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Measurements of Blast Noise Propagation Over Water at Aberdeen Proving Ground, MD

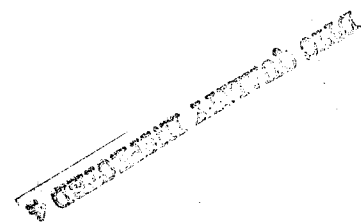
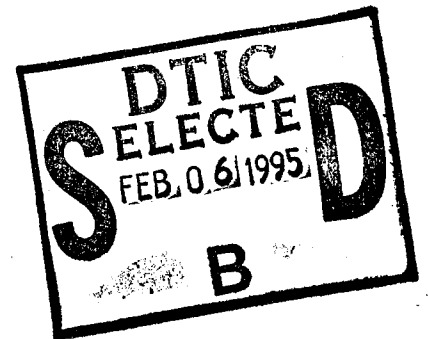
by

Michael J. White
Carolyn R. Shaffer
Richard Raspet

Loud noises produced by Army training can cause public annoyance and alarm in neighboring communities. For this reason, it is important to accurately predict noise levels at great distances over different types of terrain and in different atmospheric conditions.

However, the propagation of blast noise over large distances is not well understood, partly because the types and sizes of explosions produced on Army training ranges are unique; few data sources are available. This study was part of a larger effort to systematically collect noise level and atmospheric data over a variety of terrains, coincident with Army-type explosions. Such data will supplement existing blast noise data bases to provide a sufficient range of experimental conditions to test future blast noise propagation models.

This report contains blast data received over water, in a range of atmospheric conditions. During the experiment, the atmosphere was periodically tested to determine speed-of-sound profiles of blast propagation along the nine-microphone array. Blast signals were processed to obtain peak-level, flat-weighted, and C-weighted sound exposure levels for each event and for each microphone.



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FOREWORD

This study was performed for the Office of the Chief of Engineers (OCE) under Project 4A162720A896, "Base Facility Environmental Quality"; Work Unit A0, "Advanced Studies for Environmental Systems and Analysis"; Task 044, "Atmospheric and Terrain Effects on Noise Propagation." The OCE technical monitor was LTC J. Stratta, DAEN-ZCE.

This experiment was conducted by the Environmental Compliance Modeling and Simulation Division (EC) of the U.S. Army Construction Engineering Research Laboratories (USACERL). The USACERL principal investigator was Dr. Paul Schomer. The experiment was designed by Dr. Richard Raspet. Carolyn R. Shaffer was a graduate student in the College of Electrical Engineering at the University of Illinois. Special thanks are due to Wendell Hulmes of USACERL, who set up much of the data collection equipment, flew the tethered sonde balloon, and carefully determined various acoustic quantities from tape recordings. Mr. Hulmes was invaluable in explaining details of the measurement and data reduction. The assistance of the USAF 6th Weather Squadron of Scott AFB, Belleville, IL in performing rawinsonde balloon weather measurements is gratefully acknowledged. Thanks are also due to the Test and Evaluation Command, Combat Systems Test Activity (TECOM-CSTA) for preparing and detonating the explosives used, and to Aberdeen Proving Ground for providing boats used at the microphone stations and for their excellent cooperation throughout the measurement. Dr. Michael J. White supervised the last phase of data analysis and completed the final draft of this report. Mr. William D. Goran is Acting Chief, USACERL-EN. The USACERL technical editor was William J. Wolfe, Information Management Office.

LTC David J. Rehbein is Commander of USACERL, and Dr. L.R. Shaffer is Director.

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MEASUREMENTS OF BLAST NOISE PROPAGATION OVER WATER AT ABERDEEN PROVING GROUND, MD

1 INTRODUCTION

Background

The blast noise produced by weapons fire and explosive demolition is of growing concern to all Army installations engaged in active training. High doses of impulse noise progressing off base can cause public annoyance and alarm in neighboring communities. The Installation Compatible Use Zone (ICUZ) program was initiated to deal with issues involving the Army installation and its surrounding communities. Under ICUZ, one of the duties of an installation is to produce an area map, divided into zones according to the estimated noise levels resulting from all Army activities. The sizes of the noise zones are particularly sensitive to changes in estimation of noise levels. For example, variance of 3 dB in the noise level typically halves or doubles the predicted area of the noise zones. Such variance could easily arise from neglecting the influence of terrain or weather on sound propagation. For this reason, it is important to be able to accurately predict the noise levels at great distances over different types of terrain and in various atmospheric conditions.

In spite of efforts by many researchers, the propagation of blast noise to large distances from explosions is still not well understood. One reason is that the types and sizes of explosions produced on Army installations are unique; few data sources are available. Also, blast propagation phenomena are sensitive to subtle changes in the atmosphere or terrain, making them difficult to predict. There is a need for research to gather blast propagation data, and to document the changes in blast noise propagation due to changes in atmosphere and terrain.

Objective

The purpose of this continuing study is to systematically collect noise level and atmospheric data coincident with Army-type explosions over a variety of terrains. This data will supplement existing blast noise data taken at Fort Bliss, TX and Fort Leonard Wood, MO, taken under a range of experimental conditions to test future blast noise propagation models. The objective of this phase of research was to collect blast data received over water in a range of atmospheric conditions.

Approach

In this experiment, nine microphones were placed roughly along a line between two sites where charges were detonated. A 1.25- and 5-lb charge were exploded at one end of the array, then on the other end. This sequence was repeated three times per each 1-hour set. The detonations were performed in sets of 12, in two 1-hour periods per day, well separated in time to maximize the variety of weather profiles encountered. The atmosphere was periodically sampled to determine speed-of-sound profiles of propagation along the microphone array. The blast signals were processed in the laboratory to obtain peak-level, flat-weighted, and C-weighted sound exposure levels for each event and each microphone.

Mode of Technology Transfer

The data taken in this study, along with that taken at Fort Bliss, TX and Fort Leonard Wood, MO, will be further analyzed to verify current noise prediction techniques and to identify potential improvements to those techniques. The results of these analyses will be forwarded to the Army Environmental Hygiene Agency (AEHA) at Aberdeen Proving Ground for use in the BNOISE program, to help derive better noise prediction methods. It is also anticipated that the data collected in this study will be made available in electronic form (low-density, 5-1/4-in., DOS formatted, microcomputer diskette) from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, tel. (703) 487-4785.

2 MEASUREMENTS

Measurement Procedure and Equipment

The blast noise measurement exercises were carried out at Aberdeen Proving Ground, MD in June 1984. Nine microphone recording stations were situated in a 26-km-long array across Chesapeake Bay and recorded signals from blasts periodically detonated near the ends of the array (Figure 1).

At each blasting site, C-4 plastic explosives were prepared and discharged in a fixed sequence alternating between sites (Table 1). The C-4 explosives were issued in "bricks" weighing 1.25 lb (0.568 kg) each. One (and alternately four) of the bricks was molded into a nearly spherical shape and placed on a post approximately 1 m high to avoid the direct interaction of the explosion with the surface. A total of 348 explosions were detonated over 12 days.

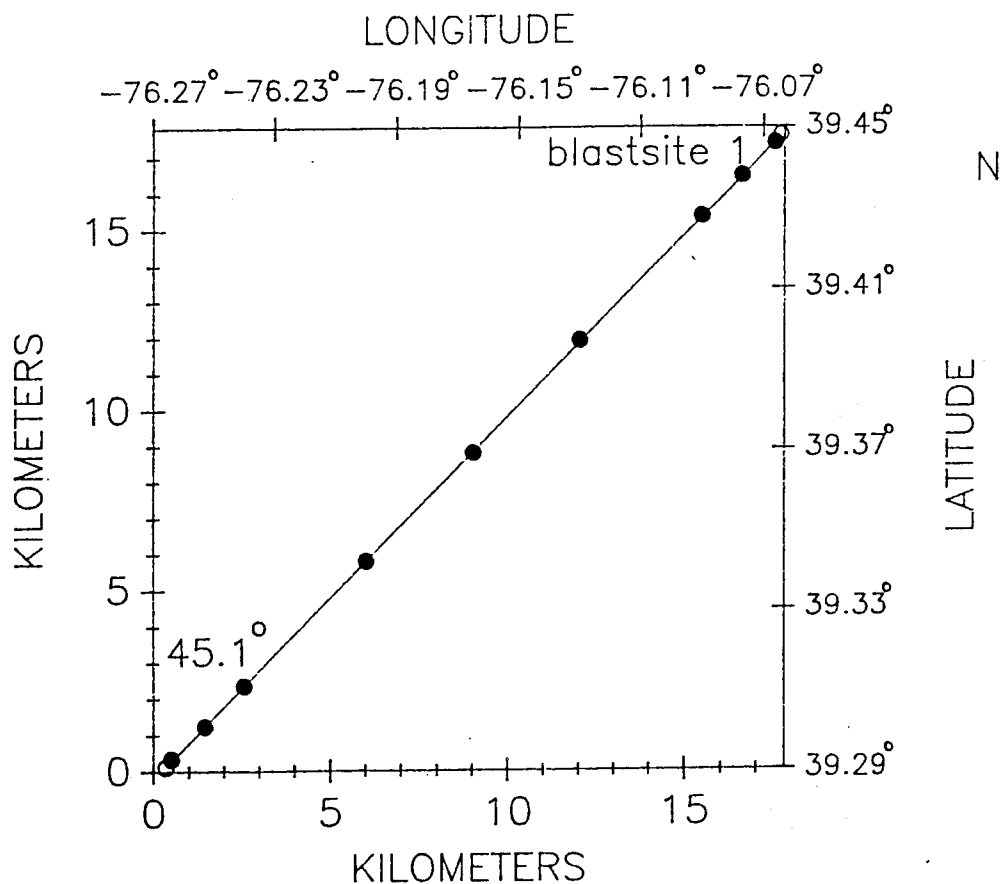


Figure 1. Microphone Layout.

Table 1

Blasting Sequence

Charge Size	Blasting Site
1 (1.25 lb)	1
4 (5 lb)	1
1 (1.25 lb)	2
4 (5 lb)	2

Acoustic Measurements And Processing

Each microphone station was composed of a Bruel and Kjaer (B&K) type 4921 outdoor microphone unit, a USACERL model 370 True-integrating Environmental Noise Monitor, and a Nagra DJ single-channel tape recorder. A block diagram of the setup is shown in Figure 2. The B&K outdoor microphone unit contained a B&K 4149 quartz-coated, 0.5 in. (12.7 mm) condenser microphone element with a frequency response of +1 to -2 db from 20 Hz to 10 kHz. The microphone unit was mounted upright on a pole and tripod assembly to position the condenser element 1.2 m (4 ft) above the surface.

The USACERL noise monitor was configured to measure the integrated sound exposure level from the blasts. The monitor split the input signal from the microphone through an internal filter to obtain C-weighting. Each station operator logged the peak level, flat-weighted SEL, and C-weighted SEL in a notebook from the USACERL monitor display. The flat-weighted signals were sent to the Nagra recorder for further laboratory processing. The tape recorder was activated approximately 1 min before the blast noise arrived. Blasts were recorded at 1.5 in./s (ips) while voice information (i.e., speech identifying each blast by run number) was recorded at 15 ips. The blasts were later played back in the laboratory at 15 ips. At these recording and playback speeds, the playback output of the recorder did not lose low frequency components of the blasts, as it would have at 1.5 ips. When played back at 15 ips, the recorded low frequencies were scaled to higher output frequencies and lost less low frequency information.

In the laboratory, the blast signals were played into an Analogic Corporation Data Precision model Data 6000 signal analyzer. The Data 6000 was programmed to trigger on the blast pulse and separate the blast signal from the pretrigger ambient noise. The Data 6000 was further used to calculate refined flat- and C-weighted sound exposure levels from the blast signal. The flat-weighted SEL was compared to an

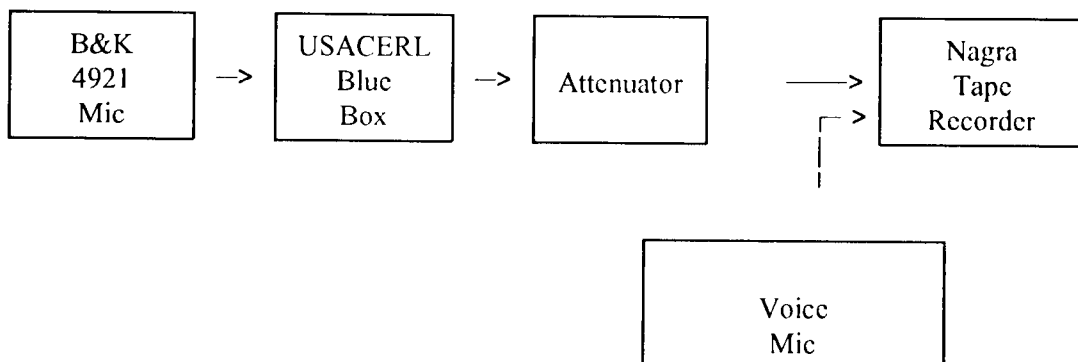


Figure 2. Block Diagram of Experimental Setup.

SEL computed from an equal-interval sample of the pretrigger ambient noise. The measurement was omitted if it did not exceed the ambient level. With this procedure, it was possible to obtain more precise values than from the USACERL monitor alone.

All of the refined levels values are tabulated in Appendix A. The peak level, flat- and C-weighted SELs are recorded by microphone and event. Values of 0.0 dB indicate failure of the blast signal to exceed the ambient noise, and values of 30.0 dB are used to indicate missing data due to other reasons (e.g., equipment problems, failure to start recording in time to capture the waveform, etc.). Noise levels are plotted against distance from the blast, for peak, flat-, and C-weighted SEL in Appendix B.

Meteorological Measurements

During the testing, meteorological data (wind speed, wind direction, pressure, temperature, and relative humidity versus altitude) were gathered from rawinsonde balloons and an instrumented tethersonde flown from a point on the shore about one-third of the way from site 1 to site 2.

An Atmospheric Instrumentation Research, Inc. model TS-1BR-X tethered balloon was used to obtain detailed measurements near the ground. The height to which the tethersonde was flown was restricted by the wind conditions, although in most cases data were obtained to about 300 m in height. The sampling of weather data began approximately 15 min before sound-level measurements began and continued until about 15 min afterward. A plan to run the tethersonde up and down three or four times per hour was rarely achieved due to handling difficulty and wind. The tethersonde typically was flown up and down two or three times during this time period.

From the tethersonde, the temperature was obtained by precision matched thermistors, which measured to an accuracy of ± 0.5 °C. The pressure sensor was a temperature-compensated aneroid transducer accurate to ± 0.25 m/s, while wind direction was obtained with a ± 5 degree accuracy.

The USAF 6th Weather Squadron of Scott AFB released and tracked GMD-1 rawinsonde balloons near the tethersonde site. Meteorological data were telemetered from the balloons back to the tracking station at 100 m height intervals up to about 5000 m above ground.

Speed-of-Sound Profiles

Both sets of balloon data (rawinsonde and tethersonde) were used to determine an effective speed of sound as a function of height. The velocity of an acoustic wave progressing through a real, windy atmosphere can be found from adding the proper sound speed in still air to the wind motion. This was accomplished by calculating the effective sound speed (adjusted for wind) as:

$$c_{adj} = c + w \cos(\theta_w + \theta_p) \quad \text{Eq 1}$$

where c is the speed of sound in still air, w is the wind speed, θ_w is the wind direction, and θ_p is the sound propagation direction.

Both angles are measured clockwise from zero degrees north. In meteorology, the wind direction is always the angle from which wind blows—the air flow is in the opposite direction ($\theta_w + \pi$ rad). As one would expect, speed increases in the direction of wind flow and decreases when in opposition.

Equation 1 assumes that the wind velocity field varies negligibly along the direction of sound propagation, and also that the path of propagation is nearly horizontal and in one vertical plane, or that the drift caused by crosswinds is negligible. The proper speed of sound in still air is given by:

$$c = \sqrt{\gamma R T} \quad \text{Eq 2}$$

where γ (gamma) is the ratio of specific heats, R is the universal gas constant, and T_k is the temperature on the Kelvin scale ($^{\circ}\text{K} + 273 = ^{\circ}\text{C}$).

Both γ and R depend on the water vapor content of the air, according to:

$$\gamma = (7 + h)/(5 + h) \quad \text{Eq 3}$$

and

$$R = R_o/(29 - 11h) \quad \text{Eq 4}$$

where h is the mole fraction of water molecules in air and R_o is equal to 8314.16 J/kg/K. Water vapor content may be calculated from the relative humidity and temperature by the expression:

$$h = 10^{-2} (\text{RH}) p_{\text{sat}} / p$$

and the Goff-Gratch relation:

$$\begin{aligned} \log_{10}(p_{\text{sat}}/p_{s0}) = & 10.79586 (1 - 1/T_r) - 5.02808 \log_{10}(T_r) \\ & + 1.50474 \times 10^{-4} [1 - 10^{-8.29692(T_r - 1)}] \\ & + 0.42873 \times 10^{-3} [-1 + 10^{4.76955(1 - 1/T_r)}] \\ & - 2.2195983 \end{aligned} \quad \text{Eq 6}$$

where $T_r = T/T_{01}$

In Equations 5 and 6 the above, p is the atmospheric pressure in Pascals, RH is the relative humidity in percent, T_{01} is 273.16 K and p_o is the reference pressure with value 1.013×10^5 Pascal. Equations 1 to 6 are sufficient to determine c_{adj} , given the temperature, relative humidity, atmospheric pressure, wind speed and direction, and the direction of acoustic propagation.

Computed values c_{adj} are plotted in Appendix C. In Appendix C, graphs are shown of height versus sound speed for propagation in both directions along the microphone array. Each of the sound speed profiles corresponds to several blasting events.

3 SUMMARY

This experiment was part of a continuing project to collect noise level and atmospheric data coinciding with Army-type explosions over a variety of terrain. This part of the study systematically collected noise level and atmospheric data coincident with such explosions over water, at the Aberdeen Proving Ground, MD. Detailed noise-level data were tabulated, and sound-speed profiles were derived from these measurements. (Appendixes A and C) In this experiment, nine microphones were placed roughly along a line between two sites where charges were detonated. The detonations were well separated in time to maximize the variety of weather profiles encountered. The atmosphere was periodically sampled to determine speed-of-sound profiles of propagation along the microphone array. The blast signals were processed in the laboratory to obtain the peak level (P) and the flat-weighted (F) and C-weighted (C) SELs for each event and each microphone. Noise levels were plotted against distance for peak level, flat-, and C-weighted SELs (Appendix B).

APPENDIX A: Noise Level Measurements

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
9	1553	C	0.0	105.1	100.6	97.9	110.1	0.0	0.0	86.7	80.2
		F	0.0	110.4	104.7	101.6	109.7	0.0	0.0	91.2	103.5
		P	0.0	129.3	124.8	121.8	117.3	0.0	0.0	109.1	102.6
13	1620	C	0.0	98.4	101.8	96.6	93.1	88.8	0.0	80.2	80.1
		F	0.0	104.1	106.3	99.8	97.6	92.4	0.0	89.7	101.9
		P	0.0	122.9	126.5	119.4	114.0	110.7	0.0	100.3	102.8
17	1645	C	115.2	93.7	97.5	92.6	88.8	84.5	0.0	80.8	74.6
		F	117.0	101.4	110.5	97.1	94.8	90.5	0.0	89.3	97.4
		P	144.7	118.6	121.0	115.4	107.9	103.9	0.0	105.1	97.5
19	1137	C	112.2	104.5	99.5	98.2	96.2	93.8	30.0	89.7	88.6
		F	115.0	109.4	105.1	101.8	99.8	97.3	30.0	94.1	93.3
		P	137.5	130.5	121.6	120.2	118.9	115.2	30.0	109.1	106.0
23	1200	C	112.6	104.8	103.1	98.5	96.5	94.8	92.2	90.9	89.2
		F	115.7	108.4	107.7	102.1	100.4	98.1	97.3	95.3	93.9
		P	139.5	131.3	125.5	122.0	117.3	113.3	109.7	108.8	106.0
27	1218	C	115.8	105.3	104.7	101.4	98.8	96.2	93.0	92.5	89.3
		F	118.5	108.9	108.4	104.7	102.2	99.2	96.4	96.1	94.9
		P	140.5	130.1	129.2	124.8	118.9	114.3	111.7	109.9	106.8
33	1518	C	113.3	101.1	102.2	97.6	88.5	93.8	90.1	89.2	82.4
		F	116.4	106.3	106.2	101.1	96.1	97.4	95.8	93.6	98.1
		P	138.2	127.4	126.4	118.8	97.2	102.6	108.2	106.5	99.6
37	1535	C	113.6	107.5	104.5	99.2	98.6	94.9	91.6	91.0	84.1
		F	116.9	110.7	107.8	102.5	102.0	98.4	96.0	94.9	101.9
		P	138.3	135.0	127.0	121.4	118.8	113.6	109.7	108.0	100.6
41	1552	C	113.9	107.1	103.0	100.4	87.9	98.1	94.9	93.8	86.8
		F	117.2	110.4	106.9	104.0	101.5	101.4	99.0	97.5	96.5
		P	138.0	133.1	116.0	122.4	118.3	118.5	114.4	111.6	105.0
43	1136	C	115.1	97.4	90.9	95.0	91.8	87.8	85.3	83.1	81.3
		F	117.9	10.0	95.7	99.5	96.4	91.6	89.3	90.6	89.4
		P	140.3	110.7	111.7	116.2	111.6	105.9	104.3	102.1	100.4
47	1158	C	115.5	97.3	97.2	92.2	96.8	91.6	88.1	84.0	81.1
		F	118.2	102.3	102.9	97.2	100.1	94.8	91.7	89.9	88.7
		P	140.9	120.3	120.7	115.4	119.4	111.9	111.0	106.1	103.0
51	1218	C	115.9	93.6	103.5	92.4	90.0	91.6	84.8	80.2	70.4
		F	118.7	101.5	107.8	96.4	94.6	94.5	88.4	90.0	80.8
		P	139.1	116.7	126.3	113.4	110.3	112.8	106.6	102.0	91.0
55	1521	C	111.6	97.4	91.0	81.1	85.9	82.1	85.5	84.3	78.0
		F	114.8	105.4	109.0	84.9	98.6	88.8	90.9	92.2	104.8
		P	136.9	114.4	112.8	100.8	100.2	90.9	89.8	94.5	104.0
59	1541	C	112.4	98.5	88.8	87.6	84.2	84.2	82.5	79.1	77.3
		F	115.8	106.6	97.8	92.1	91.3	88.9	90.8	94.8	102.6
		P	137.2	117.9	112.7	110.6	100.5	90.8	99.5	94.3	100.8
63	1558	C	112.2	99.9	77.9	82.5	87.8	79.8	83.1	75.9	79.9
		F	115.5	108.4	95.6	90.4	94.9	86.6	92.2	91.1	103.6
		P	137.1	122.0	99.8	91.5	97.0	90.3	91.0	93.1	102.4
66	1143	C	111.5	106.3	82.6	86.5	95.4	84.5	83.8	82.2	81.8
		F	114.7	103.2	96.7	92.9	101.7	84.7	89.6	97.0	101.0
		P	136.6	111.7	103.6	109.2	113.8	99.1	103.8	102.7	104.4
70	1202	C	112.5	104.4	82.9	89.1	86.2	85.8	86.2	81.9	81.2
		F	115.6	103.3	99.1	94.7	93.1	90.0	93.3	96.6	105.0
		P	136.8	110.6	103.0	113.5	109.2	105.2	106.3	100.6	102.8
74	1220	C	112.1	109.1	90.1	93.1	92.4	85.0	86.6	85.1	78.5
		F	115.5	116.4	101.9	97.5	97.0	90.5	94.2	99.6	101.4
		P	137.1	127.4	112.0	115.0	114.3	105.8	102.9	105.7	102.1

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
150	1930	C	117.8	108.8	101.7	82.4	30.0	83.6	0.0	0.0	0.0
		F	119.8	111.6	106.5	92.4	89.4	91.7	0.0	0.0	0.0
		P	145.7	134.6	123.1	98.4	100.3	101.1	0.0	0.0	0.0
154	1955	C	118.3	107.1	101.3	91.3	30.0	83.2	0.0	0.0	0.0
		F	120.6	110.3	106.6	97.0	84.1	89.9	0.0	0.0	0.0
		P	145.2	132.2	124.2	114.4	98.5	101.2	0.0	0.0	0.0
158	2014	C	118.0	30.0	30.0	91.3	30.0	30.0	0.0	82.3	0.0
		F	120.0	30.0	30.0	97.1	89.4	30.0	0.0	96.2	0.0
		P	147.9	30.0	30.0	114.4	107.1	30.0	0.0	107.6	0.0
162	2230	C	118.9	110.5	106.3	96.6	30.0	85.9	83.4	81.8	82.8
		F	120.7	112.9	110.1	101.5	96.2	89.7	88.4	86.1	103.8
		P	144.6	137.7	128.3	119.6	112.5	108.6	104.6	101.6	103.3
166	2250	C	116.6	106.9	99.8	95.3	30.0	30.0	81.3	30.0	82.3
		F	119.1	110.3	103.9	99.3	97.8	30.0	86.4	30.0	102.5
		P	142.6	133.5	122.8	116.8	103.9	30.0	104.0	30.0	102.2
170	2307	C	116.5	106.8	99.8	97.1	30.0	88.0	81.4	78.3	80.4
		F	118.9	110.7	104.2	101.8	97.1	92.2	86.3	84.4	106.0
		P	144.2	131.1	123.3	119.6	115.2	106.3	102.0	101.2	102.8
174	1906	C	114.9	99.4	86.5	76.4	30.0	80.0	0.0	0.0	0.0
		F	117.4	102.9	89.1	81.4	83.4	82.1	0.0	0.0	0.0
		P	142.2	130.4	110.7	94.5	84.6	79.7	0.0	0.0	0.0
178	1927	C	112.8	92.1	76.9	72.9	30.0	30.0	0.0	0.0	0.0
		F	115.7	100.5	84.0	76.4	81.7	30.0	0.0	0.0	0.0
		P	138.8	116.5	99.0	80.4	82.9	30.0	0.0	0.0	0.0
182	1945	C	112.4	100.5	70.4	69.6	30.0	78.7	0.0	0.0	0.0
		F	115.1	110.3	82.4	80.1	81.8	87.3	0.0	0.0	0.0
		P	138.0	126.6	94.6	85.4	82.5	88.9	0.0	0.0	0.0
186	2236	C	116.7	100.4	77.7	74.2	30.0	79.2	0.0	30.0	0.0
		F	118.9	103.8	82.9	84.2	88.2	82.1	0.0	30.0	0.0
		P	143.6	131.5	102.9	88.9	83.7	83.4	0.0	30.0	0.0
190	2257	C	115.8	97.3	82.3	71.8	30.0	79.0	0.0	0.0	0.0
		F	118.2	103.0	88.3	78.1	84.1	81.0	0.0	0.0	0.0
		P	142.6	129.9	107.0	87.8	82.6	83.8	0.0	0.0	0.0
197	1943	C	115.7	109.3	102.8	99.8	30.0	92.8	91.5	89.8	90.5
		F	118.4	111.9	105.9	103.1	93.8	96.7	95.1	94.3	101.9
		P	142.0	136.1	127.5	120.7	110.3	111.7	108.5	108.3	108.2
201	2002	C	115.7	105.7	103.4	100.6	30.0	93.6	30.0	91.7	92.1
		F	118.1	108.7	109.4	104.0	95.7	97.4	30.0	97.0	99.7
		P	142.8	134.4	126.8	121.8	112.0	113.2	30.0	109.7	108.8
205	2018	C	116.3	105.4	105.0	100.5	30.0	95.7	93.4	91.4	91.7
		F	118.7	108.2	107.7	104.0	96.8	99.2	96.5	95.3	103.3
		P	144.1	133.8	127.7	122.9	114.5	115.1	110.8	110.4	109.1
207	2222	C	119.1	107.5	106.8	101.7	30.0	96.5	94.0	90.9	93.4
		F	120.9	111.1	110.2	105.4	99.8	100.0	97.0	94.9	97.5
		P	148.3	130.7	128.2	126.1	118.0	116.8	109.6	109.7	110.7
211	2245	C	117.1	108.6	105.8	102.5	30.0	97.6	94.3	92.2	93.8
		F	119.3	112.0	109.6	106.1	99.1	100.7	97.0	95.9	97.3
		P	145.6	134.1	128.8	126.1	118.4	119.5	113.2	111.9	111.8
215	2302	C	30.0	110.7	108.5	103.5	30.0	100.0	30.0	95.1	96.5
		F	30.0	113.5	110.9	106.8	100.9	103.0	30.0	98.1	99.9
		P	30.0	134.1	130.9	127.7	118.9	121.4	30.0	115.1	115.3
219	205	C	116.4	107.1	99.5	96.6	30.0	96.0	91.5	93.9	92.7
		F	118.7	110.8	103.9	101.7	92.7	99.3	95.9	100.4	108.5
		P	144.9	132.2	123.2	119.5	108.6	114.2	108.2	114.7	110.8

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
223	225	C	117.6	111.6	104.1	87.1	30.0	89.9	90.8	90.3	90.3
		F	119.8	114.1	107.9	91.5	100.0	93.5	95.2	97.7	108.9
		P	146.8	140.5	128.6	110.4	119.0	119.1	98.1	110.4	107.3
227	244	C	116.5	108.1	103.9	84.0	30.0	91.5	89.0	86.7	85.0
		F	118.8	110.9	108.2	88.1	97.6	95.5	93.9	93.6	103.5
		P	144.6	135.1	126.9	105.7	114.2	114.3	101.8	107.1	105.3
231	406	C	115.3	108.5	102.3	98.5	30.0	94.6	82.1	89.8	91.6
		F	118.1	112.2	107.1	106.7	30.0	99.1	87.8	106.3	107.9
		P	142.1	133.2	123.4	122.7	30.0	116.5	112.9	110.4	112.6
239	441	C	115.3	108.0	97.8	99.4	30.0	90.3	93.2	91.9	89.1
		F	117.7	111.8	103.8	103.4	86.3	97.1	98.8	106.8	110.9
		P	145.0	133.6	120.4	121.5	111.3	113.0	112.4	108.8	108.1
243	202	C	113.4	87.5	75.3	77.4	83.6	30.0	76.9	0.0	0.0
		F	116.1	101.0	87.9	85.7	89.1	30.0	79.3	0.0	0.0
		P	139.4	110.4	97.9	88.8	103.4	30.0	99.1	0.0	0.0
247	226	C	112.0	81.8	72.7	77.3	82.4	80.0	0.0	0.0	0.0
		F	115.1	95.3	84.4	92.6	90.1	90.2	0.0	0.0	0.0
		P	136.3	107.7	95.3	98.9	101.4	95.3	0.0	0.0	0.0
251	244	C	114.1	87.8	79.7	82.2	97.7	82.2	0.0	0.0	0.0
		F	116.8	97.1	91.7	101.8	100.8	89.2	0.0	0.0	0.0
		P	140.1	111.2	101.0	104.5	120.6	102.7	0.0	0.0	0.0
255	405	C	115.7	95.8	77.2	78.9	84.8	82.6	88.7	0.0	0.0
		F	118.1	101.4	85.9	81.1	90.2	87.7	89.7	0.0	0.0
		P	141.3	124.2	101.1	89.1	94.7	103.2	90.6	0.0	0.0
259	425	C	116.0	94.2	78.2	76.4	79.4	77.4	88.5	0.0	0.0
		F	118.4	100.9	86.6	79.7	85.6	85.7	89.8	0.0	0.0
		P	143.6	120.3	100.7	83.8	93.5	91.2	89.4	0.0	0.0
261	438	C	115.4	100.1	86.2	74.6	83.2	77.6	87.5	0.0	0.0
		F	117.8	103.8	91.1	77.9	81.4	81.3	88.6	0.0	0.0
		P	141.7	128.3	108.1	80.9	91.3	88.9	88.4	0.0	0.0
267	338	C	30.0	30.0	30.0	89.4	84.0	81.1	97.2	80.1	30.0
		F	30.0	30.0	30.0	95.7	96.7	90.2	98.1	89.4	30.0
		P	30.0	30.0	30.0	108.4	100.2	96.5	98.1	102.5	30.0
271	357	C	30.0	30.0	78.0	83.8	88.6	79.3	96.6	74.5	30.0
		F	30.0	30.0	98.4	91.7	101.5	88.5	97.1	85.9	30.0
		P	30.0	30.0	97.8	96.8	101.7	92.5	96.4	91.6	30.0
275	417	C	30.0	30.0	82.5	85.1	83.7	79.4	96.3	75.9	30.0
		F	30.0	30.0	98.3	91.2	99.9	89.1	98.9	89.3	30.0
		P	30.0	30.0	101.6	99.5	100.0	89.7	101.3	89.9	30.0
279	159	C	114.5	94.4	104.0	96.3	93.6	89.8	93.3	89.2	91.6
		F	117.3	102.1	108.2	100.5	97.5	93.4	97.2	94.1	95.5
		P	140.1	117.4	125.9	118.4	112.0	107.5	112.4	106.7	110.6
283	220	C	114.5	92.1	97.8	94.8	93.8	84.5	84.7	86.7	86.0
		F	117.3	97.9	102.4	100.0	98.3	91.0	90.7	94.0	90.9
		P	139.8	116.1	122.8	116.6	114.9	102.2	107.4	106.3	109.4
287	238	C	115.0	92.3	86.3	90.8	91.1	87.0	87.4	86.5	87.1
		F	117.7	97.9	95.9	95.1	96.2	94.4	94.1	97.6	91.7
		P	142.5	118.0	110.4	111.7	109.4	105.7	109.4	104.0	106.9
291	359	C	114.5	98.5	102.9	97.8	75.3	91.8	87.9	84.6	84.7
		F	117.2	103.4	106.5	101.5	101.7	99.7	94.6	90.4	89.1
		P	142.3	122.4	127.3	119.6	120.6	114.0	109.5	105.8	104.5
295	419	C	112.7	102.7	99.8	97.2	91.4	88.3	83.3	84.9	84.0
		F	115.8	106.3	103.9	101.0	99.9	94.8	92.5	89.2	89.6
		P	140.7	127.6	123.1	119.2	110.3	107.6	101.7	105.3	106.8

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
299	435	C	115.5	105.2	97.2	98.3	95.1	93.7	89.3	86.9	89.8
		F	118.1	108.5	102.8	102.1	104.3	104.1	94.5	91.0	93.5
		P	144.9	130.6	121.0	120.8	115.9	114.8	109.5	110.4	113.2
303	219	C	112.2	30.0	81.7	97.7	82.2	78.2	0.0	0.0	0.0
		F	115.9	30.0	93.8	107.4	96.3	89.5	0.0	0.0	0.0
		P	136.7	30.0	103.0	109.7	97.8	91.4	0.0	0.0	0.0
307	240	C	112.4	91.4	79.1	81.6	80.4	77.8	0.0	0.0	0.0
		F	115.9	101.3	93.4	101.4	91.7	86.7	0.0	0.0	0.0
		P	137.0	114.1	101.7	106.6	93.1	88.6	0.0	0.0	0.0
311	258	C	114.3	92.1	80.7	83.7	82.3	78.6	0.0	0.0	0.0
		F	117.4	104.0	97.4	98.7	95.8	88.5	0.0	0.0	0.0
		P	138.7	116.0	101.1	104.7	96.7	90.8	0.0	0.0	0.0
315	407	C	113.1	84.5	69.6	84.9	81.0	77.1	77.7	0.0	0.0
		F	116.4	100.4	91.3	99.0	94.1	89.2	88.0	0.0	0.0
		P	137.8	108.1	93.7	106.2	97.9	90.2	90.2	0.0	0.0
319	429	C	113.4	83.1	75.1	81.9	80.9	77.1	75.7	0.0	0.0
		F	138.1	102.4	95.5	102.3	91.2	82.9	84.1	0.0	0.0
		P	137.9	106.2	95.6	109.4	93.6	85.6	87.3	0.0	0.0
323	445	C	114.2	82.1	68.1	81.9	80.8	77.1	76.9	0.0	0.0
		F	116.9	102.8	90.8	99.7	90.1	84.5	86.1	0.0	0.0
		P	139.5	126.8	93.3	101.8	94.8	87.3	87.6	0.0	0.0
329	228	C	30.0	30.0	84.9	90.3	85.2	90.5	0.0	0.0	0.0
		F	30.0	30.0	102.1	98.4	103.4	103.9	0.0	0.0	0.0
		P	30.0	30.0	102.8	100.1	105.8	103.9	0.0	0.0	0.0
333	245	C	30.0	30.0	86.8	88.9	84.1	86.8	0.0	0.0	0.0
		F	30.0	30.0	102.4	103.1	103.9	101.2	0.0	0.0	0.0
		P	30.0	30.0	103.9	108.0	104.9	104.4	0.0	0.0	0.0
337	300	C	30.0	30.0	88.2	84.0	87.0	86.0	0.0	0.0	0.0
		F	30.0	30.0	105.1	101.9	104.6	100.2	0.0	0.0	0.0
		P	30.0	30.0	104.9	109.2	107.9	103.5	0.0	0.0	0.0
341	415	C	30.0	30.0	91.4	95.8	88.3	87.5	86.0	84.2	82.4
		F	30.0	30.0	108.6	113.7	106.4	100.7	95.5	99.5	109.4
		P	30.0	30.0	108.9	117.5	107.4	103.1	96.5	101.9	106.4
345	433	C	30.0	30.0	90.5	91.0	85.3	87.4	86.5	85.3	79.9
		F	30.0	30.0	108.1	111.6	104.5	101.9	94.6	103.7	106.4
		P	30.0	30.0	107.2	116.4	105.8	101.4	96.7	106.3	102.9
349	455	C	30.0	30.0	85.5	94.1	86.7	86.9	86.8	30.0	30.0
		F	30.0	30.0	102.4	104.6	104.6	102.4	96.8	30.0	30.0
		P	30.0	30.0	102.8	110.5	106.2	104.4	99.4	30.0	30.0

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
11	1608	C	0.0	93.2	92.5	102.5	94.5	103.5	0.0	112.1	116.5
		F	0.0	99.0	96.9	105.1	99.2	106.2	0.0	114.8	118.6
		P	0.0	107.8	106.0	117.8	104.7	120.1	0.0	136.5	144.8
15	1633	C	85.9	94.2	92.9	98.2	100.1	104.1	0.0	111.5	117.5
		F	94.3	101.6	104.4	101.5	103.6	107.2	0.0	114.7	119.6
		P	98.3	108.7	110.1	112.6	115.6	120.2	0.0	135.6	145.8
21	1150	C	82.8	86.2	85.3	90.7	92.0	97.8	101.7	107.7	114.9
		F	89.4	102.7	93.8	93.5	95.6	100.6	104.9	110.1	117.1
		P	98.1	103.7	104.0	108.1	111.3	119.0	126.0	133.0	142.5
25	1209	C	85.0	86.3	87.2	90.1	93.8	96.2	101.7	104.8	115.8
		F	96.1	98.0	93.3	93.3	97.3	99.3	104.7	106.9	117.9
		P	101.7	104.0	103.1	109.8	113.3	117.5	126.0	129.1	142.9
29	1226	C	84.6	86.9	87.9	90.8	92.1	95.6	101.7	105.1	116.6
		F	92.3	97.9	93.2	94.2	95.4	98.4	104.2	107.2	118.5
		P	100.8	103.4	105.1	110.6	109.6	117.3	123.7	128.3	143.4
31	1507	C	91.9	91.7	94.0	97.4	89.4	101.6	105.7	111.2	117.2
		F	95.9	95.8	87.6	100.4	92.8	104.0	108.7	112.4	119.2
		P	104.9	103.8	105.8	110.2	103.7	106.7	127.8	134.1	144.5
35	1526	C	93.0	92.7	95.5	97.6	97.0	100.4	109.7	110.0	116.4
		F	97.8	98.6	99.9	100.1	100.6	103.4	112.4	112.1	118.8
		P	105.8	104.6	108.4	109.9	110.3	116.0	128.5	131.8	143.6
39	1544	C	91.0	91.8	95.0	98.7	97.7	101.7	106.4	110.8	116.0
		F	95.9	96.1	98.2	101.0	100.8	104.4	109.5	112.8	118.3
		P	102.6	102.7	106.5	111.3	111.8	116.8	128.6	132.8	143.1
45	1147	C	88.1	88.7	89.5	85.5	94.2	97.8	100.6	104.1	114.7
		F	93.4	97.1	95.1	86.7	98.1	100.6	104.2	108.0	116.9
		P	102.1	103.2	103.7	105.5	110.8	114.8	123.8	128.5	143.1
49	1209	C	93.3	93.2	94.0	94.3	95.3	100.2	103.5	107.3	116.8
		F	96.5	97.9	98.4	98.3	99.0	102.9	106.2	111.0	118.9
		P	110.7	111.3	111.0	111.8	111.4	117.9	125.8	132.0	145.2
57	1532	C	93.8	94.0	96.8	98.4	98.5	101.0	106.9	110.2	118.1
		F	99.2	101.5	103.3	102.5	103.0	105.1	109.7	113.2	120.2
		P	106.1	107.9	109.9	113.1	114.8	118.7	128.8	134.4	148.3
61	1550	C	93.7	95.0	95.2	99.0	100.1	101.9	108.6	111.2	115.8
		F	100.4	100.4	100.2	102.3	107.4	105.1	111.3	114.2	118.1
		P	108.0	108.2	109.0	113.6	115.0	118.4	130.7	136.4	146.1
68	1153	C	92.0	93.0	91.8	95.6	102.6	102.6	108.9	110.9	118.6
		F	98.0	102.4	97.5	98.9	106.0	105.4	110.9	113.9	120.6
		P	107.8	110.8	107.2	112.0	124.5	122.0	132.4	133.7	147.4
72	1211	C	87.4	88.3	87.1	90.8	96.9	98.6	105.0	107.9	116.8
		F	96.0	103.5	97.6	95.2	101.0	102.4	107.7	118.3	118.9
		P	103.6	104.2	102.8	107.2	115.0	118.2	127.1	133.7	145.5
76	1228	C	88.1	89.4	88.8	92.0	96.5	100.6	107.6	110.4	117.4
		F	98.2	100.7	98.8	95.8	99.9	103.4	109.6	114.7	119.5
		P	103.1	105.4	106.0	107.9	113.7	120.0	130.0	136.1	144.7
80	1555	C	89.5	91.1	90.7	94.2	97.3	99.3	118.0	109.3	118.7
		F	96.0	103.3	99.6	98.1	101.9	103.2	114.2	115.7	120.3
		P	106.1	108.3	105.6	108.9	112.8	117.6	130.1	131.1	147.1
84	1621	C	88.7	90.3	91.2	94.4	99.2	100.0	106.3	110.4	116.6
		F	96.4	105.1	101.4	99.4	103.9	104.4	109.7	116.1	118.6
		P	105.5	108.0	107.5	110.5	116.6	119.9	130.0	132.4	144.2
88	1639	C	89.0	85.2	90.8	96.2	96.7	100.5	106.6	112.0	118.3
		F	97.1	91.6	98.9	100.5	102.2	104.6	109.7	114.7	120.2
		P	104.2	108.8	106.0	111.7	114.9	120.6	130.7	134.5	146.5

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
92	1145	C	78.6	30.0	86.5	78.4	89.6	87.8	87.1	30.0	113.4
		F	93.2	30.0	89.7	82.7	94.9	92.9	94.1	30.0	116.6
		P	98.4	30.0	97.0	100.6	112.1	108.9	108.0	30.0	137.9
96	1208	C	76.1	75.4	77.1	87.4	82.8	93.6	30.0	98.0	114.0
		F	87.4	91.7	96.3	91.0	90.1	97.3	30.0	105.9	117.1
		P	94.3	96.3	98.3	108.6	99.7	116.6	30.0	121.3	137.7
100	1227	C	73.7	76.3	80.7	84.9	86.0	93.8	92.3	95.1	113.1
		F	89.5	93.5	90.7	89.3	90.7	96.7	95.8	112.1	116.4
		P	93.7	98.5	102.3	108.8	107.6	116.3	115.9	119.2	138.1
104	1521	C	79.7	77.8	79.6	81.3	89.0	95.5	103.6	109.2	116.3
		F	86.3	89.4	89.7	86.7	92.3	98.6	105.8	115.5	118.5
		P	94.7	96.0	100.0	103.7	111.0	118.1	126.7	137.3	142.0
108	1541	C	77.0	78.0	86.6	81.8	85.1	97.3	101.0	104.9	116.6
		F	85.6	86.8	95.8	85.6	88.6	100.0	103.6	113.3	118.5
		P	93.8	99.2	109.1	103.0	106.5	119.5	124.4	132.1	142.3
112	1558	C	73.6	81.2	78.8	87.6	84.4	91.6	98.0	100.2	115.4
		F	89.7	98.9	90.5	91.4	87.7	93.9	100.3	119.6	117.5
		P	90.3	97.5	101.4	110.1	104.9	115.9	123.5	128.3	142.0
116	1917	C	89.6	90.5	88.8	96.4	95.8	102.0	110.1	112.0	119.3
		F	95.0	96.1	94.6	101.7	101.6	106.0	112.7	116.5	121.2
		P	105.2	106.0	105.7	114.5	115.3	122.9	134.0	135.0	148.3
120	1935	C	88.3	89.3	88.8	93.9	99.0	100.9	110.2	108.9	119.3
		F	94.1	95.1	94.4	99.0	103.5	104.8	109.5	115.4	121.3
		P	105.4	105.0	108.7	111.1	118.3	121.4	129.6	134.0	148.0
124	1954	C	85.1	90.0	90.0	94.5	96.4	100.7	106.9	107.8	119.0
		F	91.7	99.0	95.9	100.3	101.3	104.5	110.4	115.3	121.0
		P	101.9	107.0	107.3	113.5	114.7	120.3	131.0	133.3	147.4
128	1934	C	74.2	76.5	30.0	0.0	79.6	87.4	95.0	102.8	115.2
		F	79.3	80.3	30.0	0.0	88.7	91.4	97.5	105.0	118.3
		P	97.8	96.6	30.0	0.0	103.9	110.0	120.6	131.5	142.5
132	1951	C	83.7	82.7	79.3	89.3	85.8	90.5	95.9	98.4	113.4
		F	88.6	87.3	83.8	93.0	91.0	94.6	98.6	101.5	116.2
		P	107.4	106.6	103.4	110.6	108.6	112.8	121.5	123.7	141.4
136	2009	C	90.9	80.8	79.2	91.3	92.3	92.4	99.4	103.7	116.4
		F	100.8	86.3	84.0	99.6	96.4	96.1	102.0	105.6	118.7
		P	114.8	103.9	104.8	114.3	116.7	123.9	124.2	133.3	144.3
140	2240	C	0.0	0.0	0.0	0.0	30.0	79.3	88.3	97.8	113.8
		F	0.0	0.0	0.0	0.0	90.5	85.2	92.6	100.6	117.1
		P	0.0	0.0	0.0	0.0	94.5	87.1	111.7	124.4	141.5
144	2301	C	0.0	0.0	0.0	0.0	30.0	80.6	86.2	98.7	114.5
		F	0.0	0.0	0.0	0.0	90.9	92.3	90.8	100.0	117.9
		P	0.0	0.0	0.0	0.0	95.0	95.6	111.0	124.9	143.4
148	2321	C	0.0	0.0	0.0	0.0	30.0	79.3	84.5	91.9	113.4
		F	0.0	0.0	0.0	0.0	82.6	84.0	89.6	97.0	116.6
		P	0.0	0.0	0.0	0.0	90.7	86.5	108.5	115.7	141.0
152	1942	C	73.5	72.3	0.0	0.0	30.0	80.9	0.0	89.4	110.9
		F	80.7	78.6	0.0	0.0	84.3	89.7	0.0	102.3	115.1
		P	95.7	96.1	0.0	0.0	89.7	92.3	0.0	112.0	135.4
156	2005	C	72.8	78.0	0.0	0.0	30.0	81.7	0.0	90.3	111.8
		F	80.1	83.8	0.0	0.0	86.0	94.6	0.0	97.7	115.6
		P	98.0	101.5	0.0	0.0	90.3	97.0	0.0	113.2	136.0
160	2025	C	71.6	78.9	0.0	78.5	30.0	78.3	0.0	89.8	112.3
		F	78.8	85.2	0.0	81.1	86.5	86.5	0.0	99.1	115.8
		P	94.8	103.8	0.0	92.9	94.1	90.3	0.0	112.3	137.1

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
164	2240	C	0.0	0.0	0.0	75.5	30.0	0.0	88.2	95.8	111.9
		F	0.0	0.0	0.0	84.9	92.7	0.0	94.7	99.9	115.3
		P	0.0	0.0	0.0	87.4	97.8	0.0	101.7	120.3	135.8
168	2258	C	0.0	0.0	71.9	74.5	30.0	0.0	88.3	97.9	114.3
		F	0.0	0.0	75.2	80.7	93.7	0.0	92.9	102.3	117.1
		P	0.0	0.0	95.5	93.5	94.1	0.0	105.0	121.5	139.6
172	2317	C	0.0	0.0	0.0	74.0	30.0	0.0	87.5	101.0	113.8
		F	0.0	0.0	0.0	80.3	91.7	0.0	93.6	104.6	117.1
		P	0.0	0.0	0.0	84.1	93.0	0.0	103.5	124.1	137.5
176	1918	C	93.3	93.8	95.9	97.8	30.0	100.7	102.5	106.7	115.6
		F	97.4	97.6	99.1	101.6	98.9	107.3	105.4	109.5	117.5
		P	113.8	114.5	116.8	121.1	118.2	125.3	127.1	133.2	144.9
180	1937	C	90.5	91.4	92.8	94.5	30.0	100.1	105.1	107.6	116.4
		F	95.2	95.5	95.9	98.0	96.6	102.7	107.5	109.6	118.4
		P	109.0	110.1	111.5	114.8	115.0	122.6	127.2	133.7	143.6
184	1953	C	91.9	94.2	30.0	96.9	30.0	103.4	107.0	110.3	117.6
		F	96.1	98.1	30.0	100.1	100.7	105.9	109.5	112.9	119.7
		P	107.6	111.0	30.0	116.4	120.2	126.3	132.4	133.7	146.0
188	2248	C	88.2	91.5	88.9	92.1	30.0	30.0	102.2	105.8	115.8
		F	92.8	96.6	91.3	95.3	94.5	30.0	105.6	108.4	117.9
		P	109.4	114.0	108.1	114.9	111.8	30.0	125.8	132.0	143.6
192	2307	C	90.3	90.4	30.0	30.0	30.0	98.5	83.4	104.8	115.7
		F	95.0	95.3	30.0	85.8	95.0	101.7	90.3	107.2	117.5
		P	111.6	114.2	30.0	100.1	111.8	121.8	105.9	135.3	144.7
194	2315	C	84.0	90.2	93.6	92.1	30.0	30.0	0.0	30.0	30.0
		F	89.3	94.5	99.9	95.7	93.7	30.0	0.0	30.0	30.0
		P	107.8	113.0	117.2	114.8	115.0	30.0	0.0	30.0	30.0
195	1933	C	0.0	0.0	0.0	0.0	30.0	84.3	92.7	101.8	116.6
		F	0.0	0.0	0.0	0.0	79.6	87.3	94.6	103.5	118.7
		P	0.0	0.0	0.0	0.0	88.6	103.7	118.3	132.1	143.6
199	1952	C	0.0	0.0	0.0	0.0	30.0	80.8	93.2	102.1	117.3
		F	0.0	0.0	0.0	0.0	78.4	83.0	94.9	103.1	118.7
		P	0.0	0.0	0.0	0.0	85.8	98.0	116.6	129.9	144.7
203	2010	C	0.0	0.0	0.0	0.0	30.0	79.7	90.6	100.3	116.9
		F	0.0	0.0	0.0	0.0	78.9	84.8	93.5	109.4	118.8
		P	0.0	0.0	0.0	0.0	83.7	94.3	113.3	129.9	144.2
209	2234	C	0.0	0.0	0.0	73.3	30.0	81.3	90.7	98.3	116.9
		F	0.0	0.0	0.0	77.4	82.0	84.7	94.4	99.2	118.6
		P	0.0	0.0	0.0	80.5	83.5	101.6	109.0	119.9	142.3
213	2253	C	0.0	0.0	0.0	73.0	30.0	83.6	96.3	98.8	116.6
		F	0.0	0.0	0.0	77.6	81.5	87.1	98.7	100.7	118.9
		P	0.0	0.0	0.0	82.4	92.6	106.4	121.9	118.8	140.8
217	2313	C	0.0	0.0	0.0	72.3	30.0	79.8	89.9	99.0	116.4
		F	0.0	0.0	0.0	75.2	81.5	86.1	91.9	99.9	118.2
		P	0.0	0.0	0.0	80.0	82.1	91.6	104.2	120.9	140.1
221	215	C	0.0	0.0	0.0	78.2	30.0	86.6	90.2	97.5	115.2
		F	0.0	0.0	0.0	89.4	82.2	104.5	96.9	110.0	118.8
		P	0.0	0.0	0.0	92.1	86.0	107.3	100.7	113.5	137.4
225	234	C	0.0	0.0	0.0	77.2	30.0	79.8	88.3	95.4	115.0
		F	0.0	0.0	0.0	85.7	81.9	91.3	93.8	99.2	119.2
		P	0.0	0.0	0.0	91.2	83.3	98.9	99.2	115.0	138.8
229	253	C	0.0	0.0	0.0	77.0	30.0	74.4	89.5	91.6	115.0
		F	0.0	0.0	0.0	87.3	84.1	87.7	93.8	97.8	118.5
		P	0.0	0.0	0.0	90.6	88.3	89.4	107.1	113.6	137.2

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
233	416	C	0.0	0.0	0.0	81.8	30.0	77.3	90.7	93.6	115.0
		F	0.0	0.0	0.0	101.3	84.4	87.7	97.5	107.1	118.8
		P	0.0	0.0	0.0	104.8	86.0	90.0	98.6	113.1	136.5
237	433	C	0.0	0.0	0.0	81.4	30.0	79.2	90.8	92.3	115.0
		F	0.0	0.0	0.0	99.8	85.1	94.1	97.7	102.7	119.0
		P	0.0	0.0	0.0	102.9	86.8	97.1	97.5	111.9	135.5
241	449	C	0.0	0.0	0.0	80.0	30.0	77.5	89.8	94.3	114.8
		F	0.0	0.0	0.0	95.7	75.8	91.7	96.8	108.2	118.5
		P	0.0	0.0	0.0	99.6	85.2	95.0	101.0	114.7	137.2
245	217	C	86.1	84.9	96.3	87.5	94.5	91.4	99.9	106.7	117.2
		F	89.6	87.9	96.4	94.8	98.4	95.1	102.5	109.1	119.6
		P	105.3	105.3	113.2	109.7	117.3	112.7	124.4	133.2	144.3
249	236	C	91.7	88.8	87.4	89.1	88.6	91.6	100.8	110.9	119.1
		F	94.6	92.4	95.2	97.4	94.8	93.8	103.3	113.3	120.9
		P	108.6	107.4	109.2	112.9	110.5	115.7	125.3	134.8	147.1
253	255	C	80.2	82.5	89.5	86.1	90.6	97.0	100.7	109.7	119.2
		F	84.5	87.1	95.1	96.9	95.7	100.3	103.4	112.4	121.5
		P	98.4	105.4	112.7	107.3	111.5	119.2	122.8	132.6	145.9
257	417	C	89.4	90.0	89.0	94.1	91.9	91.7	98.9	107.0	118.5
		F	97.4	98.8	94.2	98.4	96.5	94.6	101.1	109.2	120.3
		P	110.8	113.2	109.6	116.2	114.9	114.9	124.8	134.3	147.2
263	446	C	83.6	84.0	83.4	87.0	90.8	91.0	96.4	99.1	116.8
		F	95.2	90.7	89.1	91.0	94.1	94.5	99.0	102.0	119.0
		P	104.4	106.7	103.2	109.2	111.5	113.9	121.6	126.9	142.9
265	454	C	87.9	88.0	84.8	87.2	85.7	90.0	99.7	101.3	117.3
		F	95.0	92.1	88.9	92.2	90.4	94.1	102.4	103.8	119.3
		P	111.2	110.8	105.9	108.9	104.8	112.3	124.6	128.4	143.4
269	348	C	30.0	30.0	88.1	86.1	91.2	95.3	101.4	105.1	30.0
		F	30.0	30.0	100.0	92.1	99.7	99.5	104.5	108.3	30.0
		P	30.0	30.0	111.2	107.4	114.0	119.0	122.2	127.9	30.0
273	409	C	30.0	30.0	84.2	87.8	89.2	97.3	98.1	97.9	30.0
		F	30.0	30.0	101.6	93.8	97.5	100.1	100.1	102.1	30.0
		P	30.0	30.0	104.6	109.0	110.2	119.8	115.2	121.3	30.0
277	428	C	30.0	30.0	86.9	89.1	91.4	92.4	102.1	97.8	30.0
		F	30.0	30.0	101.7	94.1	99.9	96.9	104.1	102.0	30.0
		P	30.0	30.0	108.1	110.4	114.7	115.9	126.3	123.0	30.0
281	211	C	0.0	0.0	0.0	82.9	81.4	79.9	89.3	97.1	116.0
		F	0.0	0.0	0.0	90.4	90.3	88.5	94.0	101.6	118.7
		P	0.0	0.0	0.0	92.9	100.5	97.2	111.7	120.7	139.6
285	230	C	0.0	0.0	0.0	82.3	83.5	80.5	88.1	98.7	116.2
		F	0.0	0.0	0.0	90.3	94.6	90.9	94.4	103.1	118.5
		P	0.0	0.0	0.0	91.4	96.9	99.4	111.4	126.7	141.2
289	247	C	72.6	74.0	75.0	83.3	81.8	83.1	90.8	98.6	116.0
		F	76.3	77.7	78.8	88.5	92.7	92.2	96.8	103.1	118.9
		P	94.0	91.9	95.1	98.5	98.6	102.7	113.9	123.1	139.6
293	411	C	77.7	76.7	82.9	83.3	84.3	83.8	83.5	92.9	115.6
		F	89.1	95.2	91.0	89.8	96.1	100.5	90.3	97.7	118.8
		P	100.2	100.5	105.7	103.7	108.3	104.1	104.9	117.5	138.0
297	427	C	68.9	73.5	75.5	82.2	83.5	84.3	92.1	96.7	116.6
		F	85.5	90.1	90.0	90.6	95.3	97.0	99.3	100.6	118.9
		P	93.0	95.6	96.6	94.7	104.6	105.1	114.6	121.2	140.5
301	444	C	75.0	78.3	80.1	80.2	84.4	88.4	88.9	95.1	116.1
		F	89.4	90.6	93.9	87.5	94.9	99.8	94.6	99.1	118.9
		P	99.5	101.4	103.1	101.0	104.9	113.9	113.5	120.4	139.0

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
305	231	C	85.3	84.2	92.5	94.6	92.6	96.3	104.9	111.3	118.2
		F	106.1	99.3	97.4	99.0	98.4	99.6	108.0	114.0	120.8
		P	106.2	106.1	115.5	117.5	116.6	118.8	128.7	136.9	144.4
309	250	C	92.3	90.9	89.0	89.9	92.7	94.5	102.3	106.6	118.2
		F	103.0	104.1	97.5	101.3	97.4	98.3	105.6	109.2	120.2
		P	114.8	114.5	111.7	113.5	116.8	117.6	125.3	132.0	146.0
313	308	C	90.0	88.3	92.4	92.7	92.1	98.1	98.4	105.5	119.2
		F	103.7	97.9	99.1	102.0	97.5	102.2	102.6	109.2	121.0
		P	112.7	112.0	114.0	116.6	115.1	121.3	122.0	130.3	147.8
317	419	C	89.3	89.4	83.7	87.5	89.8	96.3	102.2	107.0	118.2
		F	99.7	107.5	93.0	101.8	96.1	100.2	104.9	109.4	120.2
		P	108.4	109.7	104.3	108.2	110.8	117.2	125.0	134.8	145.9
321	437	C	83.6	85.3	86.9	92.2	92.8	99.7	101.8	109.4	117.4
		F	102.8	104.4	95.0	97.8	96.9	102.1	104.5	111.2	119.2
		P	104.7	106.0	104.6	113.0	116.6	121.8	124.4	133.1	146.0
325	453	C	84.4	85.1	83.2	87.7	91.6	92.5	97.2	104.0	117.2
		F	101.0	98.9	91.3	102.0	95.7	96.0	99.9	106.6	119.2
		P	102.7	102.8	99.7	106.0	111.0	114.4	121.5	130.0	144.7
327	219	C	30.0	30.0	89.5	90.5	95.4	96.2	30.0	108.1	119.2
		F	30.0	30.0	102.9	96.6	106.4	103.3	30.0	111.3	120.9
		P	30.0	30.0	102.1	107.2	113.6	116.4	30.0	130.0	147.8
331	236	C	30.0	30.0	87.6	92.7	89.3	95.1	104.9	108.0	116.4
		F	30.0	30.0	103.6	99.9	101.9	101.4	107.8	114.4	118.2
		P	30.0	30.0	104.4	105.2	109.8	115.3	127.6	130.0	143.2
335	252	C	30.0	30.0	92.2	93.1	93.8	97.9	100.5	110.0	119.7
		F	30.0	30.0	105.6	108.6	108.3	102.7	105.1	113.2	121.2
		P	30.0	30.0	110.8	116.4	115.4	118.4	123.4	133.6	148.8
339	407	C	30.0	30.0	90.2	91.7	93.4	95.3	101.0	108.3	119.0
		F	30.0	30.0	103.6	104.2	105.6	102.5	104.1	111.9	121.0
		P	30.0	30.0	103.2	108.2	114.2	115.1	124.4	130.6	146.8
343	424	C	30.0	30.0	92.0	94.7	93.2	30.0	104.6	111.4	119.6
		F	30.0	30.0	106.7	114.2	107.3	30.0	107.8	114.3	121.2
		P	30.0	30.0	107.0	121.9	111.2	30.0	127.6	133.1	147.8
347	441	C	30.0	30.0	89.8	92.1	96.1	96.9	103.5	112.5	119.6
		F	30.0	30.0	107.7	110.2	105.0	103.3	107.1	115.5	121.4
		P	30.0	30.0	109.1	112.2	118.2	116.0	125.9	135.0	149.5

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
10	1602	C	0.0	109.7	104.7	103.5	100.5	95.4	0.0	84.9	82.1
		F	0.0	114.4	109.4	107.3	105.2	100.3	0.0	91.4	101.7
		P	0.0	133.2	127.4	124.6	122.7	116.0	0.0	104.2	101.7
14	1626	C	117.6	101.0	97.9	95.7	93.4	89.1	0.0	81.8	74.0
		F	121.5	106.9	105.1	100.9	99.9	94.7	0.0	88.4	94.9
		P	143.3	125.5	121.7	118.3	114.8	110.1	0.0	98.5	93.8
18	1652	C	118.3	108.9	103.9	101.8	93.0	91.8	0.0	88.7	82.7
		F	122.2	113.5	112.4	106.7	99.4	97.8	0.0	94.9	93.9
		P	144.3	136.5	127.2	125.5	114.8	113.7	0.0	110.0	105.6
20	1145	C	117.1	107.7	105.2	100.2	98.9	97.6	95.2	93.4	92.7
		F	121.6	114.0	110.0	106.2	104.8	102.7	100.6	99.4	99.1
		P	143.7	133.2	127.7	123.5	121.6	118.6	115.0	114.0	112.0
24	1204	C	117.7	107.6	109.6	102.9	101.2	98.6	96.5	95.4	93.1
		F	122.6	112.3	113.7	107.7	106.4	103.5	101.6	101.4	99.5
		P	142.9	135.5	134.7	126.8	123.5	120.1	115.7	115.2	112.4
28	1222	C	119.6	108.6	109.3	105.0	101.3	99.7	97.2	96.2	93.9
		F	123.8	113.5	114.0	109.3	106.6	104.1	101.9	101.8	99.8
		P	145.0	134.3	132.2	129.1	123.5	118.6	115.4	115.7	112.4
34	1522	C	116.3	104.9	105.1	100.4	98.0	96.0	94.4	91.4	88.7
		F	121.4	110.3	109.4	105.4	103.2	101.3	100.1	95.3	100.7
		P	141.7	131.4	129.3	121.5	117.2	114.3	112.4	110.6	106.0
38	1539	C	119.1	111.7	107.2	103.7	99.9	100.3	98.3	97.5	90.9
		F	123.4	115.5	111.9	108.1	109.5	104.8	103.2	102.3	103.9
		P	145.1	138.0	133.6	126.3	118.6	118.5	115.9	114.6	108.8
42	1557	C	117.6	110.6	107.7	105.2	101.4	99.9	96.5	96.5	89.9
		F	122.6	115.2	112.7	109.5	106.5	104.8	102.3	102.0	99.7
		P	142.9	136.9	132.9	127.9	122.5	119.3	116.0	114.8	107.9
44	1143	C	120.0	99.9	95.5	100.4	96.0	91.9	88.2	87.0	81.3
		F	123.5	106.3	102.8	106.0	101.6	97.7	92.1	93.9	90.9
		P	146.1	124.5	120.6	123.3	117.8	114.8	107.8	107.1	100.6
48	1204	C	119.8	99.5	106.4	98.8	97.3	95.7	93.6	89.2	86.9
		F	123.8	107.7	111.1	105.1	102.6	101.3	98.4	95.4	93.6
		P	145.1	123.7	133.3	121.5	122.2	117.9	114.7	110.8	107.2
52	1223	C	120.1	99.8	106.9	96.8	96.6	92.6	85.1	82.1	67.9
		F	124.0	106.9	112.0	103.1	101.3	98.1	90.2	89.1	81.2
		P	145.1	124.5	132.7	118.9	120.0	113.4	108.8	105.5	89.3
56	1527	C	115.5	101.1	87.3	80.5	88.3	82.4	80.9	78.9	78.1
		F	120.4	108.6	102.9	85.4	96.0	87.9	89.2	92.6	102.4
		P	141.1	123.3	111.0	90.2	96.7	89.3	87.9	93.9	100.9
60	1545	C	115.8	103.9	100.0	88.4	85.4	82.5	89.9	78.7	79.2
		F	121.1	110.8	105.6	91.7	91.6	90.6	94.1	92.8	104.7
		P	140.9	128.0	125.7	111.1	103.1	92.1	91.9	97.6	102.4
64	1603	C	116.6	97.7	90.1	83.5	87.8	81.0	85.0	74.6	78.0
		F	121.5	108.6	103.1	88.9	95.7	88.5	86.2	90.2	103.8
		P	141.8	120.7	113.8	106.8	99.1	90.2	92.3	89.8	103.0
67	1149	C	116.1	99.0	88.7	92.4	91.2	86.4	90.1	87.2	86.6
		F	120.9	122.9	100.4	100.4	98.2	92.8	95.3	98.6	101.2
		P	141.5	120.8	110.2	116.5	117.8	105.7	111.4	110.5	106.5
71	1207	C	115.6	97.6	89.6	100.4	98.8	91.0	91.6	89.2	89.0
		F	120.3	105.8	99.2	104.2	100.6	97.1	98.1	100.4	105.9
		P	141.4	117.2	111.9	127.7	114.8	112.8	114.0	110.9	110.7
75	1224	C	115.0	107.2	92.0	94.1	92.0	87.1	92.5	88.3	87.4
		F	120.2	116.5	101.4	101.4	99.6	95.2	99.1	98.0	102.0
		P	140.7	129.6	116.4	119.2	114.9	111.3	112.2	112.5	109.8

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
79	1550	C	116.0	106.8	80.2	79.1	79.5	80.7	82.2	76.8	80.9
		F	121.0	106.4	102.8	84.0	102.5	89.8	99.3	97.0	107.7
		P	141.7	115.3	105.0	92.3	103.8	92.2	99.8	96.5	104.7
83	1617	C	116.5	105.2	73.9	81.4	83.3	79.0	82.5	80.5	71.4
		F	121.2	105.9	100.7	84.6	94.5	86.4	90.8	99.4	99.0
		P	141.8	116.5	100.4	92.8	97.6	88.3	91.7	100.1	95.8
87	1635	C	117.3	105.3	74.9	79.6	82.0	79.7	84.0	79.9	78.8
		F	121.9	106.8	104.8	85.3	95.4	89.6	98.6	98.6	103.1
		P	142.5	110.3	103.0	91.6	98.9	92.6	96.6	97.4	102.1
91	1139	C	118.7	102.6	95.5	84.5	82.1	81.1	82.3	30.0	76.4
		F	122.7	107.3	100.1	88.0	89.4	84.7	87.3	30.0	105.3
		P	145.7	128.5	125.3	110.4	101.2	87.7	88.0	30.0	101.2
95	1204	C	118.3	101.4	91.2	82.5	92.0	80.8	82.4	75.8	73.8
		F	122.2	106.4	98.3	88.9	97.3	84.6	88.0	92.5	101.7
		P	146.4	128.0	116.5	105.0	99.3	90.0	86.3	93.3	98.9
99	1223	C	119.0	103.8	95.9	88.5	82.7	81.6	82.4	77.0	77.2
		F	122.7	107.6	101.7	93.3	88.0	84.9	85.7	96.0	103.8
		P	146.5	130.6	122.0	113.2	104.0	94.8	87.3	97.4	100.5
103	1517	C	118.2	101.8	95.8	87.8	81.9	82.0	88.6	0.0	0.0
		F	122.3	107.9	100.1	90.4	84.4	83.0	105.5	0.0	0.0
		P	144.9	128.1	124.1	115.0	104.3	97.9	106.5	0.0	0.0
107	1536	C	119.2	100.7	93.6	85.8	81.0	80.0	0.0	0.0	0.0
		F	122.9	107.6	98.1	89.6	83.1	81.4	0.0	0.0	0.0
		P	146.1	128.9	122.9	110.4	98.9	89.5	0.0	0.0	0.0
111	1554	C	119.5	101.9	94.3	86.1	81.9	79.5	0.0	0.0	0.0
		F	123.0	107.7	100.9	88.9	83.8	80.7	0.0	0.0	0.0
		P	147.0	130.1	123.5	111.5	99.9	88.0	0.0	0.0	0.0
115	1912	C	115.2	110.5	78.7	81.9	78.1	81.8	84.7	80.4	78.6
		F	120.5	125.1	106.7	88.7	84.1	92.8	93.5	99.3	102.4
		P	141.1	125.4	104.4	93.5	102.8	95.1	92.8	98.3	99.2
119	1931	C	115.7	95.4	80.5	80.2	0.0	80.4	86.6	80.3	80.6
		F	120.5	115.2	104.4	86.5	0.0	91.9	93.6	101.3	103.9
		P	141.3	114.8	103.6	93.5	0.0	95.0	93.2	101.0	104.7
123	1950	C	115.9	105.0	76.7	79.2	0.0	81.0	86.0	79.8	79.7
		F	120.7	128.3	106.6	84.4	0.0	91.7	92.8	97.1	105.8
		P	141.5	129.0	104.0	89.9	0.0	94.9	90.9	98.6	103.6
127	1930	C	118.5	99.7	30.0	77.3	30.0	79.8	88.5	72.0	73.3
		F	122.7	105.4	30.0	81.7	30.0	83.6	95.6	85.8	101.6
		P	145.0	125.3	30.0	95.0	30.0	84.2	97.2	86.9	98.1
131	1948	C	118.3	98.5	82.4	74.9	30.0	80.5	88.5	71.4	73.4
		F	122.5	104.6	97.8	83.2	30.0	83.8	93.3	85.6	100.7
		P	144.2	122.7	111.0	87.3	30.0	103.6	92.0	87.2	97.8
135	2005	C	118.7	98.5	87.8	74.7	0.0	80.2	89.7	71.5	71.8
		F	122.6	104.1	94.9	79.1	0.0	84.1	94.8	83.8	100.9
		P	145.2	125.3	113.3	88.0	0.0	85.6	93.0	86.2	98.8
139	2234	C	117.9	98.0	98.2	95.8	30.0	88.4	86.0	86.0	86.5
		F	122.4	105.7	105.2	101.5	30.0	94.6	93.8	94.4	95.5
		P	143.8	123.7	122.7	120.4	30.0	112.1	112.5	110.7	110.7
143	2256	C	117.9	99.9	98.5	101.8	30.0	93.6	89.1	90.4	91.8
		F	122.4	106.7	105.6	107.5	101.2	99.0	96.7	97.8	99.3
		P	143.8	126.1	125.1	125.6	117.9	115.9	113.5	111.9	114.1
147	2316	C	118.3	100.0	94.6	96.0	30.0	91.4	94.6	89.5	90.5
		F	122.6	106.2	102.8	101.5	96.7	98.1	100.2	97.7	98.0
		P	144.5	125.7	119.9	118.9	119.7	114.1	117.9	113.3	114.4

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
151	1936	C	122.1	112.2	108.4	93.3	30.0	82.8	0.0	0.0	0.0
		F	125.8	115.5	113.7	99.7	93.0	92.9	0.0	0.0	0.0
		P	148.9	141.6	133.1	114.6	108.9	102.6	0.0	0.0	0.0
155	1959	C	120.5	111.2	104.5	93.5	30.0	82.2	0.0	0.0	0.0
		F	124.1	114.7	110.0	100.5	89.8	91.9	0.0	0.0	0.0
		P	147.0	139.4	129.1	117.9	104.9	101.4	0.0	0.0	0.0
159	2021	C	121.3	112.5	107.8	96.7	30.0	86.5	0.0	0.0	82.3
		F	124.9	116.4	113.4	101.3	91.7	94.0	0.0	0.0	90.5
		P	149.9	141.2	131.3	119.9	108.3	106.7	0.0	0.0	106.1
163	2236	C	120.4	110.7	105.0	97.2	30.0	90.8	82.3	75.5	83.8
		F	124.0	114.3	110.4	104.9	103.3	96.2	91.0	85.4	104.2
		P	148.4	137.1	129.2	122.2	114.1	113.7	106.5	102.8	103.6
167	2254	C	121.2	110.6	105.7	102.1	30.0	94.0	91.5	82.9	84.5
		F	125.0	114.7	111.0	107.8	99.0	100.1	97.4	91.3	105.0
		P	147.9	136.7	128.1	125.0	115.0	116.3	113.9	106.3	108.4
171	2312	C	120.6	111.4	107.0	102.5	30.0	90.6	86.8	84.6	83.9
		F	124.4	115.3	111.7	108.6	105.0	97.2	93.8	90.2	102.6
		P	147.1	138.9	131.8	126.5	120.1	113.7	112.6	104.8	106.2
175	1913	C	117.9	99.7	84.3	73.1	30.0	79.3	0.0	0.0	0.0
		F	121.9	105.4	90.1	76.4	82.1	80.8	0.0	0.0	0.0
		P	145.9	129.2	111.2	88.0	83.3	81.6	0.0	0.0	0.0
179	1932	C	116.6	110.2	77.5	71.9	30.0	30.0	0.0	0.0	0.0
		F	121.4	117.8	87.4	74.8	82.2	30.0	0.0	0.0	0.0
		P	141.9	134.9	103.0	80.1	82.9	30.0	0.0	0.0	0.0
183	1949	C	116.4	104.5	77.8	70.4	30.0	79.3	0.0	0.0	0.0
		F	120.8	115.7	89.7	87.7	81.7	89.7	0.0	0.0	0.0
		P	142.8	130.1	102.2	94.0	84.6	82.9	0.0	0.0	0.0
187	2243	C	121.1	97.5	80.0	72.1	30.0	79.8	0.0	0.0	0.0
		F	124.5	103.8	90.1	78.9	84.3	81.8	0.0	0.0	0.0
		P	149.0	128.4	107.0	84.7	83.3	82.9	0.0	0.0	0.0
191	2302	C	120.3	103.9	30.0	68.6	30.0	78.6	0.0	0.0	0.0
		F	124.2	107.2	30.0	74.8	83.2	80.6	0.0	0.0	0.0
		P	146.3	134.5	30.0	81.0	82.9	82.9	0.0	0.0	0.0
198	1948	C	120.0	112.8	106.7	103.4	30.0	95.5	95.2	94.0	94.1
		F	123.6	115.9	111.1	108.4	97.8	100.8	100.5	99.9	103.2
		P	147.7	142.3	129.5	126.7	113.6	115.0	114.8	113.4	112.7
202	2006	C	119.7	109.3	106.9	103.6	30.0	97.4	96.2	94.6	95.0
		F	123.7	113.2	110.7	108.6	99.3	102.6	100.9	100.7	102.0
		P	146.6	136.8	130.4	127.1	116.4	117.8	115.0	113.4	113.4
206	2022	C	119.9	110.2	106.9	103.8	30.0	97.6	95.8	94.9	94.5
		F	123.8	113.5	111.3	109.0	100.3	103.5	100.5	101.0	103.8
		P	146.9	135.9	129.9	128.2	117.6	118.8	114.6	115.1	113.6
208	2227	C	120.9	111.9	111.3	107.0	30.0	100.4	98.2	96.8	98.2
		F	124.3	116.7	116.1	112.2	102.3	105.3	102.7	102.7	103.6
		P	148.9	139.4	134.1	129.5	120.0	120.6	115.6	115.7	116.0
212	2249	C	121.1	111.1	110.5	106.7	30.0	100.5	97.2	96.4	97.3
		F	124.6	116.9	115.9	111.9	103.1	105.5	102.0	102.5	102.8
		P	148.6	135.0	134.7	128.4	120.2	119.9	114.5	115.2	114.9
216	2308	C	121.7	111.9	109.2	105.6	30.0	100.8	98.4	96.7	97.9
		F	124.8	116.9	114.1	110.5	102.5	105.6	102.8	102.4	102.8
		P	150.1	135.9	133.0	129.7	119.8	119.2	115.1	115.9	115.6
220	210	C	120.2	112.2	107.4	30.0	30.0	98.7	95.3	93.7	94.1
		F	123.9	115.7	113.0	30.0	100.4	103.3	100.8	107.5	110.3
		P	148.1	141.3	130.4	30.0	116.8	118.9	116.0	118.7	116.3

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
224	230	C	122.2	111.4	107.9	102.3	30.0	93.5	90.9	91.0	94.1
		F	125.7	114.8	112.7	108.8	97.9	98.8	96.7	98.1	109.7
		P	149.0	139.3	132.6	125.6	114.9	115.9	108.7	111.6	116.5
228	249	C	120.6	112.3	106.6	96.7	30.0	93.0	91.4	90.1	91.7
		F	124.1	115.0	111.2	104.6	67.6	98.7	97.9	98.2	107.8
		P	149.4	143.1	131.6	121.8	115.3	114.9	109.2	112.8	114.7
232	411	C	120.0	114.5	105.1	98.9	30.0	97.5	94.1	94.4	91.8
		F	123.7	117.3	110.9	106.9	95.2	103.8	101.2	103.8	110.2
		P	146.7	143.2	128.5	122.3	111.7	119.0	114.0	116.5	114.8
235	424	C	115.3	108.5	102.1	93.9	30.0	93.7	92.0	89.7	92.1
		F	118.0	111.9	106.9	102.3	91.1	98.8	97.6	99.8	110.1
		P	141.8	132.5	125.3	115.2	106.2	115.6	111.3	106.0	111.4
236	428	C	120.9	111.3	104.4	96.9	30.0	97.3	94.5	92.5	91.3
		F	124.0	114.8	110.0	105.4	95.0	103.9	100.7	106.7	111.7
		P	149.7	138.4	128.9	121.1	110.8	119.4	116.2	110.4	111.4
240	445	C	117.9	111.5	104.6	103.9	30.0	99.0	95.7	95.5	93.9
		F	122.6	115.9	110.4	111.0	87.9	106.1	102.9	109.4	112.0
		P	144.4	140.5	126.9	127.1	111.6	122.6	117.7	116.4	116.3
244	210	C	117.5	89.6	79.5	69.3	93.1	86.3	82.2	0.0	0.0
		F	121.6	100.7	92.9	81.7	92.6	93.0	85.2	0.0	0.0
		P	144.2	114.4	105.3	93.6	117.2	109.3	104.8	0.0	0.0
248	232	C	117.1	89.0	78.2	78.3	30.0	89.9	0.0	0.0	0.0
		F	121.6	99.6	92.8	88.2	30.0	91.7	0.0	0.0	0.0
		P	142.4	113.8	104.1	93.9	30.0	97.7	0.0	0.0	0.0
252	249	C	116.5	94.8	30.0	75.5	84.6	92.6	0.0	0.0	0.0
		F	121.2	103.3	30.0	89.3	91.3	97.5	0.0	0.0	0.0
		P	141.9	120.2	30.0	96.1	117.6	117.6	0.0	0.0	0.0
256	412	C	119.9	99.4	83.5	76.0	84.1	81.4	89.7	0.0	0.0
		F	123.6	106.3	91.9	81.0	89.9	87.6	90.8	0.0	0.0
		P	146.2	126.1	108.5	92.0	104.9	103.1	95.6	0.0	0.0
260	430	C	119.8	99.8	88.0	77.2	82.8	77.6	87.7	0.0	0.0
		F	123.7	106.3	95.7	81.5	86.7	87.7	88.0	0.0	0.0
		P	145.8	124.5	111.3	89.4	89.9	91.1	87.1	0.0	0.0
262	442	C	119.6	105.3	93.0	74.8	81.3	77.8	88.0	0.0	0.0
		F	123.7	109.3	99.3	80.0	86.6	80.6	89.0	0.0	0.0
		P	145.2	133.9	116.5	88.9	91.0	90.7	87.1	0.0	0.0
268	344	C	30.0	30.0	87.2	87.4	83.0	83.1	97.2	74.5	30.0
		F	30.0	30.0	103.5	92.5	103.6	91.0	98.3	85.7	30.0
		P	30.0	30.0	108.6	99.2	102.9	102.3	97.0	92.8	30.0
272	405	C	30.0	30.0	82.0	85.7	84.2	80.9	96.8	70.7	30.0
		F	30.0	30.0	96.5	93.7	101.3	87.4	97.0	83.4	30.0
		P	30.0	30.0	108.1	98.8	101.0	102.4	94.1	84.4	30.0
276	424	C	30.0	30.0	85.9	86.6	83.8	79.1	95.8	75.4	30.0
		F	30.0	30.0	101.4	94.0	98.8	90.2	96.7	87.1	30.0
		P	30.0	30.0	109.1	103.6	99.4	92.2	96.7	90.9	30.0
280	205	C	118.2	98.8	103.6	99.8	96.6	93.3	91.2	89.0	89.5
		F	122.6	104.5	108.3	106.5	101.8	100.1	97.5	96.1	96.8
		P	144.0	124.0	128.0	123.9	117.7	113.0	113.6	111.1	111.7
284	225	C	118.5	96.6	100.1	30.0	94.9	95.9	92.0	90.8	93.8
		F	122.9	103.7	106.8	30.0	102.5	101.2	97.6	98.4	100.1
		P	144.6	122.2	123.6	30.0	117.8	117.8	111.6	110.6	116.4
288	242	C	118.0	98.1	94.0	95.4	91.7	90.5	92.2	90.3	91.1
		F	122.7	104.7	102.8	101.7	99.9	96.9	99.3	102.0	98.8
		P	144.1	123.3	115.3	117.5	111.9	110.5	115.7	112.1	112.2

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
292	405	C	119.4	105.7	104.9	101.4	99.0	97.2	89.2	90.7	93.9
		F	123.5	110.9	110.1	107.7	105.4	103.9	96.2	97.7	100.9
		P	145.6	132.4	128.6	125.0	123.3	120.2	111.6	113.2	118.8
296	423	C	118.3	108.1	105.9	99.1	93.2	93.5	88.1	85.1	87.9
		F	122.6	112.4	121.0	105.3	102.9	105.2	95.1	93.0	96.1
		P	144.2	135.8	130.2	121.3	115.3	118.6	109.4	105.5	112.8
300	440	C	118.6	106.5	107.6	102.9	84.9	97.6	87.7	86.3	86.3
		F	122.8	111.6	112.4	108.6	104.6	107.9	97.1	92.9	95.1
		P	144.9	131.9	133.6	124.8	120.2	121.6	109.7	108.4	111.7
304	225	C	116.6	95.0	82.4	82.8	80.6	77.6	0.0	0.0	0.0
		F	121.4	104.5	95.9	102.7	93.6	88.8	0.0	0.0	0.0
		P	142.1	120.0	107.4	105.2	94.8	90.4	0.0	0.0	0.0
308	246	C	117.3	94.5	83.0	83.8	81.1	77.6	0.0	0.0	0.0
		F	122.4	103.9	97.3	101.5	96.6	86.8	0.0	0.0	0.0
		P	142.7	120.1	107.6	104.4	97.4	87.7	0.0	0.0	0.0
312	303	C	117.2	96.0	83.8	83.9	80.6	77.1	0.0	0.0	0.0
		F	122.3	106.1	97.2	98.6	92.4	81.8	0.0	0.0	0.0
		P	142.7	121.1	118.3	99.9	94.7	84.0	0.0	0.0	0.0
316	414	C	117.2	86.7	76.5	83.5	77.1	76.4	77.4	0.0	0.0
		F	121.9	101.0	93.7	102.3	88.5	84.4	87.4	0.0	0.0
		P	142.9	111.6	98.2	108.3	95.4	86.6	90.9	0.0	0.0
320	433	C	118.1	88.6	73.9	82.6	80.5	74.3	77.5	0.0	0.0
		F	122.7	103.9	91.7	97.6	92.8	81.7	87.2	0.0	0.0
		P	144.5	114.3	98.8	100.5	95.3	85.0	85.4	0.0	0.0
324	449	C	118.9	87.3	74.2	86.0	81.9	77.8	77.5	0.0	0.0
		F	123.0	102.2	92.5	95.5	94.4	85.2	86.8	0.0	0.0
		P	146.2	113.7	97.9	98.6	96.9	89.0	90.2	0.0	0.0
330	232	C	30.0	30.0	87.2	91.8	87.5	88.5	0.0	0.0	0.0
		F	30.0	30.0	102.8	100.2	100.8	101.4	0.0	0.0	0.0
		P	30.0	30.0	103.4	104.1	103.4	103.7	0.0	0.0	0.0
334	248	C	30.0	30.0	86.4	91.3	81.7	97.9	0.0	0.0	0.0
		F	30.0	30.0	103.6	103.8	103.7	113.6	0.0	0.0	0.0
		P	30.0	30.0	130.0	114.6	107.6	115.7	0.0	0.0	0.0
338	305	C	30.0	30.0	88.6	85.4	85.0	87.9	0.0	0.0	0.0
		F	30.0	30.0	104.4	103.6	103.2	102.4	0.0	0.0	0.0
		P	30.0	30.0	105.4	107.0	106.8	108.0	0.0	0.0	0.0
342	420	C	30.0	30.0	89.1	92.6	87.7	86.7	86.6	84.2	84.0
		F	30.0	30.0	108.3	108.0	106.0	100.8	95.9	100.4	106.7
		P	30.0	30.0	107.4	112.8	106.6	102.3	97.5	107.2	105.4
346	436	C	30.0	30.0	90.8	92.0	85.7	84.4	85.7	81.7	77.4
		F	30.0	30.0	106.8	108.9	102.4	100.0	95.5	92.8	106.0
		P	30.0	30.0	107.0	113.7	104.5	103.2	98.9	96.9	102.5
350	459	C	30.0	30.0	84.7	90.1	85.6	88.1	88.3	30.0	30.0
		F	30.0	30.0	104.9	104.7	105.6	102.8	97.6	30.0	30.0
		P	30.0	30.0	104.7	107.4	106.7	106.8	99.1	30.0	30.0

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
12	1616	C	0.0	102.8	97.6	99.3	103.1	105.5	0.0	113.7	120.8
		F	0.0	107.7	103.0	103.7	107.5	109.9	0.0	117.5	124.1
		P	0.0	116.9	110.9	113.7	119.5	122.8	0.0	137.5	149.2
16	1638	C	87.5	91.5	89.6	99.7	101.7	104.3	0.0	113.7	121.5
		F	93.4	99.9	102.3	104.8	106.5	109.1	0.0	117.8	124.9
		P	99.3	108.6	105.5	104.1	110.9	121.3	0.0	136.2	150.8
22	1155	C	84.9	85.9	87.1	93.4	95.6	100.3	105.2	110.5	118.8
		F	91.5	99.8	90.7	97.3	100.4	104.4	109.8	113.0	122.3
		P	100.6	100.9	103.4	113.6	117.6	121.8	130.4	138.0	146.4
26	1213	C	89.0	89.5	89.9	95.1	95.9	98.8	104.8	107.5	118.7
		F	99.2	100.0	95.4	99.9	100.8	103.3	108.3	110.6	122.2
		P	107.9	107.4	107.6	114.4	118.4	120.5	126.7	134.3	146.4
30	1231	C	88.0	90.1	92.2	95.2	95.2	99.2	103.8	108.1	119.2
		F	98.8	98.3	96.5	99.7	100.1	103.9	107.6	111.1	122.8
		P	106.2	108.3	110.2	116.9	116.8	121.2	127.4	134.9	146.5
32	1513	C	90.9	91.5	96.6	88.7	98.0	100.0	110.1	111.7	119.3
		F	95.5	97.3	99.7	89.8	102.6	104.0	115.8	115.0	123.1
		P	101.8	103.5	107.3	105.9	103.7	106.3	128.2	136.0	147.3
36	1530	C	95.0	95.2	95.6	100.9	100.1	103.7	108.5	114.1	121.7
		F	98.7	101.1	101.0	103.9	104.1	107.3	112.6	116.4	123.6
		P	107.5	108.5	106.6	112.7	113.5	119.2	130.5	138.4	148.6
40	1548	C	97.3	97.6	97.1	99.4	99.0	102.5	97.0	112.0	119.5
		F	101.0	101.3	100.9	102.3	103.1	106.0	111.3	115.3	123.8
		P	111.3	110.5	110.3	111.3	113.6	118.4	129.4	136.6	148.0
46	1152	C	92.9	93.8	95.1	98.6	100.1	103.1	106.7	109.6	119.7
		F	98.5	100.0	102.1	103.5	104.1	107.3	111.2	113.0	122.9
		P	107.7	109.2	109.7	115.0	117.8	122.3	130.7	135.9	147.4
50	1213	C	94.8	94.9	94.9	96.8	96.7	103.1	104.7	112.3	120.5
		F	99.8	100.5	100.6	102.8	99.6	106.8	109.6	114.4	123.7
		P	110.0	110.6	110.3	114.9	116.2	121.4	129.5	140.1	149.8
53	1228	C	84.6	79.3	91.4	93.5	93.3	97.3	101.4	107.0	115.8
		F	91.9	99.9	100.9	96.5	97.1	100.3	104.5	109.3	117.9
		P	98.1	98.3	106.0	110.6	110.6	115.2	122.8	132.8	145.2
54	1231	C	88.2	89.2	91.0	94.0	97.1	99.5	105.4	110.2	120.1
		F	92.5	98.2	103.4	97.8	102.5	104.7	109.5	112.9	123.2
		P	100.5	103.3	104.6	108.6	113.5	118.2	128.8	138.0	147.7
58	1537	C	102.0	101.3	99.8	101.9	102.7	105.3	111.6	115.2	121.0
		F	107.7	108.1	105.3	107.3	108.0	110.3	115.7	118.9	124.5
		P	114.5	113.8	113.0	116.5	117.8	122.7	123.9	139.6	150.5
62	1554	C	98.9	100.0	102.0	102.5	101.4	104.7	109.4	113.9	119.4
		F	105.4	106.6	107.4	107.9	106.9	109.8	115.5	118.5	123.2
		P	111.3	112.9	115.8	116.6	116.8	121.6	131.7	139.0	149.4
65	1607	C	92.0	95.6	98.5	99.8	100.6	104.5	110.1	114.1	121.5
		F	100.0	104.1	105.3	105.7	106.5	110.1	114.3	118.5	125.4
		P	106.8	108.7	112.6	115.1	116.3	121.8	132.3	139.1	148.9
69	1158	C	93.1	92.9	92.6	94.1	98.4	103.2	110.1	112.6	122.6
		F	98.5	102.3	98.4	98.9	102.8	107.1	113.0	116.9	125.6
		P	109.2	109.0	108.0	110.9	115.9	122.0	131.9	140.1	150.6
73	1216	C	92.4	93.7	92.5	97.2	98.7	102.5	109.9	111.9	120.9
		F	94.0	102.3	103.8	102.1	104.2	107.0	113.0	118.9	124.0
		P	109.4	111.3	109.3	115.0	117.7	122.7	132.7	138.9	148.0
77	1232	C	92.7	30.0	91.2	95.6	100.1	103.2	110.1	113.3	120.9
		F	99.7	30.0	101.6	100.5	105.0	107.7	113.4	116.9	124.4
		P	108.9	30.0	109.3	113.2	118.2	123.5	132.4	140.1	149.0

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
81	1559	C	93.0	94.3	95.3	98.3	98.3	101.7	110.2	113.7	120.9
		F	102.8	105.1	103.1	104.4	105.0	107.5	115.1	119.1	124.7
		P	109.2	112.1	112.1	115.1	115.8	121.3	134.6	139.3	149.5
85	1626	C	94.8	96.5	98.1	100.8	98.7	103.3	108.5	111.9	120.7
		F	101.6	104.4	105.6	106.7	105.5	109.6	113.7	118.6	124.2
		P	110.6	112.4	113.9	117.7	117.4	124.2	132.7	134.5	148.7
89	1643	C	91.5	92.8	93.7	99.1	99.5	101.4	108.3	113.4	121.7
		F	99.5	99.0	104.1	105.3	105.8	107.7	112.9	118.6	124.7
		P	108.7	109.9	112.2	117.3	118.7	122.6	133.0	137.3	150.4
93	1149	C	79.2	79.9	79.3	30.0	91.1	94.5	92.4	99.6	118.2
		F	89.5	92.5	92.7	30.0	96.9	99.9	99.4	110.7	122.8
		P	98.6	100.3	103.6	30.0	112.8	119.4	115.7	124.6	143.4
97	1214	C	77.3	80.1	85.1	84.8	87.0	96.2	99.4	101.5	117.9
		F	93.9	94.5	94.8	92.3	93.8	102.0	103.6	112.6	122.6
		P	97.4	103.9	109.0	109.3	107.8	121.0	124.8	125.2	143.1
101	1231	C	77.6	80.4	87.1	90.9	88.3	99.3	97.2	101.7	118.1
		F	87.2	91.2	95.7	96.8	94.8	103.3	102.0	112.1	122.8
		P	99.4	103.2	110.8	114.7	111.4	125.3	121.6	125.0	143.1
105	1526	C	82.0	79.7	82.7	86.6	88.4	97.0	104.9	111.1	119.9
		F	92.9	89.9	90.4	93.4	94.9	102.7	108.7	116.3	123.6
		P	101.2	101.0	103.5	109.1	112.6	121.3	130.6	140.1	146.4
109	1546	C	80.9	80.5	81.3	84.0	86.2	96.4	102.2	106.4	119.4
		F	89.1	89.7	91.0	90.1	91.6	101.2	106.1	117.3	123.0
		P	103.9	101.8	103.6	104.7	109.2	121.4	126.8	133.5	145.6
113	1602	C	78.5	76.9	80.1	92.3	87.1	92.7	101.0	103.9	119.0
		F	89.5	88.6	93.2	97.7	91.5	96.6	103.9	116.0	122.9
		P	100.5	97.7	102.5	114.7	112.0	116.8	127.1	132.1	145.7
117	1921	C	92.4	95.4	95.5	100.0	100.9	104.6	111.1	113.2	121.0
		F	100.4	103.0	102.8	107.2	107.6	110.5	115.8	118.5	124.8
		P	109.9	112.4	113.6	120.0	119.9	126.1	137.0	136.6	150.0
121	1940	C	92.0	94.9	93.7	100.2	100.6	105.0	111.1	114.0	121.3
		F	98.3	101.3	100.6	106.7	107.1	110.5	115.7	119.8	125.4
		P	109.6	112.6	112.0	119.8	121.6	126.9	136.3	137.6	150.4
125	1959	C	92.4	94.9	95.3	100.2	103.6	105.7	110.6	112.6	121.8
		F	100.0	102.6	102.4	107.1	110.0	111.2	115.5	118.9	125.1
		P	111.4	113.6	113.3	119.4	124.2	127.8	135.6	136.7	150.8
129	1939	C	84.7	83.7	83.1	91.1	88.5	92.5	100.3	105.4	119.4
		F	91.7	90.9	90.5	99.3	94.8	96.5	103.9	108.8	123.3
		P	109.0	107.6	103.1	114.8	112.3	116.5	127.9	134.3	147.1
133	1955	C	86.4	84.5	80.3	92.5	30.0	92.3	99.8	105.2	118.7
		F	93.7	91.9	87.6	97.9	98.1	98.8	103.7	108.8	122.9
		P	109.3	108.2	103.7	113.7	116.8	116.7	127.0	133.9	145.4
137	2013	C	86.4	83.7	81.9	90.4	92.7	95.9	102.5	107.3	119.4
		F	91.8	89.5	87.6	95.4	98.5	100.8	106.1	110.4	123.2
		P	110.6	108.0	106.9	112.8	117.1	118.7	129.4	136.1	147.4
141	2246	C	0.0	30.0	0.0	0.0	30.0	80.1	90.5	100.3	117.5
		F	0.0	30.0	0.0	0.0	91.4	86.1	96.6	105.7	122.9
		P	0.0	30.0	0.0	0.0	94.1	94.7	113.8	126.1	145.2
145	2306	C	0.0	0.0	0.0	0.0	30.0	80.4	90.2	98.9	117.3
		F	0.0	0.0	0.0	0.0	91.8	89.0	96.5	104.9	122.9
		P	0.0	0.0	0.0	0.0	95.2	93.3	112.9	124.9	146.2
149	2325	C	0.0	0.0	0.0	0.0	30.0	79.8	88.2	98.2	117.8
		F	0.0	0.0	0.0	0.0	88.6	88.9	98.4	104.1	123.3
		P	0.0	0.0	0.0	0.0	92.2	94.4	111.4	125.2	146.3

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
153	1950	C	81.0	79.8	87.7	83.6	30.0	81.0	0.0	93.6	116.7
		F	91.2	90.5	94.0	91.4	83.9	89.9	0.0	102.9	121.9
		P	106.8	105.2	108.9	102.7	86.0	91.9	0.0	118.4	142.0
157	2009	C	83.1	81.0	92.7	81.3	30.0	79.9	0.0	30.0	116.3
		F	91.0	91.2	97.7	88.0	86.0	88.4	0.0	30.0	121.9
		P	106.8	105.5	115.5	101.5	89.2	89.8	0.0	30.0	141.7
161	2030	C	85.6	81.4	84.3	80.3	30.0	82.5	0.0	95.3	116.1
		F	92.4	90.1	91.4	88.9	87.7	103.4	0.0	106.4	121.9
		P	106.9	105.4	107.5	101.4	91.0	107.1	0.0	119.1	141.2
165	2245	C	0.0	67.5	0.0	75.1	30.0	0.0	89.3	101.5	117.5
		F	0.0	74.8	0.0	84.2	92.8	0.0	95.4	108.1	122.4
		P	0.0	91.7	0.0	87.9	93.9	0.0	109.5	124.9	142.6
169	2303	C	0.0	0.0	70.9	73.8	30.0	0.0	89.3	105.5	117.6
		F	0.0	0.0	76.9	80.1	94.0	0.0	95.1	111.1	122.3
		P	0.0	0.0	95.0	96.3	95.0	0.0	110.3	130.3	142.3
173	2323	C	0.0	0.0	0.0	75.2	30.0	0.0	89.0	106.6	118.4
		F	0.0	0.0	0.0	82.6	93.5	0.0	95.0	111.4	122.4
		P	0.0	0.0	0.0	95.5	96.4	0.0	108.8	131.8	143.6
177	1923	C	98.5	99.2	100.7	102.3	30.0	30.0	107.8	112.8	121.4
		F	103.6	104.4	105.2	107.4	102.7	30.0	112.2	116.7	124.5
		P	118.0	119.3	120.7	125.0	122.1	30.0	132.3	140.5	149.0
181	1941	C	96.8	97.1	99.1	99.5	30.0	104.7	108.8	114.1	120.4
		F	102.7	103.0	104.4	105.0	101.3	109.1	113.0	117.9	123.8
		P	116.9	117.5	118.7	120.4	119.1	128.0	133.5	141.9	147.9
185	1957	C	96.8	98.6	98.5	30.0	30.0	105.5	109.9	114.8	121.9
		F	102.6	104.1	103.8	30.0	103.2	110.2	114.0	118.6	125.3
		P	114.4	116.6	117.3	30.0	121.6	128.5	133.6	138.2	150.0
189	2252	C	92.4	96.0	92.5	97.1	30.0	97.6	106.2	108.2	119.6
		F	99.4	102.5	100.4	103.5	97.8	105.7	111.2	112.6	123.1
		P	115.7	121.5	119.1	121.6	116.2	120.0	132.1	134.5	146.8
193	2312	C	94.7	95.1	94.2	97.0	30.0	100.1	87.9	111.1	120.8
		F	101.1	101.0	90.9	103.2	98.7	105.5	94.2	113.9	123.9
		P	117.6	120.5	114.1	120.8	115.8	123.4	116.2	141.9	149.8
196	1938	C	75.2	78.9	77.9	30.0	30.0	86.5	95.8	105.3	120.4
		F	77.0	80.2	80.0	76.9	79.5	89.1	98.2	108.1	123.8
		P	94.2	101.4	100.1	93.9	90.9	105.5	123.3	136.0	147.2
200	1957	C	0.0	0.0	0.0	0.0	30.0	81.1	93.9	106.0	121.2
		F	0.0	0.0	0.0	0.0	78.4	83.5	96.4	110.3	124.5
		P	0.0	0.0	0.0	0.0	86.5	98.8	120.2	137.0	149.2
204	2014	C	0.0	0.0	0.0	0.0	30.0	82.7	93.6	103.8	119.9
		F	0.0	0.0	0.0	0.0	79.0	85.6	97.1	107.2	123.3
		P	0.0	0.0	0.0	0.0	87.4	104.7	120.1	134.3	146.6
210	2240	C	0.0	0.0	0.0	69.5	30.0	86.5	101.8	104.1	118.6
		F	0.0	0.0	0.0	73.6	81.4	91.5	104.7	108.5	123.3
		P	0.0	0.0	0.0	79.6	93.5	108.6	129.7	129.5	144.6
214	2258	C	0.0	0.0	0.0	74.0	30.0	86.5	98.5	106.2	117.5
		F	0.0	0.0	0.0	77.0	82.6	88.8	102.1	110.1	122.7
		P	0.0	0.0	0.0	87.3	95.8	110.6	122.3	132.4	143.0
218	2318	C	0.0	0.0	0.0	72.0	30.0	78.5	91.2	100.3	119.0
		F	0.0	0.0	0.0	74.8	81.7	85.7	95.4	105.3	123.2
		P	0.0	0.0	0.0	79.0	83.9	94.8	110.7	122.2	143.0
222	221	C	0.0	0.0	0.0	79.4	30.0	78.2	90.7	99.3	118.6
		F	0.0	0.0	0.0	91.3	81.7	90.0	96.9	105.3	123.0
		P	0.0	0.0	0.0	96.7	84.1	101.9	110.1	122.1	142.9

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
226	238	C	0.0	0.0	0.0	74.9	30.0	80.0	89.6	97.5	117.6
		F	0.0	0.0	0.0	86.5	82.2	91.4	96.0	105.5	123.0
		P	0.0	0.0	0.0	90.5	87.1	99.5	109.6	121.7	141.8
230	257	C	0.0	0.0	0.0	76.8	30.0	80.5	89.8	95.8	117.7
		F	0.0	0.0	0.0	86.2	87.8	92.5	95.0	103.6	122.7
		P	0.0	0.0	0.0	89.5	91.2	103.0	108.7	120.1	142.0
234	420	C	0.0	0.0	0.0	79.6	30.0	79.2	90.9	97.6	117.8
		F	0.0	0.0	0.0	102.4	86.4	87.8	96.9	111.0	123.0
		P	0.0	0.0	0.0	106.4	88.7	89.2	104.4	119.6	141.7
238	437	C	0.0	0.0	0.0	80.9	30.0	79.0	91.2	96.7	117.1
		F	0.0	0.0	0.0	100.8	76.0	90.0	98.8	107.9	122.5
		P	0.0	0.0	0.0	103.3	87.1	93.2	106.1	120.0	141.2
242	454	C	0.0	0.0	0.0	83.1	30.0	79.5	91.8	97.0	118.2
		F	0.0	0.0	0.0	99.9	76.0	93.0	99.5	105.3	123.1
		P	0.0	0.0	0.0	108.2	87.2	94.9	108.5	120.1	141.9
246	221	C	93.4	94.2	91.6	93.2	95.7	93.0	103.6	111.6	122.5
		F	100.1	101.2	100.0	100.6	102.7	101.7	106.9	114.7	126.0
		P	115.2	118.3	115.1	115.4	120.3	117.4	133.2	139.7	150.6
250	240	C	86.7	83.7	81.7	91.4	88.2	92.4	101.6	109.3	121.8
		F	92.6	88.8	92.2	100.7	97.4	100.1	106.4	113.4	125.4
		P	106.1	102.2	104.9	115.2	112.8	117.4	126.7	137.0	149.9
254	259	C	86.0	86.1	84.7	89.1	98.4	96.9	102.4	108.3	121.5
		F	92.2	92.2	94.4	96.8	103.4	101.8	106.4	112.6	125.2
		P	107.2	109.0	109.5	113.7	121.9	123.2	129.6	134.8	148.9
258	421	C	90.6	91.2	88.6	93.6	93.6	92.0	102.4	109.1	122.5
		F	99.6	99.9	96.0	99.1	98.8	97.6	106.3	112.6	126.1
		P	113.0	112.3	108.2	113.9	115.5	115.4	130.1	136.9	150.5
264	450	C	90.9	89.9	90.2	92.5	88.7	96.6	105.0	105.5	123.1
		F	99.7	97.3	95.6	99.1	95.6	102.8	108.6	109.4	126.3
		P	113.3	112.9	111.1	115.1	109.7	119.6	130.7	134.3	151.0
266	458	C	88.1	88.6	88.7	90.7	92.2	93.4	102.0	103.3	121.2
		F	96.7	95.2	94.6	97.2	96.7	99.4	105.9	108.1	124.9
		P	110.3	110.4	113.2	113.1	112.8	116.9	128.1	131.3	150.3
270	353	C	30.0	30.0	90.2	93.6	94.1	92.2	101.8	102.4	30.0
		F	30.0	30.0	101.2	99.7	101.2	97.6	106.0	107.7	30.0
		P	30.0	30.0	114.7	116.7	118.4	113.9	125.5	127.6	30.0
274	413	C	30.0	30.0	90.1	93.9	96.4	99.3	102.3	100.6	30.0
		F	30.0	30.0	99.0	99.7	102.0	105.7	107.1	106.3	30.0
		P	30.0	30.0	113.0	117.7	118.7	123.6	124.8	125.5	30.0
278	433	C	30.0	30.0	89.6	92.2	90.4	94.1	98.9	101.4	30.0
		F	30.0	30.0	98.8	98.5	98.4	94.6	103.1	107.2	30.0
		P	30.0	30.0	111.1	113.5	111.3	116.9	118.5	126.7	30.0
282	216	C	0.0	62.5	0.0	83.2	82.5	78.5	95.2	102.1	117.5
		F	0.0	68.9	0.0	90.9	91.2	88.1	99.9	108.0	122.7
		P	0.0	85.2	0.0	92.9	101.1	98.3	120.8	126.8	142.8
286	234	C	70.5	67.4	0.0	82.3	83.1	81.5	91.5	102.1	118.2
		F	74.7	73.3	0.0	89.4	95.1	91.5	97.8	107.3	123.1
		P	92.2	89.4	0.0	93.9	99.2	103.9	115.6	127.5	144.7
290	251	C	80.4	77.4	82.8	86.0	87.2	87.6	92.5	100.4	118.2
		F	85.8	83.7	88.4	92.2	95.1	94.7	99.3	106.7	122.4
		P	103.1	100.1	105.8	107.0	109.9	110.2	117.4	125.7	143.9
294	415	C	76.3	78.2	82.9	82.8	88.5	97.3	88.0	98.3	118.1
		F	92.9	92.5	92.1	89.6	96.5	99.9	96.6	104.4	122.8
		P	99.7	102.3	104.1	106.3	112.4	110.5	112.6	123.1	142.0

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 4, DIRECTION (SITE) 2 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
298	431	C	77.8	78.7	82.4	83.8	90.8	90.6	93.8	98.7	118.3
		F	88.7	92.4	91.6	90.8	97.7	101.1	101.0	105.1	122.9
		P	100.0	102.3	106.1	106.2	117.5	113.0	118.8	123.2	143.2
302	448	C	74.6	77.5	81.1	82.4	89.9	89.6	85.1	99.8	118.3
		F	92.7	90.3	93.5	88.8	100.5	98.3	100.5	105.4	123.0
		P	97.4	99.6	103.5	104.9	113.3	111.6	125.1	125.1	143.4
306	235	C	90.3	91.9	97.6	97.4	90.4	98.8	106.1	30.0	121.2
		F	103.5	102.4	104.2	104.7	100.0	105.6	111.9	30.0	124.8
		P	110.9	115.7	120.0	119.6	115.5	122.0	128.5	30.0	149.0
310	255	C	90.8	92.9	95.0	96.1	95.9	99.0	104.0	111.2	121.2
		F	105.8	104.1	102.8	102.8	102.1	105.7	108.8	115.3	124.9
		P	112.0	116.1	118.5	119.4	121.0	123.5	129.1	136.8	147.2
314	311	C	90.0	88.8	30.0	92.4	97.1	100.3	102.8	112.4	120.4
		F	100.4	101.5	30.0	100.9	103.1	105.8	107.9	115.8	124.5
		P	111.2	111.7	30.0	116.9	120.5	122.1	125.2	139.6	148.4
318	424	C	91.3	84.6	89.6	93.7	91.4	96.1	103.6	108.3	120.3
		F	100.6	105.7	97.0	101.5	99.8	102.4	107.6	111.4	124.1
		P	112.7	107.2	109.2	115.2	115.1	118.6	131.2	138.6	148.9
322	441	C	90.5	92.4	90.4	92.0	97.7	99.6	100.9	106.2	119.8
		F	101.7	101.8	97.4	100.2	103.2	104.2	104.1	109.4	123.9
		P	111.9	115.5	113.7	116.5	120.0	120.3	127.1	136.2	148.3
326	457	C	87.8	85.4	87.7	95.0	91.5	96.0	99.6	106.1	121.0
		F	100.8	102.0	95.8	103.0	97.7	101.7	103.0	109.5	124.4
		P	109.3	106.7	108.6	116.7	112.0	118.9	126.2	134.5	149.5
328	224	C	30.0	30.0	91.4	94.4	97.8	99.3	103.6	113.1	121.9
		F	30.0	30.0	103.1	102.2	105.9	106.3	108.5	117.0	124.8
		P	30.0	30.0	110.6	114.8	118.2	120.1	127.6	136.5	150.7
332	241	C	30.0	30.0	95.5	97.5	98.4	103.4	107.4	113.1	123.0
		F	30.0	30.0	104.9	104.7	108.5	109.9	112.9	117.9	126.4
		P	30.0	30.0	115.8	107.2	120.5	125.2	130.1	138.2	151.9
336	256	C	30.0	30.0	96.2	100.1	100.2	103.0	106.5	116.0	122.2
		F	30.0	30.0	106.9	111.4	109.2	109.1	111.8	119.5	125.7
		P	30.0	30.0	117.1	120.3	120.1	125.8	130.3	143.0	151.4
340	411	C	30.0	30.0	93.8	98.7	96.5	98.3	104.1	113.9	122.7
		F	30.0	30.0	107.0	115.1	107.5	106.3	108.6	118.3	126.1
		P	30.0	30.0	111.1	121.4	119.9	121.0	126.6	137.3	152.3
344	429	C	30.0	30.0	96.0	102.5	101.2	102.6	105.6	115.0	124.6
		F	30.0	30.0	105.4	115.1	109.3	108.1	111.7	118.9	127.3
		P	30.0	30.0	114.7	122.1	122.5	124.0	128.0	140.9	153.1
348	445	C	30.0	30.0	91.3	98.7	98.1	104.2	108.2	112.7	120.9
		F	30.0	30.0	108.3	110.0	107.5	110.3	113.1	117.5	124.9
		P	30.0	30.0	110.6	118.1	120.0	127.3	131.9	138.4	148.5

ABERDEEN PROVING GROUNDS DATA

CHARGE SIZE 1, DIRECTION (SITE) 1 BLASTS

RUN	TIME	SEL	MIC 1	MIC 2	MIC 3	MIC 4	MIC 5	MIC 6	MIC 7	MIC 8	MIC 9
78	1544	C	110.2	105.9	81.9	77.3	84.2	80.7	83.4	81.2	76.5
		F	113.9	108.0	102.5	84.3	107.2	90.6	91.4	99.3	103.7
		P	135.1	30.0	101.7	90.9	104.0	94.9	100.0	99.6	101.1
82	1613	C	112.3	106.8	73.8	79.0	85.5	79.8	81.8	78.4	75.2
		F	115.5	106.9	96.6	82.2	101.1	90.9	88.7	96.6	105.0
		P	137.1	114.0	97.3	92.2	100.1	93.7	87.7	97.9	104.3
86	1631	C	113.0	104.9	72.8	79.8	83.8	81.4	83.1	80.2	79.0
		F	116.2	105.4	98.6	83.8	98.1	89.9	92.1	97.0	105.0
		P	137.3	110.3	97.3	93.3	100.5	94.0	91.3	96.5	102.6
90	1133	C	114.7	99.7	90.5	80.4	84.2	81.3	82.4	30.0	77.7
		F	117.3	103.3	98.3	84.4	93.5	87.3	88.5	30.0	104.7
		P	142.1	127.6	115.7	101.1	96.3	92.4	87.5	30.0	103.3
94	1155	C	116.3	100.4	91.0	80.6	81.8	80.7	82.5	75.8	76.7
		F	118.7	104.1	97.2	84.6	89.9	84.1	88.0	94.3	104.4
		P	143.2	128.2	116.2	102.8	95.6	94.4	86.6	95.2	102.2
98	1218	C	115.0	99.3	91.8	76.9	81.3	80.9	83.3	76.1	78.3
		F	117.6	102.8	97.0	80.3	85.4	83.8	87.2	99.1	105.4
		P	142.4	125.2	117.2	86.3	97.1	92.3	89.6	98.1	104.0
102	1510	C	114.0	99.0	90.6	81.7	77.6	80.0	87.7	0.0	0.0
		F	116.7	106.1	95.6	86.0	81.1	82.8	88.9	0.0	0.0
		P	140.1	127.0	118.7	108.1	98.3	94.9	90.3	0.0	0.0
106	1531	C	115.6	96.9	88.1	83.7	83.4	80.9	0.0	0.0	0.0
		F	118.1	102.8	93.4	86.3	85.4	82.3	0.0	0.0	0.0
		P	142.9	125.5	113.5	106.8	94.3	91.5	0.0	0.0	0.0
110	1550	C	115.9	98.2	88.1	79.3	78.5	79.3	0.0	0.0	0.0
		F	118.3	102.8	100.2	83.0	80.6	80.5	0.0	0.0	0.0
		P	142.1	126.7	115.9	103.9	93.4	86.6	0.0	0.0	0.0
114	1904	C	111.7	30.0	83.7	81.9	0.0	82.0	87.0	79.2	80.6
		F	115.2	30.0	108.4	87.2	0.0	94.6	96.3	99.8	104.1
		P	136.3	30.0	105.8	89.9	0.0	98.0	95.0	100.9	103.0
118	1926	C	111.7	93.6	77.5	83.1	0.0	81.0	86.3	80.7	79.6
		F	115.3	110.7	107.0	90.5	0.0	91.6	93.2	100.9	104.0
		P	136.7	110.8	105.3	94.1	0.0	94.7	91.1	100.2	102.4
122	1944	C	109.9	95.8	75.5	81.0	0.0	81.9	86.0	78.8	79.2
		F	113.9	113.2	103.4	86.1	0.0	94.4	93.3	100.3	105.7
		P	135.1	112.2	102.8	93.4	0.0	97.1	91.7	100.0	101.8
126	1924	C	114.5	97.0	30.0	75.6	30.0	80.3	88.7	71.7	74.9
		F	117.1	103.2	30.0	81.6	30.0	84.4	95.2	85.3	104.3
		P	140.9	121.8	30.0	87.1	30.0	84.6	93.5	88.0	103.1
130	1943	C	113.4	91.2	81.3	75.1	30.0	80.1	88.1	75.1	72.5
		F	115.8	100.3	97.4	83.2	30.0	84.5	93.8	89.8	100.9
		P	138.9	116.3	105.4	89.7	30.0	102.5	91.2	91.1	97.8
134	2000	C	113.6	94.4	85.1	76.9	0.0	80.1	88.4	0.0	75.4
		F	116.2	99.9	94.3	81.7	0.0	83.9	92.9	0.0	101.8
		P	139.7	119.7	109.4	94.3	0.0	84.6	90.1	0.0	99.7
138	2228	C	113.3	93.4	90.6	89.6	30.0	84.5	81.5	78.4	81.2
		F	116.0	101.8	97.8	94.1	93.1	90.2	86.3	84.4	89.5
		P	139.1	117.5	114.4	112.6	109.5	106.3	105.3	103.7	105.6
142	2252	C	113.5	96.3	93.6	94.2	30.0	90.8	87.6	87.4	88.4
		F	116.2	102.9	99.7	98.4	95.0	102.1	92.6	92.8	93.8
		P	139.3	121.4	116.8	118.2	110.8	114.2	108.8	110.3	112.8
146	2311	C	114.1	96.6	89.6	90.1	30.0	92.3	88.8	89.9	87.6
		F	116.8	102.6	95.7	94.7	95.1	96.5	93.1	94.4	93.5
		P	139.2	120.0	114.3	110.5	110.3	114.5	112.2	113.0	110.2

APPENDIX B: Noise Level vs. Distance

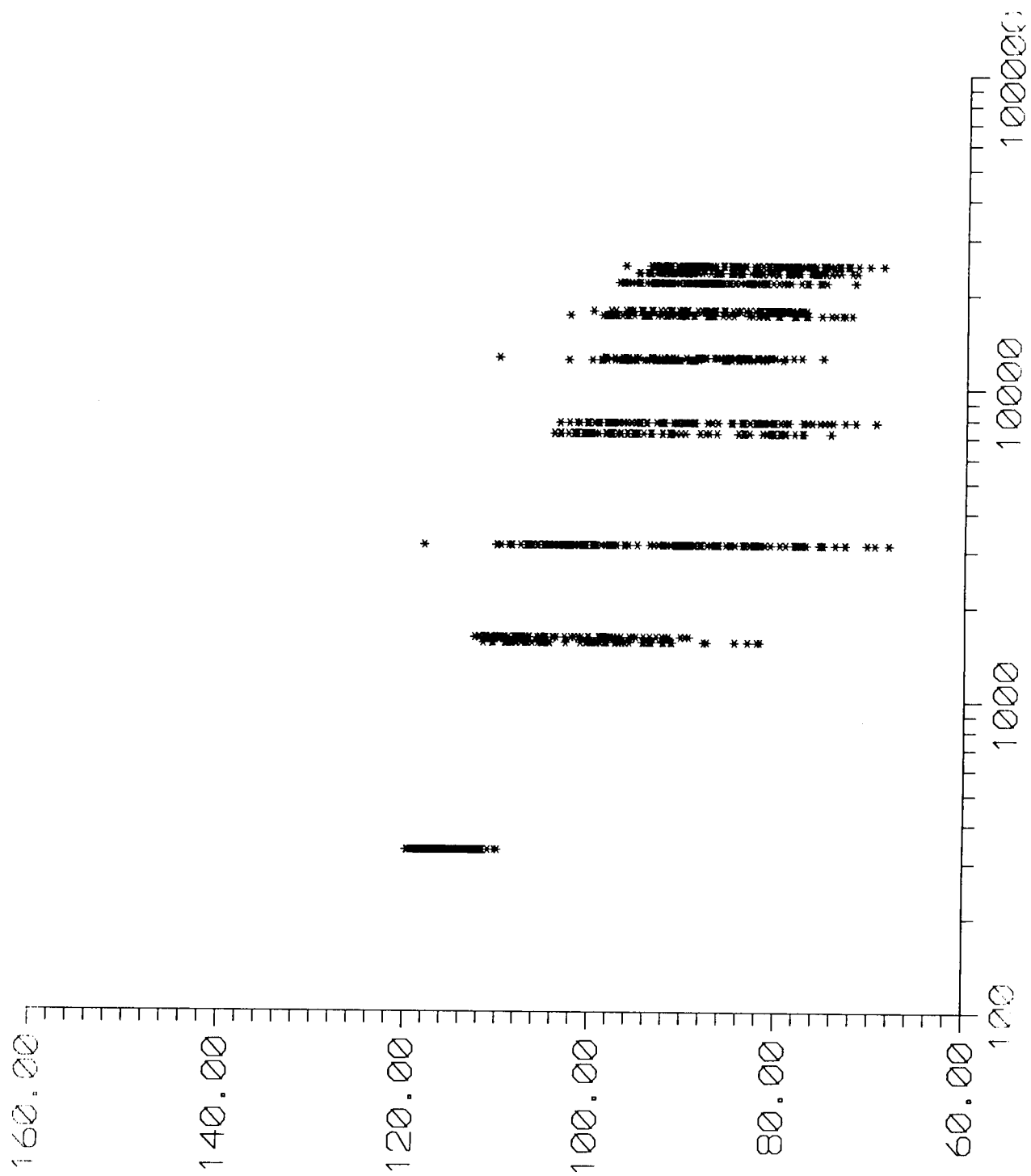


Figure B1. C-weighted sound-exposure levels (dB) vs. distance (m) for Sites 1 and 2, charge size 1.

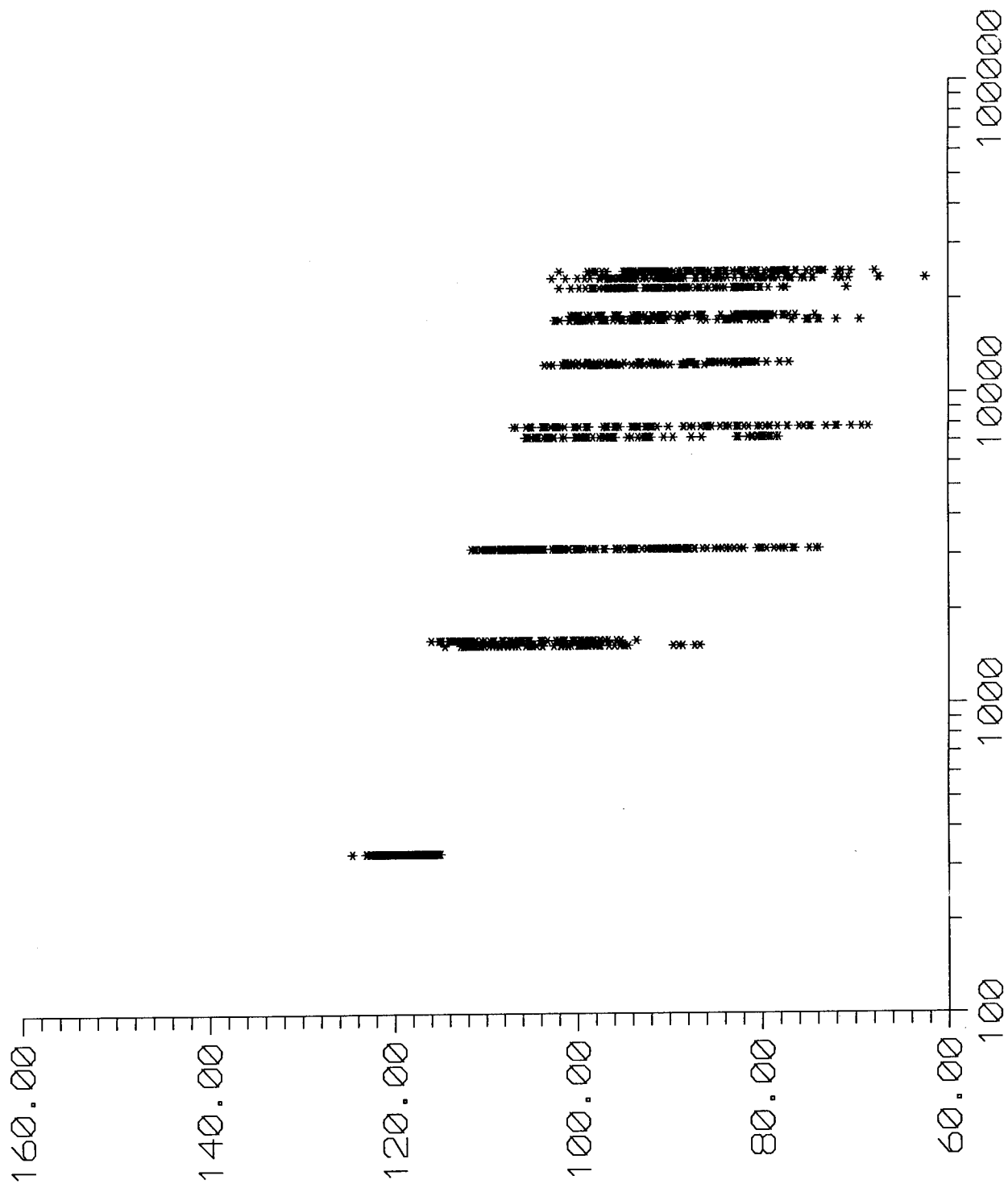


Figure B2. C-weighted sound-exposure level (dB) vs. distance (m) for Sites 1 and 2, charge size 4.

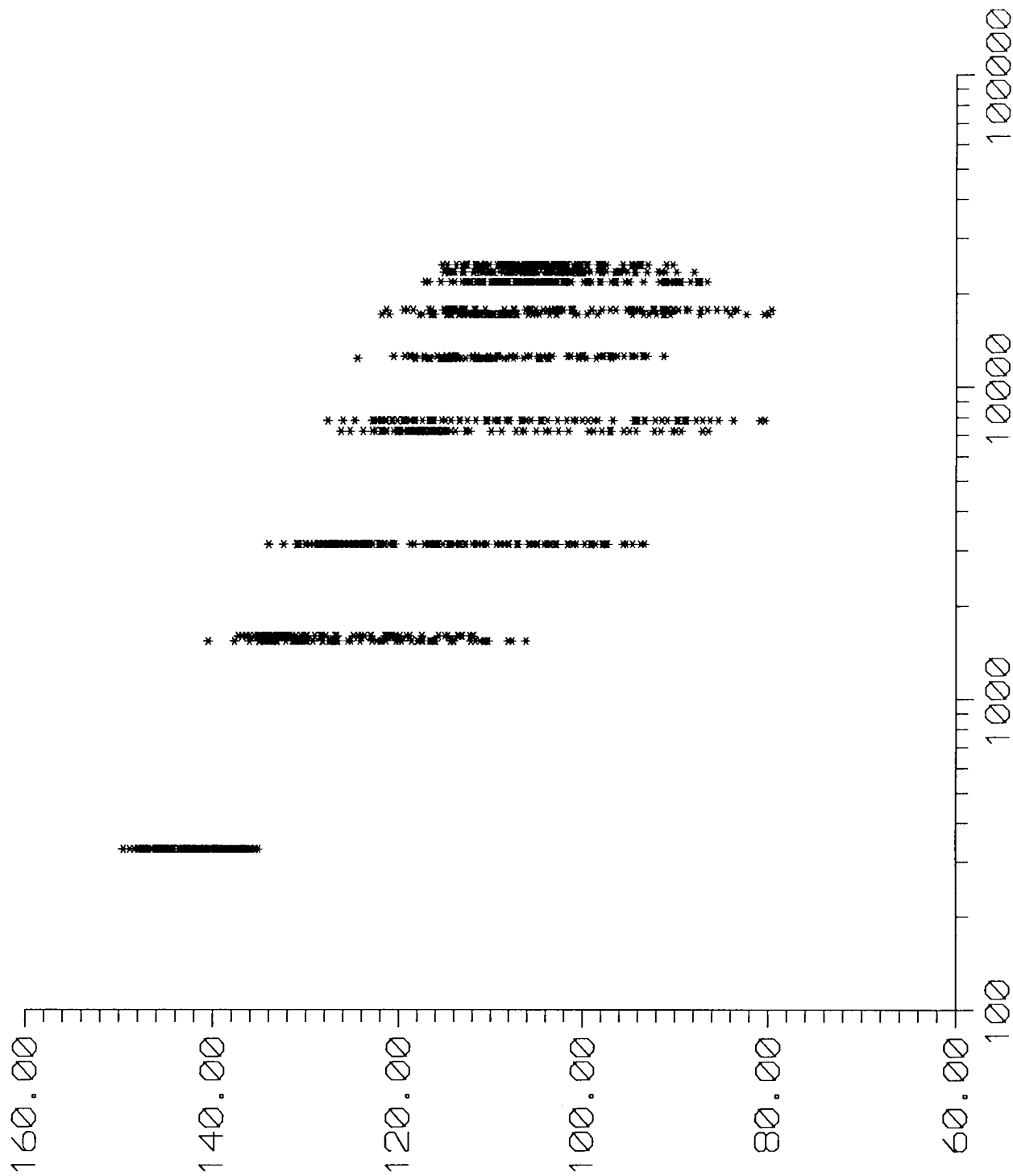


Figure B3. Peak sound-exposure levels (db) vs. distance (m) for Sites 1 and 2, charge size 1.

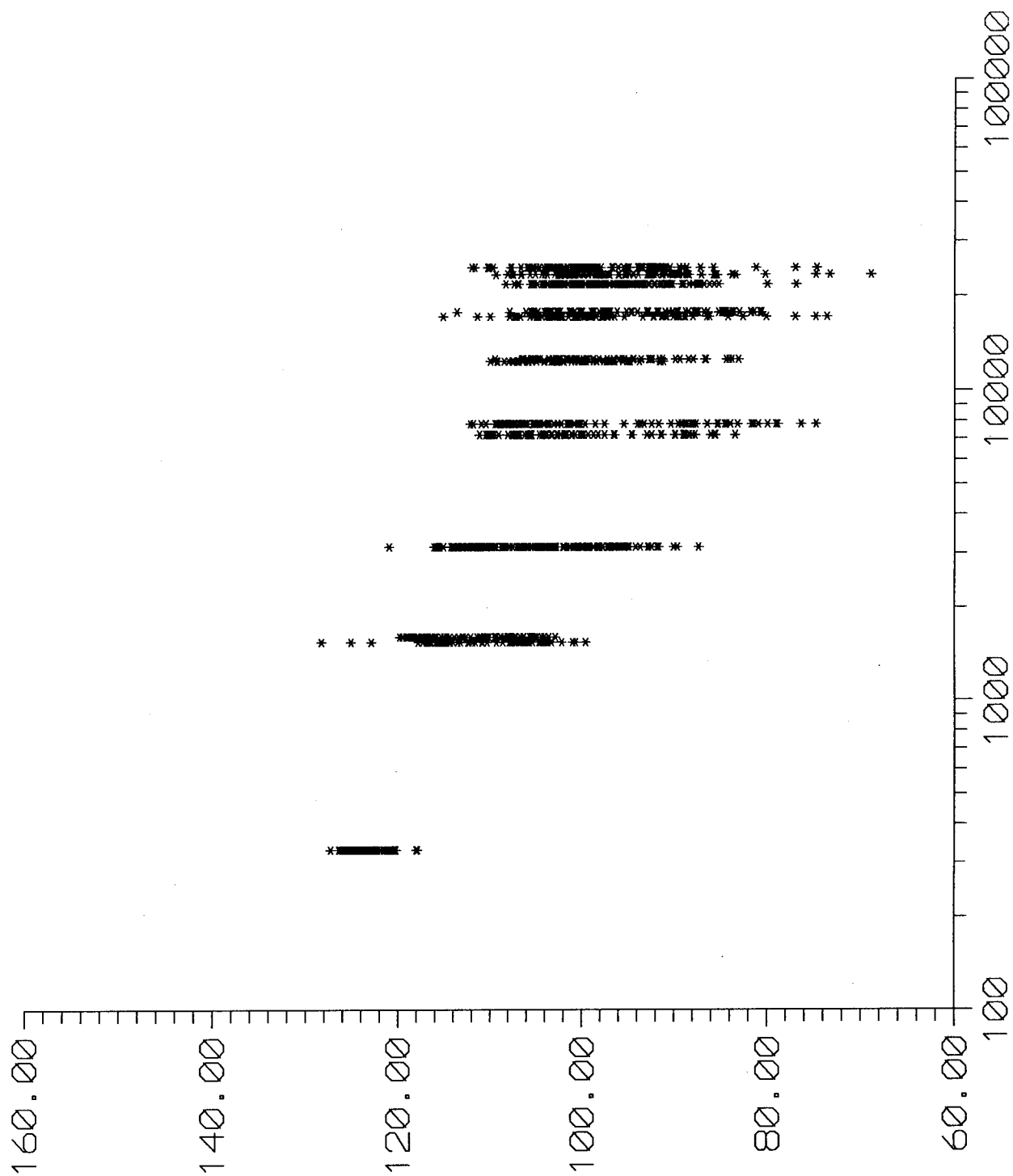


Figure B4. F-weighted sound exposure levels (dB) vs. distance (m) for Sites 1 and 2, charge size 4.

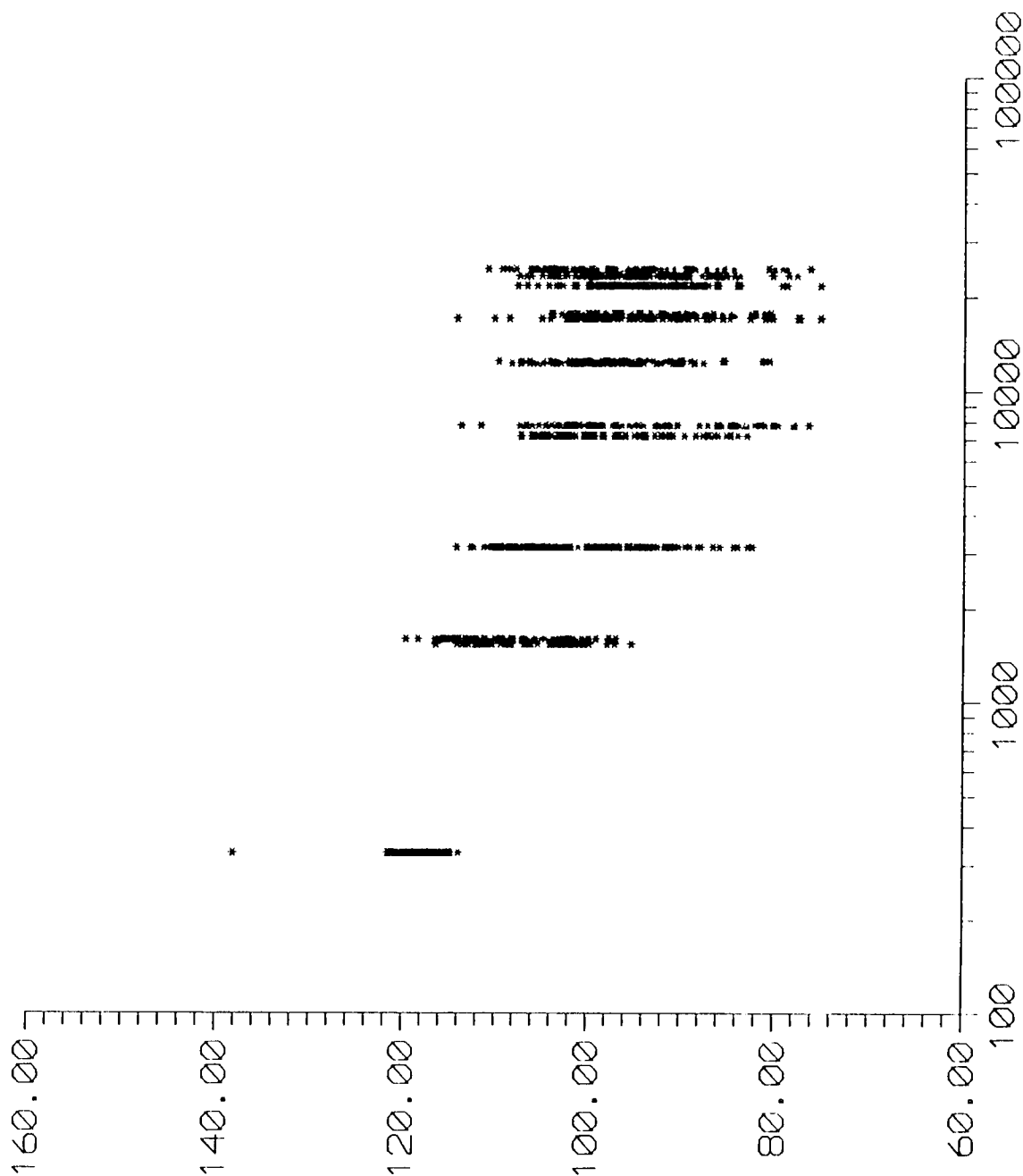


Figure B5. F-weighted sound exposure levels (dB) vs. distance (m) for Sites 1 and 2, charge size 1.

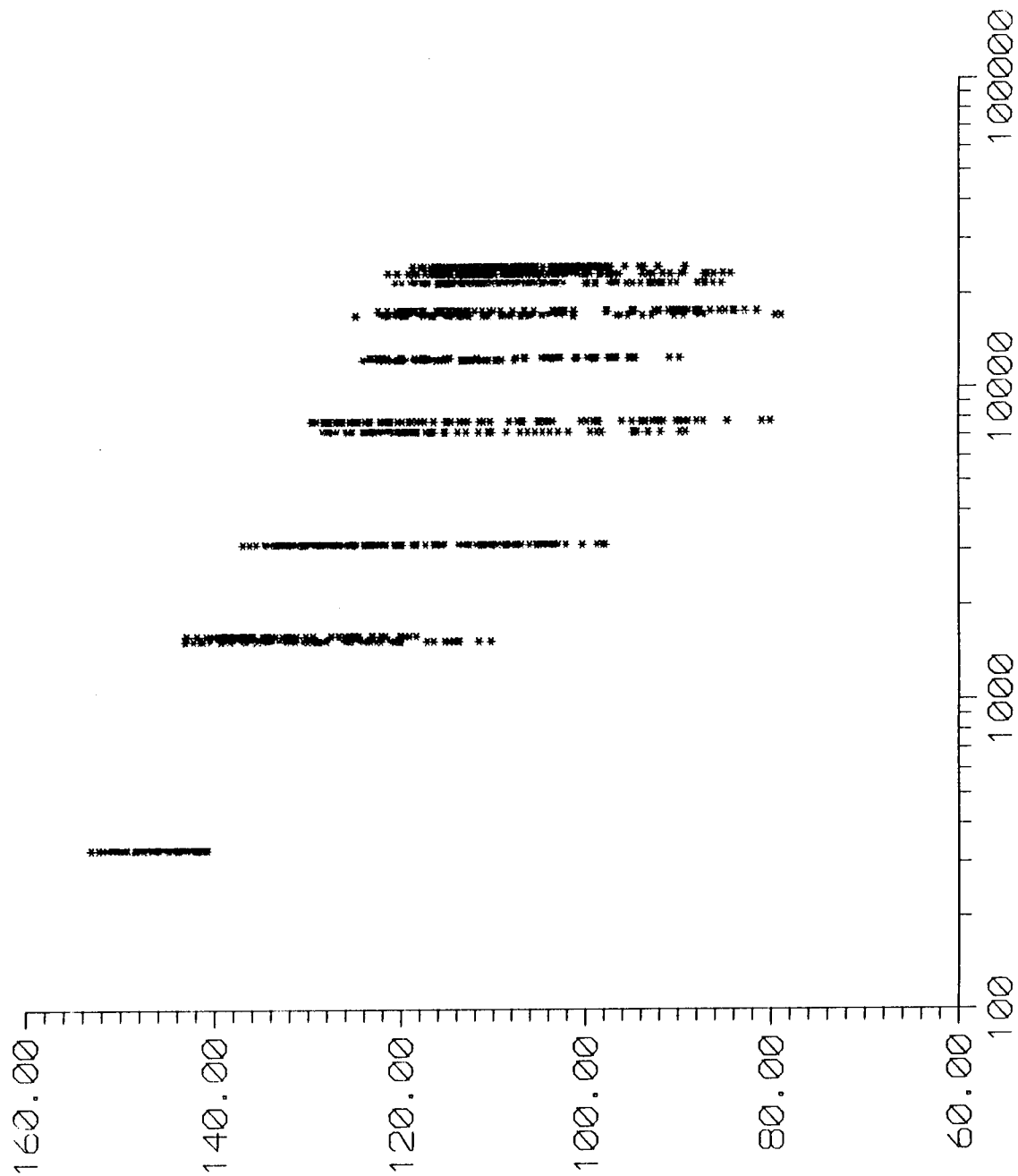


Figure B6. Peak sound-exposure levels (dB) vs. distance (m) for Sites 1 and 2, charge size 4.

APPENDIX C: Sound Speed Profiles

The following sound-speed profiles correspond with the tabular data presented in Appendix A. Due to equipment malfunction, no data were recorded for blasts 1 to 9; sound-speed profiles begin with blast 9. The dashed curve corresponds to propagation from Site 1, and the solid curve corresponds to propagation from Site 2.

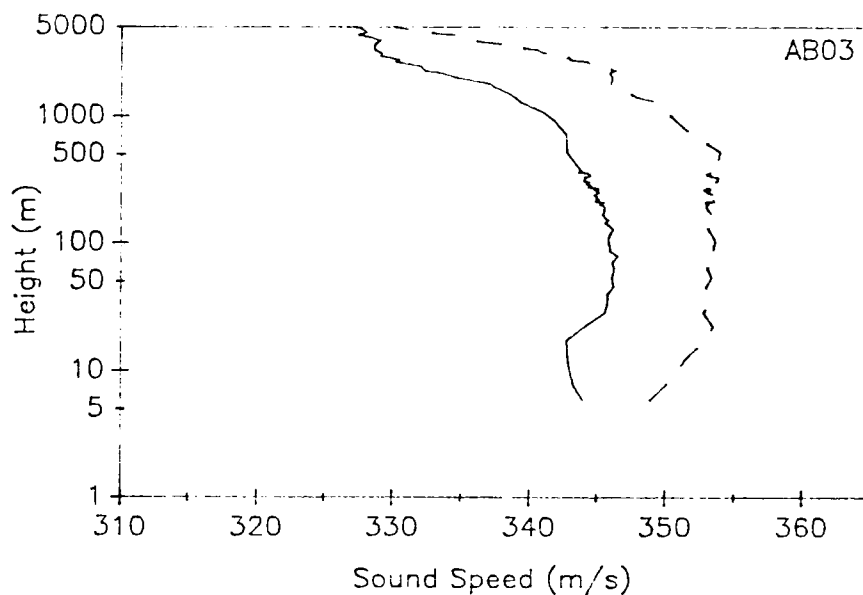


Figure C1. Sound Speed (m/s) for Blasts 9 to 18.

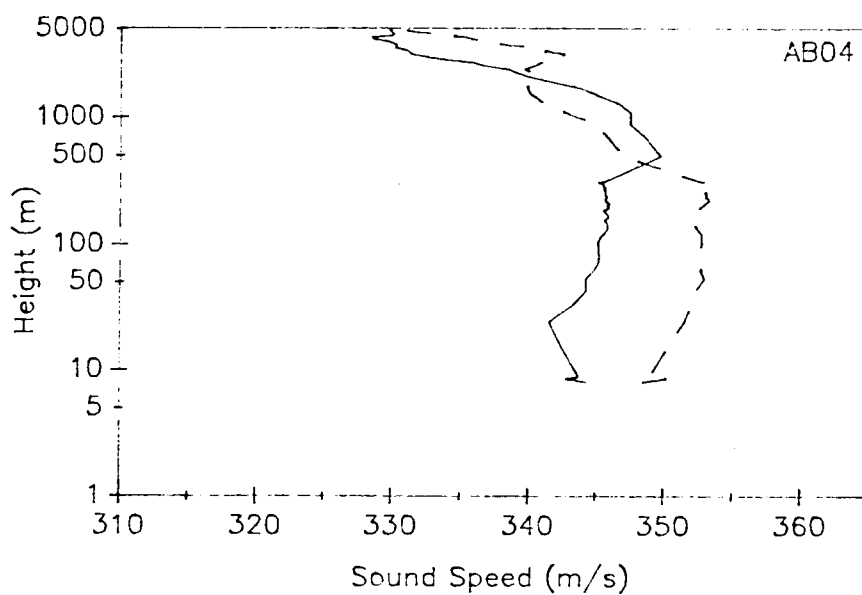


Figure C2. Sound Speed (m/s) for Blasts 19 to 30.

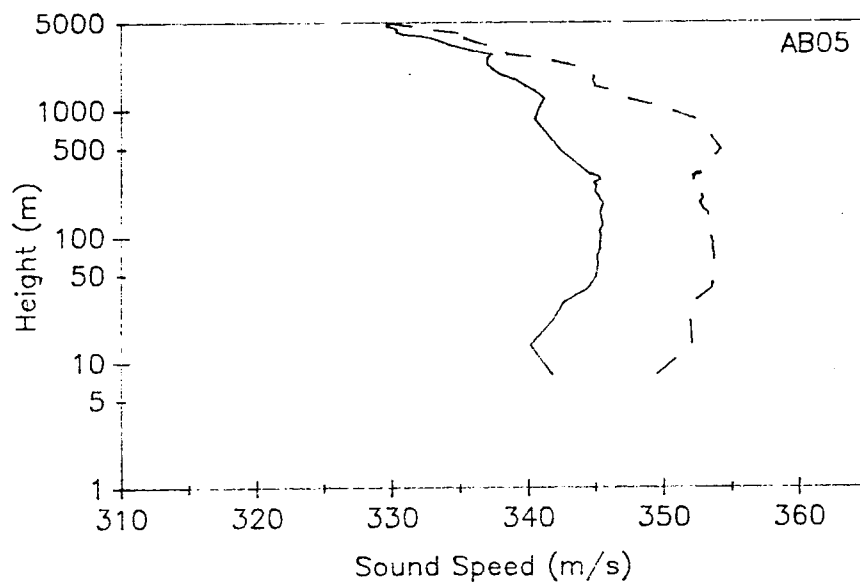


Figure C3. Sound speed (m/s) for blasts 31 to 42.

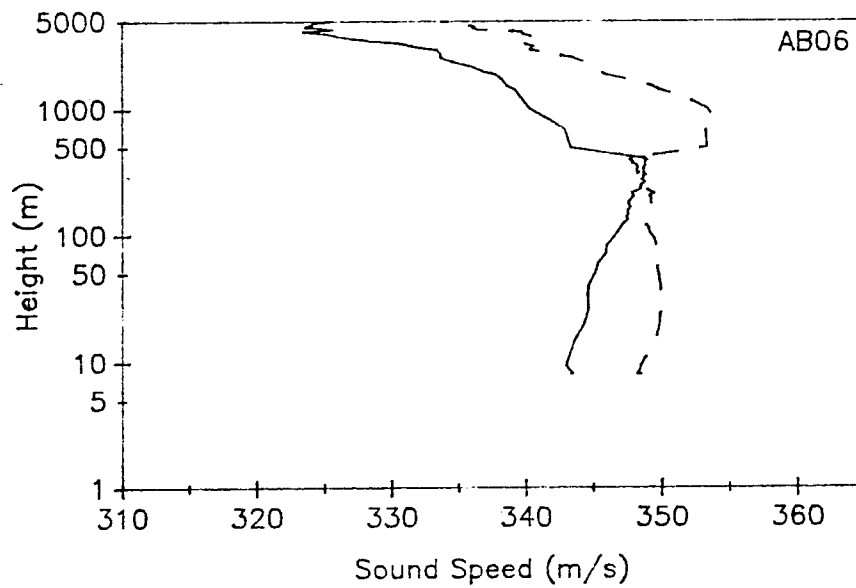


Figure C4. Sound speed (m/s) for blasts 43 to 54.

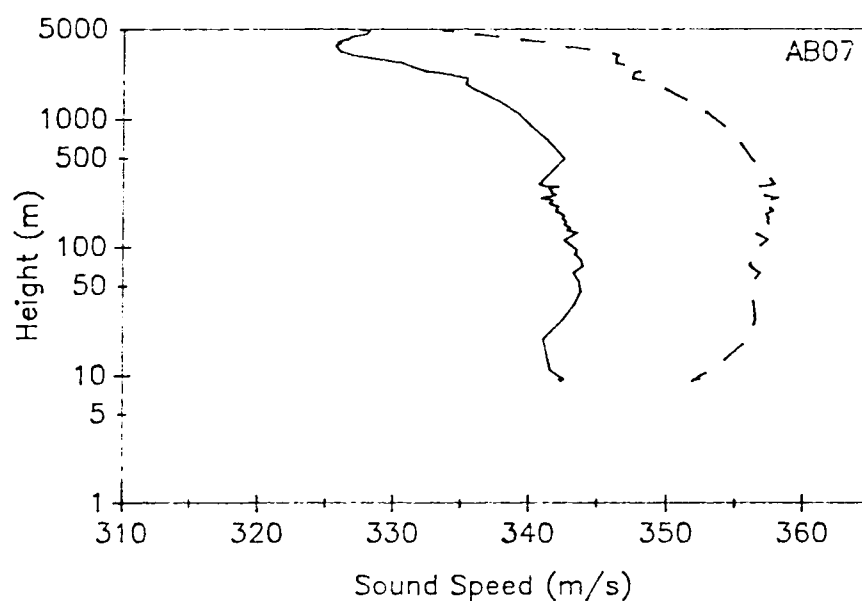


Figure C5. Sound speed (m/s) for blasts 55 to 65.

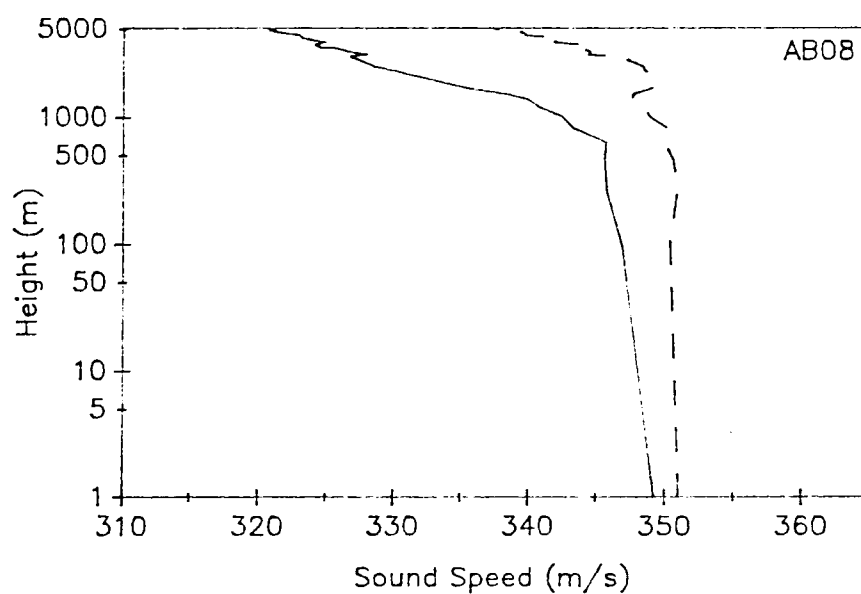


Figure C6. Sound speed (m/s) for blasts 66 to 77.

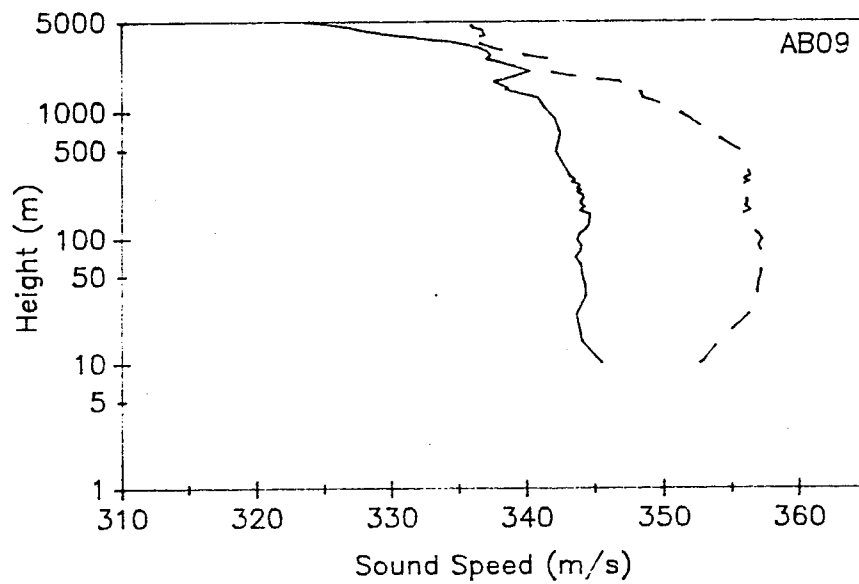


Figure C7. Sound speed (m/s) for blasts 78 to 89.

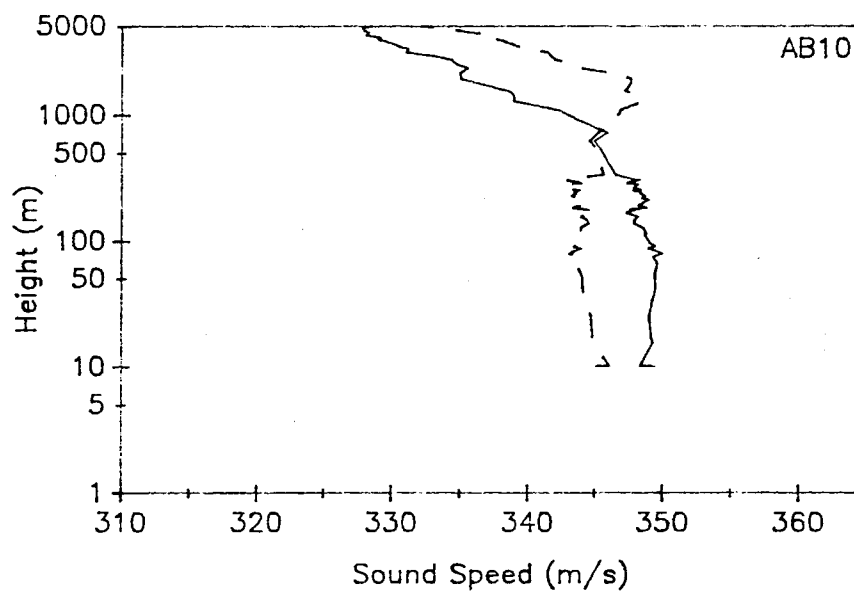


Figure C8. Sound speed (m/s) for blasts 90 to 101.

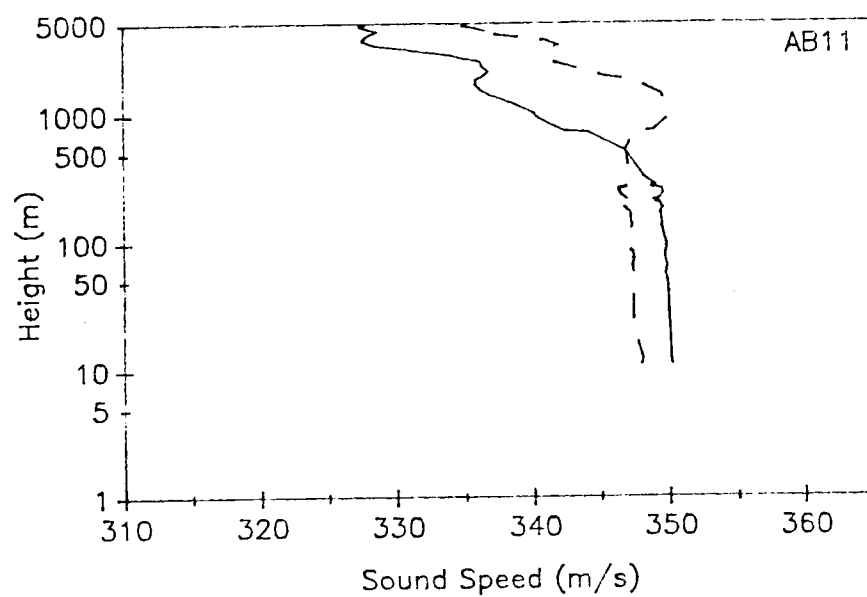


Figure C9. Sound speed (m/s) for blasts 102 to 113.

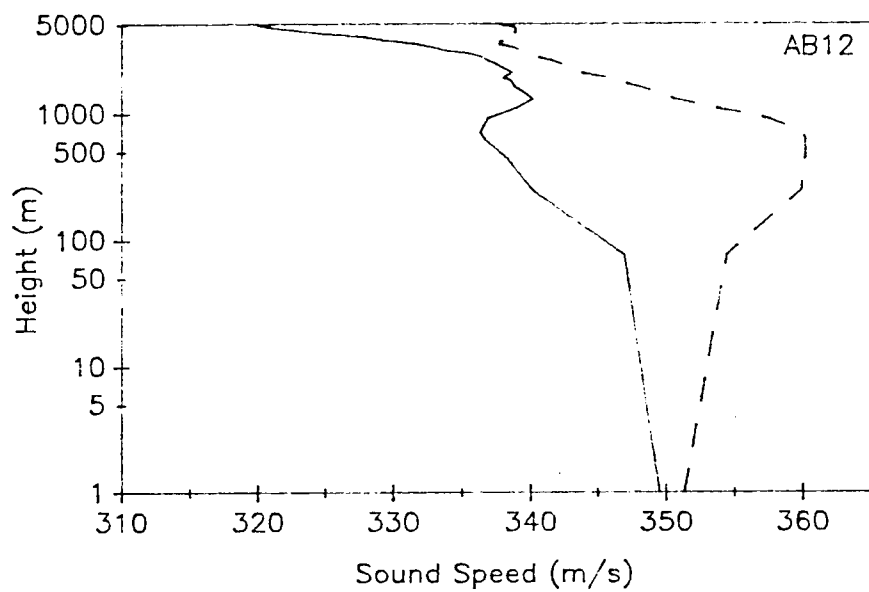


Figure C10. Sound speed (m/s) for blasts 114 to 125.

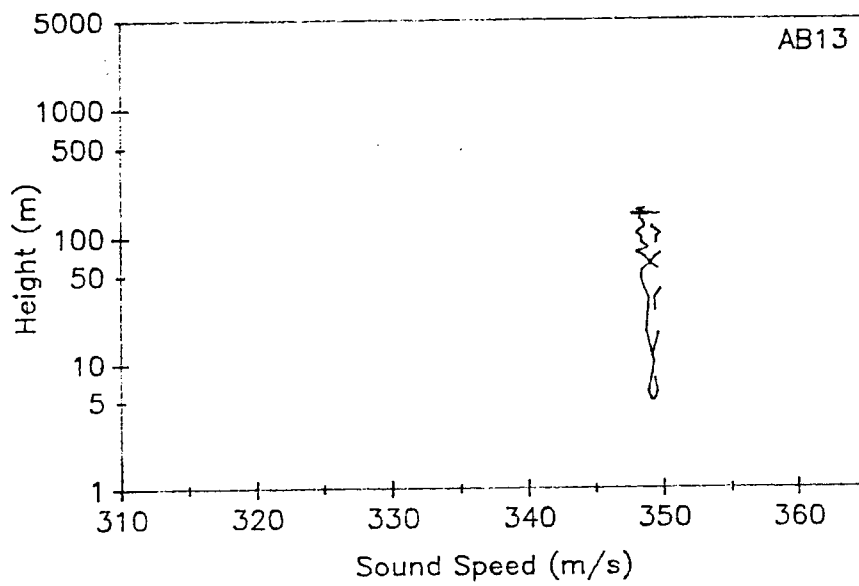


Figure C11. Sound speed (m/s) for blasts 126 to 137.

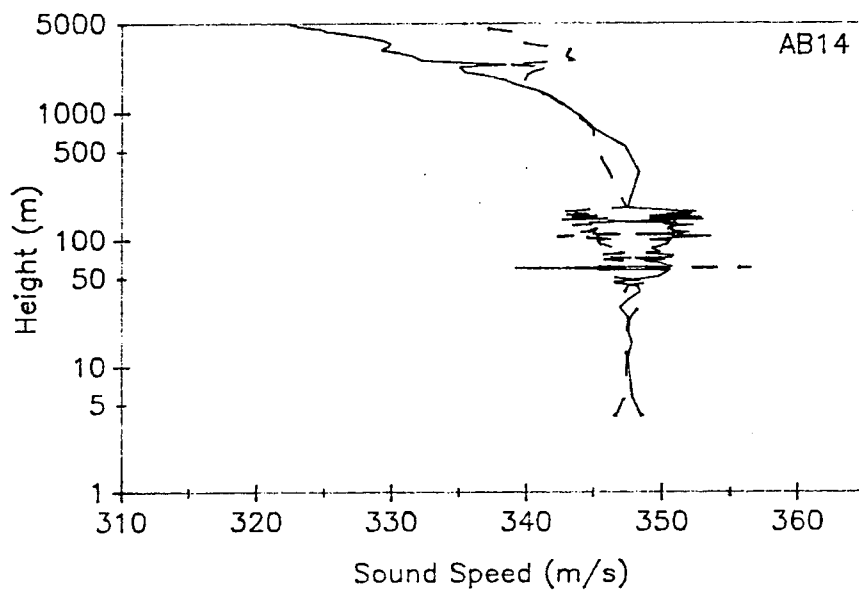


Figure C12. Sound speed (m/s) for blasts 138 to 149.

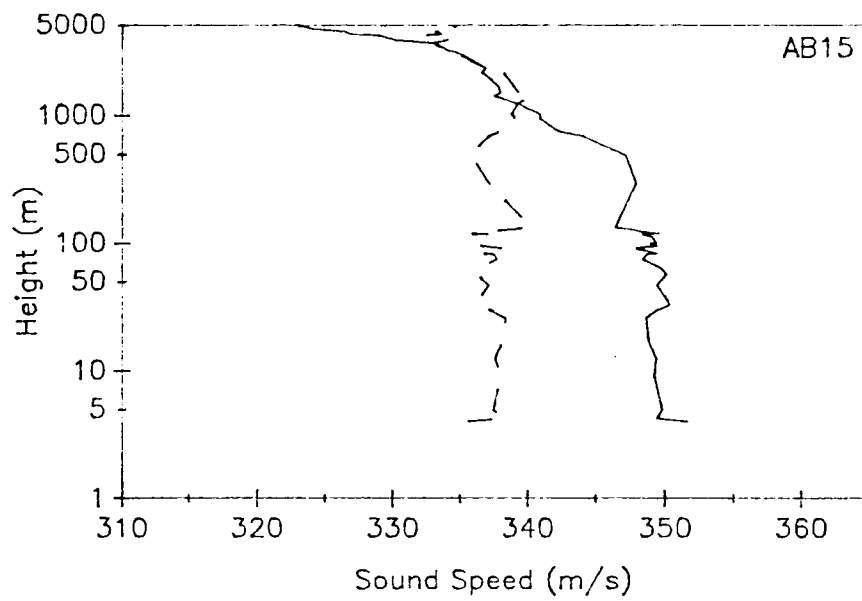


Figure C13. Sound speed (m/s) for blasts 150 to 161.

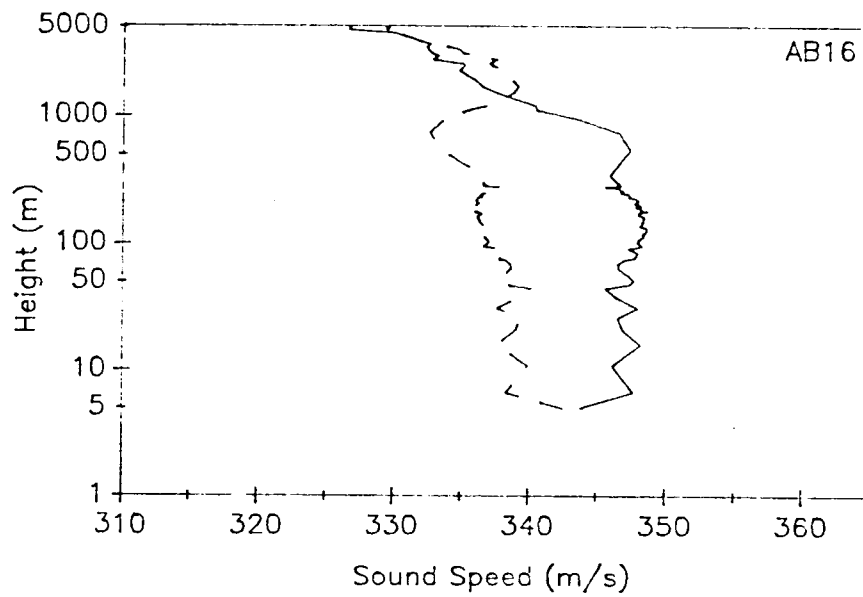


Figure C14. Sound speed (m/s) for blasts 162 to 173.

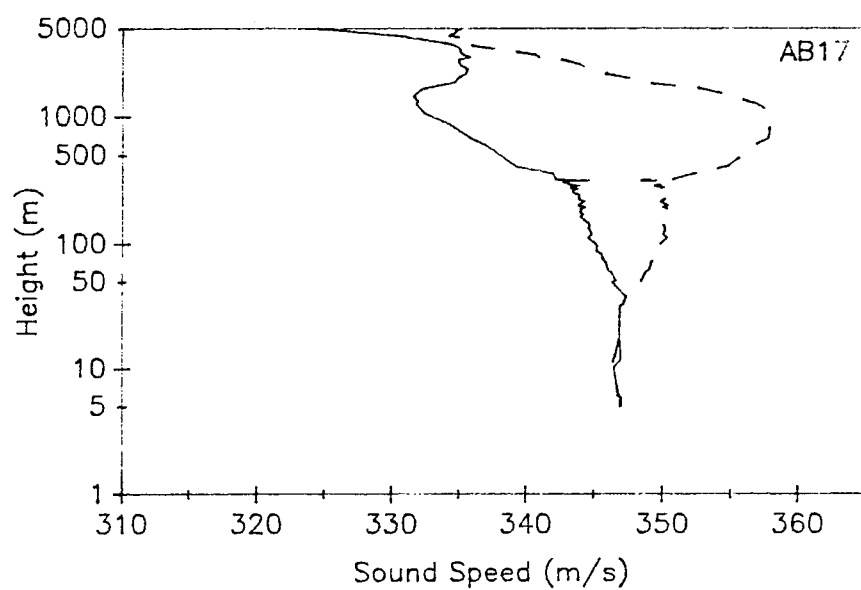


Figure C15. Sound speed (m/s) for blasts 174 to 185.

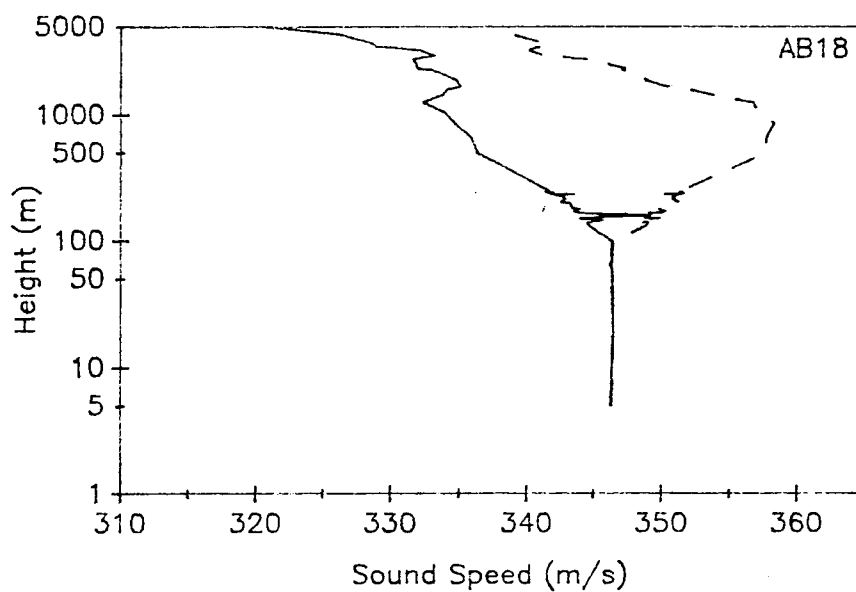


Figure C16. Sound speed (m/s) for blasts 186 to 194.

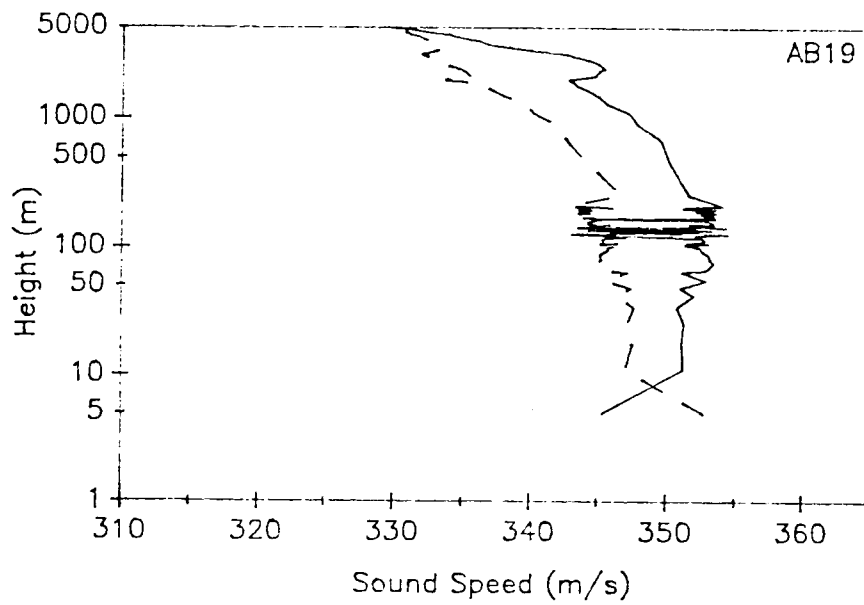


Figure C17. Sound speed (m/s) for blasts 195 to 206.

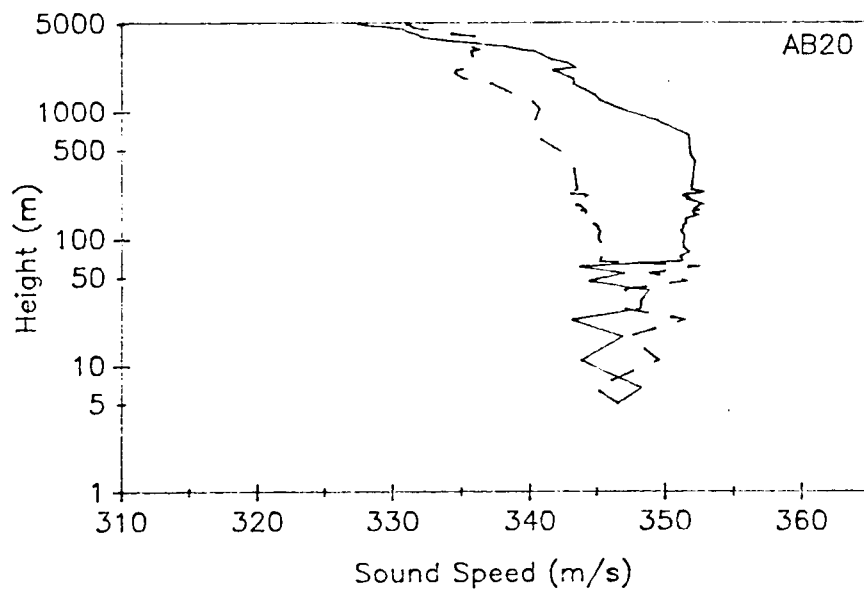


Figure C18. Sound speed (m/s) for blasts 207 to 218.

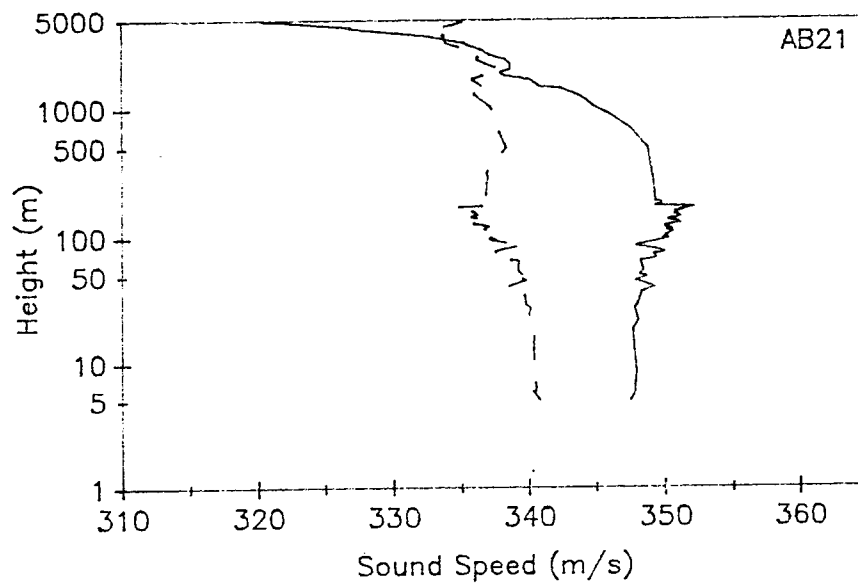


Figure C19. Sound speed (m/s) for blasts 219 to 230.

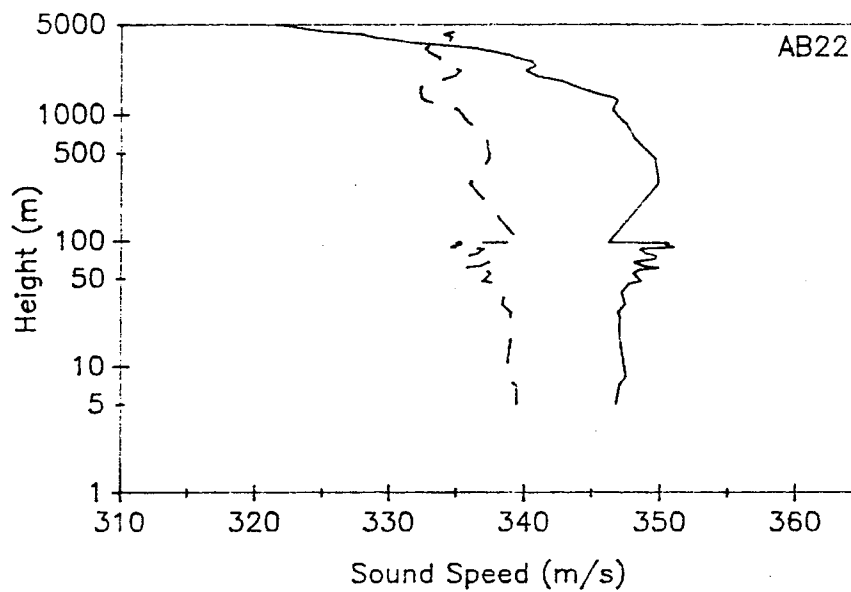


Figure C20. Sound speed (m/s) for blasts 231 to 242.

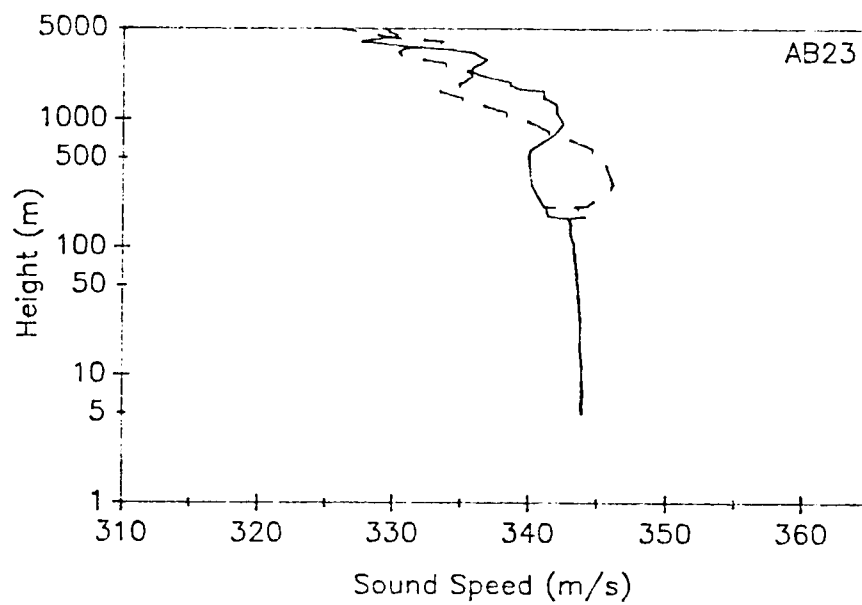


Figure C21. Sound speed (m/s) for blasts 243 to 254.

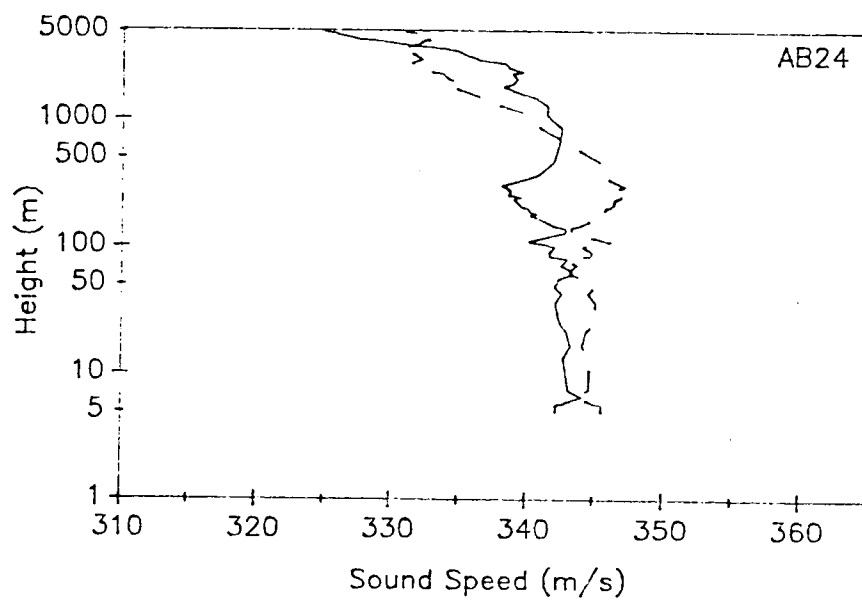


Figure C22. Sound speed (m/s) for blasts 255 to 266.

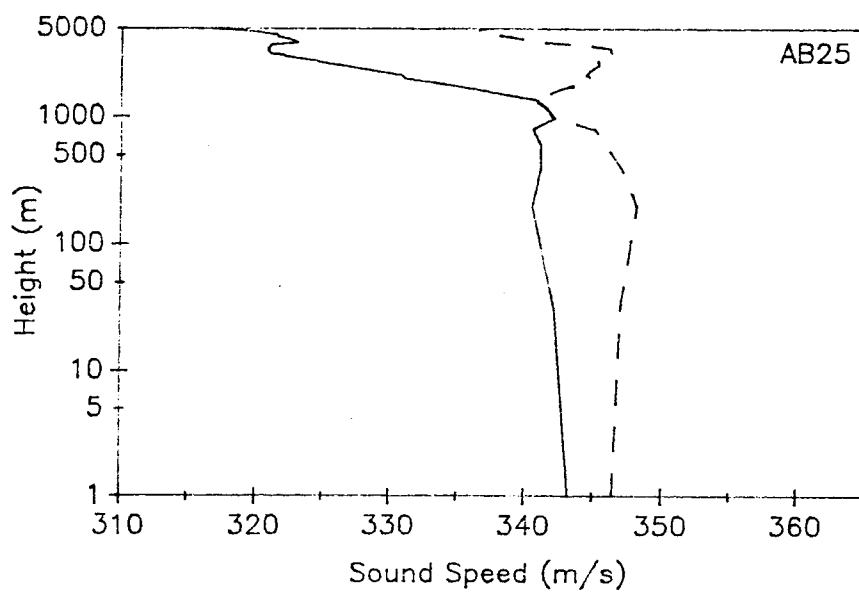


Figure C23. Sound speed (m/s) for blasts 267 to 278.

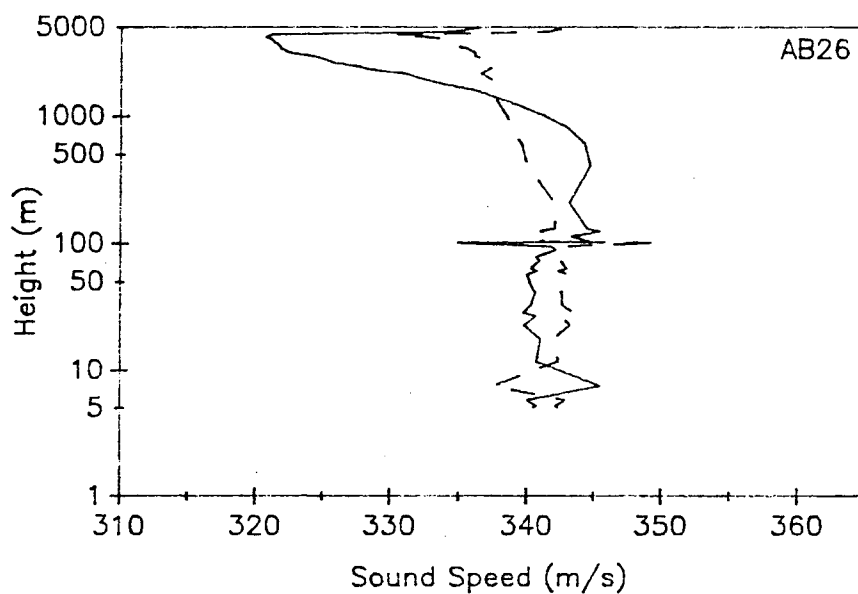


Figure C24. Sound speed (m/s) for blasts 279 to 290.

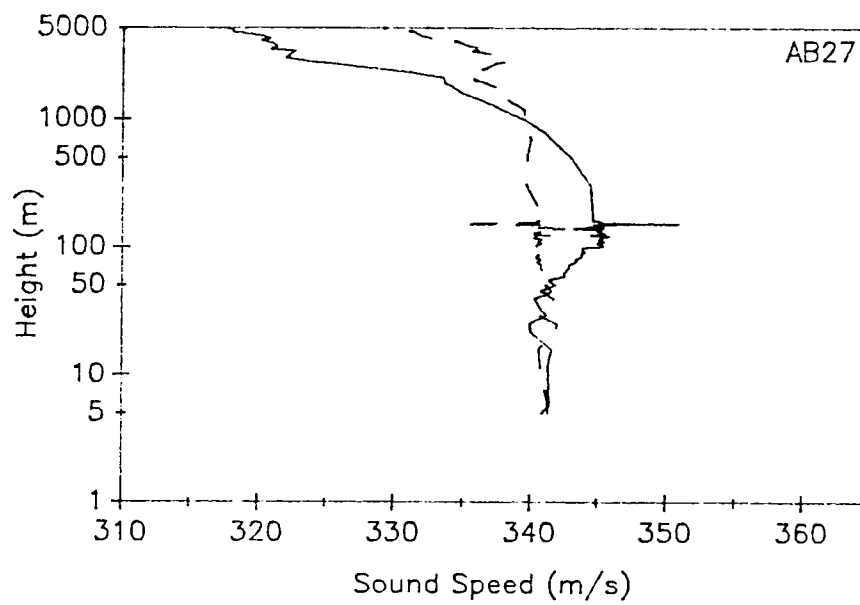


Figure C25. Sound speed (m/s) for blasts 291 to 302.

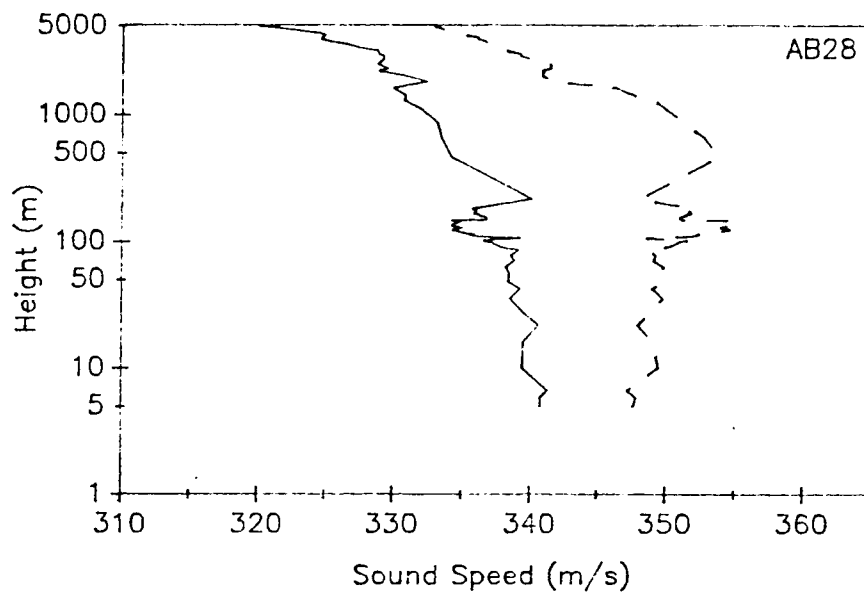


Figure C26. Sound speed (m/s) for blasts 303 to 314.

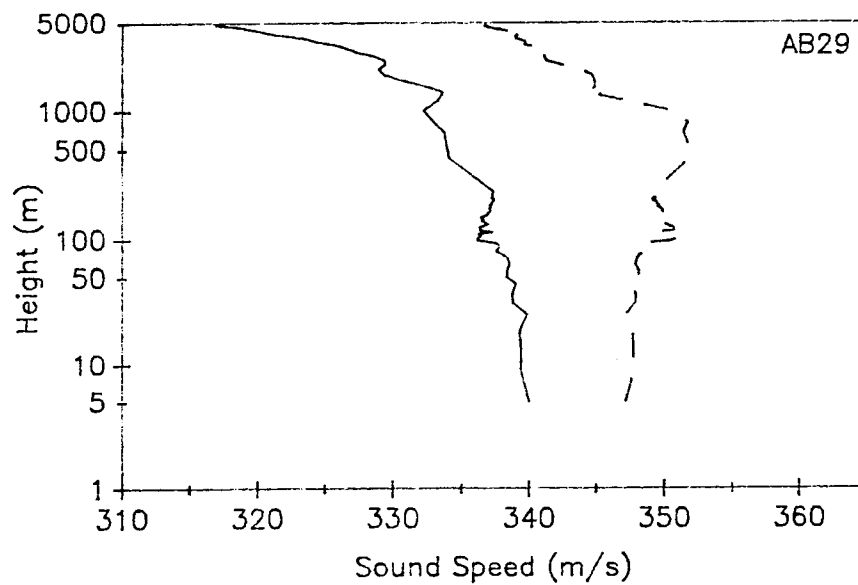


Figure C27. Sound speed (m/s) for blasts 315 to 326.

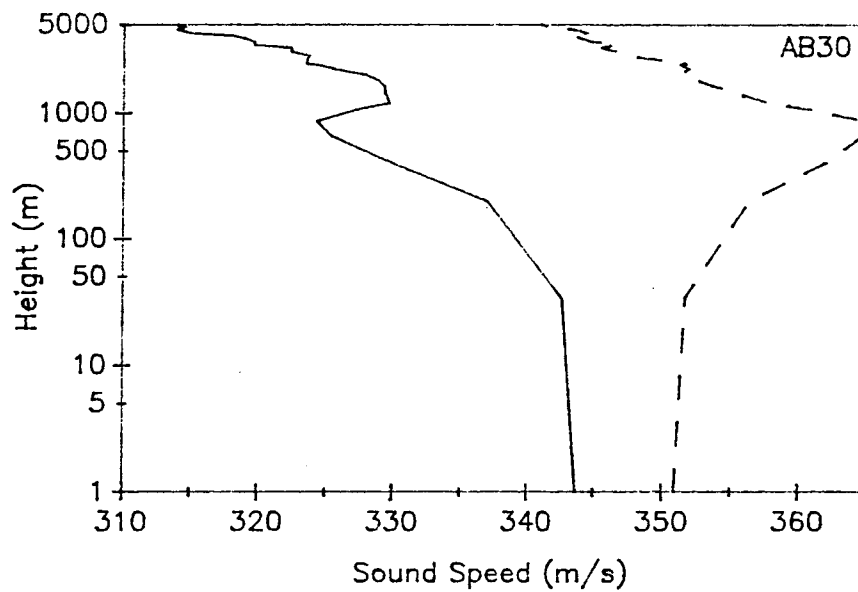


Figure C28. Sound speed (m/s) for blasts 327 to 338.

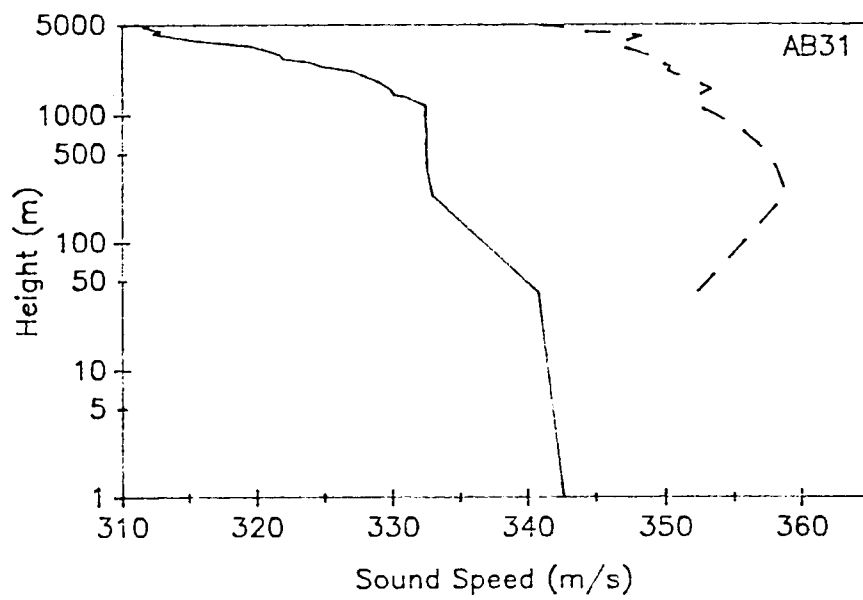


Figure C29. Sound speed (m/s) for blasts 339 to 350.

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