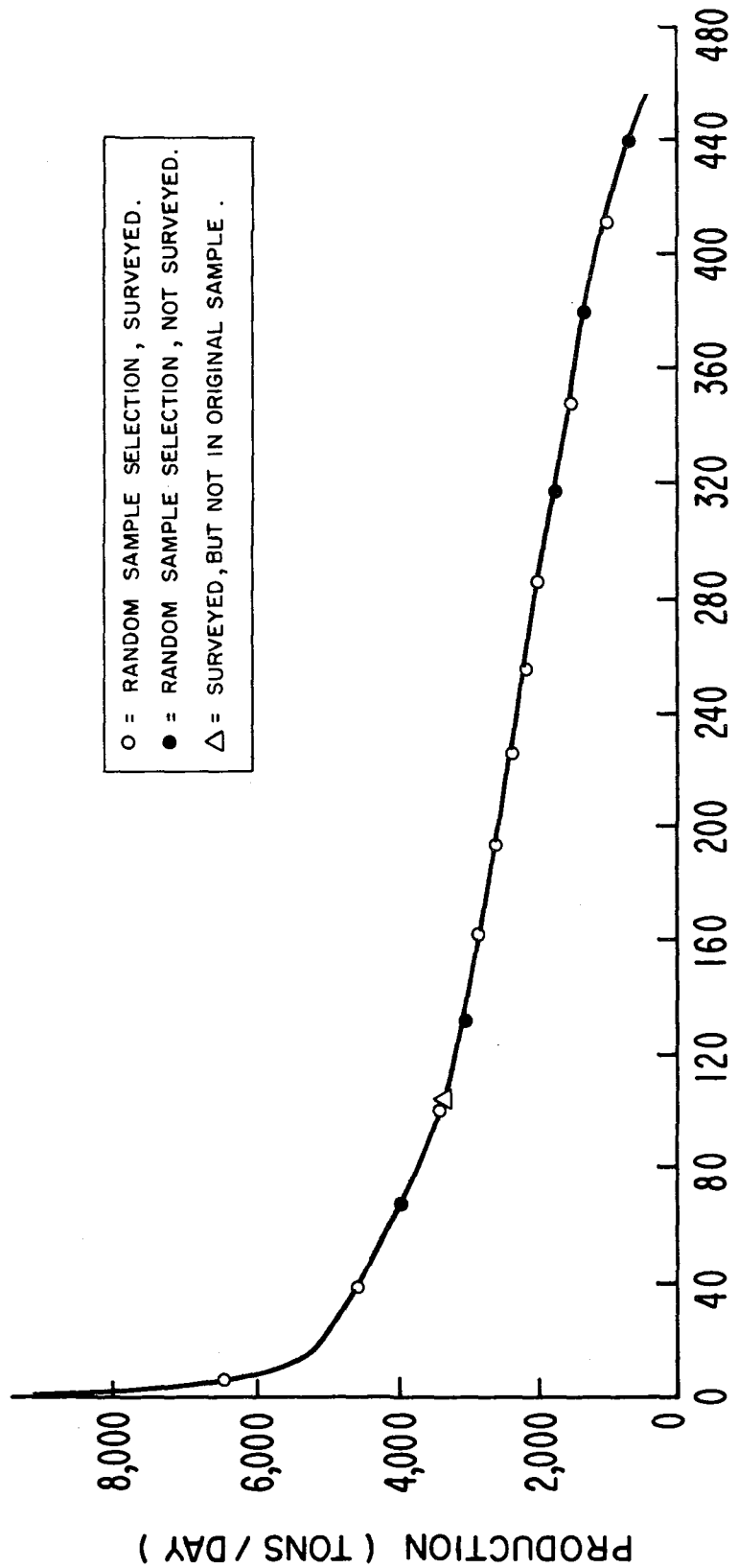


Figure 1. COAL PRODUCTION ESTIMATES USED IN SELECTING THE MINE SAMPLE

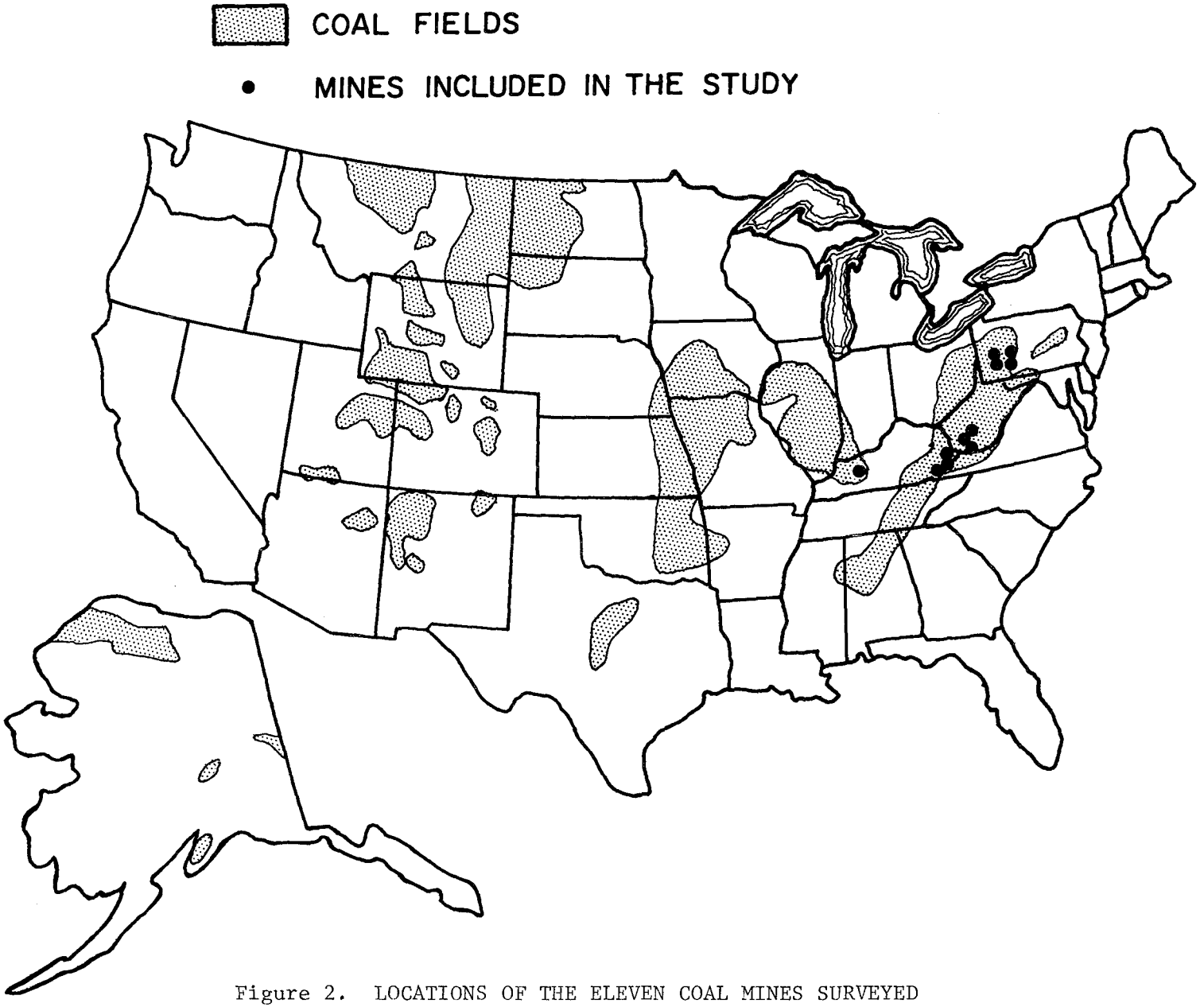


Figure 2. LOCATIONS OF THE ELEVEN COAL MINES SURVEYED

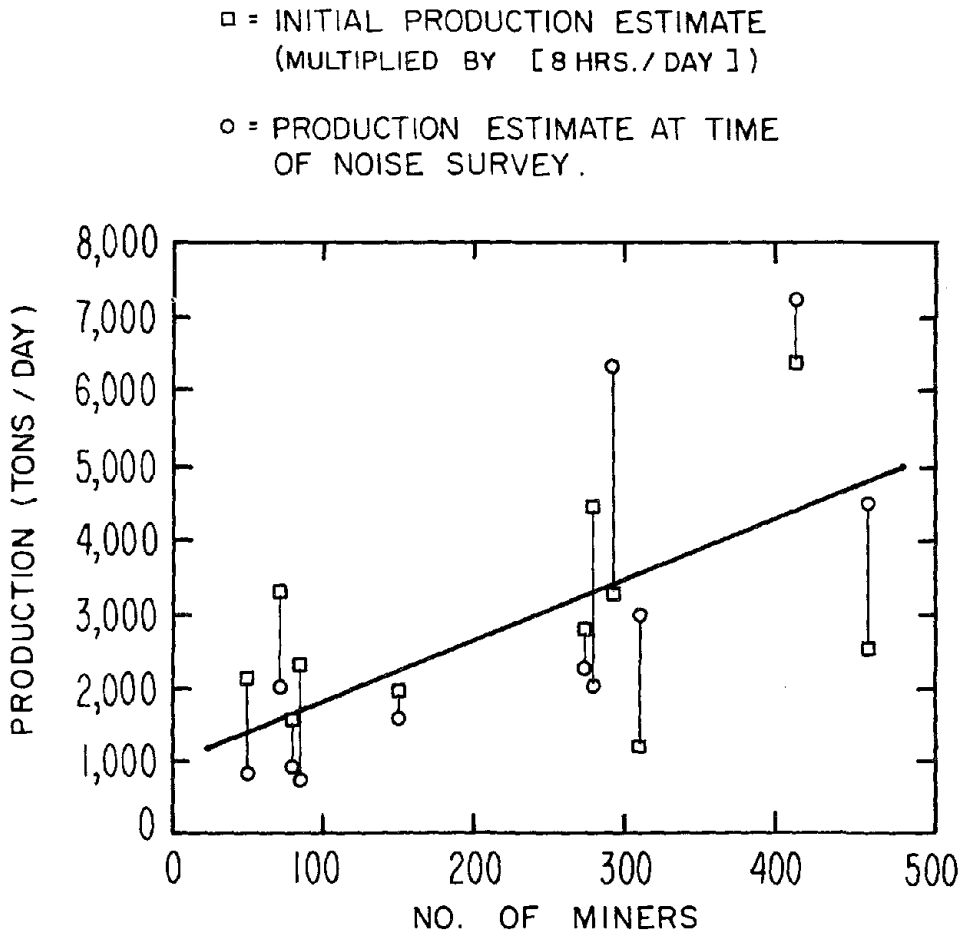


Figure 3. COAL PRODUCTION ESTIMATES AS A FUNCTION OF NUMBER OF MINERS, for the eleven mines in the study.

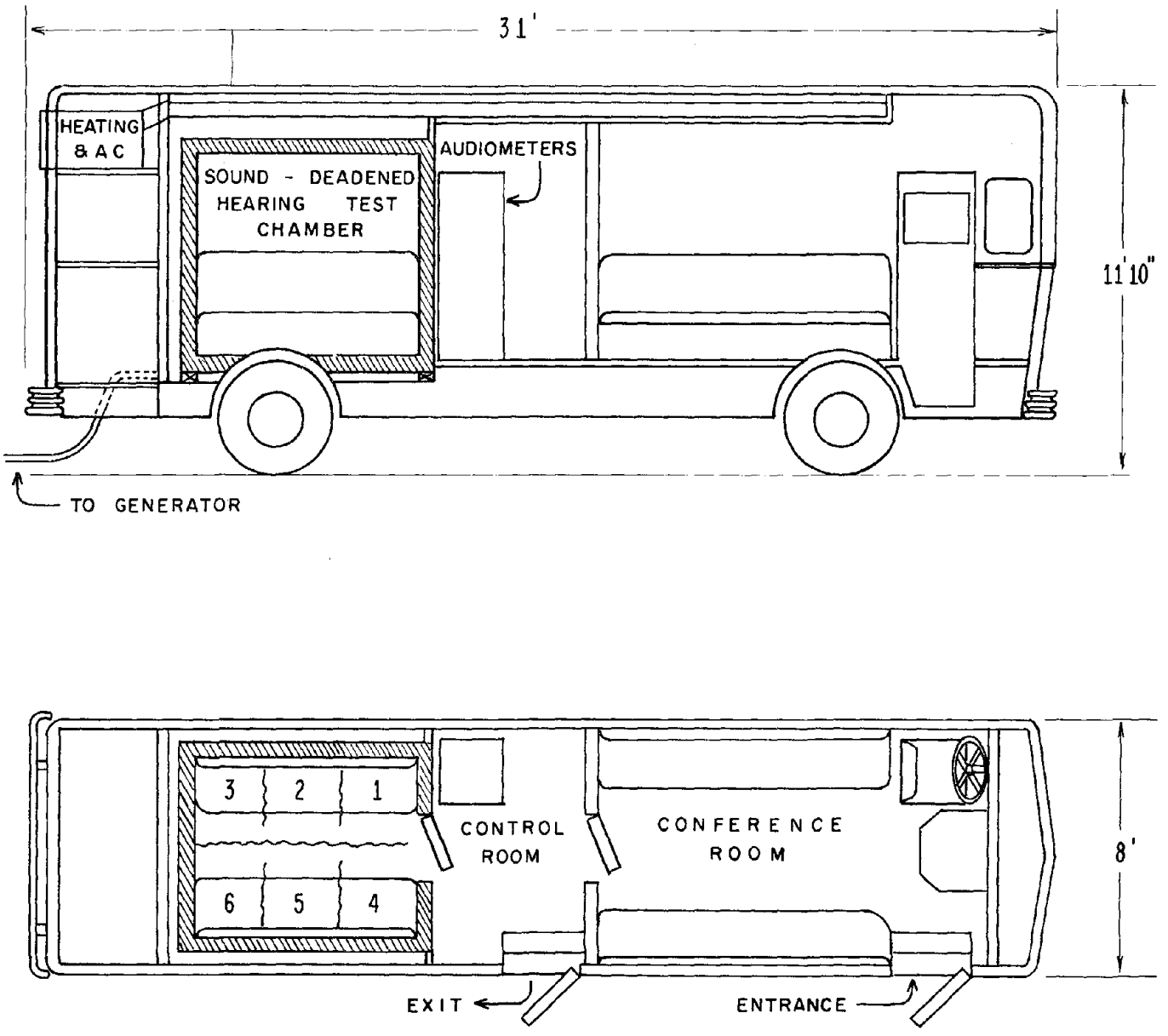


Figure 4. LAYOUT OF AUDIOMETRIC VAN

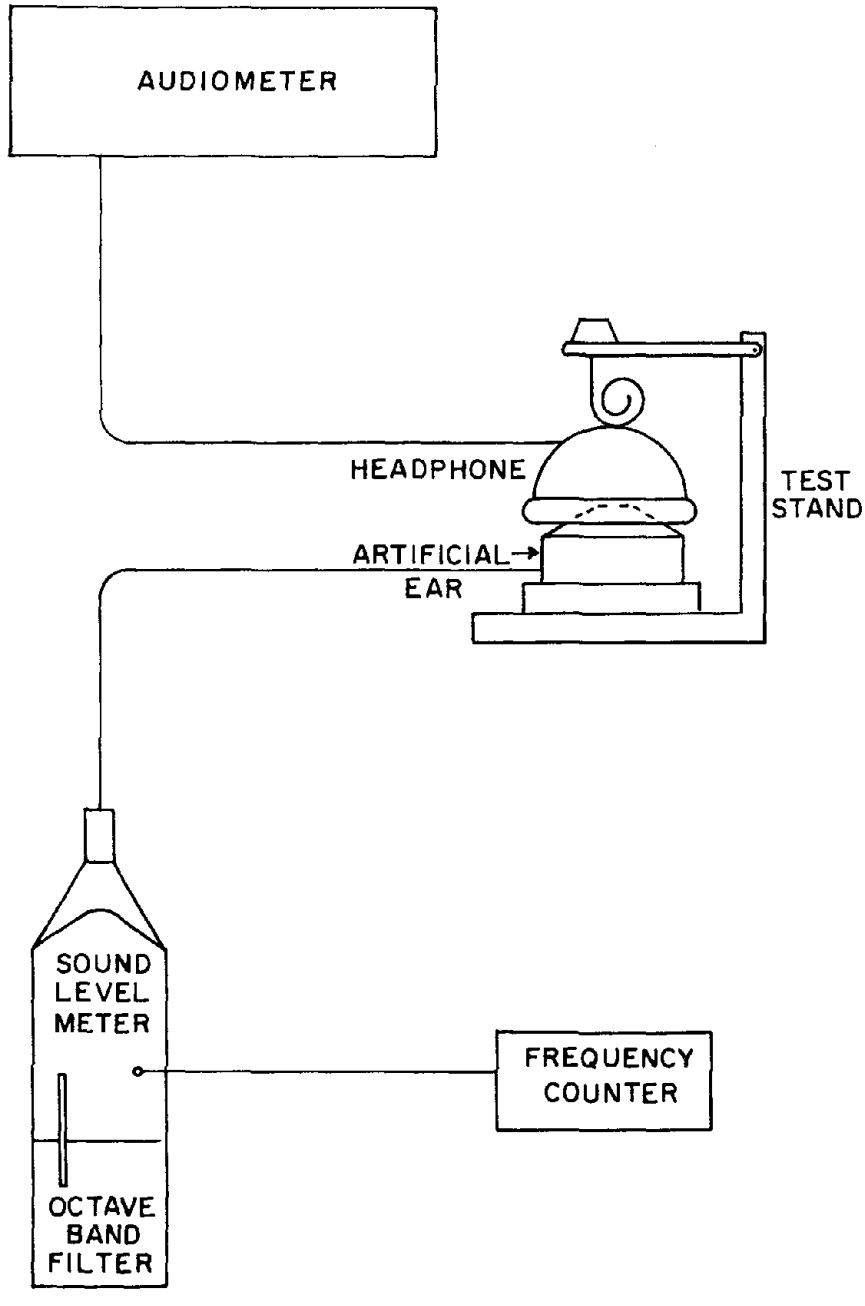


Figure 5. INSTRUMENT CALIBRATION SET-UP

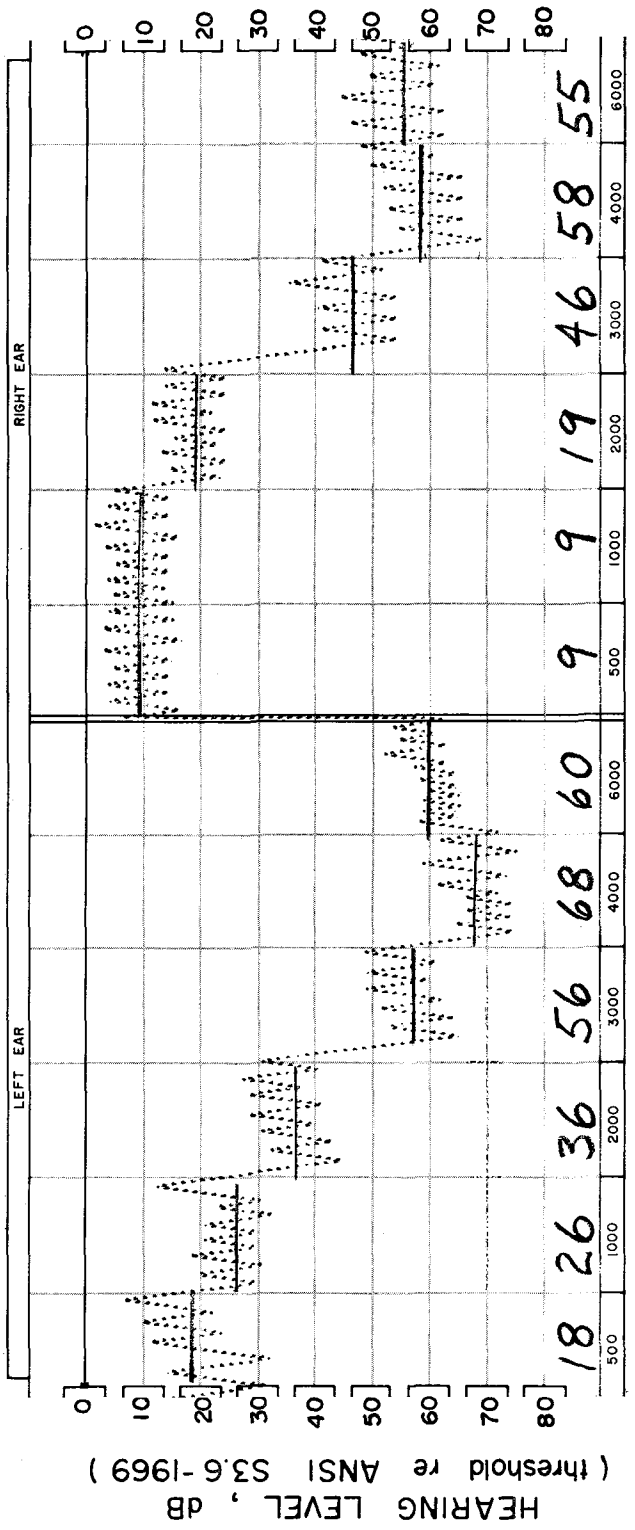


Figure 6. SAMPLE COAL MINER AUDIOGRAM; note that with the 10 dB attenuator on, the range of hearing levels on the card is from -10 dB to 90 dB.

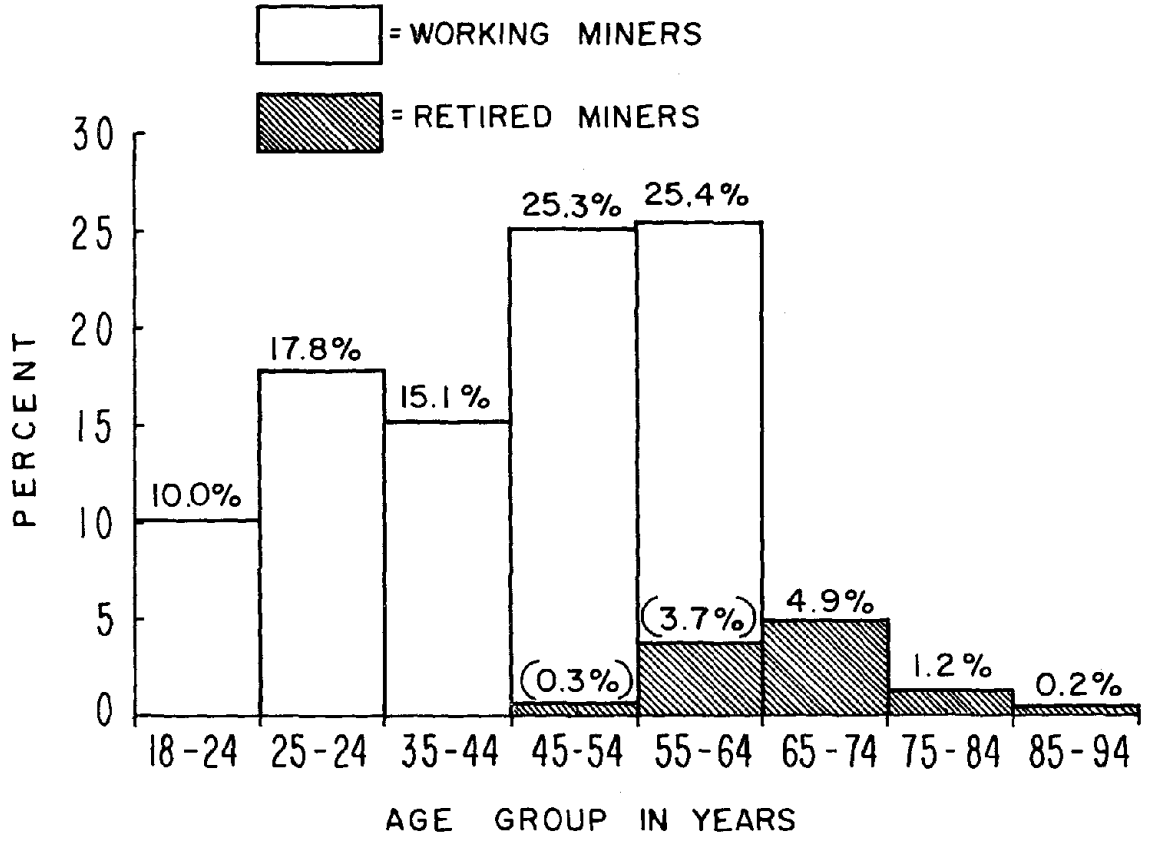


Figure 7. COMBINED AGE DISTRIBUTION OF ALL MINERS TESTED (NOTE: For age groups 45-54 and 55-64, the percentages shown at the top represent the sum total of retired miners (in parentheses) and working miners.)

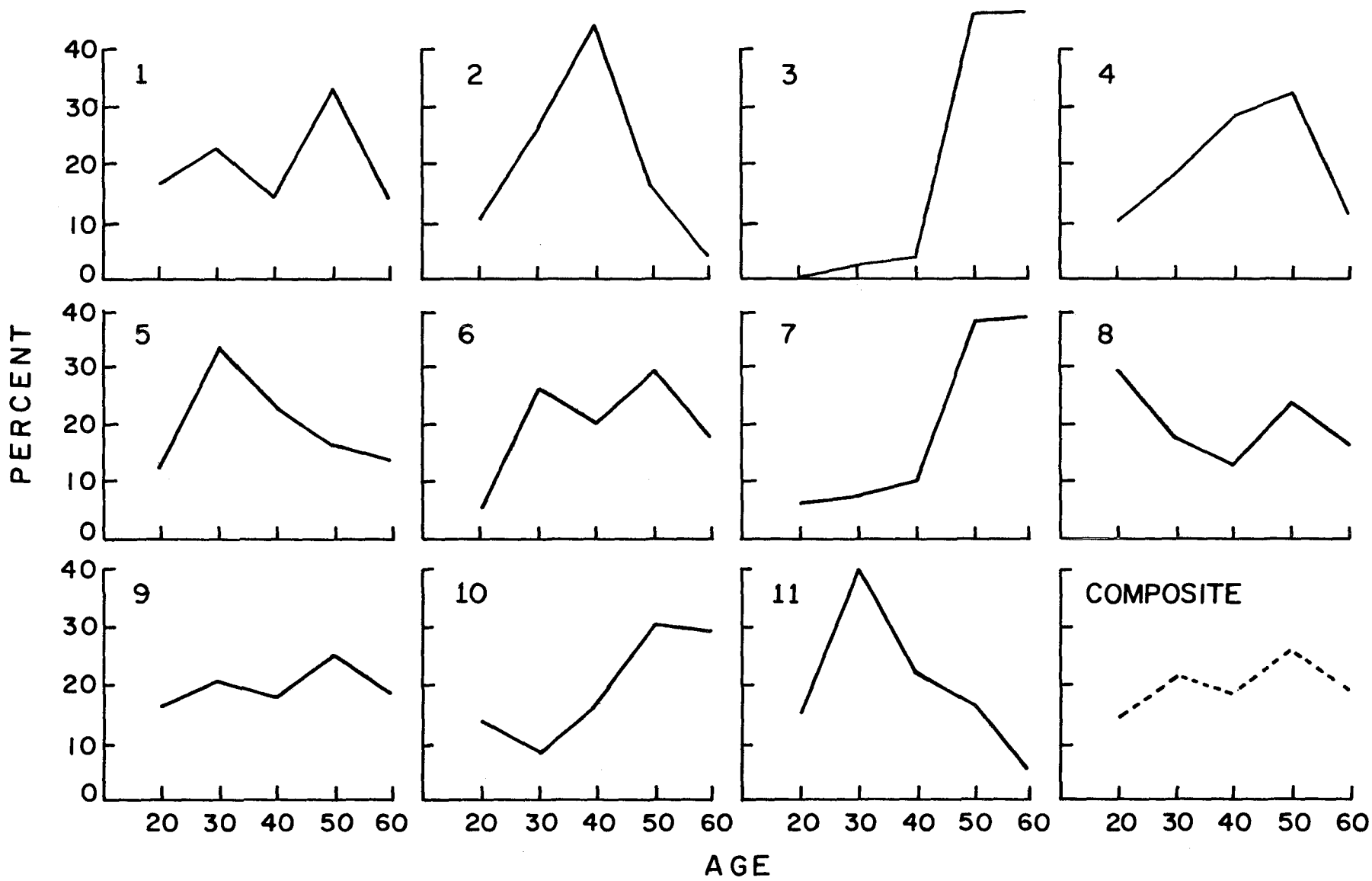


Figure 8. AGE DISTRIBUTIONS OF ALL MINERS AT EACH OF THE ELEVEN MINES SURVEYED
The last graph is the composite age distribution of all miners at the eleven mines.

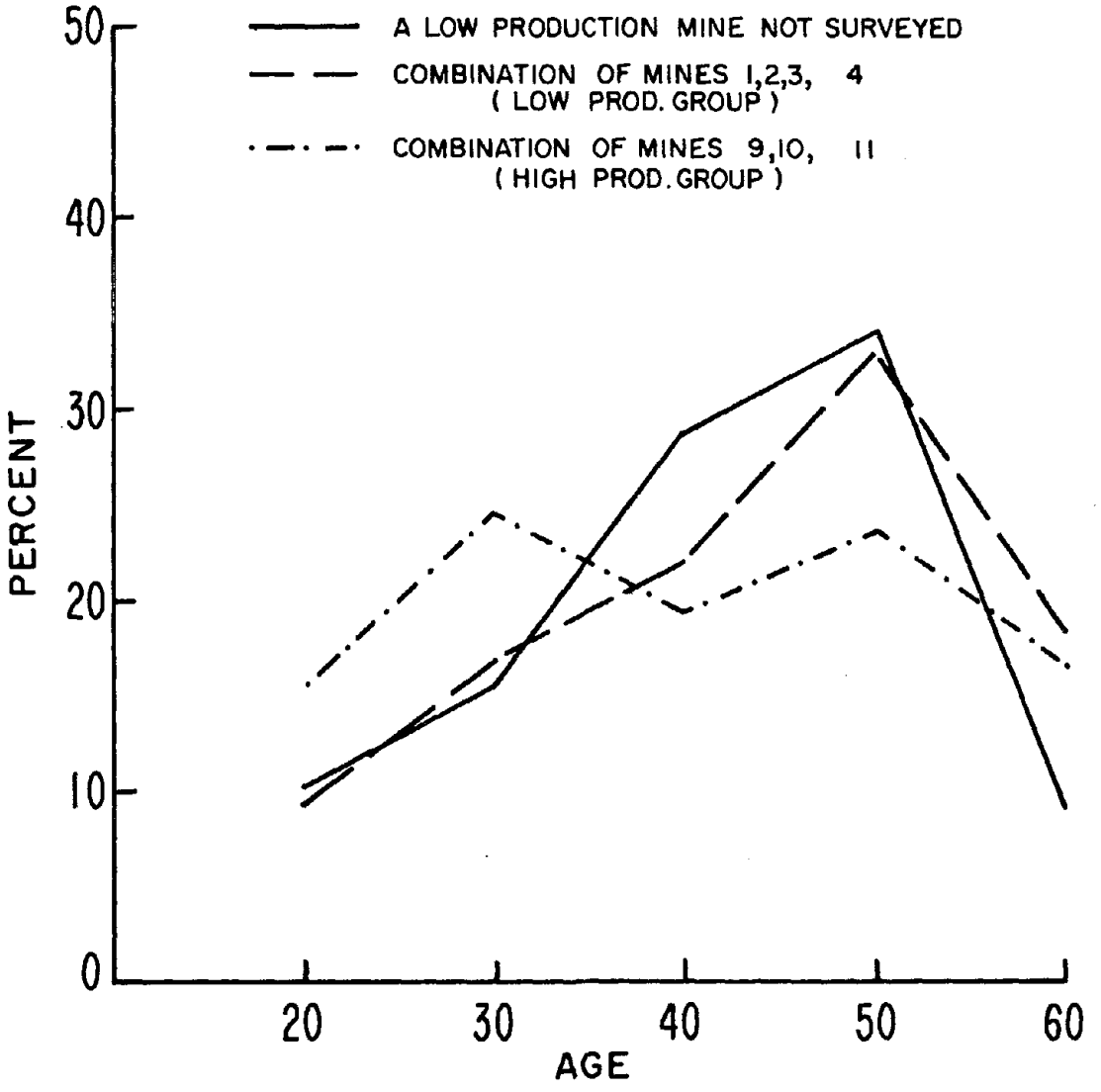


Figure 9. COMPARISON OF THE AGE DISTRIBUTION FOR ONE OF THE MINES NOT SURVEYED TO THE COMBINED AGE DISTRIBUTIONS OF THE FOUR LOWEST PRODUCTION AND THE THREE HIGHEST PRODUCTION MINES IN THE STUDY

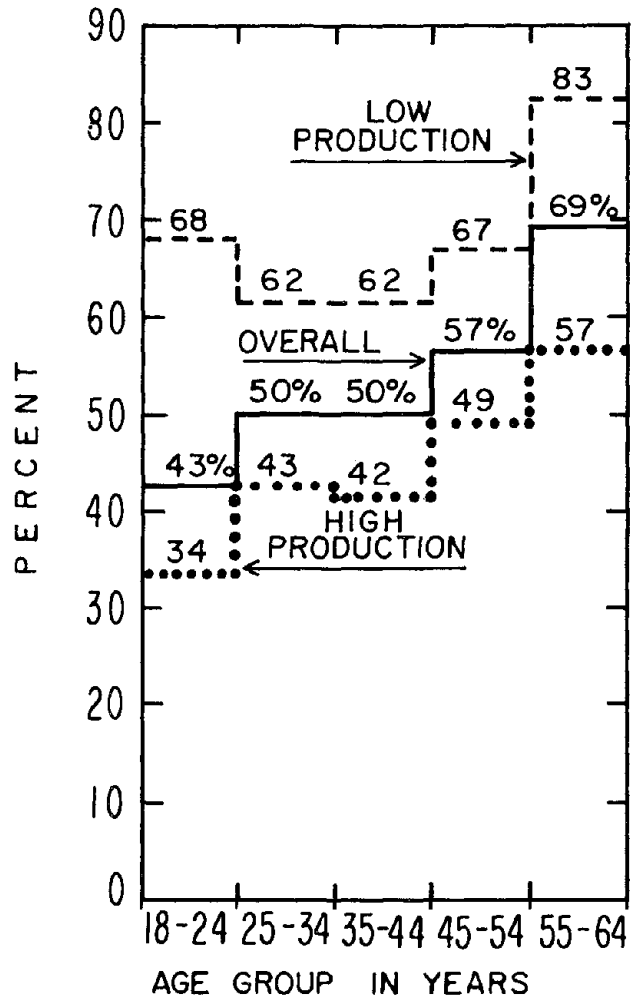


Figure 10. PERCENT PARTICIPATION VERSUS AGE GROUP: RATIO OF NUMBER OF MINERS TESTED TO NUMBER OF MINERS AT THE MINES; "Low production" represents the combination of mines 1 through 4 given in Table 1, "Overall" represents all eleven mines, and "High production" represents mines 9 through 11 in Table 1.

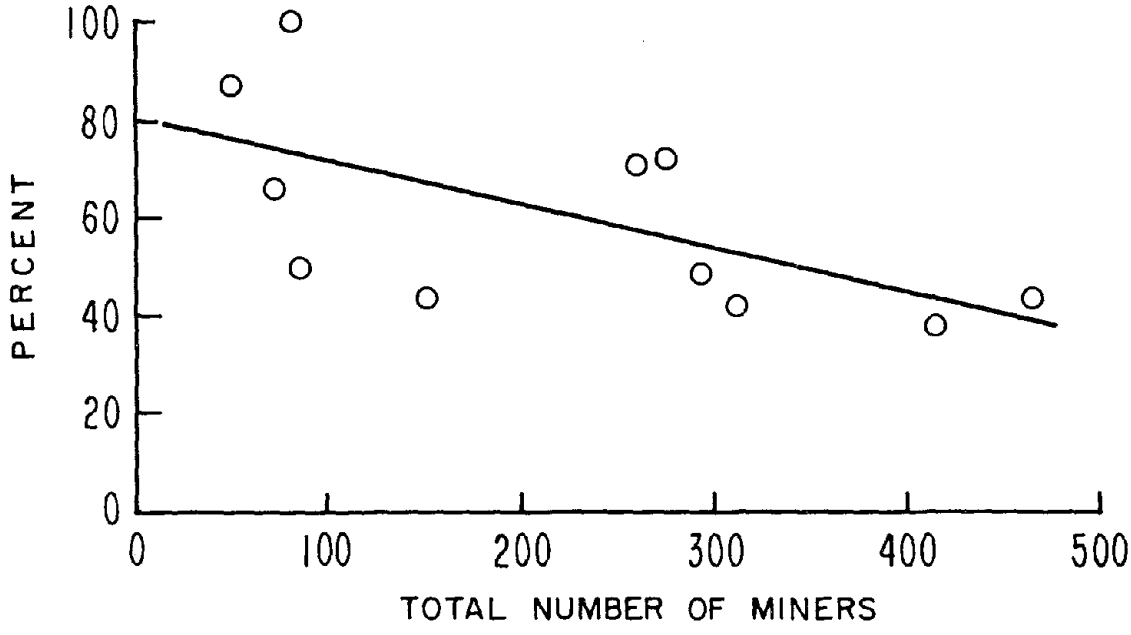


Figure 11. PERCENT PARTICIPATION VERSUS NUMBER OF MINERS: RATIO OF NUMBER OF MINERS TESTED TO NUMBER OF MINERS AT THE MINES

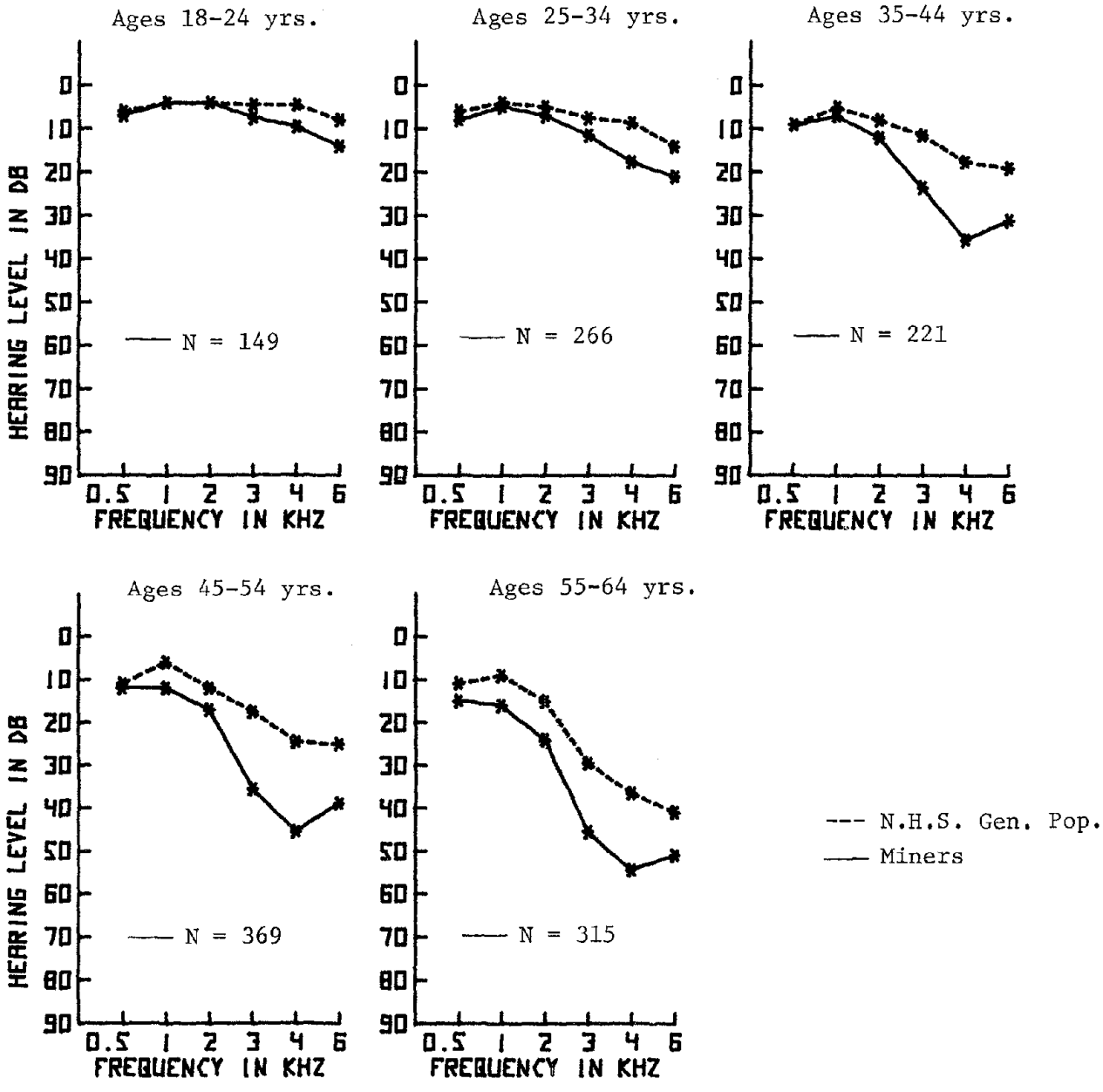


Figure 12. MEDIAN HEARING LEVELS FOR WORKING MINERS COMPARED TO NATIONAL HEALTH SURVEY GENERAL POPULATION, using better ear at each test frequency

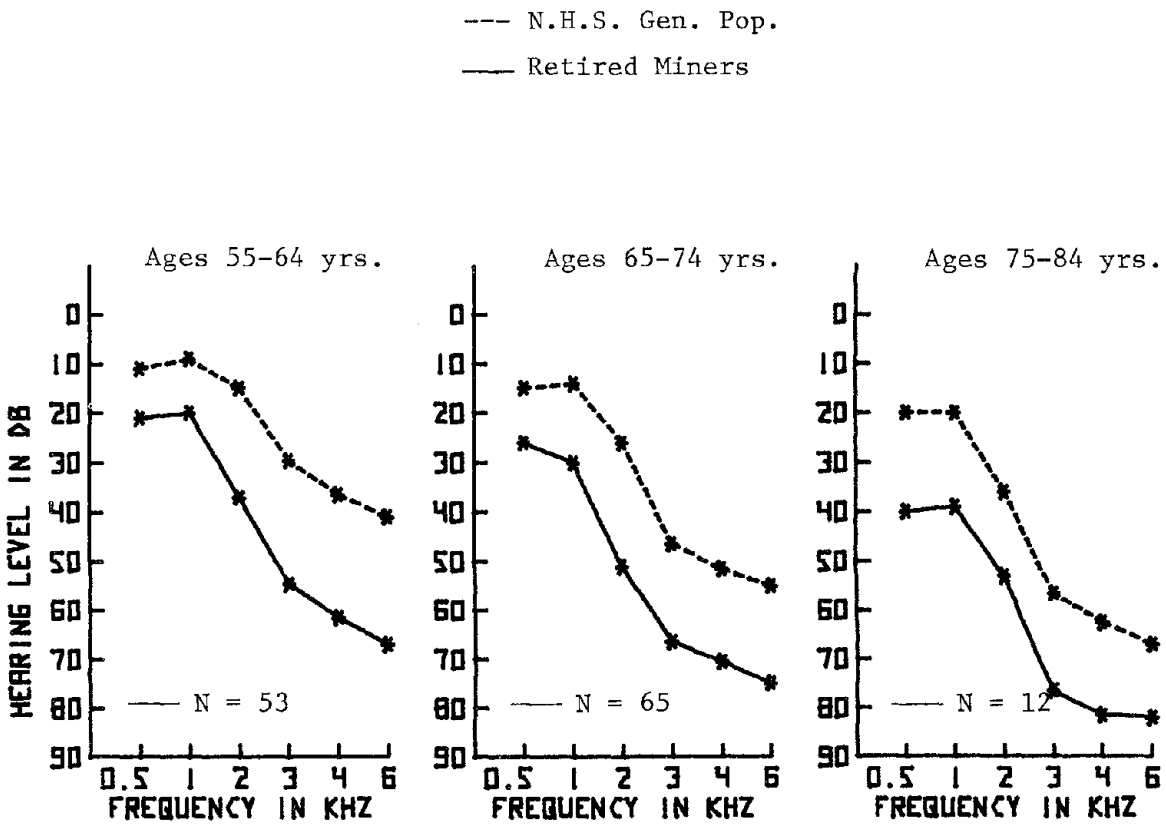


Figure 13. MEDIAN HEARING LEVELS FOR RETIRED MINERS COMPARED TO NATIONAL HEALTH SURVEY GENERAL POPULATION, using better ear at each test frequency

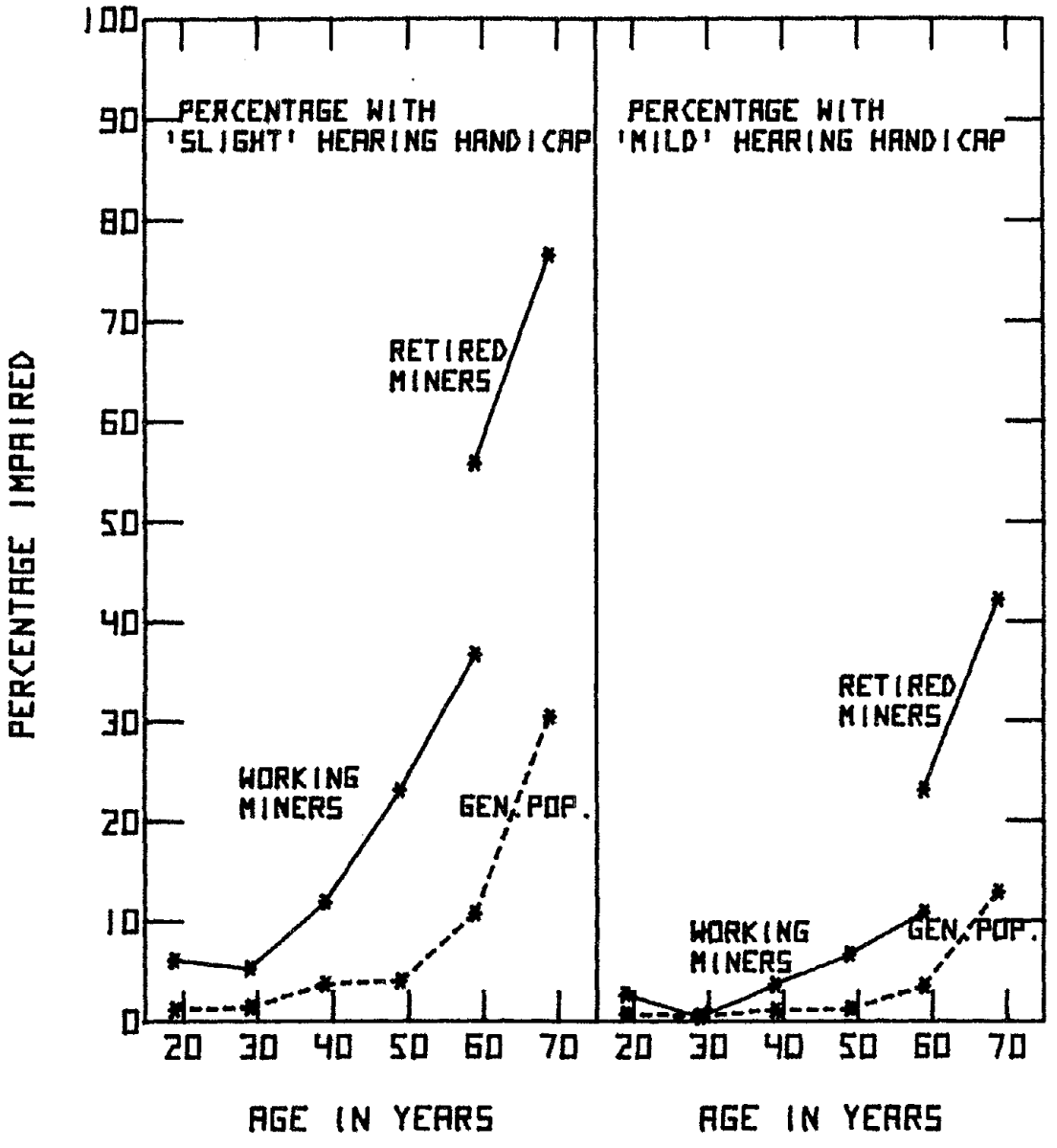


Figure 14. PERCENTAGE WITH HEARING HANDICAP FOR MINERS COMPARED TO NATIONAL HEALTH SURVEY GENERAL POPULATION, based on AAOO criteria of better ear average for 0.5, 1, and 2 KHz

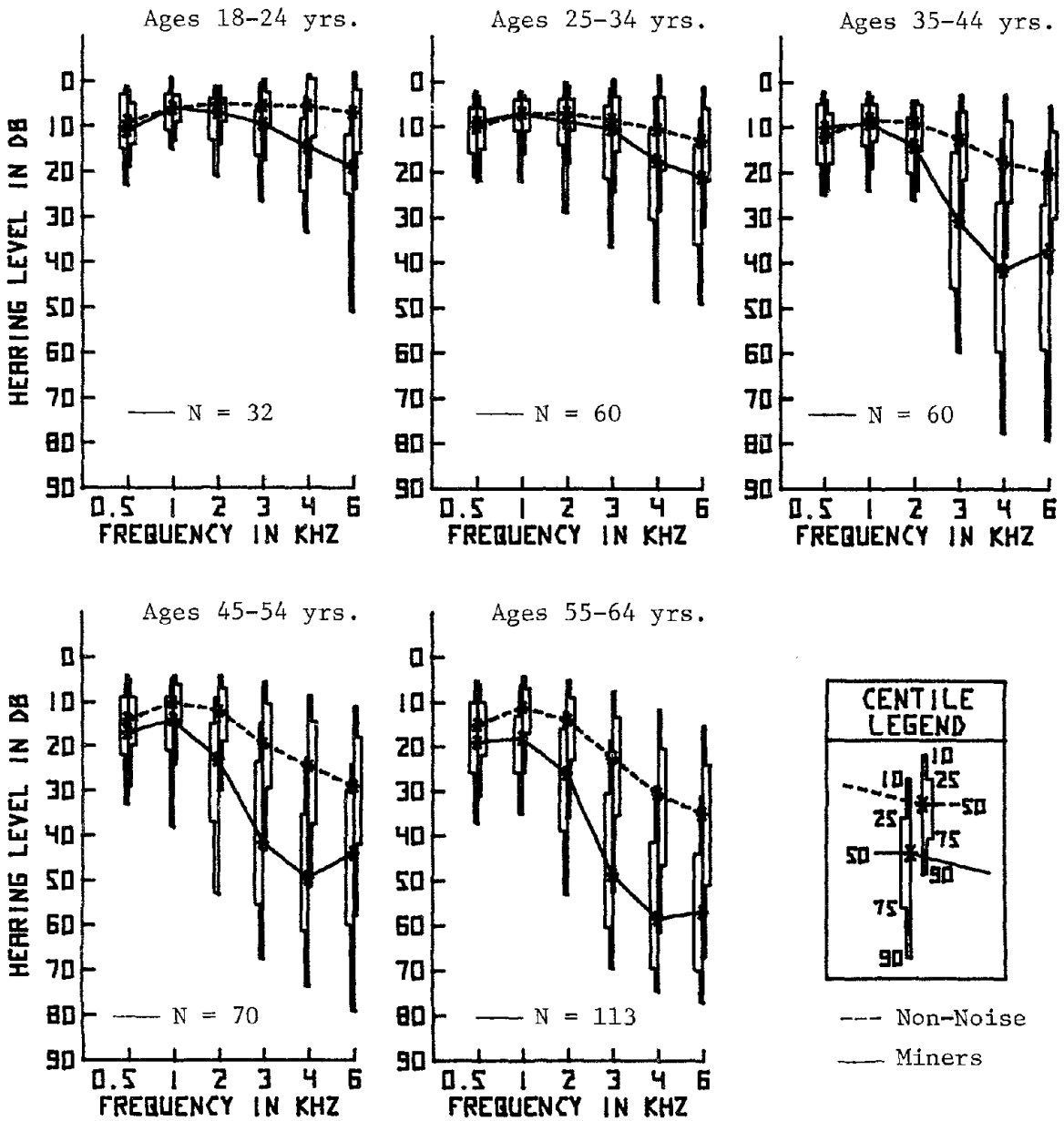


Figure 15. HEARING LEVEL DISTRIBUTIONS FOR SCREENED GROUP OF MINERS COMPARED TO NIOSH (ONHS) NON-NOISE DATA, using left and right ear averages at each test frequency

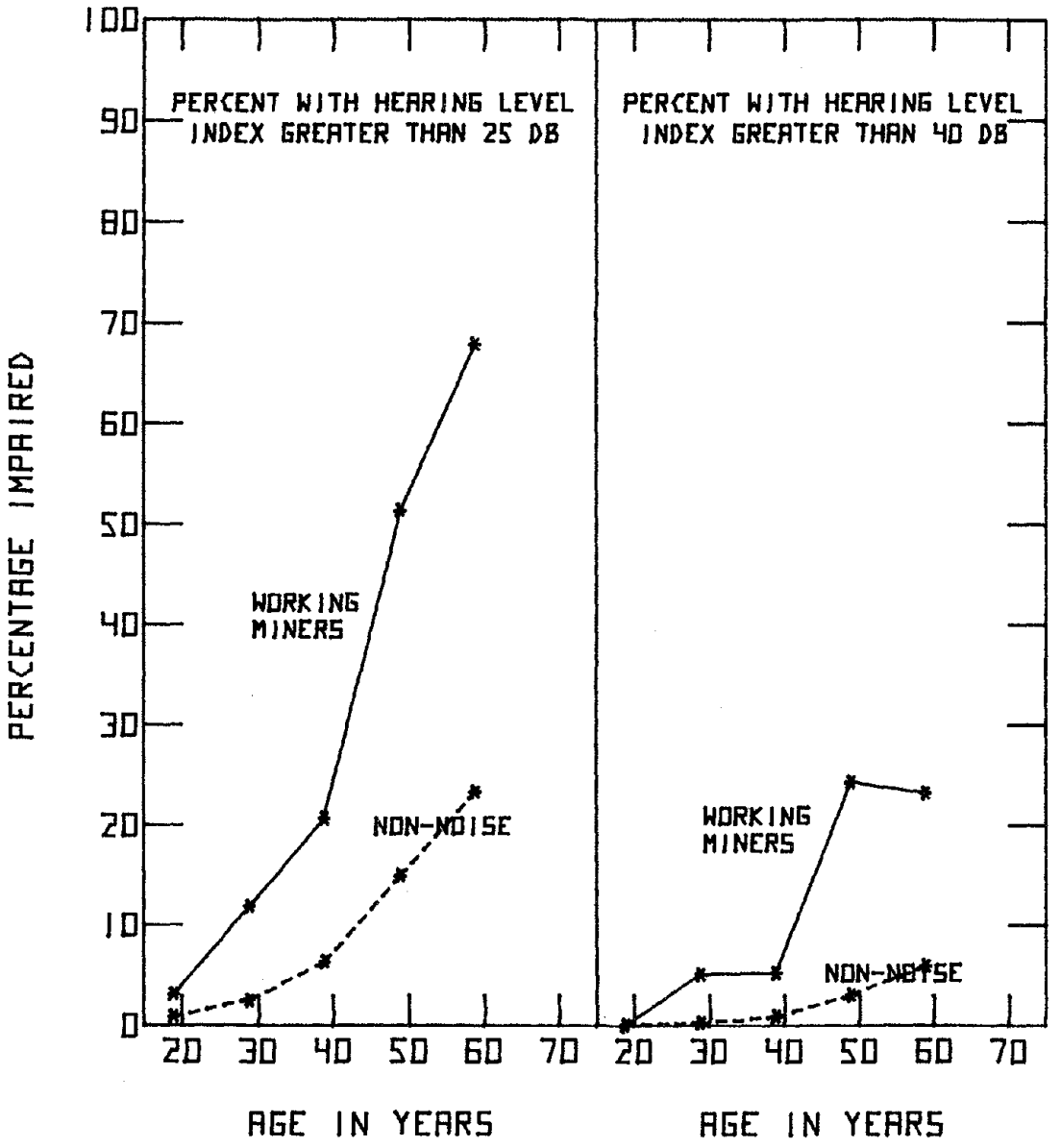


Figure 16. PERCENTAGE EXCEEDING 25 and 40 dB FENCES FOR SCREENED GROUP OF MINERS COMPARED TO NIOSH (ONHS) NON-NOISE DATA, based on the average of hearing levels at 1, 2, and 3 KHz using both ears

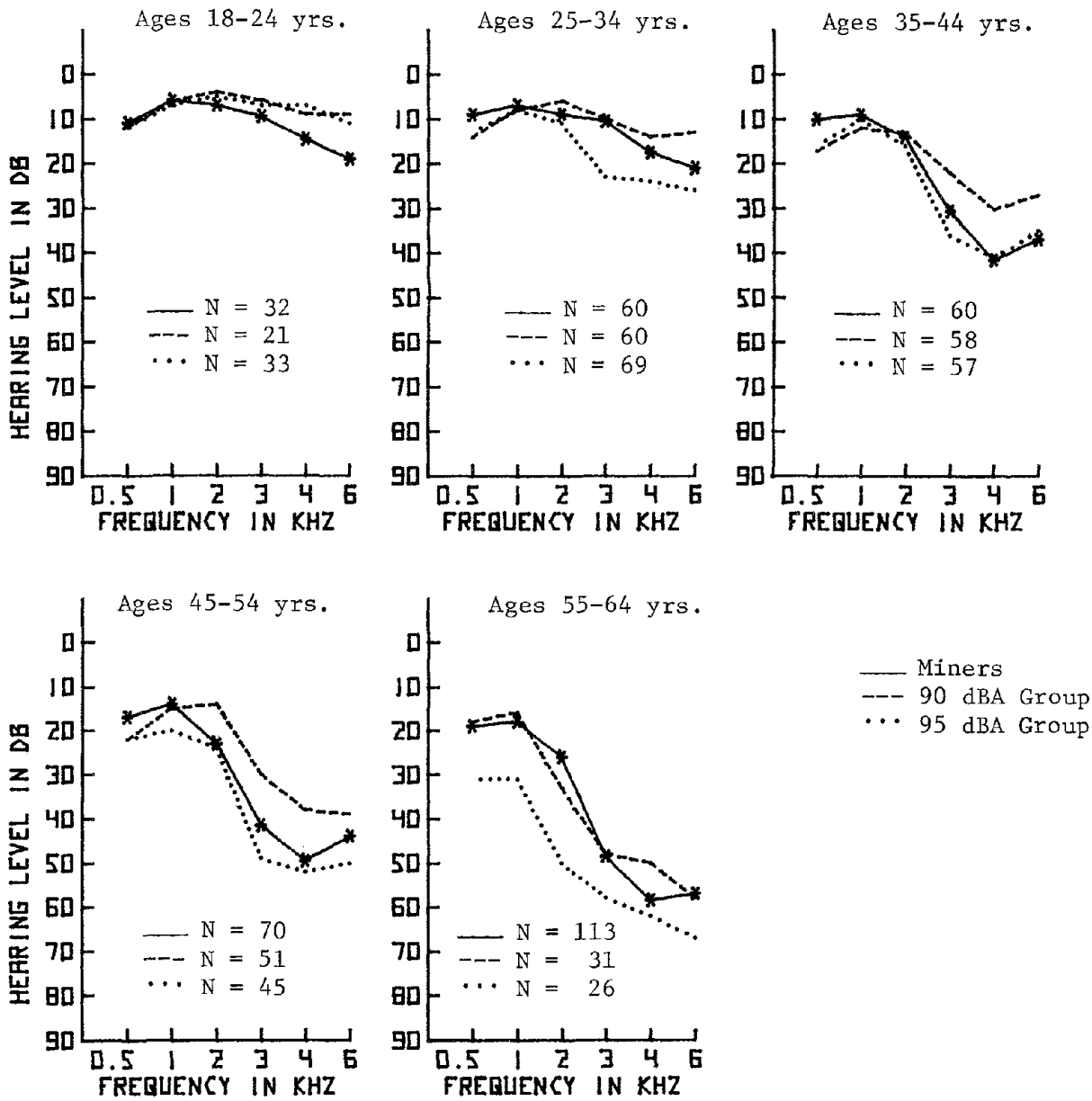


Figure 17. MEDIAN HEARING LEVELS FOR SCREENED GROUP OF MINERS COMPARED TO NIOSH (ONHS) 90 AND 95 dBA NOISE EXPOSED GROUPS, using the left and right ear averages at each test frequency

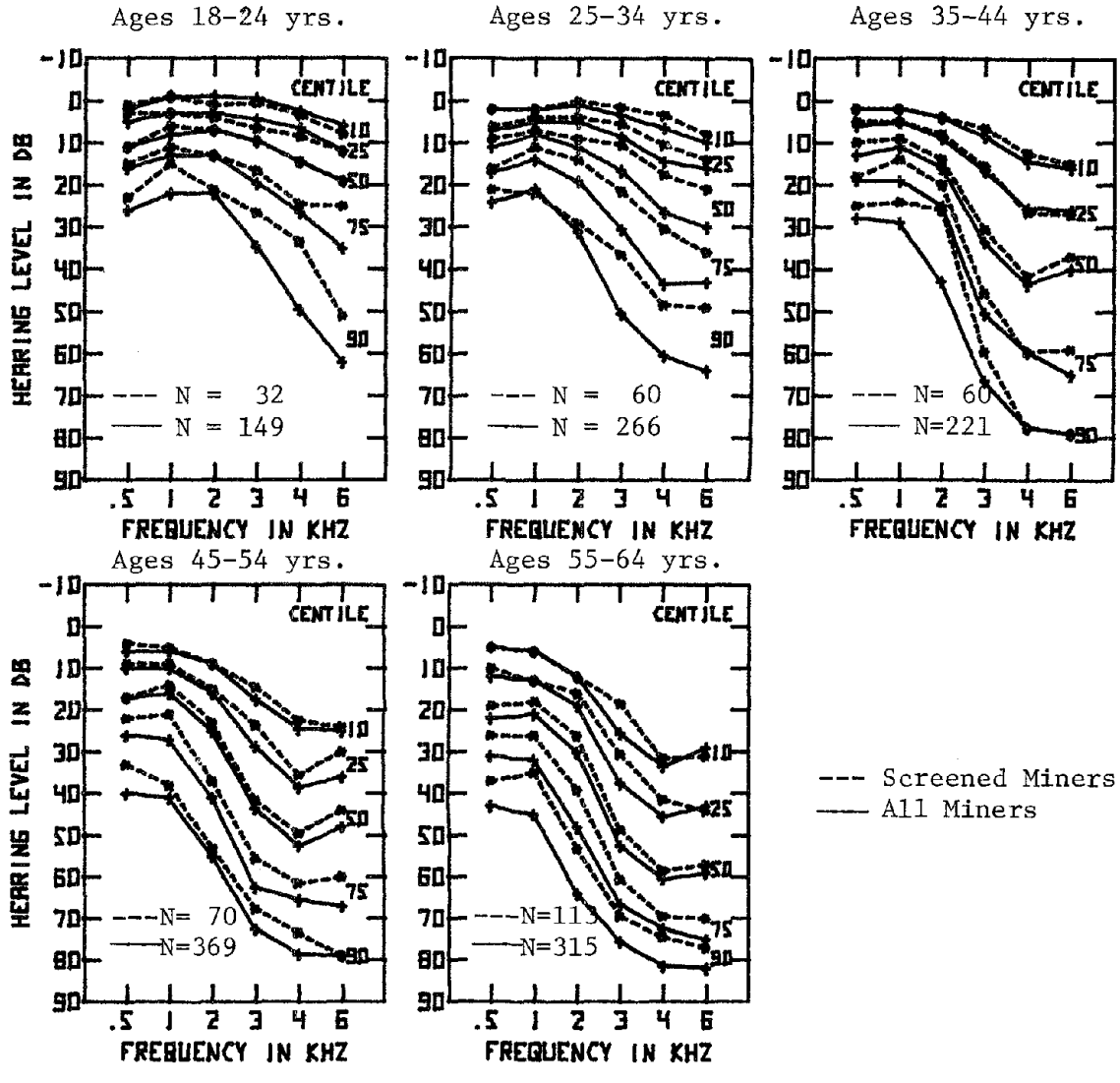


Figure 18. HEARING LEVEL CENTILE DISTRIBUTIONS FOR ALL TESTED MINERS COMPARED TO SCREENED GROUP OF MINERS, using left and right ear averages at each test frequency

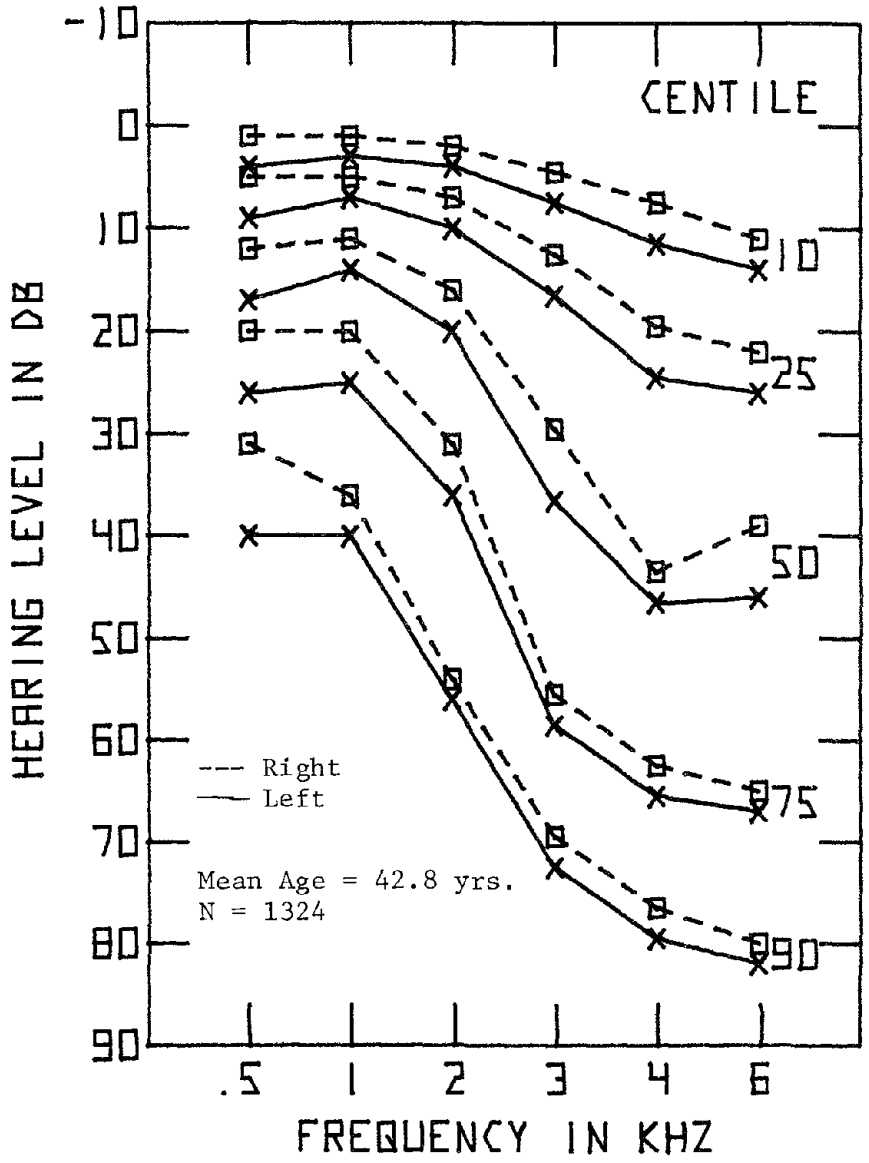


Figure 19. HEARING LEVEL CENTILE DISTRIBUTIONS FOR ALL MINERS TESTED, COMPARING LEFT TO RIGHT EARS

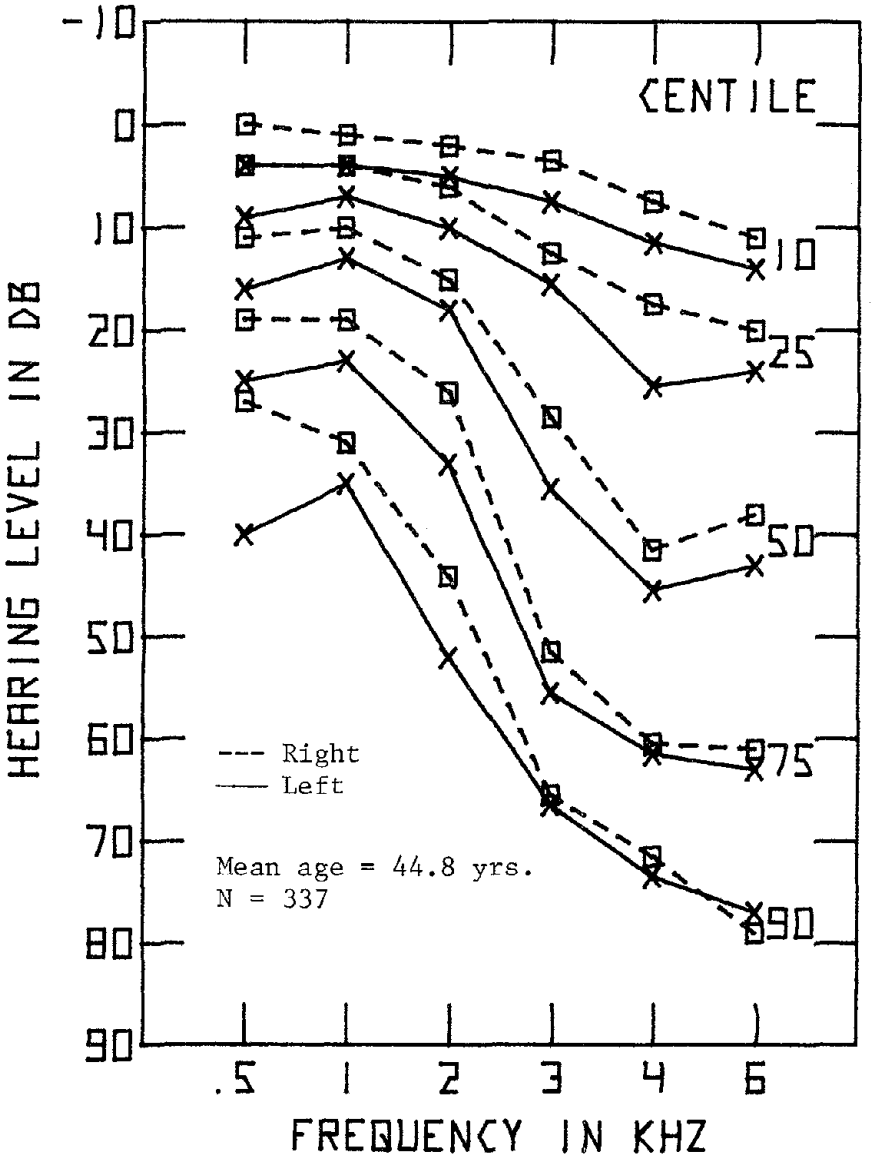


Figure 20. HEARING LEVEL CENTILE DISTRIBUTIONS FOR SCREENED GROUP OF MINERS, COMPARING LEFT TO RIGHT EARS

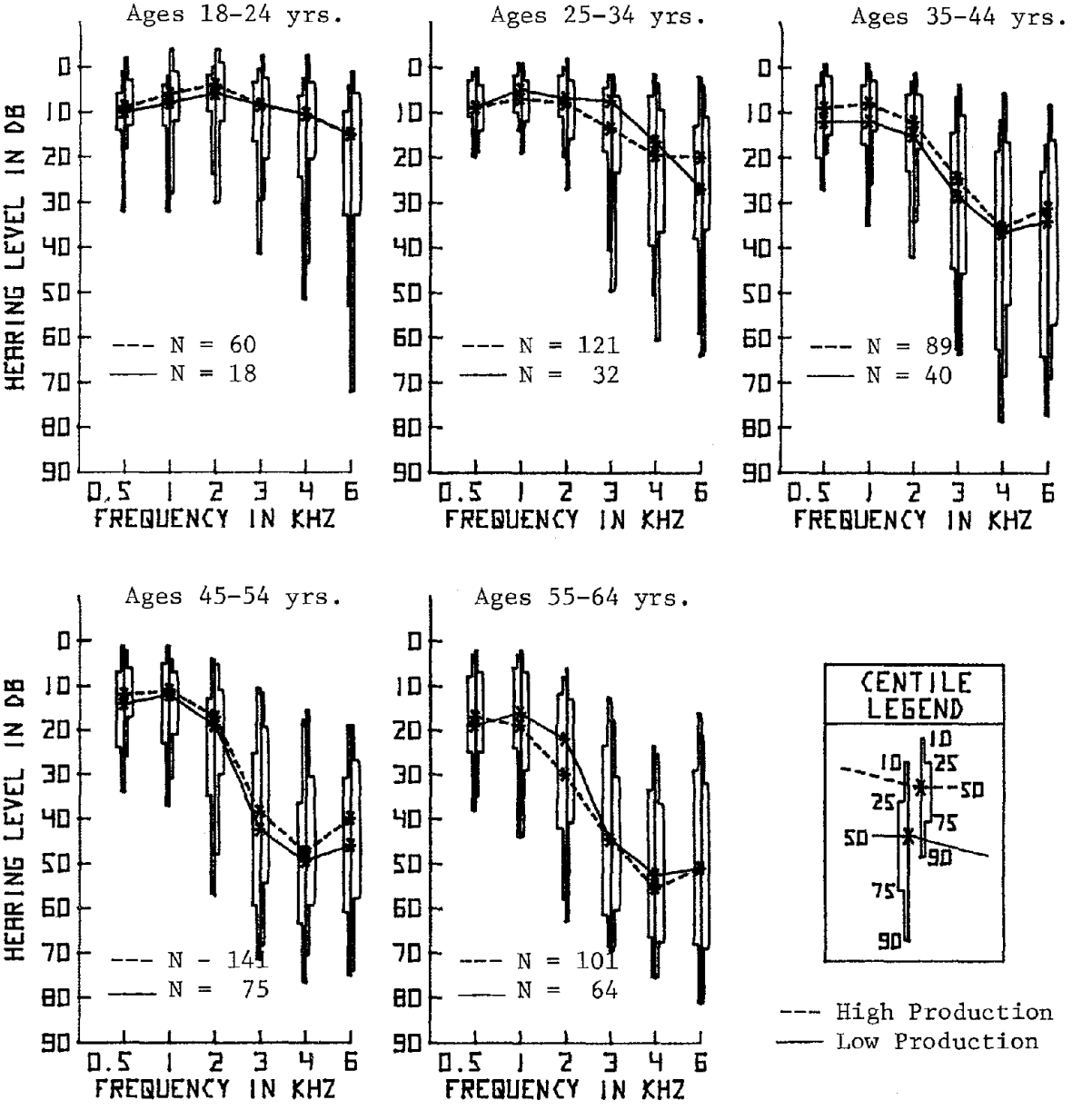


Figure 21. HEARING LEVEL DISTRIBUTIONS FOR MINERS IN HIGH PRODUCTION AND LOW PRODUCTION MINES, using better ear at each test frequency

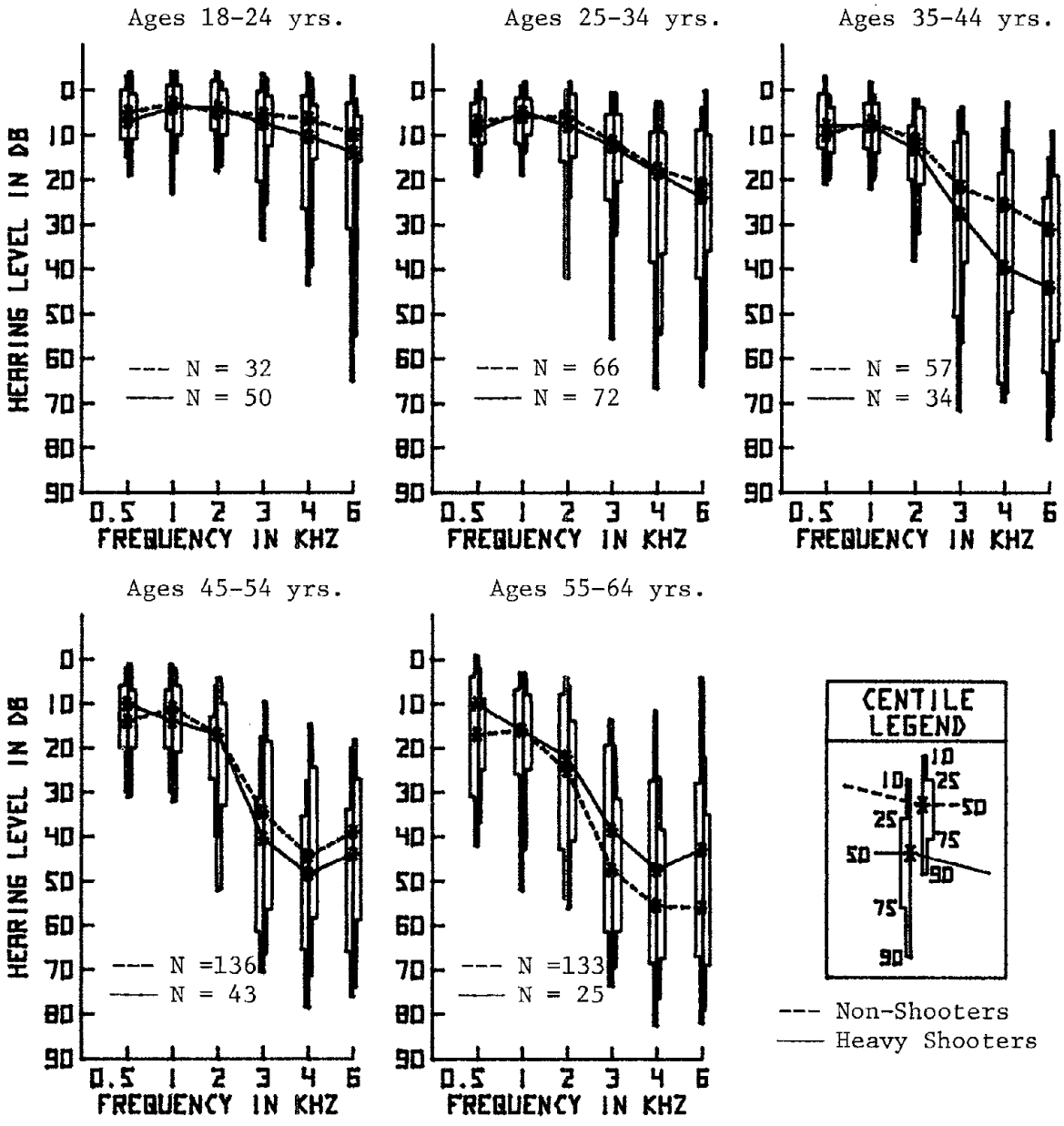


Figure 22. HEARING LEVEL DISTRIBUTIONS FOR MINERS WHO ARE NON-SHOOTERS COMPARED TO HEAVY SHOOTERS, using better ear at each test frequency

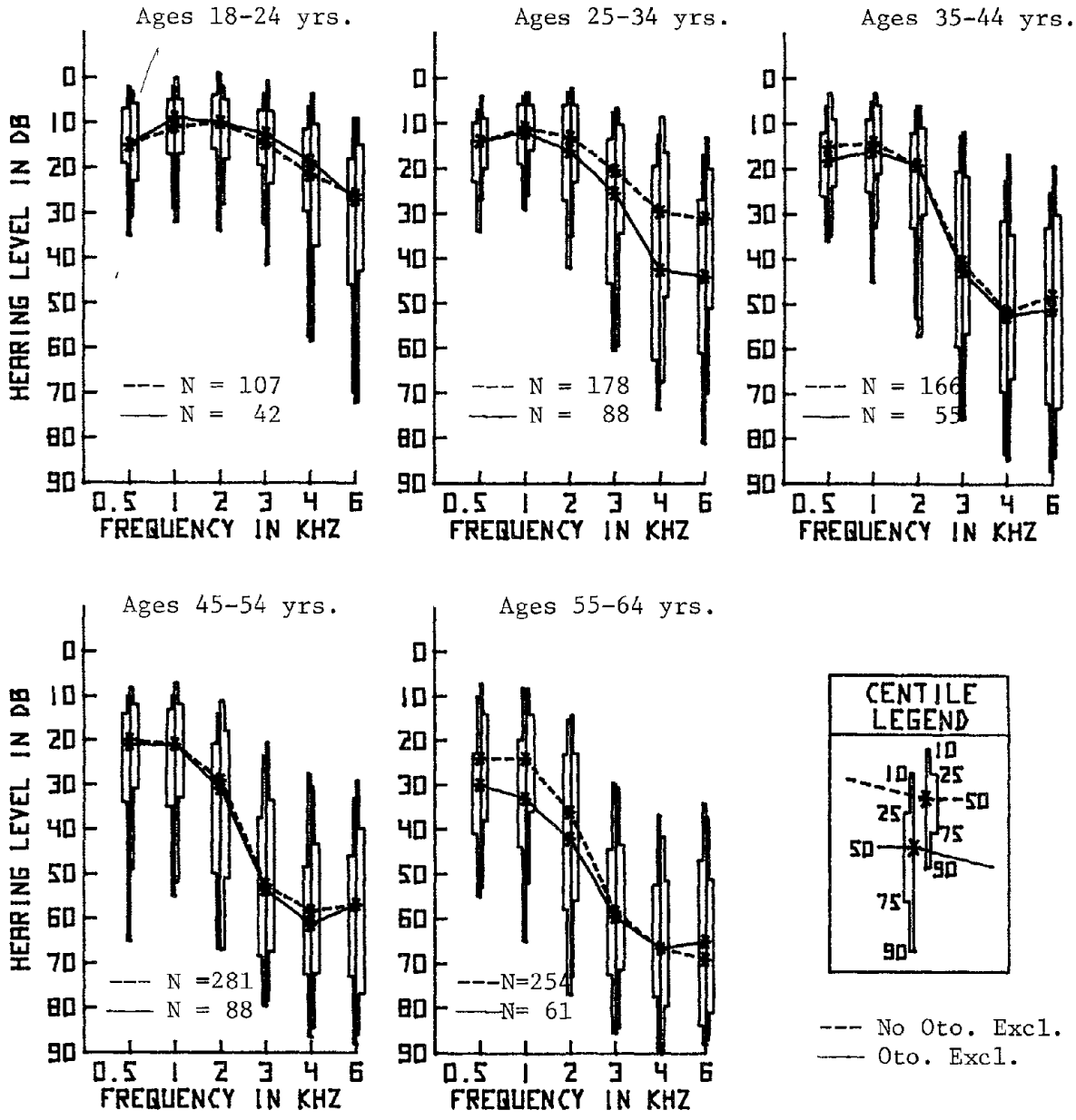


Figure 23. HEARING LEVEL DISTRIBUTIONS FOR MINERS NOT EXCLUDED FOR OTOSCOPIC REASONS COMPARED TO THOSE WHO WERE, using poorer ear at each test frequency

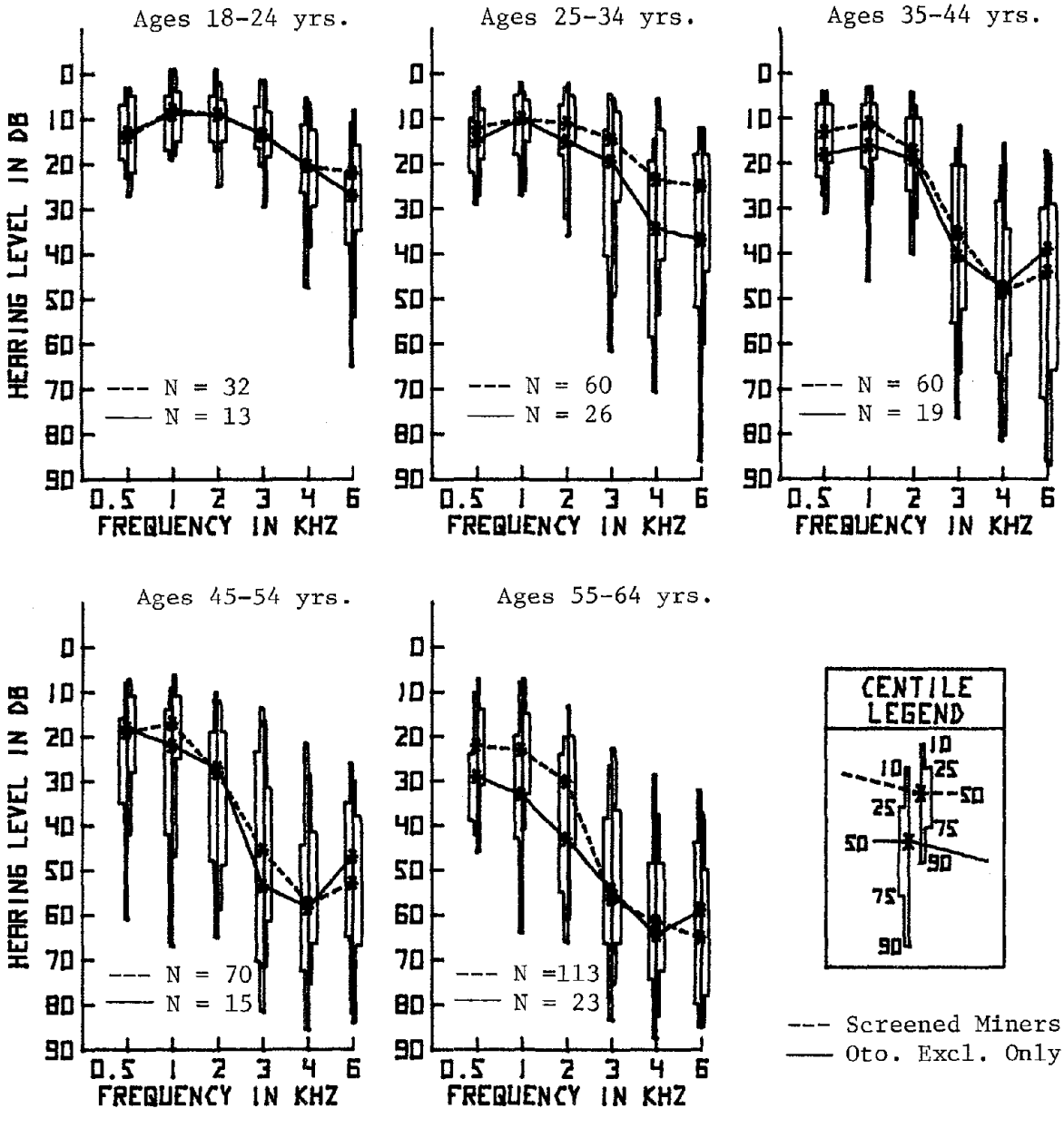


Figure 24. HEARING LEVEL DISTRIBUTIONS FOR MINERS IN SCREENED GROUP COMPARED TO THOSE WHO WERE EXCLUDED FOR OTOSCOPIC REASONS ONLY, using poorer ear at each test frequency

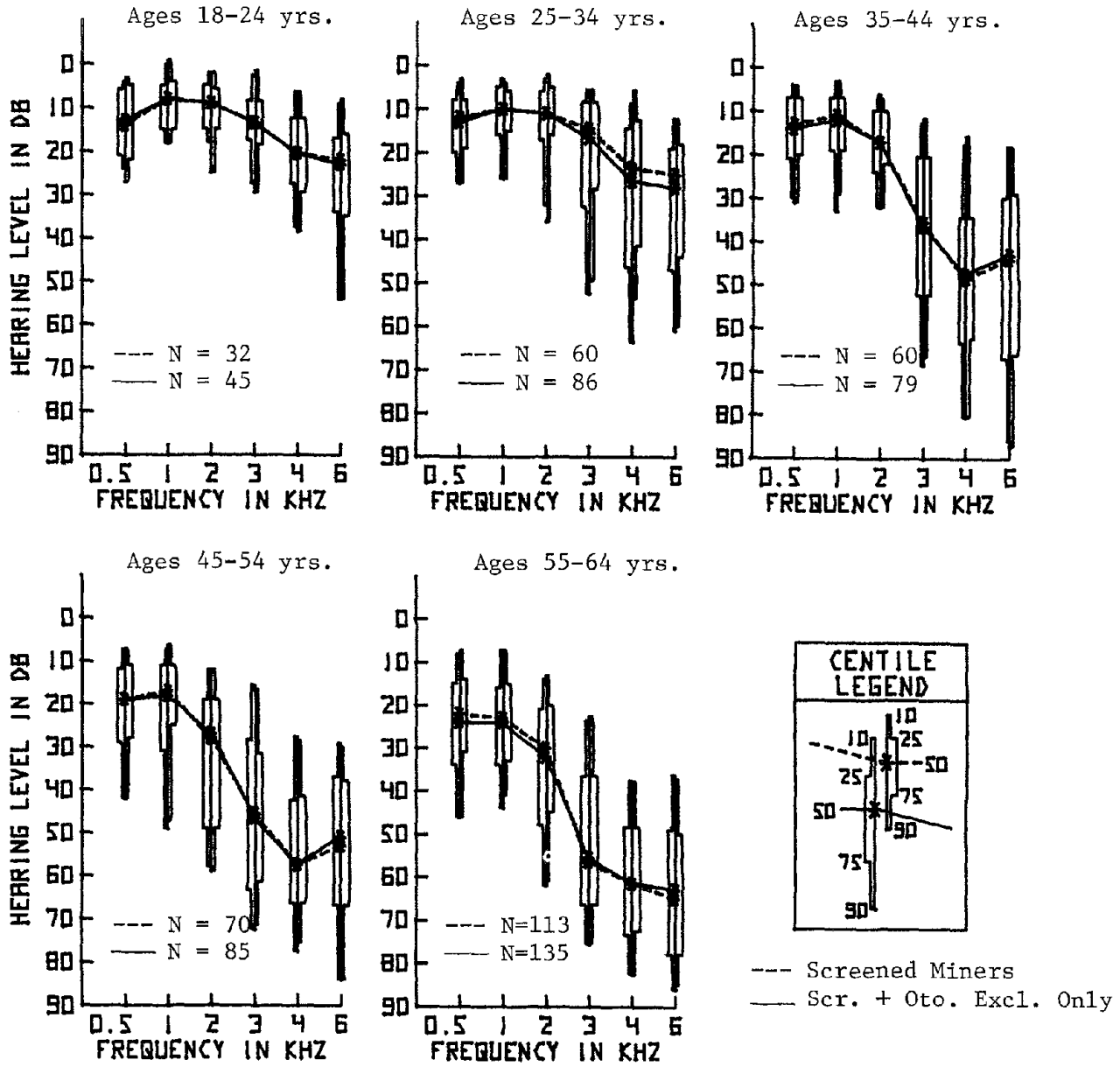


Figure 25. HEARING LEVEL DISTRIBUTIONS FOR SCREENED GROUP OF MINERS COMPARED TO SCREENED GROUP PLUS THOSE MINERS WHO WERE EXCLUDED FOR OTOSCOPIC REASONS ONLY, using poorer ear at each test frequency

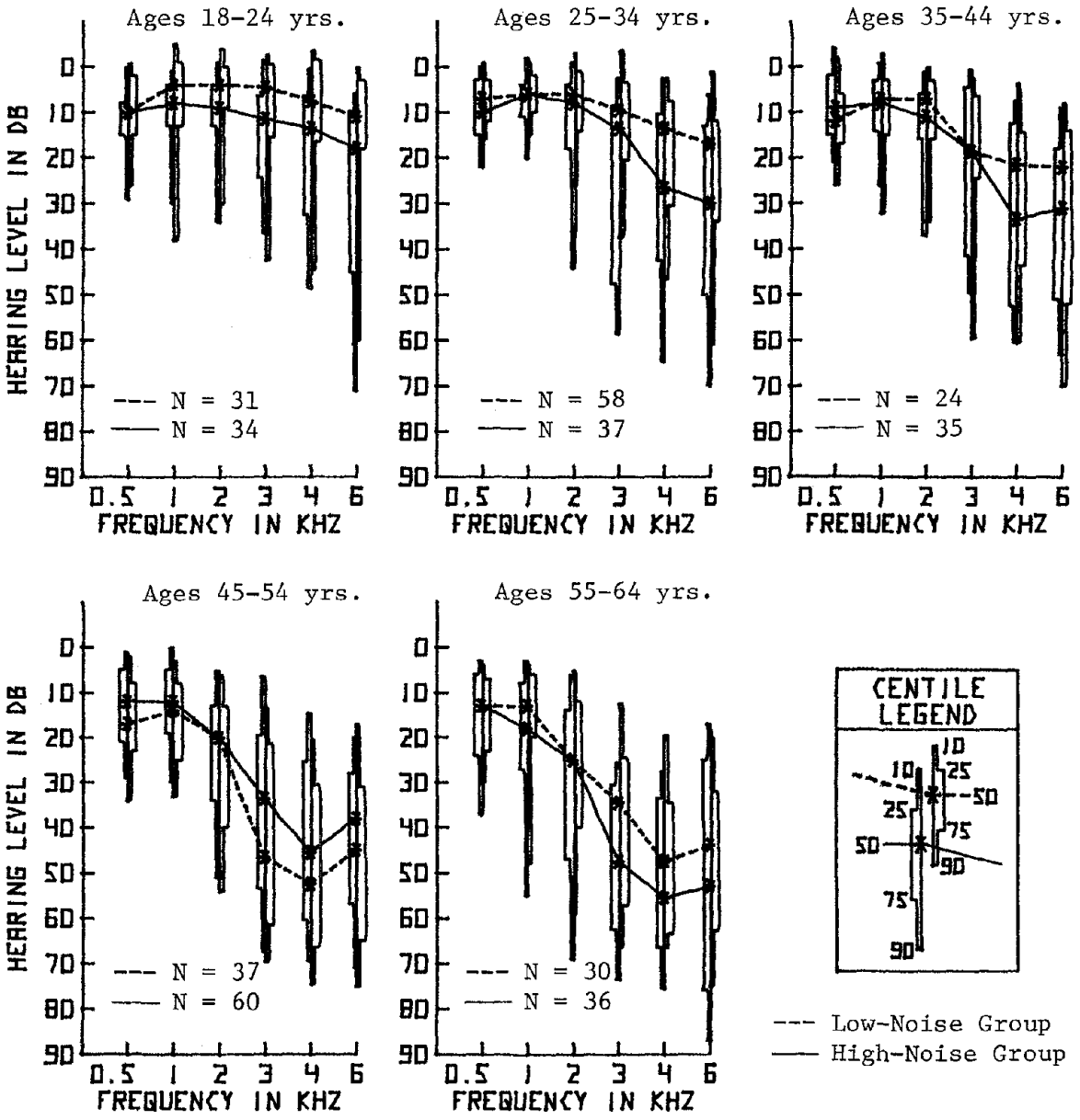


Figure 26. HEARING LEVEL DISTRIBUTIONS FOR A GROUP OF LOW-NOISE EXPOSED MINERS COMPARED TO A GROUP OF HIGH-NOISE EXPOSED MINERS, using better ear at each test frequency

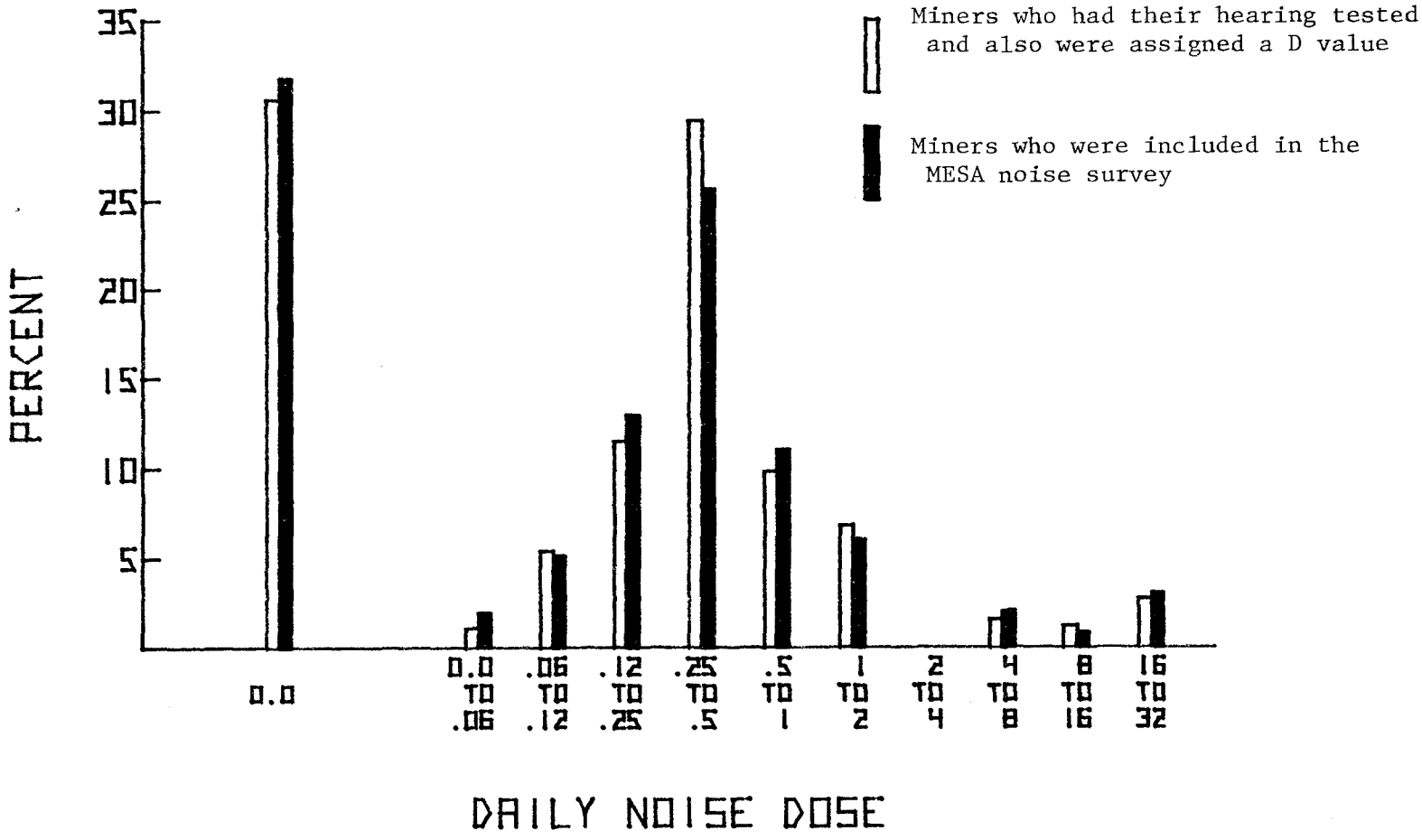


Figure 27. DISTRIBUTIONS OF DAILY NOISE DOSE (D) FOR TWO MINER GROUPS. The solid bars represent all miners who were assigned a D value from the MESA noise survey, and the other bars represent a subset of that group which is miners who also had their hearing tested.

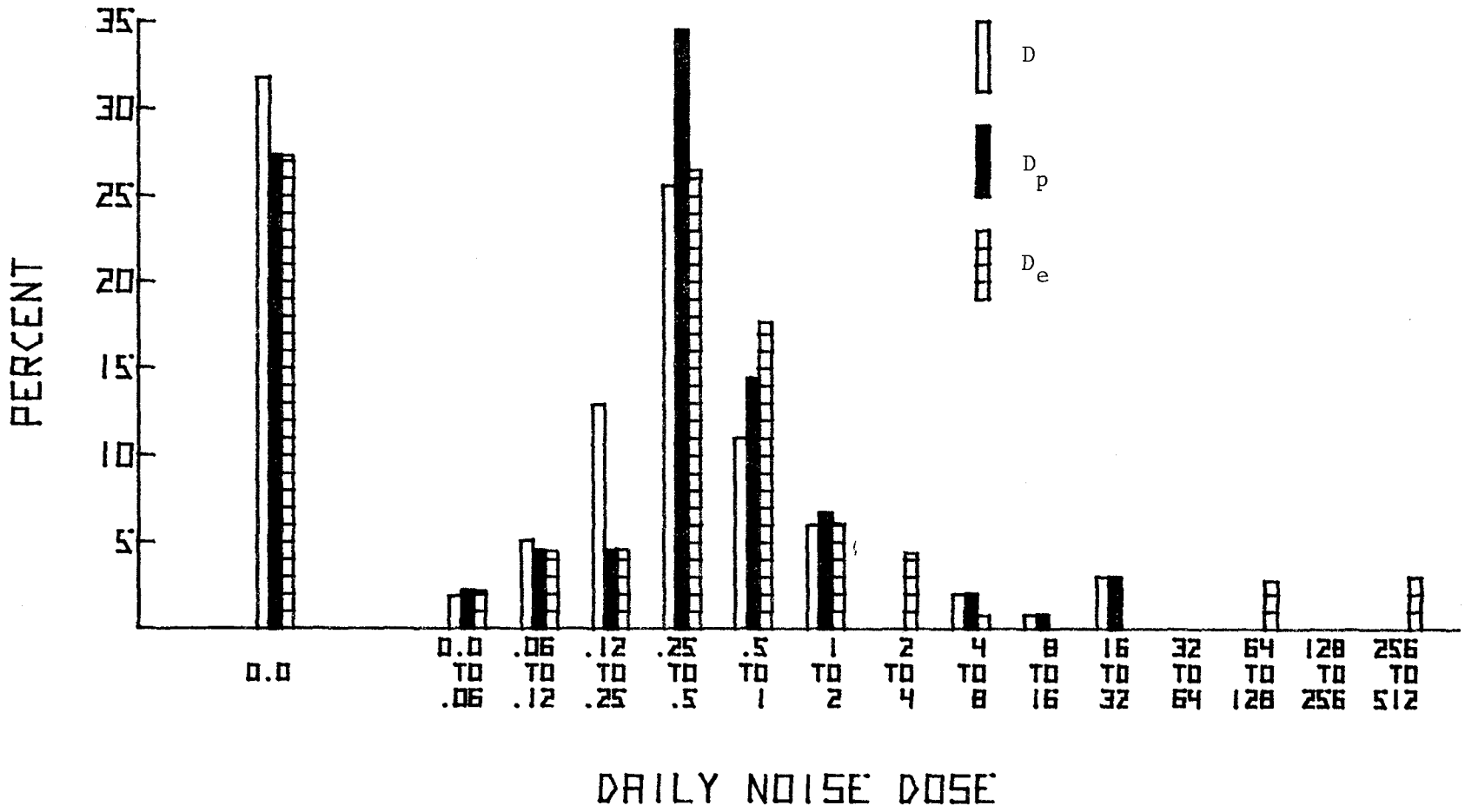


Figure 28. DISTRIBUTIONS OF DAILY NOISE DOSE, USING THREE DIFFERENT DOSE COMPUTING METHODS (D, D_p, D_e), FOR MINERS. (Refer to page 27 in the text for explanations of the three dose computing methods.)

TABLES

Table 1

NUMBER OF MINERS IN THE SAMPLE

Coal Mine No.	Production (Tons/day)	Number of Miners	Number of Miners Tested	% of Miners Tested	Number of Miners in Screened Sample	% of Tested Miners in Screened Sample
1	750	83	44	53%	3	7%
2	800	50	44	88	12	27
3	950	80	80	100	45	56
4	1600	152	70	46	5	7
5	2000	261	188	72	28	15
6	2000	72	48	67	15	31
7	2300	275	201	73	82	41
8	3000	312	150	48	53	35
9	4500	463	212	46	33	16
10	6300	292	148	51	26	18
11	7200	416	164	39	35	21
Total		2456	1349*	55%	337	25%

* In addition to working miners, 150 non-working or retired miners were tested.

Table 2

DISTRIBUTION OF COAL MINERS BY JOB DESCRIPTIONS:
FOR TOTAL AND SCREENED SAMPLES

Job Description	Occup. Code	Number of Miners: Total	(Scr. Sample)	Job Description	Occup. Code	Number of Miners: Total	(Scr. Sample)
				Section Workers (Face)			
Belt Man/Conveyor Man	001*	11	(2)	Contin. Miner Helper	035	33	(5)
Electrician	002*	16	(2)	Contin. Miner Oper.	036	46	(16)
Electrician Helper	003*	1	(0)	Cutting Mach. Oper.	038	14	(4)
Mechanic	004*	53	(20)	Jack Setter (Longwall)	041	8	(4)
Mechanic Helper	005*	5	(2)	Loading Mach. Helper	042	8	(3)
Rock Duster	006*	5	(1)	Loading Mach. Oper.	043	10	(3)
Blaster/Shooter	007*	6	(1)	Shear Oper./Plow Oper. Longwall	044	1	(0)
Vent. Man/Mason	008*	1	(0)	Roof Bolter	046	97	(26)
Timberman/Jack Setter (Auger-intake side)	010*	18	(3)	Roof Bolter Mounted	048	10	(2)
Wireman	011*	1	(1)	Section Foreman	049	64	(16)
Laborer	016*	3	(2)	Shuttle Car Oper.	050*	102	(33)
Brattice Man	032	16	(5)	Utility Man	053	16	(2)
Coal Drill Oper.	034	9	(1)	Scoop Car Oper.	054	2	(0)

* Denotes a cross-reference with a related occupation in another area.

Table 2 (cont'd)

Job Description	Occup. Code	Number of Miners: Total	(Scr. Sample)	Job Description	Occup. Code	Number of Miners: Total	(Scr. Sample)
		General Underground (Non-Face)					
Belt Man/Conveyor Man	101*	28	(6)	Oiler	118*	4	(2)
Electrician	102*	3	(1)	Welder	119*	2	(0)
Mechanic	104*	19	(5)	Coal Dump Oper.	122*	6	(5)
Mechanic Helper	105*	12	(2)	Transit Man	123*	1	(1)
Vent. Man/Mason	108*	6	(0)	Labor Foreman	149	5	(0)
Supply Man	109*	9	(1)	Shuttle Car Oper.	150*	1	(1)
Timberman	110*	3	(3)	Belt Cleaner	154	4	(1)
Wireman	111*	5	(0)	Chainman	155	1	(1)
Laborer	116*	56	(14)	Pumper	157	4	(1)
Rodman	117*	2	(1)	Rock Mach. Oper.	158	10	(3)
		Underground Transportation (Non-Face)					
Belt Man/Conveyor Man	201*	4	(1)	Dispatcher	265*	4	(0)
Trackman	216	14	(4)	Motorman	269	67	(16)
Rope Rider	262	14	(3)	Buggy Pusher	277	1	(0)

* Denotes a cross-reference with a related occupation in another area.

Table 2 (cont'd)

Job Description	Occup. Code	Number of Miners: Total (Scr. Sample)	Job Description	Occup. Code	Number of Miners: Total (Scr. Sample)
		Above Ground			
Conveyor Oper.	301*	1 (0)	Car Dropper	373	28 (6)
Electrician	302*	9 (2)	Cleaning Plant Oper.	374	10 (4)
Electrician Helper	303*	1 (0)	Road Grader Oper.	375	1 (0)
Mechanic	304*	42 (8)	Coal Truck Driver	376*	2 (1)
Mechanic Helper	305*	2 (0)	Crane Oper.	378	3 (1)
Coal Sampler	314*	1 (0)	Dryer Oper.	379	1 (0)
Laborer	316*	7 (1)	Fine Coal Plant Oper.	380	1 (0)
Welder (Shop)	319	11 (2)	Highlift Oper.	382	1 (0)
Hoist Engineer/Oper.	321*	6 (1)	Lampman	385	6 (2)
Coal Dump Oper.	322*	4 (2)	Refuse Truck Driver	386	3 (0)
Boom Oper.	340	7 (1)	Scalper-Screen Oper.	388	1 (1)
Shuttle Car Oper.	350*	1 (0)	Tipple Oper.	392	7 (1)
Shopman	360*	6 (0)	Carpenter	394	1 (0)
Bulldozer Oper.	368	6 (2)			
		Supervisory Staff			
Master Electrician	402*	2 (0)	Fire Boss	462*	1 (1)
Dust Sampler	414*	3 (1)	Inspector	464	2 (1)
Maintenance Foreman	418*	9 (0)	Superintendent	481	5 (0)
Surveyor	423*	1 (0)	Outside Foreman	489	5 (1)
Assist. Mine Foreman	430	8 (2)	Prep. Plant Foreman	494	4 (2)
Mine Foreman	449	6 (0)	Safety Director	495	3 (1)
Engineer	456	1 (1)	Timekeeper	497	5 (1)

* Denotes a cross-reference with a related occupation in another area.

Table 3

EXCLUSION CATEGORIES USED IN THE SCREENING PROCEDURE

EXCLUSION CODE	MINERS ASSIGNED EXCLUSION CODES: Number	As a % of All Miners Excluded	As a % of All Miners Tested
ALL CATEGORIES	1013 (432)*	100.0%	75.1%
NOISE EXPOSURE HISTORY			
1(A)-Job History	56 (17)	5.5%	4.2%
2(B)-Mechanized Farming	3 (1)	0.3%	0.2%
3(C)-Military Weapon Noise	329 (93)	32.5%	24.4%
4(D)-Military Non-Weapon Noise	45 (12)	4.4%	3.3%
5(E)-Civilian Weapon Noise	249 (52)	24.6%	18.5%
6(F)-Civilian Off-Job Activity Noise	148 (23)	14.6%	11.0%
7(G)-Pre-test Noise Exposure	14 (1)	1.4%	1.0%
MEDICAL HISTORY			
8(H)-History of Trauma-Fracture	222 (37)	21.9%	16.5%
9(I)-Ear Drainage	67 (3)	6.6%	5.0%
10(J)-Recent Middle Ear Infection	46 (10)	4.5%	3.4%
11(K)-Ear Surgery	9 (2)	0.9%	0.7%
12(L)-Tinnitus	253 (51)	25.0%	18.8%
13(M)-Labyrinthine Disorder	4 (1)	0.4%	0.3%
14(N)-Medication	74 (11)	7.3%	5.5%
OTOSCOPIC EXAM			
15(O)-Occlusion	98 (24)	9.7%	7.3%
16(P)-Perforation	13 (0)	1.3%	1.0%
17(Q)-Scar Tissue	79 (23)	7.8%	5.9%
18(R)-Calcerous Deposits	25 (4)	2.5%	1.9%
19(S)-Inflamed Drum	63 (16)	6.2%	4.7%
20(T)-Malformation/Growth	3 (1)	0.3%	0.2%
21(U)-Audiometric Irregularity	81 (20)	8.0%	6.0%
22(V)-Other Otoscopic	90 (19)	8.9%	6.7%
23(W)-Family History of Hearing Loss	37 (6)	3.7%	2.7%
24(X)-Incomplete Questionnaire	18 (5)	1.8%	1.3%

* The number of miners assigned only one exclusion code.

TABLE 4

PERMISSIBLE NOISE EXPOSURES

Sound Level, dBA	Permitted Duration per Day, Hours: For "D"*	For "D_p"	For "D_e"
85	--	16	25
87	--	12	16
90	8	8	8
92	6	6	5
95	4	4	2½
97	3	3	1½
100	2	2	3/4
102	1½	1½	½
105	1	1	¼
110	½	½	1/12
115	¼ or less	¼ or less	⋮

* The mathematical expression for calculating the permissible duration for any given sound level is:

$$T = \frac{8}{2^{\left(\frac{L-90}{5}\right)}}$$, where T = permissible time, hours
L = sound level between 90 and 115 dBA

Note that the "5" in the exponent of 2 accounts for the 5 dB increase of sound level for each halving of time.

D, D_p, and D_e are explained in the section "Summary of Noise Survey" in this report.

APPENDIX A

QUESTIONNAIRE FORM

O.M.B. No. 68-R1269

O.M.B. NO. 68-R1269
APPROVAL EXPIRES: 5-31-74

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
National Institute for Occupational Safety and Health
Cincinnati, Ohio 45202

COAL MINE NOISE AND HEARING STUDY

ASSURANCE OF CONFIDENTIALITY

The U. S. Public Health Service hereby gives its assurance that your identity and your relationship to any information obtained by reason of your participation in the Coal Mine Noise and Hearing Study will be kept confidential in accordance with PHS regulations (42 CFR 1.103 (a)) and will not otherwise be disclosed except as specifically authorized below. A copy of this regulation will be made available to you upon request.

Marcus M. Key, M.D.
Assistant Surgeon General
Director
National Institute for Occupational
Safety and Health

CONSENT

I hereby voluntarily agree to participate in the Coal Mine Noise and Hearing Study which will be conducted by the U.S. Public Health Service. It has been explained to me that in addition to my answering a questionnaire, there will be a routine medical examination of my ears and a standard hearing test. I have been advised that I may withdraw from this study at any time if I so desire.

_____
Signature Date

AUTHORIZATION TO RELEASE MEDICAL INFORMATION

I hereby request the U.S. Public Health Service to inform my personal physician of the evidence discussed with me which could indicate an ear disorder.

Dr. _____

_____
Street

_____
City State Zip Code

_____
Telephone

_____
Signature Date

NIOSH-2-72

Plant Name _____
Worker Number _____

(Note: Questions 1 - 9 are to be completed with help of staff interviewer.)

1. NAME: _____ 2. SEX:_____ 3. AGE:_____

4. ADDRESS: _____

5. JOB HISTORY:

   a. Present Job Description _____

      No. of Years _____ Full-time: yes - no
      Ear Protection: yes - no - sometimes

   b. Other Job Descriptions with Same Employer _____

      No. of Years _____ Full-time: yes - no
      Ear Protection: yes - no - sometimes

   c. Other Noisy Jobs with Different Employer _____

      No. of Years _____ Full-time: yes - no
      Ear Protection: yes - no - sometimes

6. MILITARY SERVICE:

   a. Circle the number of years you were on active duty in the military service. 0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - more
      (If you were not in the military, continue to the next page)

   b. What Branch? Army Navy Marines Air Force Coast Guard

   c. Circle the number of years you were in combat. 0 - 1 - 2 - 3 - 4 - 5 - more

   d. List in the following blanks the job or jobs you had in the military.

      _____ Ear Protection: yes - no - sometimes

      _____ Ear Protection: yes - no - sometimes

      _____ Ear Protection: yes - no - sometimes

      _____ Ear Protection: yes - no - sometimes

   e. Did you fire weapons for more than 100 days? yes - no

   f. What kinds of weapons did you fire? individual crew both

Plant Name _____
Worker Number _____

7. NON-OCCUPATIONAL NOISE EXPOSURE:

a. Have you used firearms as a civilian? yes - no
If yes, do you wear ear protection? yes - no - sometimes

b. How many years have you been shooting? _____

c. How many rounds per year? 100 or less 500 1000 or more

d. Do you participate in any of the following hobbies or off-job activities? (Circle yes or no for EACH item)

(1) Rock Band yes no No. of Years____ daily weekly monthly

(2) Motorbike riding yes no No. of Years____ daily weekly monthly

(3) Machine workshop yes no No. of Years____ daily weekly monthly

(4) Automobile racing yes no No. of Years____ daily weekly monthly

(5) Flying yes no No. of Years____ daily weekly monthly

(6) Mechanized farming (tractor) yes no No. of Years____ daily weekly monthly

(7) Chain saws yes no No. of Years____ daily weekly monthly

(8) Others _____ No. of Years____ daily weekly monthly

8. LAST NOTABLE EXPOSURE

a. Have you been exposed to a loud noise since leaving your job yesterday? yes - no
(If no, please continue to next page)

b. If yes, what was the nature of your exposure (specify, e.g., horn, airplane, workplace, gunshot, etc.)? _____

c. How many hours ago did this exposure take place? _____

d. How long did this exposure last? (In minutes or hours) _____

Plant Name _____
Worker Number _____

9. RELEVANT MEDICAL HISTORY:

Have you had any of the following:
(Circle yes or no for EACH item - if yes, elaborate in the space provided)

a. Severe blow to head yes no _____

b. Head noises yes no _____

c. Medical treatment for ears yes no _____

d. Running ears yes no _____

e. Earaches yes no _____

f. Hearing aid yes no _____

g. Medication yes no _____

h. Deafness in the family yes no _____

i. Do you think you have normal hearing? yes - no

10. OTOLOGIC CHECK

(This question will be completed by staff medical officer)

a. Perforation R _____ L _____

b. Drainage R _____ L _____

c. Malformation R _____ L _____

d. Occlusion R _____ L _____

e. Disease R _____ L _____

f. Scars R _____ L _____

g. Others R _____ L _____

APPENDIX B

CONSIDERATIONS AFFECTING VALIDITY OF ANALYSIS

This Appendix provides additional detail regarding:

EFFECTS OF BACKGROUND NOISE IN THE TEST ENVIRONMENT

Although the background noise levels measured in the audiometric test chamber were in conformance with the ANSI S3.1-1960 "Standard Criteria for Background Noise in Audiometric Test Rooms," it should be noted that these criteria are not presently considered sufficient to prevent the possibility of masking effects for persons having good or excellent hearing. The standard audiometric thresholds were redefined by ANSI in 1969 but the background limits have not yet been changed. An ANSI working group has been formulating the needed changes and a proposed standard exists, although it is neither final nor official at the present time. A recent report published by the National Physical Laboratory (NPL) of Great Britain has provided much useful data on masking of audiometric thresholds by background noise, and the results are in fairly close agreement with the proposed ANSI standard.

For TDH 39 headphones with MX-41/AR cushions, the proposed ANSI standard (as of Summer 1975)[1] listed the following background noise octave band limits for no significant masking with listeners having 0 dB Hearing Level: 21.5 dB at 500 Hz, 29.5 dB at 1000 Hz, 34.5 dB at 2000 Hz, 39.0 dB at 3000 Hz, 42.0 dB at 4000 Hz, and 41.0 dB at 6000 Hz. If a listener has a greater hearing level (poorer hearing) by a specified number of decibels, then the noise could be that number of decibels louder with no significant effect.

The NPL report mentioned above provides results of a detailed study of the threshold shift at 500 Hz due to background noise. The results are expressed in terms of third octave band noise levels, but these can be converted to octave band levels if one simply adds five decibels as in the proposed ANSI standard. With this correction the data for threshold shift at 500 Hz for listeners having 0 dB Hearing Level are as follows: 14.0 dB octave band noise level produces 1 dB shift, 18.7 produces 2 dB shift, 21.7 dB produces 3 dB shift, 26.4 produces 5 dB shift. (The NPL data and the proposed ANSI standard can thus be brought into conformance at 500 Hz if one assumes that "no significant shift" as expressed in the proposed ANSI standard means 3 decibels.)

It should be kept in mind that the masking effects described above are somewhat random and will not affect every test equally. As pointed out in the NPL report, hearing thresholds below zero are often recorded in industrial surveys even when theory would predict some masking effects. Furthermore, although the above data give noise level limits for testing persons having 0 dB Hearing Level, the numbers can easily be converted to provide audiogram measurement boundaries for any specified background noise levels.

---

1 Private Communication: G. Studebaker, Chairperson, Working Group S3-56

Since the NIOSH study utilized Rudmose RA-125 Otocups to provide additional attenuation beyond that provided by the TDH 39/MX-41/AR ear cushions, it is necessary to take account of the additional noise attenuation. According to a study by Copeland and Mowry,[2] the Otocups provide additional noise attenuation in the amount of 16 dB at 500 Hz, 10 dB at 1000 Hz, 7 dB at 2000 Hz, 5 dB at 3000 Hz, 3 dB at 4000 Hz, and 10 dB at 6000 Hz.

According to measurements performed in the NIOSH audiometric test van, the octave band levels of background noise were 37 dB at 500 Hz, 36 dB at 1000 Hz, 34 dB at 2000 Hz, 35 dB at 4000 Hz, and 35 dB at 8000 Hz. By first subtracting the Otocup attenuations and then subtracting the results from the proposed ANSI background noise limits, one arrives at the following hearing levels, which represent the best audiogram that can be measured in the NIOSH van without some possible distortion due to masking effects:

> -0.5 dB(HL) at 500 Hz, -3.5 dB(HL) at 1000 Hz, -7.5 dB(HL) at 2000 Hz, -9.0 dB(HL) at 3000 Hz, -10.0 dB(HL) at 4000 Hz, -16.0 dB(HL) at 6000 Hz.

Thus it should be possible to accurately measure hearing thresholds at the 0 dB level at all test frequencies in the NIOSH test van, and negative thresholds at the higher frequencies. This assumes, of course, that the Otocups perform as predicted, and that no extraneous noises are present in the test room. Since the Otocup attenuation levels used are averages, one would expect the actual performance to be sometimes better, sometimes worse.

The masking effect creates a kind of soft boundary, or zone of uncertainty at the upper left corner of the audiogram. It is partially for this reason that the NIOSH statistical analysis emphasized median and centile levels rather than computing mean hearing levels. Mean levels can be influenced to some extent by such boundary effects, but centile and median levels are unperturbed so long as they are away from the limiting boundary. An examination of the statistical audiogram curves presented in this report will reveal that in virtually every case the median hearing curve is far enough away from this boundary to rule out any likelihood of serious distortion of the data to background noise masking effects under ordinary operating conditions.

---

2 The Journal of the Acoustical Society of America, Vol. 49 # 6 (1971) p. 1757

CALIBRATION OF AUDIOMETERS

Although the ANSI S3.6-1969 "Specifications for Audiometers" Standard specifies minimum requirements for accuracy of calibration of audiometers, the scientific research goals of hearing survey work sometimes require calibration procedures that go beyond mere compliance with the tolerance limits of the standard. If all research were to be performed using one reliable, stable audiometer, then calibration would be completely unnecessary for hearing level comparison studies. However, if it is desired to compare one's results with those of others, or if more than one audiometer is used, then frequent calibration checks are important. If a large number of audiometers are used and if the calibration errors are uncorrelated and "average out" to zero, then the result will merely be a slight inflation of the statistical variance.

During the course of the NIOSH study of coal miners, frequent calibration checks were performed on the six audiometers in the van. Although screwdriver adjustments were sometimes made to correct significant errors, this practice was discouraged except when absolutely necessary, since it was feared that frequent readjustment might degrade the ruggedness of the calibration potentiometers and would increase the chance of blunders. Instead, the calibration deviations of each audiometer were usually just measured for later insertion into the computer for data correction. It is not an easy matter to perform a thorough check of six audiometers, and during the course of the study the calibration technique was continually being evaluated to see if it could be improved. It should be noted as a postscript that upon completion of the coal miner study the following actions were taken to provide for easier and more accurate calibration in future hearing survey work: (1) the audiometers were replaced by a new type more amenable to routine calibration checks and (hopefully) more stable, (2) new acoustical measurement instruments were purchased to be permanently installed in the NIOSH audiometric van to provide on-the-spot capability for rapid checkout of audiometers, (3) a programmable electroacoustic test system was developed for performing exhaustive calibration tests automatically in the laboratory.

In order to verify no systematic errors were introduced into the data as a result of calibration deficiencies in one or more audiometers, a comparative analysis was performed to reveal any differences from audiometer to audiometer. Figure B-1 shows aggregate hearing level statistics for each audiometer station in the van, revealing no substantial influence upon the hearing data.

The coupler sound pressure levels used as the audiometric zero reference are as follows*:

	500	1000	2000	3000	4000	6000	Hz
Reference Levels	82.7	76.2	77.2	79.5	79.6	86.5	dB

These levels differ only very slightly (at most 1.8 dB) from the values listed in the appendix of the ANSI S3.6-1969 standard. The differences reflect the effect of the RA-125 Otocups, as reported in manufacturers data. The B&K 4144 microphone was used with protective grid in place.

In the section of this report which describes the data base, hearing data are presented that were taken from a report entitled, "Hearing Levels of Adults by Age and Sex," USPHS, 1965. Since these data were based upon earlier reference coupler sound pressure levels for TDH 39 headphones, appropriate corrections were applied to bring the data into conformance with the reference levels now listed in the appendix of the ANSI S3.6-1969 standard.

* These coupler sound pressure levels are the sound pressure levels corresponding to a hearing level of 70 dB at each test frequency.

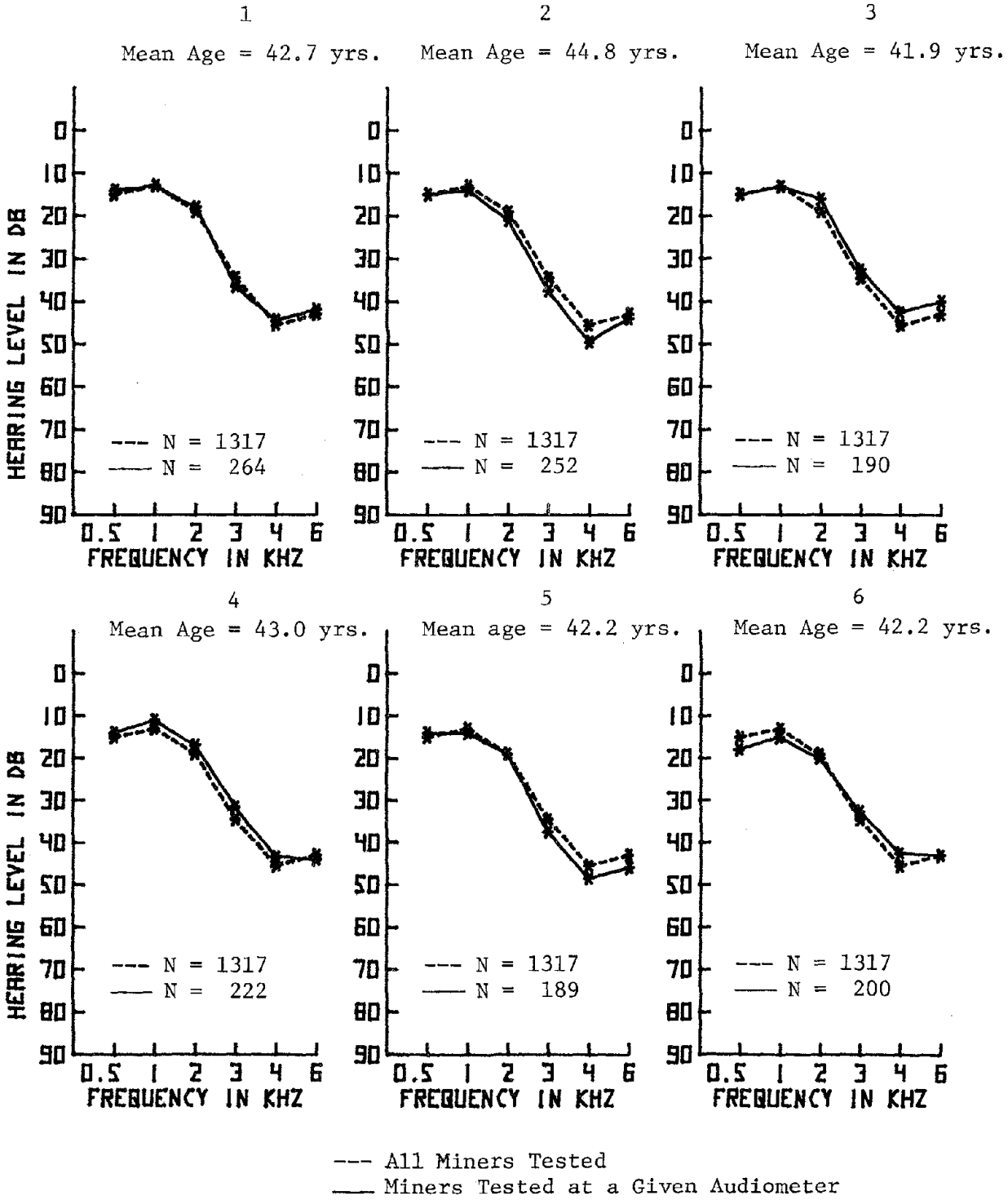


Figure B-1. MEDIAN HEARING LEVELS FOR ALL WORKING MINERS TESTED COMPARED TO THOSE TESTED ON EACH OF SIX AUDIOMETERS, using left and right ear averages; N for all miners is 1317 because 32 audiograms could not be used.

TEMPORARY THRESHOLD SHIFT DUE TO NOISE EXPOSURE

If workers are removed from a noisy environment and immediately given an audiometric test, some of the measured hearing loss may be due to a "temporary threshold shift" which would not have been present if sufficient time had elapsed for recovery. Since this phenomenon does not represent a chronic loss of health, it is important to design hearing studies to eliminate this factor. Precautions taken during the course of the coal miner study included testing each miner before his workshift and questioning the miner to make sure he was not exposed to any severe noises prior to the test. Although it is remotely possible that in a few isolated cases there might have been some lingering effects of the previous day's noise exposure, it is not conceivable that these effects could have had substantial impact on the hearing loss data. Laboratory experiments performed by NIOSH[3] and others[4] have shown that temporary threshold shift usually disappears rapidly. Persistent shifts seem to occur primarily at 3 or 4 kilohertz, and even then only in individuals who have experienced very severe threshold shifts initially. It seems unlikely that any individual working daily in coal mine noise could continue to experience severe threshold shifts on a daily basis without eventually incurring a permanent loss that would reduce the size of the daily temporary loss. Perhaps a more important consideration can be expressed as follows: if daily exposure to coal mine noise produces any "temporary" effects which are still present at the beginning of the next day's workshift, then for the working coal miner these effects can be regarded as chronic, and should be included in any assessment of the impact of the noise upon the worker's health.

3 Schmidek, M., B. Margolis, and T. Henderson. "Effects of the Level of Noise Interruptions on Temporary Threshold Shift." American Industrial Hygiene Association Journal, May 1975, p. 351.

4 Ward, W. D., A. Glorig, and D. L. Sklar. "Relation between Recovery from Temporary Threshold Shift and Duration of Exposure." J. Acous. Soc. Amer. 31:600 (1959).

ACCURACY OF STATISTICS VS GROUP SAMPLE SIZE

Since hearing level is greatly influenced by age, it is logical to divide the coal miners into age groups, as has been done in this report, so that effects due to noise may be more clearly seen. Other classification criteria have also been applied, reducing the sizes of the groups even further, such as selection of specific occupational groups, elimination of miners with otoscopic evidence of abnormalities, elimination of miners having previous noisy jobs, etc. After completion of this classification and elimination process, one must perform a statistical assessment of the hearing level data for each group. Obviously, if a particular group turns out to contain only 3 or 4 miners then the data is not very meaningful. The question then arises, "How large must a group be so that the statistical analysis gives a valid representation of that population of miners?," or phrased another way "Considering the size of the group, just how accurate is our measurement of the hearing statistics?" These questions can be answered through the use of statistical confidence intervals.

Suppose that it is desired to ascertain the hearing level statistics of a certain population of coal miners (for example the population of all miners aged 45 to 55 who have worked as continuous miner operators for 20 years or more, and who have no evidence of non-occupational noise exposure or suspicious medical history). This can be done by measuring the hearing levels of a random sample of N coal miners from this population. At a particular audiometric test frequency the average of the hearing levels, i.e. the sample mean, will have a normal distribution centered around the population mean and with a standard deviation equal to $\sigma/\sqrt{N}$ where σ represents the standard deviation of the population.[5] (The foregoing statement is based upon elementary statistical theory and the assumption that N is large, or that the hearing levels have an approximately normal distribution). It is therefore possible to assign 90% confidence interval brackets[6] of width $\pm 1.65\ \sigma/\sqrt{N}$. If it is assumed for the sake of discussion that a sample of 100 miners is tested at an audiometric test frequency of 3 KHz, resulting in a sample mean of 31 dB with a raw standard deviation of 18 dB, then it is possible to state with 90% confidence that the mean hearing level of the population is 31 dB $\pm$3.0 dB ($1.65\ \sigma/\sqrt{N} = 1.65 \times 18/\sqrt{100} \approx 3.0$ dB). This, of course, assumes that the measurements contain no systematic error or bias, and also that the raw standard deviation is an adequate estimate of the true standard

5 Hogg, R. V., and A. T. Craig. Introduction to Mathematical Statistics. New York, New York, 3rd Edition, 1970, p. 182.

6 Dixon, W. J., and F. J. Massey. Introduction to Statistical Analysis. McGraw-Hill, Inc., 1969, p. 77.

deviation of the population. It is thus apparent that in order to determine how large N must be, one must first know the (approximate) standard deviation σ, the required level of confidence, and the permissible size of the error tolerance brackets around the estimated mean level.

With regard to the last of these, the following point should be stressed: the mere fact that one cannot with certainty determine the hearing level of a single miner to within better than ± 5 dB does not imply that it is senseless to attempt to bracket the mean hearing level of a population to within better than 5 dB. Indeed the population mean has an exact numeric value which can be estimated as precisely as one desires by making N large enough. In some applications, where one must compare the hearing loss of two groups in order to determine the validity of a formula for noise-induced hearing loss, a precision better than 5 dB may be required. However the validity of such precision is limited by (a) the degree to which one can control factors which might influence the hearing levels differentially with respect to the tested groups, and (b) the validity of the control group data. At any rate, tolerance brackets of ± 1 dB may be difficult to attain, since at the 90% confidence level this would require a group size of 882 (assuming σ = 18 dB, as before).

The above discussion may be used as background for interpretation of the statistical data presented in this report. Although the standard deviations are not displayed in the graphs of this report, a suitable empirical approximation to σ can be obtained by taking three-fourths of the decibel difference between the 25th and 75th percentile hearing levels. However, since the report emphasizes median hearing levels instead of mean hearing levels, some further discussion is necessary. The median of a sample is a slightly inferior estimate of central tendency as compared to the sample mean. In fact, for normal distributions it takes about a 60% larger sample size to determine the median within the same level of accuracy. Thus in using the sample median instead of the sample mean, the N should be replaced by 0.637 N in the formulas of the preceding paragraphs.[7] Although there is indeed a penalty associated with the use of the median, it should be recalled that the median is less sensitive to distortions arising from "boundary effects" such as background noise masking, and is perhaps more appropriate since the distribution of hearing levels is not exactly normal. Moreover since the hearing levels are not exactly normally distributed (they are more nearly log-normal) the .637 conversion factor is an approximation.

It is also possible to utilize non-parametric confidence level limits for the median which are valid for any statistical distribution, and

7 Ibid, p. 130.

which for large N can be expressed in terms of the sample percentile points as follows: with 90% confidence, the true median will lie between the sample-percentiles[8]

$$(50 \pm 82.3/\sqrt{N})\text{th percentile}$$

where N is the size of the sample.

For example, for N = 100 one can state with 90% confidence that the true median lies between the 42nd percentile and the 58th percentile of the sample data. $(82.3/\sqrt{100} = 8.23 \tilde{=} 8)$

The methods of data analysis and presentation utilizes in this report are relatively simple and straightforward. More complex statistical procedures could have been used, such as multivariate analysis, multiple regression, factor analysis, transformation to normal distributions, etc. Proper application of these more sophisticated techniques would have had an effect similar to that of increasing the sample size. However the results would have been more difficult to present with clarity and credibility and might have been received with some renitence. There are, of course, some popular "statistical tests" which are straightforward. For example, it would have been possible to perform "t" tests, (or "F" tests) for each pair of groups or conditions that was compared, and to flag all those audiometric frequencies at which the test "proved" the existence of a "statistically significant effect." This would have been grossly inappropriate and perhaps misleading for several reasons. First, the hearing thresholds at the various thresholds are statistically correlated, and more complex procedures would be necessary to account for this. Second, multiple application of such tests will result in a certain percentage of the results being positive even when no effect is present. Third, the term "statistically significant effect," although often used, is technically incorrect and should be replaced by "The null hypothesis is rejected, based upon a test having a significance level of .05 (for example)." When expressed in these terms the impact is less dramatic. Fourth, for every factor investigated in this report it is reasonable to postulate that there is bound to be some effect, even though it may be so small as to be inconsequential. Thus if the test leads to rejection of the null hypothesis, then this merely proves that the data sample was large enough to prove what was already known to be true anyway (i.e. any real effect, no matter how trivially small, can be made to be "statistically significant" if one takes a large enough sample of data). Such a result is of questionable value, since it gives no direct estimate of the size of the effect, nor does it establish that the effect is large enough to be of consequence. It should be pointed out, however, that the formulas which are used in such tests do have value, and are directly related to the confidence intervals discussed in the previous paragraphs.

8 Mood, A. M. Introduction to the Theory of Statistics, McGraw-Hill, Inc. 1950, p. 389.

THE USE OF EXCLUSION CRITERIA

In addition to grouping, classifying, and sorting for such factors as age, years of experience, job description and noise exposure, it has been customary in this and previous NIOSH studies to apply exclusion criteria to weed out those persons whose hearing may have been affected by certain "irrelevant" factors. A detailed listing of exclusion criteria appears elsewhere in this report. In the brief list that follows, six exclusion criteria are presented for purposes of discussion. It should be noted that the last of these was <u>not</u> applied in the coal miner study because it was not possible to do bone-conduction audiograms in the NIOSH audiometric van.

a. significant recreational noise exposure
b. suspicion of ear pathology based on medical history and otoscopic observation
c. previous noisy job
d. unilateral hearing loss
e. excessive ear wax
f. conductive hearing loss evidenced by bone-conduction audiogram

Several reasons for the application of such criteria can be asserted. First, the factor may be coincidentally related to the independent variable (noise exposure or job type) and thus present a false effect. For example, workers in noisy jobs might do more shooting than other workers. Second, the effect of the factor may introduce so much random variability that it obscures the desired analysis. This problem can, of course, be alleviated by taking a larger sample. Third, one may philosophically argue that it is only necessary to determine the effects of the occupational noise upon the normal (non-pathological) ears of workers not previously exposed and who do not subject themselves to excessive recreational noise.

However, the first of these arguments can be countered by more effective use of control data and better study design, the second can be solved by increasing the sample size, and the third may not be valid. If substantial numbers of workers have "pathological" ears or engage in noisy recreational activities, then the effect of occupational noise on them is not any less important. Moreover, the application of exclusion criteria is often based on very sketchy evidence, and the elimination process is therefore inaccurate. The benefit gained by this crude refinement of the sample may be offset by the reduction in sample size. For these reasons, the data in this report include hearing statistics calculated both before and after application of exclusion criteria.

With regard to the specific exclusion criteria listed above several comments can be made. For criterion (a), hearing data were excluded only if there was some indication of substantial or unusual exposure from noisy recreational activities. Estimates were obviously somewhat crude. In criterion (b), a diagnosis of pathology was not attempted; rather, suspicious signs were simply noted. The prevalence of such signs among coal miners appeared to be unusually high, and the resulting sample size was thus reduced markedly. Many coal miners had previous jobs that were assumed to be noisy enough to qualify under criterion (c); here again the estimates were rather crude.

Criterion (d) was a "bootstrap" exclusion in the sense that hearing data was excluded on the basis of an examination (by the computer) of the audiogram itself. In particular, any audiogram which showed a left/right hearing differential of more than 40 dB at two test frequencies was excluded. This practice is somewhat questionable since selective discrimination on the basis of the dependent variable can prejudice a sample. However in this case arguments can be presented to defend the practice. First, the existence of a unilateral loss is very strongly indicative of an unusual pathological condition in one ear, since unilateral noise exposures are rare (presumably). Thus retention of the data might contribute to excessive random variability. Second, a large unilateral loss implies that the recorded hearing thresholds in the poorer ear may be invalid due to transmission of sound to the better ear, such as by bone conduction. At any rate, the number of audiograms excluded for this reason (d) was not large.

Criterion (c) is partially a bootstrap exclusion, in the sense that miners having substantial ear wax were not excluded unless they also showed unusual low frequency losses. This policy was followed in the interests of preserving as much of the data as possible, and because it was known that even large amounts of ear wax often have little or no effect on hearing thresholds. There may have been some slight bias effect, but the number of miners excluded was very small.

Since bone-conduction audiometry was not done, criterion (f) could not be applied. Some estimate of probable conductive hearing loss could have been attempted upon examination of the audiogram, but this practice could have very strongly biased the data. If bone conduction audiometry had been performed post hoc upon only those miners having suspicious audiograms, this also could have introduced a substantial bias, in that all miners with suspicious audiograms would have been subjected to a subsequent test that was bound to erroneously exclude some borderline cases. Therefore if bone conduction audiometry had been performed, of

necessity it ought to have been performed upon all miners without discrimination. The difficulty of performing such tests in the audiometric van precluded this practice. In future occupational surveys it may be possible to do bone-conduction tests at a single frequency if appropriate instruments can be developed. However if the efficiency of the testing operation is reduced, then the sample sizes may be reduced accordingly due to practical limitations. (i.e. it may not be possible to test as many workers if bone conduction tests are done.)

EFFECTS OF SELF-SELECTION

Since the coal miners' participation in the hearing study was voluntary, it is appropriate to explore the possibility that the sample may have been biased due to self selection on the part of the coal miners. As reported elsewhere in this report, the degree of voluntary participation by the miners was not uniform from mine to mine, and was also dependent upon age. In light of the type of analysis that was performed it is unlikely that any substantial bias in the hearing statistics would result from these variations alone. However, if the inclination of the coal miners to report for the scheduled hearing test was somehow correlated with their noise exposure or some other factor, a systematic bias could be introduced. A special analysis of personnel records, MESA noise survey data, and records of hearing test attendance was performed to reveal any such problems.

Records were available listing the noise exposures, job codes, and personal identifiers of all miners covered by the MESA noise survey (a total of 2049 miners). However, by the time the hearing tests were administered (often much later) there was no guarantee that all of these men were still working at the mine. To correct for this factor, the MESA personnel lists were collated with mine payroll lists obtained at the time of the hearing tests to eliminate miners not still present, leaving a total of 1768.

The resulting data were then broken down by noise exposure and are listed in the first row of Table B-1, as "Remaining Miners." It may be assumed that virtually all of these miners were requested to report for hearing tests, with the "participants" being those who actually appeared and were tested.

Although a total of 1349 working miners were tested for hearing loss, only 1030 of these had been covered by the MESA noise surveys; these miners are shown in the second row of the table. Therefore one may conclude that out of 1768 miners covered by the MESA noise survey who were still present at the time of the hearing tests, only 1030 actually participated, yielding an aggregate participation rate of 58%. When the participation rates are broken down by noise exposure, as in the third row of the Table, it is clear that those miners with heavy noise exposure had participation rates comparable to the others. Thus it is not likely that a bias was introduced due to a dependency of the self selection process upon noise exposure.

However, it should be noted that the above analysis does not conclusively prove that there was no dependency of the self selection process upon the individual coal miner's concern about his hearing, and therefore (possibly) upon his degree of hearing loss as perceived by himself. Such uncertainty could have been eliminated only by achieving virtually 100% participation.

Table B-1

PARTICIPATION VS DAILY NOISE DOSE

	Daily Noise Dose							
	0	0 to .25	.25 to .50	.50 to 1.0	1.0 to 2.0	2.0 to 16	>16	All
Remaining miners at time of hearing test	497	187	613	234	126	57	54	1768
Participants from those miners remaining	287	105	364	142	76	28	28	1030
Rate of participation	57.7%	56.1%	59.4%	60.7%	60.3%	49.1%	51.8%	58.2%

OPTIMIZING THE FORMULA FOR DAILY NOISE

It was anticipated that the results of the hearing and noise surveys of coal mines might shed some light upon the problem of selecting the most appropriate formula for computing the daily noise dose. The presently existing formula found in current OSHA regulations was inherited from the preexisting Walsh Healey Standard, and was originally inspired by the time-weighted-average concept that is used extensively in standards for air contaminants. It employs a 5 dB trading relationship for noise level vs. duration which is based largely upon laboratory studies of temporary hearing threshold shift that have never been validated by studies of permanent hearing loss. In recent years this formula has come under some question. Although the 5 dB rule was retained in the NIOSH recommended standard, the NIOSH criteria document itself stated that in so doing NIOSH was merely acknowledging a precedent, since no convincing data could be found to either prove or disprove the validity of the rule.

The term "noise exposure pattern" as used here, means a sequence of noise levels and durations that represent the typical workday pattern, e.g., two hours at 95 dBA, followed by four hours at 100 dBA, followed by two hours at 92 dBA. The purpose of a formula for "daily noise dose" is to compute, for any given noise exposure pattern, a numerical value representing the risk imposed by the noise exposure. Since the principal use of the formula is in regulations and standards, the following requirement is essential:

> Requirement # 1. The defining formula for daily noise dose must be sufficiently simple for implementation of standards and regulations.

This does not imply that the formula must be easily calculable by hand (although that would be advantageous). However it must be easy to ascertain the daily noise dose by use of practical, not-too-costly instruments and procedures. Of course for scientific research purposes it may be permissible to relax Requirement # 1 in order to enable more exact refinement of damage-risk-criteria, but eventually some simplifying approximation must be made.

Usually the value $D = 1$ is taken as the dividing line between permissible and prohibited noise exposures. If so, then the following requirement applies:

> Requirement # 2. The formula must classify noise exposures rationally at the point $D = 1$; i.e., a noise exposure pattern for which $D>1$ must be more hazardous to hearing than one for which $D<1$.

This requirement is probably not strictly met by any of the currently proposed formulas, due to the limitations imposed by Requirement # 1 and the uncertainty of available scientific evidence.

If the concept of dose is to be of some use beyond simply providing a yes-no discrimination between permissible and prohibited exposures, then an additional requirement must be met, which is a generalization of Requirement # 2.

> Requirement # 3. Ideally the formula should properly rank-order all noise exposures; i.e., the value of D for noise exposure pattern "A" should exceed the value for noise exposure "B" if, and only if, noise exposure "A" is more hazardous than "B."

Obviously, a corollary is that two noise exposure patterns should yield the same value of D if, and only if, they are equally hazardous.

The following requirement is dictated by the intent of standards and regulations:

> Requirement # 4. The formula should be defined so that the degree of risk associated with D = 1 is at the dividing line between "acceptable" and "unacceptable," as determined by appropriate assessment of the health benefits and the feasibility of meeting the limits thus imposed, in keeping with occupational health criteria and legislation.

Conformance with the following requirements is quite useful, if not absolutely mandatory:

> Requirement # 5. Ideally, the formula should yield D = 0 only for noise exposures that are harmless. At the very least, it should define a borderline zone $0<D<1$ of exposures that are conditionally acceptable.

For example, it is useful to use the point D = 0.5 as an action point for establishment of an audiometric testing program.

> Requirement # 6. Ideally, the formula should result in a relationship between the degree of risk and the numerical value of D that is reasonably continuous, and preferably, approximately linear or log-linear.

Of the recently proposed formulas for noise dose, most are "histogram-determined" in the sense that the value of D can be computed from the level-duration histogram of the day's noise exposure without knowledge

of the sequence of occurrence of the individual segments of the noise pattern. For example, this means that the following noise exposure patterns will yield the same value of D:

6 hours at 105 dBA followed by 2 hours at 85 dBA;
or 2 hours at 85 dBA, followed by 6 hours at 105 dBA;
or 8 hours consisting of 105 dBA with eight fifteen minute "interruptions" at 85 dBA.

All of the following standards or recommended standards employ histogram-determined formulas for D: (a) the current OSHA regulations, (b) the newly proposed OSHA standard, (c) the NIOSH recommended standard, (d) the "L_{eq}" formulas proposed by EPA, and (e) the current Federal Coal Mine regulations.

There has been one proposed Federal Coal Mine Standard which was not completely histogram-determined, since it incorporated a substantial allowance for interruptions. (See Federal Register, Dec. 9, 1970, pp. 18671 - 18672). However this proposed standard was subsequently discarded, partially because it did not adequately meet Requirement # 1.

In this report two particular formulas were considered, with the doses denoted by D_p, D_e. The formula for D_p employs a 5 dB rule with an 85 dBA lower cutoff; 90 dBA for 8 hours yields $D_p = 1.00$ (see Table 4). The formula for D is the same except that a 3 dB rule is used. Both of these formulas are histogram-determined, and both satisfy Requirement #'s 1, 4, 5, and 6 comparably well. Thus, they can be contrasted only by determining which of the two better satisfies Requirement # 3. (Note that # 2 is just a special case of # 3). The comparison can thus be done by testing to see which formula provides a better prediction (or rank-ordering) of the hearing loss data.

However, without even examining the hearing loss data, it may be possible to conclude that the available set of noise exposure patterns is not of sufficient variety to permit discrimination of D_e and D_p, no matter what the hearing loss data might show. In particular, if for each noise exposure pattern a point is plotted on a scatter diagram having coordinates (D_e, D_p), and if the great majority of these points fall close to a single curve, then both formulas will rank-order the risks in approximately the same way, and thus both formulas meet Requirement # 3 equally. (This implies that, for the particular set of noise exposure patterns in question, there exists a graph which allows one to compute D_e from D_p, or vice-versa, without knowledge of the noise exposure program.)

For the coal mine study, the hearing loss did not correlate well with the noise survey data. However, in light of the above discussion, the scatterplot of D_e vs. D_p shown in Figure B-2 suggests that the better formula could not have been chosen with certainty even if the correlation had been better. Stated another way, the values of D_e and D_p obtained from the noise survey data were such inadequate measures of the lifetime noise exposures of individual miners that neither of the formulas appeared to meet Requirement # 3.

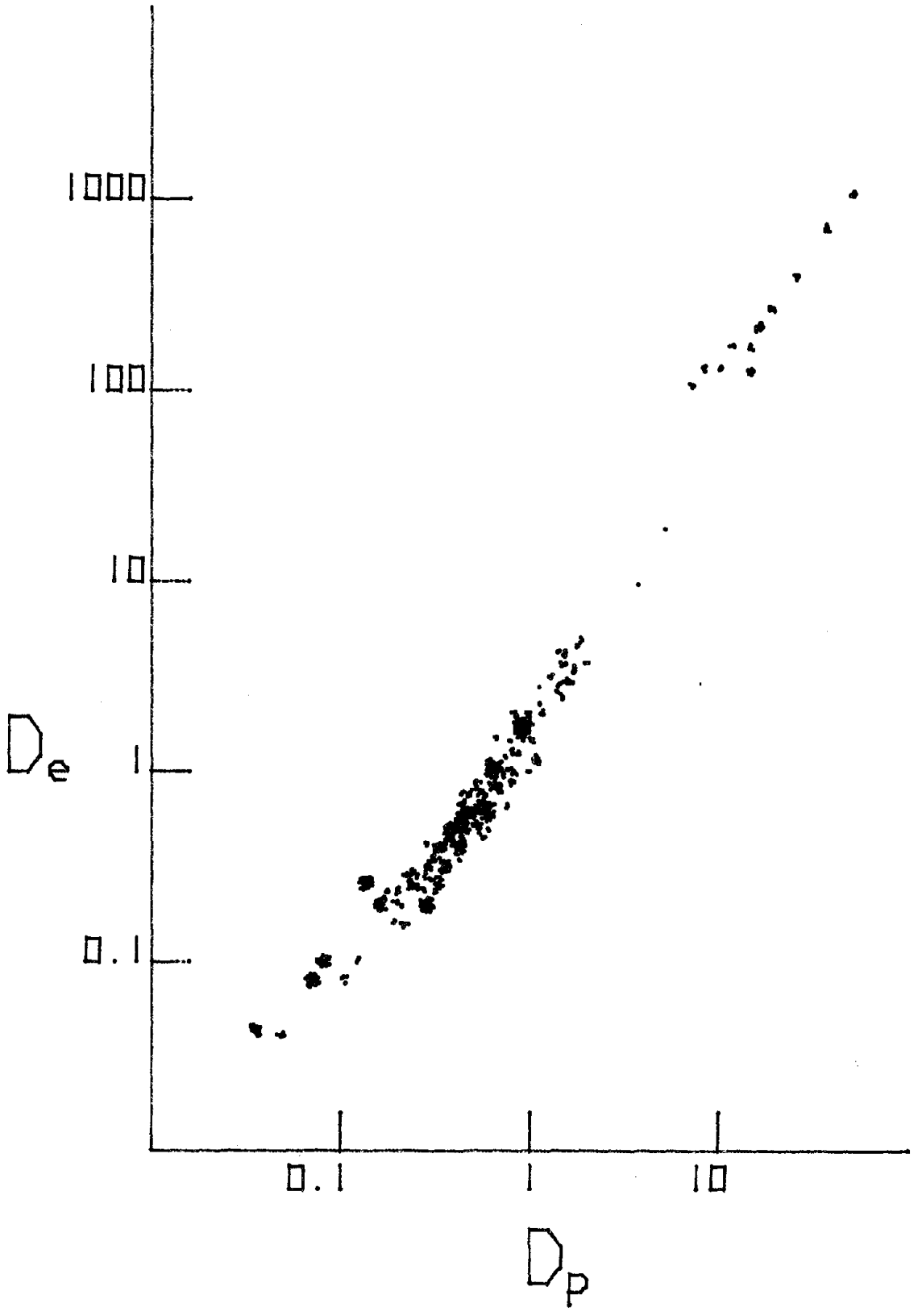


Figure B-2. SCATTERPLOT OF D_e VERSUS D_p FOR COAL MINE NOISE EXPOSURE PATTERNS

APPENDIX C

NON-NOISE-EXPOSED MODEL*

* taken from Reference 2

HEARING LEVELS OF NON-NOISE EXPOSED PERSONS

In order to use the hearing level statistics of the non-noise exposed persons as baseline statistics for comparison with the noise exposed populations, a mathematical model was developed to generate "non-noise exposed" hearing level statistics for a population having any specified distribution of ages.

Figures 4-8 show a comparison of the model with raw data. The figures illustrate centile distributions of the male, non-noise exposed, raw hearing level data split into five age groups. (This splitting was performed so that each age group contained the same number of workers.) These figures also show centile distributions generated by the mathematical model, based on the actual distributions of ages within each age group. The data generated by the model are termed "Smoothed Data" in the figures.

At the 10%, 25%, and 50% (or median) levels, comparisons of model versus raw data indicate agreement to within 3 dB; at the 75% and 90% levels, agreement is to within 5 dB, except at the 90% level for the 38 to 48 years age group. (A complete presentation of non-noise exposed male and female population statistics will be published in a subsequent report.)

The model was developed after verification of a Gaussian distribution of the logarithm of [hearing level + K], with age as a parameter, where K is a constant which depends upon frequency, i.e., $K = K(f)$ where f is the audiometer test frequency in Hertz. In fact linear regression of log[hearing level + K] on age proved to accurately fit the hearing level data of non-noise exposed workers (i.e., those working in noise levels <80 dBA). For each of the six audiometer frequencies, K was selected to provide homogeneity of the variance of hearing level data about the regression line. Hearing levels were averaged over left and right ears.

The method by which the mathematical model generates "non-noise" hearing level statistics for any sample population of workers is as follows: For each member of the sample population of a log-Gaussian probability distribution of hearing level is generated. This distribution, of course, depends upon his age and sex, as well as audiometric frequency, and is derived using the regression line that statistically fits non-noise exposed persons. These distributions are then superimposed to form a single, "mixture distribution" for the entire group. Using this mixture distribution it is possible to derive non-noise statistics of any type, e.g., centile distributions.

All non-noise data presented in this report have been generated by the technique just described. It should be noted that, within the context of this report, "non-noise exposed" does not indicate total lack of exposure to occupational noise, but rather that the noise level was <80 dBA, and thus "not significant" according to most current criteria. Most of the sample was well below this level.

FIGURE C-1

ONHS: MALE NON-NOISE EXPOSED WORKERS AGES 17 TO 26 YEARS

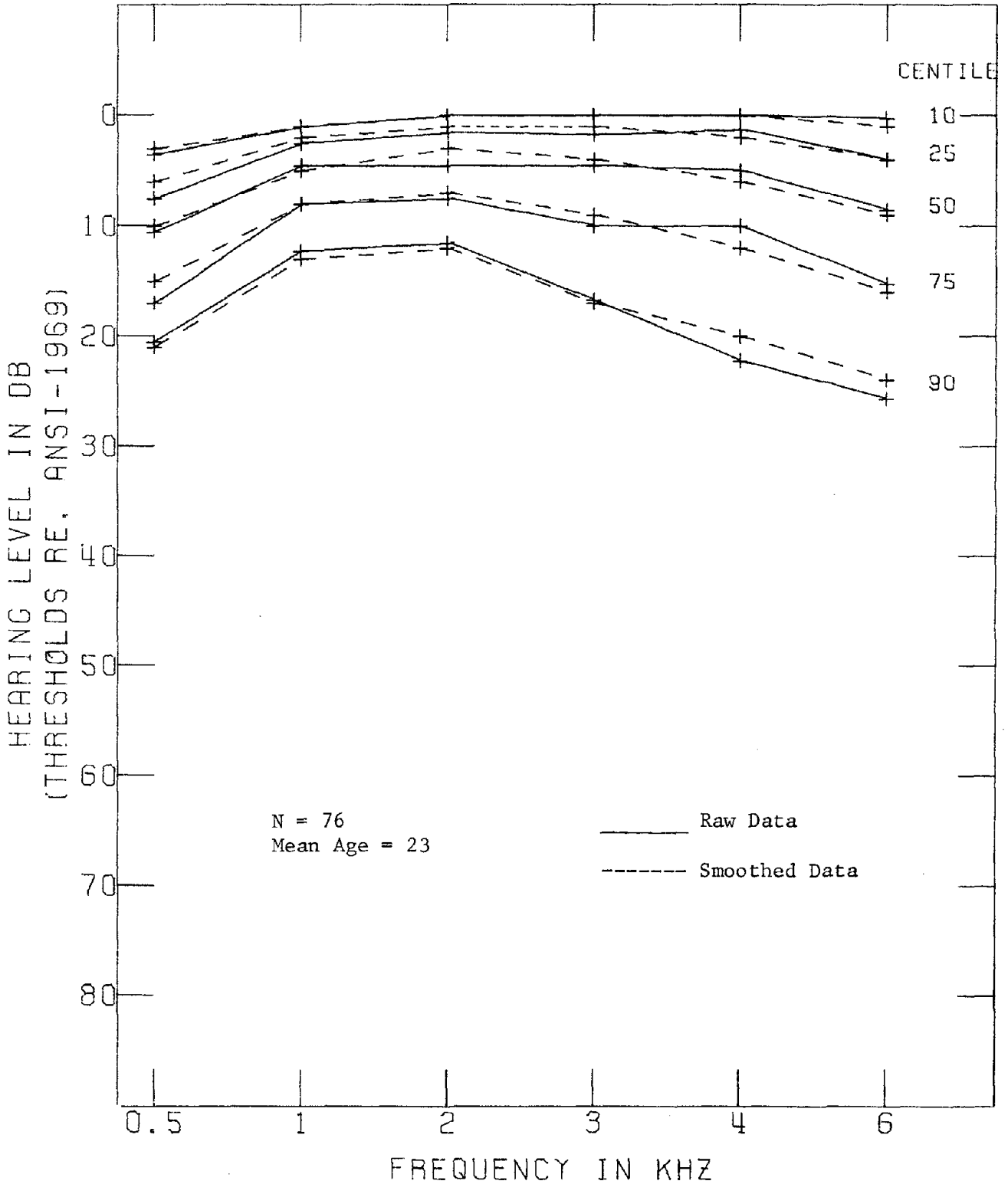


FIGURE C-2

ONHS: MALE NON-NOISE EXPOSED WORKERS AGES 26 to 32 YEARS

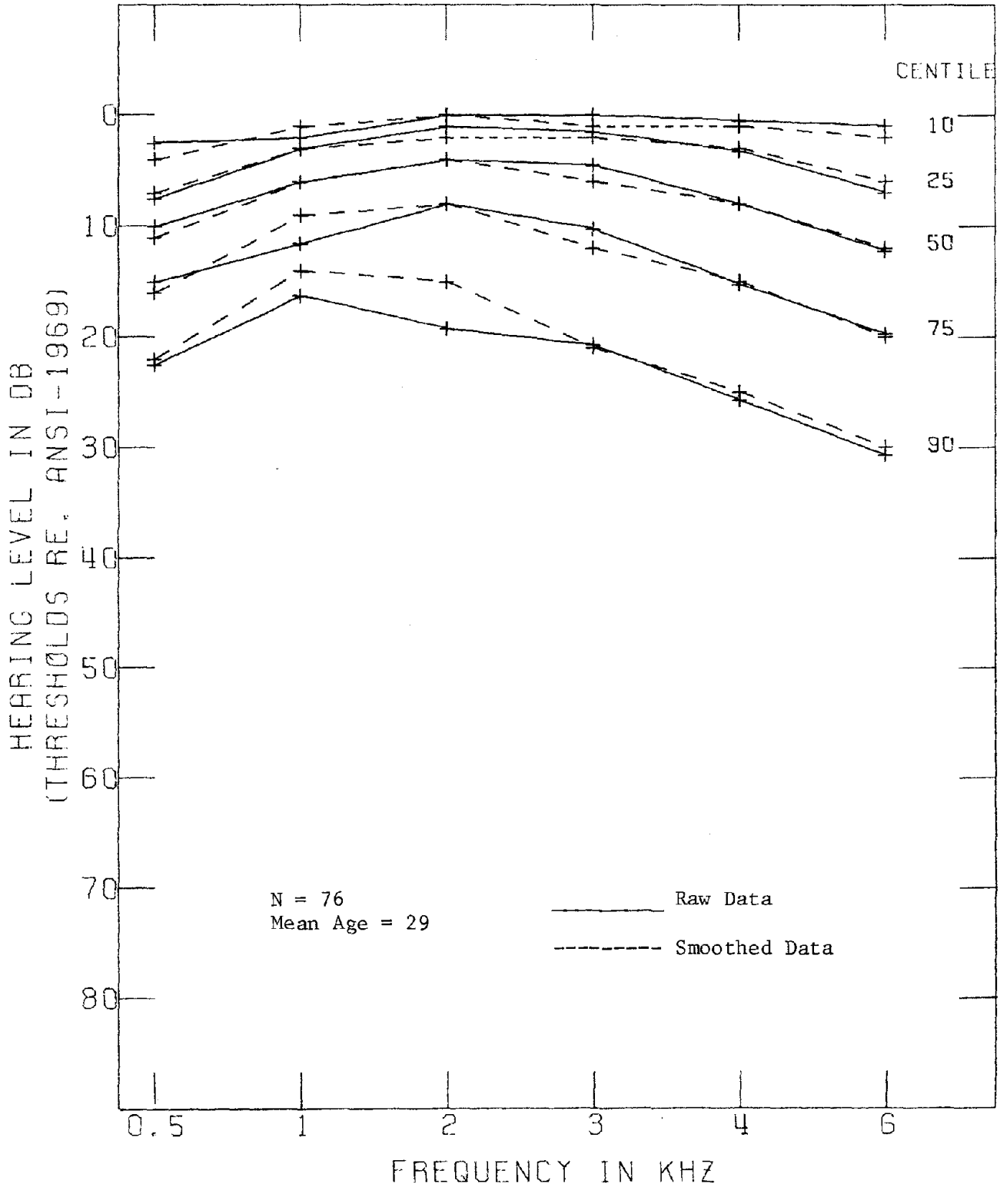


FIGURE C-3

ONHS: MALE NON-NOISE EXPOSED WORKERS AGES 32 TO 38 YEARS

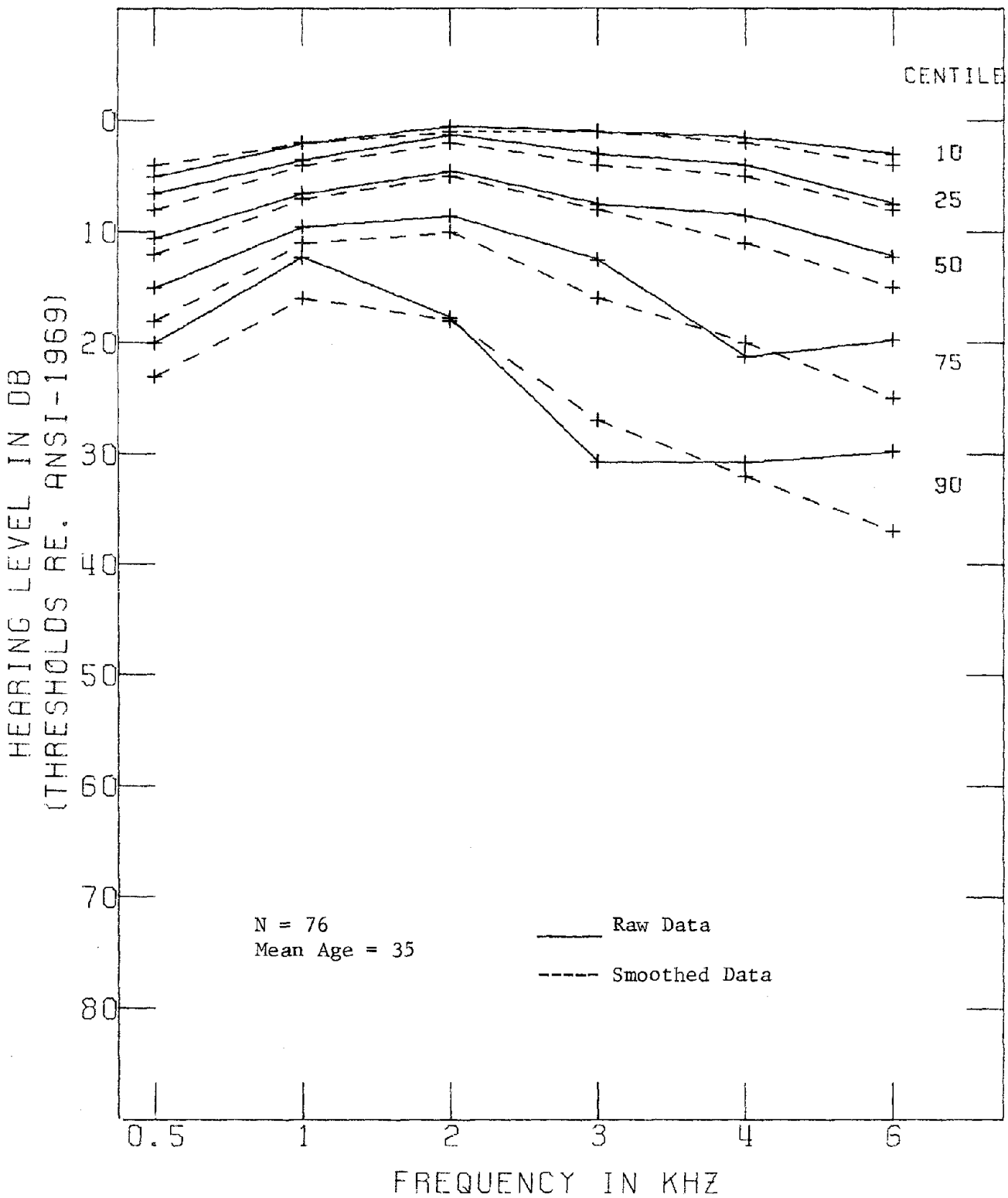


FIGURE C-4

ONHS: MALE NON-NOISE EXPOSED WORKERS AGES 38 TO 48 YEARS

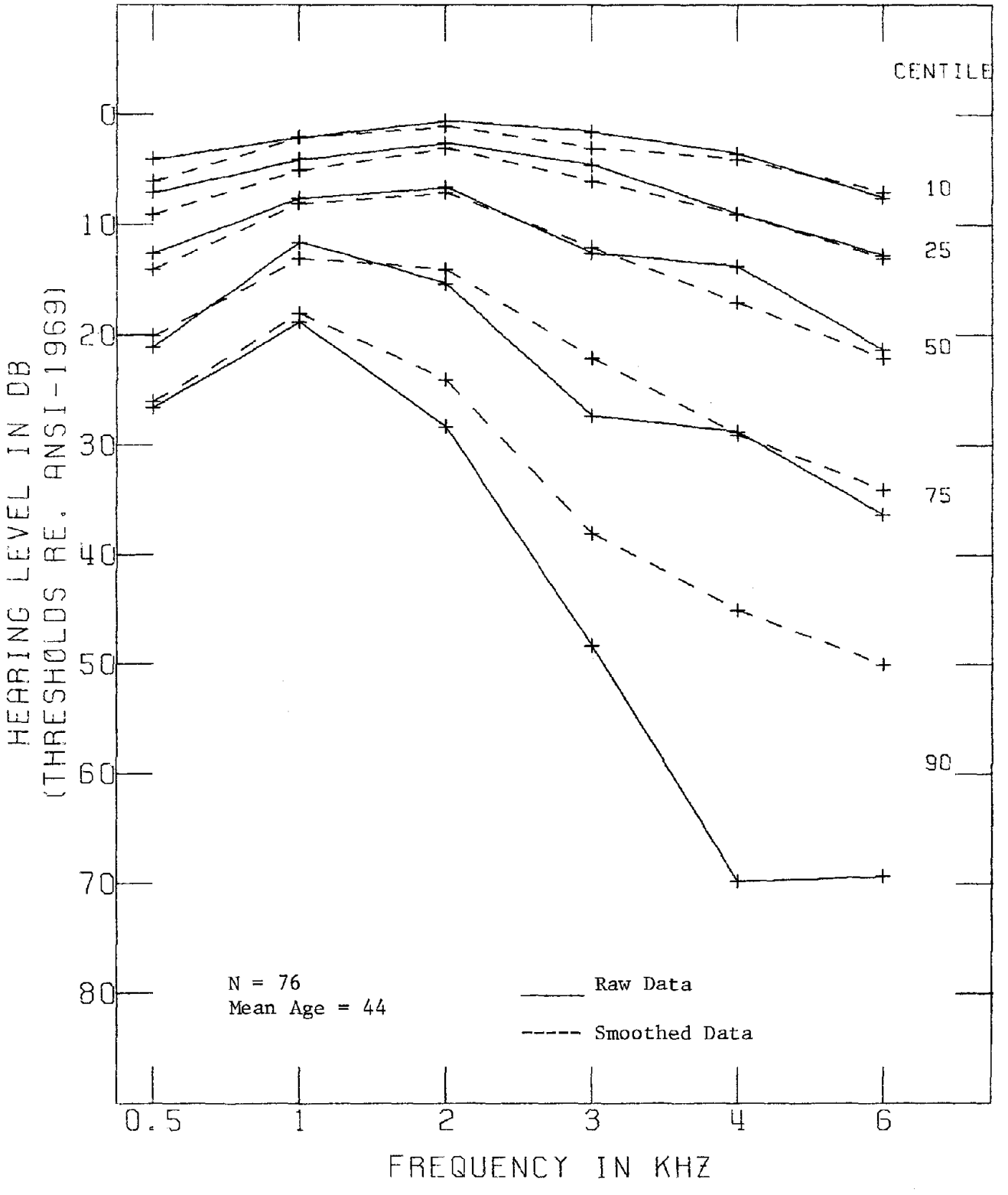
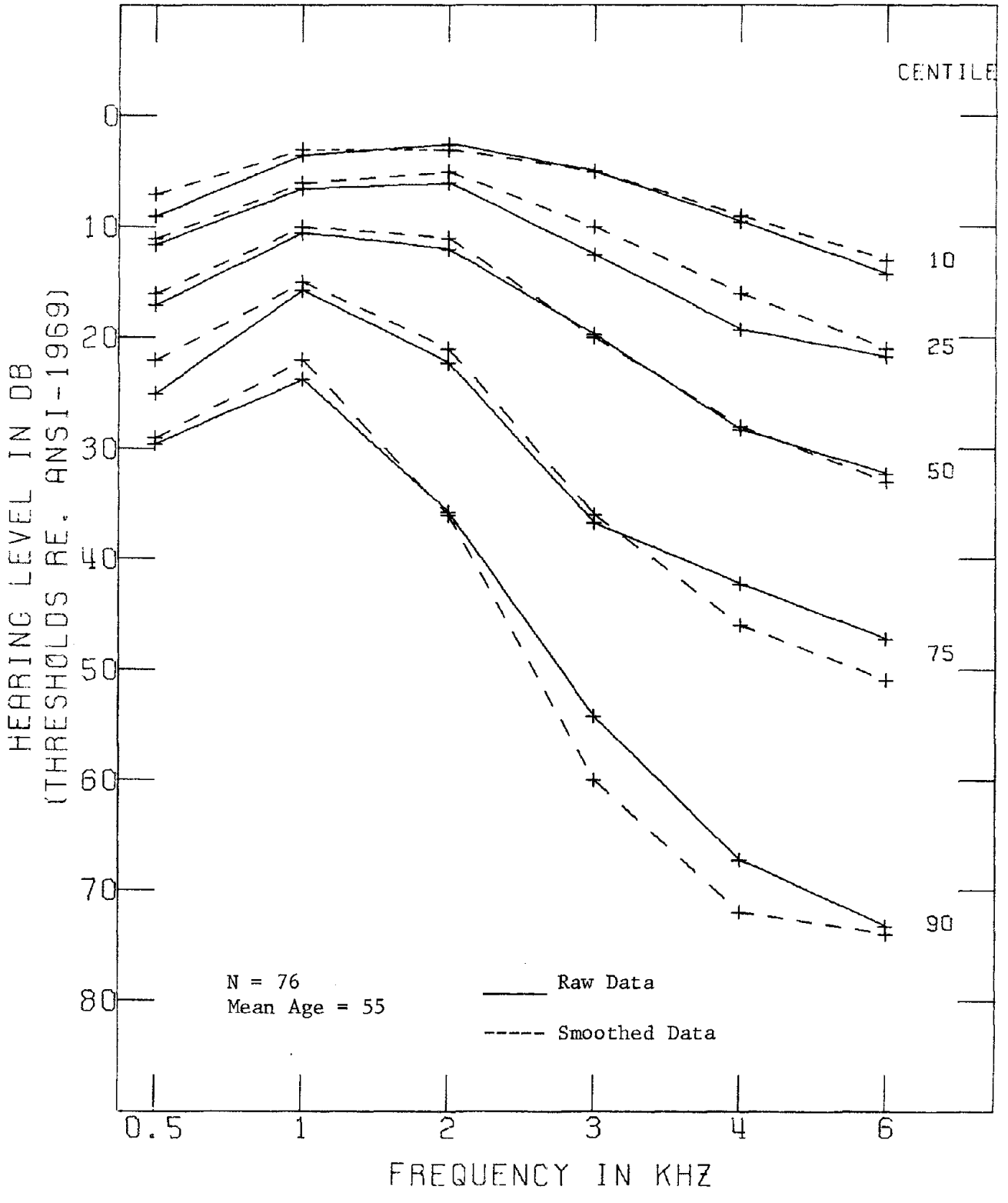


FIGURE C-5

ONHS: MALE NON-NOISE EXPOSED WORKERS AGES 48 TO 65 YEARS



APPENDIX D

INDIVIDUAL SUBJECT DATA*

This Appendix has been included to allow other researchers to analyze or observe the hearing data of coal miners who participated in this study. The data are arranged in order by age for the working miners only (N = 1349). Column headings used in the data list are explained below:

AGE - in years

MINE - number corresponding to Table 1

JOB YRS
1 2 3 - years of working experience on current job (1), previous jobs with same employer (2), and previous jobs with other employers (3). The "'" after a "3" indicates that this job was noisy but not in coal mining.

OCC
CD - occupation code corresponding to job descriptions in Table 2. A blank indicates the subject was not assigned a code.

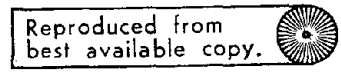
HEARING LEVELS (TEST KHZ/EAR)
.5L 1L 2L 3L 4L 6L .5R 1R 2R 3R 4R 6R - hearing levels in dB for both ears at six test frequencies; corrections have been made from audiometer calibration checks (including Otocup corrections). A minus sign (-) before a number indicates a negative threshold, and two dashes (--) in place of a number indicate an uninterpretable threshold.

HLI/MID-KHZ
1 2 3 4 - hearing level indices which are the averages of three frequencies for both ears: the "1" represents the middle (MID) frequency of .5, 1, and 2 kHz; "2" the MID frequency of 1, 2 and 3 kHZ; "3" the MID frequency of 2, 3, and 4 kHZ; and "4" the MID frequency of 3, 4, and 6 kHZ. A minus sign (-) before a number indicates a negative HLI, and two dashes (--) in place of a number indicate that a HLI could not be calculated.

* listed without personal identifiers

EXCL CODES - exclusion codes assigned to the subject, corresponding to Table 3. A row of stars denotes that the individual's data are included in the screened sample (i.e., no exclusion codes).

SHOT N YR - recreational firearm shooting experience. A "N" of "1" represents "less than 100 rounds per year;" "2" represents "approximately 500 rounds per year;" and "3" represents "greater than 1000 rounds per year." "YR" represents the number of years of recreational shooting experience.



AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
18	2	1	1	0	50	05	17	11	12	27	16	00	03	04	18	30	23	07	11	17	21	*******1		2
19	2	0	0	1	1	20	17	15	21	05	08	10	13	08	02	06-02		14	13	09	06	E	3	13
19	2	1	1	0		07	06	09	08	20	21	10	13	04	09	13	00	08	08	10	12	*******1		6
19	2	0	1	0		03-01		04	12	10	06	06-03-04			09-04		03	01	03	04	06	F	2	7
19	2	1	0	0	50	13	07	02	06	22	27	00	04	03	06	14	14	05	05	09	15	EF	3	9
19	2	1	0	0	116	03	05	06	03	12	17	05	04	02	11	17	41	04	05	06	17	*******1		7
19	2	1	1	0	35	17	07	06	12	23	19	05	05	08	19	14	24	05	10	14	18	*******1		7
19	5	1	0	0		34	32	27	44	53	48	32	31	21	28	32	69	30	30	34	49	F	1	8
19	7	0	0	0	154	-02	01-06-03-01			33		02-03		01	05	13-03		-01-01		01	07	EFHS	2	15
19	7	1	0	0		5	06	02	04-01-03		16	-07-04-02-04				09	16	00-01		00	05	*******		0
19	7	1	0	0	117	13	09	06	17	25	21	10	08	04	14	08	17	09	10	12	17	S	1	2
19	9	1	0	0		05-02		08	02-02		23	01-01		05	07-01		04	03	03	03	05	*******		0
19	9	1	1	0	53	06	02	02-01		02	10	00-03-03-01-01-06						01-01-01			00	EFL	2	8
20	2	0	0	0		10	05	10	07	09	06	04	04	06	02	05	11	07	06	06	06	*******2		4
20	2	0	6	0	50	17	11	12	07	35	44	07	06	00	02	07	35	09	06	10	21	EFG	2	10
20	2	1	1	2	42	20	07	12	52	61	49	14	05	24	38	36	48	14	23	37	47	E	2	6
20	2	0	0	0	50	13	09	06	05	16	20	07	04	05	06	05	09	07	06	07	10	*******1		3
20	4	2	0	0		01	05	02	08	04	28	04	08	00	10	06	20	03	05	05	12	*******1		2
20	6	0	0	0	116	25	08	02	12	03	10	13	04	01	01	04	09	09	05	04	06	*******1		6
20	7	1	1	0	116	16	13	14	17	20	21	13	10	09	06	21	15	13	12	15	17	EFHV	2	6
20	8	3	0	0	46	19	22	10	22	32	32	15	14	18	21	22	37	16	18	21	27	L	1	2
20	8	0	2	2	46	41	35	26	32	36	36	26	23	19	17	31	22	28	25	27	29	L	1	1
20	8	1	1	0	116	09	07	13	16	15	22	10	02	03	02	09	02	07	07	09	11	HK		0
20	8	0	0	0	116	22	18	13	08	08	13	06	04	04	14	07	04	11	10	09	09	*******1		7
20	9	2	0	0		16	10	11	10	26	32	07	16	12	06	19	27	12	11	14	20	G	1	5
20	9	1	0	0	46	09	15	17	24	31	32	10	08	17	20	22	14	13	17	22	24	*******1		10
20	9	0	0	0		12	06	11	24	17	16	02	03	15	20	23	30	08	13	16	21	E	2	10
20	9	2	0	0		06	05	02	00	07	23	06	04	05	02	08	18	05	03	04	09	F	1	2
20	9	1	1	0	109	07-03		18	05	07	01	-01-03			05-01-03		13	04	03	05	03	U		0
20	11	1	0	0	50	15	05-02		11	15	16	10	06	03	07	09	23	06	05	07	13	*******1		5
20	11	2	0	1	46	20	12	06	39	60	55	09	19	06	29	53	54	12	18	32	48	EF	2	10
20	11	0	0	1		16	11	04	20	30	26	13	07	04	12	13	18	10	10	14	20	F	1	2
20	11	0	1	0	116	10	02	00	06-01		17	20	16	07	05	11	14	09	06	04	08	L		0
20	11	2	0	0	101	19	06	12	10	19	23	02-05-04-05-05-12						05	02	04	05	FS	1	8
21	2	1	1	2	50	15	11	16	12	21	08	11	02	13	19	13	09	11	12	15	13	EF	2	5
21	2	1	0	0		-01	00-05-03			06	34	01-03-05-06-01-05						-02-04-03			04	E	3	12
21	2	2	3	0	46	20	12	13	17	15	19	04	05	00	09	12	14	09	09	11	14	*******1		6
21	3	2	1	2	1	06-04		08	07	13	19	-01-02		02	14	03	08	02	04	08	10	*******		0
21	3	1	1	0	50	07	05	09	15	23	12	-01-03-02			01	14	38	03	04	10	17	*******1		9
21	4	1	0	1	46	18	07	06	23	19	15	10	02	06	11	22	12	08	09	14	17	F	2	10
21	4	0	0	1	116	05	00	00	10	11	41	-01-05-03			00-02-02			-01	00	02	09	E	2	12
21	6	2	0	2	154	22	16	04	13	13	14	06	02	10	04	14	23	10	08	09	13	S		0
21	6	1	0	0	277	22	15	24	23	31	37	15	12	08	22	16	11	16	17	20	23	E	2	10
21	7	2	1	0	46	10	02	04	08	03	03	15	09	13	13	12	07	09	08	09	07	EFHLSW	3	11
21	7	0	0	0	116	11	06	00	00	34	39	03	00	00	-01	09	07	03	01	07	14	FSV		0
21	7	0	1	0	46	12	16	14	11	13	20	14	14	14	11	13	07	14	13	12	12	FL		0
21	7	1	1	0	36	50	69	63	80	81	82	33	40	49	50	63	81	51	58	64	73	EL		0
21	7	2	1	0	36	20	10	00	16	04	27	10	04	04	06	13	10	08	07	07	12	V		0
21	7	3	0	3	116	20	17	38	44	44	33	10	12	30	34	37	38	21	29	38	38	FHG		0
21	8	2	3	0	46	09	06-02		--	--	--	--	--	--	--	--	--	--	--	--	--	SU	1	2
21	8	3	0	0	105	57	58	60	62	65	--	--	73	76	80	80-13		--	68	74	--	EL	3	13
21	8	1	1	0	35	-03-01		01	10	12	--	03-06-04-02-01					18	-02	00	02	--	G	2	10
21	9	0	0	0		08	03-02		01	24	43	-03	02-04-05			06	43	01-01		03	18	S	1	7
21	11	1	0	2	101	14	05	16	24	21	17	12	02	12	30	35	06	10	15	23	22	*******		0
21	11	1	1	1		28	20	20	17	16	00	08	04	03	14	04	11	14	13	12	10	C	1	5
21	11	2	0	0	46	32	31	32	31	21	34	28	38	34	25	26	40	33	32	28	29	*******1		11
21	11	1	0	3	101	-01-04		00	10	11	07	03	00	02	05	03	10	00	02	05	07	AH		0
21	11	2	0	1	10	19	13	24	30	24	24	05	07	17	21	18	18	14	19	22	22	ELH	3	6
22	2	1	0	3	41	13	00-03-01		01	17		-02-02-01-03-03					03	01-02-02			02	EF	3	8
22	2	1	0	2	116	20	12	04	05	02	15	11	07	04	04	03	02	10	06	03	05	CEG	3	12

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
22	2	1	0	0		02	07	09	17	15	31	06	05	08	17	23	13	06	10	15	19	*******1		10
22	2	1	0	3'		06	06	05-02		26	08	06	08	08	02	22	61	07	04	10	19	EF	3	7
22	2	0	0	0		14	13-01-02-06				20	05-01		00-04-02-03				05	01-03		00	H	1	5
22	2	3	1	0	158	21	14	17	27	24	12	14	14	19	29	17	31	17	20	22	23	*******		0
22	3	3	0	0	35	31	31	42	41	43	45	29	42	44	40	41	49	37	40	42	43	LX	1	10
22	4	1	0	0		08	01-03		02-06		11	05-02		01	01-05		06	02	00-02		01	H	1	10
22	4	1	0	0		09	05	02-02-03			13	10	18	21	10	06	16	11	09	05	06	CE	2	8
22	4	1	1	0	50	28	16	10	13	26	55	19	08	04	03	07	51	14	09	10	26	*******1		1
22	5	0	2	0	2	11	07	02	06	19	04	09	05	05	09	09	05	07	06	08	08	LR		0
22	5	2	1	0	109	36	42	50	47	50	51	35	42	51	59	69	73	43	48	54	58	L	1	4
22	5	1	2	1	50	06	06	09	14	21	29	05	05	01	02	10	03	05	06	09	13	G	1	2
22	7	1	0	3'	4	25	28	27	37-10-12			-10	42	61	30	29	26	29	37	29	16	EGHJX	3	10
22	7	0	0	0	53	11	07	10	19	17	25	21	16	26	17	39	53	15	16	21	28	EH	3	10
22	7	2	1	0	46	32	31	24	21	17	30	17	14	11	13	12	27	22	19	16	20	IV	1	5
22	7	0	0	0	16	24	14	17	20	19	43	06	06	17	25	38	48	14	16	22	32	*******		0
22	7	2	0	0	116	01-03-02			02-02		07	-03	02	04	10	09	29	00	02	03	09	EG	3	10
22	7	2	3	0	53	13	14	18	14	06	10	04	03	07	12	06	04	10	11	10	08	G		0
22	7	3	0	0	305	60	65	50	51	51	60	32	52	54	75	68	79	52	58	58	64	IP	1	1
22	7	1	2	0	418	00	02	00	00	02	10	03-01-01			06	06	02	01	01	02	04	FV	1	6
22	7	0	2	0	49	15	15	05	10	21	13	-05-02-05			09	06	02	04	05	07	10	EHV	2	16
22	8	0	0	0	116	34	15	04	01-01-09			05-05-06-02-03-12						08	01-01-05			EFL	2	5
22	9	2	0	0	53	28	32	15	04	00	00	01	02	02	11	07	04	13	11	06	04	CEHW	2	5
22	9	1	3	0		03-04-03-01				39	02	-03-03		03-02		34-02		-01-02		11	11	*******1		5
22	9	2	0	0	46	17	07	16	10	07	46	-02-03		08	02	05	77	07	07	08	24	FU	1	10
22	9	1	1	0	46	13	01	08-01		03	08	01	04	02-01		08	13	05	02	03	05	EL	3	6
22	9	2	0	0		82	76	53	34	78	71	40	19	27	28	56	72	50	39	46	56	ILUU	1	10
22	9	1	1	0		12	08	09	10	04	21	12	08	14	19	27	22	11	11	14	17	S		0
22	9	1	1	0		16	02	09	08	06	09	04	06	09	16	05-01		08	08	09	07	HSV		0
22	9	2	1	0		20	13	16	10	09	14	24	31	34	15	21	18	23	20	17	14	*******2		2
22	10	1	1	0		16	14	18	42	70	63	51	71	56	58	62	65	38	43	51	60	EISV	2	8
22	10	1	1	0	46	20	12	12	12	42	18	10	09	08	08	08	28	12	10	15	19	H	1	4
22	11	0	0	4'	10	18	14	10	09	29	20	12	13	18	12	13	10	14	13	15	15	A	1	6
22	11	1	2	3'	10	01-05-03			03	09	17	00-02-04			06	06	15	-02-01		03	09	AV		0
22	11	1	2	2	43	15	10	11	01	00	06	08	04-02		01	07	25	08	04	03	06	EJ	2	10
22	11	1	1	1	50	26	20	16	31	86	86	16	09	08	28	75	74	16	19	40	63	EJ	2	10
23	2	0	0	0	10	15	08	27	37	47	39	09	05	09	35	40	31	12	20	32	38	CE	2	10
23	2	5	2	0		03-04-02			05	43	46	03-01		27	12	35	35	04	06	20	29	CEH	2	12
23	2	1	0	0	50	06	15	09	15	40	27	06	04-01		18	40	16	07	10	20	26	CE	2	11
23	2	2	0	0	42	01	02	08	04	12	25	02	02	07	00	01	13	04	04	05	09	*******1		10
23	2	1	1	0	50	14	07	17	14	16	14	16	17	28	28	31	38	17	18	22	23	*******1		15
23	3	3	0	0	50	21	04-02		09	08	25	02-03-04-03				04	10	03	00	02	09	C		0
23	4	2	0	0	105	00	01	03-01		00	04	04-02		04	05-02		39	02	02	01	07	CEF	2	8
23	4	2	0	0	105	24	15	12	10	21	00	21	15	11	11	07	07	16	12	12	09	*******1		6
23	4	1	1	2	36	17	10	33	41	50	55	11	09	10	15	34	24	15	20	30	36	E	3	7
23	5	2	0	2	46	23	14	16	27	37	56	10	08	09	12	18	15	13	14	20	27	EG	2	13
23	5	1	1	1	340	20	24	08	15	33	62	10	26	03	05	04	19	15	13	11	23	ELS	2	14
23	6	2	1	0	36	15	10	04	14	11	16	15	18	15	22	14	18	13	14	13	16	IJS	1	8
23	7	0	3	0	48	12	10	04	13	13	32	23	20	02	07	09	14	12	09	08	14	G	1	9
23	7	1	0	0	16	02	04	06	03	29	23	00	01	02	04	07	16	03	03	08	13	G		0
23	7	1	1	0	46	19	09	11	12	13	16	14	13	10	05	14	02	13	10	11	10	FV		0
23	8	2	0	0	50	06	05	08	09	10	33	09	03	04	07	11	44	06	06	08	19	HW	1	6
23	8	1	4	0	35	11	14	06	09	04	21	--	12	08-02		04	10	--	08	05	07	U		0
23	8	3	1	1	105	25	19	09	27	49	18	17	19	04	21	15	21	16	16	21	25	HIN	1	10
23	8	2	0	0	46	21	13	08	51	55	55	09	06	04	26	27	27	10	18	28	40	CL	1	5
23	8	2	0	0	46	59	45	30	27	43	89	16	26	19	31	35	72	33	30	31	49	E	2	9
23	9	5	0	2	46	10	04	13	52	63	73	17	06	08	25	64	74	10	18	37	58	*******1		5
23	9	2	0	0	50	17	18	05	12	60	73	04	08	01	23	52	64	09	11	25	47	V		0
23	9	3	0	0		02	07	03-04		04-04		-02	04	05	00	14	49	03	02	03	10	EL	2	17
23	9	0	3	1		06	03	00	15	09	24	04	01	03	09	20	41	03	05	09	19	HIV	1	4
23	9	0	3	0		07	09	14	45	54	76	15	10	28	41	69	90	14	24	42	62	F	1	10

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HL1/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
23	9	2	1	0		02	06	15	19	16	14	03	00	03	00	06	12	05	07	10	11	J	1	10
23	10	2	0	0	53	22	24	06	04	04	08	11	04	16	04	04	07	14	10	06	05	CEF	2	15
23	10	0	2	0	50	03	02	05	12	58	47	-01	-01	06	05	41	74	02	05	21	39	*******		0
23	10	3	1	0	42	10	07	11	13	67	71	06	08	11	09	--	--	09	10	--	--	S	1	3
23	11	1	0	3	101	12	04	11	25	77	76	06	01	08	27	41	64	07	13	31	51	EL	2	11
23	11	3	0	0	216	17	17	11	13	25	28	15	11	07	56	41	27	13	19	25	31	E	2	6
23	11	0	2	0	6	03	01	-05	05	10	50	03	02	06	04	17	54	02	02	06	23	EFL	3	15
23	11	1	0	0	46	15	10	10	09	11	08	09	06	12	17	17	08	10	11	12	11	*******	1	7
24	2	2	3	0		18	18	12	06	14	37	20	12	19	10	09	16	17	13	11	15	C	1	15
24	2	2	1	0		04	10	06	17	13	19	10	10	09	12	26	30	08	11	14	19	C	1	7
24	2	1	2	0		25	17	15	19	59	69	19	09	01	22	49	54	14	14	27	45	C	1	15
24	2	2	0	0	41	25	12	-01	13	10	57	04	04	06	07	21	73	08	07	09	30	C		0
24	4	1	0	0	116	31	12	07	23	13	07	20	14	07	16	15	10	15	13	13	14	F		0
24	4	2	0	0	304	33	20	07	16	20	33	12	10	12	21	16	12	16	14	15	20	H	1	12
24	4	1	0	0	414	34	16	17	19	21	--	27	14	12	14	05	20	20	15	14	--	*******		0
24	5	0	1	0		05	19	09	16	17	15	01	08	07	02	06	12	08	10	09	11	M		0
24	5	0	1	1		06	05	15	16	20	54	06	07	-01	15	13	10	06	09	13	21	MS	1	13
24	5	1	1	0	10	24	10	04	11	25	33	12	10	01	11	07	19	10	08	10	17	EFHIMW	2	8
24	7	2	0	0	46	11	17	20	41	25	--	11	10	13	30	33	08	14	22	27	--	CDEFHW	2	8
24	7	1	0	0	53	07	04	00	-02	08	04	12	14	01	-02	04	08	06	02	01	03	CH	1	3
24	8	2	3	0	46	55	55	36	37	44	86	54	61	57	55	63	69	53	50	48	59	EH	2	15
24	9	0	2	0		23	16	26	22	43	39	31	17	16	18	19	19	22	19	24	26	C	1	10
24	9	2	0	0		05	04	-02	05	15	15	01	-04	-01	03	07	56	01	01	04	17	EHRW	3	6
24	9	5	0	0		05	06	00	04	28	13	04	00	-01	-02	22	11	02	01	08	12	*******1		10
24	9	0	0	0		14	05	-03	11	00	22	-08	-03	-04	03	31	10	00	01	06	13	CU	1	8
24	11	2	0	0	4	07	09	09	03	07	06	07	04	-01	06	13	26	06	05	06	10	EPW	2	11
24	11	2	1	4	49	23	22	09	20	20	18	15	15	06	14	23	12	15	14	15	18	J		0
24	11	1	3	0	999	36	20	24	31	52	67	16	10	13	09	15	24	20	18	24	33	CLP	1	10
24	11	1	0	4	6	07	06	18	11	22	11	03	01	23	21	21	15	10	13	19	17	EI	2	10
24	11	0	0	4'		10	04	-02	08	11	-01	02	04	04	03	21	03	04	03	07	07	ACEH	3	6
25	2	1	5	5'	50	62	48	38	25	33	41	24	14	25	20	15	16	35	28	26	25	*******1		15
25	2	1	0	0	35	14	07	07	13	10	09	10	11	07	20	41	11	09	11	16	17	E	2	12
25	2	5	2	0	50	06	00	04	-04	-06	03	-02	-03	-01	-06	-06	-02	01	-02	-03	-04	F		0
25	2	3	3	0	36	22	08	02	11	12	14	16	07	-01	10	02	15	09	06	06	10	*******1		13
25	4	1	0	0	116	07	05	06	14	12	13	08	07	03	07	11	12	06	07	09	11	*******		0
25	6	6	0	0		09	05	01	10	04	-11	00	00	01	05	08	-02	03	04	05	02	J	1	15
25	6	1	0	0		15	05	04	17	44	42	11	05	06	13	12	09	08	08	16	23	V	1	16
25	7	1	1	0	50	13	16	11	26	50	21	09	10	04	17	71	68	11	14	30	42	L	1	5
25	8	3	0	0	46	44	47	65	56	86	86	56	69	69	77	85	80	58	64	73	78	EFHI	3	18
25	9	1	2	0		10	04	23	14	45	39	06	07	07	07	39	39	10	10	22	30	EL	2	15
25	9	3	0	0		13	06	13	13	09	27	16	23	23	17	11	44	16	16	14	20	CEV	2	10
25	9	1	1	1	101	--	--	--	36	33	43	23	15	19	21	22	19	--	--	--	29	EJLOUV	2	12
25	9	1	0	0	46	12	06	06	36	50	34	10	11	05	15	38	46	08	13	25	36	HIO		0
25	9	3	1	0	46	28	28	34	21	13	02	12	10	14	14	17	17	21	20	19	14	CHP	1	10
25	9	0	4	0		11	06	02	16	20	29	04	03	-03	03	19	26	04	04	09	19	CHILW	1	10
25	9	1	0	0		04	04	10	38	47	36	-05	-06	18	33	37	33	04	16	30	37	L	1	8
25	9	4	2	0	373	12	06	-03	15	40	52	18	00	-01	11	31	31	05	05	15	30	LW	1	4
25	9	3	1	4	109	18	07	47	65	78	86	19	08	46	78	74	73	24	42	64	75	EI	2	10
25	9	2	1	0	43	56	51	45	39	34	33	34	36	43	31	48	43	44	41	40	38	*******1		20
25	10	3	0	0	360	-02	-01	-07	22	31	05	00	02	-03	03	04	15	-02	03	08	13	CEF	2	15
25	11	3	0	0	4	11	09	05	09	13	40	06	10	05	08	10	21	08	08	08	17	CFLS	1	10
25	11	0	0	4'		22	16	21	19	26	12	14	10	12	17	13	10	16	16	18	16	*******		0
25	11	2	0	0	4	13	07	10	16	11	22	06	06	05	15	18	10	08	10	12	15	FLNS		0
25	11	2	0	6	49	17	06	09	21	35	23	07	05	09	15	23	32	09	11	18	25	O	1	9
25	11	1	0	0		06	-01	-01	11	15	14	01	04	15	16	17	18	04	07	12	15	D		0
25	11	1	0	0	497	18	19	25	19	12	24	17	21	28	36	20	22	21	25	23	22	N	1	5
25	11	2	0	0	46	18	12	08	09	04	15	16	06	08	06	05	10	11	08	06	08	EHI	2	9
26	1	0	0	0	4	20	07	10	04	04	24	10	06	08	13	11	31	10	08	08	14	*******1		3
26	2	1	0	0	46	15	12	09	07	33	32	07	05	07	07	54	39	09	08	19	28	E	2	10
26	2	4	1	0	35	13	09	29	52	43	30	06	04	09	49	51	33	12	25	39	43	CE	2	14

AGE		JOB YRS		OCC		HEARING LEVELS(TEST KHZ/EAR)												MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
26	2	2	0	3'		10	15	32	33	32	34	22	20	32	38	44	31	22	28	35	35	AFH	1	15
26	2	1	0	2	10	01	-05	09	04	20	07	-04	-08	-01	-05	02	06	-01	-01	05	05	CE	2	18
26	3	3	0	0	35	15	10	04	16	22	21	16	13	07	13	16	21	11	10	13	18	HK	1	10
26	4	1	0	0	116	22	14	07	13	18	14	11	07	06	10	07	-03	11	09	10	10	C		0
26	5	2	2	2		10	05	08	07	13	20	03	02	03	02	07	23	05	04	06	12	HLK	1	3
26	5	4	0	0		14	10	04	08	62	69	03	02	07	06	18	69	07	06	17	38	H	1	8
26	6	0	0	0		21	13	13	14	25	36	19	23	16	31	32	31	18	18	22	28	CHLS	1	2
26	7	2	2	0	269	43	28	49	38	63	60	04	07	05	07	31	27	23	22	32	37	FLN	1	18
26	7	2	0	2	116	38	42	26	26	27	39	40	53	58	63	73	75	43	45	45	50	FLNV		0
26	7	2	5	0	418	05	14	03	17	79	86	-05	-02	01	37	63	40	03	12	33	53	FU		0
26	8	2	0	0	4	10	12	11	31	37	66	03	05	06	14	24	71	08	13	20	40	*******		0
26	9	1	2	2		05	08	01	04	-05	31	-03	09	06	00	14	23	04	05	03	11	C	1	12
26	9	1	0	0		07	06	-04	01	-01	18	06	07	-01	07	15	06	04	03	03	07	CE	3	8
26	9	1	1	0		14	19	27	26	34	38	11	09	14	26	21	32	16	20	24	29	V		0
26	9	2	2	0		10	06	-04	08	-06	01	12	09	04	17	15	04	06	07	05	06	L	1	18
26	9	1	3	0	49	05	05	08	13	21	-02	00	03	06	03	11	13	05	06	10	10	V	1	6
26	9	1	4	0		-04	04	31	22	08	09	-05	-02	13	09	08	34	06	13	15	15	E	2	15
26	9	1	2	0		09	02	-03	-01	-03	19	-07	-04	-03	03	17	51	-01	-01	01	14	K	1	6
26	9	5	0	0		10	03	15	06	-01	24	22	09	04	16	04	02	11	09	07	08	CEFHJ	3	21
26	11	2	1	1	10	08	04	14	28	26	31	09	04	04	19	18	02	07	12	18	20	L	1	12
26	11	3	2	4	50	13	18	34	36	71	70	05	14	20	18	35	33	17	23	35	44	CEFGH	2	12
26	11	4	0	0	50	11	13	24	43	76	74	02	05	-01	28	23	16	09	19	32	43	LUV	1	8
26	11	2	2	0	34	15	17	13	18	11	20	15	15	14	08	06	04	15	14	12	11	JL	1	10
26	11	1	1	2	46	09	07	09	25	12	27	03	-04	02	11	-04	15	04	08	09	14	H	1	16
26	11	0	1	4'	7	29	20	25	22	28	59	20	15	19	11	14	40	21	19	20	29	AFH		0
26	11	2	0	2	49	13	10	13	11	13	22	09	11	05	09	09	07	10	10	10	12	*******1		10
26	11	3	0	1	4	15	14	05	17	37	34	10	11	05	13	30	20	10	11	18	25	EH	2	16
26	11	1	0	1	10	09	-01	-03	09	03	-03	-01	-04	-01	04	-01	17	00	01	02	05	W		0
27	2	1	1	0	50	20	08	16	13	22	27	13	-03	06	28	37	48	10	11	20	29	EF	2	17
27	2	1	0	2		10	11	07	24	22	10	05	12	13	23	32	19	10	15	20	21	*******1		17
27	3	2	0	0	150	10	04	06	12	22	13	04	08	06	04	13	17	06	07	10	13	*******1		4
27	3	4	0	3'	50	22	08	22	21	21	36	12	03	04	14	15	34	12	12	16	23	E	2	20
27	4	1	0	0	105	08	11	14	15	19	13	02	02	10	06	11	20	08	10	12	14	CE	3	10
27	5	3	3	0	2	12	16	10	08	21	46	11	09	19	13	19	38	13	12	15	24	CEFHS	3	10
27	5	1	2	0	46	14	14	05	16	62	63	11	11	02	10	54	60	10	10	25	44	HN	1	4
27	5	1	2	0	109	16	14	14	57	75	59	18	17	18	38	58	39	16	26	43	54	HLNP	1	17
27	7	1	1	0	50	25	28	32	17	21	20	21	19	12	11	16	10	23	20	18	16	U	1	11
27	7	3	0	3'	49	00	04	05	05	07	22	01	01	03	02	01	11	02	03	04	08	H	1	10
27	7	2	0	0	11	12	05	01	14	05	25	00	00	-01	-01	-02	15	03	03	02	09	*******1		15
27	7	0	2	1	5	31	27	34	45	59	63	25	23	16	21	36	45	26	28	35	45	E	2	10
27	7	2	2	0	5	10	08	10	44	57	61	08	11	14	15	20	01	10	17	26	33	CEFHL	3	15
27	8	3	0	0	46	19	06	17	50	--	26	13	11	27	51	70	52	16	27	--	--	R	1	16
27	8	4	0	0	46	03	07	13	47	46	60	01	07	13	21	33	25	07	18	29	38	M		0
27	9	1	1	0		19	06	06	12	12	20	08	08	04	16	11	24	09	09	10	16	C		0
27	9	1	0	8		08	14	10	05	21	24	-01	02	-02	05	14	-01	05	06	09	11	*******1		12
27	9	9	0	0	35	12	12	34	54	43	31	05	07	35	51	44	42	18	32	43	44	FILV	1	21
27	9	2	0	0	53	12	06	13	65	72	84	11	05	15	41	53	37	10	24	43	58	L	1	10
27	9	1	3	3'	316	11	08	14	30	37	32	01	04	10	32	49	09	08	16	26	31	EV	2	14
27	9	3	0	0		10	03	03	58	51	27	09	06	01	12	57	38	05	14	30	40	EV	2	15
27	10	0	1	4'		09	01	12	57	50	08	09	07	13	44	51	48	09	22	36	43	AL	1	10
27	10	1	0	0	50	15	11	15	18	25	54	11	12	10	20	15	43	12	14	17	29	E	2	10
27	11	1	0	0	116	18	12	04	11	14	17	10	02	-06	-03	03	-03	07	03	04	06	EF	2	10
27	11	0	0	6	7	13	09	02	22	14	24	13	16	11	13	05	26	11	12	11	17	J	1	2
27	11	1	0	5	43	11	07	09	10	15	16	04	07	06	06	09	16	07	07	09	12	*******		0
27	11	2	0	0	4	00	02	07	15	12	05	01	-06	03	02	07	-01	01	04	07	06	D	1	10
27	11	1	0	4	34	02	06	10	09	16	21	04	03	09	08	22	11	06	07	12	14	E	2	17
27	11	0	2	2	7	22	07	11	33	46	--	12	07	07	18	28	23	11	14	24	--	FHUW		0
27	11	0	0	0	101	12	18	21	56	44	39	06	12	18	56	53	20	15	30	41	44	CE	2	15
27	11	1	0	1	999	02	01	05	05	04	-02	02	02	05	01	06	06	03	03	04	05	*******1		10
27	11	2	0	0		11	07	18	18	59	64	-03	04	11	03	46	30	08	10	26	36	LV		0

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
28	3	2	1	4'	50	17	18	21	24	25	13	23	17	33	27	41	23	22	23	28	25	AH	1	16
28	4	1	1	0	46	04	10	00	11	59	53	-01	05	00	02	40	42	03	05	18	34	*******	1	16
28	5	7	0	0		07	05	05	07	01	44	02	06	01	10	03	36	04	06	04	17	DEFV	2	10
28	7	2	3	5'	4	18	13	16	19	65	64	32	34	46	29	50	66	27	26	37	49	HLO	1	16
28	7	0	0	0	116	21	12	09	12	13	09	-01	00	-03	01	03	30	06	05	06	11	FJ	1	16
28	7	6	0	0	373	20	21	32	33	41	77	12	06	08	07	05	16	17	18	21	30	L	1	12
28	7	2	1	0	149	08	-01	02	-02	10	07	-05	02	-03	-01	14	18	01	-01	03	07	IV	1	12
28	7	5	0	0		10	05	12	07	15	06	04	10	09	09	16	14	08	09	11	11	CEFHN	2	20
28	7	1	5	5'	48	03	-03	09	68	59	45	08	09	43	69	69	54	12	32	53	60	ACL	1	20
28	8	4	0	0	46	15	17	24	24	27	53	18	18	42	29	35	43	22	26	30	35	CEJS	3	15
28	8	4	0	0	50	12	11	19	58	91	86	15	27	43	66	91	80	21	37	61	78	I	1	12
28	9	1	2	0	118	13	08	07	05	02	18	13	08	05	-02	-03	18	09	05	02	06	EJLS	3	18
28	9	2	1	7		13	16	06	13	15	08	08	01	04	13	06	12	08	09	09	11	ILO		0
28	9	5	0	0	109	-02	02	06	04	24	14	02	05	-01	09	11	05	02	04	09	11	G	1	0
28	9	3	0	30'		26	16	19	35	65	51	17	21	16	15	10	17	19	20	26	32	AFHIO	1	15
28	9	5	0	3		12	09	16	15	11	21	23	07	06	12	17	20	12	11	13	16	V	1	14
28	10	1	1	0		29	22	15	12	25	28	20	14	10	05	14	36	18	13	13	20	E	2	15
28	10	2	0	0	46	14	18	18	22	29	46	09	08	12	13	14	52	13	15	18	29	*******	1	12
28	11	1	0	0	999	18	20	28	25	31	57	11	13	20	22	13	03	18	21	23	25	CE	2	16
28	11	2	0	0	101	13	15	13	14	46	41	32	22	17	19	37	46	19	17	24	34	EHJS	2	3
28	11	3	0	0	43	20	21	29	40	64	68	21	13	16	23	28	59	20	24	33	47	EFHIJL	2	20
28	11	5	3	1	116	10	07	16	23	72	82	03	04	08	12	45	83	08	12	29	53	EFGJL	3	20
28	11	8	0	0	4	17	20	12	15	20	34	14	21	23	38	47	55	18	21	26	35	*******	1	10
28	11	0	1	2	46	25	26	51	86	91	83	14	19	46	66	71	80	30	49	68	79	CEH	2	16
28	11	1	0	6	46	14	06	06	19	14	14	12	16	17	17	14	26	12	13	14	17	*******	1	17
28	11	1	0	9	101	15	13	29	38	28	12	21	11	27	41	55	37	19	26	36	35	HV	1	15
29	2	0	1	0		26	30	24	62	67	67	13	23	05	43	52	64	20	31	42	59	H	2	3
29	6	2	4	0		15	09	06	13	49	46	07	01	03	22	44	28	07	09	23	33	S	1	10
29	6	2	2	0		19	10	16	55	52	34	09	11	08	43	52	42	12	24	37	48	J	1	12
29	6	0	2	0	116	11	04	01	47	80	87	01	10	02	07	29	31	05	12	27	47	JV	1	14
29	7	6	0	0	104	-01	05	13	17	14	17	01	03	08	15	18	26	05	10	14	18	*******	1	18
29	7	5	0	0	123	11	07	08	08	05	16	07	00	00	-04	06	01	06	03	04	05	*******	1	10
29	7	4	0	0	201	23	18	10	29	45	36	14	14	17	21	42	35	16	18	27	34	JW		0
29	9	2	0	0	50	36	33	21	48	38	26	19	15	16	30	39	35	23	27	32	36	CEV	2	15
29	9	2	0	0	104	12	13	16	39	64	54	13	08	18	27	25	14	13	20	31	37	W		0
29	9	5	2	3	368	21	04	04	42	49	20	02	00	04	14	11	20	06	11	20	26	VW	1	E
29	9	3	0	1	46	-02	04	-01	07	19	18	03	-03	04	03	26	46	01	02	09	20	ILG	1	15
29	9	5	0	0		14	02	05	04	14	08	04	00	11	-03	20	15	06	03	08	09	V	1	3
29	9	2	1	0		08	07	03	14	15	16	10	05	14	16	22	18	08	10	14	17	EJ	2	10
29	11	1	0	0	497	19	12	31	28	11	27	07	07	27	29	16	05	17	22	23	19	EHL	3	16
29	11	2	0	2	116	28	17	16	19	19	17	15	10	10	12	17	28	16	14	15	16	V	1	1
29	11	1	0	5	4	24	23	28	25	46	27	09	13	08	17	42	34	18	19	27	32	EF	2	16
29	11	1	3	3'	6	23	25	14	09	22	09	17	14	01	08	18	04	16	12	12	11	F		0
29	11	1	1	0	46	20	11	39	67	45	--	31	13	18	58	26	25	22	34	42	--	GIDU		0
29	11	1	1	2	101	09	06	05	12	21	14	10	-01	07	09	28	17	06	06	13	17	S	1	15
30	2	2	7	0		13	07	14	07	14	15	04	04	05	00	01	12	08	06	07	08	*******	1	18
30	2	1	0	5	16	03	05	07	07	02	-02	03	-02	-02	-03	-01	-02	02	02	01	00	*******		0
30	2	1	0	1		19	10	06	06	02	22	13	05	07	00	08	31	10	06	05	11	*******	1	20
30	2	10	0	0	48	01	02	-02	-03	04	42	01	02	02	13	49	04	01	02	10	18	F		0
30	2	1	0	8'	4	05	03	06	07	29	33	-02	06	00	10	01	24	03	05	09	17	*******		0
30	3	4	0	0	105	12	-03	15	07	05	08	03	01	03	02	01	-02	05	04	05	03	*******	1	18
30	3	3	0	2	304	06	07	26	70	69	66	17	19	06	13	16	74	14	23	33	51	DU		0
30	4	1	0	0	46	18	17	47	66	72	67	18	22	76	93	92	91	33	53	74	80	CE	2	15
30	4	2	0	1	4	20	11	05	20	36	62	15	10	01	13	13	03	10	10	14	24	*******		0
30	4	2	0	0	50	32	27	19	24	20	40	13	12	08	14	17	14	19	17	17	21	F	1	15
30	5	1	7	7	10	07	09	15	22	29	25	20	25	62	70	64	65	23	34	43	46	HILSU	1	10
30	6	3	0	0	2	16	16	30	32	42	44	15	07	08	13	20	16	15	18	24	28	FG	1	12
30	6	1	0	0	118	08	06	14	02	02	01	02	02	09	-01	00	12	07	05	04	02	*******	1	15
30	7	3	3	0	49	03	07	12	30	42	25	02	02	-01	14	13	11	04	11	18	22	*******		0
30	7	5	0	0	319	10	12	10	42	37	46	17	12	12	20	36	37	12	18	26	36	J		0

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
30	7	6	3	0	104	05	00	-02	-02	11	13	13	07	02	25	27	25	04	05	10	16	L	1	15
30	6	3	0	0	105	07	06	-04	04	12	04	09	03	-05	-03	07	04	03	00	02	04	J	1	6
30	9	3	0	0	304	29	19	26	36	64	86	07	05	19	33	43	86	18	23	37	58	HS		0
30	9	1	0	0	32	13	13	21	39	43	50	06	03	14	51	50	37	12	23	36	45	CV		0
30	9	0	0	0		20	15	12	17	15	14	12	09	11	22	08	10	13	14	14	14	*******		0
30	9	2	1	2		16	13	35	79	81	--	22	27	33	57	75	85	24	41	60	--	EH	2	15
30	9	2	1	7'	101	20	12	26	22	25	20	09	06	23	18	23	20	16	18	23	21	A	1	20
30	9	9	0	0		11	10	25	65	57	47	08	05	21	77	71	80	13	34	52	66	EL	3	18
30	9	4	0	8		23	21	14	13	24	61	12	13	09	51	55	45	15	20	27	41	EV	2	20
30	9	0	6	0	376	12	03	09	07	36	08	11	-05	-05	-04	-04	-08	04	01	06	06	FG		0
30	9	2	2	8	38	12	09	10	13	26	44	06	11	06	07	17	26	09	09	13	22	EFV	2	20
30	9	3	1	9	101	05	06	01	10	04	42	02	-02	-02	03	05	61	02	03	03	21	EJL	2	20
30	10	11	0	0	316	--	02	08	-03	13	24	09	-01	09	10	46	62	--	04	14	25	E	2	20
30	10	1	2	5	7	12	04	26	22	29	-03	16	16	32	33	50	27	16	22	32	25	CEF	3	17
30	10	2	0	0	388	22	17	36	52	49	47	10	08	22	29	55	36	19	27	40	44	*******	1	24
30	10	1	0	0		12	04	11	30	14	19	03	02	02	07	04	19	06	09	11	15	DEFH	2	20
30	11	2	0	5	116	20	32	56	78	84	82	18	27	31	79	91	78	31	50	70	82	*******	1	15
30	11	2	3	8	49	08	06	-05	03	06	14	04	01	-05	02	04	18	02	01	01	03	FV	1	25
30	11	2	1	2	109	14	08	16	07	19	26	04	04	16	11	13	23	10	10	13	16	EF	2	15
30	11	2	5	5'	4	63	48	55	--	--	73	40	38	26	37	48	56	45	--	--	--	AU		0
30	11	3	0	6		09	06	25	30	31	30	13	04	14	25	26	31	13	18	26	29	*******		0
30	11	0	0	3	50	09	05	22	24	24	11	16	03	12	31	20	10	11	16	22	20	EL	2	15
30	11	1	0	5	101	17	07	21	68	92	86	15	13	06	24	80	87	13	23	48	73	HL		0
31	2	10	1	0	4	03	07	06	06	17	37	12	13	14	06	12	26	09	09	10	17	EF	2	18
31	2	7	10	0		06	10	07	11	27	38	07	02	04	07	10	34	06	07	11	21	*******	1	15
31	2	1	1	0	44	00	07	06	-02	09	20	03	05	11	04	19	09	05	05	08	10	E	3	15
31	3	2	0	3'	2	08	00	05	31	43	36	05	-05	03	10	18	29	03	07	18	26	C	1	19
31	5	3	1	3'		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	J		0
31	6	1	2	0	46	31	26	24	47	47	57	43	46	56	71	71	69	38	45	52	63	FS	1	16
31	7	6	0	4'	304	20	13	01	21	14	23	10	10	06	10	31	21	10	10	14	20	CDEH	2	17
31	7	2	2	0	142	11	10	01	11	18	22	06	09	01	10	39	22	07	07	13	20	DI		0
31	7	1	3	0	4	20	09	12	12	18	26	09	16	02	10	04	09	11	10	09	13	JNV	1	15
31	8	2	0	0	46	05	05	04	09	21	38	01	09	07	04	04	-05	05	06	08	12	*******	1	10
31	8	2	0	0	46	07	10	29	59	71	70	09	04	04	10	20	56	11	19	32	47	CHOU		0
31	9	4	1	1	36	15	14	20	17	29	29	02	00	07	13	09	51	10	12	16	24	F	2	20
31	9	3	0	0	32	07	10	10	10	21	34	-01	03	07	06	20	--	06	08	12	--	CDEFLG	3	15
31	9	3	3	0	363	39	30	36	35	34	37	16	27	28	29	22	33	29	31	30	31	CV	1	10
31	9	3	2	0	109	06	01	04	35	60	21	-07	-06	-02	06	29	21	-01	06	22	28	EL	2	5
31	9	4	0	0	46	03	-02	07	16	27	09	-02	-02	-01	00	10	23	01	03	10	14	CEL	3	20
31	9	0	0	9		19	16	-03	08	29	77	10	11	-02	03	19	64	09	05	09	33	*******	1	20
31	10	5	0	0	392	24	35	30	23	51	55	10	08	11	07	08	16	20	19	21	26	H	1	15
31	11	1	0	0	497	27	16	30	26	13	11	16	13	27	21	21	13	22	22	23	17	HN		0
31	11	2	2	0	104	04	15	68	82	86	87	08	09	59	76	74	76	27	51	74	80	V		0
31	11	3	0	3	319	17	12	07	11	28	22	14	11	12	11	25	20	12	11	15	19	*******	1	15
31	11	1	0	1	6	08	13	18	18	29	42	10	-01	02	06	36	36	08	09	18	28	CHRH		0
31	11	5	0	0	43	14	15	18	25	22	27	16	07	12	26	23	36	14	17	21	26	FI	1	2
31	11	0	0	0	116	31	16	20	17	21	35	06	-01	01	10	13	34	12	10	13	21	L		0
31	11	2	1	2	38	27	35	49	50	48	60	20	33	34	39	40	37	33	40	43	45	*******	1	17
31	11	2	0	1	158	06	07	11	14	04	15	08	08	06	05	34	28	08	08	12	16	CES	2	12
31	11	2	1	0	101	08	02	05	05	28	23	04	03	01	06	15	17	04	04	10	15	EG	2	20
32	2	3	2	0	4	03	02	03	07	21	06	02	03	05	27	20	11	03	08	14	15	*******		0
32	2	1	0	0	116	34	33	44	48	52	55	26	22	44	49	36	47	34	40	45	48	E	2	25
32	2	2	5	6'		23	17	14	22	35	31	18	11	07	11	19	19	15	14	18	23	GH	1	20
32	2	5	7	0	35	26	14	16	57	63	57	12	09	15	60	66	56	15	28	46	60	*******	1	15
32	2	6	12	0		10	04	06	08	12	-12	-02	09	03	-01	07	18	05	05	06	05	*******	1	20
32	4	0	0	10'	116	10	04	10	13	18	10	03	04	15	18	11	22	08	11	14	15	E	2	17
32	4	5	0	8'		37	18	18	28	40	29	19	13	16	23	26	18	20	19	25	27	A		0
32	5	5	1	0	269	08	06	04	24	75	81	01	07	02	05	47	69	05	08	26	50	CW		0
32	6	4	0	0	50	25	15	00	16	06	15	11	03	00	04	04	04	09	06	05	08	DE	2	12
32	7	4	0	0	36	03	02	08	09	38	12	15	04	07	26	67	61	07	09	26	35	V		0

AGE		JOB YRS		OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3 CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
32	7	7	0	0 49	15	13	10	15	12	13	24	14	15	13	10	17	15	13	12	13	F		0
32	7	5	1	0 373	09	11	08	12	07	14	05	04	05	13	20	19	07	09	11	14	*******	1	17
32	7	12	1	2 4	29	16	28	74	77	69	22	19	28	68	79	77	24	39	59	74	LR	1	15
32	7	1	1	6' 53	09	10	24	11	26	33	-01	10	23	37	36	47	13	19	26	31	HINGRS		0
32	9	15	0	0 38	14	05	12	42	45	48	07	00	19	17	37	19	10	16	28	34	*******	1	20
32	9	2	0	0	35	31	18	38	64	78	13	09	06	18	57	86	19	20	33	57	V	1	10
32	9	1	0	0 54	11	10	04	01	07	-01	10	09	07	08	05	06	09	06	05	04	UU	1	2
32	9	3	2	2 368	17	11	01	09	19	18	12	02	09	03	39	25	09	06	13	19	*******	1	5
32	9	4	3	0	-04	05	23	46	64	66	-04	-01	19	25	09	13	06	19	31	37	CEHGU	2	20
32	9	0	5	0	40	29	24	39	39	26	19	28	27	41	52	55	26	31	37	42	ILPR	1	15
32	9	2	2	5	21	18	17	63	63	24	16	16	12	55	59	36	17	30	45	50	W	1	4
32	11	2	1	3 999	09	03	06	06	17	28	05	00	01	35	54	51	04	08	20	32	F	1	10
32	11	0	3	0 32	07	-03	05	15	19	14	-09	-07	-04	07	05	20	-02	02	08	13	*******		0
32	11	1	0	7 49	11	03	17	21	33	11	06	06	13	28	22	05	09	15	22	20	E	3	15
32	11	3	0	0 102	08	06	-01	60	69	73	09	05	04	14	61	61	05	15	34	56	*******	1	16
32	11	1	0	3' 4	20	12	51	61	58	28	17	14	18	50	62	26	22	34	50	47	A		0
33	2	5	10	0	16	10	04	08	42	20	11	03	03	04	05	18	08	05	11	16	M	1	19
33	4	2	0	0 303	10	09	07	23	20	46	13	11	07	17	24	15	10	12	16	24	C	1	20
33	6	1	4	7'	28	26	15	23	41	35	21	19	06	22	22	44	19	18	21	31	*******	1	17
33	7	3	4	3' 4	34	37	39	35	68	57	26	30	28	34	66	44	32	34	45	50	L		0
33	7	7	0	2 373	11	05	05	08	11	22	05	04	05	11	07	14	06	06	08	12	*******	1	5
33	7	4	2	0 119	33	28	16	36	49	48	15	15	15	17	25	17	20	21	26	32	W	1	10
33	7	1	0	0 10	16	09	01	-03	05	25	12	-01	-05	-02	-01	10	05	00	-01	05	*******	1	20
33	8	0	0	12'116	27	13	11	08	36	36	12	09	07	08	16	05	13	09	14	18	A	1	15
33	9	4	0	4'	11	11	05	09	14	20	11	13	07	00	01	07	10	07	06	08	U		0
33	9	2	1	4'	09	06	24	15	84	76	03	02	08	17	91	82	09	12	40	61	AELV	2	15
33	9	1	0	6	09	19	27	48	50	46	-04	00	04	12	31	06	09	19	26	32	*******	1	20
33	11	2	0	9 101	36	37	29	32	63	43	14	13	29	51	63	30	26	32	44	47	F		0
33	11	1	2	3 53	18	13	06	41	50	32	11	03	04	31	47	30	09	16	30	38	*******	1	20
33	11	6	0	3' 4	11	08	12	14	26	28	16	18	22	27	34	51	15	17	22	30	A	1	15
33	11	2	1	0 109	13	13	21	41	48	47	10	10	04	32	32	18	12	20	29	36	EFJL	3	5
33	11	1	1	1 101	12	06	06	54	65	43	13	06	07	42	44	36	08	20	36	47	EFL	3	20
33	11	1	1	0 999	25	20	66	68	68	75	37	45	85	85	83	78	46	61	76	76	EFH	3	12
34	1	6	0	0 155	07	12	09	07	11	31	05	05	16	07	09	40	09	09	10	17	*******		0
34	2	8	2	4'	11	02	03	17	53	56	20	13	04	13	62	49	09	09	25	41	DE	2	20
34	3	3	0	0 109	02	06	01	06	20	18	16	04	05	-02	13	19	06	03	07	12	*******		0
34	3	1	3	0 316	17	14	05	19	44	19	08	04	04	-03	22	09	09	07	15	18	DX	1	15
34	4	1	3	0 373	20	13	12	34	47	25	14	07	07	11	32	29	12	14	24	29	*******	1	15
34	4	3	0	4'269	10	06	19	17	14	-04	04	01	11	28	14	24	09	14	17	15	*******		0
34	7	4	6	0 459	04	02	00	07	20	13	03	02	-04	06	14	20	01	02	07	13	*******		0
34	7	9	0	0 360	25	16	11	11	22	42	23	13	13	11	15	23	17	12	14	20	CR	1	20
34	7	7	7	0 5	25	27	45	56	48	45	15	26	46	57	64	75	31	43	52	57	CEHU	2	20
34	7	9	0	9'481	-04	06	12	38	32	49	-02	-04	08	17	20	37	03	13	21	32	FHL	1	15
34	8	5	2	6 4	07	18	25	59	72	57	13	11	16	46	53	46	15	29	45	55	C		0
34	8	4	0	0 46	20	14	20	40	60	77	52	48	51	68	68	79	34	40	51	65	L	1	15
34	9	1	2	0	00	01	12	21	29	34	04	-03	18	21	44	39	05	12	24	31	FHL	1	15
34	9	3	0	0 54	18	05	33	49	47	50	21	06	18	33	34	24	17	24	35	39	U	1	16
34	9	1	3	0	34	32	39	57	81	82	14	23	26	71	66	58	28	41	56	69	CELW	2	10
34	9	4	0	12	34	27	59	67	66	53	14	21	29	58	66	38	31	43	57	58	*******	1	10
34	9	2	1	0	27	19	26	50	54	53	17	19	18	61	63	49	21	32	45	55	W	1	20
34	10	0	5	0 42	32	20	14	21	27	21	05	-01	05	08	18	12	13	11	15	18	*******		0
34	11	1	0	14 101	08	03	12	18	32	23	05	04	01	02	21	22	06	07	14	19	*******		0
34	11	0	0	2 38	13	13	16	20	19	28	07	06	16	15	07	02	12	14	15	15	*******		0
34	11	0	3	11 32	14	19	23	12	47	28	15	18	22	21	23	19	19	19	24	25	C		0
34	11	0	2	0 32	16	09	22	35	44	46	10	03	04	32	36	32	11	17	29	37	JL		0
34	11	1	1	2 53	37	28	--	--	39	35	--	--	--	--	48	42	--	--	--	--	*******		0
34	11	3	0	1	11	05	15	10	24	07	08	11	10	15	10	27	10	11	14	15	U	1	10
35	1	3	0	7'319	22	14	18	22	26	21	42	26	17	22	22	24	23	20	21	23	A	1	16
35	2	1	0	5'	00	04	03	11	48	47	00	06	03	07	53	33	03	06	21	33	A		0
35	2	1	0	3' 48	03	10	07	18	61	74	07	00	12	10	25	56	07	09	22	40	*******		0

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
35	4	2	0	0	116	16	08	11	19	48	27	13	04	04	33	04	23	09	13	20	25	DH		0
35	4	1	0	6'	105	01	06	64	74	87	77	02	02	30	58	69	66	18	39	63	72	AE	2	20
35	5	8	0	0	2	77	82	84	80	80	80	53	54	57	70	86	81	68	71	76	79	CFS	1	16
35	6	3	1	3	158	03	03	05	06	12	11	10	02	06	10	14	19	05	05	09	12	HN	1	20
35	7	2	5	12	49	04	00	10	69	77	66	05	02	-03	68	81	90	03	24	50	75	*******	1	18
35	7	0	0	2	53	17	14	16	35	32	74	13	13	13	30	51	57	14	20	29	46	EN	2	20
35	7	7	0	0	304	05	07	07	03	12	16	01	03	03	08	21	26	04	05	09	14	F	1	15
35	7	1	2	2	116	13	14	08	26	70	88	18	25	12	12	51	88	15	16	30	56	LO	2	12
35	7	6	0	0	304	07	10	12	31	60	57	09	08	09	33	49	77	09	17	32	51	ELO	2	25
35	8	3	15	0	49	15	06	05	09	06	37	08	00	02	17	35	39	06	06	12	24	HOS	1	20
35	8	3	0	0	105	01	04	05	16	24	10	-06	-04	12	06	21	26	02	06	14	17	H	1	15
35	8	2	0	0	46	23	19	11	17	11	27	15	14	16	11	21	04	16	15	14	15	S		0
35	8	4	0	0	50	20	20	18	24	51	39	13	09	22	34	68	67	17	21	36	47	*******	1	20
35	9	4	9	2		27	26	36	68	77	69	22	28	36	60	62	43	29	42	56	63	LNSV	1	13
35	9	6	0	2	46	-09	-03	-03	16	64	77	-08	03	-03	-01	15	63	-04	01	14	39	CE	3	20
35	9	1	0	10'		13	13	08	18	30	25	00	09	13	11	18	03	09	12	16	17	AS	1	15
35	9	3	0	0	104	-01	02	00	08	26	11	-03	-05	36	38	41	17	05	13	25	23	H	1	25
35	10	2	0	2		07	03	02	06	13	31	07	-06	06	10	03	23	03	03	06	14	O		0
35	11	1	0	10	101	09	11	22	48	37	31	08	04	18	32	26	34	12	22	30	34	*******		0
36	2	1	0	0	48	21	25	16	06	18	20	13	17	11	05	11	27	17	13	11	14	*******		0
36	2	2	0	4'		59	43	81	91	90	88	44	27	66	93	87	64	53	67	84	89	A	1	11
36	4	2	1	4'	35	02	06	22	07	09	29	01	05	06	12	15	11	07	10	12	14	AD	1	15
36	6	2	10	0		04	-01	05	22	33	30	06	09	04	13	15	27	05	09	15	23	HJKLO		0
36	6	1	0	0	53	23	28	53	57	68	54	20	28	47	43	27	44	33	43	49	49	IO	1	20
36	7	15	18	3'	50	03	02	--	53	37	91	01	02	10	35	46	69	--	--	--	55	*******		0
36	7	10	7	0	49	-01	00	01	28	33	10	04	08	23	56	48	31	06	19	31	34	S	1	20
36	7	1	0	0	269	07	13	04	59	62	75	11	19	08	48	53	76	10	25	39	62	O	1	20
36	8	2	0	0	46	44	36	55	67	66	44	37	39	55	53	61	48	45	51	59	56	*******	1	20
36	8	1	2	0	50	09	05	08	08	14	34	03	08	00	04	05	11	06	05	06	12	FHLO	1	20
36	9	5	9	0		02	01	01	23	16	18	-04	01	-02	26	23	12	00	08	14	19	C	1	15
36	9	1	1	0	32	25	27	42	54	80	74	25	28	42	53	76	67	32	41	58	67	H	1	10
36	9	1	4	3		02	04	18	59	62	54	02	04	67	62	54	46	16	36	53	56	CE	2	20
36	9	3	2	0	38	18	05	04	15	32	57	-02	03	08	10	29	54	06	07	16	33	CES	2	25
36	9	1	4	5		16	12	26	24	13	36	06	08	19	17	11	08	15	18	18	18	E	3	18
36	10	1	0	0		12	00	16	38	39	46	01	-05	03	31	13	34	05	14	23	33	*******		0
36	10	3	0	0	322	19	21	22	50	58	51	12	13	16	27	49	38	17	25	37	45	*******	1	24
36	10	3	0	0	50	05	07	09	07	09	25	01	07	09	17	23	22	06	09	12	17	*******	1	20
36	11	1	0	3	101	05	06	10	12	28	20	00	02	10	36	50	49	06	13	24	32	*******		0
36	11	0	3	0	216	23	19	17	23	18	17	15	16	08	24	18	13	16	18	18	19	L	1	20
36	11	3	0	17	49	08	10	14	42	60	64	01	02	11	01	22	17	08	13	25	34	OU		0
36	11	3	0	0	319	10	03	10	15	29	43	12	05	14	08	05	07	09	09	13	18	HO		0
36	11	4	0	2	4	17	09	77	81	72	64	09	07	59	67	68	26	30	50	70	63	E	3	15
36	11	3	0	0	4	19	23	37	36	54	61	09	03	23	27	29	88	19	25	34	49	DFILO		0
36	11	1	0	0	32	10	11	19	72	77	80	06	10	58	86	89	82	19	43	67	81	C	1	24
37	2	1	0	15	116	16	48	59	88	90	87	01	07	74	81	71	82	34	59	77	83	CE	2	10
37	2	0	0	0		16	01	14	13	16	19	-02	-04	10	10	12	20	06	07	12	15	E	2	20
37	2	1	4	1	48	22	25	35	44	42	55	23	23	34	30	17	30	27	32	33	36	CE	3	20
37	2	3	3	0		03	02	21	51	42	53	19	06	09	20	21	28	10	18	27	36	CF	1	20
37	4	2	14	0	49	03	03	02	03	05	02	01	02	-01	06	11	-02	02	02	04	04	*******	1	4
37	5	8	0	0	46	27	22	19	39	60	56	10	07	18	29	56	56	17	22	37	49	U	1	15
37	5	5	6	0	2	13	08	08	15	20	07	12	10	19	10	23	23	12	12	16	16	CU		0
37	5	5	4	10'	2	17	09	20	55	38	51	15	06	26	78	82	72	16	32	50	62	R	1	20
37	7	1	2	1	262	-02	01	14	24	55	54	06	-02	27	32	54	43	07	16	34	43	CE	3	25
37	7	2	4	0		23	02	27	32	46	31	11	07	15	48	46	34	14	22	35	39	N		0
37	7	5	15	0	304	15	07	11	07	05	22	18	13	03	23	30	37	11	11	13	20	EFHO	2	20
37	7	3	2	0	304	18	16	21	23	22	16	13	03	04	13	03	15	13	13	14	15	U		0
37	9	1	3	15	118	31	38	65	76	67	75	19	27	64	76	91	83	41	58	73	78	*******	1	20
37	9	1	1	10		06	03	09	43	19	02	11	04	-02	37	54	08	05	16	26	27	CF	1	25
37	9	0	5	0		50	51	64	75	--	--	40	66	--	--	--	--	--	--	--	--	*******	1	20
37	9	5	0	0		10	16	27	42	44	40	03	08	22	20	14	17	14	22	28	29	*******		0

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
37	9	2	1	1	373	31	31	51	71	78	81	12	16	17	21	17	15	26	34	42	47	U	1	25
37	9	3	3	6		02	07	18	60	64	37	-02	00	14	66	59	58	07	27	47	57	*******	1	10
37	10	3	0	0	269	35	26	20	25	36	22	10	01	04	20	16	20	16	16	20	23	*******		0
37	11	1	1	2	157	20	14	15	61	35	-06	20	18	26	93	49	45	19	38	46	46	FVW	1	20
37	11	2	1	3'	34	05	04	02	09	14	28	05	06	13	36	24	05	06	12	16	19	AW	1	10
37	11	3	0	4	4	32	32	45	61	65	45	25	27	38	67	66	42	33	45	57	57	HL	1	20
38	4	3	23	0	373	29	24	39	60	57	68	20	23	33	58	62	67	28	39	51	62	CX		0
38	4	3	0	8'	800	11	-03	08	15	23	12	05	05	05	13	03	10	05	07	11	12	*******	1	15
38	4	1	1	19'	46	14	14	06	12	10	09	15	09	05	05	12	08	11	08	08	09	A	1	23
38	4	3	1	0	50	19	14	24	40	55	70	19	21	27	46	--	--	21	29	--	--	*******		0
38	4	1	0	0	105	15	15	26	28	69	68	03	05	00	20	26	27	11	16	28	39	U	1	26
38	5	16	0	0	46	35	46	45	60	65	64	27	36	42	47	52	72	39	46	52	60	LNU	1	11
38	5	5	10	10'	2	12	11	07	27	43	26	15	13	09	50	72	64	11	19	34	47	CE	2	10
38	5	16	0	0	392	21	17	18	13	22	17	17	05	12	08	19	24	15	12	15	17	*******	1	20
38	7	2	3	16'	269	22	23	49	61	63	62	22	20	34	57	80	89	28	41	57	68	ACFHS	1	8
38	7	1	0	0	101	20	10	08	21	67	45	19	14	08	16	35	31	13	13	26	36	JW	1	20
38	7	2	1	1	41	13	08	11	30	24	75	01	04	11	24	49	43	08	15	25	41	S	1	20
38	8	4	4	14		16	23	15	16	25	24	11	15	13	07	29	17	16	15	17	19	FMU	1	6
38	9	3	0	15		23	17	20	60	46	39	10	03	17	37	49	33	15	26	38	44	S	1	10
38	9	3	3	5	38	10	06	02	25	36	16	-01	00	04	09	16	31	04	08	15	22	EH	2	15
38	9	3	1	4		23	22	30	40	37	13	14	16	36	57	81	65	24	33	47	49	CU	1	20
38	9	2	2	14		36	26	26	50	60	49	25	30	31	40	54	49	29	34	43	50	J	1	20
38	10	6	0	14'	34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	U	1	20
38	10	3	0	2	269	10	10	02	51	80	87	--	--	--	--	--	--	--	--	--	--	U	1	8
38	10	0	1	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	FJU	1	15
38	10	10	0	0	50	81	68	72	--	--	--	--	--	--	--	--	--	--	--	--	--	U		0
38	11	2	0	2	50	03	06	14	25	55	42	06	02	13	25	16	13	07	14	24	29	*******		0
38	11	3	0	5	38	11	15	32	40	49	54	01	05	14	22	03	19	13	21	26	31	JVW		0
38	11	1	2	2	50	25	33	42	49	44	42	07	18	26	24	41	40	25	32	37	40	H		0
38	11	1	2	3	32	13	14	17	23	18	--	06	08	00	12	44	55	10	12	19	--	*******		0
39	2	4	4	0		02	05	09	52	47	12	-02	00	-05	00	06	14	02	10	18	22	U	1	20
39	2	2	4	0		26	34	42	44	46	37	02	13	14	22	22	30	22	28	31	33	F	1	25
39	4	17	0	0		16	15	14	22	14	22	02	06	03	-04	03	17	09	09	08	12	*******		0
39	4	1	0	0	46	07	04	00	14	54	34	04	01	06	01	14	19	04	04	15	22	*******	1	20
39	4	1	2	0	50	06	04	11	22	43	20	-06	01	03	47	46	48	03	15	28	37	*******	1	17
39	7	0	0	2	116	08	08	07	11	08	17	01	04	06	04	11	16	06	07	08	11	FU		0
39	8	15	0	0	46	24	20	15	30	61	47	10	09	32	64	61	51	18	28	44	52	CE	2	15
39	8	3	0	0	46	03	05	03	06	02	10	-03	-01	-01	-03	01	-02	01	01	01	02	L	1	20
39	8	1	3	10'	36	15	07	14	44	54	75	04	-02	18	49	55	14	09	22	39	48	AEHN	2	5
39	9	3	0	5'	101	11	07	20	38	42	37	07	01	10	28	35	30	09	17	29	35	ACE	2	27
39	9	6	0	3	46	02	02	08	62	57	56	03	04	17	44	67	81	06	23	42	61	*******	1	20
39	9	5	2	0		13	16	12	25	20	12	01	06	12	12	11	17	10	14	15	16	CDEHIL	2	25
39	9	1	17	0		36	26	15	59	81	86	22	21	18	63	91	86	23	34	54	77	ILW	1	10
39	9	3	0	0		04	-01	02	06	08	22	07	05	01	01	04	29	03	02	03	11	CE	2	25
39	10	5	1	4'		69	42	71	82	90	87	29	32	38	71	84	65	47	56	72	80	*******	1	14
39	11	2	1	3	116	14	09	07	20	22	44	14	08	06	11	12	31	10	10	13	23	*******		0
39	11	1	2	0	116	06	19	04	24	16	07	77	85	62	83	74	67	42	46	44	45	HLNU		0
40	1	3	0	5'	4	15	07	08	30	52	41	08	09	06	22	47	31	09	14	27	37	*******	1	15
40	2	2	16	16'		10	02	03	54	46	58	15	13	11	47	61	61	09	22	37	54	*******	1	24
40	3	2	5	3'	50	21	06	04	20	23	21	12	02	01	16	38	31	08	08	17	25	DH		0
40	4	2	0	10'	46	11	07	07	22	29	33	01	03	11	05	35	26	07	09	18	25	*******	1	20
40	4	1	0	0	46	-03	02	12	12	10	15	00	-03	05	03	09	16	02	05	08	11	*******	1	28
40	4	2	0	0	46	15	14	12	22	40	65	16	14	11	13	24	46	14	14	20	35	C		0
40	5	1	1	0	10	03	04	21	38	35	40	10	11	33	52	48	26	14	26	38	40	*******	1	26
40	6	7	0	9	50	26	20	07	08	15	32	03	11	04	08	31	30	12	10	12	20	HQ	1	6
40	7	0	0	0	116	24	16	08	10	26	34	16	05	12	03	15	13	14	09	12	17	L	1	25
40	8	3	18	0	49	27	10	36	76	91	68	06	19	58	60	68	78	26	43	65	73	L	1	25
40	8	2	0	0	35	33	16	23	40	52	31	04	04	33	47	43	32	19	27	39	41	CHLQ	1	5
40	9	4	2	3		10	05	09	29	57	55	13	10	07	11	53	50	09	12	27	42	CHL		0
40	9	4	4	3		15	14	14	25	44	26	16	06	07	21	15	42	12	14	21	29	*******	1	20

AGE		JOB YRS			OCC		HEARING LEVELS(TEST KHZ/EAR)											HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
40	10	1	1	0	101	24	50	59	77	82	76	34	44	59	79	84	75	45	61	73	79	CE	3	30
40	10	3	0	1	49	23	17	20	35	79	71	20	13	12	30	81	77	18	21	43	62	*******1		5
40	10	8	0	6'	262	37	35	37	37	57	63	--	82	86	85	84	81	--	60	64	68	AHU	1	10
40	11	1	0	0	7	38	20	23	32	40	45	13	10	15	52	64	40	20	25	37	45	J		0
40	11	2	0	9	999	12	01	05	42	26	26	06	05	01	41	36	27	05	16	25	33	DH	1	25
40	11	3	0	20	7	14	19	22	38	56	70	13	08	22	28	37	55	16	23	34	47	*******		0
40	11	2	0	0	50	09	13	14	63	68	69	12	13	11	62	70	75	12	29	48	68	E	2	20
41	2	2	20	0		06	07	09	09	07	06	05	09	09	03	03	21	08	08	06	08	C	1	19
41	2	10	0	13'		09	17	24	32	51	56	10	13	25	62	61	31	16	29	42	49	W	1	25
41	2	1	3	0		04	05	-05	10	04	05	03	-01	-02	01	03	14	01	01	02	06	*******		0
41	4	2	1	0	36	10	04	02	22	53	65	22	29	14	12	14	12	14	14	19	29	C	1	8
41	4	1	1	0	36	19	10	04	06	12	25	05	05	03	00	10	26	08	05	06	13	*******1		6
41	4	1	0	21'	49	20	09	30	50	44	51	26	14	19	51	64	56	20	29	43	52	FH	1	30
41	4	1	3	2	105	13	13	11	44	68	63	22	17	21	42	75	74	16	25	43	61	CE	2	30
41	5	18	0	0	2	20	12	09	29	37	30	02	04	00	10	18	24	08	11	17	24	*******1		20
41	7	6	0	0	4	18	19	26	79	80	63	13	21	26	60	80	63	21	42	62	74	M	1	30
41	7	3	9	4'	449	05	05	06	30	46	33	04	06	04	03	16	28	05	09	17	26	HV		0
41	7	3	8	12'	494	36	40	41	47	74	68	06	08	10	26	53	61	24	29	42	55	F		0
41	7	2	5	8'	304	18	31	71	75	75	76	29	45	51	--	--	--	41	--	--	--	CN	1	20
41	8	3	0	1	46	-06	10	32	74	86	87	10	08	10	32	69	83	11	28	50	72	*******1		10
41	8	3	0	0	35	14	15	18	48	59	35	04	08	09	04	47	27	11	17	31	36	E	2	20
41	8	18	0	0	4	18	06	-04	07	17	08	01	02	-01	-02	24	11	04	02	07	11	C	1	20
41	8	1	13	4	116	06	12	33	77	76	72	10	11	28	61	71	71	17	37	57	71	CL		0
41	9	2	19	0		19	21	30	30	41	56	07	09	13	16	20	19	17	20	25	30	H	1	3
41	9	20	0	15	53	08	02	14	18	34	20	03	02	15	17	23	29	07	11	20	23	C	1	25
41	11	2	0	21	34	16	17	21	25	16	05	15	17	13	07	18	19	17	17	16	15	*******1		41
41	11	2	0	21	101	21	22	36	69	72	87	10	05	13	65	67	78	16	35	53	73	HJN		0
42	1	0	0	15'		21	14	24	29	32	39	10	07	21	20	19	56	16	19	24	32	EFH	3	30
42	2	5	8	0		05	14	16	22	48	39	05	03	09	62	51	--	09	21	34	--	CF	1	25
42	2	20	3	4	4	20	17	13	37	72	91	12	13	04	43	70	66	13	21	40	63	S	1	30
42	2	2	20	0		03	11	08	17	49	29	06	03	04	08	22	30	06	08	18	26	*******1		25
42	3	1	5	10'	1	30	33	34	57	68	59	24	19	21	36	44	34	27	34	43	50	A	1	20
42	3	2	0	0	110	20	14	26	37	53	47	16	20	17	22	38	37	19	23	32	39	*******1		9
42	4	1	0	5'	50	27	16	26	26	67	89	21	20	15	35	54	79	21	23	37	58	*******1		30
42	4	2	0	0	104	14	01	-01	18	66	79	19	-01	-01	11	36	69	05	04	21	46	C	1	30
42	5	7	0	5	2	17	14	16	60	70	37	17	13	19	14	34	29	16	23	35	40	CES	2	30
42	5	12	0	12	269	19	19	20	59	52	40	08	13	13	28	36	18	15	25	34	39	CEIU	2	30
42	7	5	0	5	350	63	59	43	56	71	66	41	31	35	46	47	42	45	45	49	54	ILV		0
42	7	6	0	0	378	45	48	54	73	69	66	46	52	50	77	76	69	50	59	66	71	DIT	1	33
42	7	1	0	12'	49	14	07	10	31	27	25	01	07	03	06	45	34	07	11	20	28	L	1	30
42	8	3	14	5'	49	10	05	26	21	18	25	-01	21	29	13	04	30	15	19	18	18	HL	1	8
42	8	2	23	0	49	17	35	32	40	40	29	18	46	31	42	34	15	30	38	36	35	W	1	20
42	9	5	0	0	32	12	07	24	42	44	43	05	09	10	25	48	31	11	19	32	39	*******1		20
42	9	1	2	0		22	13	19	57	68	57	17	08	10	20	50	57	15	21	37	51	LRS	1	20
42	9	3	3	6	304	57	41	54	68	88	86	53	44	61	49	89	86	52	59	75	84	HILW	1	30
42	9	5	5	3		00	07	18	55	62	46	01	04	04	14	48	57	06	17	33	47	FLV	1	20
42	10	10	0	12		22	21	31	82	71	46	15	17	22	41	33	26	21	36	46	50	W	1	18
42	10	7	0	13'	38	25	19	23	54	48	38	19	16	25	47	28	21	21	31	37	39	U		0
42	11	2	0	2	4	28	21	21	19	16	12	20	11	16	18	26	31	20	18	19	20	LW	1	15
42	11	1	0	1	116	11	11	05	05	25	20	18	19	15	10	19	22	13	11	13	17	CH		0
43	2	5	0	22	36	28	06	07	46	47	44	11	04	16	53	48	31	12	22	36	45	*******1		33
43	3	2	0	3'	1	19	12	09	76	91	91	10	05	04	71	84	89	10	29	56	83	ADH		0
43	4	2	2	7'	36	26	17	30	22	31	34	09	09	15	17	33	46	18	18	24	30	*******		0
43	4	2	1	6'	105	-02	04	18	39	37	51	-03	01	24	46	62	54	07	22	37	48	A	1	5
43	5	2	10	8		00	-01	18	52	86	68	27	18	23	21	59	33	14	22	43	53	FU	1	4
43	5	3	15	0	46	23	12	16	53	51	45	22	12	15	40	54	39	17	25	38	47	*******		0
43	6	4	1	10	46	03	05	40	56	44	41	-03	04	10	19	34	25	10	22	34	36	U	1	5
43	7	4	7	0	48	20	26	26	43	49	46	16	27	18	23	37	33	22	27	32	38	H	1	20
43	8	15	0	0	418	18	16	20	42	46	66	25	15	18	27	60	88	19	23	35	55	L	1	33
43	8	6	13	0	49	16	11	15	13	32	15	15	15	16	11	14	14	15	13	17	16	*******1		30

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHUT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CUDES	N	YR
43	8	19	6	0	269	20	22	23	52	43	28	13	17	13	45	33	16	18	29	35	36	EH	2	19
43	8	3	10	0	49	12	14	17	48	42	57	00	17	06	19	30	30	11	20	27	37	CEH	3	5
43	8	1	1	11	49	11	04	15	67	91	81	11	03	08	61	66	68	09	26	51	72	EFGLN	2	20
43	9	11	0	3'		12	09	05	08	91	86	13	14	18	14	60	71	12	11	32	55	ACL	1	30
43	9	4	0	18		36	34	29	50	61	80	14	27	32	35	51	47	29	34	43	54	CIO	1	30
43	9	3	0	4		09	14	07	20	29	17	19	21	11	20	22	16	14	15	18	20	V	2	2
43	9	15	12	0		11	16	14	10	26	52	11	12	15	16	26	79	13	14	18	35	CL		0
43	9	4	0	23	46	03	27	47	77	80	86	46	49	63	76	84	85	39	56	71	81	U		0
43	9	25	0	1	46	12	10	30	64	66	57	17	12	16	52	53	51	16	31	47	57	LU	1	25
43	9	1	22	0		29	44	43	56	58	59	36	37	46	63	91	87	39	48	59	69	HIN	1	25
43	10	3	0	7'	43	37	25	22	42	37	57	20	14	16	42	43	45	22	27	33	44	E	3	30
43	10	0	7	0	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	HU	1	30
43	10	2	0	0	53	21	23	25	70	71	64	22	33	31	40	74	80	26	37	52	66	V		0
43	11	1	2	2		31	14	19	65	52	46	02	04	66	68	66	70	23	39	56	61	CIJPR	1	5
43	11	2	0	8	10	12	25	29	37	42	59	11	13	10	39	37	34	17	25	32	41	F		0
44	2	3	22	0		05	12	21	12	21	33	00	02	03	07	16	33	07	09	13	20	H	1	6
44	2	10	0	0	42	28	29	23	45	63	61	20	13	21	18	22	19	22	25	32	38	U		0
44	2	1	16	0	41	11	08	07	26	52	62	02	12	05	27	45	46	08	14	27	43	*******1		32
44	3	4	2	11'	46	10	12	11	24	51	18	13	02	11	55	62	34	10	19	35	40	*******1		25
44	3	4	3	20'	46	11	09	44	53	62	56	02	06	13	52	66	62	14	29	48	58	*******1		25
44	4	10	17	0	373	06	11	14	56	68	70	08	09	18	62	72	79	11	28	48	63	*******		0
44	5	1	12	0	53	32	32	58	94	92	87	14	13	00	46	64	77	25	40	59	76	HNOU		0
44	5	7	10	8	216	18	14	18	42	75	78	08	06	09	25	67	82	12	19	39	61	LNW	1	25
44	5	2	3	0	35	27	20	03	07	13	22	14	21	12	10	04	11	16	12	08	11	CI		0
44	5	8	15	0	269	32	33	36	70	79	74	60	76	75	83	81	71	52	62	70	76	FHN	1	5
44	5	12	5	0	386	06	16	68	71	68	76	04	21	36	56	68	83	25	45	61	70	L		0
44	7	3	0	12'	430	08	04	06	15	31	31	-04	03	05	38	24	30	04	12	20	28	CH	1	35
44	7	15	11	0	49	41	18	34	53	57	44	16	02	31	48	52	34	24	31	46	48	F		0
44	7	3	22	0	418	10	15	13	20	54	44	13	15	08	19	50	54	12	15	27	40	JLQ	1	30
44	7	4	0	0	41	37	34	32	50	91	91	18	29	19	30	92	89	28	32	52	74	*******1		28
44	7	4	21	0	494	05	11	07	38	40	38	02	08	22	54	52	24	09	23	35	41	*******1		25
44	7	20	4	0	302	11	07	21	52	62	30	02	07	16	61	63	29	11	27	46	49	*******1		20
44	7	4	21	0	379	35	47	56	62	67	73	34	44	46	58	58	56	44	52	58	62	L		0
44	7	2	0	0	489	31	20	14	25	35	37	28	20	21	23	26	24	22	20	24	28	*******		0
44	8	5	21	0	108	17	26	21	85	90	86	69	32	19	70	80	70	31	42	61	80	C	1	44
44	8	18	7	0	269	14	05	07	38	38	41	25	07	10	27	36	35	11	14	26	36	L	1	3
44	9	2	0	0		15	26	38	55	58	73	26	26	27	45	64	56	26	36	48	58	EFL	2	30
44	9	5	0	2		38	28	23	57	80	87	24	22	15	48	70	87	25	32	49	71	CEF	2	25
44	10	0	6	0	104	12	15	18	50	79	86	11	03	14	83	86	78	12	30	55	77	*******1		30
44	11	2	0	22	49	-03	05	57	93	91	79	00	06	30	78	73	64	16	45	70	79	CEF	2	30
44	11	1	0	26	49	06	03	03	21	28	38	00	00	-02	10	06	06	02	06	11	18	R	1	20
44	11	2	0	0	50	09	14	19	49	42	67	01	09	13	23	46	35	11	21	32	43	*******1		20
44	11	2	0	0	6	30	19	13	17	43	27	18	29	16	15	27	--	21	18	22	--	*******1		3
45	1	5	0	22'	216	32	12	18	42	36	36	00	05	22	24	24	22	15	20	27	30	*******1		27
45	1	4	0	16'	374	28	22	36	47	34	48	20	13	28	40	41	39	25	31	37	41	*******		0
45	2	2	0	0		14	15	08	25	25	29	13	09	02	34	31	11	10	15	21	26	C		0
45	3	3	3	22'		23	14	14	24	54	28	09	08	04	20	35	35	12	14	25	32	CHJ	1	20
45	3	1	0	0		33	27	24	44	35	31	12	11	07	04	22	23	19	19	22	26	CP	1	33
45	4	14	11	0	374	32	23	33	60	47	55	22	07	18	36	36	39	23	29	38	45	*******		0
45	4	6	22	0	305	37	59	44	42	61	55	16	13	08	27	31	37	30	32	35	42	O	1	15
45	4	2	0	5'	4	14	15	77	78	74	72	16	24	77	72	76	62	37	57	75	72	CH	1	20
45	4	3	1	0	116	20	19	43	54	53	30	15	07	26	55	42	55	22	34	45	48	C		0
45	4	1	17	4'	462	31	32	37	62	57	52	18	19	25	23	44	38	27	33	41	46	*******1		33
45	5	1	20	0	269	12	10	14	36	45	35	07	10	27	66	54	44	13	27	40	46	V	1	24
45	6	5	0	12	116	21	16	17	51	50	59	21	18	09	26	39	47	17	23	32	45	HQ		0
45	6	6	20	0	449	11	14	17	16	19	45	10	09	17	13	12	34	13	14	15	23	N	1	30
45	6	8	0	20'	149	76	51	25	37	57	79	35	42	57	62	55	54	48	46	49	57	HLQS		0
45	7	10	19	0	149	--	--	23	42	62	35	16	14	13	19	58	34	--	--	36	41	HJLNPR	1	15
45	7	10	18	0	269	69	80	75	72	81	78	23	14	21	37	46	61	47	50	55	62	HNU		0
45	7	15	10	0	36	23	24	34	03	-02	25	02	17	61	72	71	82	27	35	40	42	ILNPQUV	1	16

AGE	JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
45	7	3	23	0	414	17	27	27	19	25	24	06	11	16	14	27	39	17	19	21	24	CHO		0
45	7	1	19	0	380	42	36	35	41	43	48	10	10	11	25	26	30	24	26	30	35	C		0
45	7	20	0	0	304	25	19	22	48	56	47	21	16	21	39	48	45	21	27	39	47	DQ	1	30
45	8	2	0	0	36	24	26	05	31	35	44	48	16	16	14	33	47	23	18	22	34	EIOS	2	35
45	8	0	4	0	481	21	09	12	43	46	36	05	07	15	22	24	42	12	18	27	35	EFL	2	30
45	8	28	0	0	418	02	-03	07	29	58	40	37	52	48	68	58	51	24	33	44	50	UV		0
45	9	1	26	0	34	10	15	16	26	24	19	08	07	18	17	15	32	12	16	19	22	HLV		0
45	9	4	2	0		16	19	45	80	70	65	06	18	25	65	84	67	22	42	61	72	EGLV	3	30
45	9	5	12	20'	34	24	09	29	48	58	49	16	20	16	21	66	40	19	24	39	47	W	1	1
45	10	3	3	0	34	32	33	31	--	45	86	49	43	32	31	48	44	37	--	--	--	ELS	2	25
45	11	2	0	0	53	26	31	39	62	78	76	17	13	11	23	53	54	23	30	44	57	HL	1	25
45	11	2	0	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	U	1	15
46	1	6	0	0		20	17	03	42	73	66	15	-04	05	52	63	51	09	19	39	58	X		0
46	2	1	0	1	10	12	15	25	36	56	66	11	05	15	41	32	44	14	23	34	46	*********	1	10
46	2	8	14	4'		11	03	00	04	02	08	09	04	00	03	10	03	05	02	03	05	C		0
46	3	2	0	5'	110	42	40	38	62	65	62	23	24	33	74	72	66	33	45	57	67	*********	1	30
46	4	10	18	0	414	31	22	38	62	84	87	17	24	20	20	44	69	25	31	44	61	EU	2	30
46	4	5	0	4'	495	30	13	43	62	65	73	18	11	31	92	91	86	24	42	64	78	*********	1	25
46	4	0	0	0	373	31	32	36	74	76	67	30	43	52	63	74	72	37	50	62	71	CF	1	9
46	4	19	2	0	373	39	27	27	76	75	70	86	81	87	93	92	91	58	65	75	83	CU	1	10
46	4	24	0	0		24	14	03	14	32	36	11	15	13	16	25	34	13	12	17	26	********		0
46	4	20	10	0	36	03	02	17	43	46	19	02	03	28	62	55	24	09	26	42	41	*********	1	40
46	4	1	2	18	49	18	08	11	22	23	21	07	07	07	19	17	36	10	12	16	23	CH	1	20
46	5	1	4	11	269	67	70	68	79	79	--	80	86	87	85	85	86	76	79	80	--	EHILW	S3	30
46	5	2	24	0	265	71	72	77	78	80	--	53	53	60	64	72	78	64	67	72	--	CFL	1	35
46	6	13	1	6	49	20	23	21	42	33	31	20	11	26	35	34	22	20	26	32	33	H	1	30
46	6	5	4	0	2	14	13	12	15	40	41	15	03	15	33	48	34	12	15	27	35	H	1	25
46	6	20	0	1	49	12	11	43	34	11	15	02	09	19	10	04	16	16	21	20	15	FO	1	30
46	7	1	5	0	304	10	17	17	42	46	44	07	16	20	44	58	42	15	26	38	46	E	2	35
46	7	4	21	0	104	32	28	36	55	53	34	26	12	19	50	52	41	26	33	44	47	N	1	30
46	7	11	9	0	4	12	11	16	48	52	39	24	13	17	55	64	49	16	27	42	51	********		0
46	8	16	0	0	418	13	06	08	21	24	49	02	03	04	19	24	33	06	10	16	28	C		0
46	8	8	0	0	319	12	14	28	47	53	31	10	04	48	76	89	85	19	36	57	63	CV	1	30
46	8	20	7	0	262	--	66	24	22	36	61	32	27	26	45	60	30	--	35	35	42	ILRU	1	3
46	8	1	20	0	216	07	07	18	72	69	62	11	07	19	32	54	31	12	26	44	53	*********	1	20
46	8	3	23	0	49	19	26	72	76	70	48	15	23	42	65	70	78	33	51	66	68	N	1	35
46	8	8	6	0	49	13	10	06	64	50	--	09	07	14	64	59	58	10	27	43	--	U		0
46	8	8	18	0	49	14	12	29	52	48	24	14	14	26	53	47	20	18	31	42	40	M		0
46	9	6	0	0	304	25	28	68	63	54	44	23	26	48	62	56	21	36	49	58	50	CHLV	1	15
46	9	3	3	13		06	24	23	50	45	41	-04	14	23	41	45	55	14	29	38	46	CL		0
46	9	0	4	14		26	34	37	88	91	86	29	35	37	87	90	88	33	53	71	88	Q	1	30
46	9	7	9	1		11	04	16	17	56	51	21	13	33	35	54	53	16	20	35	44	CU	1	30
46	10	2	0	24'	43	10	00	34	61	--	--	25	33	51	44	48	65	26	37	--	--	C	1	5
46	11	3	0	22	101	48	43	57	92	91	83	15	21	26	44	58	67	35	47	61	72	H	1	10
46	11	2	0	26	4	07	08	70	70	71	66	11	11	52	73	72	76	27	47	68	71	L		0
46	11	3	2	3	46	13	-02	08	32	54	28	02	00	07	63	63	38	05	18	38	46	C		0
46	11	2	0	26	38	15	16	29	43	69	74	09	09	10	18	36	31	15	21	34	45	E	2	36
47	2	7	1	23'	111	22	32	59	55	52	49	13	12	19	23	12	39	26	33	36	38	CU	1	30
47	2	3	22	1	4	10	14	24	27	76	86	00	01	03	15	29	26	09	14	29	43	CHU	1	30
47	2	3	22	0		00	03	08	12	11	41	00	03	04	08	17	24	03	06	10	19	*********	1	20
47	2	11	0	0	49	18	16	07	27	39	24	02	03	12	25	40	31	10	15	25	31	C		0
47	3	1	7	3'	1	40	37	37	56	69	66	30	37	38	57	61	80	37	44	53	65	CW	1	25
47	4	7	22	0	322	20	15	20	32	48	40	70	64	66	49	62	49	43	41	46	46	CEU	2	34
47	4	10	10	0	316	27	23	45	73	72	42	20	15	34	44	47	38	27	39	52	52	C	1	20
47	4	20	10	0	50	51	51	47	83	83	80	49	40	28	50	86	77	44	50	63	76	C		0
47	4	20	11	0	108	44	43	48	52	49	48	40	38	39	41	37	40	42	43	44	44	CE	2	20
47	5	4	12	0	340	-06	08	01	27	53	30	00	00	-01	45	39	19	00	13	27	35	N		0
47	7	16	11	0	269	32	26	34	57	58	63	17	16	20	27	45	41	24	30	40	48	CFL	1	20
47	7	17	10	0	321	27	16	31	51	59	59	27	17	20	23	33	31	23	26	36	42	LNV	1	10
47	7	18	11	0	50	18	14	14	65	73	66	08	13	14	65	72	69	14	31	50	68	DFN	1	5

AGE	JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
47	7	22	4	0	319	60	42	29	40	39	11'	02	09	08	33	40	29	25	27	31	32	D	1	5
47	7	27	0	0		15	05	20	22	17	25	05	06	18	41	28	34	12	19	24	25	AD	1	30
47	7	3	0	0	101	34	45	25	38	51	59	07	12	15	17	30	24	23	25	29	36	I		0
47	7	10	18	0	269	15	10	07	29	56	46	17	19	14	19	54	21	14	16	30	37	DG	1	10
47	7	1	8	15'		19	08	11	37	45	26	07	04	06	49	45	24	09	19	32	37	GJLS*	1	20
47	7	13	14	0	50	20	33	20	23	16	22	20	25	19	17	14	35	23	23	18	21	LX		0
47	8	3	21	0	35	39	33	46	58	55	65	12	12	14	46	45	63	26	35	44	55	CF		0
47	9	5	24	0	374	17	12	05	43	35	29	14	09	10	42	43	34	11	20	29	37	L		0
47	9	8	15	0	50	20	34	52	63	67	53	24	33	56	61	59	64	37	50	59	61	C	1	15
47	10	7	4	20'	481	13	11	16	11	44	87	00	01	06	16	67	65	08	10	26	48	C	1	30
47	11	2	0	24		36	35	51	71	--	--	--	--	--	--	--	--	--	--	--	--	U	1	3
47	11	2	0	21	38	10	04	24	40	49	50	09	12	23	22	34	40	14	21	32	39	CLV		0
48	1	1	1	17'	116	65	62	59	87	90	88	10	02	03	47	41	38	34	43	54	65	CEHU	2	32
48	1	7	0	15'	319	27	23	24	45	54	65	11	02	09	38	52	49	16	23	37	50	H	1	10
48	2	8	0	0	158	10	08	07	23	34	19	06	02	05	28	52	19	06	12	25	29	C	1	22
48	2	3	0	8'	116	16	06	05	07	32	33	06	07	05	16	21	13	08	08	14	20	AC	1	32
48	2	12	11	0		16	20	16	33	47	40	13	13	18	19	27	20	16	20	26	31	CE	3	25
48	2	7	0	15'		36	53	70	76	71	54	00	01	29	52	60	50	32	47	59	60	CKU	1	25
48	2	2	0	27'	35	33	14	11	17	15	33	56	55	49	61	50	79	36	34	34	42	U		0
48	4	20	10	0	304	03	09	24	37	43	37	11	07	18	22	71	61	12	19	36	45	*******		0
48	4	25	5	0	304	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	U	1	36
48	4	0	0	3'	116	11	10	19	61	62	55	07	10	24	62	62	69	14	31	48	62	CEF	2	28
48	5	0	14	12	50	01	22	42	50	58	64	11	20	35	54	65	54	22	37	50	57	CNU	1	20
48	5	20	2	0	269	37	27	23	49	44	54	25	20	16	33	32	49	25	28	33	43	CLN		0
48	5	8	15	0	36	78	82	93	92	91	91	13	34	73	75	71	74	62	75	82	82	CU		0
48	5	27	0	0	269	66	75	84	84	85	61	38	32	70	79	76	62	61	71	79	78	CLN		0
48	6	3	2	8'	102	30	30	48	53	64	67	23	26	33	39	58	41	32	38	49	53	AU	1	28
48	7	1	15	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SUX		0
48	7	12	18	0	48	24	31	33	44	63	58	66	87	76	71	86	89	53	57	62	69	HGU		0
48	7	20	0	0	4	38	42	75	80	84	86	50	51	53	92	91	86	52	65	79	86	*******		0
48	7	11	11	0	49	12	09	06	22	51	28	15	24	13	32	36	32	13	18	26	33	CHNR	1	26
48	8	10	20	0	418	28	26	21	71	63	78	27	29	31	70	76	69	27	41	55	71	LR	1	10
48	8	13	10	4	304	31	45	83	80	81	87	13	30	48	70	66	86	42	59	71	78	CU	1	30
48	8	2	0	0	46	28	35	26	52	75	70	32	34	25	12	33	18	30	31	37	43	UU		0
48	8	20	5	0		12	07	07	17	23	34	11	08	14	13	12	09	10	11	14	18	CH	1	15
48	9	12	15	0	304	17	15	33	60	61	77	21	27	52	75	82	86	28	44	60	73	CLN	1	36
48	9	2	25	0		05	09	40	75	91	89	06	02	42	76	91	90	17	41	69	85	CE	2	36
48	10	12	16	0	42	40	46	50	65	65	81	20	20	19	37	54	61	33	39	46	60	E	2	30
48	10	25	0	0	36	59	47	64	82	81	74	21	20	68	87	78	78	47	61	76	80	CEX	1	38
48	11	2	0	17	38	14	11	60	59	52	52	04-	02	12	46	60	68	17	31	48	56	CE	2	8
49	1	20	0	20'		35	62	58	60	63	83	25	33	47	50	54	61	43	52	55	62	X		0
49	1	1	1	19'	116	10	15	09	13	32	22	06	07	07	15	27	24	09	11	17	22	C	1	30
49	1	1	0	29'		09	07	19	36	47	37	07	07	14	33	30	19	11	19	30	33	CE	2	25
49	1	2	0	18'	269	20	22	69	59	80	78	18	18	45	77	82	88	32	48	68	77	C		0
49	1	0	0	23'	116	11	05	19	43	37	40	11	12	12	42	59	32	12	22	35	42	*******	1	37
49	2	0	25	0	35	15	12	14	32	27	28	10	17	08	52	51	45	13	22	30	39	C	1	5
49	2	5	23	0	269	24	18	17	31	45	31	22	14	17	44	49	44	19	23	34	40	C		0
49	3	7	0	15'	368	32	29	47	68	73	88	24	27	74	77	84	84	39	54	70	79	CH	1	20
49	3	9	0	0		08	03	13	24	42	27	07	06	24	45	43	26	10	19	32	34	CH		0
49	3	3	2	17'	116	11	16	09	40	34	40	11	14	13	22	23	32	12	19	23	32	CH	1	20
49	3	3	4	20'	1	25	29	16	28	42	27	63	59	51	61	62	37	41	41	43	43	C	1	33
49	4	20	2	0	304	23	12	51	60	56	64	25	25	15	15	23	09	25	30	36	38	CU		0
49	4	16	3	0		42	67	71	75	77	91	15	24	31	62	79	73	42	55	66	76	U		0
49	5	0	20	0	340	30	33	38	71	64	55	28	18	51	74	74	39	33	47	62	63	CR		0
49	5	10	0	17	269	09	39	39	70	--	81	07	14	13	13	71	34	20	31	--	--	U	1	35
49	5	4	0	0		28	39	48	75	64	50	21	12	35	59	54	32	31	45	56	55	C		0
49	5	1	15	9	302	73	45	34	34	41	68	33	32	19	27	24	58	39	32	30	42	LU		0
49	6	2	18	0	392	12	04	55	92	91	91	18	19	56	78	92	89	27	51	77	89	CLV	1	40
49	7	25	4	0	269	17	25	50	--	--	--	15	17	57	--	--	--	30	--	--	--	N		0
49	7	13	19	0	418	08	11	07	51	50	18	08	19	19	53	52	43	12	27	38	44	LN		0

AGE	MINE	JOB 1	2	3	OCC CD	.5L	HEARING LEVELS(TEST KHZ/EAR) 1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	HLI/MID-KHZ 1	2	3	4	EXCL CODES	SHOT N	YR
49	7	3	29	0	262	18	27	28	35	29	57	10	09	13	12	15	44	18	21	22	32	DHQ		0
49	7	21	10	0	489	31	16	39	74	88	76	05	12	19	56	40	31	20	36	53	61	CLQU		0
49	7	2	18	0	464	15	06	16	14	29	44	17	11	05	08	15	16	12	10	14	21	*******		0
49	7	12	15	0	36	16	27	51	60	73	70	24	26	45	60	59	75	32	45	58	66	DILQ		0
49	8	2	0	0	216	24	26	53	51	58	47	13	32	41	58	55	47	32	43	52	52	*******1		40
49	8	11	11	0	36	-01	00	02	03	27	27	03	06	02	04	12	28	02	03	08	17	CE	2	15
49	8	3	25	0	216	20	10	13	49	56	53	57	13	26	--	--	--	23	--	--	--	HL		0
49	8	2	21	0	50	33	25	24	54	44	44	48	06	04	35	63	56	23	25	37	49	CLQ	1	15
49	8	4	1	10	46	02	11	33	64	54	49	-01	00	11	49	62	61	09	28	45	56	ILQ		0
49	8	5	0	25'	104	11	12	13	70	79	69	05	12	23	10	17	16	13	23	35	43	U		0
49	9	1	27	0		25	21	19	32	26	25	20	16	18	28	31	33	20	22	25	29	D		0
49	11	4	0	0		04	03	20	37	46	53	02	02	05	18	23	23	06	14	25	33	C		0
49	11	8	0	0	49	09	06	19	48	70	80	24	25	46	68	90	88	22	39	60	77	EH	2	35
49	11	3	0	1	46	18	09	26	34	44	37	15	05	19	27	58	40	15	20	34	40	EHLV		0
50	1	7	0	28'		06	18	34	67	82	75	14	22	28	55	78	77	20	37	57	72	E	2	20
50	1	2	0	25'	35	16	12	23	24	20	28	15	12	16	38	37	61	16	21	26	34	C		0
50	1	0	0	31'	35	25	29	36	44	43	61	23	01	35	28	29	31	25	29	36	39	CE	2	35
50	1	6	0	5'	35	21	22	22	16	57	59	22	24	14	34	63	81	21	22	34	51	A		0
50	2	0	0	0		13	11	11	18	17	22	07	04	16	23	23	27	10	14	18	21	CF		0
50	2	9	13	6'		15	27	13	12	31	41	12	20	14	27	67	54	17	19	27	38	C	1	32
50	2	3	22	0	158	15	16	29	36	47	69	04	04	13	36	25	49	14	23	31	43	*******1		35
50	2	1	30	16		13	11	11	18	17	22	07	04	16	23	23	27	10	14	18	21	CF	1	10
50	2	3	0	0	46	23	17	23	22	32	33	17	13	10	23	18	29	17	18	21	26	C	1	20
50	2	28	0	0		37	33	34	55	54	70	18	18	43	80	73	75	31	44	56	68	C	1	38
50	3	8	7	20'	36	12	03	19	44	38	30	02	00	15	33	34	44	09	19	30	37	C		0
50	4	18	13	0	368	20	13	53	69	81	77	18	16	19	70	91	86	23	40	64	79	*******1		15
50	4	5	25	0	304	52	33	54	71	68	82	30	21	60	83	90	89	42	54	71	80	CH	1	30
50	4	20	4	0	322	16	25	34	47	65	83	22	13	22	45	69	81	22	31	47	65	*******1		30
50	4	4	29	0	374	56	73	70	68	79	81	55	45	70	80	92	89	62	68	76	81	CH	1	6
50	4	20	0	0	376	25	24	35	47	57	48	18	06	21	44	55	48	22	29	43	50	*******		0
50	4	5	0	33'	36	18	04	13	24	84	77	05	07	10	62	60	42	10	20	43	59	F		0
50	4	1	6	3'	269	02	07	15	20	43	19	04	12	13	17	53	31	09	14	27	30	AF	1	38
50	4	15	5	0	4	22	25	36	36	68	87	17	14	69	68	92	91	31	41	61	73	*******		0
50	4	5	27	0	4	39	27	25	20	40	75	08	13	59	69	76	91	29	35	48	62	CH	1	20
50	4	2	1	1	50	09	23	32	33	61	50	24	22	30	30	48	69	23	28	39	48	X	1	26
50	4	25	7	0	49	06	07	09	64	71	75	15	23	01	46	75	89	10	25	44	70	CH	1	10
50	4	7	0	0	430	20	08	27	30	53	33	18	10	11	23	40	41	16	18	30	36	C		0
50	4	8	25	0	49	03	03	05	33	42	42	06	05	01	-03	24	35	04	07	17	29	*******1		35
50	4	2	0	3'	35	14	19	14	17	42	38	09	07	20	08	46	35	14	14	24	31	H		0
50	4	20	12	0	269	03	05	14	23	44	38	09	02	13	26	36	37	08	14	26	34	C	1	20
50	5	1	23	2	340	41	32	24	56	58	57	26	26	14	23	50	47	27	29	38	49	LNV		0
50	6	32	0	0		69	72	78	79	77	73	52	52	68	69	86	82	65	70	76	77	CHN		0
50	6	7	0	6'	216	31	20	09	46	46	46	19	11	04	54	54	39	16	24	35	47	ILN		0
50	7	20	7	0	50	20	24	31	26	36	23	25	22	17	14	23	19	23	22	24	23	*******		0
50	7	20	12	0	321	09	05	18	66	65	53	22	18	05	22	60	36	13	23	39	50	CHL	1	40
50	7	32	0	0	104	42	26	26	29	46	47	22	23	16	18	21	32	26	23	26	32	CJV		0
50	7	4	27	0	262	17	17	57	55	50	52	10	12	45	52	51	31	26	40	51	48	DL		0
50	7	2	30	0	316	27	26	40	63	66	57	28	34	44	55	57	43	33	44	54	57	CQ	1	30
50	7	25	2	0	319	21	56	59	59	55	52	25	50	61	66	65	58	45	58	61	59	DL	1	2
50	7	4	27	1	373	30	20	27	35	37	44	14	18	29	30	36	32	23	26	32	35	DL	1	35
50	7	2	23	0		26	33	57	85	83	76	33	40	62	92	92	89	42	61	78	86	L	1	25
50	8	3	0	2	4	20	18	34	51	48	29	16	09	55	59	47	37	25	38	49	45	*******		0
50	8	19	3	0	262	12	04	31	63	62	53	12	10	37	30	44	46	18	29	44	49	CHL		0
50	8	4	29	0	49	17	17	19	20	32	24	14	10	04	05	08	27	14	12	14	19	U		0
50	8	15	12	0	304	30	30	68	85	82	86	34	35	56	63	51	52	42	56	67	70	L		0
50	9	20	10	0	304	23	21	14	40	33	37	39	36	40	60	44	55	29	35	38	45	CL	1	5
50	9	3	28	0		14	21	51	87	75	86	05	36	53	69	75	86	30	53	68	79	CHL		0
51	1	4	0	4'		40	37	52	68	74	60	21	27	57	64	72	68	39	51	64	67	*******		0
51	1	1	0	10'	116	25	35	64	78	82	81	27	42	34	45	65	62	38	50	61	69	ACH	1	35
51	1	7	0	8'	36	09	04	24	69	67	35	02	12	16	47	57	23	11	29	46	49	*******		0

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
51	1	3	2	26'	373	21	40	54	64	61	71	11	32	54	63	63	66	35	51	60	64	CE	3	27
51	2	19	0	3'	158	03	24	21	25	23	18	10	16	25	24	31	17	17	22	25	23	A	1	6
51	2	6	1	21'	36	09	18	60	68	67	62	12	14	51	70	64	71	27	47	63	67	CE	2	35
51	3	0	4	23'	154	25	12	56	67	52	65	13	12	46	52	58	49	27	41	55	57	CJ	1	25
51	3	6	3	0	374	28	33	37	63	75	56	25	18	41	55	63	57	30	41	55	61	CH	1	35
51	3	8	0	13'	374	25	44	52	62	46	27	24	51	55	61	50	33	42	54	54	46	*******	1	30
51	3	8	1	7'	108	32	33	19	33	37	40	39	35	18	25	22	47	29	27	25	34	C	1	30
51	4	4	17	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	CU	1	5
51	4	7	26	0	50	21	16	11	53	52	50	12	22	12	35	67	63	16	25	38	53	*******		0
51	4	18	15	0	36	40	44	60	86	90	88	46	45	61	74	81	71	49	62	75	81	E		0
51	4	3	31	0	111	19	15	17	42	45	52	14	12	11	42	41	32	15	23	33	42	C		0
51	4	6	20	0	49	17	17	44	64	72	51	14	23	74	73	72	74	32	49	66	67	CGH	1	30
51	4	3	2	0	36	32	15	25	25	24	39	25	16	27	24	27	49	23	22	25	31	C	1	40
51	4	2	20	2	49	-03	00	00	20	39	37	02	14	11	47	56	64	04	15	29	44	C		0
51	4	10	21	0	50	16	12	41	67	81	76	07	14	28	24	55	36	20	31	49	56	CU	1	5
51	4	23	6	0	321	42	43	33	58	66	60	14	04	20	30	26	29	26	31	39	45	C	1	36
51	5	3	0	21	216	85	87	88	88	86	--	85	88	90	89	--	--	87	88	--	--	IL	1	30
51	5	26	0	0	269	54	52	67	73	78	88	33	39	53	58	69	76	50	57	66	73	CFHL	1	30
51	5	14	29	0	304	19	26	28	67	78	90	15	21	39	83	91	87	25	44	64	82	C		0
51	7	12	20	0	392	13	23	57	55	60	56	10	33	52	55	62	55	31	46	57	57	CH	1	40
51	7	4	9	0	373	61	68	84	87	88	91	35	45	56	71	78	82	58	68	77	83	CHLT		0
51	7	25	7	0	269	23	05	14	13	15	32	10	08	14	20	15	11	12	12	15	17	N		0
51	7	20	13	0	321	12	22	27	52	50	64	08	21	32	67	68	64	20	37	49	61	LO		0
51	7	15	5	3'	316	08	24	33	52	43	24	02	07	17	36	44	26	15	28	37	37	AHJN	1	10
51	7	1	31	0	378	28	13	28	35	64	46	04	10	21	11	31	13	17	20	31	33	*******	1	10
51	7	25	0	0	497	10	12	13	32	26	36	08	11	06	14	29	48	10	15	20	31	*******	1	30
51	7	32	16	0	50	--	39	38	46	37	49	15	13	43	41	55	41	--	37	43	45	CL	1	40
51	8	2	19	0	216	28	13	16	43	56	49	02	09	23	62	76	56	15	28	46	57	CO	1	25
51	8	23	15	0	36	13	22	48	70	63	48	17	17	24	63	61	44	24	41	55	58	O	1	3
51	8	1	32	0	36	15	09	21	26	57	48	10	04	12	08	24	28	12	13	24	32	QV	1	1
51	8	19	0	14		25	26	26	76	65	78	35	38	31	75	84	71	30	45	59	75	CEH	3	30
51	8	3	23	0	50	15	23	28	83	90	87	19	22	37	84	90	87	24	46	68	87	C	1	20
51	9	7	20	0	43	15	17	51	58	60	46	14	14	13	51	56	38	21	34	48	51	CP	1	30
51	11	2	0	30	32	09	11	11	41	39	36	07	10	14	29	37	13	10	19	28	32	HLN	1	10
51	11	3	0	22	4	03	03	11	13	19	22	-02	09	04	08	01	25	05	08	09	14	S	1	10
51	11	2	0	14	101	22	23	37	83	85	74	12	05	14	87	87	84	19	41	65	83	CFH	1	30
51	11	1	0	20	38	19	13	30	51	67	34	06	05	73	93	91	90	24	44	67	71	CUU	1	38
52	1	0	0	18'		05	02	03	32	01	11	01	03	04	14	02	24	03	10	09	14	C	1	5
52	1	7	0	23'	301	25	37	63	67	76	76	27	23	46	60	51	56	37	49	60	64	H	1	40
52	1	7	0	12'	50	75	77	71	82	91	86	08	04	11	63	86	86	41	51	67	82	CU	1	3
52	1	6	0	0	449	00	03	49	48	47	51	01	04	14	13	17	44	12	22	31	36	X	1	32
52	1	4	0	10'		21	25	19	35	40	39	24	22	24	52	58	75	23	29	38	50	AC		0
52	1	0	0	7'	50	12	12	10	62	66	66	10	11	13	63	66	60	11	28	46	64	*******		0
52	2	31	0	0		42	44	45	84	91	86	35	49	63	86	91	86	46	62	76	87	*******	1	20
52	2	9	0	0	158	10	15	14	11	25	54	11	14	16	13	38	51	13	14	19	32	C	1	30
52	2	3	0	25'		28	22	34	77	80	88	23	32	23	64	81	70	27	42	60	76	CEF	2	30
52	2	3	0	0	46	32	20	60	63	61	65	31	24	37	63	70	54	34	44	59	62	C	1	20
52	2	1	24	2	1	11	12	25	50	57	37	04	17	13	19	25	14	14	23	31	33	*******	1	35
52	2	3	6	0		17	15	16	53	92	78	23	16	17	42	70	78	17	26	48	69	E	3	40
52	2	31	2	0		20	24	34	48	59	61	29	13	12	36	45	50	22	28	39	50	C	1	35
52	3	3	4	15'	42	16	09	14	52	61	86	16	12	17	63	64	57	14	28	45	64	CH	1	42
52	4	23	3	2	373	08	-01	10	13	53	48	02	-01	22	46	60	67	07	15	34	48	CX		0
52	4	14	24	0	373	51	47	74	76	74	64	29	40	66	64	74	68	51	61	71	70	*******		0
52	4	22	10	0	374	34	42	55	59	73	67	51	59	60	68	72	86	50	57	64	71	*******		0
52	4	24	6	0	50	20	08	26	22	22	10	00	08	04	09	07	19	11	13	15	15	C		0
52	4	12	23	0	50	10	05	20	15	32	51	13	03	15	17	24	34	11	12	20	29	H	1	39
52	4	3	0	30'	46	35	30	42	34	52	29	28	16	22	34	44	38	29	30	38	38	CEF	2	20
52	4	33	0	0	111	46	31	61	64	66	69	48	52	42	73	75	69	47	54	63	69	C		0
52	4	7	4	2	104	09	07	07	25	24	52	29	43	63	60	59	72	26	34	39	48	D		0
52	4	5	27	0	104	44	29	22	34	33	37	31	28	17	31	30	14	29	27	28	30	C	1	33

AGE	JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
52	4	8	26	1	46	07	06	42	51	49	32	01	02	51	52	70	60	18	34	52	52	*******1	30	
52	4	22	12	0	430	09	10	11	26	35	33	16	16	06	07	04	37	11	13	15	23	H	1	5
52	4	14	19	0	269	--	--	43	35	59	42	29	37	39	25	55	40	--	--	42	42	X	1	32
52	4	1	0	0	316	20	23	13	28	46	30	15	16	16	29	42	68	17	21	29	40	*******1	15	
52	4	6	0	1	373	06	12	29	35	33	10	06	11	21	21	17	17	14	21	26	22	*******1	20	
52	5	12	12	0	50	24	18	24	71	68	50	45	36	23	55	51	37	28	38	48	55	FLO		0
52	5	2	7	12'	35	10	18	18	52	57	45	09	09	17	55	71	72	14	28	45	58	CDLO		0
52	6	2	2	20	269	83	79	77	74	72	63	21	21	26	32	48	50	51	51	55	56	UV	1	30
52	7	1	0	21'	449	10	05	17	45	63	49	20	17	06	52	39	35	13	24	37	47	CFV		0
52	7	15	7	0	269	09	07	11	44	63	64	11	08	24	45	51	59	12	23	39	54	CHNV		0
52	7	9	5	6	36	09	06	55	62	49	48	15	09	24	61	61	39	20	36	52	53	FH	1	34
52	7	2	23	5'	149	16	18	33	66	69	68	14	10	11	56	70	66	17	32	51	66	CHLNV	1	10
52	7	4	2	15'	373	24	23	43	82	83	77	79	82	94	93	92	91	58	69	81	86	DLQU	1	45
52	7	19	6	10'	49	24	20	14	49	39	25	09	20	13	33	39	26	17	25	31	35	EFHJU	3	45
52	7	13	15	0	50	03	12	08	03	35	22	10	07	10	38	58	44	08	13	25	33	LNV	1	25
52	8	3	29	0	49	26	56	79	93	91	89	20	30	69	93	91	90	47	70	86	91	CIL	1	40
52	8	18	6	32'	46	45	65	79	77	83	89	50	66	74	80	85	86	63	73	79	83	ACJL	1	10
52	8	26	2	3'		07	08	06	35	69	74	03	13	08	30	51	64	08	17	33	54	A		0
52	8	30	0	0	36	12	14	16	42	43	35	08	14	18	49	57	36	14	25	37	43	E	2	30
52	8	4	23	0	50	31	35	37	62	62	58	--	41	51	59	59	79	--	47	55	63	*******1		5
52	8	27	0	0	269	29	31	49	62	61	87	18	22	38	58	65	75	31	43	55	68	*******		0
52	8	2	24	0	269	21	21	18	19	32	26	10	11	09	12	16	04	15	15	17	18	CI	1	18
52	9	0	28	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	CLO	2	2
52	9	7	17	5	304	24	13	20	67	74	54	13	04	14	46	59	54	15	27	46	59	CQ	1	10
52	9	31	0	0		30	33	28	44	53	69	12	23	37	33	49	84	27	33	40	55	EFHL	2	45
52	9	5	28	0		11	12	26	48	30	60	04	06	04	41	50	41	11	23	33	45	ELV	2	40
52	11	3	0	20	154	18	11	17	20	28	46	19	24	21	26	17	29	18	20	21	27	*******		0
52	11	2	2	2	32	09	20	17	24	15	28	03	10	15	13	25	61	12	16	18	27	CEHV		0
52	11	1	0	2	5	19	21	22	33	67	58	04	05	13	30	57	24	14	21	37	45	*******1	25	
52	11	2	0	19	50	09	12	22	29	41	60	04	08	14	19	38	43	12	17	27	38	*******1	35	
53	1	5	0	15'	319	13	13	35	53	50	58	09	12	23	45	39	17	18	30	41	43	CEH A	3	30
53	1	2	5	30'	116	57	52	61	87	91	81	45	51	41	74	76	72	51	61	71	80	*******1	35	
53	1	7	0	7'	116	15	02	14	08	47	68	12	05	06	12	39	21	09	08	21	32	*******		0
53	1	7	0	30'		16	12	14	13	42	38	05	17	04	00	16	20	11	10	15	21	*******1	6	
53	1	7	0	30'		19	22	26	62	47	23	10	09	14	43	56	33	17	29	41	44	*******1	25	
53	1	3	4	23'	269	17	18	34	50	52	68	21	20	29	40	52	64	23	32	43	54	*******		0
53	1	7	0	0	35	25	14	04	22	41	53	10	10	10	08	52	32	12	11	23	34	*******1	30	
53	1	6	0	8'	50	11	08	14	13	12	30	13	10	18	00	11	12	12	10	11	13	*******		0
53	2	2	5	0	32	29	11	34	64	72	77	05	04	14	63	62	34	16	32	51	62	*******1	35	
53	2	2	30	0		03	02	12	10	22	04	04	02	04	25	30	22	05	09	17	19	CI		0
53	2	9	0	7'	35	05	08	10	18	14	39	02	03	03	02	05	20	05	07	08	16	CH	1	30
53	2	20	2	0	50	20	28	19	57	50	20	-09	-04	07	26	33	24	10	22	32	35	G	1	20
53	3	8	0	10'	43	04	05	20	28	47	38	01	17	23	23	50	38	12	19	32	37	*******1	30	
53	3	3	5	9'	201	11	02	02	18	23	39	08	-02	07	04	20	06	05	05	12	18	C	1	2
53	3	3	2	20'	46	10	07	64	--	--	--	09	46	24	58	57	80	27	--	--	--	CX	1	10
53	4	2	33	0	49	25	11	19	25	36	42	21	09	16	19	19	21	17	16	22	27	CH	1	38
53	4	30	0	0	117	43	45	54	56	62	30	17	25	53	55	52	54	40	48	55	51	*******		0
53	4	6	22	0	36	11	09	07	27	26	36	-02	-02	05	07	20	15	05	09	15	22	*******		0
53	5	33	0	0	385	08	12	25	27	43	66	05	13	13	36	54	49	13	21	33	46	HNO		0
53	7	1	33	0	269	57	56	58	58	56	56	17	37	40	44	28	25	44	49	47	44	N		0
53	7	5	12	17'	304	06	13	22	21	21	51	00	04	16	21	29	30	10	16	21	29	CHNV	1	33
53	8	20	10	0	49	69	56	44	52	59	77	11	14	10	53	66	65	34	38	47	62	EHILQSU	3	3
53	8	15	22	0	50	43	26	47	72	66	70	45	65	70	78	91	86	49	60	70	77	CL		0
53	8	6	0	13	46	19	29	25	54	79	84	15	10	26	59	71	65	21	34	52	68	FHL	1	30
53	8	30	5	0	449	23	10	01	14	43	39	15	14	03	23	51	30	11	11	22	33	L		0
53	9	8	25	0		47	55	57	69	70	71	10	14	14	76	69	49	33	47	59	67	EHUV	2	50
53	9	3	9	22	4	17	22	27	10	03	42	12	19	07	15	59	40	17	17	20	28	V		0
53	9	10	23	3	302	07	12	22	49	46	65	14	13	21	56	66	60	15	29	43	57	L	1	43
53	9	0	27	8		07	07	52	70	57	61	02	05	50	66	64	63	21	42	60	63	*******		0
53	9	15	18	5		12	11	22	52	50	48	00	04	16	34	50	36	11	23	37	45	CEFV	3	40

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHUT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
53	9	5	21	10	104	17	16	28	46	51	48	05	23	33	55	72	55	20	33	47	54	LS		0
53	10	1	0	0		16	07	39	66	--	78	15	01	26	77	78	79	17	36	--	--	HU		0
53	11	2	0	30	46	14	07	34	58	74	63	69	38	62	93	91	90	37	49	68	78	JS	1	5
53	11	1	0	29	50	17	11	05	57	78	88	18	14	11	23	-04	--	13	20	28	--	D		0
53	11	18	12	0	46	17	12	25	63	64	56	-03	11	33	63	69	63	16	34	53	63	CIJLV		0
53	11	1	15	8'	304	35	38	25	49	72	73	10	34	40	52	58	67	30	40	49	62	AL	1	35
53	11	2	0	0	38	18	14	14	56	46	33	16	10	16	54	49	32	15	27	39	45	S	1	30
53	11	1	0	11		13	14	13	41	53	41	07	15	13	51	66	--	13	24	39	--	UV	2	10
54	1	2	2	0	216	50	52	45	54	61	46	30	23	15	54	53	41	36	40	47	51	*******	1	25
54	1	7	0	29'	36	15	20	25	25	22	19	05	12	24	33	39	41	17	23	28	30	*******	1	44
54	1	4	0	29'		01	09	44	58	47	57	09	27	72	73	74	66	27	47	61	62	H	1	20
54	1	7	0	28'	430	55	57	64	62	60	88	08	12	08	68	73	70	34	45	56	70	HLU	1	3
54	1	2	0	20'	122	36	24	29	52	43	58	30	24	28	47	63	53	29	34	43	52	*******	1	10
54	2	13	25	0	269	15	14	22	32	11	29	10	11	28	57	50	26	17	27	33	34	C		0
54	2	6	30	0		15	12	08	12	35	21	11	15	23	40	63	27	14	18	30	33	*******	1	20
54	2	30	0	0	36	17	25	21	09	61	31	18	16	27	20	40	31	21	20	29	32	*******		0
54	2	7	0	10'		32	34	19	26	28	33	09	02	01	07	18	13	16	15	16	21	*******	1	35
54	2	9	6	0	35	31	25	17	35	34	55	34	22	34	40	46	64	27	29	34	45	CE	3	12
54	2	7	2	19'	158	03	00	01	16	41	37	00	01	13	02	22	34	03	05	16	25	CH	1	28
54	2	3	0	10'		10	10	03	16	24	17	07	02	-01	12	21	21	05	07	12	18	*******	1	40
54	3	4	2	37'	1	08	14	34	53	54	40	01	13	43	50	54	30	19	34	48	47	A	1	30
54	4	22	0	0	304	19	13	29	70	72	72	19	18	45	63	73	78	24	40	58	71	DH		0
54	4	4	18	0	373	41	48	64	91	90	87	84	82	94	93	92	91	69	79	87	90	F	1	8
54	4	6	20	0	46	16	20	55	44	45	44	12	17	17	28	23	28	23	30	35	35	*******	1	25
54	4	1	1	35'	46	17	24	33	35	58	50	27	43	44	43	62	67	31	37	46	52	*******		0
54	4	6	28	0		40	28	16	20	34	74	26	31	27	21	29	32	28	24	24	35	C	1	15
54	4	12	25	0	35	24	13	47	73	69	79	23	12	52	71	76	77	29	45	64	74	D		0
54	4	30	0	0	304	14	08	34	61	69	59	10	12	65	70	71	91	24	42	61	70	*******		0
54	6	1	8	0	35	12	01	15	31	40	49	02	-05	03	06	14	28	05	08	18	28	CD		0
54	6	3	13	12	216	11	05	45	63	67	60	04	01	30	71	91	75	16	36	61	71	E	2	25
54	7	18	18	0	321	26	18	26	42	50	51	13	14	14	15	23	15	19	21	28	32	*******		0
54	7	34	0	0	402	18	10	01	12	19	53	16	14	07	26	25	37	11	12	15	28	HNQV	1	20
54	7	17	10	0	46	64	70	64	70	66	66	38	57	67	64	62	46	60	65	65	62	NO		0
54	7	15	15	0	48	06	18	40	60	77	71	11	37	36	30	41	48	25	37	47	54	E		0
54	7	20	7	0	373	27	15	08	13	26	27	16	17	07	25	24	35	15	14	17	25	V	1	25
54	7	22	6	0	497	20	16	26	66	66	55	21	22	27	52	67	80	22	35	50	64	EFLW	1	30
54	7	30	0	0	386	40	39	48	73	78	75	33	49	60	69	72	89	45	56	66	76	DV	1	40
54	7	23	14	0	302	10	16	17	45	38	46	03	03	04	34	44	49	09	20	30	42	FH	1	34
54	7	29	0	0	104	19	14	67	66	82	80	15	16	29	60	59	58	27	42	60	67	ILQV	1	35
54	7	0	25	0	49	26	19	29	50	65	62	03	10	50	59	72	69	23	36	54	63	L	1	40
54	7	2	27	0	373	28	21	53	79	75	87	13	18	15	67	65	58	25	42	59	72	LPQ		0
54	7	12	26	26'	119	31	23	52	56	52	42	07	11	36	52	51	40	27	38	50	49	CEFLNV	2	45
54	7	24	0	0	4	30	24	21	28	35	20	15	15	15	18	17	09	20	20	22	21	CEFL	2	35
54	8	23	0	0	4	06	03	23	40	60	64	-01	09	08	39	56	36	08	20	37	49	*******	1	25
54	8	25	0	0	108	11	06	70	68	83	86	--	04	72	83	80	88	--	50	76	81	LU		0
54	8	23	2	0	269	25	17	13	84	85	80	14	17	12	72	84	78	16	36	58	80	CEL	2	45
54	8	12	10	0	101	46	42	51	76	82	77	37	32	52	52	66	54	43	51	63	68	S	1	30
54	8	1	33	0	385	32	45	41	67	69	73	78	37	43	63	88	84	46	49	62	74	LNQ	1	10
54	8	10	0	0	36	22	22	18	24	47	26	31	19	13	10	13	19	21	18	21	23	L		0
54	8	11	14	0	262	15	04	06	43	60	47	23	05	05	45	48	32	10	18	34	46	LN		0
54	8	10	10	0	35	28	37	28	42	66	72	13	25	25	24	47	53	26	30	38	50	CR	1	20
54	9	12	13	0	43	10	19	51	70	71	79	10	09	50	59	69	77	25	43	61	71	CI		0
54	9	4	29	0		02	04	17	68	80	72	-02	01	25	--	--	--	08	--	--	--	EKW	2	40
54	9	1	29	7	382	43	46	26	35	47	34	27	22	17	28	31	44	30	29	30	36	E	2	30
54	9	10	17	0	46	19	24	19	35	20	48	12	14	18	22	28	38	18	22	23	32	L	1	20
54	10	2	22	10'	360	49	54	61	61	63	65	--	--	--	--	--	--	--	--	--	--	AU	1	40
54	11	1	1	37	10	26	22	44	64	68	64	23	29	28	29	20	47	29	36	42	48	N		0
54	11	1	0	38	32	13	10	13	20	41	29	-02	09	11	21	22	19	09	14	21	25	*******	1	10
54	11	3	0	24	4	10	06	15	37	64	48	04	06	28	43	62	57	12	22	41	52	*******	1	40
55	1	6	0	4'	36	00	04	11	37	29	36	01	02	13	22	39	18	05	15	25	30	*******		0

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHUT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
55	1	0	0	20'		35	29	13	22	31	25	10	05	06	44	54	31	16	20	28	34	C		0
55	1	7	0	24'	50	00	05	14	71	80	83	07	02	11	68	91	88	07	28	56	80	C	1	38
55	1	7	0	30'	50	39	25	16	22	52	30	18	10	14	10	41	52	20	16	26	34	*******	1	40
55	1	0	0	0		31	20	15	23	15	29	13	15	09	13	00	09	17	16	12	15	*******		0
55	1	6	0	10'		26	28	34	63	63	65	18	22	18	37	46	42	24	34	43	52	*******		0
55	1	6	0	0	423	--	05	34	44	52	82	06	07	08	15	25	75	--	19	29	49	C	1	40
55	2	8	20	10'		11	33	45	58	47	30	33	34	75	78	80	52	39	54	64	57	F	1	30
55	2	10	25	2		38	24	26	53	52	30	30	10	06	37	33	45	22	26	34	41	*******		0
55	2	5	0	34'	4	12	17	29	37	55	60	09	14	15	27	39	48	16	23	33	44	*******	1	40
55	2	1	0	24'	35	15	10	11	59	67	71	11	05	09	38	56	67	10	22	40	59	ACH	1	10
55	2	15	15	0	158	49	26	14	15	29	71	74	35	24	26	35	45	37	23	24	37	*******		0
55	2	4	26	0		21	18	26	53	72	81	05	22	16	57	68	81	18	32	48	68	C	1	31
55	3	4	0	8'	2	10	08	15	55	60	52	02	09	06	55	59	61	08	25	41	57	CE	3	45
55	3	7	0	30'	302	15	24	34	65	72	63	22	21	32	37	55	82	25	35	49	62	*******	1	35
55	3	2	6	28'		12	21	27	62	73	78	13	15	31	62	82	83	20	36	56	73	F	1	35
55	3	2	6	2	104	14	09	22	50	81	66	10	03	10	14	25	12	11	18	33	41	CU		0
55	4	7	20	0	373	06	12	22	22	48	26	18	30	30	21	44	59	20	23	31	36	CE	2	36
55	4	6	20	0		34	25	65	78	75	75	26	27	67	73	75	70	41	56	72	74	C		0
55	4	4	32	0	374	10	11	20	55	61	32	18	13	10	41	68	59	14	25	42	52	C		0
55	4	22	15	0	322	52	57	52	77	80	70	85	76	88	93	92	91	68	74	80	84	CX		0
55	4	1	25	0	374	30	28	23	32	47	43	23	21	37	27	50	29	27	28	36	38	C		0
55	4	22	0	10'	489	71	77	72	88	88	82	50	46	46	39	41	62	60	61	62	66	ACEKU	2	12
55	4	22	0	0		01	05	32	54	74	79	-03	11	02	24	42	57	08	21	38	55	D		0
55	4	37	0	0		33	18	16	46	42	50	16	14	24	56	62	80	20	29	41	56	C		0
55	4	2	4	11'	116	07	-03	19	53	51	36	03	-02	33	67	68	70	10	28	48	57	*******		0
55	4	39	0	0	385	26	15	05	18	41	39	22	16	21	44	62	70	18	20	32	45	*******	1	10
55	4	37	0	0	50	33	22	37	58	64	57	07	14	14	49	59	53	21	32	47	56	*******		0
55	4	18	10	2	50	31	36	57	71	76	73	29	28	66	75	79	79	41	55	70	75	CN		0
55	4	0	0	0	157	19	13	24	27	31	39	11	11	33	43	68	61	19	25	37	45	H	1	8
55	4	3	0	16'	269	39	24	22	45	36	31	22	22	24	31	27	43	26	28	31	35	H	1	38
55	4	1	16	10'	269	10	15	30	52	67	66	09	12	26	62	73	88	17	33	51	68	AC		0
55	4	10	10	5'	402	66	63	54	58	70	64	35	45	60	86	91	87	54	61	70	76	K		0
55	4	6	22	0	373	18	16	32	58	71	84	30	15	33	65	62	68	24	36	53	68	C		0
55	4	6	31	0	50	14	07	17	37	53	46	16	15	11	27	31	43	13	19	29	39	*******	1	6
55	5	1	38	0	340	25	13	22	49	36	23	13	14	26	51	46	37	19	29	38	40	*******		0
55	5	3	8	12'	340	06	07	63	85	85	82	09	19	55	83	84	84	27	52	76	84	L	1	45
55	5	8	4	0	302	05	05	30	67	68	44	01	01	39	76	75	68	14	36	59	66	CN		0
55	5	7	14	15	340	27	29	26	37	43	50	39	43	55	86	91	88	37	46	56	66	OU	1	40
55	5	3	14	20	35	22	11	06	25	37	39	13	10	10	28	28	21	12	15	22	29	NU		0
55	6	7	0	3	386	65	66	77	82	90	88	60	52	61	66	66	76	64	67	73	78	CIS	1	20
55	7	20	11	0	50	42	37	44	49	57	58	24	42	41	50	58	41	38	44	50	52	G		0
55	7	26	0	0	269	22	12	06	14	22	56	06	-02	13	12	19	52	10	09	14	29	*******		0
55	7	20	8	0	269	43	38	30	68	80	87	25	25	29	58	71	58	32	41	56	70	*******	1	8
55	7	18	3	3'	36	04	08	06	52	72	66	08	02	05	30	53	33	06	17	36	51	H	1	10
55	7	33	3	3'	49	09	07	10	20	33	17	08	02	04	16	27	19	07	10	18	22	*******	1	20
55	7	1	0	0		20	24	28	23	29	26	10	13	13	36	40	38	18	23	28	32	*******		0
55	7	2	29	0	265	02	10	27	69	78	74	04	09	38	60	71	66	15	35	57	69	O	1	40
55	7	31	31	0	269	02	10	56	68	77	80	03	08	44	59	62	53	21	41	61	66	H		0
55	7	31	0	0	116	75	86	88	88	90	88	22	19	28	41	66	63	53	58	67	72	LNU		0
55	7	2	8	6'	449	-01	01	06	14	41	26	-05	05	05	13	29	29	02	07	18	25	D		0
55	7	1	14	6'	4	45	46	77	74	81	79	43	38	43	76	81	68	49	59	72	76	LN		0
55	7	10	20	0	104	05	20	35	28	43	37	08	19	24	27	32	37	19	25	31	34	*******		0
55	7	15	20	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	LOU		0
55	8	12	10	18	49	-01	01	12	41	56	32	-06	06	07	29	42	45	03	16	31	41	*******	1	45
55	8	20	14	0	50	22	46	78	80	79	80	15	22	63	69	68	82	41	60	73	76	CL	1	40
55	8	6	26	0	269	10	18	28	57	53	41	04	07	27	27	27	25	16	27	36	38	*******		0
55	8	10	15	0	50	38	40	65	92	91	86	26	33	55	76	71	65	43	60	75	80	LQ	1	10
55	8	19	3	0	262	07	33	31	49	70	62	76	65	51	46	33	56	44	46	46	52	L	1	30
55	8	16	14	0	46	04	37	38	44	31	42	17	35	41	56	44	22	29	42	42	40	JL	1	20
55	8	1	21	0	116	28	25	65	66	66	48	22	33	30	73	74	51	34	49	62	63	*******		0

AGE	JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
55	8	18	16	0	46	25	56	72	81	83	80	50	60	73	70	71	79	56	69	75	77	L		0
55	8	15	20	0	304	64	53	48	78	91	76	32	26	37	63	75	64	43	51	65	74	EFHL	2	25
55	8	8	18	0	49	17	27	39	58	68	57	09	10	22	47	58	52	21	34	48	56	*******	1	30
55	8	26	11	0	46	04	05	-02	29	59	56	07	10	40	56	64	43	11	23	41	51	CE	2	30
55	8	8	13	0	46	34	36	72	70	89	87	28	38	77	80	77	86	48	62	77	81	CL		0
55	8	15	11	0	49	19	21	46	--	--	--	--	--	--	66	77	57	--	--	--	--	LU	1	6
55	8	25	8	4	269	13	07	34	53	54	24	18	13	13	42	50	37	16	27	41	43	HL	1	8
55	9	8	21	0		09	12	44	67	68	63	12	17	68	93	91	90	27	50	72	78	*******	1	20
55	9	30	0	0		07	26	34	33	44	48	00	20	29	19	19	37	19	27	29	33	EH	2	45
55	11	2	0	35	50	67	74	84	87	86	87	53	61	77	86	86	82	69	78	84	85	L	1	4
55	11	2	0	28	10	10	08	08	61	73	50	19	10	22	56	65	55	13	27	47	60	FHS		0
55	11	25	0	25'	38	16	22	51	60	60	60	10	07	18	46	60	57	21	34	49	57	*******	1	10
55	11	2	0	30		26	25	21	20	28	40	47	48	41	38	36	30	35	32	30	32	CDHL		0
56	1	2	6	29'	36	15	08	14	67	66	89	06	04	24	58	71	89	12	29	50	73	*******	1	41
56	1	2	0	24'		46	33	24	32	25	39	30	28	19	23	37	46	30	26	26	33	*******	1	7
56	1	5	0	23'	116	05	07	15	54	50	63	05	03	23	62	68	76	10	27	45	62	*******		0
56	1	7	0	1	50	05	07	10	14	33	54	20	19	11	14	13	08	12	12	16	22	*******	1	30
56	2	21	20	20'	269	17	02	11	25	52	27	00	03	06	17	41	28	07	11	25	31	CE	2	41
56	2	5	32	0		35	32	48	61	56	40	20	15	16	30	58	40	28	34	45	47	EI	2	20
56	2	1	0	5'	4	13	03	07	29	50	35	-01	00	01	22	41	56	04	10	25	39	H	1	10
56	2	10	0	0	49	10	25	32	43	34	64	18	20	44	39	47	72	25	34	40	50	*******	1	40
56	2	10	0	28'	50	44	47	48	57	71	69	05	04	05	07	43	36	26	28	38	47	U	1	35
56	2	1	0	0	49	08	07	58	72	73	74	15	16	50	71	78	75	26	46	67	74	CE	2	40
56	2	5	0	35'	41	03	07	21	56	60	38	05	00	13	35	49	28	08	22	39	44	*******		0
56	3	3	0	34'	46	24	28	49	63	64	42	16	43	47	62	56	29	35	49	57	52	*******	1	35
56	3	2	4	21'	3	22	27	12	03	44	33	53	35	54	72	91	71	34	34	46	52	FLU	1	35
56	4	24	0	0	373	46	34	47	74	83	76	30	28	42	75	91	83	38	50	68	80	W	1	30
56	4	30	7	0	304	14	24	29	40	39	35	28	14	20	57	51	68	22	31	39	48	CF	1	25
56	4	20	0	0	319	14	15	55	68	69	65	23	12	28	62	65	63	25	40	58	65	C	1	8
56	4	21	0	0	4	21	29	49	68	66	77	14	19	13	53	56	62	24	38	51	63	*******	1	10
56	4	4	0	10'	50	43	46	51	92	91	91	31	46	84	92	92	89	50	68	83	91	C	1	20
56	4	15	10	0	50	23	24	21	35	40	58	18	23	45	45	53	58	26	32	40	48	C	1	40
56	4	3	0	34'	4	45	26	28	36	40	40	19	18	54	36	17	25	32	33	35	32	*******	1	30
56	4	10	19	0	392	32	34	37	64	71	62	21	23	23	67	77	62	28	41	56	67	C	1	35
56	4	30	8	0		05	06	79	--	81	77	01	08	--	73	73	--	--	--	--	--	*******		0
56	4	25	0	0	49	03	15	17	72	75	75	03	14	16	34	58	34	11	28	45	58	C		0
56	5	2	15	22	35	10	09	30	52	08	-03	04	04	09	56	68	48	11	27	37	38	SU	1	15
56	5	25	3	0	373	46	46	43	70	72	69	24	34	37	70	71	67	38	50	60	70	CENU	1	40
56	6	5	0	9'	108	30	17	36	41	65	69	31	24	42	52	52	59	30	35	48	56	AILN	1	35
56	6	6	7	4	50	20	16	23	15	68	18	24	19	10	16	33	28	19	16	27	29	Q	1	40
56	7	14	0	0	116	51	60	64	44	46	43	44	55	45	53	38	38	53	53	48	43	DL		0
56	7	27	10	0	269	--	--	--	61	62	50	51	53	57	73	--	85	--	--	--	--	D		0
56	7	35	0	0	360	46	42	54	58	62	47	29	28	32	26	58	40	39	40	48	48	HL	1	10
56	7	29	0	0	269	24	35	34	34	36	48	42	43	35	39	44	44	36	37	37	41	D		0
56	7	25	5	8'	104	30	34	29	61	53	46	13	14	15	22	53	29	23	29	39	44	HV		0
56	7	26	16	0	494	10	31	15	29	64	50	08	10	12	33	61	34	14	22	35	45	*******	1	15
56	7	8	38	0	489	35	26	20	18	23	33	24	15	22	21	25	53	24	20	21	29	G		0
56	7	30	4	0	304	25	35	32	51	43	62	20	25	35	44	53	68	29	37	43	53	CF		0
56	7	32	0	0	2	22	12	22	35	54	51	19	13	08	17	55	48	16	18	32	43	*******	1	45
56	7	34	0	0	269	38	32	45	55	49	53	04	06	06	26	42	22	22	28	37	41	Q	1	10
56	8	22	34	0	4	49	42	47	60	58	59	28	36	34	43	45	46	39	44	48	52	*******		0
56	8	10	20	0	36	37	40	51	64	91	74	09	11	63	64	69	74	35	49	67	72	L		0
56	8	20	0	0	4	25	28	57	68	71	64	33	37	62	90	89	86	40	57	73	78	ILRS	1	40
56	9	1	26	12		22	13	17	20	18	39	11	12	22	31	49	56	16	19	26	35	*******		0
56	9	20	0	8		--	--	--	52	55	49	19	21	32	25	20	40	--	--	--	40	L		0
56	9	12	22	0	373	10	09	15	25	55	45	--	--	--	--	--	--	--	--	--	--	CLU		0
56	9	10	16	0	302	21	25	32	51	60	46	36	28	28	50	52	55	28	36	45	52	EKO	1	50
56	9	1	25	3'	464	-02	00	27	31	55	37	-05	13	21	43	57	38	09	22	39	43	AL	1	40
57	1	7	0	32'	50	76	73	67	76	74	71	47	44	44	63	79	91	59	61	67	75	*******		0
57	1	7	0	25'	4	21	23	54	85	87	84	13	07	24	57	73	66	24	42	63	75	*******	1	38

AGE		JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHUT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
57	1	7	0	28'	269	25	28	25	51	63	85	46	52	44	58	82	89	37	43	54	71	K		0
57	1	1	3	33'	35	28	30	18	41	56	57	20	21	34	54	61	76	25	33	44	57	*******		0
57	1	3	4	0	122	20	23	24	38	37	54	13	14	19	43	42	39	19	27	34	42	*******1		20
57	1	7	0	35'	430	05	07	09	12	31	50	05	07	17	16	59	78	08	11	24	41	*******1		42
57	1	6	0	33'	269	25	18	39	38	72	59	26	17	06	21	52	39	22	23	38	47	*******		0
57	2	3	0	34'	158	40	47	54	94	92	87	15	15	39	63	55	69	35	52	66	76	CH		0
57	2	25	17	0	116	44	31	29	43	40	56	31	31	23	57	51	53	32	36	40	50	E	2	15
57	2	20	0	0		35	26	28	74	72	72	22	16	19	47	61	49	24	35	50	62	FHK	1	40
57	2	24	0	0	49	31	18	19	87	80	75	30	18	19	67	69	79	23	38	57	76	*******1		2
57	3	3	4	26'	1	42	43	93	92	91	86	19	15	56	83	83	76	45	64	83	85	C		0
57	3	3	5	3'	201	11	04	23	70	73	72	02	01	12	45	72	76	09	26	49	68	*******1		25
57	3	2	5	33'	157	14	07	28	54	59	49	01	13	25	52	58	48	15	30	46	53	W	1	10
57	4	40	0	8'	304	29	--	52	56	64	79	29	47	60	61	74	79	--	--	61	69	D		0
57	4	2	0	27'	36	20	21	15	63	80	84	13	15	13	41	60	63	16	28	45	65	*******		0
57	4	8	7	15'	46	23	24	24	34	33	50	19	19	17	25	52	47	21	24	31	40	*******1		20
57	4	20	18	0	269	18	24	29	50	69	66	-10	22	21	61	54	56	17	34	47	59	*******		0
57	4	23	15	0	36	10	25	46	49	43	49	13	28	43	50	42	39	28	40	45	45	*******1		5
57	4	32	8	0	49	-04	10	19	21	13	02	-04	10	27	18	14	23	10	17	18	15	GH	1	30
57	4	2	28	0	101	--	34	35	38	65	71	23	33	21	50	67	72	--	35	46	60	*******		0
57	4	35	0	0	157	25	08	38	73	84	82	24	13	13	33	64	45	20	30	51	63	*******		0
57	4	2	38	0	46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	U	1	10
57	4	10	17	9'	46	04	11	16	30	25	26	05	08	19	32	26	12	11	19	24	25	*******1		15
57	4	15	22	0	4	51	25	16	35	41	47	24	18	11	11	24	41	24	19	23	33	*******1		20
57	6	2	23	0	481	02	-01	14	29	43	39	04	-03	10	28	27	23	04	13	25	31	CHV		0
57	6	3	27	0	418	19	12	17	34	44	41	03	03	16	21	52	42	12	17	30	39	CHN	1	25
57	6	10	0	28	49	25	21	24	20	40	27	15	19	15	46	59	31	20	24	34	37	S		0
57	6	2	14	16	201	41	25	19	27	69	68	33	39	31	37	71	83	31	30	42	59	PS	1	40
57	7	15	10	0	46	41	20	39	56	71	59	25	21	31	47	69	62	30	36	52	60	CHL		0
57	7	4	21	0	495	10	06	-01	13	19	04	01	01	-03	26	43	19	02	07	16	20	CL	1	35
57	7	15	17	0	48	77	92	93	92	91	91	20	57	67	73	76	89	68	79	82	85	LS	1	5
57	7	21	19	0	302	04	05	07	16	46	41	12	14	17	42	45	42	10	17	29	38	L		0
57	7	12	36	0		18	27	58	66	64	53	20	29	37	59	57	55	32	46	57	59	L	1	10
57	7	34	3	0	302	66	56	64	74	90	85	17	15	26	47	61	55	41	47	60	68	IJPU	1	30
57	7	30	0	0	104	09	06	11	47	47	43	08	07	13	40	48	72	09	21	34	49	*******1		40
57	8	3	19	13	49	18	07	06	48	45	20	29	07	16	57	48	34	14	23	36	42	LMO		0
57	8	30	0	4'	304	35	42	41	61	60	30	29	24	45	50	57	39	36	44	52	49	AL	1	40
57	8	18	12	0	50	17	26	60	72	65	63	36	37	35	37	51	61	35	44	53	58	J		0
57	8	32	2	5'	269	24	23	19	37	58	87	22	18	19	37	65	58	21	25	39	57	A	1	35
57	8	20	15	5	262	20	32	36	43	45	58	14	27	42	51	51	60	29	38	44	51	*******1		20
57	9	2	10	0		13	12	57	76	81	76	15	07	21	60	61	65	21	39	59	70	*******		0
57	9	29	0	10		20	44	54	47	56	54	11	11	45	51	45	60	31	42	49	52	N	1	25
57	9	13	0	0		09	06	27	46	54	39	05	05	30	77	85	68	14	32	53	61	*******		0
57	9	11	16	3		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	QU		0
57	9	9	22	0	34	21	21	35	62	52	36	15	13	53	68	61	60	26	42	55	56	L		0
57	11	3	0	30		38	18	59	63	64	64	15	15	08	21	29	48	26	31	40	48	EFLU	2	45
57	11	3	0	12	10	24	22	27	46	73	89	17	13	36	62	53	48	23	34	49	62	CQS	1	40
58	1	7	0	32'	4	11	12	14	21	47	37	10	07	14	13	25	61	11	13	22	34	*******1		40
58	1	6	0	0	385	25	29	59	62	60	71	15	21	48	71	61	78	33	48	60	67	*******1		40
58	1	7	0	35'	50	22	13	63	57	53	81	25	14	45	63	63	70	30	42	57	64	H		0
58	1	1	6	31'	385	20	44	43	50	51	41	30	65	55	57	54	49	43	52	51	50	T	1	42
58	1	3	0	38'	304	26	21	14	24	22	37	10	09	11	13	34	24	15	15	19	25	*******1		42
58	1	7	1	0	36	32	13	34	58	57	74	13	11	24	65	65	69	21	34	50	64	C		0
58	2	30	10	0	102	09	22	84	84	84	63	21	32	44	58	57	46	35	54	68	65	CE	2	45
58	2	5	17	20'	41	24	38	36	33	37	80	22	24	13	25	31	26	26	28	29	38	*******1		42
58	2	12	38	0		15	11	34	68	92	89	10	13	13	53	66	69	16	32	54	73	D	1	40
58	2	1	5	23'		25	15	13	41	31	28	10	18	27	27	42	48	18	23	30	36	*******1		10
58	2	4	0	36'	50	10	40	42	82	91	84	03	25	54	72	85	81	29	52	71	82	CE	2	15
58	2	4	0	0		46	37	48	59	74	73	35	37	55	55	76	80	43	48	61	69	*******		0
58	2	6	1	35'	36	15	18	64	84	92	78	35	34	84	93	92	91	42	63	85	88	*******1		5
58	2	12	26	0		24	22	36	47	52	75	15	17	18	56	55	41	22	33	44	54	C	1	3

AGE		JOB YRS			OCC		HEARING LEVELS(TEST KHZ/EAR)											HLI/MID-KHZ				EXCL	SHUT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
58	2	13	0	8'		30	35	71	85	86	86	23	20	19	67	87	89	33	49	69	83	C		0
58	4	30	6	0	304	71	74	77	77	80	76	44	46	59	65	69	74	62	66	71	73	*******		0
58	4	4	2	9'	319	82	85	91	90	89	87	80	86	91	91	90	86	86	89	90	89	*******1		30
58	4	22	15	0		71	81	84	85	84	84	76	82	86	86	87	81	80	84	85	84	*******		0
58	4	3	1	5'	46	38	28	42	76	92	89	63	62	62	67	75	89	49	56	69	81	C		0
58	4	8	30	0	50	52	54	56	49	42	69	54	46	41	58	62	51	51	51	51	55	N	1	5
58	4	1	2	21'	50	29	23	16	24	22	70	21	26	19	19	20	29	22	21	20	30	F	1	5
58	4	37	0	3'	111	42	27	58	65	71	59	32	21	58	62	69	75	40	48	64	67	F	1	30
58	4	5	34	0		15	22	23	52	52	54	15	15	23	32	44	55	19	28	37	48	*******		0
58	6	31	0	2		08	22	26	37	45	58	10	17	27	38	43	58	18	28	36	46	H		0
58	8	1	35	0	262	22	58	82	93	91	86	41	69	94	93	91	77	61	81	90	88	O		0
58	8	12	10	0	50	54	37	82	88	83	86	27	32	74	85	85	88	51	66	83	86	CL		0
58	8	28	5	0	304	24	26	29	47	50	61	24	23	29	48	46	55	26	34	41	51	*******1		20
58	8	2	28	0	116	26	28	37	62	69	82	20	25	35	61	66	70	29	41	55	68	E	2	35
58	8	1	39	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	U		0
58	8	1	31	0	262	82	71	77	78	81	74	35	43	57	63	69	72	61	65	71	73	*******		0
58	9	5	33	0	368	28	19	20	33	45	41	18	18	33	65	91	86	23	31	48	60	HU	1	40
58	9	27	17	0	49	13	15	31	74	76	36	14	14	29	74	82	78	19	39	61	70	*******		0
59	1	3	4	34'	122	30	27	54	62	71	69	38	18	15	45	61	48	30	37	51	59	*******		0
59	1	7	0	37'	269	23	25	30	53	48	52	21	22	18	50	56	29	23	33	42	48	*******1		30
59	1	2	5	33'	116	25	23	26	63	67	48	56	52	44	43	54	79	38	42	49	59	*******		0
59	1	1	18	10'	430	30	17	18	43	51	46	10	08	23	42	48	06	18	25	37	39	AE	2	43
59	1	1	6	41'	373	25	25	74	73	77	78	36	17	26	61	80	64	34	46	65	72	C		0
59	2	3	6	10'	1	42	44	78	92	91	86	10	14	45	65	80	70	39	56	75	80	L		0
59	2	4	1	45'	41	15	07	15	37	35	37	25	37	48	37	21	20	25	30	32	31	S		0
59	2	7	10	32'		06	26	12	21	39	49	04	11	03	53	58	77	10	21	31	49	*******1		23
59	3	2	6	26'	118	20	08	26	65	63	73	19	07	26	60	53	69	18	32	49	64	D		0
59	4	1	37	0		22	16	19	32	43	65	09	20	05	22	15	37	15	19	22	35	*******		0
59	4	36	2	0	50	22	13	10	44	61	57	22	24	24	41	59	40	19	26	40	50	*******1		15
59	4	10	28	0	50	19	07	04	22	45	22	23	06	02	13	34	26	10	09	20	27	*******		0
59	4	13	0	10'	35	28	38	36	54	56	57	28	27	43	68	81	75	33	44	56	65	*******		0
59	4	4	0	3'	46	20	13	60	56	60	52	06	03	59	60	46	50	27	42	57	54	AHX	1	40
59	4	39	0	0	116	14	20	15	30	40	38	05	23	19	35	43	49	16	24	30	39	*******		0
59	4	2	40	0	101	44	37	46	72	84	87	14	17	49	68	67	65	35	48	64	74	*******		0
59	4	2	37	0	35	06	01	14	31	33	19	02	06	05	52	48	25	06	18	30	34	C		0
59	4	5	0	0	50	08	06	11	14	--	--	09	15	17	19	27	39	11	14	--	--	*******1		36
59	4	20	22	0	304	21	20	35	65	68	67	26	30	43	70	81	83	29	44	60	72	*******		0
59	5	8	20	5	2	22	23	56	64	64	51	20	19	36	52	55	40	29	42	54	54	UW	1	5
59	5	17	0	0	2	--	34	16	50	66	46	11	11	17	32	44	43	--	27	37	47	CENS	2	40
59	7	1	0	31'	49	11	07	29	45	32	35	05	06	32	55	54	64	15	29	41	47	V		0
59	7	30	0	0	49	40	39	39	63	64	89	25	21	45	67	82	89	35	46	60	75	FO	1	45
59	7	6	33	0	304	25	25	15	60	65	47	28	33	43	37	67	61	28	35	48	56	W	1	40
59	7	12	21	0	378	18	17	17	82	84	91	20	15	32	66	76	84	20	38	59	80	L	1	40
59	7	27	0	0		05	06	09	49	49	58	00	02	10	36	38	34	05	19	32	44	*******1		35
59	7	35	5	0	321	79	84	82	86	84	81	14	08	59	59	61	43	54	63	72	69	FNU	1	20
59	7	10	29	0	304	27	27	33	46	57	53	08	14	28	40	49	87	23	31	42	55	CO	1	30
59	8	12	27	0	262	08	17	65	66	69	64	01	10	31	50	53	51	22	40	55	59	*******1		2
59	8	2	34	0	46	46	35	51	55	53	24	11	19	31	45	36	25	32	39	45	39	*******		0
59	8	1	26	0	50	54	53	59	46	51	69	39	43	53	50	48	35	50	51	51	50	CEL	2	5
59	8	37	0	0	269	16	20	12	39	51	35	14	12	13	32	29	27	15	21	29	35	HIKLW		0
59	9	2	33	0		29	21	19	59	56	73	16	09	20	67	83	78	19	32	50	69	IL		0
59	9	2	37	0		17	12	24	61	70	53	13	07	11	27	56	65	14	24	41	55	HLO	1	40
59	9	3	0	6		35	26	38	65	70	60	37	44	67	89	87	--	41	55	69	--	C	1	26
59	9	3	29	6		43	33	30	42	51	50	20	19	16	49	50	21	27	31	39	44	HILW	1	40
59	10	0	0	0	360	18	14	37	91	91	87	--	--	--	--	--	--	--	--	--	--	EHU	2	40
59	10	7	0	31'	269	31	20	52	68	61	65	24	23	58	71	57	70	35	49	61	65	*******1		40
60	1	2	0	36'	430	46	32	43	67	61	51	25	21	23	67	63	81	32	42	54	65	*******		0
60	2	12	16	15'		23	34	45	73	77	87	22	32	19	37	27	48	29	40	46	58	*******1		44
60	2	1	0	23'	42	22	15	42	60	53	67	12	36	26	56	68	51	26	39	51	59	*******1		5
60	3	1	3	20'	110	30	34	66	90	91	91	24	31	45	83	90	87	38	58	77	88	*******		0

AGE	JOB YRS			OCC	HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
60	4	20	5	0	314	14	14	25	59	53	59	17	12	27	63	63	68	18	33	48	61	FX		0
60	4	20	19	0	36	75	78	74	67	70	76	18	13	23	64	66	62	47	53	60	67	U		0
60	4	3	0	14'	50	33	24	32	60	57	51	14	12	10	34	41	36	21	29	39	46	*******1	45	
60	4	30	12	0	49	15	14	18	16	22	30	11	08	05	19	25	13	12	13	17	21	*******1	35	
60	4	30	15	1	269	19	16	15	48	71	80	08	17	17	28	69	87	15	23	41	64	*******1	20	
60	4	9	3	28'	495	09	35	53	92	91	86	10	14	18	62	74	68	23	46	65	79	E	1	55
60	5	25	0	0	2	19	23	32	61	76	50	36	52	66	82	87	71	38	53	67	71	U		0
60	5	16	9	0	373	24	48	58	62	61	58	15	43	57	74	72	62	41	57	64	65	LR	1	35
60	7	20	22	0	481	09	02	09	47	56	25	09	09	13	49	58	23	09	21	38	43	HU		0
60	7	20	19	2		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	EHNUV	2	30
60	7	24	16	0	122	23	24	38	44	58	71	30	39	51	67	78	80	34	44	56	66	V		0
60	7	19	20	0	392	60	53	66	74	91	85	32	36	38	68	75	79	48	56	68	78	J	1	40
60	8	11	25	0	10	--	--	12	53	21	02	02	-02	05	42	51	48	--	--	30	36	U	2	30
60	8	4	32	0	262	-03	08	12	53	50	39	-03	08	11	57	56	32	06	25	40	48	L		0
60	8	20	12	11	50	12	03	11	14	39	22	10	05	05	20	26	16	08	10	19	23	CHO	1	30
60	8	33	2	0	269	24	62	64	63	71	83	35	58	65	64	67	81	51	63	65	71	Q		0
60	9	5	23	0		03	25	19	35	47	48	28	08	11	41	42	37	16	23	32	41	O		0
61	1	6	0	36'	269	26	23	69	64	70	59	26	37	55	60	71	87	39	51	65	68	*******		0
61	1	2	0	0	430	03	05	15	28	72	75	06	09	08	05	08	02	08	12	22	31	U		0
61	1	0	0	0		55	47	37	62	75	78	10	32	38	74	76	81	37	48	60	74	*******		0
61	2	40	0	0	269	15	04	23	32	41	29	10	06	05	13	09	21	11	14	20	24	E	2	35
61	2	35	0	10'	32	20	30	44	77	81	72	25	31	64	75	72	69	36	53	69	74	L	1	45
61	4	15	30	0	304	14	18	25	62	83	91	00	08	41	64	66	89	18	36	57	76	*******1	20	
61	4	4	0	28'	304	48	32	44	67	68	72	31	26	42	63	71	64	37	46	59	67	QX		0
61	4	16	16	9'	116	12	19	57	73	72	88	16	12	16	32	61	80	22	35	52	67	CU		0
61	4	10	10	0	36	12	10	29	65	65	50	09	12	23	60	63	66	16	33	51	61	C	1	20
61	4	39	0	0	269	14	19	26	60	50	46	08	14	15	52	60	62	16	31	44	55	H	1	35
61	4	26	20	0	104	02	09	16	59	73	58	03	16	35	50	71	55	14	31	50	61	*******		0
61	4	25	8	3'	269	49	21	33	43	52	57	21	34	27	38	49	43	31	33	40	47	E	2	35
61	4	2	36	0	269	12	22	36	69	83	76	07	20	34	68	84	89	22	41	62	78	C	1	15
61	4	5	38	0	46	27	27	24	29	53	53	28	24	31	37	54	41	27	29	38	44	*******1	25	
61	4	23	20	0	49	29	40	36	30	57	64	14	22	25	58	54	42	28	35	43	51	*******1	10	
61	4	45	0	0	489	34	23	22	23	57	28	07	14	15	21	59	52	19	20	33	40	E	1	50
61	4	17	14	6'		21	32	44	66	73	69	23	32	42	55	50	71	32	45	55	64	*******1	15	
61	5	1	17	0	36	30	25	35	45	57	84	42	41	43	62	60	82	36	42	50	65	FU		0
61	5	9	0	27	111	45	47	93	73	74	71	43	61	60	68	66	61	58	67	72	69	HILQ		0
61	5	30	0	0	392	54	67	76	74	79	75	43	50	64	77	81	78	59	68	75	77	LQ		0
61	6	1	6	6	32	61	52	93	92	91	86	36	31	72	72	66	67	58	69	81	79	EL	1	50
61	7	22	20	0	46	41	58	68	79	78	83	44	54	69	75	72	77	56	67	73	77	EH	1	50
61	7	32	0	0	8	--	--	--	--	74	74	24	34	39	41	77	89	--	--	--	--	V		0
61	7	23	21	0	360	14	20	40	56	65	71	15	18	65	87	91	86	29	48	67	76	L		0
61	8	39	0	0	269	12	10	18	41	38	09	10	06	--	35	31	27	--	--	--	30	EU	2	2
61	8	12	23	0	304	41	37	38	58	74	64	34	45	54	62	61	59	42	49	58	63	*******1	40	
61	8	10	12	3'	269	04	11	33	34	52	82	03	12	28	45	86	84	15	27	46	64	ACL	1	30
61	8	11	25	0	216	51	44	48	75	75	74	38	26	25	58	59	59	39	46	56	66	LNOS		0
61	8	1	36	0	50	40	35	66	78	91	89	27	30	63	70	81	90	44	57	75	83	L	1	40
61	9	6	25	0		25	55	76	80	89	87	15	32	74	83	89	86	46	67	82	85	L	1	40
61	9	20	20	0		07	26	39	55	57	63	23	26	25	51	67	75	24	37	49	61	LO	1	10
61	11	2	0	40		20	--	59	69	--	--	--	40	--	--	70	--	--	--	--	--	QU		0
62	1	7	0	30'	373	20	12	21	34	61	66	32	32	35	56	65	86	25	32	45	61	H		0
62	1	6	0	0	36	31	14	14	54	52	17	20	16	14	31	29	16	18	24	32	33	*******		0
62	1	7	0	38'	122	10	09	09	40	39	64	00	03	06	14	24	57	06	13	22	39	*******		0
62	2	23	2	0	49	32	34	20	16	32	34	10	13	09	23	38	34	20	19	23	29	*******1	10	
62	4	7	18	13	375	47	66	86	88	88	86	75	77	85	86	91	83	73	81	87	87	EH	2	25
62	4	17	19	3'	36	12	21	17	63	66	81	23	24	23	32	69	71	20	30	45	63	*******1	20	
62	4	1	10	20'	49	34	32	38	50	75	61	35	17	14	12	26	41	28	27	36	44	E	2	25
62	4	10	35	0	269	15	20	29	67	70	70	16	16	25	59	70	51	20	36	53	64	*******1	30	
62	4	20	6	0	269	13	20	26	44	58	43	08	08	13	23	34	13	15	22	33	36	C	1	10
62	6	7	0	0	108	30	22	44	68	67	79	23	16	65	71	75	64	33	48	65	70	HLR	1	20
62	7	23	22	0		11	17	58	77	84	86	26	23	31	65	77	80	28	45	65	78	Q		0

AGE	JOB YRS			OCC		HEARING LEVELS(TEST KHZ/EAR)												HLI/MID-KHZ				EXCL	SHOT	
	MINE	1	2	3	CD	.5L	1L	2L	3L	4L	6L	.5R	1R	2R	3R	4R	6R	1	2	3	4	CODES	N	YR
62	8	2	17	0	10	-02	06	08	15	14	37	07	13	17	17	24	28	08	13	16	22	ELO	2	10
62	8	1	34	0	50	24	08	21	55	65	59	13	00	07	19	11	26	12	18	29	39	O	1	5
62	9	3	42	0	385	04	16	05	35	19	37	21	20	15	22	16	13	14	19	18	23	V		0
62	11	20	0	20	216	36	61	72	79	92	86	21	28	41	57	57	64	43	56	66	72	F	1	40
63	1	7	0	39'		42	33	46	51	44	22	05	07	44	45	55	38	30	38	47	42	*******	1	1
63	4	15	5	25'	50	23	19	44	55	72	68	20	20	35	55	53	65	27	38	52	61	*******		0
63	4	30	10	4'	50	43	41	54	76	76	83	25	26	36	66	74	78	38	50	63	75	*******	1	40
63	4	6	9	13'	265	42	45	41	57	80	81	15	46	54	42	66	48	41	47	56	62	J	1	30
63	6	7	2	15		72	80	87	88	87	88	75	85	90	89	91	88	82	86	88	88	L	1	45
63	7	22	0	0	46	37	35	45	42	27	20	38	40	61	55	61	31	43	46	48	39	L		0
63	7	43	4	0	269	10	10	14	28	40	33	00	02	16	48	46	20	09	20	32	36	NO		0
63	8	13	26	0	262	11	05	17	18	14	07	09	00	21	19	09	01	11	13	16	11	E	2	20
63	8	1	30	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	FLO		0
63	9	20	19	0	32	29	42	54	60	90	87	20	21	-02	66	62	70	27	40	55	72	FH	1	40
63	11	3	0	39		41	64	82	93	91	89	35	59	61	77	81	90	57	73	81	87	EF	2	15
64	5	25	0	32	304	62	77	88	88	88	84	62	65	85	88	87	86	73	82	87	87	LO		0
64	7	1	28	0	50	33	35	50	40	27	52	25	20	37	31	22	32	33	35	34	34	LNO	1	40
64	7	39	0	0	394	90	60	94	75	90	82	05	16	37	32	43	33	50	52	62	59	OUW	1	45
64	7	30	12	0	494	38	39	69	70	85	91	23	29	49	68	71	79	41	54	68	77	EILV	3	50
64	8	20	0	0	269	26	20	27	70	65	69	22	21	27	57	66	68	24	37	52	66	*******		0
64	8	25	14	0	46	89	91	93	92	90	87	76	86	89	87	86	87	87	90	89	88	EHL	1	50
64	8	24	0	12	269	12	10	22	33	48	70	06	08	26	64	91	69	14	27	47	62	*******		0
64	9	32	0	0	1	24	28	50	87	91	86	26	26	36	79	85	72	32	51	71	83	EL	1	50
64	9	14	21	0		30	31	23	44	56	46	13	10	21	36	40	51	21	27	36	45	JS	1	10
65	1	7	0	20'	374	06	04	62	64	72	62	05	05	32	61	82	91	19	38	62	72	CE	3	25
65	4	39	0	0	265	01	06	10	06	12	18	02	04	03	13	15	10	04	07	10	12	E	3	50
65	7	5	34	0		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	HUV	1	10
65	9	20	20	0		62	47	44	38	55	66	21	12	17	26	51	36	34	31	38	45	*******	1	3
68	7	31	0	0	122	72	76	86	90	88	88	48	68	83	87	91	88	72	82	87	88	*******		0

APPENDIX E

NOISE EXPOSURE DATA

Noise exposure data are arranged in order by occupational codes from 1 to 497. These data do not correspond one-for-one with the individual hearing data in Appendix D, but they can be related in terms of occupational code and mine number. Noise levels and time durations measured during the noise survey are listed, as well as computed values of daily noise dose. Column headings used in the data list are explained below:

MINE	- number corresponding to Table 1
OCC CD	- occupation code corresponding to Table 2
DBA SOUND LEVELS (EXPOSURE TIMES) 1 2 3 4 5 6 7	- sound level in dBA with corresponding exposure time in minutes. Up to seven different component exposures are included for a single line in the list. The "<" symbol indicates that the sound level is below the listed value. The sequence of pairs (1 through 7) of level (duration)'s should not be taken to represent a chronological sequence of exposure segments.
8-HR NOISE DOSE D D(P) D(E)	- calculated values of daily noise dose, using three different formulas (see "Summary of Noise Survey" in this report).

MINE	OCC CD	1	2	3	4	5	6	7	8-HR NOISEDOSE D	D(P)	D(E)
			DBA SOUND LEVELS(EXPOSURES TIMES)								
2	1	<90(480)							0.0	0.0	0.0
3	1	91(150)	79(30)	92(11)	<90(289)				0.45	0.45	0.54
3	1	90(150)	84(210)	91(11)	<90(109)				0.39	0.61	0.57
3	1	90(150)	84(210)	91(13)	<90(107)				0.39	0.61	0.57
7	1	<90(480)							0.0	0.0	0.0
3	2	91(13)	<90(467)						0.04	0.04	0.04
5	2	<90(480)							0.0	0.0	0.0
6	2	91(120)	<90(360)						0.33	0.33	0.40
7	2	<90(480)							0.0	0.0	0.0
8	2	96(25)	<90(455)						0.14	0.14	0.26
3	3	91(13)	<90(467)						0.04	0.04	0.04
7	3	<90(480)							0.0	0.0	0.0
1	4	91(60)	<90(420)						0.16	0.16	0.20
2	4	<90(480)							0.0	0.0	0.0
4	4	93(60)	90(45)	89(25)	<90(330)				0.38	0.38	0.49
7	4	92(120)	<90(360)						0.38	0.38	0.50
8	4	96(25)	<90(455)						0.14	0.14	0.26
9	4	<90(280)							0.0	0.0	0.0
11	4	91(30)	91(120)	<90(330)					0.41	0.41	0.50
7	5	92(120)	<90(360)						0.38	0.38	0.50
11	6	91(30)	91(120)	<90(330)					0.41	0.41	0.50
3	7	82(10)	85(38)	90(46)	89(·40)	91(17)	<90(329)		0.24	0.29	0.29
10	7	94(20)	90(40)	<90(420)					0.18	0.18	0.24
10	7	<90(480)							0.0	0.0	0.0
11	7	91(30)	91(120)	<90(330)					0.41	0.41	0.50
4	8	89(25)	<90(455)						0.05	0.05	0.05
7	8	<90(480)							0.0	0.0	0.0
1	9	90(46)	91(46)	89(35)					0.31	0.31	0.35
2	9	91(180)	87(30)						0.49	0.54	0.63
2	10	<90(480)							0.0	0.0	0.0
3	10	91(13)	<90(467)						0.04	0.04	0.04
5	10	84(92)	91(74)	92(7)	89(38)	<90(269)			0.30	0.40	0.41
5	10	82(65)	92(110)	93(4)	90(51)	<90(250)			0.48	0.48	0.61
5	10	81(35)	84(25)	88(50)	84(5)	<90(365)			0.0	0.12	0.10
5	10	83(29)	84(19)	94(110)	89(5)	89(24)	<90(294)		0.52	0.54	0.80
7	10	<90(480)							0.0	0.0	0.0
8	10	96(25)	94(120)	<90(335)					0.64	0.64	1.06
11	10	91(30)	91(120)	<90(330)					0.41	0.41	0.50
7	11	<90(480)							0.0	0.0	0.0
11	11	91(30)	91(120)	<90(330)					0.41	0.41	0.50
2	16	<90(480)							0.0	0.0	0.0
7	16	<90(480)							0.0	0.0	0.0
2	32	<90(480)							0.0	0.0	0.0
5	32	<90(480)							0.0	0.0	0.0
6	32	91(120)	<90(360)						0.33	0.33	0.40
9	32	91(120)	<90(360)						0.33	0.33	0.40
11	32	91(30)	91(120)	<90(330)					0.41	0.41	0.50
3	34	82(10)	85(38)	90(46)	89(40)	91(17)	<90(329)		0.24	0.29	0.29
9	34	<90(480)							0.0	0.0	0.0
9	34	<90(480)							0.0	0.0	0.0
10	34	94(20)	90(40)	<90(420)					0.18	0.18	0.24
10	34	<90(480)							0.0	0.0	0.0
11	34	90(36)	90(38)	86(60)	87(17)	<90(329)			0.18	0.29	0.28
11	34	91(26)	89(52)	82(68)	85(13)	<90(321)			0.18	0.20	0.21
11	34	91(42)	88(70)	82(90)	83(25)	<90(253)			0.12	0.24	0.25
11	34	90(40)	87(72)	83(83)	81(17)	<90(268)			0.10	0.21	0.20
11	34	91(26)	90(52)	83(63)	85(32)	<90(307)			0.20	0.23	0.25
11	34	91(43)	90(38)	84(75)	85(55)	<90(269)			0.21	0.35	0.34
1	35	91(41)	87(194)	91(60)					0.28	0.58	0.59
2	35	98(20)	87(156)	88(32)					0.15	0.45	0.59

MINE	OCC CD	DBA SOUND LEVELS(EXPOSURES TIMES) 1	2	3	4	5	6	7	8-HR D	NOISEDOSE D(P)	D(E)
3	35	99(160)	95(32)	83(63)	91(11)	<90(214)			1.52	1.52	3.66
3	35	99(144)	91(24)	83(96)	92(11)	<90(11)			1.30	1.30	3.15
4	35	90(14)	84(45)	96(120)	92(53)	<90(248)			0.86	0.91	1.55
4	35	89(29)	89(77)	97(135)	96(59)	<90(180)			1.40	1.40	2.63
4	35	89(26)	91(42)	97(90)	95(54)	<90(268)			1.00	1.00	1.83
4	35	89(29)	92(75)	97(150)	94(90)	<90(136)			1.62	1.62	2.95
5	35	81(65)	88(120)	91(28)	95(121)	89(32)	89(38)		0.80	1.02	1.45
5	35	79(45)	85(96)	94(75)	94(30)	90(51)	<90(183)		0.56	0.67	0.91
5	35	82(38)	85(57)	93(36)	89(33)	95(114)	<90(202)		0.74	0.81	1.25
5	35	87(35)	92(48)	102(19)	96(13)	101(88)	89(24)	<90(253)	1.48	1.54	4.16
6	35	93(30)	94(19)	98(101)	86(40)	<90(290)			0.92	0.98	2.01
6	35	92(33)	90(45)	99(67)	93(19)	<90(316)			0.84	0.84	1.76
8	35	97(204)	94(32)	93(6)	84(73)	<90(165)			1.44	1.52	2.99
8	35	97(8)	97(171)	95(35)	93(28)	<90(238)			1.40	1.40	2.81
8	35	98(72)	97(24)	81(35)	<90(349)				0.67	0.67	1.52
8	35	95(8)	98(98)	95(46)	93(11)	88(66)	<90(251)		1.01	1.13	2.25
8	35	98(8)	97(92)	93(28)	91(59)	<90(293)			0.90	0.90	1.69
8	35	97(8)	95(73)	92(13)	<90(386)				0.44	0.44	0.77
8	35	95(199)	96(36)	81(35)	<90(210)				1.15	1.15	2.04
1	36	93(81)	87(154)	91(60)					0.46	0.70	0.83
2	36	98(39)	87(137)	88(32)					0.28	0.56	0.88
3	36	99(160)	95(32)	83(63)	91(11)	<90(214)			1.52	1.52	3.66
3	36	99(144)	91(24)	83(96)	92(11)	<90(205)			1.30	1.30	3.15
4	36	90(14)	84(45)	96(120)	92(53)	<90(248)			0.86	0.91	1.55
4	36	89(29)	89(77)	97(135)	96(59)	<90(180)			1.40	1.40	2.63
4	36	89(26)	91(42)	97(90)	95(54)	<90(268)			1.00	1.00	1.83
4	36	90(27)	91(15)	94(39)	101(100)	98(75)	<90(224)		1.91	1.91	4.96
4	36	89(29)	92(75)	97(150)	94(90)	<90(136)			1.62	1.62	2.95
5	36	81(65)	88(120)	91(28)	95(121)	89(32)	89(38)		0.80	1.02	1.45
5	36	79(45)	85(96)	94(75)	94(30)	90(51)	<90(183)		0.56	0.67	0.91
5	36	82(38)	85(57)	93(36)	89(33)	95(114)	<90(202)		0.74	0.81	1.25
5	36	87(35)	92(48)	102(19)	96(13)	101(88)	89(24)	<90(253)	1.48	1.54	4.16
6	36	93(30)	94(19)	98(101)	86(40)	<90(290)			0.92	0.98	2.01
6	36	92(33)	90(45)	99(67)	93(19)	<90(316)			0.84	0.84	1.76
7	36	94(33)	91(4)	92(87)	83(14)	<90(190)			0.42	0.42	0.59
7	36	92(34)	93(83)	90(11)	86(24)	<90(328)			0.43	0.47	0.63
7	36	95(28)	91(90)	84(12)	<90(350)				0.38	0.39	0.54
7	36	93(30)	95(130)	97(17)	91(6)	85(33)	<90(264)		0.85	0.89	1.51
7	36	92(57)	96(57)	94(5)	77(35)	<90(326)			0.51	0.51	0.87
7	36	94(60)	95(55)	91(5)	81(25)	<90(335)			0.53	0.53	0.87
7	36	92(70)	93(33)	91(3)	86(35)	<90(339)			0.35	0.40	0.51
7	36	93(60)	94(56)	85(70)	<90(294)				0.45	0.53	0.74
7	36	<90(480)							0.0	0.0	0.0
8	36	97(204)	94(32)	93(6)	84(73)	<90(165)			1.44	1.52	2.99
8	36	97(8)	97(171)	95(35)	93(28)	<90(238)			1.40	1.40	2.61
8	36	98(72)	97(24)	81(35)	<90(349)				0.67	0.67	1.52
8	36	95(8)	98(98)	95(46)	93(11)	88(66)	<90(251)		1.01	1.13	2.25
8	36	98(8)	97(92)	93(28)	91(59)	<90(293)			0.90	0.90	1.69
8	36	97(8)	95(73)	92(13)	<90(386)				0.44	0.44	0.77
8	36	95(199)	96(36)	81(35)	<90(210)				1.15	1.15	2.04
3	38	82(20)	85(40)	94(123)	83(20)	95(27)	91(17)	<90(233)	0.69	0.74	1.13
9	38	<90(480)							0.0	0.0	0.0
9	38	90(130)	92(73)	<90(277)					0.54	0.54	0.65
10	38	94(20)	91(108)	91(62)	<90(290)				0.55	0.55	0.69
10	38	94(102)	<90(276)						0.42	0.42	0.67
11	38	90(36)	95(11)	94(60)	84(50)	<90(323)			0.39	0.44	0.62
11	38	91(26)	96(15)	91(80)	80(60)	<90(299)			0.37	0.37	0.51
11	38	91(42)	92(18)	91(54)	82(75)	<90(291)			0.32	0.32	0.39
11	38	90(40)	94(28)	90(120)	83(80)	<90(212)			0.50	0.50	0.61
11	38	91(26)	93(13)	91(162)	87(72)	<90(207)			0.56	0.68	0.78

MINE	OCC CD	1	2	3	4	5	6	7	8-HR NOISEDOSE D	D(P)	D(E)
11	38	91(43)	94(12)	91(70)	87(65)	<90(290)			0.36	0.46	0.54
2	41	85(240)							0.0	0.29	0.20
7	41	91(50)	85(180)	<90(250)					0.14	0.35	0.31
2	42	95(146)	91(26)	91(37)	88(10)	87(32)			0.87	0.94	1.48
3	42	80(8)	88(50)	95(99)	91(17)	<90(306)			0.52	0.61	0.96
10	42	94(20)	95(79)	92(73)	<90(308)				0.69	0.69	1.09
10	42	92(70)	<90(410)						0.22	0.22	0.29
2	43	95(146)	91(26)	91(37)	88(10)	87(32)			0.87	0.94	1.48
3	43	80(8)	88(50)	95(99)	91(17)	<90(306)			0.52	0.61	0.96
9	43	100(139)	97(82)	<90(259)					1.85	1.85	4.76
9	43	102(86)	96(63)	<90(331)					1.43	1.43	4.27
10	43	94(20)	95(79)	92(73)	<90(308)				0.69	0.69	1.09
10	43	92(70)	<90(410)						0.22	0.22	0.29
11	43	90(36)	95(59)	94(74)	100(24)	<90(287)			0.91	0.91	1.71
11	43	91(26)	96(70)	93(68)	100(10)	<90(306)			0.80	0.80	1.44
11	43	91(42)	97(94)	92(114)	99(78)	<90(152)			1.72	1.72	3.50
11	43	90(40)	95(68)	91(107)	98(30)	<90(235)			0.93	0.93	1.53
11	43	91(26)	95(144)	92(120)	100(60)	<90(130)			1.71	1.71	3.37
11	43	91(43)	96(85)	96(38)	102(53)	<90(261)			1.46	1.46	3.66
11	43	101(160)	97(320)						3.78	3.78	9.57
2	44	92(175)	88(50)						0.55	0.64	0.81
7	44	91(50)	85(180)	<90(250)					0.14	0.35	0.31
7	45	<90(480)							0.0	0.0	0.0
3	46	86(54)	88(15)	84(47)	86(50)	92(11)			0.03	0.28	0.24
3	46	84(30)	86(45)	100(100)	92(10)	91(17)	<90(278)		1.04	1.13	2.81
4	46	90(14)	82(38)	92(165)	93(8)	<90(255)			0.58	0.58	0.77
4	46	89(29)	84(88)	85(38)	88(128)	95(6)			0.09	0.46	0.41
4	46	89(26)	84(60)	88(95)	91(5)	<90(294)			0.07	0.30	0.27
4	46	90(27)	86(35)	92(50)	92(5)	<90(363)			0.24	0.29	0.34
4	46	89(29)	84(65)	94(100)	92(5)	<90(281)			0.49	0.56	0.79
5	46	84(92)	91(74)	92(7)	89(38)	<90(269)			0.30	0.40	0.41
5	46	82(65)	92(110)	93(4)	90(51)	<90(250)			0.48	0.48	0.61
5	46	81(35)	84(25)	88(50)	84(5)	<90(365)			0.0	0.12	0.10
5	46	83(28)	84(19)	94(110)	89(5)	89(24)	<90(294)		0.52	0.54	0.80
6	46	93(30)	83(80)	92(90)	94(10)	<90(270)			0.43	0.43	0.60
6	46	92(53)	84(61)	94(106)	95(7)	<90(273)			0.64	0.71	1.02
7	46	94(33)	96(32)	118(100)	91(22)	100(5)	<90(310)		12.03	12.03	170.08
7	46	92(34)	94(35)	119(60)	93(5)	90(32)	<90(314)		8.35	8.35	128.48
7	46	95(28)	96(30)	92(20)	117(156)	92(6)	<90(240)		16.14	16.14	210.31
7	46	93(30)	87(20)	86(32)	97(67)	93(3)	<90(328)		0.54	0.62	1.12
7	46	92(57)	96(30)	93(24)	117(98)	99(10)	<90(261)		10.42	10.42	132.59
7	46	94(60)	96(35)	94(15)	119(49)	107(12)	<90(309)		7.34	7.34	107.00
7	46	92(70)	86(45)	85(15)	97(88)	93(30)	<90(232)		0.89	0.97	1.67
7	46	93(60)	95(50)	92(3)	86(7)	<90(360)			0.47	0.48	0.75
8	46	97(135)	95(10)	85(70)	<90(265)				0.90	0.98	1.93
8	46	97(8)	118(144)	113(41)	100(35)	<90(252)			19.48	19.48	266.72
8	46	116(149)	109(38)	104(35)	<90(258)				14.96	14.96	169.31
8	46	95(8)	121(200)	109(82)	103(30)	<90(160)			38.39	38.39	696.30
8	46	98(8)	122(244)	114(42)	105(30)	<90(156)			52.74	52.74	******
8	46	97(8)	117(149)	109(68)	<90(255)				17.37	17.37	214.74
8	46	119(177)	111(54)	103(33)	<90(216)				26.45	26.45	397.49
9	46	95(125)	<90(355)						0.60	0.60	1.04
9	46	90(112)	95(8)	<90(360)					0.31	0.31	0.36
10	46	94(20)	93(163)	<90(297)					0.67	0.67	0.99
10	46	89(28)	90(126)	90(6)	<90(320)				0.37	0.37	0.40
11	46	90(36)	93(55)	91(3)	87(13)	<90(373)			0.29	0.31	0.41
11	46	91(26)	89(43)	88(3)	84(35)	<90(373)			0.16	0.20	0.20
11	46	91(42)	89(85)	92(8)	84(13)	<90(332)			0.32	0.33	0.36
11	46	90(40)	91(46)	87(5)	83(38)	<90(351)			0.22	0.23	0.26
11	46	91(26)	90(62)	86(12)	83(15)	<90(365)			0.22	0.24	0.26

MINE	OCC CD	DBA SOUND LEVELS(EXPOSURES TIMES) 1	2	3	4	5	6	7	8-HR NOISE DOSE D	D(P)	D(E)
11	46	91(43)	92(76)	83(30)	87(8)<90(323)				0.36	0.37	0.47
10	47	89(28)	90(126)	90(6)<90(320)					0.37	0.37	0.40
2	48	95(84)	91(40)	95(5)	90(15)	88(32)			0.57	0.63	0.97
7	48	94(33)	96(32)	118(100)	91(22)	100(5)<90(310)			12.03	12.03	170.08
7	48	92(34)	94(35)	119(60)	93(5)	90(32)<90(314)			8.35	8.35	128.48
7	48	95(28)	96(30)	92(20)	117(156)	92(6)<90(240)			16.14	16.14	210.31
7	48	93(30)	87(20)	86(32)	97(67)	93(3)<90(328)			0.54	0.62	1.12
7	48	92(57)	96(30)	93(24)	117(98)	99(10)<90(261)			10.42	10.42	132.59
7	48	94(60)	96(35)	94(15)	119(49)	107(12)<90(309)			7.34	7.34	107.00
7	48	92(70)	86(45)	85(15)	97(88)	93(30)<90(232)			0.89	0.97	1.67
7	48	93(60)	95(50)	92(3)	86(7)<90(360)				0.47	0.48	0.75
2	49	85(240)							0.0	0.29	0.20
4	49	93(120)	90(60)	90(30)<90(270)					0.65	0.65	0.87
6	49	91(120)<90(360)							0.33	0.33	0.40
7	49	91(50)	92(90)<90(340)						0.42	0.42	0.54
8	49	96(25)	94(120)<90(335)						0.64	0.64	1.06
9	49	91(120)<90(360)							0.33	0.33	0.40
10	49	91(25)	92(30)<90(425)						0.16	0.16	0.21
11	49	91(30)	91(120)<90(330)						0.41	0.41	0.50
1	50	87(40)	87(121)	90(46)	91(60)				0.28	0.53	0.53
2	50	87(39)	87(72)	87(70)	88(32)				0.0	0.34	0.29
3	50	92(119)	86(115)	89(107)	91(11)<90(128)				0.63	0.79	0.87
3	50	91(99)	89(90)	84(53)	91(17)<90(221)				0.51	0.56	0.61
4	50	82(181)	84(117)	85(53)	90(14)<90(115)				0.03	0.22	0.16
4	50	89(29)	84(88)	85(99)	86(33)<90(231)				0.06	0.32	0.23
4	50	89(26)	83(120)	86(68)	86(35)<90(231)				0.05	0.20	0.16
4	50	90(27)	93(34)	85(30)	84(17)<90(372)				0.19	0.24	0.29
4	50	89(29)	92(100)	86(80)	85(65)<90(206)				0.38	0.56	0.61
5	50	86(142)	87(204)	84(46)<90(88)					0.0	0.57	0.45
5	50	86(52)	85(25)	85(114)	90(51)<90(238)				0.12	0.36	0.30
5	50	89(75)	88(54)	85(297)<90(55)					0.16	0.61	0.49
5	50	91(88)	84(94)	87(52)	89(24)<90(222)				0.29	0.47	0.47
6	50	93(30)	91(101)	85(128)	84(40)<90(181)				0.39	0.58	0.62
6	50	92(33)	90(67)	87(65)	87(40)<90(275)				0.26	0.43	0.45
7	50	94(33)	86(44)	87(20)	92(31)<90(352)				0.24	0.33	0.42
7	50	90(42)	87(105)	92(34)	92(34)<90(265)				0.32	0.48	0.53
7	50	95(28)	86(55)	89(51)	94(22)<90(324)				0.33	0.41	0.54
7	50	93(30)	85(97)	86(71)	94(64)<90(218)				0.38	0.59	0.73
7	50	92(57)	86(32)	92(29)	90(19)<90(343)				0.32	0.36	0.44
7	50	94(60)	84(21)	83(28)	84(13)<90(358)				0.25	0.29	0.42
7	50	92(70)	86(43)	87(17)	88(23)<90(327)				0.22	0.35	0.40
7	50	93(60)	88(45)	88(32)	86(28)<90(315)				0.22	0.40	0.47
8	50	88(105)	85(34)	87(57)<90(284)					0.0	0.32	0.28
8	50	97(8)	92(85)	86(84)	92(24)<90(279)				0.39	0.51	0.65
8	50	87(36)	85(14)	84(32)<90(398)					0.0	0.11	0.08
8	50	95(8)	91(55)	90(36)	88(62)<90(319)				0.28	0.39	0.45
8	50	98(8)	90(46)	91(28)	85(92)<90(306)				0.25	0.36	0.42
8	50	97(8)	83(37)	90(22)	86(72)<90(341)				0.10	0.20	0.24
8	50	87(99)	90(54)	88(144)<90(183)					0.13	0.55	0.51
9	50	90(72)	87(199)	90(55)<90(154)					0.30	0.62	0.59
9	50	93(43)	89(40)<90(397)						0.32	0.32	0.39
10	50	94(20)	92(38)	90(108)	89(24)<90(182)				0.51	0.51	0.62
10	50	92(35)	89(90)<90(229)						0.30	0.30	0.33
11	50	90(36)	87(42)	86(96)	84(96)	87(22)<90(188)			0.09	0.42	0.34
11	50	91(26)	87(40)	84(48)	82(48)	89(34)<90(284)			0.14	0.26	0.24
11	50	91(42)	88(47)	89(57)	85(57)	89(25)<90(252)			0.29	0.44	0.43
11	50	90(40)	88(32)	88(35)	81(35)	88(23)<90(315)			0.10	0.26	0.25
11	50	91(26)	89(72)	84(72)	86(72)	86(72)	86(41)<90(197)		0.22	0.55	0.48
11	50	91(43)	89(43)	85(75)	83(75)	86(35)<90(209)			0.21	0.35	0.33
7	51	91(50)	87(180)<90(250)						0.14	0.42	0.40

MINE	UCC CD	DBA SOUND LEVELS(EXPOSURES TIMES) 1	2	3	4	5	6	7	8-HR NOISEDOSE D	D(P)	D(E)
7	52	91(50)	87(180)	<90(250)					0.14	0.42	0.40
5	53	<90(480)							0.0	0.0	0.0
6	53	91(120)	<90(360)						0.33	0.33	0.40
7	53	91(50)	92(90)	<90(340)					0.42	0.42	0.54
9	53	91(120)	<90(360)						0.33	0.33	0.40
10	53	91(25)	92(30)	<90(425)					0.16	0.16	0.21
11	53	91(30)	91(120)	<90(330)					0.41	0.41	0.50
7	60	<90(480)							0.0	0.0	0.0
11	60	91(30)	91(120)	<90(330)					0.41	0.41	0.50
7	62	<90(480)							0.0	0.0	0.0
4	101	90(120)	86(210)	90(30)	<90(120)				0.36	0.65	0.61
7	101	<90(480)							0.0	0.0	0.0
8	101	96(25)	<90(455)						0.14	0.14	0.26
9	101	90(120)	<90(360)						0.29	0.29	0.31
10	101	91(25)	<90(455)						0.07	0.07	0.08
11	101	91(30)	<90(450)						0.08	0.08	0.10
2	102	<90(480)							0.0	0.0	0.0
6	102	<90(480)							0.0	0.0	0.0
11	102	91(30)	<90(450)						0.08	0.08	0.10
11	102	<90(480)							0.0	0.0	0.0
2	104	<90(480)							0.0	0.0	0.0
3	104	95(60)	92(15)	90(45)					0.44	0.44	0.68
4	104	93(60)	90(45)	89(25)	<90(330)				0.38	0.38	0.49
7	104	<90(480)							0.0	0.0	0.0
8	104	96(25)	<90(455)						0.14	0.14	0.26
9	104	<90(280)							0.0	0.0	0.0
10	104	91(120)	91(25)	<90(335)					0.40	0.40	0.48
11	104	91(30)	<90(450)						0.08	0.08	0.10
3	105	95(60)	92(15)	90(45)					0.44	0.44	0.68
4	105	93(60)	90(45)	89(25)	<90(330)				0.38	0.38	0.49
7	105	<90(480)							0.0	0.0	0.0
8	105	96(25)	<90(455)						0.14	0.14	0.26
7	106	91(90)	<90(390)						0.25	0.25	0.30
3	108	91(13)	<90(467)						0.04	0.04	0.04
4	108	89(25)	<90(455)						0.05	0.05	0.05
6	108	<90(480)							0.0	0.0	0.0
7	108	<90(480)							0.0	0.0	0.0
8	108	96(25)	<90(455)						0.14	0.14	0.26
3	109	79(180)	92(11)	83(60)	<90(229)				0.03	0.03	0.05
5	109	<90(480)							0.0	0.0	0.0
9	109	90(180)	<90(299)						0.43	0.43	0.47
9	109	90(180)	<90(300)						0.43	0.43	0.47
11	109	91(30)	<90(450)						0.08	0.08	0.10
3	110	99(95)	92(11)	<90(374)					0.83	0.83	2.04
3	110	99(90)	84(60)	91(11)	<90(319)				0.78	0.84	1.97
1	111	91(60)	<90(420)						0.16	0.16	0.20
2	111	<90(480)							0.0	0.0	0.0
4	111	90(30)	<90(430)						0.07	0.07	0.08
5	111	<90(480)							0.0	0.0	0.0
8	111	96(25)	<90(455)						0.14	0.14	0.26
1	116	91(60)	<90(420)						0.16	0.16	0.20
2	116	<90(480)							0.0	0.0	0.0
3	116	91(13)	<90(467)						0.04	0.04	0.04
4	116	90(30)	<90(430)						0.07	0.07	0.08
6	116	<90(480)							0.0	0.0	0.0
7	116	<90(480)							0.0	0.0	0.0
8	116	96(25)	94(120)	<90(335)					0.64	0.64	1.06
4	117	90(30)	<90(430)						0.07	0.07	0.08
7	117	<90(480)							0.0	0.0	0.0
3	118	91(13)	<90(467)						0.04	0.04	0.04

MINE	OCC CD	DBA SOUND LEVELS(EXPOSURES TIMES) 1	2	3	4	5	6	7	8-HR NOISEDOSE D	D(P)	D(E)
6	118	<90(480)							0.0	0.0	0.0
9	118	90(120)<90(360)							0.29	0.29	0.31
7	119	<90(480)							0.0	0.0	0.0
1	122	84(196)	91(60)						0.16	0.37	0.33
7	122	<90(480)							0.0	0.0	0.0
7	123	<90(480)							0.0	0.0	0.0
3	136	91(13)<90(467)							0.04	0.04	0.04
3	143	91(13)<90(467)							0.04	0.04	0.04
6	149	<90(480)							0.0	0.0	0.0
7	149	<90(480)							0.0	0.0	0.0
3	150	91(13)<90(467)							0.04	0.04	0.04
3	154	90(150)	84(210)	91(13)<90(107)					0.39	0.61	0.57
6	154	86(330)	89(150)						0.63	1.08	0.97
7	154	91(120)<90(360)							0.33	0.33	0.40
11	154	91(30)<90(450)							0.08	0.08	0.10
1	155	91(60)<90(420)							0.16	0.16	0.20
3	157	91(13)<90(467)							0.04	0.04	0.04
4	157	90(30)<90(430)							0.07	0.07	0.08
5	157	<90(480)							0.0	0.0	0.0
11	157	91(30)<90(450)							0.08	0.08	0.10
2	158	99(212)	87(20)	88(10)					1.77	1.82	4.49
6	158	94(120)<90(360)							0.50	0.50	0.79
11	158	91(30)<90(450)							0.08	0.08	0.10
3	201	90(150)	84(210)	91(13)<90(107)					0.39	0.61	0.57
6	201	<90(480)							0.0	0.0	0.0
7	201	<90(480)							0.0	0.0	0.0
1	216	91(60)<90(420)							0.16	0.16	0.20
5	216	89(75)	92(75)	89(330)					1.77	1.77	1.84
6	216	<90(480)							0.0	0.0	0.0
8	216	<90(480)							0.0	0.0	0.0
11	216	91(30)<90(450)							0.08	0.08	0.10
7	220	<90(480)							0.0	0.0	0.0
7	262	<90(480)							0.0	0.0	0.0
8	262	<90(480)							0.0	0.0	0.0
10	262	<90(480)							0.0	0.0	0.0
4	265	90(30)<90(430)							0.07	0.07	0.08
5	265	<90(480)							0.0	0.0	0.0
7	265	<90(480)							0.0	0.0	0.0
8	265	<90(480)							0.0	0.0	0.0
1	269	90(46)	91(46)	89(35)					0.31	0.31	0.35
2	269	91(180)	87(30)						0.49	0.54	0.63
4	269	89(80)	91(80)	90(30)<90(280)					0.46	0.46	0.51
5	269	89(75)	92(75)	89(330)					1.77	1.77	1.84
6	269	93(120)	91(120)<90(240)						0.77	0.77	1.03
7	269	89(120)	91(120)<90(240)						0.58	0.58	0.65
8	269	<90(480)							0.0	0.0	0.0
10	269	93(120)	90(120)<90(240)						0.72	0.72	0.94
1	301	<85(480)							0.0	0.0	0.0
3	302	<90(480)							0.0	0.0	0.0
4	302	<90(480)							0.0	0.0	0.0
5	302	<90(480)							0.0	0.0	0.0
7	302	<90(480)							0.0	0.0	0.0
8	302	<90(480)							0.0	0.0	0.0
9	302	<90(480)							0.0	0.0	0.0
4	303	<90(480)							0.0	0.0	0.0
3	304	<90(480)							0.0	0.0	0.0
4	304	<90(480)							0.0	0.0	0.0
5	304	<90(480)							0.0	0.0	0.0
7	304	<90(480)							0.0	0.0	0.0
8	304	<90(480)							0.0	0.0	0.0

MINE	OCC CD	1	2	3	4	5	6	7	8-HR NOISE DOSE D	D(P)	D(E)
		DBA SOUND LEVELS(EXPOSURES TIMES)									
9	304	<90(480)							0.0	0.0	0.0
11	304	<90(480)							0.0	0.0	0.0
4	305	<90(480)							0.0	0.0	0.0
7	305	<90(480)							0.0	0.0	0.0
7	308	<90(480)							0.0	0.0	0.0
3	309	<90(480)							0.0	0.0	0.0
4	309	<90(480)							0.0	0.0	0.0
5	309	<90(480)							0.0	0.0	0.0
8	309	<90(480)							0.0	0.0	0.0
11	309	<90(480)							0.0	0.0	0.0
4	314	<90(480)							0.0	0.0	0.0
4	315	<90(480)							0.0	0.0	0.0
3	316	<90(480)							0.0	0.0	0.0
7	316	<90(480)							0.0	0.0	0.0
9	316	<90(480)							0.0	0.0	0.0
10	316	<90(480)							0.0	0.0	0.0
11	316	<90(480)							0.0	0.0	0.0
4	319	<90(480)							0.0	0.0	0.0
7	319	<90(480)							0.0	0.0	0.0
8	319	<90(480)							0.0	0.0	0.0
11	319	<90(480)							0.0	0.0	0.0
4	321	<90(480)							0.0	0.0	0.0
7	321	<90(480)							0.0	0.0	0.0
4	322	<90(480)							0.0	0.0	0.0
10	322	<90(480)							0.0	0.0	0.0
5	340	<90(480)							0.0	0.0	0.0
8	356	94(180)	<90(300)						0.75	0.75	1.19
10	360	<90(480)							0.0	0.0	0.0
3	368	94(60)	78(60)	90(60)	82(60)	<90(240)			0.39	0.39	0.55
4	368	90(300)	<90(180)						0.72	0.72	0.79
7	368	93(180)	<90(300)						0.65	0.65	0.94
9	368	94(360)	<90(120)						1.50	1.50	2.38
1	373	87(31)							0.0	0.05	0.04
4	373	112(300)	<90(180)						15.16	15.16	26.99
5	373	<90(480)							0.0	0.0	0.0
7	373	<90(480)							0.0	0.0	0.0
9	373	<90(480)							0.0	0.0	0.0
1	374	87(31)							0.0	0.05	0.04
3	374	96(360)	<90(120)						1.98	1.98	3.78
4	374	91(300)	<90(180)						0.82	0.82	0.99
9	374	103(360)	<90(120)						5.22	5.22	19.05
4	375	<90(480)							0.0	0.0	0.0
5	375	91(180)	<90(300)						0.49	0.49	0.60
4	376	<90(480)							0.0	0.0	0.0
6	376	92(140)	<90(340)						0.44	0.44	0.58
9	376	93(240)	<90(240)						0.87	0.87	1.26
10	376	<90(480)							0.0	0.0	0.0
4	378	<90(480)							0.0	0.0	0.0
7	378	93(180)	<90(300)						0.65	0.65	0.94
7	379	<90(480)							0.0	0.0	0.0
7	380	<90(480)							0.0	0.0	0.0
7	382	90(150)	<90(330)						0.36	0.36	0.39
9	382	94(360)	<90(120)						1.50	1.50	2.38
4	385	<90(480)							0.0	0.0	0.0
5	385	<90(480)							0.0	0.0	0.0
8	385	<90(480)							0.0	0.0	0.0
9	385	<90(480)							0.0	0.0	0.0
11	385	<90(480)							0.0	0.0	0.0
1	386	<85(480)							0.0	0.0	0.0
5	386	91(180)	<90(300)						0.49	0.49	0.60

MINE	OCC CD	DBA SOUND LEVELS(EXPOSURES TIMES) 1	2	3	4	5	6	7	8-HR NOISEDOSE D	D(P)	D(E)
6	386	92(140)	<90(340)						0.44	0.44	0.58
7	386	91(120)	<90(360)						0.33	0.33	0.40
7	388	93(120)	<90(360)						0.44	0.44	0.63
10	388	92(120)	<90(360)						0.38	0.38	0.50
8	391	94(180)	<90(300)						0.75	0.75	1.19
4	392	<90(480)							0.0	0.0	0.0
5	392	<90(480)							0.0	0.0	0.0
6	392	95(210)	<90(270)						1.01	1.01	1.75
7	392	<90(480)							0.0	0.0	0.0
10	392	<90(480)							0.0	0.0	0.0
11	392	<90(480)							0.0	0.0	0.0
7	394	<90(480)							0.0	0.0	0.0
2	402	<90(480)							0.0	0.0	0.0
4	402	<90(480)							0.0	0.0	0.0
7	402	<90(480)							0.0	0.0	0.0
9	404	<90(480)							0.0	0.0	0.0
4	414	<90(480)							0.0	0.0	0.0
7	414	<90(480)							0.0	0.0	0.0
4	418	<90(480)							0.0	0.0	0.0
6	418	<90(480)							0.0	0.0	0.0
7	418	<90(480)							0.0	0.0	0.0
8	418	<90(480)							0.0	0.0	0.0
4	423	<90(480)							0.0	0.0	0.0
1	430	91(60)	<90(420)						0.16	0.16	0.20
2	430	85(240)							0.0	0.29	0.20
4	430	<90(480)							0.0	0.0	0.0
6	430	<90(480)							0.0	0.0	0.0
7	430	<90(480)							0.0	0.0	0.0
8	430	<90(480)							0.0	0.0	0.0
11	430	<90(480)							0.0	0.0	0.0
1	449	91(60)	<90(420)						0.16	0.16	0.20
4	449	<90(480)							0.0	0.0	0.0
6	449	<90(480)							0.0	0.0	0.0
7	449	<90(480)							0.0	0.0	0.0
8	449	<90(480)							0.0	0.0	0.0
11	449	<90(480)							0.0	0.0	0.0
11	456	<90(480)							0.0	0.0	0.0
4	462	90(30)	<90(430)						0.07	0.07	0.08
6	462	<90(480)							0.0	0.0	0.0
7	462	<90(480)							0.0	0.0	0.0
11	462	<90(480)							0.0	0.0	0.0
7	464	<90(480)							0.0	0.0	0.0
9	464	<90(480)							0.0	0.0	0.0
1	481	<90(480)							0.0	0.0	0.0
6	481	<90(480)							0.0	0.0	0.0
7	481	<90(480)							0.0	0.0	0.0
8	481	<90(480)							0.0	0.0	0.0
10	481	91(25)	92(30)	<90(425)					0.16	0.16	0.21
11	481	<90(480)							0.0	0.0	0.0
4	489	<90(480)							0.0	0.0	0.0
7	489	<90(480)							0.0	0.0	0.0
11	489	<90(480)							0.0	0.0	0.0
7	494	<90(480)							0.0	0.0	0.0
4	495	<90(480)							0.0	0.0	0.0
7	495	<90(480)							0.0	0.0	0.0
1	497	<90(480)							0.0	0.0	0.0
7	497	<90(480)							0.0	0.0	0.0

☆USGPO: 1976 — 657-696/5558 Region 5-11