5. UNDERWAY GEOPHYSICS ON LEG 107[1]

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INTRODUCTION

We obtained routine geophysical measurements during Leg 107 site surveys. The *JOIDES Resolution* was underway 12.7% of the time during the 49.5 days spent at sea.

The on-board instrumentation included precision echo-sounders, magnetometer, seismic reflection profilers, Loran C, and satellite navigation systems. The instruments were maintained and operated by the ODP Marine Technicians, in cooperation with the scientific party and the officers and crew of SEDCO-FOREX, Inc.

NAVIGATION

A variety of navigational aids was used when underway, in transit between sites, and during site approaches. The ship has two transit satellite receivers: a Magnavox 1107-GPS, located in the underway geophysics lab, and a Magnavox 702A-3 located on the bridge. The satellite receiver in the underway geophysics lab receives fixes from the Global Positioning System (GPS) as well as the standard transit satellite system. Both the Magnavox 1107-GPS and the Magnavox 702HP satellite receivers calculate dead reckoning positions.

The entire cruise was within the area covered by the 7990 Loran-C chain. However, Loran positioning, using the ship's Si-Tex/Koden 757 Loran receiver, proved to be highly erratic and dependent on time of day, ship's heading, and atmospheric conditions.

The transit and dead reckoning position data were written to the extended tape headers on the Masscomp (Table 1) and were extracted later to produce a navigation plot (Figs. 1 and 2). In those figures the fixes are plotted with respect to time. Fixes collected while onsite are averaged, and a single point is plotted for the entire site. The fixes were plotted on a Mercator projection map.

BATHYMETRIC DATA RECORDING

Bathymetric data were collected at 3.5 and 12 kHz during site approaches.

The standard 3.5-kHz system uses an array of 12 Raytheon TR-109 transducers and a Raytheon PTR-105B transceiver. The data were displayed on an EDO model 550 flatbed recorder. A Raytheon CESP-III correlator was used to improve signal-to-noise ratio (20 dB). An experimental towed 3.5-kHz transducer array, designed for high-speed (as fast as 13 kt) towing, was tested while approaching Site 654. The towed fish utilizes four in-line Raytheon TR-109 transducers. Pulse width for the towed fish, as for the hull-mounted array, was 100 ms. The transducer array was towed at a depth of about 10 m; in contrast the hull-mounted transducer was 6 m below sea level.

The ship has two 12-kHz transducers: a Raytheon TR-12/34 is mounted aft of the moonpool and an EDO 323B is mounted forward, under the bridge. During Leg 107, the EDO was more commonly used on site approaches because the aft transducer is in a noisier location. The 12-kHz system uses an EDO 248C transceiver and an EDO 550 flatbed recorder.

The topographic profile was drawn on the basis of depth readings, taken at 5-min intervals. This profile and the map location are shown on Figures 2 and 3.

MAGNETICS

Because of technical problems, no magnetics data were recorded during Leg 107.

SEISMIC REFLECTION PROFILES

During all site approaches except Site 655, single channel seismic reflection data were collected beginning 10–15 nmi before the first crossing of the beacon drop point. The following equipment was employed.

Sources

The standard seismic sources were two synchronized 80-in.^{3} Seismic System, Inc. water guns.

[1] Kastens, K. A., Mascle, J, Auroux, C., et al., 1987. *Proc., Init. Repts. (Pt. A), ODP*, 107.

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Streamer Hydrophones

One Teledyne Model 178 streamer, 100 m long, was towed approximately 500 m behind the vessel. It contains 60 equally spaced hydrophones whose output is transformer-coupled to the ship. The towing depth was set by external depth depressors ("birds"). The hydrophone elements were combined to produce a single signal.

Data Recording

The unprocessed digital signal was recorded on 9-track magnetic tape using an SEG-Y format and a density of 1600 bits/in. The header file for each shotpoint on the magnetic tape includes the following information: shotpoint number, date and time, wind speed, wind direction, ship's speed (pit log), ship's gyroscope heading, cumulative distance traveled, streamer and gun depth, and information concerning timing of gun firing. These data can be obtained on request from the ODP Supervisor of Data Bases.

The seismic system used a supermicro 561 Masscomp computer to record, process, and display the data. The processed profiles were displayed approximately 3 min after real time, on a 15-in.-wide Printronix high-resolution graphic printer (160 dots/in.).

Seismic data were also displayed in real time in analog format on two EDO 550 dry-paper recorders. The streamer signal was passed through an amplifier and two bandpass filters. These analog seismic lines are not shown here but can be obtained on request from the ODP Supervisor of Data Bases.

SEISMIC PROCESSING

Most of the site survey seismic lines were reprocessed during the site occupations. The processing techniques applied are described in Table 2. Final display of the reprocessed profiles used either the Printronix graphic printer or a 22-in.-wide Versatec plotter (200 dots/in.) (Figs. 4–9).

The seismic lines were displayed with the following plotting parameters:

Traces per inch: 17
Clip high = 0.10 in.
Clip low = -0.10 in.
Deflection = 0.10 in.
CDP/SP numbering increment: 10
Plot time scale: 6.25 in./s
Time label increment: 250 ms
Variable area display
Positive peaks to the right

ACKNOWLEDGMENTS

The scientific party of Leg 107 is extremely grateful to Captain Gerard Kuster and his officers and crew for their excellence in navigation and cooperative spirit. Thanks go also to the ODP group for the many hours of watch standing, to Bill Robinson for the improvements he provided to the underway geophysics laboratory during Leg 107, and to Mark Weiderspahn and Ali Tufayli of the University of Texas at Austin, who designed and wrote the seismic digital acquisition system.

Table 1. Navigation data for Leg 107.

GB	Type[a]	Julian day	Time	North latitude	East longitude	Site
G	SN	1	0708	37.82047	4.79035	
G	SN	1	0758	37.85885	5.01277	
G	SN	1	0946	37.93692	5.49322	
G	SN	1	1142	38.02947	5.97648	
G	SN	1	1214	38.05470	6.10443	
G	SN	1	1334	38.10493	6.44352	
G	SN	1	1732	38.24937	7.41980	
G	SN	1	1922	38.32860	7.88423	
G	SN	1	2004	38.35987	8.06587	
G	SN	1	2150	38.50510	8.47825	
G	SN	2	0016	38.75168	9.01940	
G	SN	2	0150	38.89607	9.22533	
G	SN	2	0404	39.01768	9.79953	
G	SN	2	0458	39.02595	10.04283	
G	SN	2	0646	39.03458	10.53093	
G	AN	2	0722	39.03802	10.69362	
G	SN	2	0910	39.04313	11.17963	
G	SN	2	1120	39.03982	11.75347	
G	SN	2	1308	39.01027	12.22497	
G	SN	2	1456	39.11663	12.76383	
G	SN	2	1928	39.02463	13.74832	
G	GP	2	2046	39.15640	13.78942	
G	GP	2	2050	39.16365	13.79283	
G	GP	2	2100	39.18118	13.80193	
G	GP	2	2110	39.19872	13.81103	
G	SN	2	2118	39.21048	13.81827	
G	GP	2	2120	39.21625	13.82013	
G	GP	2	2130	39.23210	13.83045	
G	GP	2	2145	39.25905	13.84475	
G	SN	2	2146	39.26255	13.84472	
G	GP	2	2152	39.27185	13.85167	
G	GP	2	2200	39.28667	13.86000	
G	GP	2	2205	39.29525	13.86500	
G	GP	2	2220	39.32250	12.88167	
G	GP	2	2225	39.33167	13.88667	
G	GP	2	2230	39.34000	13.89167	
G	GP	2	2235	39.35000	13.89667	
G	ST	10	1500	39.35457	13.89764	650
G	SN	10	1556	39.35725	13.90075	
G	SN	10	1822	39.35415	13.83708	
G	SN	10	2008	39.37585	13.75208	
G	SN	10	2218	39.64418	13.53533	
G	SN	10	2358	39.92075	13.27652	
G	SN	11	0046	40.05053	13.14097	
G	LC	11	0125	40.12150	13.04500	
G	LC	11	0130	40.12150	13.02550	
G	LC	11	0135	40.12217	13.01483	
G	LC	11	0140	40.12233	13.00350	
G	SN	11	0142	40.12610	12.99605	
G	LC	11	0150	40.11267	12.97250	
G	LC	11	0155	40.11283	12.95650	
G	LC	11	0205	40.12417	12.93350	
G	LC	11	0210	40.12450	12.91883	
G	LC	11	0215	40.12483	12.90450	
G	LC	11	0220	40.12550	12.88983	
G	SN	11	0230	40.13111	12.86758	
G	LC	11	0230	40.12733	12.86100	
G	LC	11	0240	40.13450	12.83450	
G	LC	11	0250	40.14683	12.80517	
G	LC	11	0300	40.14700	12.77867	
G	LC	11	0310	40.14850	12.75367	
G	SN	11	0320	40.15423	12.73065	
G	LC	11	0320	40.14967	12.72833	
G	LC	11	0330	40.15133	12.70300	
G	LC	11	0340	40.15300	12.67767	
G	LC	11	0345	40.15383	12.66467	
G	LC	11	0350	40.15450	12.65233	
G	LC	11	0355	40.15583	12.63967	
G	LC	11	0400	40.15250	12.62933	
G	LC	11	0405	40.14850	12.62083	
G	LC	11	0410	40.15300	12.61300	
G	LC	11	0415	40.15833	12.61867	
G	LC	11	0420	40.15867	12.62850	
G	LC	11	0425	40.15833	12.63817	
G	LC	11	0430	40.15750	12.64817	
G	LC	11	0435	40.15767	12.65780	

Table 1 (continued).

GB	Type[a]	Julian day	Time	North latitude	East longitude	Site
G	LC	11	0440	40.15683	12.66717	
G	LC	11	0445	40.15617	12.67683	
G	LC	11	0450	40.15583	12.68667	
G	LC	11	0500	40.15317	12.70650	
G	LC	11	0510	40.15100	12.72617	
G	LC	11	0520	40.14967	12.74617	
G	LC	11	0522	40.14917	12.75017	
G	LC	11	0530	40.14900	12.76683	
G	SN	11	0658	40.13690	12.75143	
G	SN	11	0726	40.15318	12.75218	
G	ST	17	1630	40.15066	12.75600	651
G	SN	17	1752	40.15067	12.75627	
G	SN	17	1844	40.14973	12.75537	
G	SN	17	2126	40.15055	12.75602	
G	SN	17	2336	40.17435	12.60468	
G	XX	18	0000	40.19218	12.50920	
G	XX	18	0030	40.23708	12.39868	
G	XX	18	0100	40.26300	12.34100	
G	SN	18	0118	40.27968	12.30465	
G	XX	18	0130	40.29016	12.28243	
G	XX	18	0200	40.31717	12.22000	
G	XX	18	0240	40.35325	12.13817	
G	XX	18	0300	40.37387	12.09920	
G	CC	18	0320	40.38262	12.11436	
G	CC	18	0324	40.38262	12.11827	
G	SN	18	0416	40.37782	12.14290	
G	XX	18	0430	40.35674	12.16373	
G	XX	18	0500	40.33497	12.22113	
G	XX	18	0530	40.30124	12.31298	
G	SN	18	0606	40.28942	12.33977	
G	CC	18	0621	40.27950	12.32790	
G	XX	18	0640	40.25813	12.35230	
G	SN	18	0654	40.27618	12.32610	
G	XX	18	0720	40.29925	12.23098	
G	XX	18	0800	40.33317	12.18928	
G	XX	18	0820	40.35015	12.14758	
G	SN	18	1416	40.35503	12.14315	
G	SN	18	1614	40.35534	12.14245	
G	SN	18	1632	40.35522	12.14242	
G	SN	18	1820	40.35546	12.14255	
G	ST	28	1648	40.35706	12.14247	652
G	SN	28	1810	40.35477	12.14275	
G	SN	28	1832	40.35548	12.14273	
G	SN	28	2020	40.35163	12.08727	
G	SN	28	2052	40.34780	12.07963	
G	SN	28	2240	40.30136	11.76202	
G	SN	29	0110	40.27573	11.49005	
G	LC	29	0130	40.27317	11.47033	
G	LC	29	0140	40.26950	11.46450	
G	LC	29	0150	40.26517	11.45717	
G	LC	29	0155	40.26383	11.45383	
G	LC	29	0200	40.26217	11.45067	
G	LC	29	0205	40.26067	11.44750	
G	SN	29	0342	40.26677	11.46345	
G	SN	29	0532	40.26408	11.45085	
G	SN	29	0550	40.26405	11.45010	
G	SN	29	0738	40.26395	11.45053	
G	SN	29	0816	40.26387	11.45018	
G	SN	29	1028	40.26530	11.45057	
G	ST	34	1030	40.26352	11.44945	653
G	SN	34	0044	40.26432	11.44988	
G	SN	34	0442	40.31642	11.32738	
G	SN	34	0524	40.37086	11.17225	
G	LC	34	0700	40.48383	10.82133	
G	LC	34	0715	40.49800	10.80267	
G	LC	34	0730	40.51383	10.78433	
G	CC	34	0740	40.52282	10.78433	
G	LC	34	0745	40.52950	10.76483	
G	LC	34	0800	40.54483	10.74433	
G	CC	34	0810	40.54933	10.74433	
G	LC	34	0815	40.55917	10.72350	
G	LC	34	0830	40.57283	10.70167	
G	LC	34	0845	40.58633	10.67933	
G	LC	34	0900	40.59950	10.65883	
G	LC	34	0915	40.61283	10.63683	

Table 1 (continued).

GB	Type[a]	Julian day	Time	North latitude	East longitude	Site
G	CC	34	0925	40.61933	10.63683	
G	LC	34	0930	40.62900	10.62050	
G	CC	34	0942	40.63750	10.62050	
G	LC	34	0945	40.62600	10.62100	
G	SN	34	0958	40.62293	10.62437	
G	LC	34	1000	40.61433	10.64300	
G	LC	34	1015	40.60133	10.66450	
G	LC	34	1040	40.57667	10.69417	
G	SN	34	1328	40.57930	10.69800	
G	SN	34	1402	40.57847	10.69728	
G	ST	39	1110	40.58035	10.69805	654
G	SN	39	1726	40.52468	11.12605	
G	SN	39	1918	40.41039	11.62055	
G	SN	39	2016	40.31818	11.86707	
G	GP	39	2130	40.22282	12.14137	
G	GP	39	2200	40.17937	12.24163	
G	SN	39	2206	40.18040	12.27307	
G	GP	39	2230	40.17188	12.36548	
G	GP	39	2300	40.17060	12.41088	
G	GP	39	2310	40.17080	12.42750	
G	GP	39	2320	40.17143	12.44403	
G	GP	39	2330	40.17182	12.45488	
G	GP	39	2340	40.17185	12.46387	
G	GP	40	0000	40.17137	12.48253	
G	GP	40	0010	40.17138	12.49212	
G	CC	40	0025	40.16874	12.47933	
G	SN	40	0052	40.17855	12.50565	
G	SN	40	0446	40.17253	12.46495	
G	SN	40	0630	40.17263	12.46560	
G	SN	40	0740	40.17258	12.46495	
G	SN	40	0928	40.17270	12.46515	
G	SN	40	1008	40.17237	12.46527	
G	SN	40	1028	40.17303	12.46485	
G	ST	44	0934	40.17223	12.46533	655
G	SN	44	0948	40.17258	12.46560	
G	SN	44	1232	40.17098	12.46465	
G	LC	44	1300	40.17083	12.44483	
G	SN	44	1350	40.17162	12.43845	
G	LC	44	1500	40.17783	12.27833	
G	LC	44	1515	40.17900	12.25500	
G	LC	44	1530	40.18050	12.23417	
G	SN	44	1536	40.18223	12.22797	
G	LC	44	1545	40.18150	12.23417	
G	LC	44	1601	40.18250	12.18667	
G	LC	44	1615	40.18400	12.16233	
G	SN	44	1618	40.18648	12.16383	
G	CC	44	1640	40.18791	12.18427	
G	SN	44	1804	40.18423	12.18362	
G	SN	44	2012	40.18447	12.18338	
G	SN	44	2200	40.18490	12.18337	
G	SN	44	2238	40.18453	12.18288	
G	ST	47	1432	40.18446	12.18651	656
G	SN	47	1620	40.18452	12.18958	
G	SN	47	1806	40.19455	12.16473	
G	SN	47	1904	40.23092	12.08160	
G	SN	47	2204	40.53040	11.37913	
G	SN	47	2242	40.59053	11.23230	
G	SN	47	2352	40.70995	10.94628	
G	SN	48	0028	40.75385	10.87092	
G	SN	48	0152	40.92942	10.50567	
G	SN	48	0336	41.10277	10.06690	
G	SN	48	0712	41.28858	9.10157	
G	SN	48	0944	41.55272	8.52228	
G	SN	48	1002	41.58420	8.46105	
G	SN	48	1102	41.68184	8.23492	
G	SN	48	1314	41.92060	7.73775	
G	SN	48	1406	42.00780	7.56003	
G	SN	48	1546	42.16380	7.19357	
G	SN	48	1730	42.33541	6.83750	
G	SN	48	1922	42.49922	6.50372	
G	SN	48	2030	42.59048	6.30272	
G	SN	48	2218	42.72002	5.99307	
G	SN	48	2302	42.77910	5.87145	

[a] SN = Satellite Navigation System; GP = global position; ST = Site; LC = Loran C positioning; XX = extra; CC = course change.

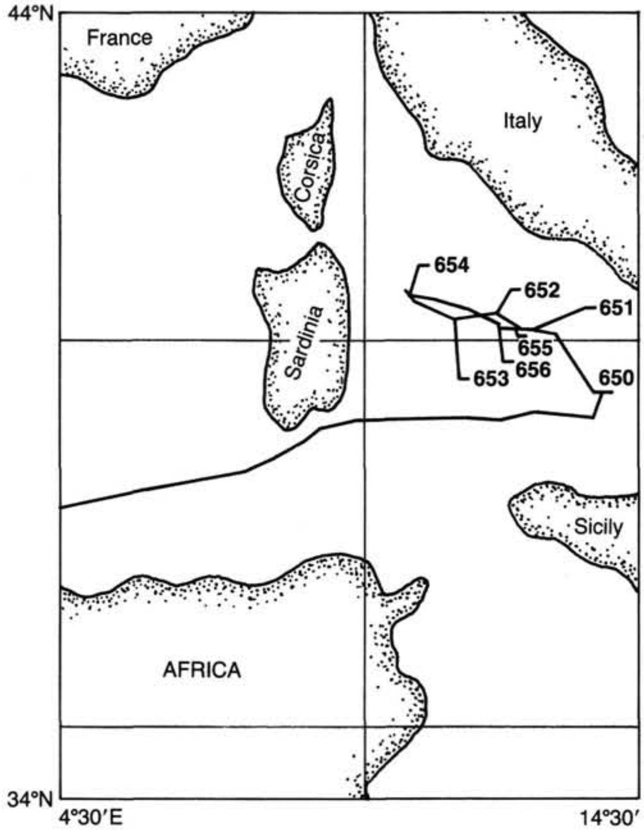

Figure 1. Track chart of *JOIDES Resolution* during Leg 107, showing site locations.

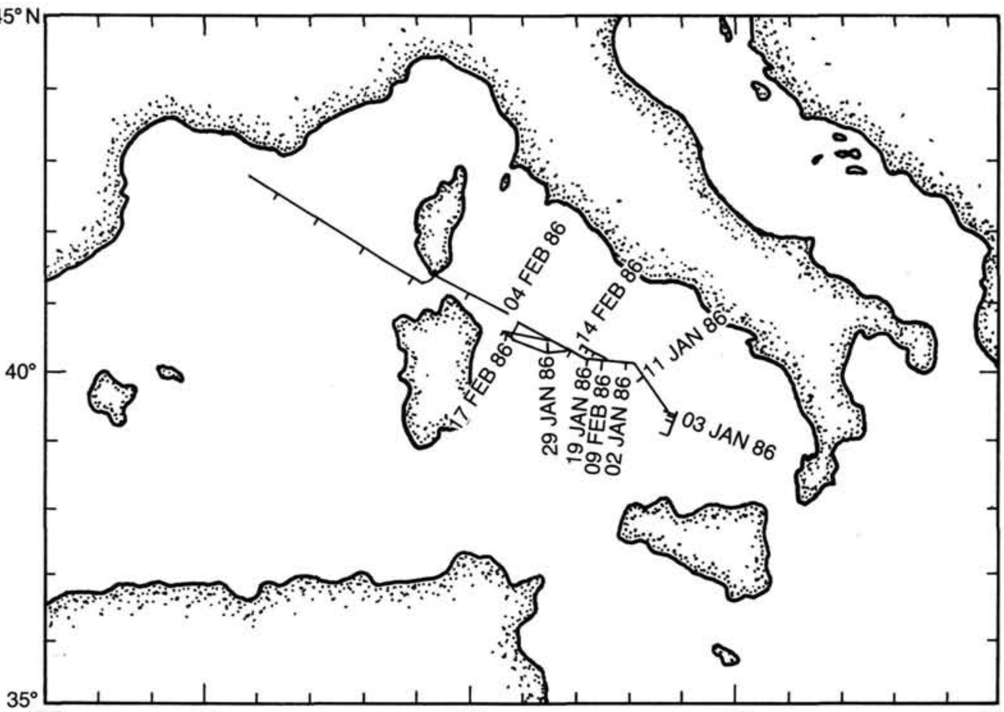

Figure 2. Track chart of bathymetric data collected during Leg 107. Track at 0.312 in./degree.

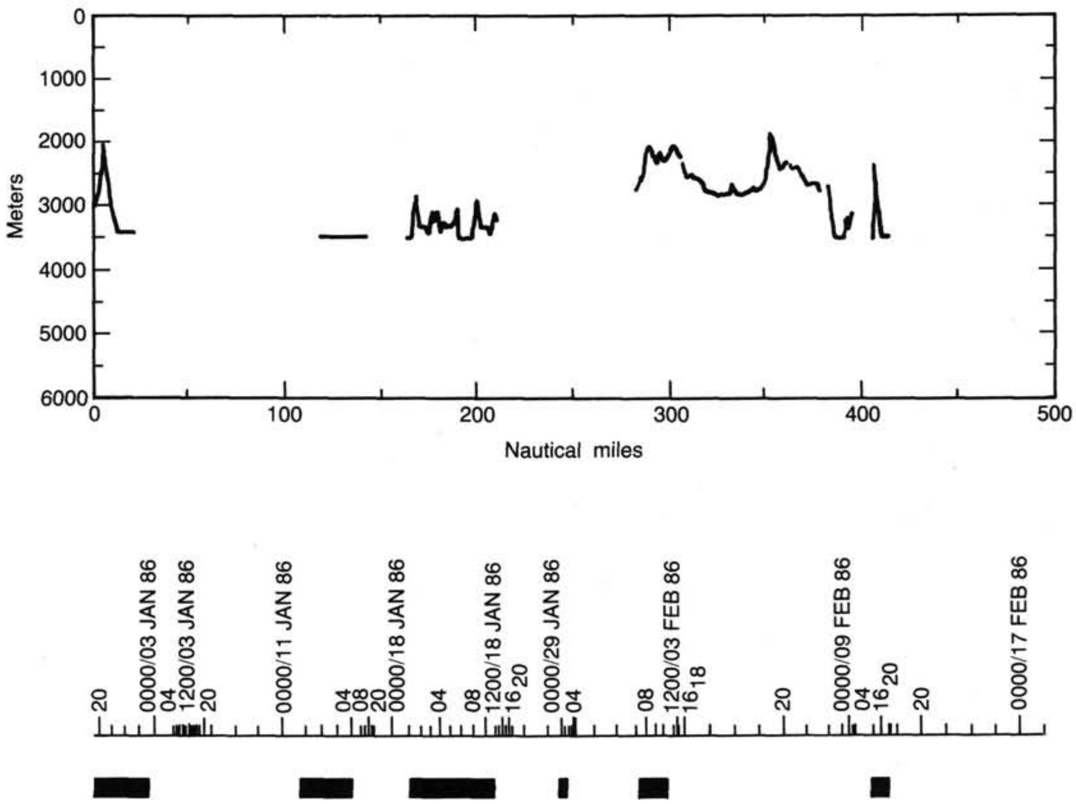

Figure 3. Depth profile vs. distance collected on board *JOIDES Resolution* during Leg 107. Time is annotated along the bottom of the profile. Section of track having seismic reflection profile records shows a wide black line along the bottom of the profile.

Table 2. Recording, processing, and display parameters of Leg 107 site survey seismic lines.

	Line 1	Line 2	Line 3	Line 4	Line 5	Line 7
Location	Survey of Site 650	Survey of Site 651	Survey of Site 652	Survey of Site 653	Survey of Site 654	Survey of Site 656
Recording parameters						
Source:	Two 80-in.^{3} water gun	Two 80-in.^{3} water gun	Two 80-in.^{3} water gun	Two 80-in.^{3} water gun	Two 80-in.^{3} water gun	Two 80-in.^{3} water gun
Amplifier gain:	85 db	85 db	85 db	70–80 db	75 db	—
Processing parameters						
[a]AGC						
Reponse time:	—	—	—	—	1000 ms	—
Start time:	—	—	—	—	2600 ms	—
% gain:	—	—	—	—	95	—
Zero phase band						
Pass filter						
Low cut (Hz):	40	20	40	40	40	40
Taper width:	10	10	10	10	10	10
High cut (Hz):	120	250	160	120	160	120
Taper width:	30	30	30	30	30	30
Trace mixing						
Number traces:	3	3	3	3	3	3
Mixed by:	Addition	Addition	Addition	Addition	Addition	Addition
Display parameters						
Plotter:	Versatec	Printronix	Printronix	Versatec	Versatec	Versatec
Data window						
From (ms):	3000	3500	4000	3000	2600	3000
To (ms):	5500	6000	6000	5000	4200	6500

[a]Automatic Gain Control

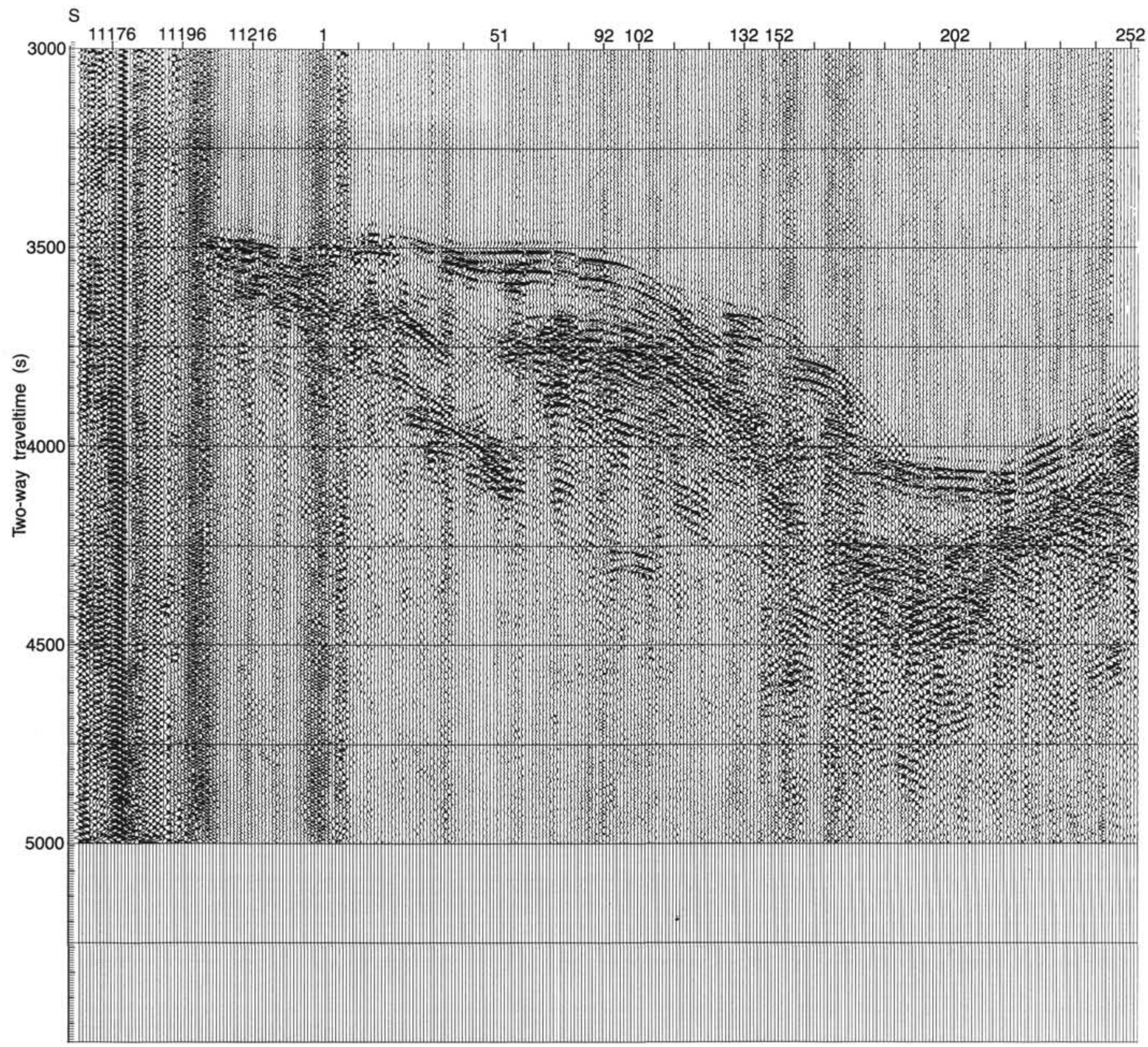

Figure 4. ODP Leg 107 seismic line 1, approaching Site 650. Vertical exaggeration ±2.5. Shot numbers are indicated on the top of the recording.

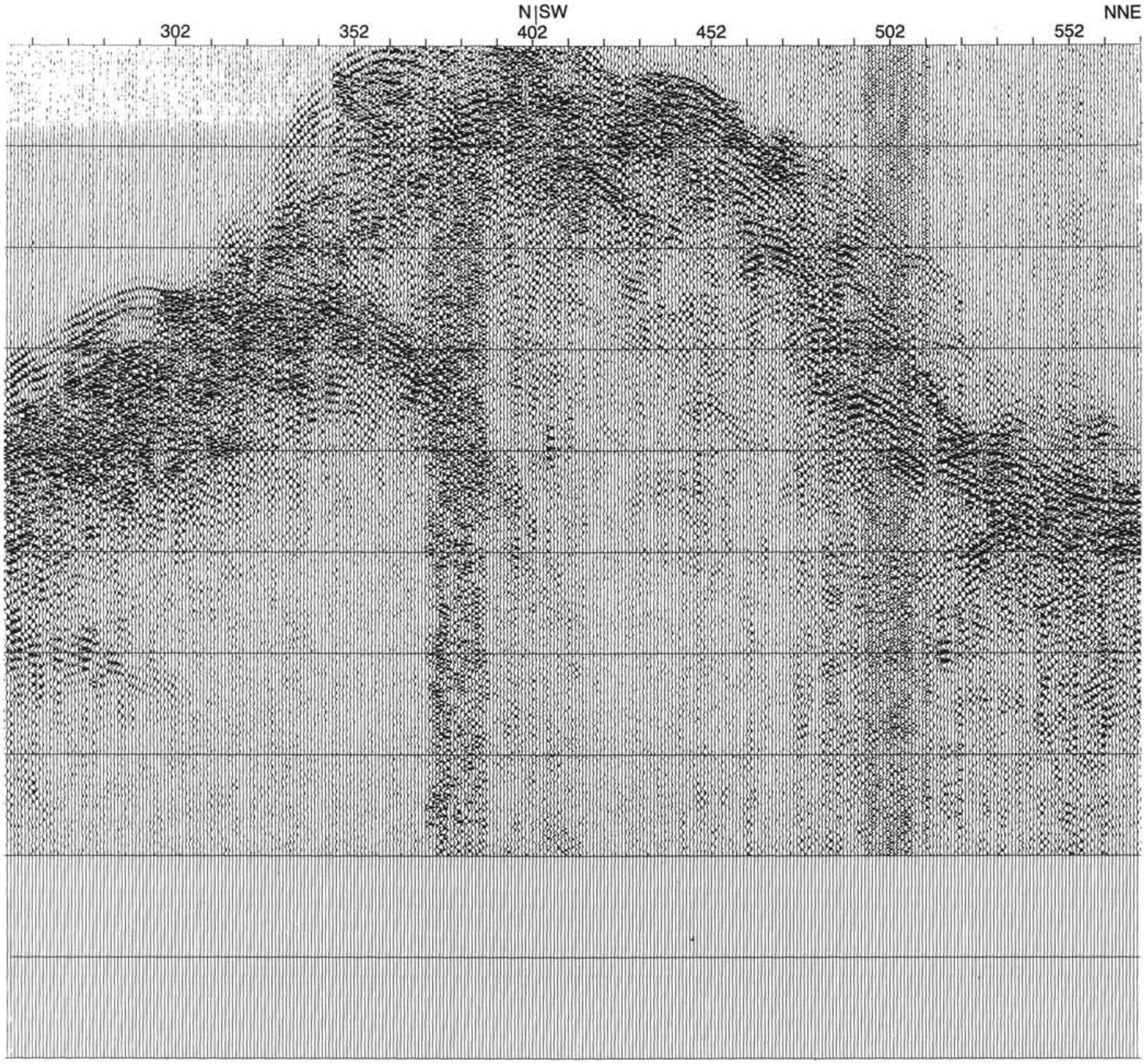

Figure 4 (continued).

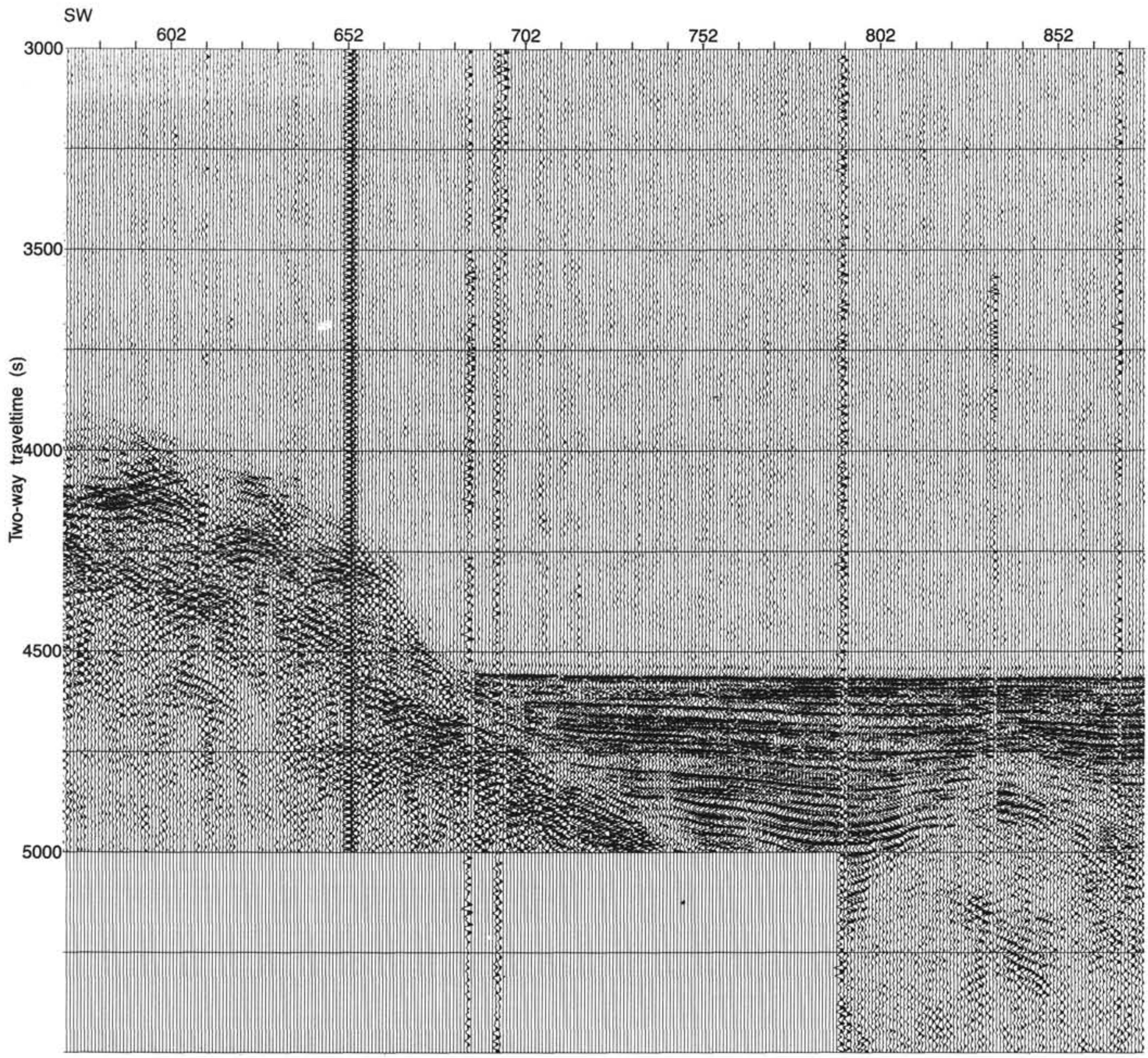

Figure 4 (continued).

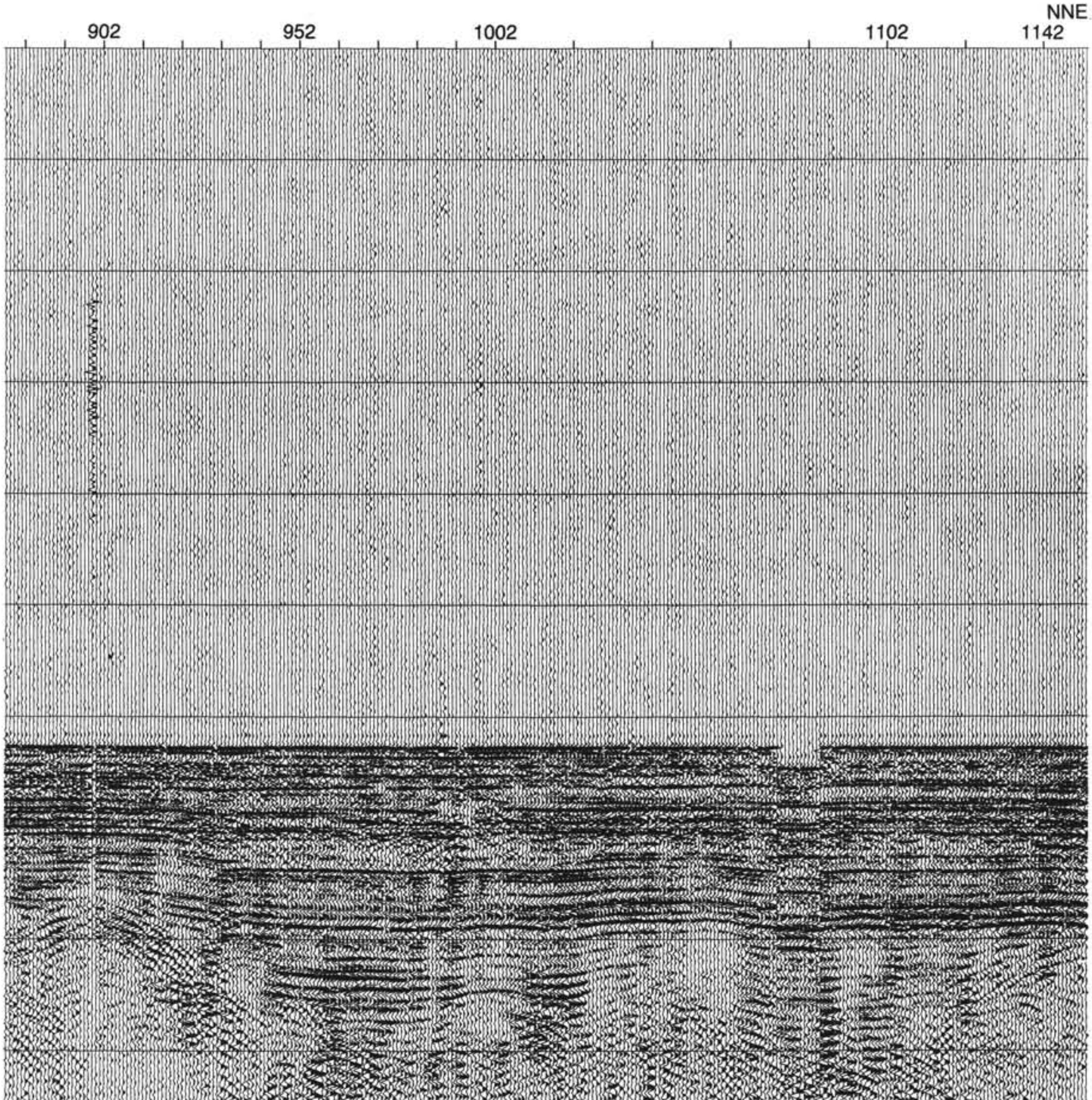

Figure 4 (continued).

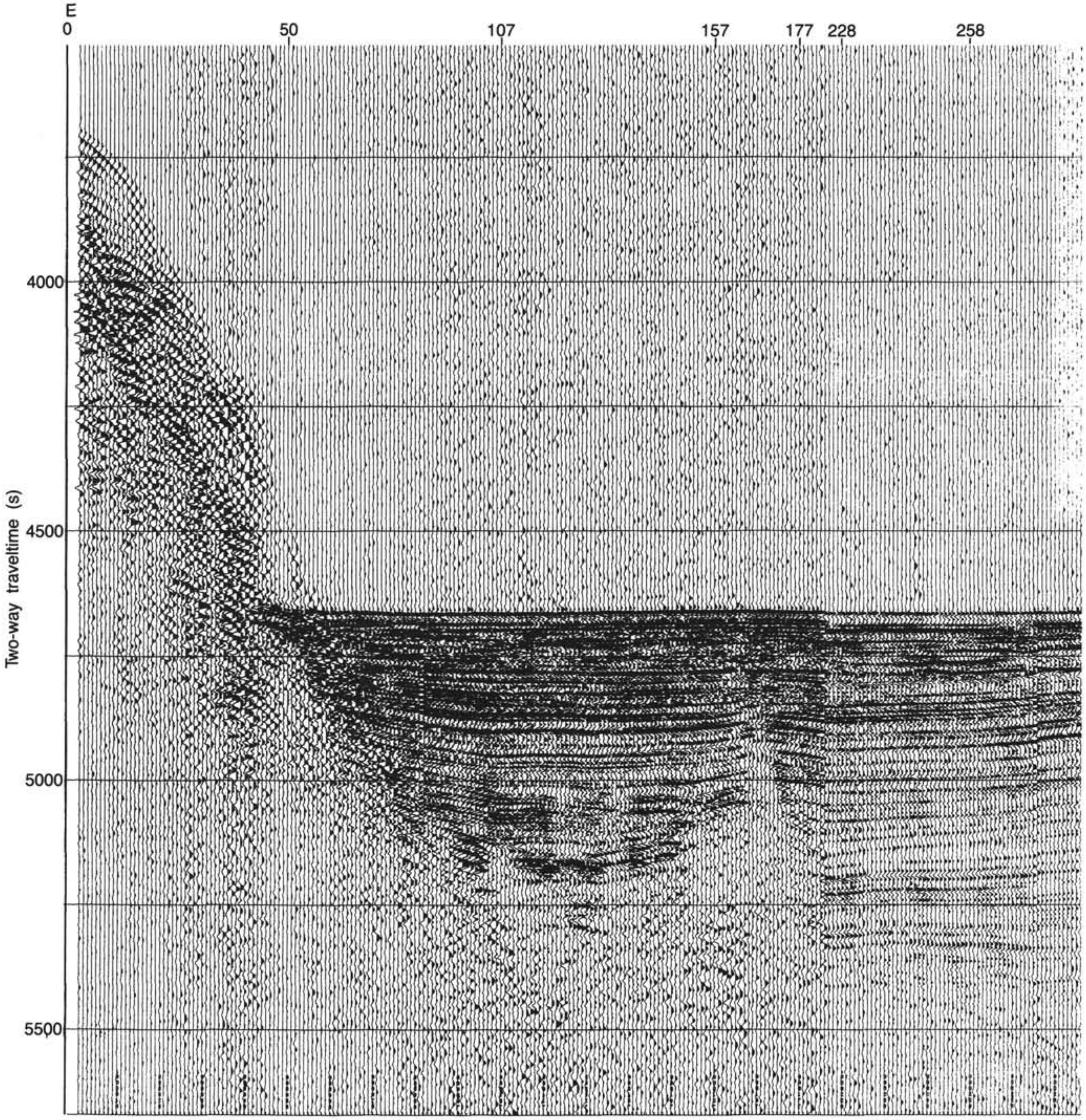

Figure 5. ODP Leg 107 seismic line 2, approaching Site 651. Vertical exaggeration ±2.5. Shot numbers are indicated on the top of the recording.

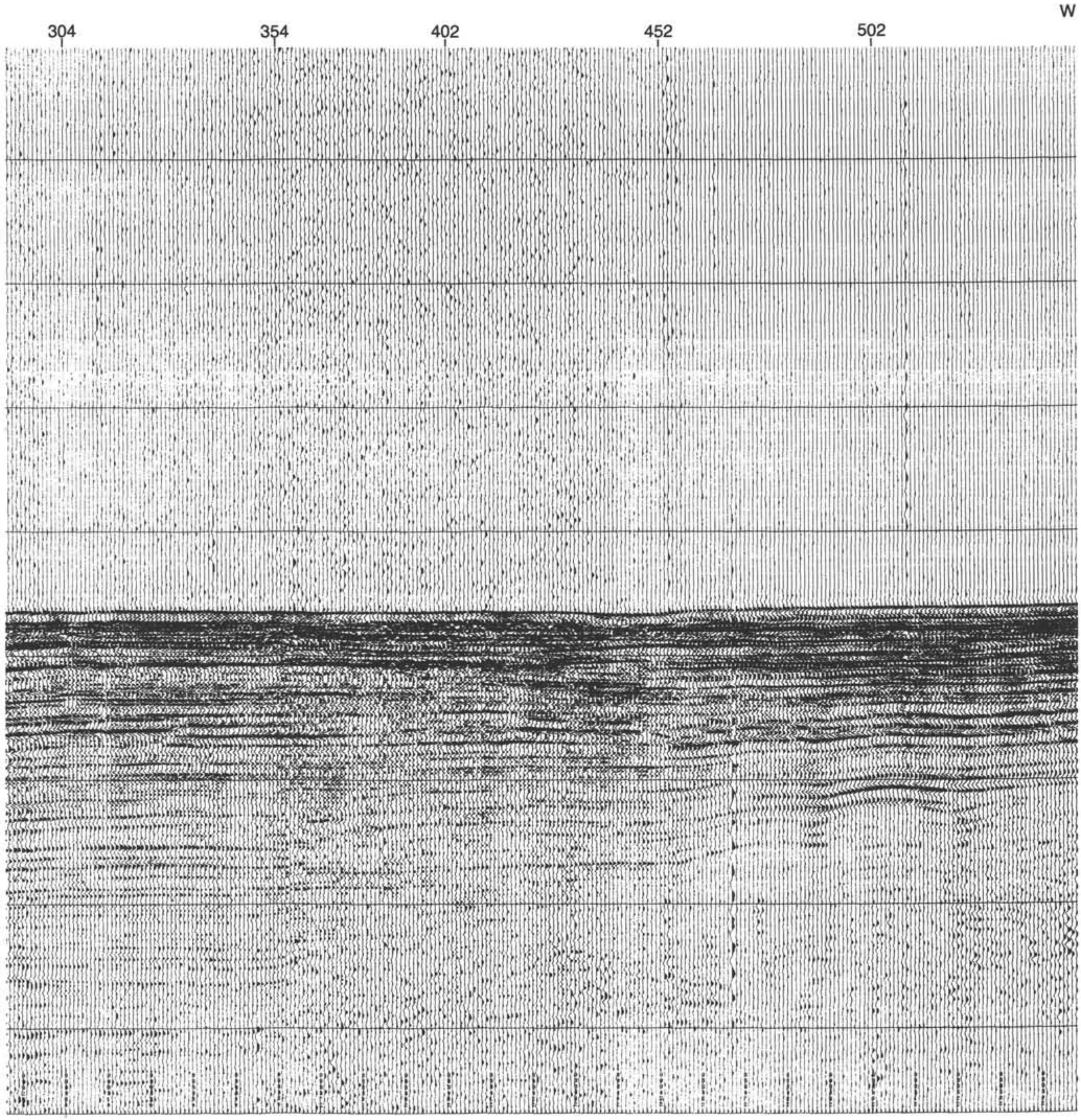

Figure 5 (continued).

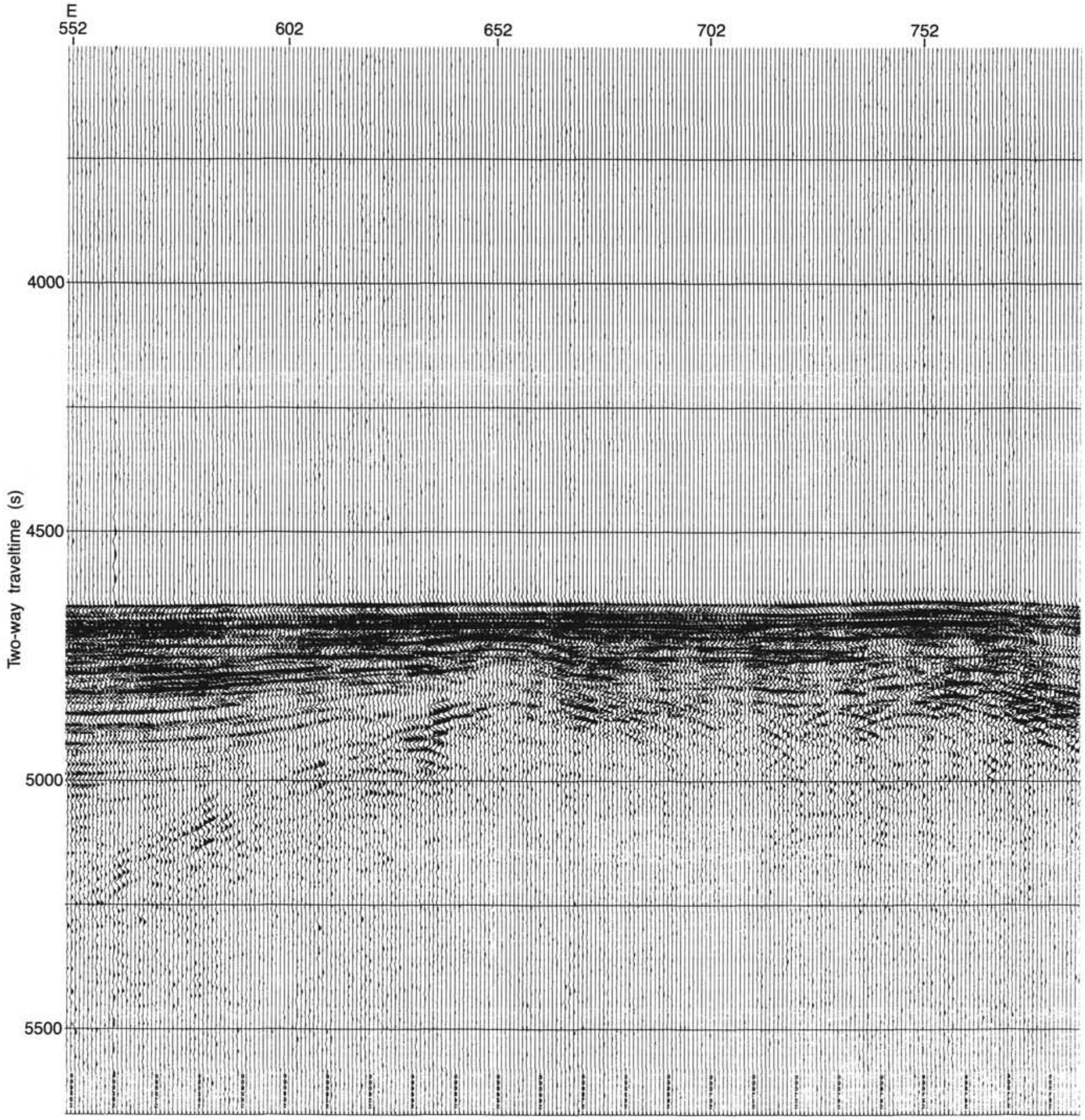

Figure 5 (continued).

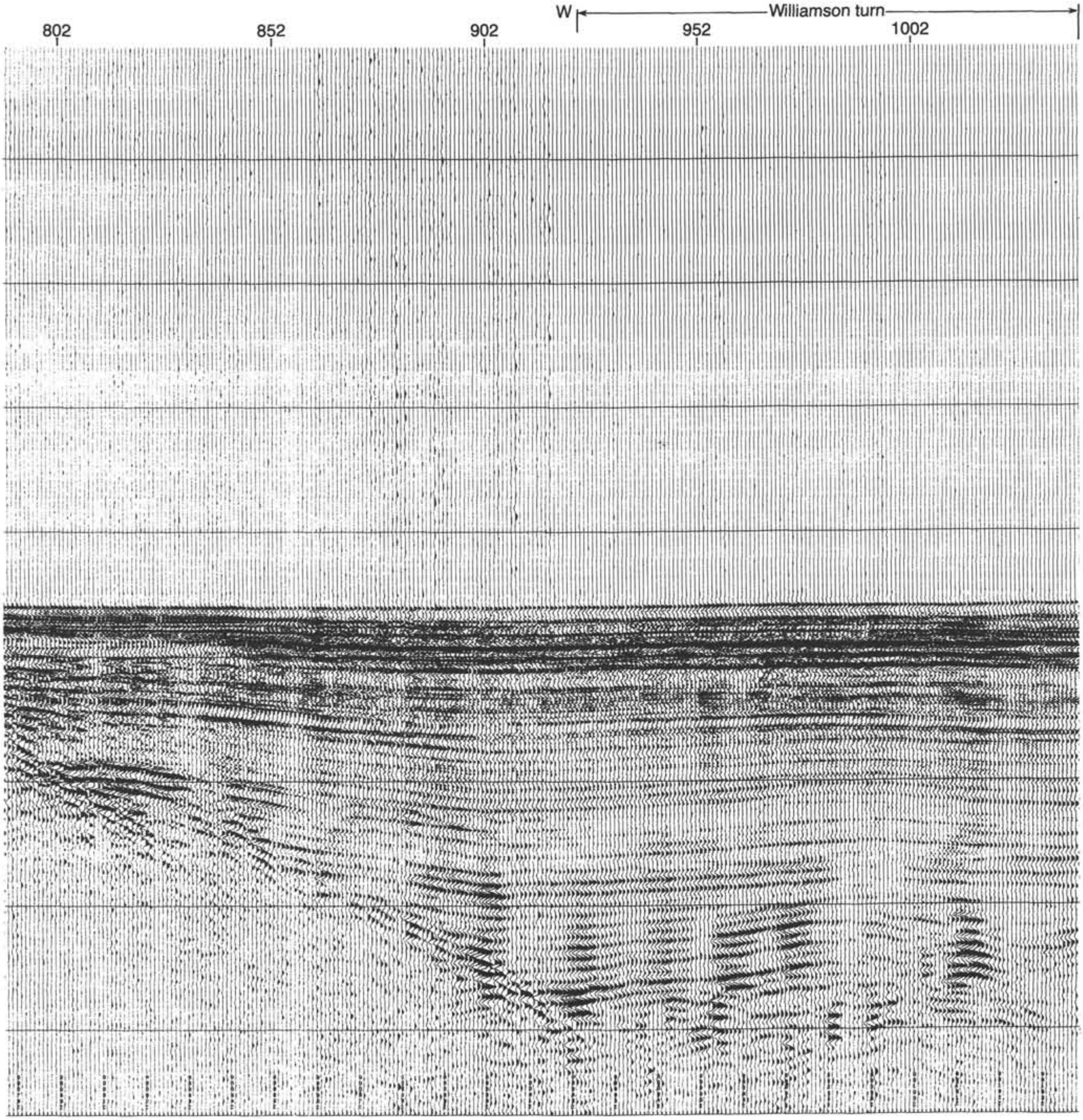

Figure 5 (continued).

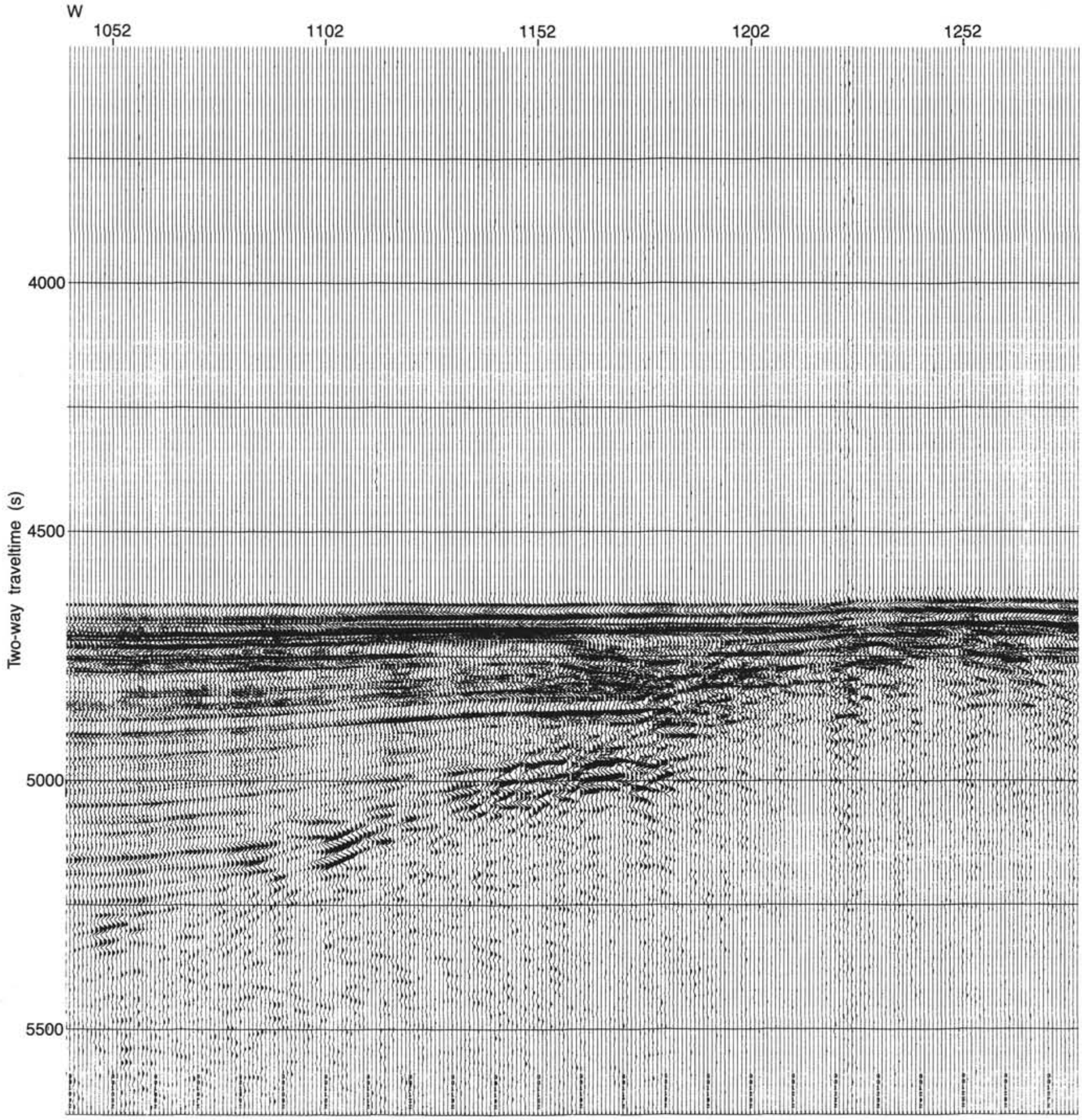

Figure 5 (continued).

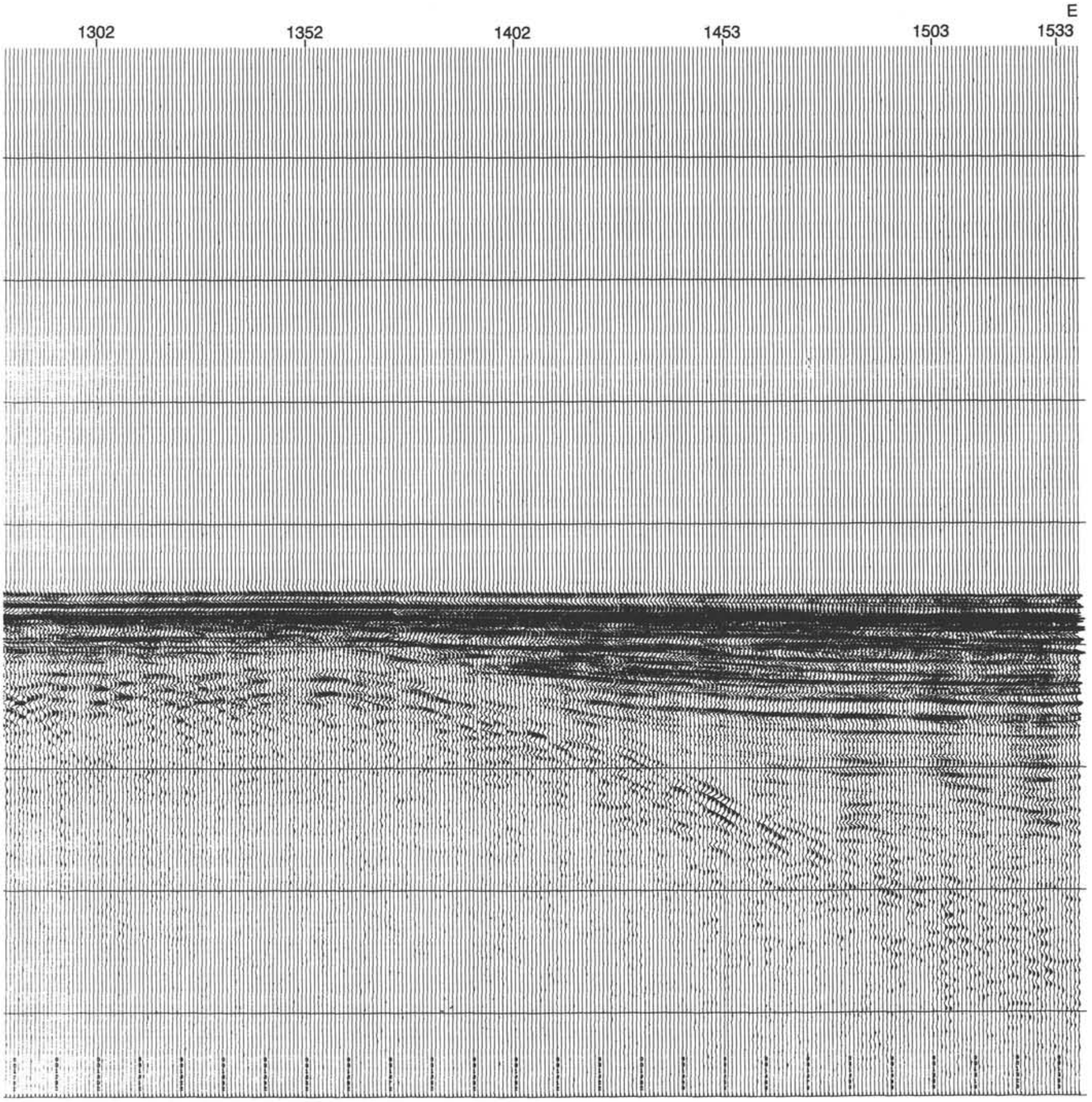

Figure 5 (continued).

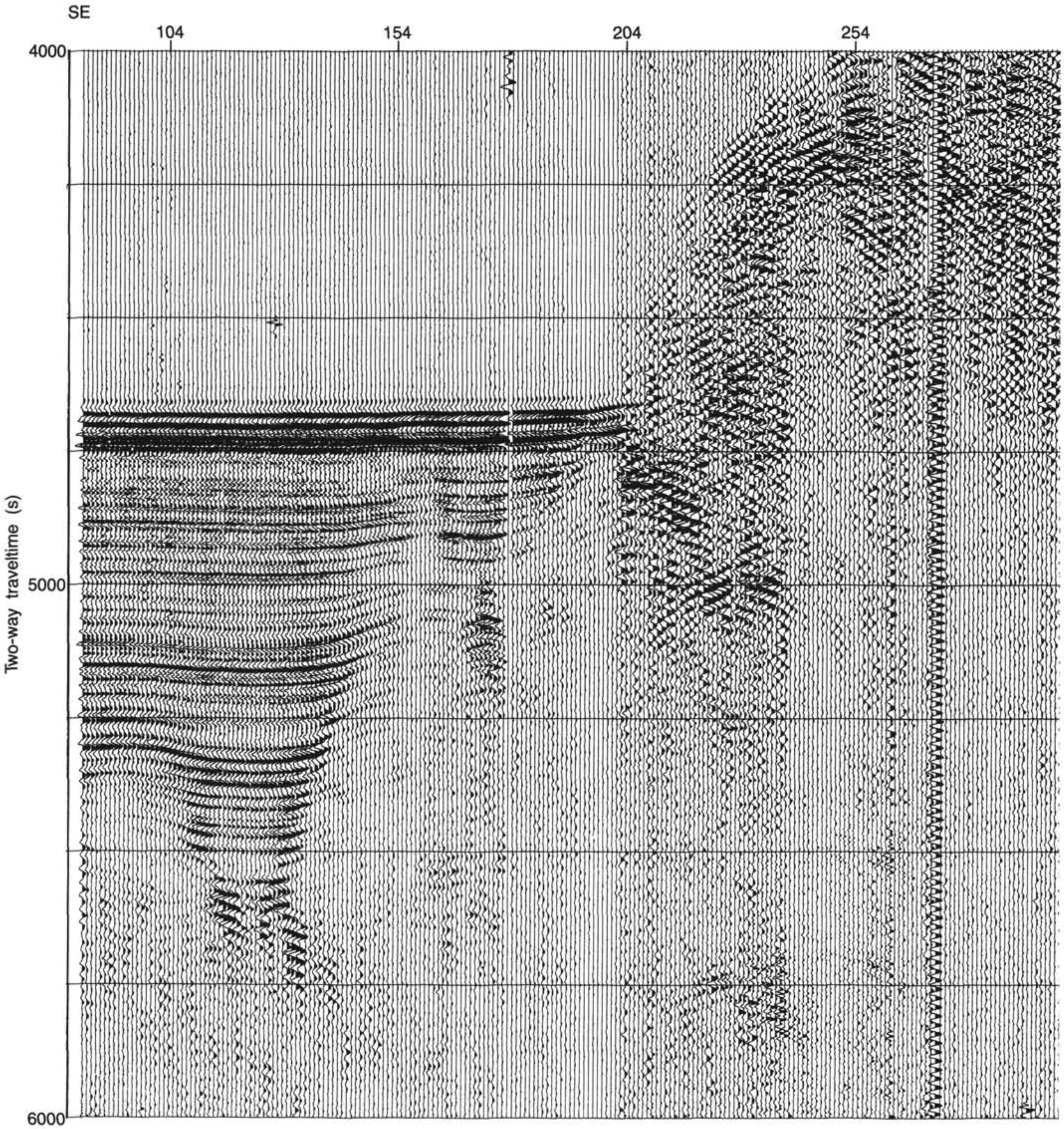

Figure 6. ODP Leg 107 seismic line 3, approaching Site 652. Vertical exaggeration ±2.5. Shot numbers are indicated on the top of the recording. Note shots 2069–2204 were not recorded.

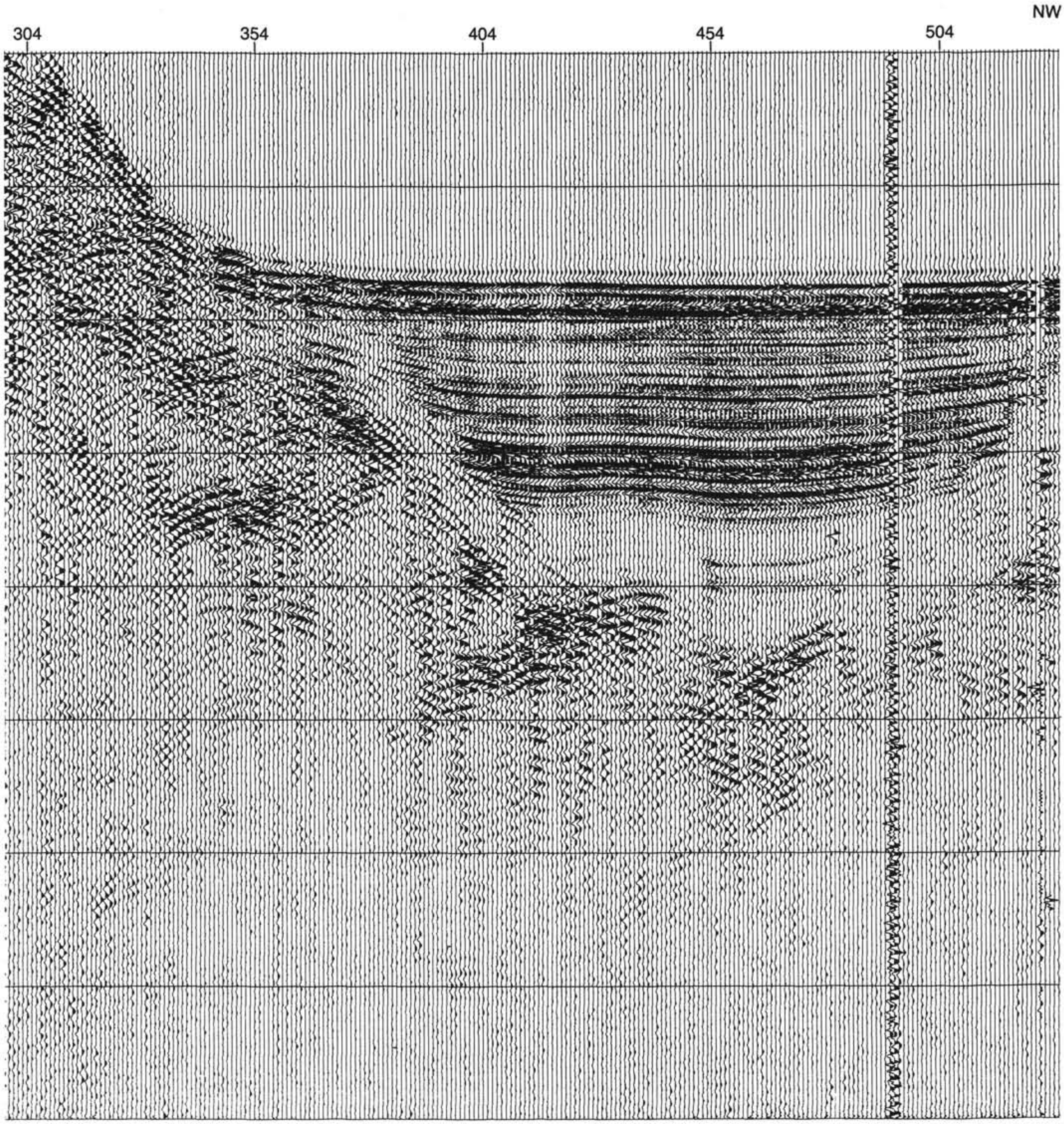

Figure 6 (continued).

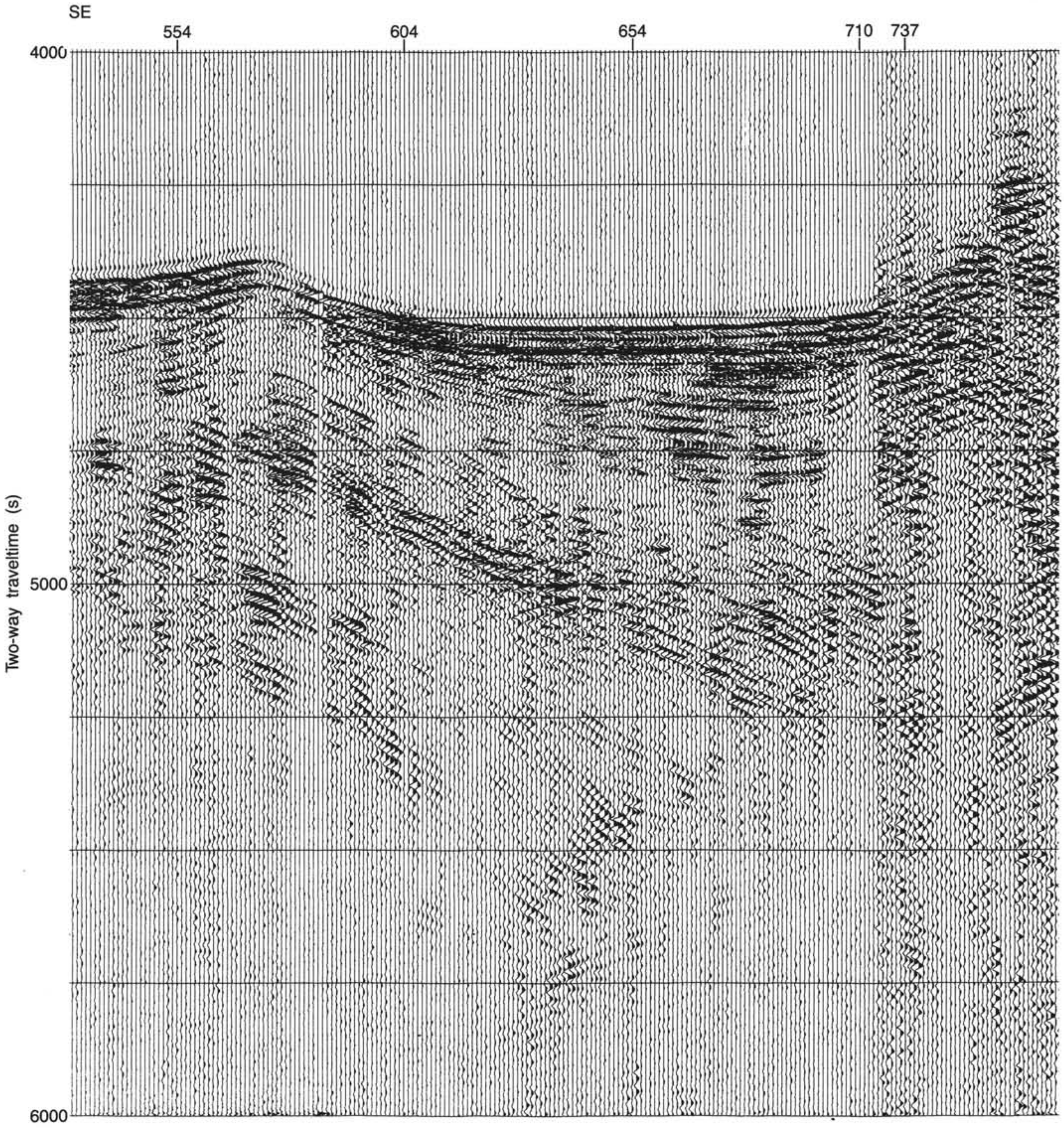

Figure 6 (continued).

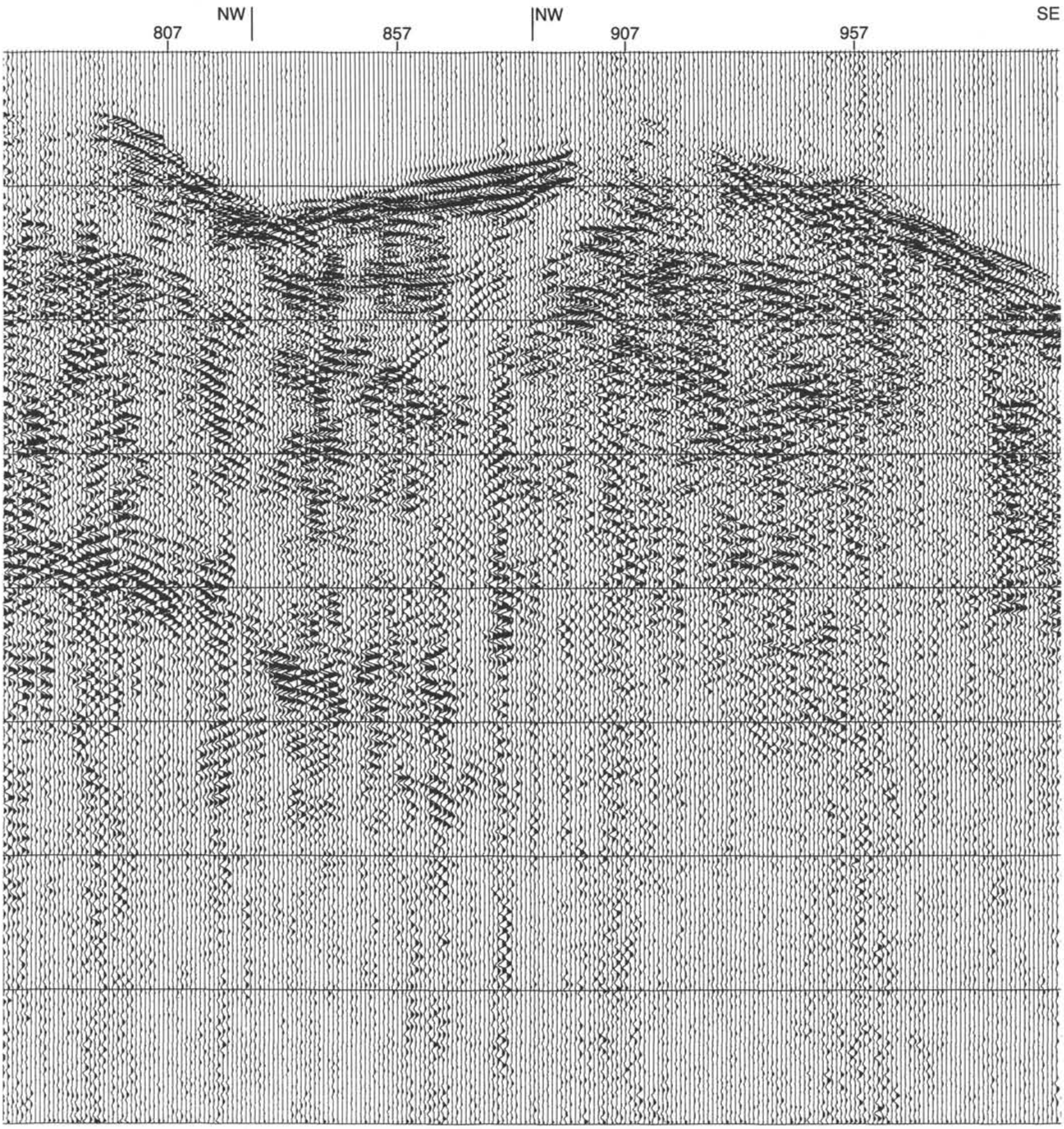

Figure 6 (continued).

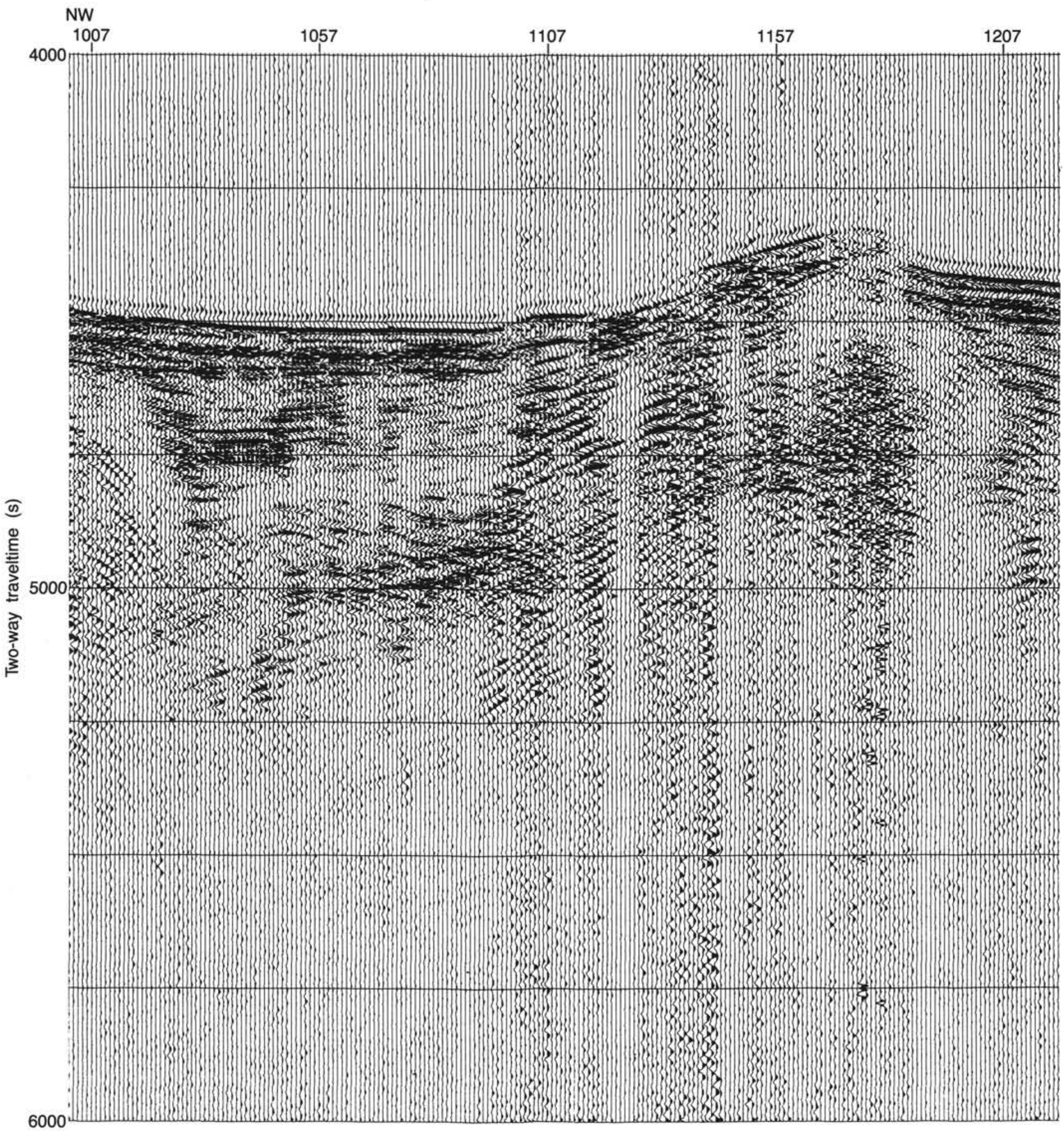

Figure 6 (continued).

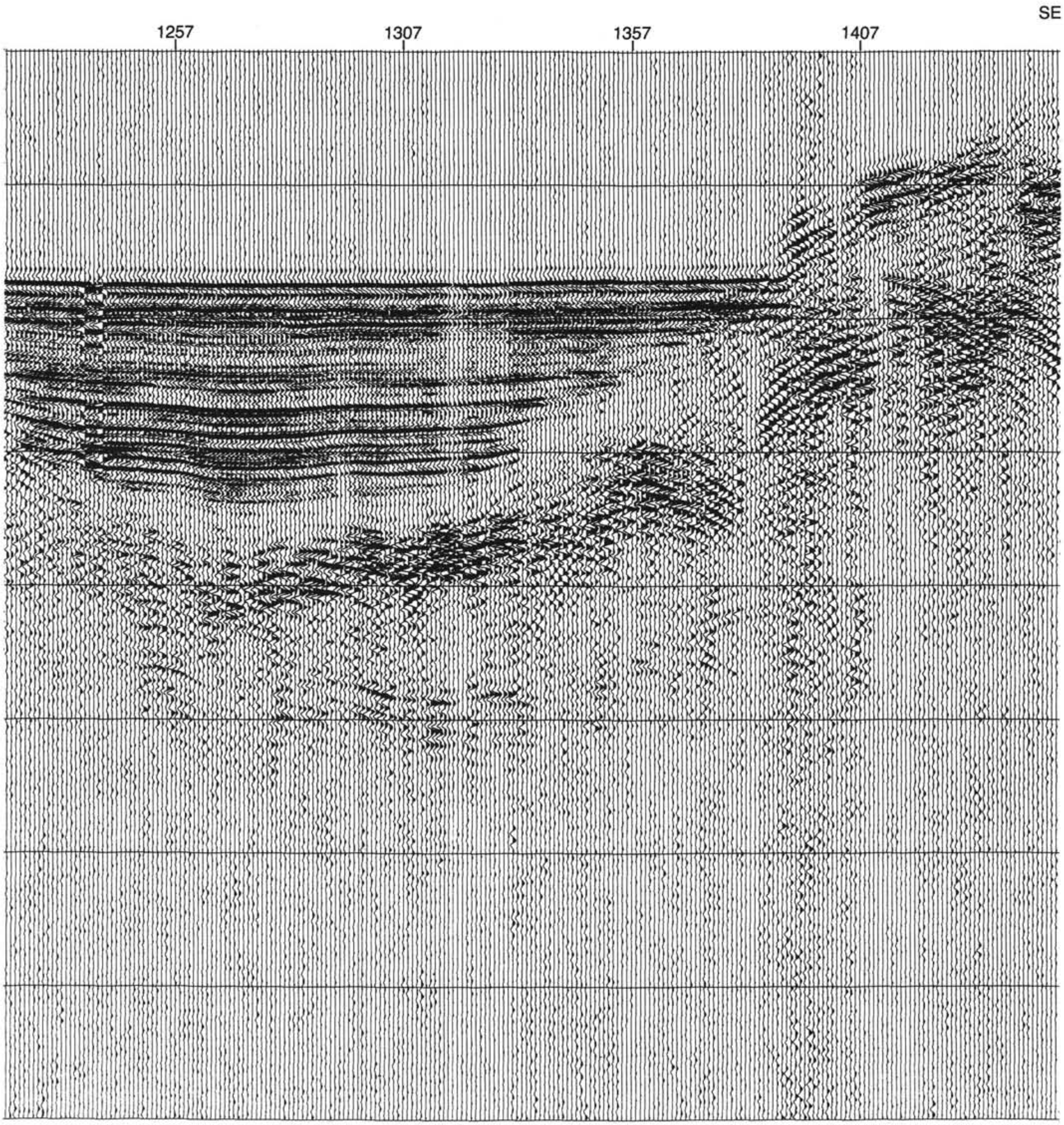

Figure 6 (continued).

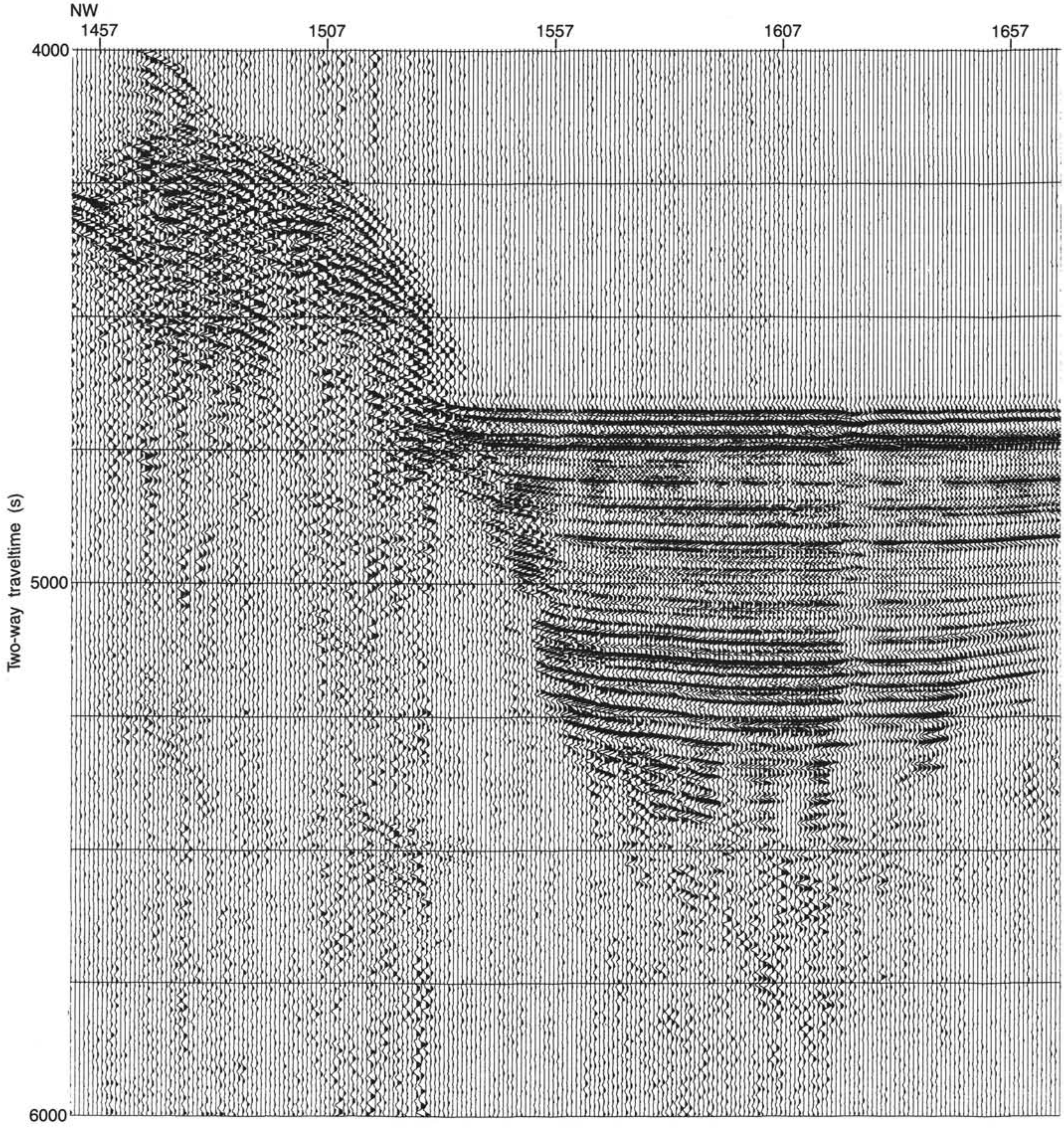

Figure 6 (continued).

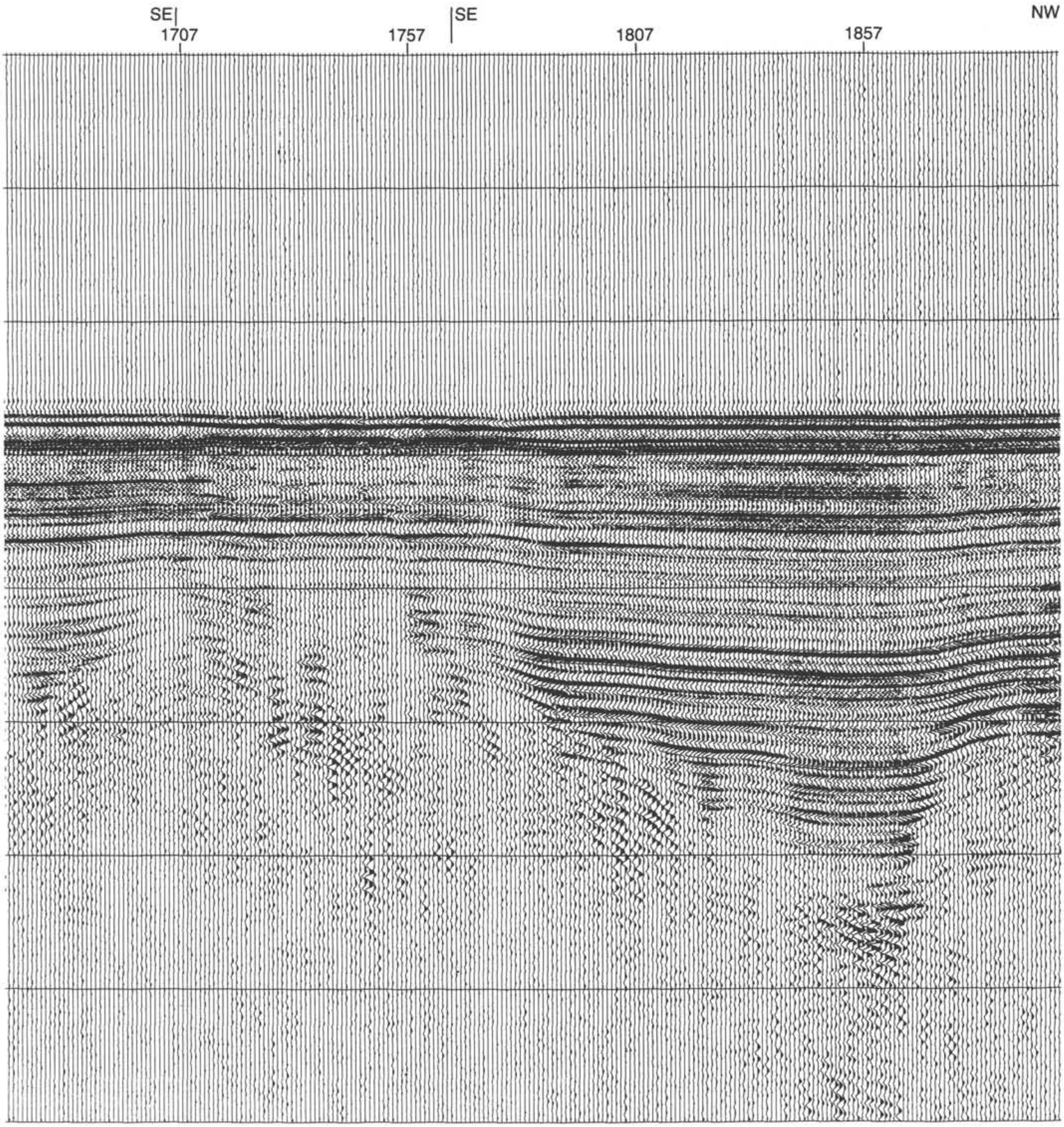

Figure 6 (continued).

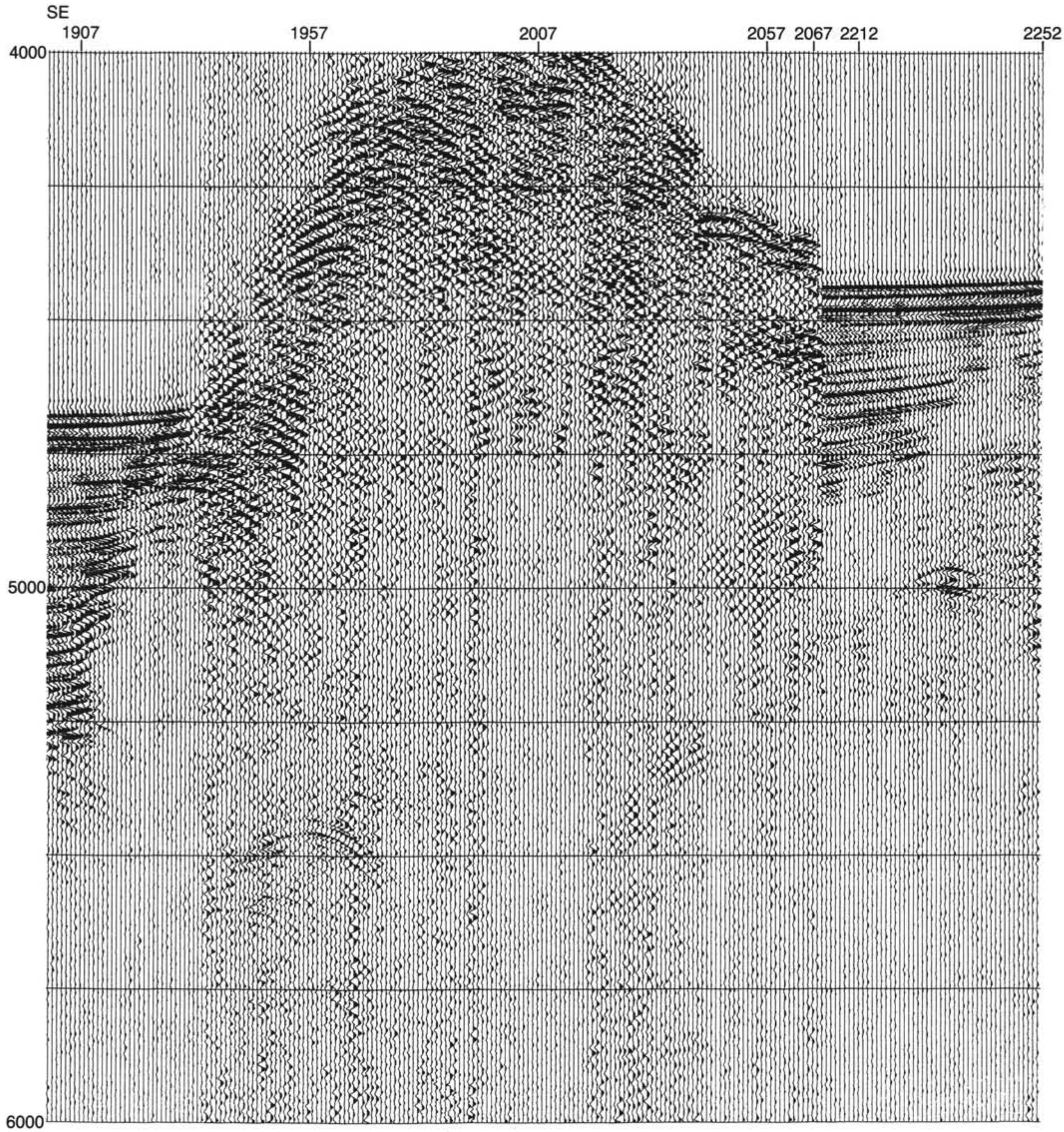

Figure 6 (continued).

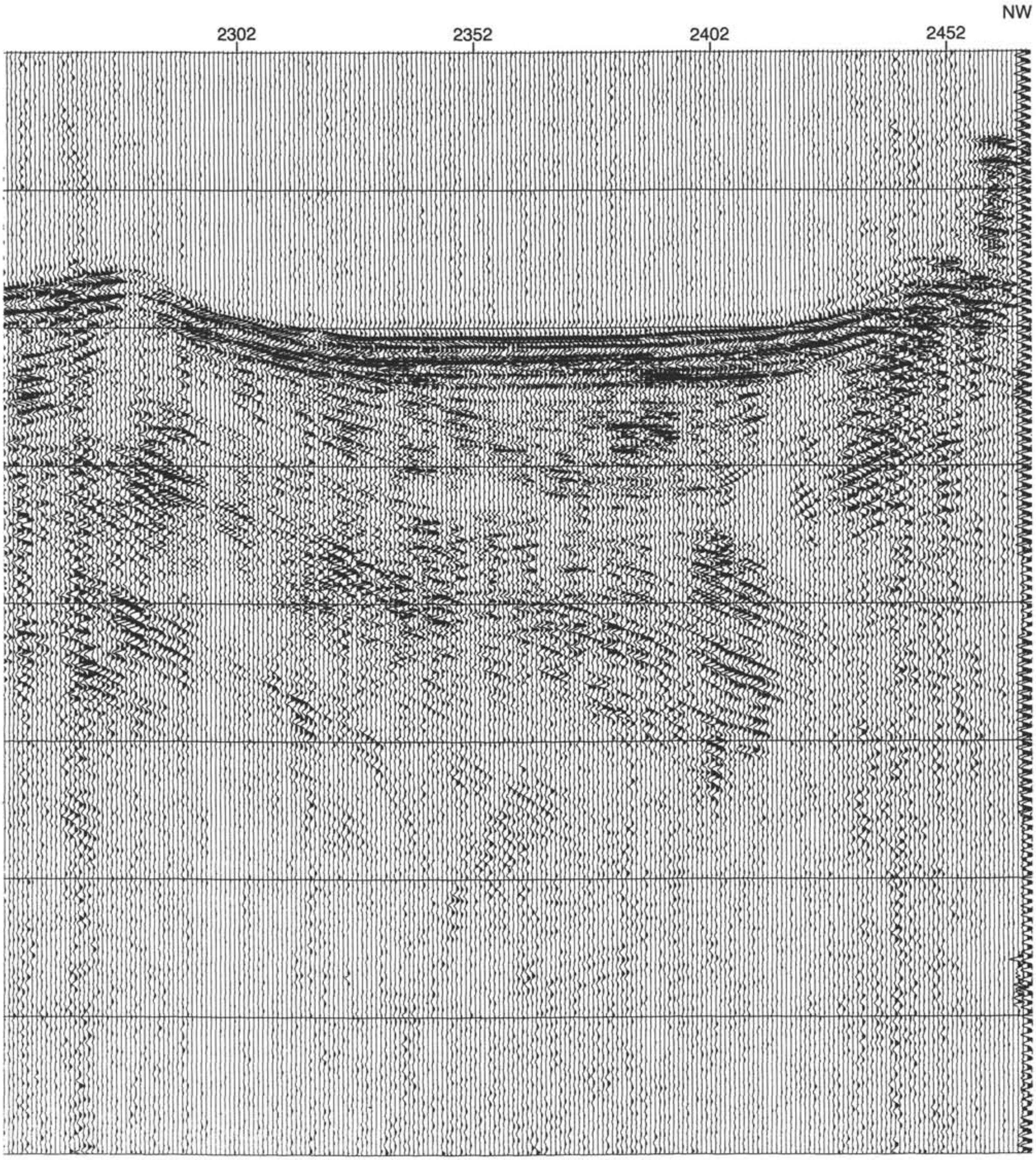

Figure 6 (continued).

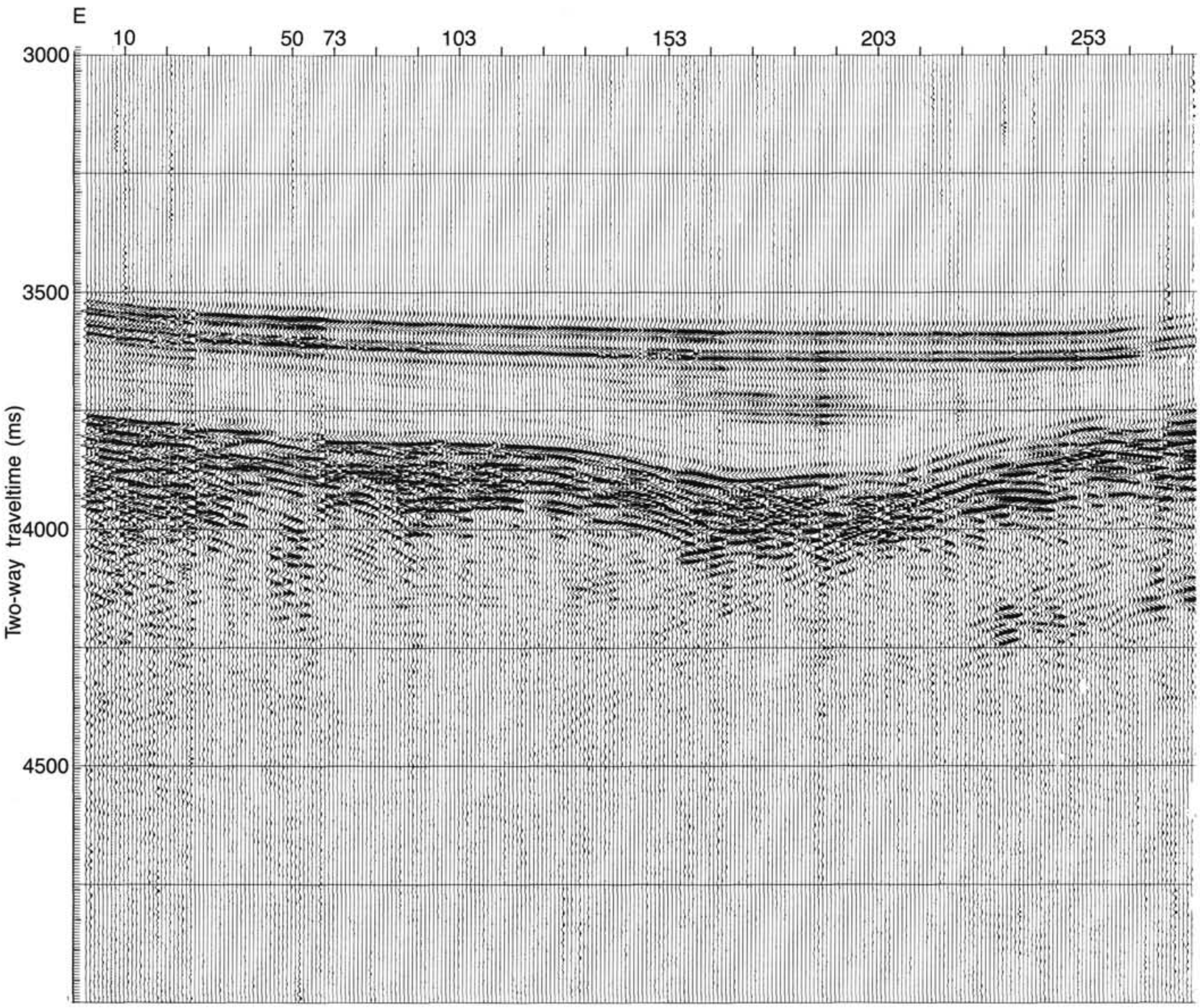

Figure 7. ODP Leg 107 seismic line 4, approaching Site 653. Vertical exaggeration ±2.5. Shot numbers are indicated on the top of the recording.

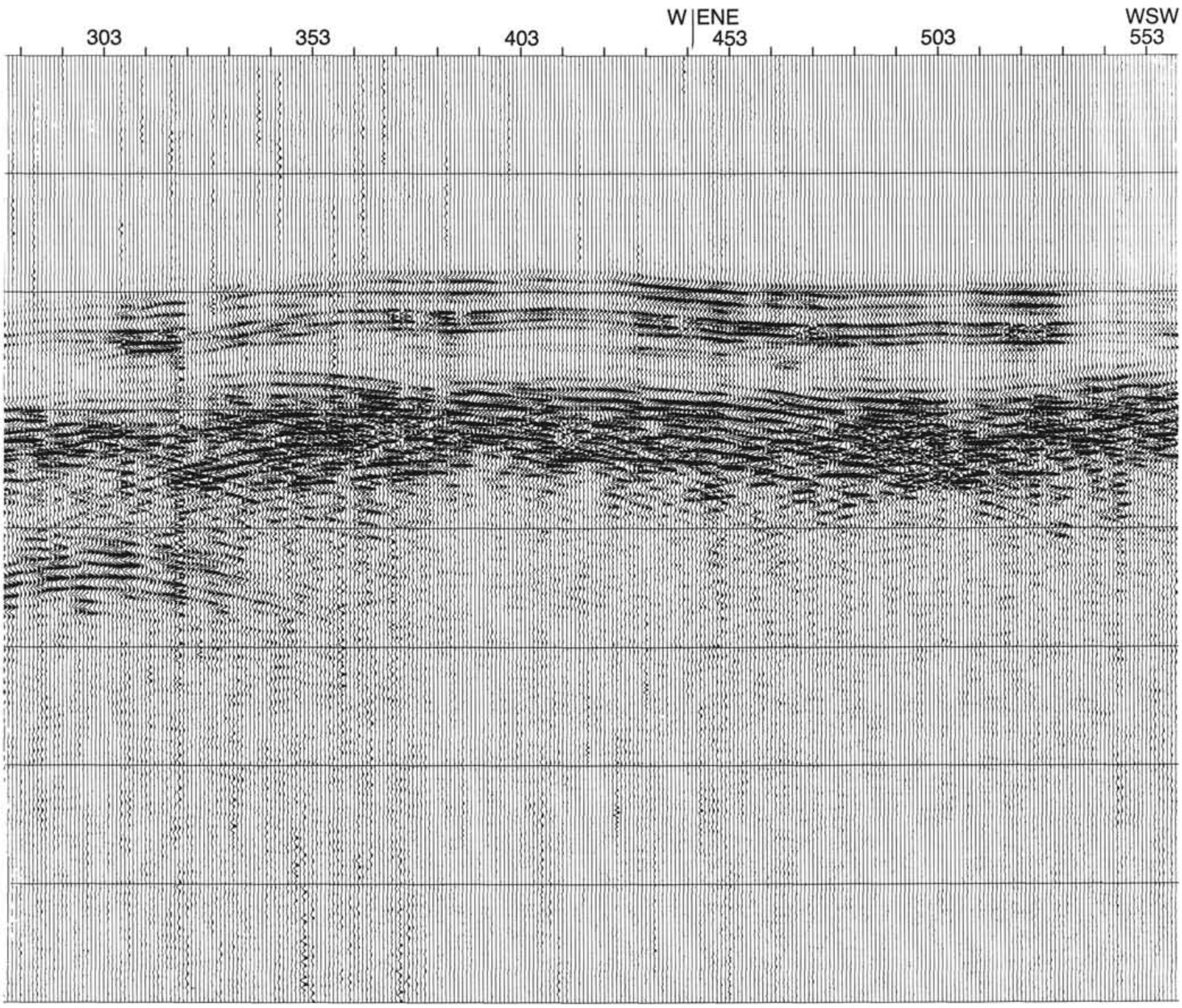

Figure 7 (continued).

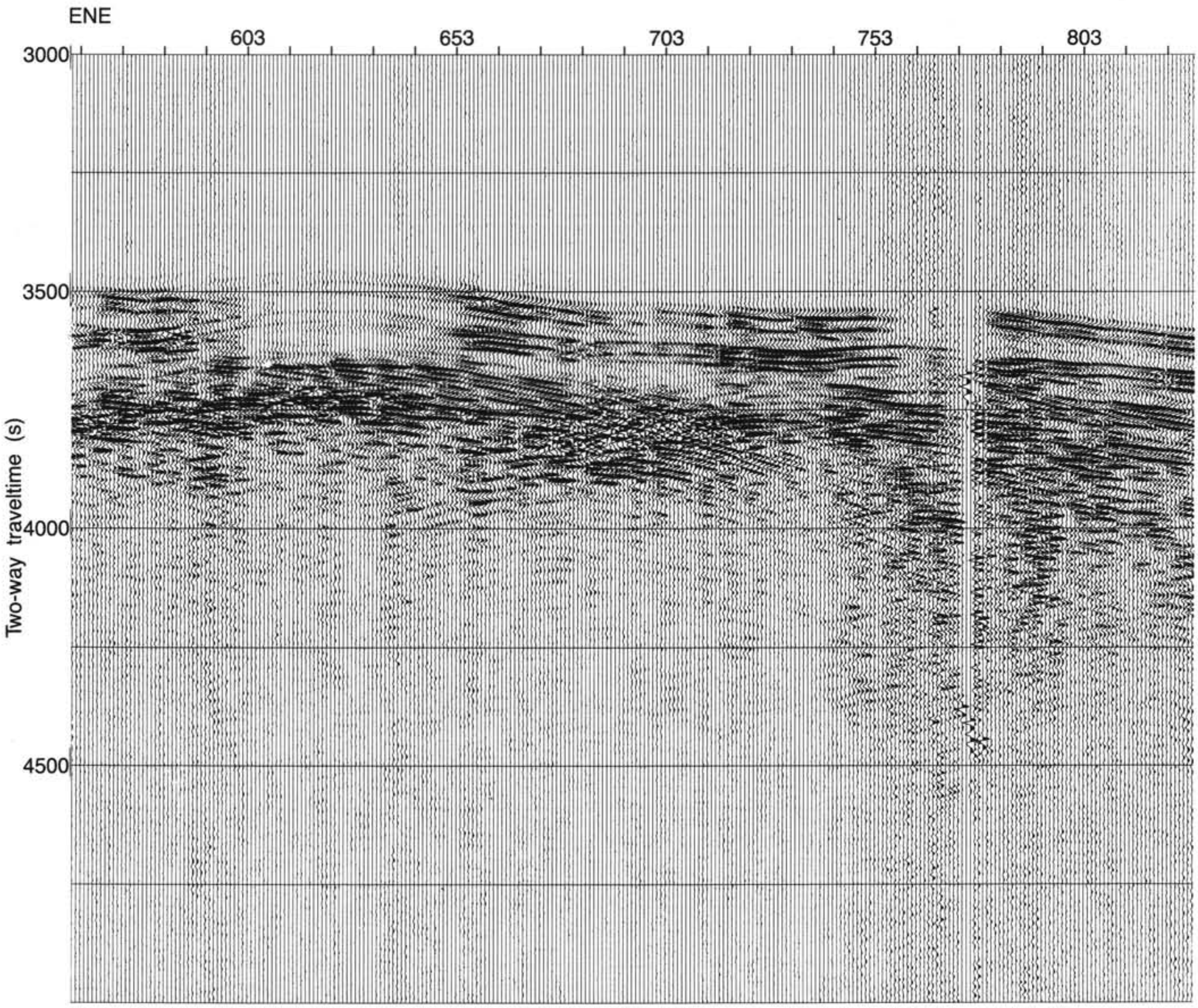

Figure 7 (continued).

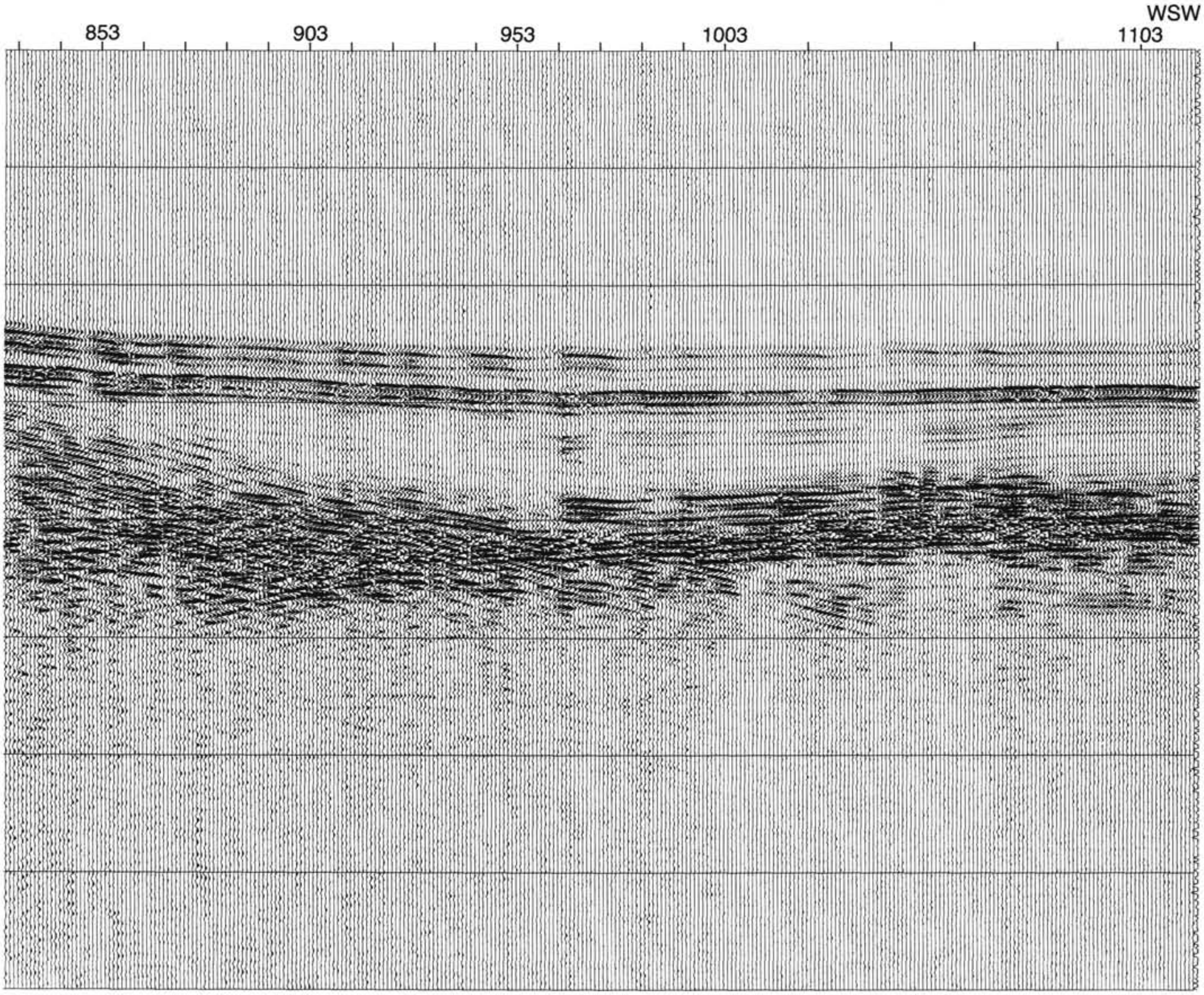

Figure 7 (continued).

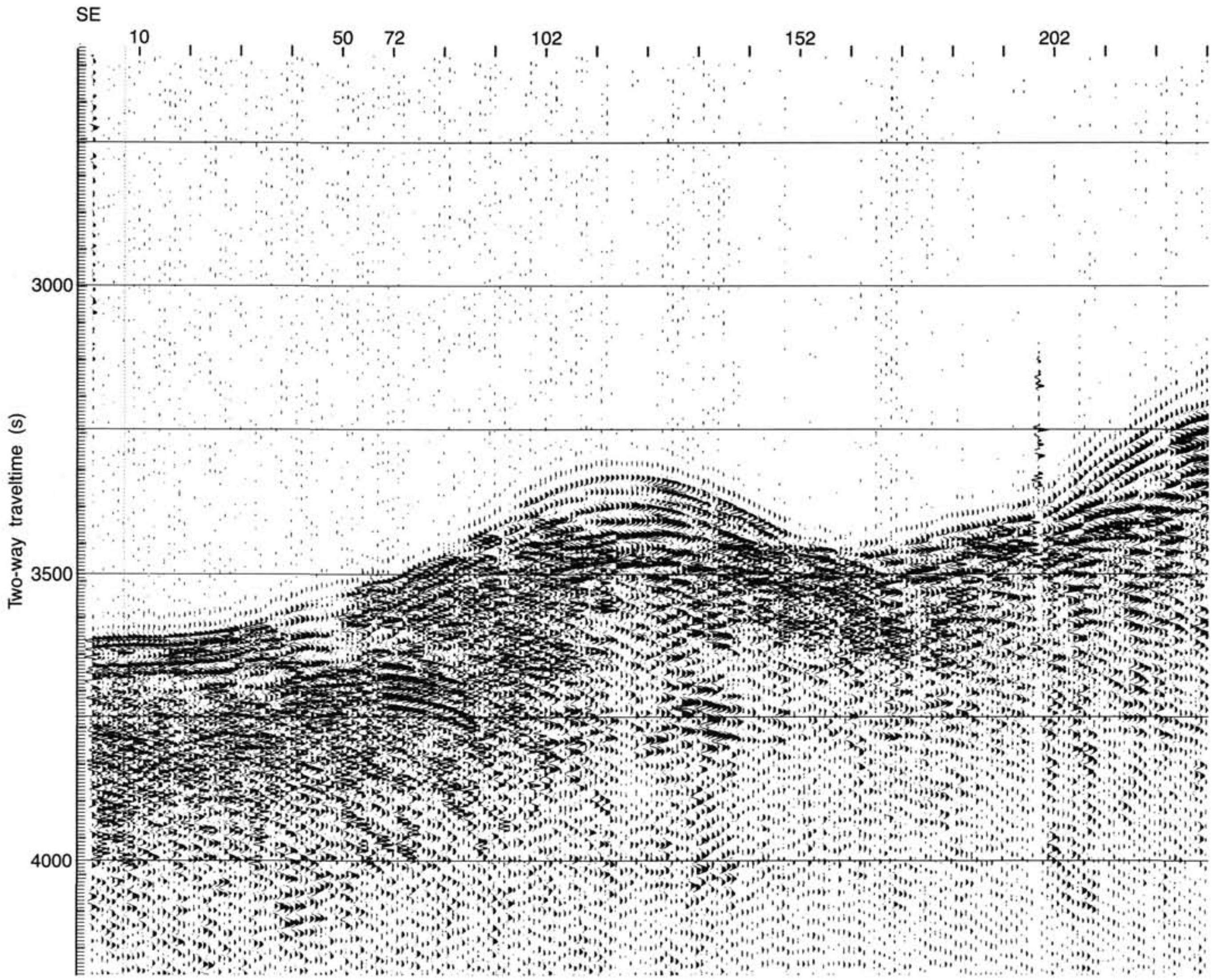

Figure 8. ODP Leg 107 seismic line 5, approaching Site 654. Vertical exaggeration ±2.5. Shot numbers are indicated on the top of the recording.

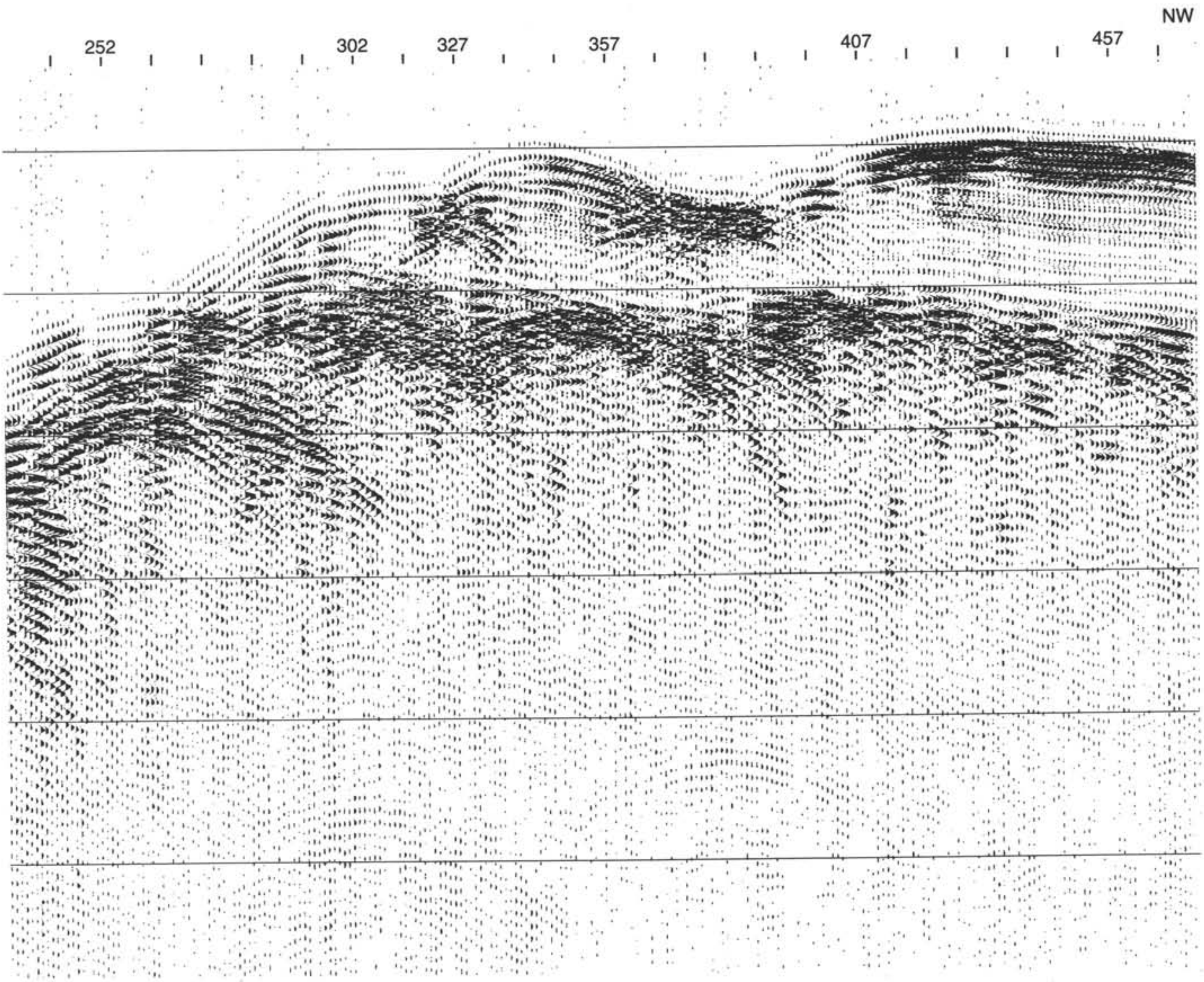

Figure 8 (continued).

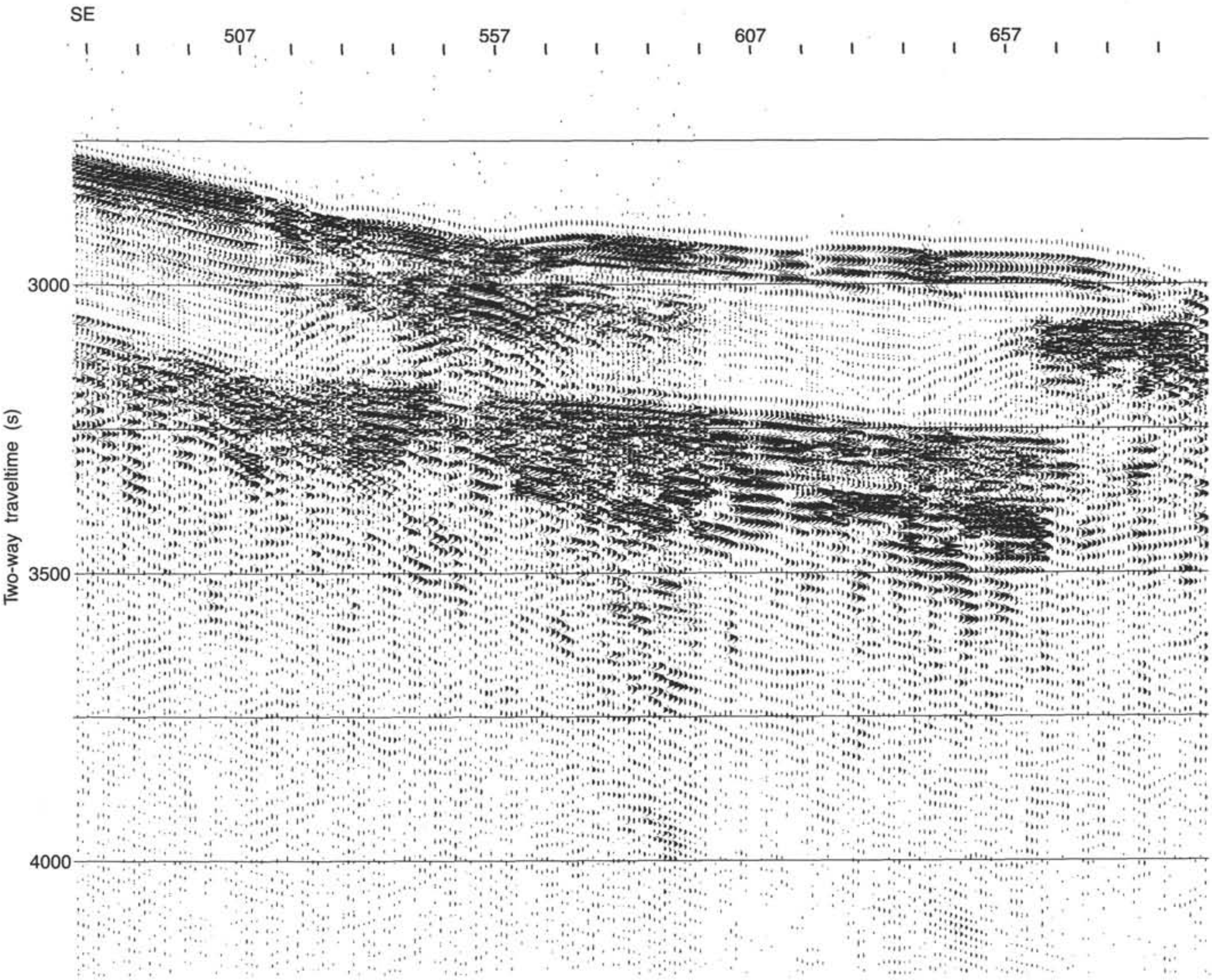

Figure 8 (continued).

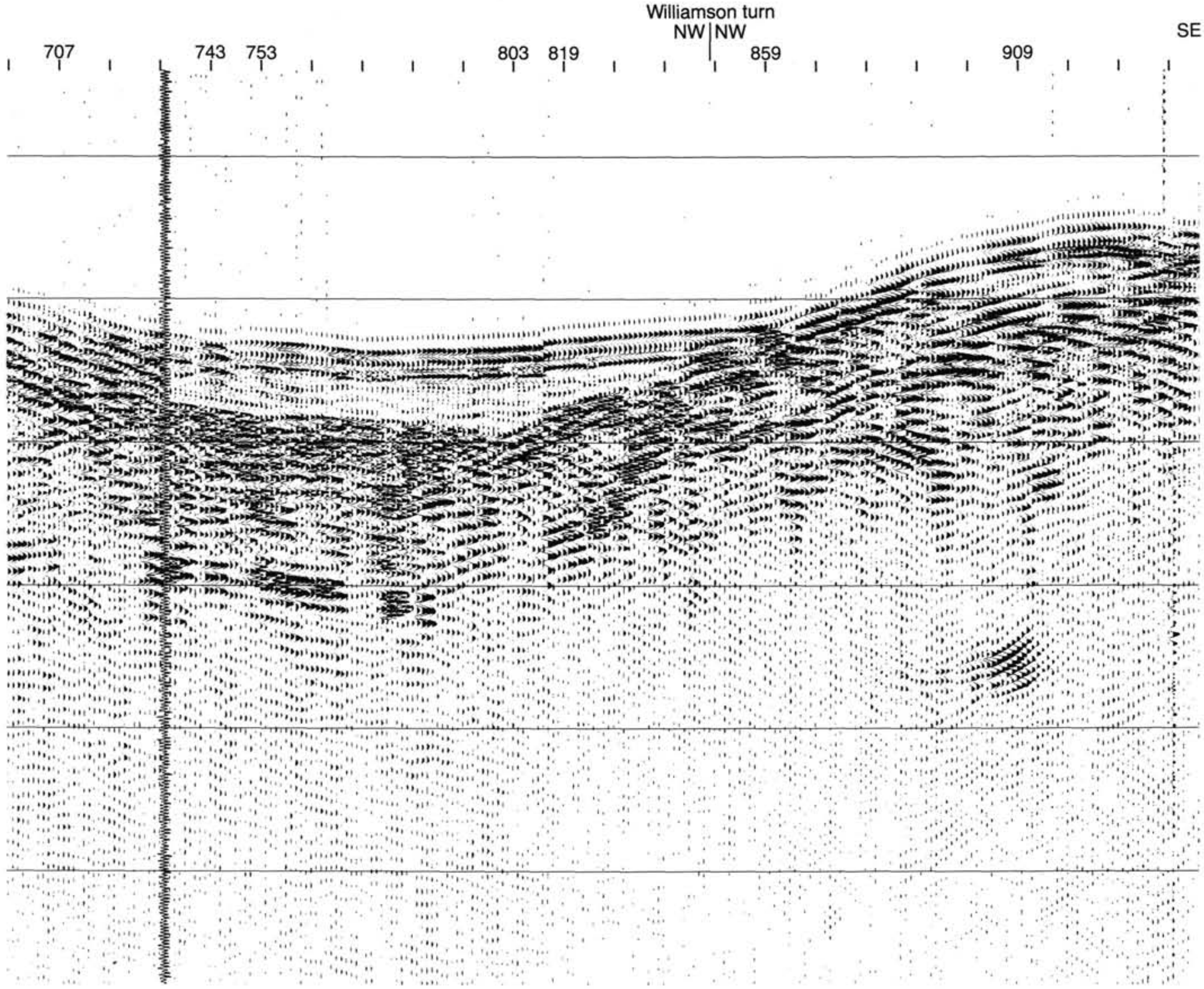

Figure 8 (continued).

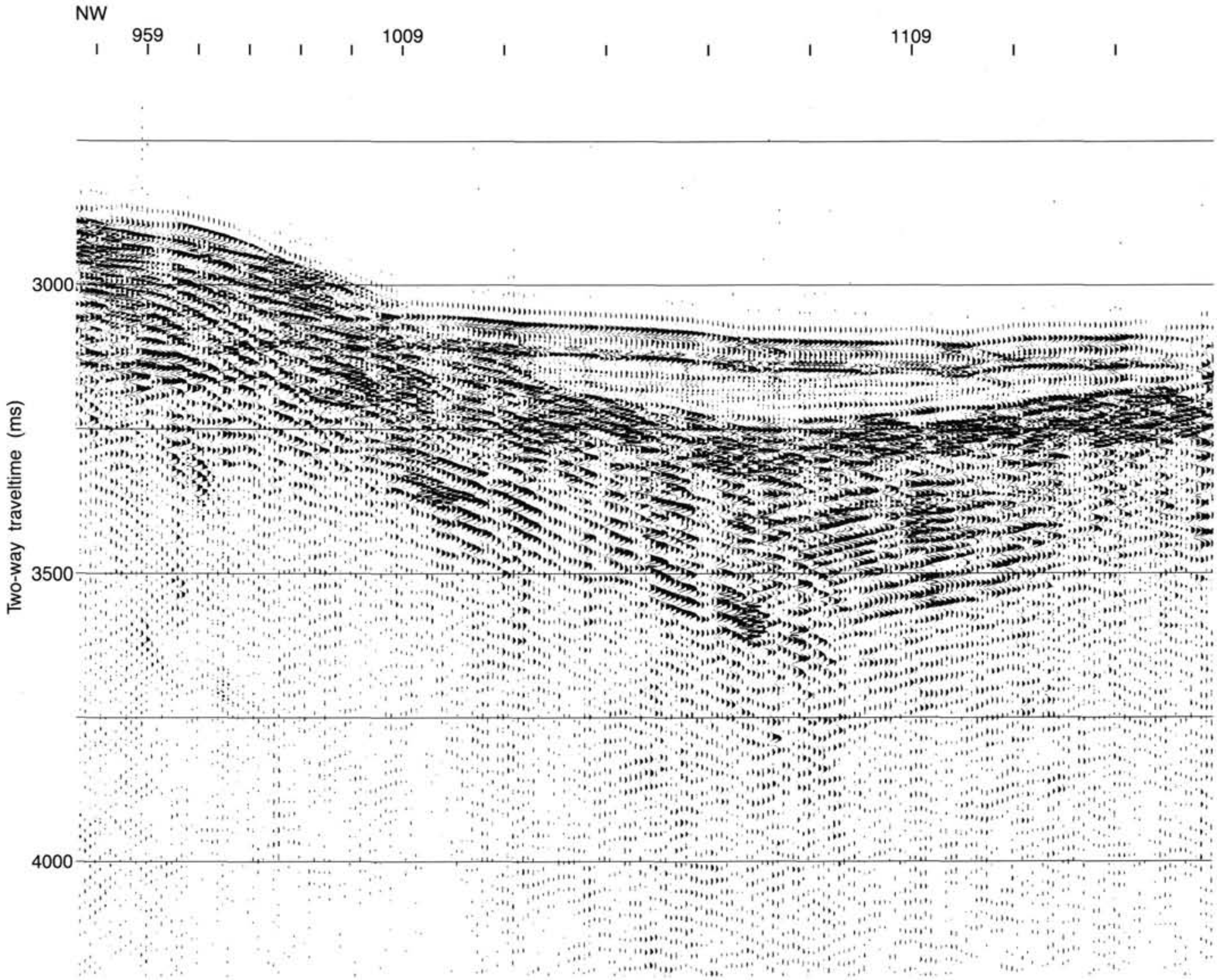

Figure 8 (continued).

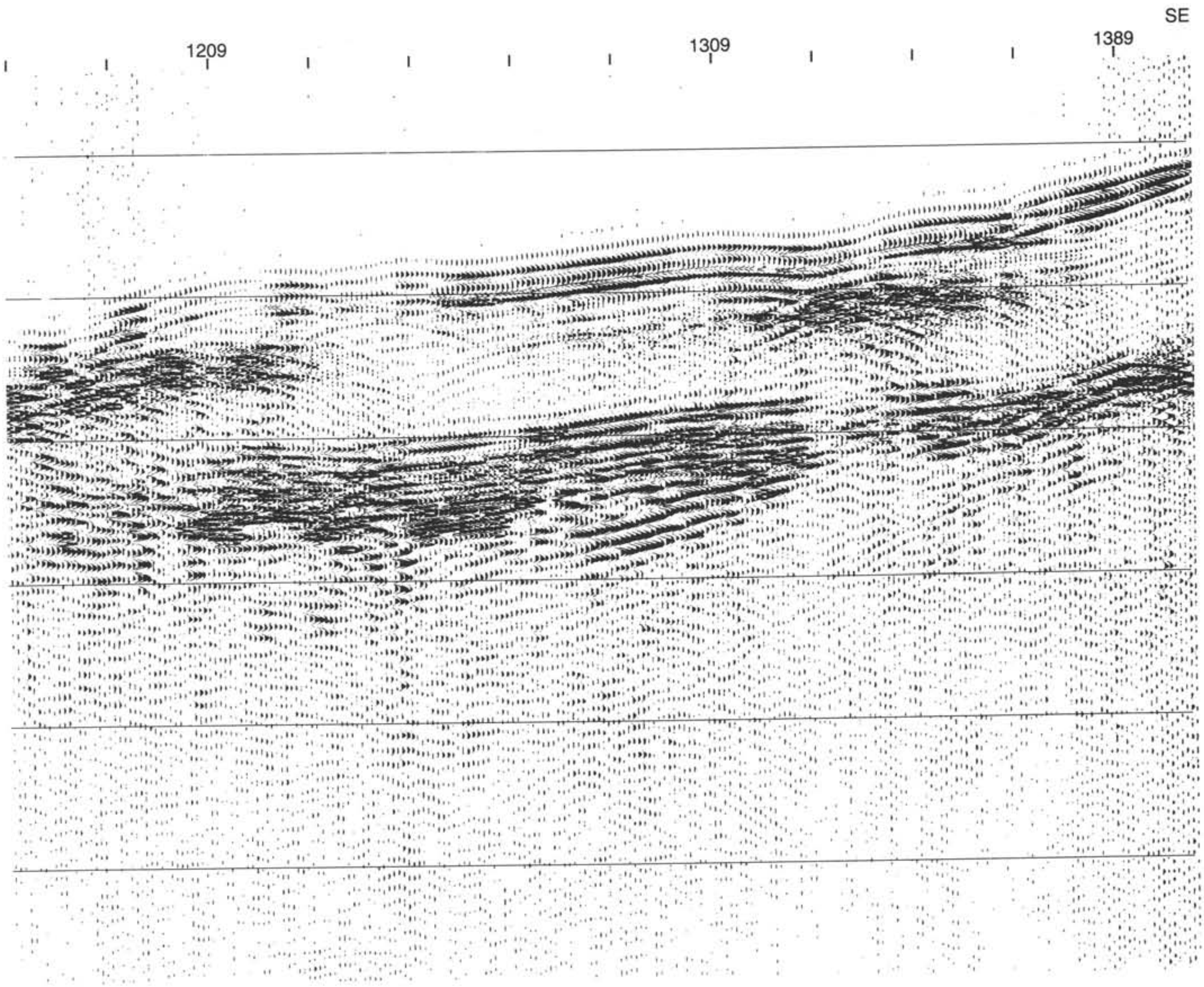

Figure 8 (continued).

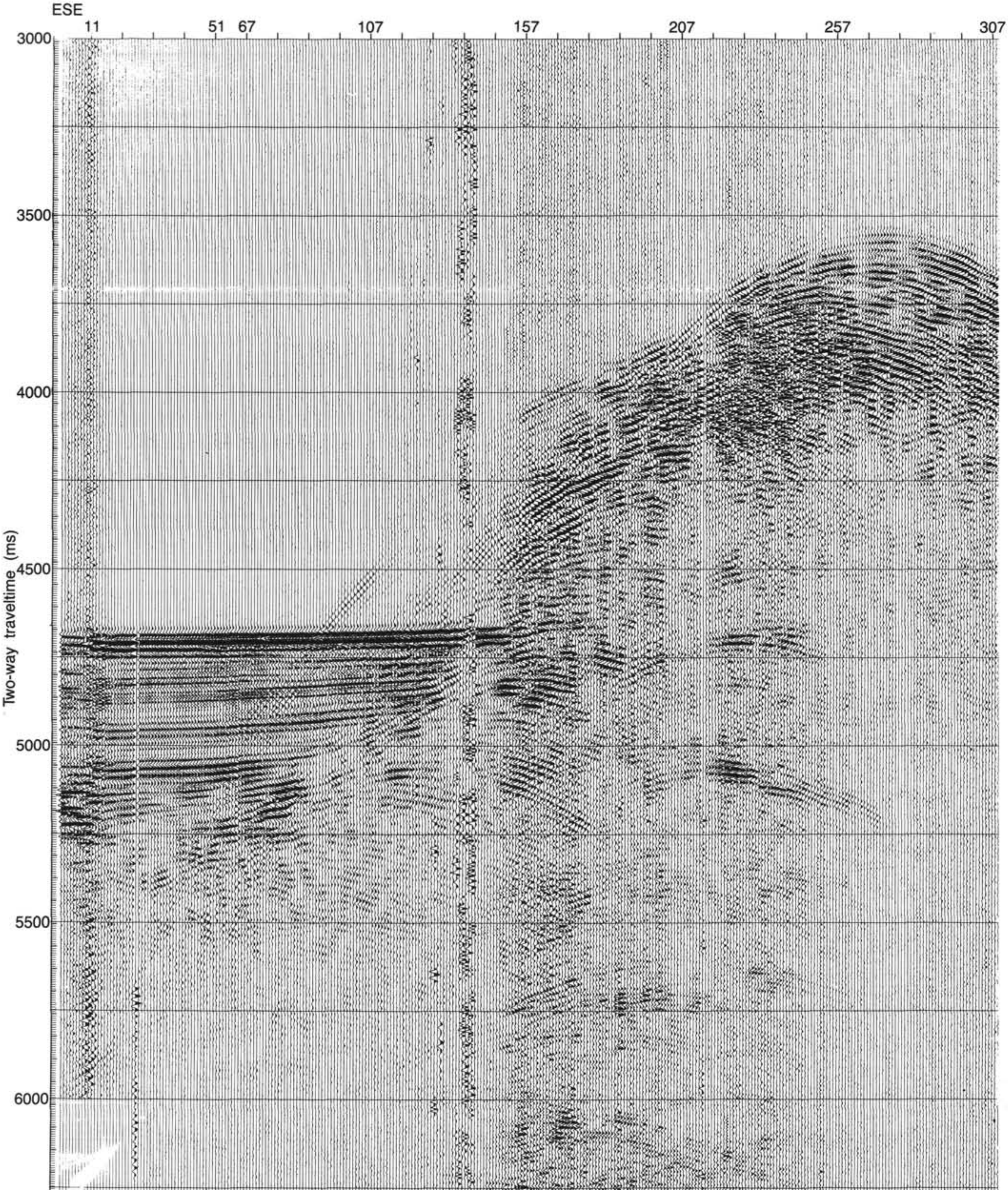

Figure 9. ODP Leg 107 seismic line 7, approaching Site 656. Vertical exaggeration ±2.5. Shot numbers are indicated on the top of the recording.

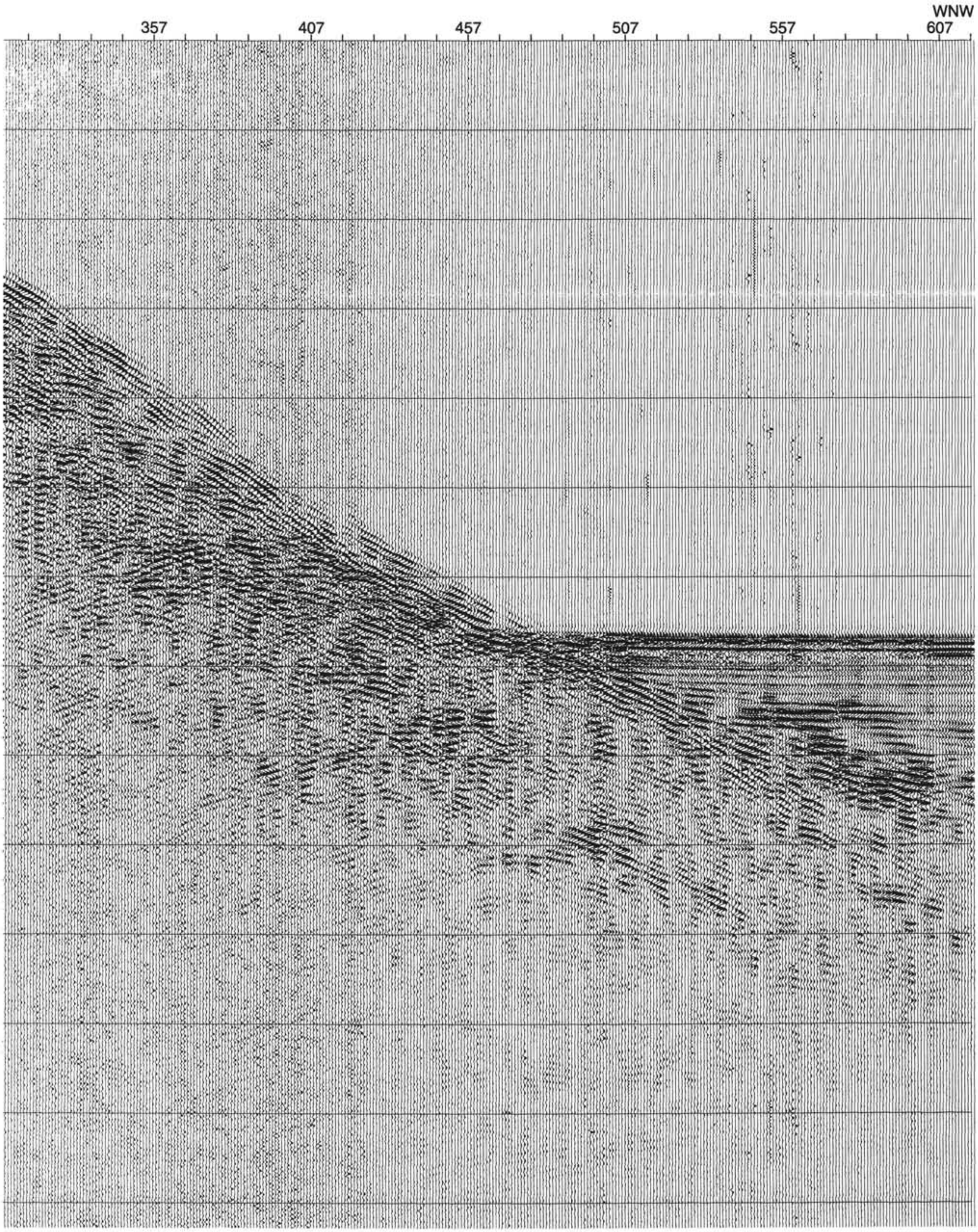

Figure 9 (continued).