PR 90-119

7/8

Velocity Data

VERTICAL SEISMIC PROFILE

BALDWIN #1

EP 12

Northern Territory

for

PACIFIC OIL & GAS PTY LTD

recorded by

VELOCITY DATA PTY. LTD.

processed by

BARCODE No. P01147

VELSEIS

Integrated Seismic Technologies

ONSHORE

Brisbane, Australia
July 5, 1990

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Rpt 303847

7 Vol.

CONTENTS

FIGURES

SUMMARY

Velocity Data Pty. Ltd. conducted a Vertical Seismic Profile survey for Pacific Oil & Gas Pty Limited in the Baldwin #1 well , EP 12 Northern Territory, Australia.
The date of the survey was February 1st, 1990.

Explosives were used as an energy source with shots being fired in shallow hand augered holes.

GENERAL INFORMATION

Name of Well	:	Baldwin #1
Location	:	EP 12, Georgina Basin.
Coordinates	:	Latitude 022 15' 47.30"
	:	Longitude 136 02' 18.14"
Date of Survey	:	February 1st 1990.
Wireline Logging	:	Century Unit 7741
Weather	:	Fine
Operational Base	:	Perth
Operator	:	A. Viersma
Client Representative	:	Mr. C. Gumley

EQUIPMENT

Downhole Tool

FM Monoline (48 mm)

Sensors:
4 SM6 4.5 Hz - 375 ohm connected in series parallel.

Preamplifier:
-48 dB fixed gain

Time Delay:
4 milliseconds

Reference Geophone

Mark Products L1 (4.5 Hz)

Recording Instrument

VDLS 11/10 software controlled digital recording system utilising SIE OPA-10 floating point amplifiers for digital recording and SIE OPA-4 amplifiers for analog presentation. The system includes a DEC LSI-11 CPU, twin cassette tape unit and printer.

RECORDING

Energy Source	: Power Gel
Shot Location	: A pattern of shotholes was drilled in an arc offset by 86 metres from a survey point Q, 6 metres from the wellhead. The array of shot holes extended over two lines. One of 25 holes and one of only eight holes 2.5 metres from the first line.
Charge Size	: 0.66 kg
Average Shot Depth	: 0.5 metres
Recording Medium	: Digital Cassette Tape
Sample Rate	: 500 Hz (2msec)

WELLSITE DATA

Elevation Data

Elevation of KB	: 349.0 metres A.S.L.
Elevation of Ground	: 345.0 metres A.S.L.
Elevation of Datum	: 337.0 metres A.S.L.
Depth Surveyed	: 1117.0 metres below KB
Total Depth	: 1117.3 metres below KB
Depth of Casing	: 318.0 metres below KB

WELLSITE DATA (Cont)

Number of Shots Used	:	30
Number of Levels Recorded	:	30
Data Quality	:	Fair
Noise Level	:	Moderate

Selection of Shot Levels

Shot levels were chosen so that the maximum one way transit time between consecutive stations was 6.0 msec. The value of 6.0 msec has been selected so as to avoid spatial aliasing during the velocity
filtering steps in the vertical seismic profile processing sequence.

The elimination of spatial aliasing is achieved by knowledge of the spectral content of the source wavelet. The calculation is as follows.

$$(t1 - t2) = \frac{1}{2.f(max)}$$

where t1 = one way time to Station 1.
t2 = one way time to Station 2.
f(max) = maximum spectral content of the source wavelet.

The RAW data set is shown in Figure 1 .

PROCESSING

Prefiltering of the Data Set (Figure 2)

To remove high frequency noise on the data set it has been passed through a bandpass Butterworth filter (roll off = 24 dB per octave) with cutoff frequencies of 10 Hz and 120 Hz. The DC bias is removed during the same process.

Correction for Spherical Divergence (Figure 3)

A number of trials were carried out using a number of different T** operators and it was decided that a value of 1.5 was an optimum.

Suppression of Upgoing Energy (Figure 4)

Each shot is time shifted by its break time so that the down going first arrivals are aligned. The time shifted data set is passed through a low pass dip filter to suppress the small amplitude upgoing waves.

Subtraction of Data Sets (Figure 5)

The flattened down going waves (zero time shift) are subtracted from the total data set.

Up Going Data Set (Figure 6)

The data set of Figure 5 is passed through a low pass dip filter to enhance horizontal reflections.

Deconvolution

An appropriate deconvolution operator was evolved from the second zero crossing of the autocorrelation function.

Filtering (Figure 7)

The upgoing data set was passed through a bandpass Butterworth filter with cutoff frequencies of 10Hz and 90Hz.

Corridor mute (Figures 8)

A corridor of the data set of figure 7 was then taken which encompassed the first 200msecs after the first break time of each trace. The number of traces skipped initially was 8.

Synthetic Seismograms (Figures 9 ,10 and 11)

The data set of figure 8 was then stacked to form the synthetic seismogram. Figure 9 is the seismogram in raw form after undergoing a polarity inversion in order to bring it to normal SEG convention. Figure 10 is the seismogram after filtering (10 - 70 Hz) and after having had an AGC function applied.
Figure 11 is the seismogram shifted by 1.4 msecs to allow for the fact that the VSP is referenced to ground level and the check shot and synthetic are referenced to a datum of 337.0m ASL. Therefore the VSP is here referenced to a datum of 337.0m ASL.

Comments

As the VSP is referenced to ground level and the synthetic is referenced to datum a bulk shift is to be expected to tie the two seismograms. The amount of shift has been calculated from the check shot survey information as follows using the value of the check shot time at datum:

$$\text{(Checkshot time - inst delay)} * \frac{\text{Depth of shot below ground}}{\text{Depth of shot below KB}}$$

The data set showed good shot point character and repeatability the end result was a good tie and close data correlation.

Geoffrey Bell
Geophysical Analyst

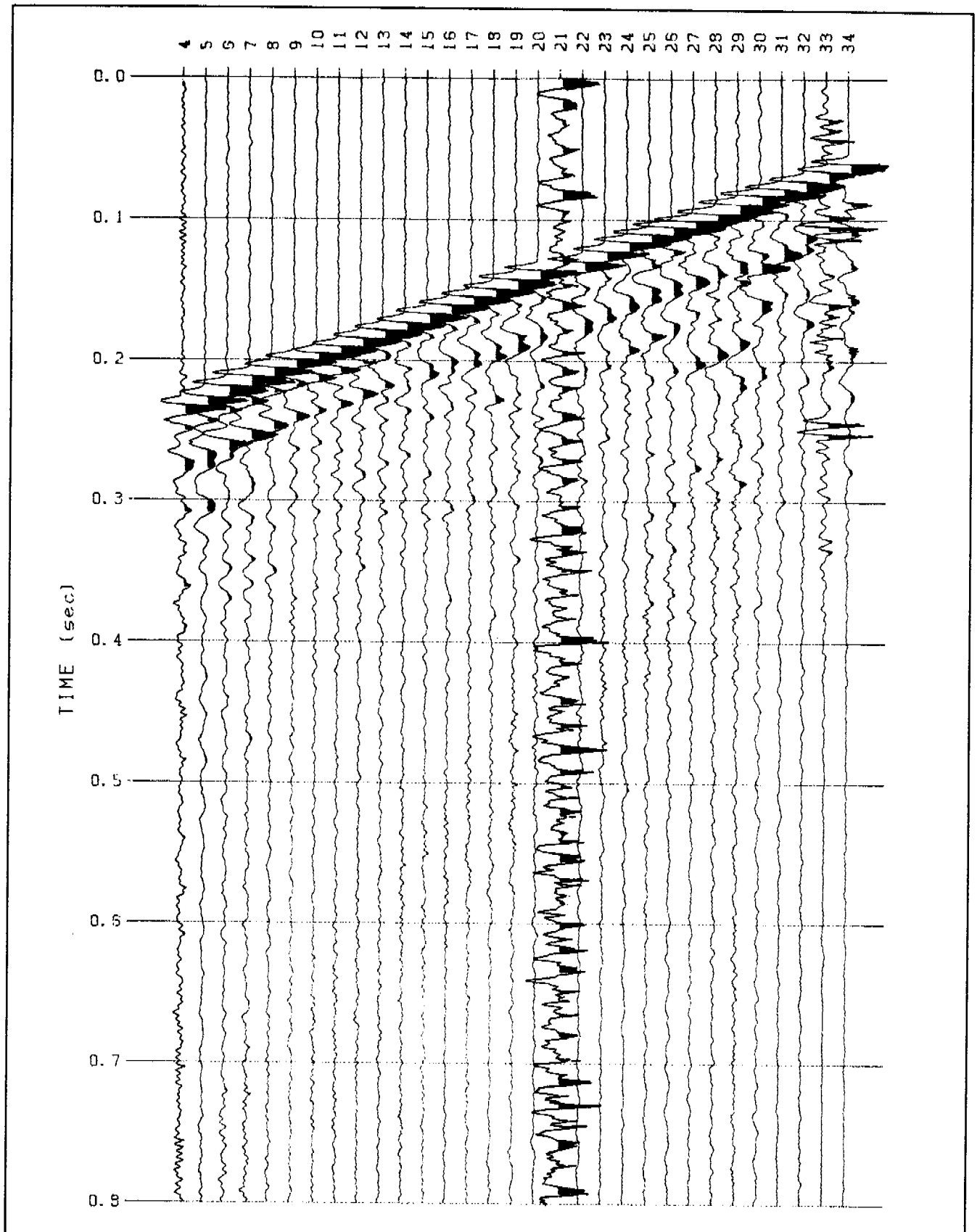

Figure 1. Raw Data Set

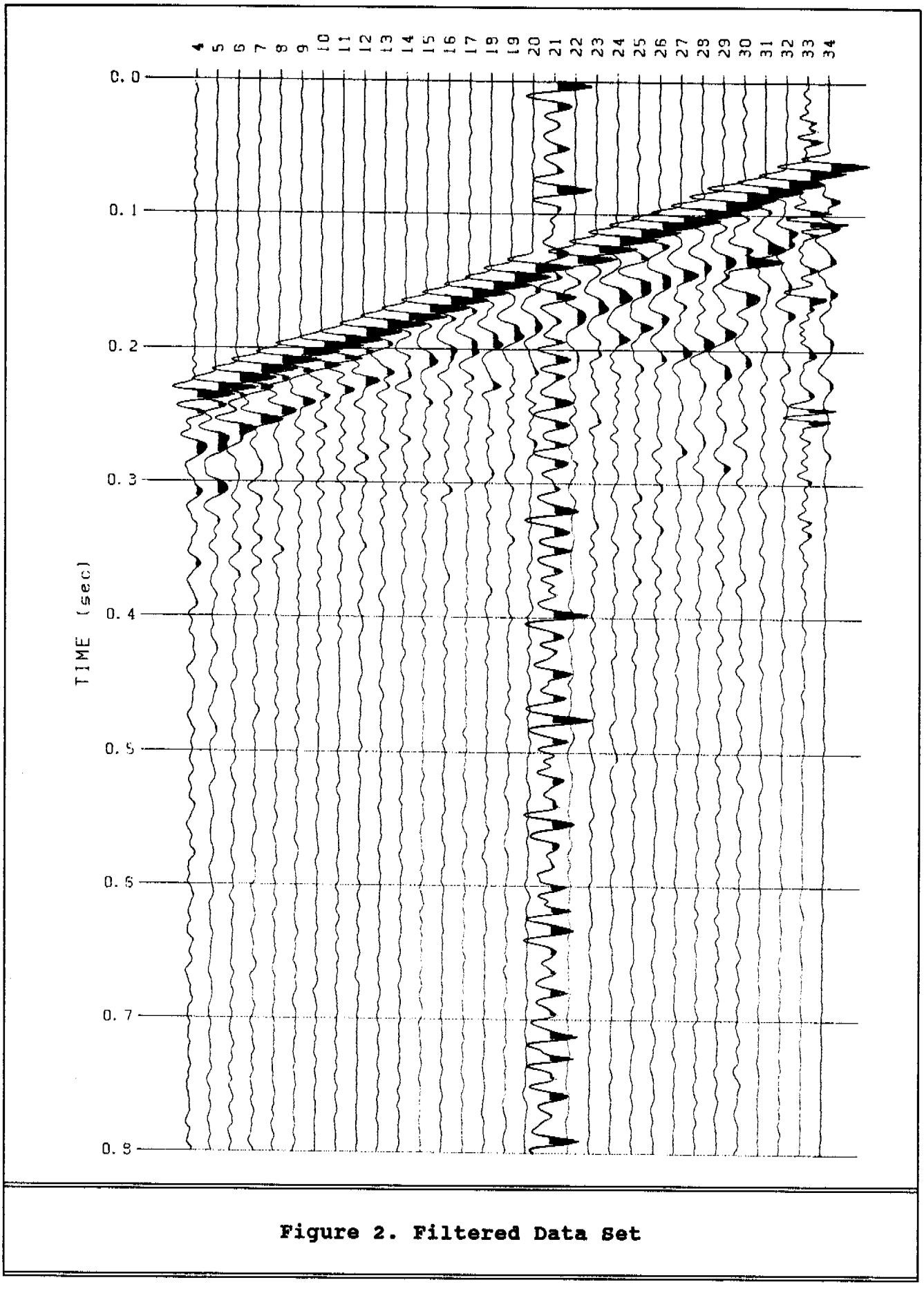

Figure 2. Filtered Data Set

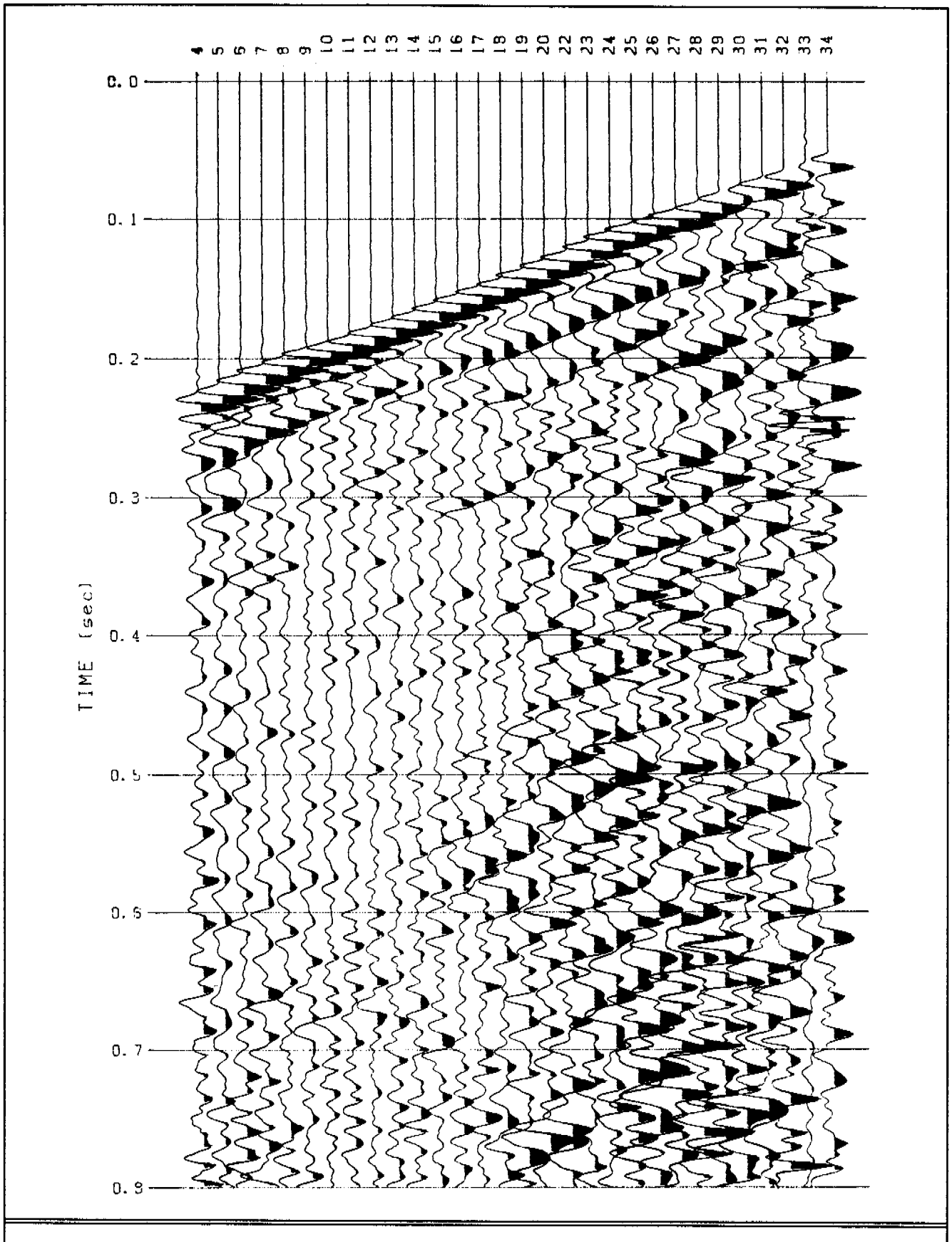

Figure 3.Correction for Spherical Divergence

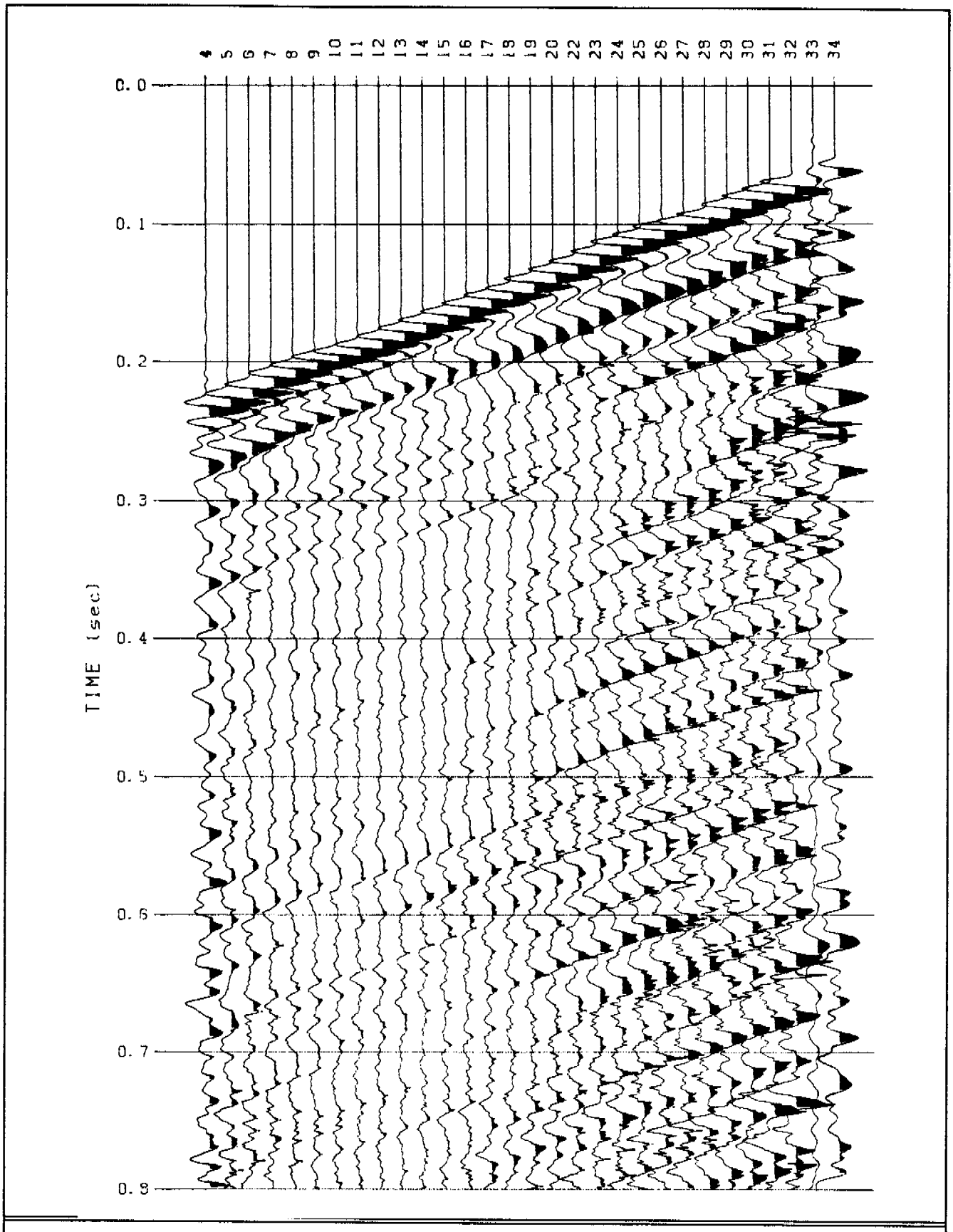

Figure 4.Down Going Data Set

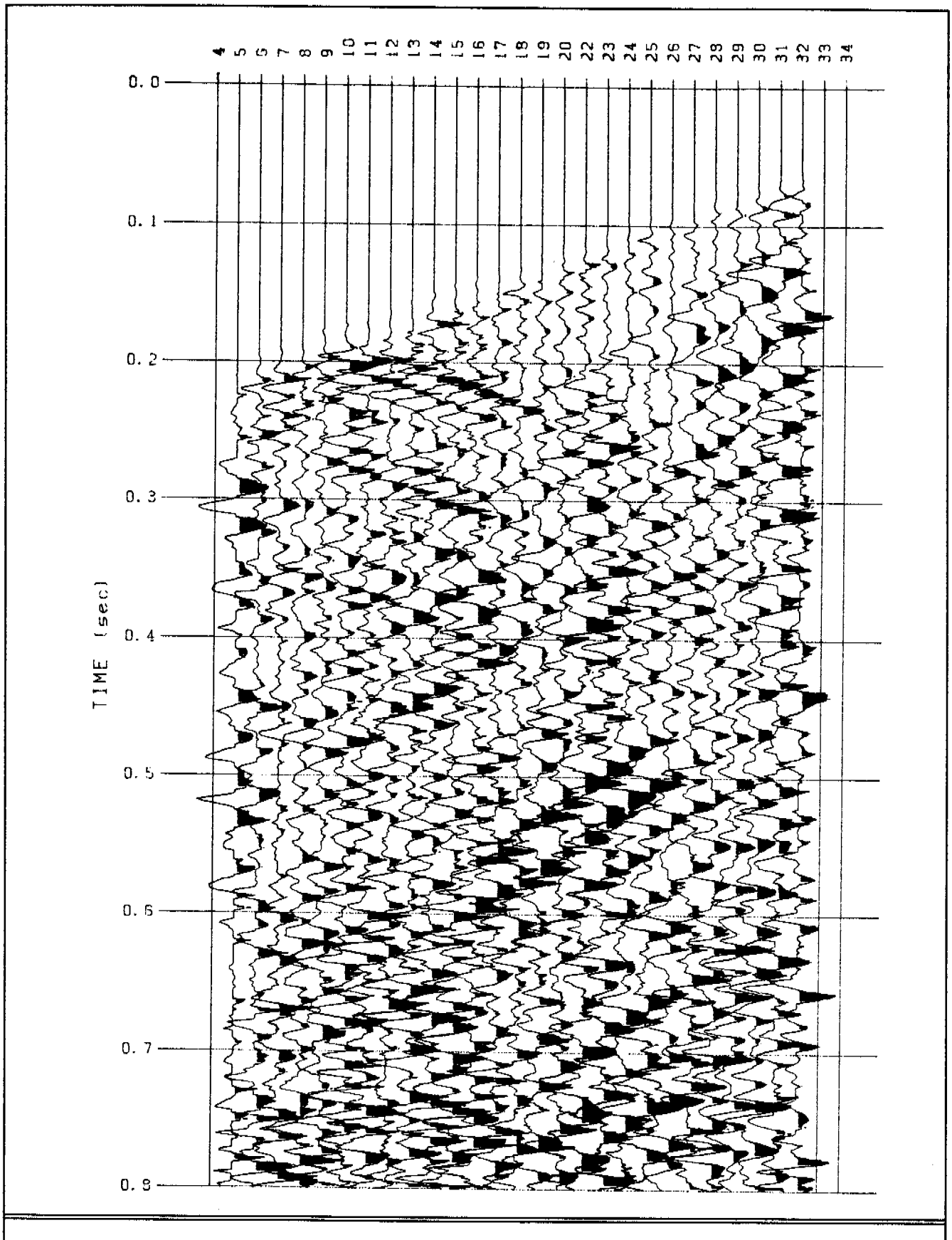

Figure 5. Subtraction of Down Going and Filtered Data Sets

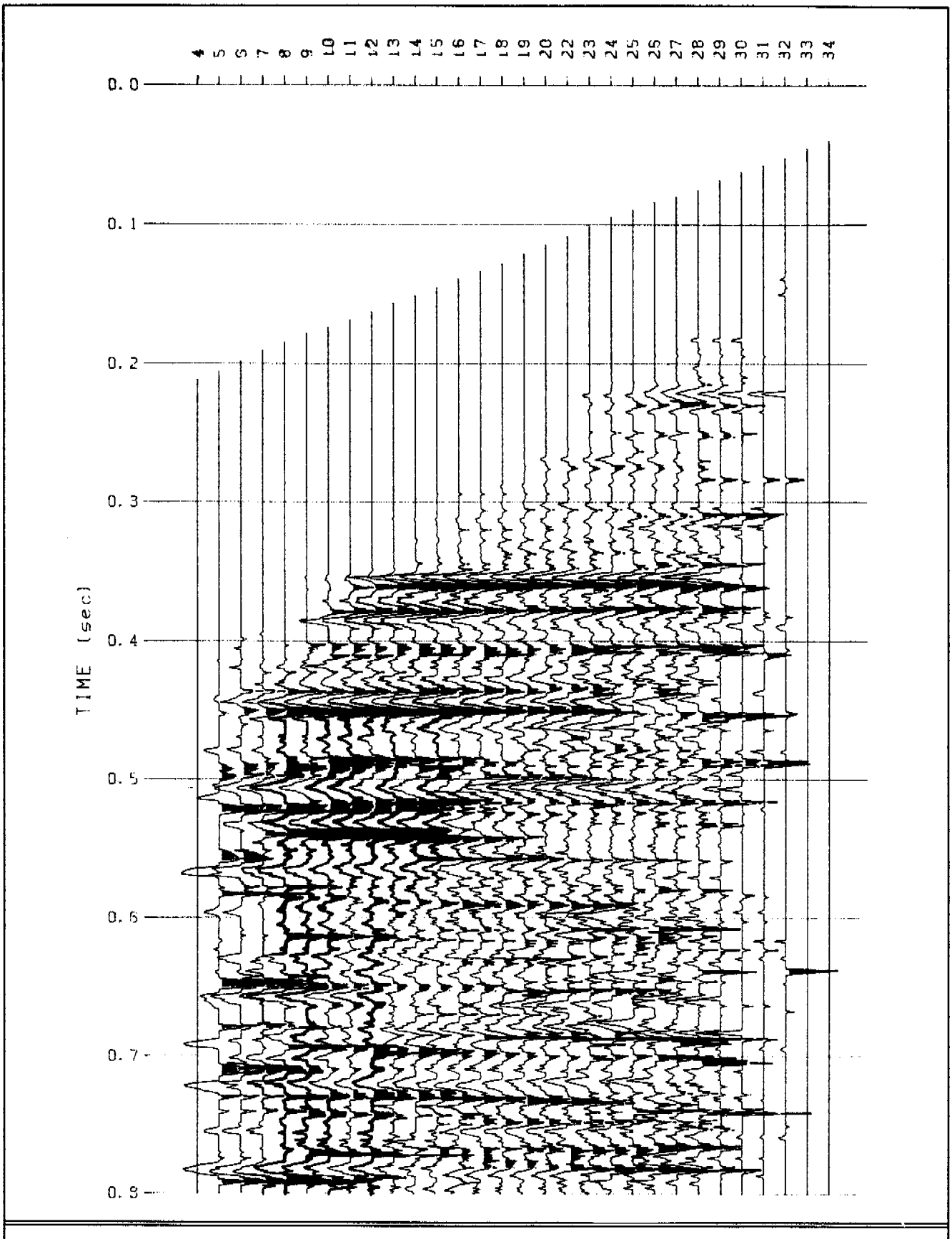

Figure 6.Upgoing Data Sets

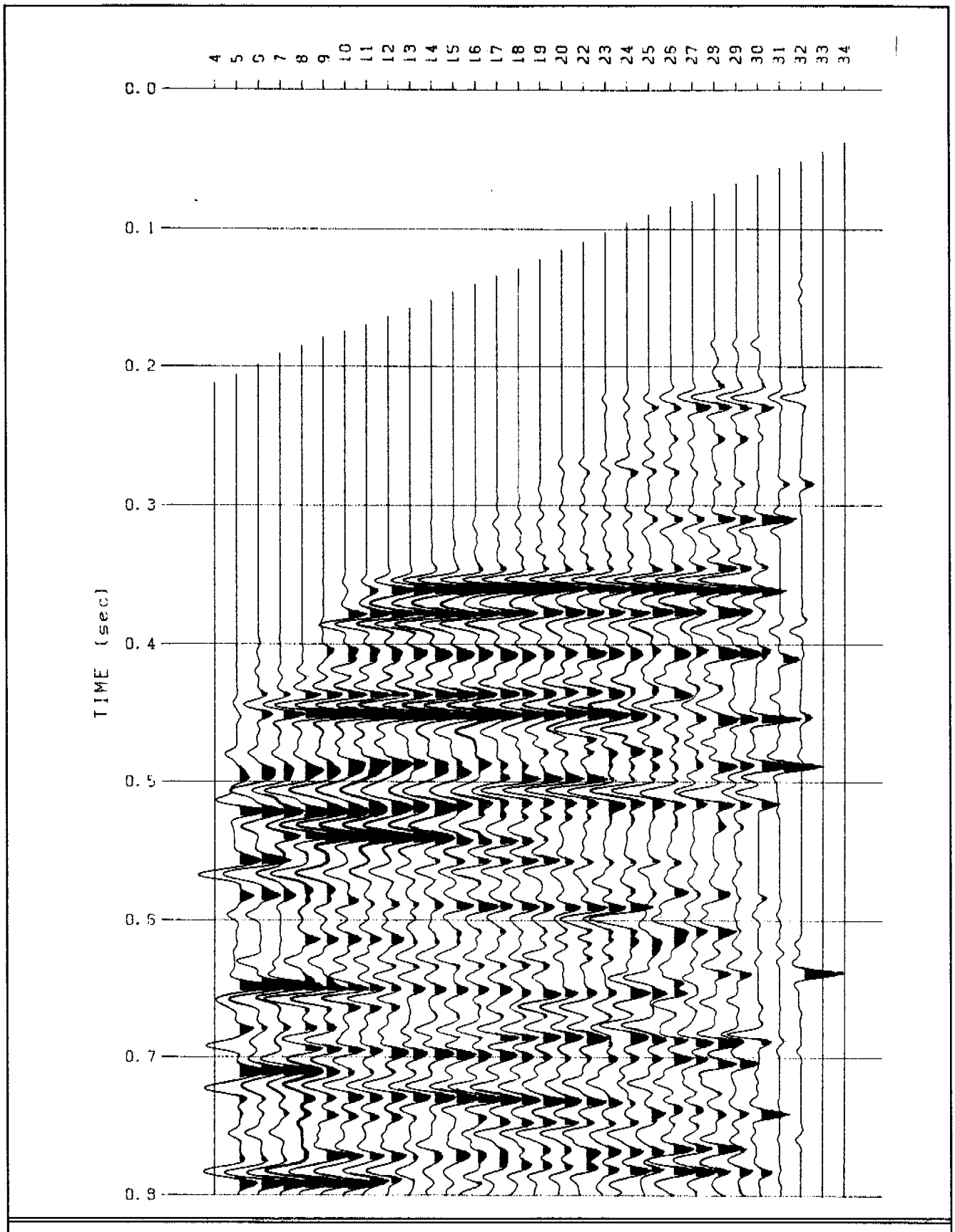

Figure 7.Upgoing Data Set (Bandpass Filtered 10-90 Hz)

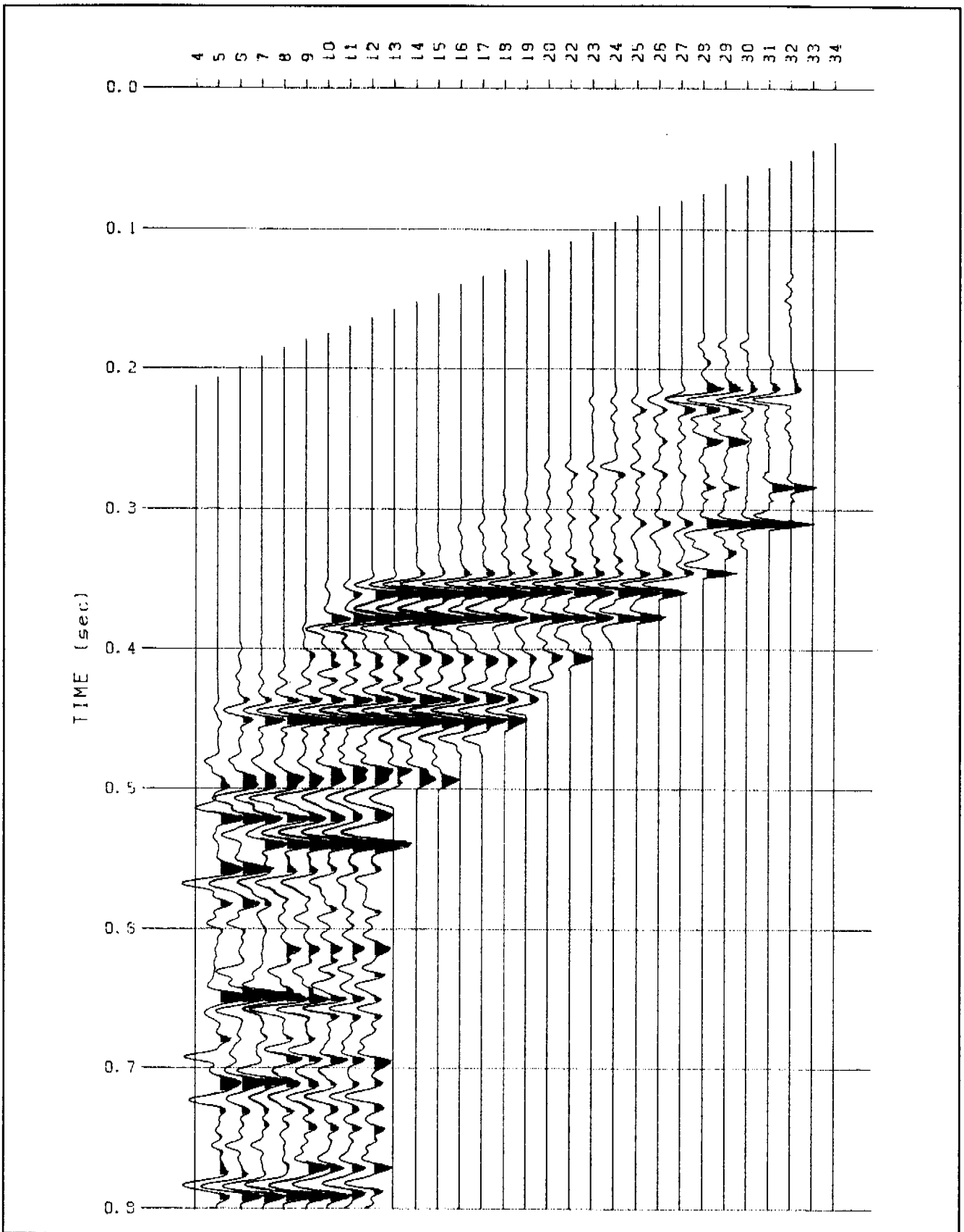

Figure 8.Corridor Mute Stack

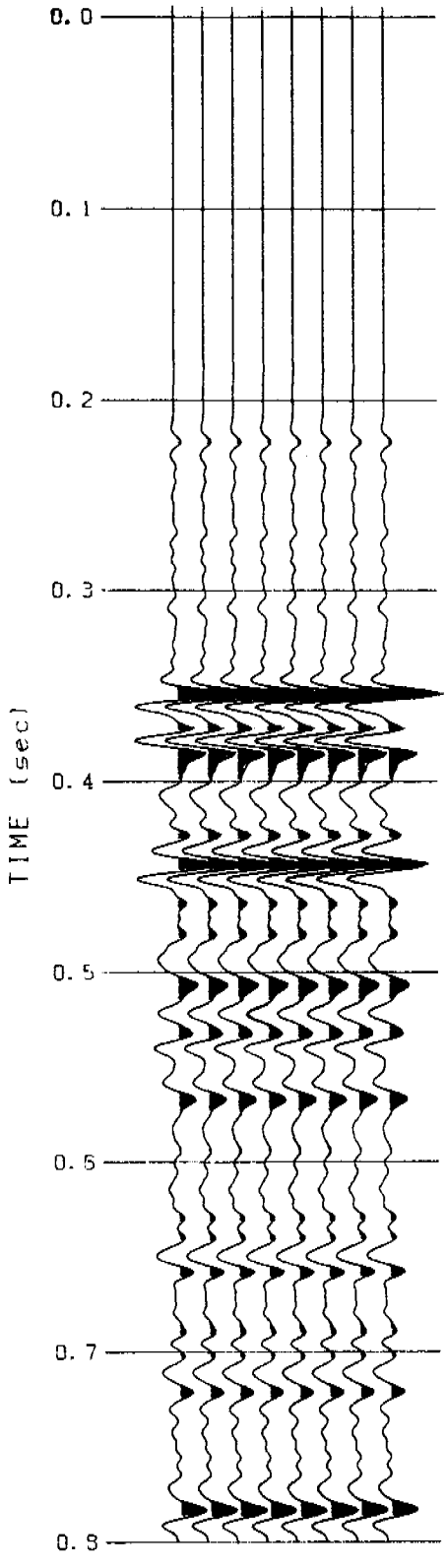

Figure 9.Synthetic Seismogram

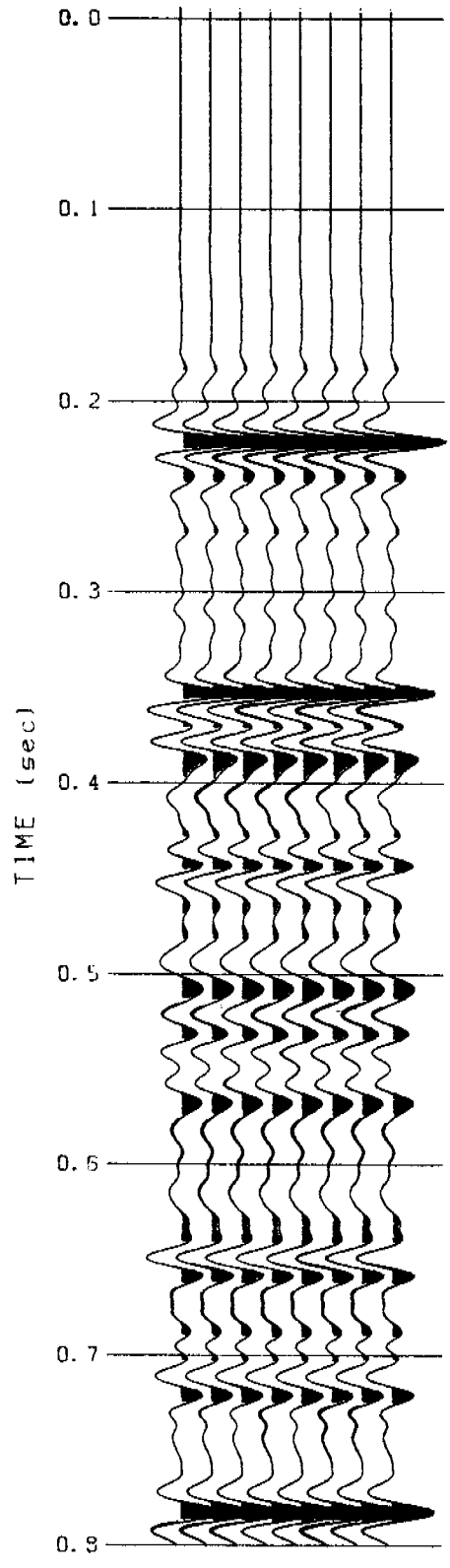

Figure 10.Synthetic Seismogram (AGC 250msec window Filter 10-70Hz)

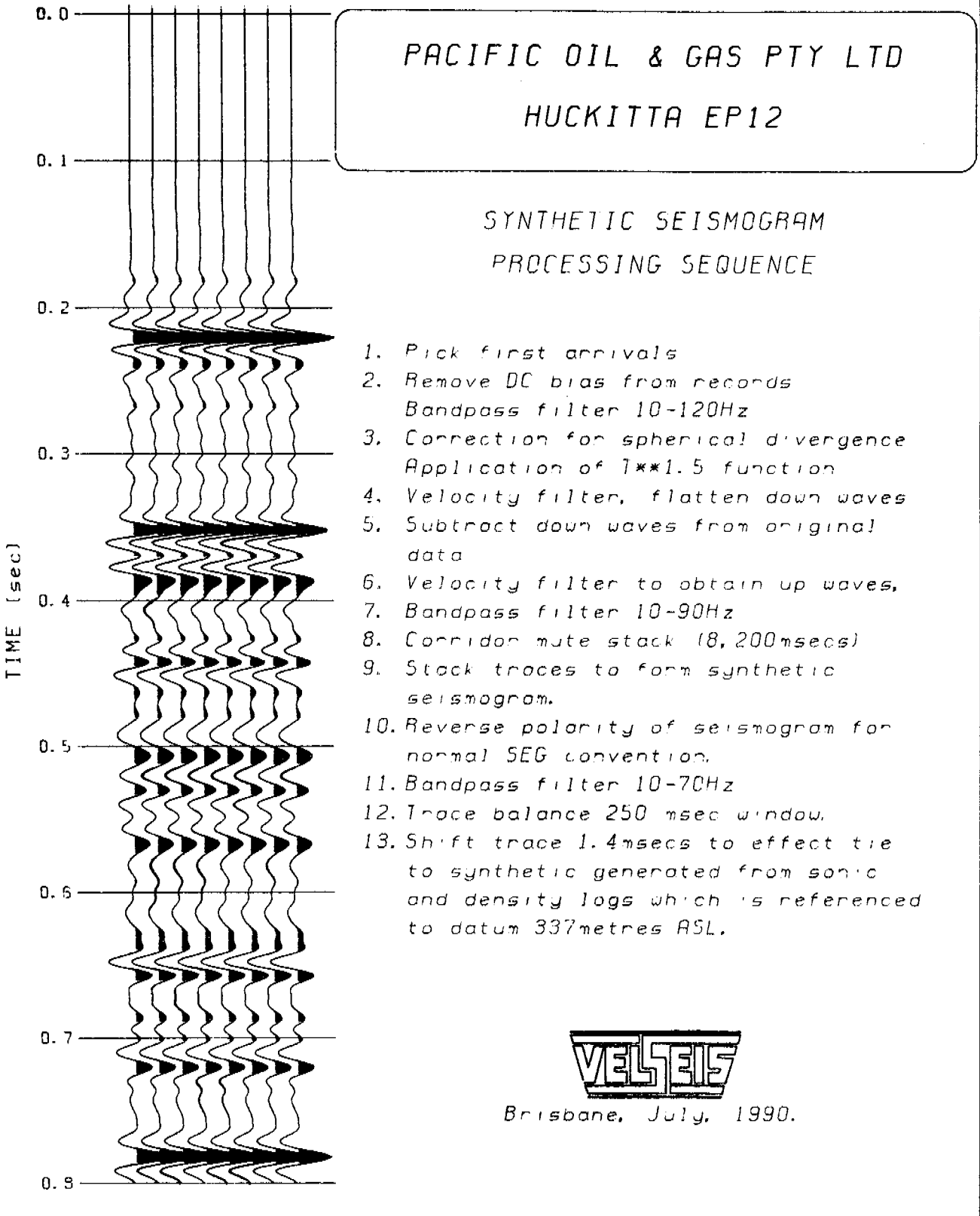

Figure 11.Synthetic Seismogram (1.4 msecs shift)