Department of Energy
Washington, DC 20585

March 16, 1994

Mr. Joseph J. Holonich, Director
Repository Licensing & Quality
Assurance Project Directorate
Division of High-Level
Waste Management
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Holonich:

The U.S. Nuclear Regulatory Commission (NRC), in a letter dated January 19, 1994 (enclosure 1), requested: (1) copies of the U.S. Department of Energy's (DOE) response to three recent information requests made by the State of Nevada Nuclear Waste Project Office (NWPO). Enclosures 2-5 are copies of the requested responses to the letters from Robert Loux to Carl Gertz dated August 31, 1993, and from Carl Johnson to Carl Gertz dated September 9, 1993. Please note that the NRC reference to a letter from Robert Loux to Carl Gertz dated October 1, 1993, is a letter from Carl Gertz to Robert Loux stating that DOE was processing the state's August 31, 1993, letter.

The NRC's January 1994 letter also made a generic request to be provided copies, with enclosures, of all responses to requests for data and information by the State of Nevada. This is an indiscriminate request that does not recognize that DOE sends a large variety of information to the State of Nevada, which may include environmental-, socioeconomic-, or transportation-related materials.

DOE prefers that the NRC request materials by making a specific, written request. DOE believes that an indiscriminate approach will result in transmitting volumes of materials that are neither wanted or needed by the NRC staff. The state generally provides the NRC with courtesy copies of their letter requests to the DOE/Yucca Mountain Site Characterization Project Office. From such correspondence, NRC may evaluate the request and decide whether to make a similar one.

NH03.1/1
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WM-11

If you have any questions, contact Chris Einberg of my staff at (202) 586-8869.

Sincerely,

Dwight E. Shelor
Associate Director for
Systems and Compliance
Office of Civilian Radioactive
Waste Management

Enclosures: (NOT RECORD MATERIAL)
1. Ltr, Reamer to Shelor, dtd 1/19/94
2. Ltr, Nelson to Loux, dtd 11/19/93
3. Ltr, Nelson to Loux, dtd 12/20/93
4. Ltr, Nelson to Loux, dtd 2/18/94
5. Ltr, Nelson to Johnson, dtd 12/15/93

cc:

R. Nelson, YMPO
R. Loux, State of Nevada
W. Offutt, Nye County, NV
T. J. Hickey, Nevada Legislative Committee
D. Bechtel, Las Vegas, NV
Eureka County, NV
Lander County, Battle Mountain, NV
P. Niedzielski-Eichner, Nye County, NV
L. Bradshaw, Nye County, NV
C. Schank, Churchill County, NV
F. Mariani, White Pine County, NV
V. Poe, Mineral County, NV
J. Pitts, Lincoln County, NV
J. Hayes, Esmeralda County, NV
B. Mettam, Inyo County, CA

rec: mtg notes dtd 3/16/94

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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JAN 19 199

Mr. Dwight E. Shelor, Associate Director
for Systems and Compliance
Office of Civilian Radioactive Waste Management
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

I-352277

Dear Mr. Shelor:

SUBJECT: REQUEST FOR INFORMATION PROVIDED TO STATE OF NEVADA NUCLEAR WASTE PROJECT OFFICE

In recent information requests (letters from R. Loux to C. Gertz dated August 31, 1993; September 9, 1993; and October 1, 1993) the State of Nevada Nuclear Waste Project Office requested data reported in U.S. Geological Survey monthly reports and a seismic refraction survey reported in the U.S. Department of Energy (DOE) Yucca Mountain Weekly Highlights dated July 1, 1993. The requested information is also of interest to the staff of the U.S. Nuclear Regulatory Commission in its pre-licensing review activities; therefore, the NRC requests copies of the information previously requested by the State. In addition, the NRC wishes to be copied on all future information/data responses to the State and provided copies of all information when it is made available.

Thank you for your prompt attention to this request. If you have any questions, you may contact Ms. Anne Garcia of my staff at (301) 504-2438.

Sincerely,

C. William Reamer, Acting Director
Repository Licensing and Quality Assurance
Project Directorate
Division of High-Level Waste Management
Office of Nuclear Material Safety
and Safeguards

cc: See next page

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~~9401314391 (2pp)~~

ENCLOSURE 1

cc w/encls:
A. B. Benson, HQ (RW-5.2) FORS
S. J. Brocoum, HQ (RW-22) FORS
L. J. Desell, HQ (RW-331) FORS
C. E. Einberg, HQ (RW-331) FORS
P. W. McKinley, USGS, Denver, CO
A. A. Boulton, SAIC, Denver, CO
M. B. Blanchard, YMP, NV
A. C. Robison, YMP, NV
M. L. Powell, YMP, NV
E. L. Lundgaard, YMP, NV
W. R. Dixon, YMP, NV
S. B. Jones, YMP, NV
T. W. Bjerstedt, YMP, NV
J. R. Dyer, YMP, NV
A. M. Simmons, YMP, NV

cc w/o encls:
J. S. Stuckless, USGS, Denver, CO
R. E. Lewis, USGS, Denver, CO
Z. E. Peterman, USGS, Denver, CO
James Paces, USGS, Denver, CO
J. F. Whelan, USGS, Denver, CO
B. D. Marshall, USGS, Denver, CO
L. R. Hayes, USGS, Las Vegas, NV
R. W. Craig, USGS, Las Vegas, NV
B. E. Reilly, SAIC, Las Vegas, NV
S. J. Bodnar, M&O/TRW, Las Vegas, NV
R. F. Lewis, M&O/TRW, Las Vegas, NV

Department of Energy
Yucca Mountain Site Characterization
Project Office
P. O. Box 98608
Las Vegas, NV 89193-8608

WBS 1.2.5.3
QA: N/A

NOV 1 9 1993

Robert R. Loux
Executive Director
Agency for Nuclear Projects
State of Nevada
Evergreen Center, Suite 252
1802 North Carson Street
Carson City, NV 89710

UPDATE ON REQUEST FOR DATA REPORTED IN U.S. GEOLOGICAL SURVEY (USGS) MONTHLY REPORTS (SCP: N/A)

References: 1. Ltr, Loux to Gertz, dtd 8/31/93
2. Ltr, Gertz to Loux, dtd 10/01/93

We have evaluated the State of Nevada's request for data, data sets, and preliminary interpretations mentioned in USGS monthly reports of ongoing work (reference 1). Enclosed are the data available at this time (enclosure 1); the remainder will be provided on a schedule from the USGS to the U.S. Department of Energy (DOE), as indicated in Enclosure 2.

The data denoted by N^5 in Enclosure 2 are scheduled for submittal to the USGS Local Records Center (LRC) on November 22, 1993, and the data denoted by N^6 are scheduled to the USGS LRC on January 31, 1994. Within 15 days of these two dates, data will be furnished to DOE and within another 15 days, DOE will release the data to the State.

If you have any questions, please contact either Ardyth M. Simmons at (702) 794-7998 or Thomas W. Bjerstedt at (702) 794-7590.

Robert M. Nelson, Jr.
Acting Project Manager

RSED:AMS-782

Enclosures:
1. Partial transmittal of requested data
2. Data Request (Summary)

YMP-5

ENCLOSURE 2

Radiogenic Isotopic Requests for Preliminary Data:

Request #1 for location and alpha-spectrometry of carbonate-rich samples will be addressed by J. Paces within 30 days of submittal to the LRC on January 31, 1994.
Requests #2 and #38 for location, leach & residue, and alpha-spectrometry of Nevares Spring tufa will also be addressed by J. Paces.

Complies with requests #3 and #4 for strontium isotopic analyses of VH2, all Tertiary volcanic aquifer samples (Tv), and the strontium isotopic analyses of VH-1 time series.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
Desert Range #1		water (well)	5/13/90	0.71133	GS910508315215.005
U3MI		water (well)	6/20/90	0.71386	GS910508315215.005
Well #3		water (well)	10/30/90	0.71547	GS910508315215.005
NV-10	Burro-Hot-Springs	water (spring)	12/4/90	0.71168	GS910508315215.005
HD-442	Cane-Spring	water (spring)	4/23/91	0.70972	GS910508315215.005
10S/48E-1dd	E of Coffers Ranch	water (well)	9/17/90	0.70924	GS910508315215.005
WL90041801	Indian Spring	water (spring)	10/17/90	0.71097	GS910508315215.005
J-12 0:10	J-12	water (well)	5/7/91	0.71197	GS910508315215.005
J-13 (3)	J-13	water (well)	5/8/91	0.71147	GS910508315215.005
HD-482 (2)	Stateline-Saloon	water (well)	4/11/91	0.71676	GS910508315215.005
HD-482	Stateline-Saloon	water (well)	3/11/91	0.71674	GS910508315215.005
VH-2	USW-VH-2	water (well)	5/7/91	0.71301	GS910508315215.005
Waterpipe Butte Spring	Water Pipe Butte-Spr.	water (spring)	4/22/91	0.71146	GS910508315215.005
Burro Hot Springs (2)	Burro-Hot-Springs	water (spring)	11/19/91	0.71168	GS920208315215.008
NV-18	Captain-Jack-Spring	water (spring)	2/28/92	0.70957	GS920208315215.008
NV-7	Coffers-Ranch	water (surface	9/10/91	0.71099	GS920208315215.008
NV-8	Colson Pond	water (spring)	11/18/91	0.70945	GS920208315215.008
NV-16 (2)	Indian Spring	water (spring)	10/9/91	0.71015	GS920208315215.008
NV-16	Indian Spring	water (spring)	10/7/91	0.71016	GS920208315215.008
J-12 15:00	J-12	water (well)	1/21/92	0.71157	GS920208315215.008
J-12 15:40 (2)	J-12	water (well)	1/16/92	0.71155	GS920208315215.008
J-12 15:20	J-12	water (well)	1/15/92	0.71152	GS920208315215.008
J-12 15:40	J-12	water (well)	1/1/92	0.71156	GS920208315215.008
J-13 11:27 (2)	J-13	water (well)	1/7/92	0.71150	GS920208315215.008
J-13 11:47	J-13	water (well)	1/10/92	0.71154	GS920208315215.008
J-13 12:07 (2)	J-13	water (well)	1/10/92	0.71146	GS920208315215.008
J-13 12:07	J-13	water (well)	1/9/92	0.71151	GS920208315215.008
J-13 11:27	J-13	water (well)	12/31/91	0.71147	GS920208315215.008
UE-25p #1 (LANL)	UE-25p-#1	water (well)	2/27/92	0.71174	GS920208315215.008
Water Well 20	Water-Well-20	water (well)	6/4/91	0.71132	GS920208315215.008

ENCLOSURE 1

NV-11	Whiterock Spring	water (spring)	11/19/91	0.71131	GS920208315215.008
NV-17	Whiterock Spring	water (spring)	11/19/91	0.70893	GS920208315215.008
Bond Gold+1ml HNO3	Beatty	water (spring)	11/9/88	0.71054	GS920208315215.012
J-13 (2)	J-13	water (well)	12/17/88	0.71138	GS920208315215.012
UE-25 WT #4	UE-25-WT-#4	water (well)	7/28/88	0.70999	GS920208315215.012
89NV25		water (spring)	12/27/89	0.71165	GS920208315215.012
Bond Gold+2ml HNO3	Beatty	water (well)	1/4/89	0.71132	GS920208315215.012
JD-9-589	Daylight Pass Spring	water (spring)	6/23/89	0.71226	GS920208315215.012
J-13	J-13	water (well)	6/22/89	0.71128	GS920208315215.012
UE5c	UE5c	water (well)	2/6/90	0.71071	GS920208315215.012
NDOT well	Amargosa/Lathrop Wells	water (well)	6/9/92	0.71082	GS930908315215.027
EG032392-01	Amargosa/Lathrop Wells	water (well)	6/8/92	0.71179	GS930908315215.027
Cowboy Joe's (2)	Amargosa/Lathrop Wells	water (well)	5/26/92	0.71177	GS930908315215.027
NDOT Well (2)	Amargosa/Lathrop Wells	water (well)	11/18/92	0.71078	GS930908315215.027
EG032692-01	Carson Slough	water (well)	6/4/92	0.71285	GS930908315215.027
EG032592-05	Carson Slough	water (well)	6/10/92	0.71348	GS930908315215.027
EG032592-04	Carson Slough	water (well)	6/8/92	0.71353	GS930908315215.027
HD-1345	Fran's Ranch	water (well)	8/17/93	0.70927	GS930908315215.027
EG032692-04	Funeral-Mtn.-Well	water (well)	5/22/92	0.71471	GS930908315215.027
JF-3 1800	JF3	water (well)	4/30/92	0.71129	GS930908315215.027
JF-3 0520	JF3	water (well)	4/2/92	0.71128	GS930908315215.027
JF-3 1735	JF3	water (well)	3/20/92	0.71137	GS930908315215.027
JF-3 1736	JF3	water (well)	4/6/92	0.71136	GS930908315215.027
091692-ZP-1	Lathrop-Wells-Cone	water (well)	10/1/92	0.71213	GS930908315215.027
Stateline Pipeline	Stateline-Pipeline	water (well)	5/15/92	0.71616	GS930908315215.027
UE-25P#1 (LANL-2)	UE-25p-#1	water (well)	6/3/92	0.71179	GS930908315215.027
VH-1 11:41:04	USW-VH-1	water (well)	8/14/92	0.71084	GS930908315215.027
VH-1 11:54:51	USW-VH-1	water (well)	9/2/92	0.71098	GS930908315215.027
VH-1 12:08:46	USW-VH-1	water (well)	8/18/92	0.71100	GS930908315215.027
VH-1 16:54:19	USW-VH-1	water (well)	9/8/92	0.71105	GS930908315215.027
VH-1 16:03:50	USW-VH-1	water (well)	9/17/92	0.71094	GS930908315215.027
VH-1 12:13:22	USW-VH-1	water (well)	9/17/92	0.71097	GS930908315215.027
VH-1 11:50:15	USW-VH-1	water (well)	9/17/92	0.71097	GS930908315215.027
VH-1 11:59:25	USW-VH-1	water (well)	9/18/92	0.71096	GS930908315215.027
VH-1 12:04:07	USW-VH-1	water (well)	9/29/92	0.71100	GS930908315215.027
VH-1 11:45:50	USW-VH-1	water (well)	9/29/92	0.71094	GS930908315215.027
VH-2 Pond-2	USW-VH-2	water (well)	6/5/92	0.71300	GS930908315215.027
VH-2 Pipe (2)	USW-VH-2	water (well)	6/5/92	0.71299	GS930908315215.027

Complies with request #5 for strontium isotopic analyses of Franklin Lake Playa water.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
GS-4	GS-wells	water (well)	8/13/92	0.71337	GS930908315215.027
GS-5	GS-wells	water (well)	8/13/92	0.71327	GS930908315215.027
GS-6	GS-wells	water (well)	8/19/92	0.71290	GS930908315215.027
GS-8-1	GS-wells	water (well)	9/29/92	0.71328	GS930908315215.027
GS-8-2	GS-wells	water (well)	8/13/92	0.71328	GS930908315215.027
GS-10	GS-wells	water (well)	8/14/92	0.71309	GS930908315215.027
GS-12	GS-wells	water (well)	8/13/92	0.71312	GS930908315215.027
GS-15	GS-wells	water (well)	8/13/92	0.71293	GS930908315215.027
GS-18	GS-wells	water (well)	8/18/92	0.71285	GS930908315215.027
GS-15 (2)	GS-wells	water (well)	8/18/92	0.71292	GS930908315215.027
EG032692-03	NFL-FL wells	water (well)	6/2/92	0.71101	GS930908315215.027
NFL-1	NFL-FL wells	water (well)	8/14/92	0.71314	GS930908315215.027
NFL-1-1	NFL-FL wells	water (well)	8/19/92	0.71300	GS930908315215.027
Well FL	NFL-FL wells	water (well)	8/18/92	0.71298	GS930908315215.027
Obelisk	NFL-FL wells	water (well)	9/29/92	0.71324	GS930908315215.027
FMC	NFL-FL wells	water (well)	9/29/92	0.71537	GS930908315215.027
NFL-1-FA	NFL-FL wells	water (well)	11/18/92	0.71330	GS930908315215.027
NFL-1-FU	NFL-FL wells	water (well)	11/18/92	0.71332	GS930908315215.027
Well 5	Well # (Franklin)	water (well)	8/19/92	0.71320	GS930908315215.027
Well 13	Well # (Franklin)	water (well)	8/18/92	0.71322	GS930908315215.027
Well 14	Well # (Franklin)	water (well)	8/18/92	0.71306	GS930908315215.027

Complies with requests #6 and #8 for strontium isotopic analyses and concentrations of Nevares Spring tufa and water samples.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
HD-492	Nevares Spring	water (spring)	4/22/91	0.71903	GS910508315215.005
HD-500 HCl-L	Nevares Spring	spring-deposit	8/11/92	0.72017	GS930908315215.027
HD-499 HCl-L	Nevares Spring	spring-deposit	8/11/92	0.72048	GS930908315215.027
HD-502 HCl-L	Nevares Spring	spring-deposit	8/11/92	0.71909	GS930908315215.027
HD-498 HCl-L	Nevares Spring	spring-deposit	8/10/92	0.71958	GS930908315215.027
HD-497 HCl-L	Nevares Spring	spring-deposit	8/10/92	0.71961	GS930908315215.027
HD-496 HCl-L	Nevares Spring	spring-deposit	8/10/92	0.71987	GS930908315215.027
HD-495 HCl-L	Nevares Spring	spring-deposit	8/10/92	0.71979	GS930908315215.027
Nevares Spring (2)	Nevares Spring	water (spring)	9/11/92	0.71909	GS930908315215.027

Complies with duplicate requests #7 and #14 for strontium isotopic analyses of six high-silica rhyolites from UE25a#1.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
UE25a#1 510.4	UE-25a-#1	tuff	6/11/90	0.71678	GS910508315215.005
UE25a#1 510.4 (2)	UE-25a-#1	tuff	8/20/90	0.71666	GS910508315215.005
UE25a#1 609.6	UE-25a-#1	tuff	6/12/90	0.71629	GS910508315215.005
UE25a#1 609.6 (2)	UE-25a-#1	tuff	8/21/90	0.71642	GS910508315215.005
UE25a#1 669.5	UE-25a-#1	tuff	6/12/90	0.71536	GS910508315215.005
UE25a#1 669.5 (2)	UE-25a-#1	tuff	8/22/90	0.71542	GS910508315215.005
UE25a#1 990.6	UE-25a-#1	tuff	6/13/90	0.71450	GS910508315215.005
UE25a#1 990.6 (2)	UE-25a-#1	tuff	8/17/90	0.71455	GS910508315215.005
UE25a#1 1093.0	UE-25a-#1	tuff	6/15/90	0.71401	GS910508315215.005
UE25a#1 1170.0	UE-25a-#1	tuff	6/15/90	0.71534	GS910508315215.005
UE25a#1 510.4 HCl-R	UE-25a-#1	tuff	10/22/92	0.71952	GS930908315215.027
UE25a#1 609.6 HCl-R	UE-25a-#1	tuff	10/22/92	0.71885	GS930908315215.027
UE25a#1 669.5 HCl-R	UE-25a-#1	tuff	10/22/92	0.71839	GS930908315215.027
UE25a#1 990.6 HCl-R	UE-25a-#1	tuff	10/22/92	0.71534	GS930908315215.027
UE25a#1 1093.0 HCl-R	UE-25a-#1	tuff	10/22/92	0.71445	GS930908315215.027
UE25a#1 1170.0 HCl-R	UE-25a-#1	tuff	10/22/92	0.71754	GS930908315215.027

The Isotope and Geochemistry Group is unable to reply to the request for data from Pyramid Lake, NV. This joint study with Larry Benson (USGS, WRD, Boulder) was funded from an SIR account and not from a DOE account. (Request #9)

Complies with requests #10 and #12 for strontium isotopic analyses of precipitation from: October, August, March and February 1992.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
2/14/92	HRF	water (rain)	5/23/92	0.70835	GS930908315215.027
3/2-3/92	HRF	water (rain)	5/27/92	0.71103	GS930908315215.027
3/7-8/92	HRF	water (rain)	5/27/92	0.72612	GS930908315215.027
3/20-23/92	HRF	water (rain)	5/22/92	0.71077	GS930908315215.027
3/30-4/1/92-1	HRF	water (rain)	5/27/92	0.71091	GS930908315215.027
3/30-4/1/92-2	HRF	water (rain)	5/26/92	0.71553	GS930908315215.027
3/30-4/1/92-3	HRF	water (rain)	6/1/92	0.71094	GS930908315215.027
3/30-4/1/92-4	HRF	water (rain)	5/26/92	0.70914	GS930908315215.027
3/30-4/1/92-5	HRF	water (rain)	6/4/92	0.71123	GS930908315215.027
3/30-4/1/92-6	HRF	water (rain)	5/26/92	0.71097	GS930908315215.027
3/30-4/1/92-7	HRF	water (rain)	6/4/92	0.71021	GS930908315215.027

Complies with request #11 for strontium isotopic analyses from USW G-4 rhyolites.

Sample #	Type	Date Analyzed	87Rb/86Sr	87Sr/86Sr	TDIF #
G-4 592.5 HCl-R	tuff	07/13/92	32.259	0.71875	GS930908315215.027
G-4 835.1 HCl-R	tuff	07/13/92	30.649	0.71849	GS930908315215.027
G-4 943.0 HCl-R	tuff	07/13/92	24.159	0.71732	GS930908315215.027
G-4 1106.6 HCl-R	tuff	07/08/92	28.252	0.71819	GS930908315215.027
G-4 1218.7 HCl-R	tuff	07/08/92	25.876	0.71774	GS930908315215.027
G-4 1263.0 HCl-R	tuff	07/08/92	23.295	0.71719	GS930908315215.027

Complies with requests #13 and #37 for location and strontium isotopic analyses from the Raven Canyon Section and JF-3.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
DH-3 HCl-R	Paintbrush Canyon	tuff	09/21/92	0.71686	GS930908315215.027
DH-4 HCl-R	Paintbrush Canyon	tuff	02/24/92	0.71689	GS920208315215.008
DH-5 HCl-R	Paintbrush Canyon	tuff	09/21/92	0.71493	GS930908315215.027
DH-8 HCl-R	Paintbrush Canyon	tuff	09/21/92	0.71782	GS930908315215.027
DH-9 HCl-R	Paintbrush Canyon	tuff	02/24/92	0.71764	GS920208315215.008
H95-10+6 HCl-R	Raven Canyon	tuff	09/25/92	0.70994	GS930908315215.027
H95-16+5 HCl-R	Raven Canyon	tuff	02/24/92	0.71013	GS920208315215.008
H95-18+0 HCl-R	Raven Canyon	tuff	09/22/92	0.71070	GS930908315215.027
H95-5+7 HCl-R	Raven Canyon	tuff	02/24/92	0.71025	GS920208315215.008
H95B-0C+0 HCl-R	Raven Canyon	tuff	02/25/92	0.70933	GS920208315215.008
H95B-11+5 HCl-R	Raven Canyon	tuff	09/22/92	0.70872	GS930908315215.027
H95B-14+35 HCl-R	Raven Canyon	tuff	06/16/92	0.70909	GS930908315215.027
H95B-18+0 HCl-R	Raven Canyon	tuff	09/22/92	0.70920	GS930908315215.027
H95B-24+0 HCl-R	Raven Canyon	tuff	02/25/92	0.70924	GS920208315215.008
H95B-4+26 HCl-R	Raven Canyon	tuff	02/25/92	0.70828	GS920208315215.008
H95C-0+1 HCl-R	Raven Canyon	tuff	09/22/92	0.71134	GS930908315215.027
H95C-0+10 HCl-R	Raven Canyon	tuff	09/22/92	0.71208	GS930908315215.027
H95C-1+0 HCl-R	Raven Canyon	tuff	02/25/92	0.71116	GS920208315215.008
H95C-10+16 HCl-R	Raven Canyon	tuff	09/21/92	0.71207	GS930908315215.027
H95C-14+6 HCl-R	Raven Canyon	tuff	02/26/92	0.71199	GS920208315215.008
H95C-18+7 HCl-R	Raven Canyon	tuff	02/26/92	0.71649	GS920208315215.008
H95C-22+0 HCl-R	Raven Canyon	tuff	09/22/92	0.70942	GS930908315215.027
H95C-4+4 HCl-R	Raven Canyon	tuff	09/22/92	0.71214	GS930908315215.027
H95C-7+10 HCl-R	Raven Canyon	tuff	02/25/92	0.71218	GS920208315215.008
JF-3 610 HCl-R	Fortymile Wash	tuff	09/24/92	0.71202	GS930908315215.027
JF-3 770 HCl-R	Fortymile Wash	tuff	09/25/92	0.71787	GS930908315215.027

Request #35 for neodymium isotopic analyses from USW G-2, G-3 and G-4 cannot be met. These samples were orginally obtained from LANL, and had been irridated for neutron activation analyses. The neodymium isotopic compositions had been effected by the irradiation, and the isotopic analyses were determined to be useless.

Request #36 for results of XRF trace-element analyses cannot be met because we are unable to specifically identify the actual data wanted.

Complies with request #39 for strontium isotopic results from VH-2 fracture fillings. "Chemistry" was requested, but we assume that the isotopic results were intended.

Sample #	Locality	Type	Date Analyzed	87Sr/86Sr	TDIF #
HD-730c HCl-L	USW VH-2	fracture filling	10/23/92	0.71106	GS930908315215.027
HD-731d HCl-I	USW VH-2	fracture filling	10/23/92	0.71132	GS930908315215.027
HD-732e HCl-L	USW VH-2	fracture filling	10/23/92	0.71102	GS930908315215.027
HD-734d HCl-L	USW VH-2	fracture filling	10/23/92	0.71136	GS930908315215.027
HD-735b HCl-L	USW VH-2	fracture filling	10/23/92	0.71111	GS930908315215.027
HD-736c HCl-L	USW VH-2	fracture filling	10/27/92	0.71157	GS930908315215.027
HD-742c HCl-L	USW VH-2	fracture filling	10/26/92	0.70909	GS930908315215.027
HD-750e HCl-L	USW VH-2	fracture filling	10/26/92	0.71034	GS930908315215.027
HD-759c HCl-L	USW VH-2	fracture filling	10/26/92	0.71128	GS930908315215.027
HD-760c HCl-L	USW VH-2	fracture filling	10/26/92	0.71043	GS930908315215.027
HD-761c HCl-L	USW VH-2	fracture filling	10/27/92	0.71102	GS930908315215.027

KEY:
HCl-L= denotes the leach of an HCl dissolution
HCl-R= denotes the residue of an HCl dissoution

DATA REQUEST

(Summary)
Agency for Nuclear Projects, Nuclear Waste Project Office

Request Dated: August 31, 1993
Request Received: September 9, 1993

Item Number	Requested Data	Source	Data Included (Y/N)
	Strontium		
1	Location and analysis of carbonate-rich samples	[a] 01/93, p. 64	N [6]
2	Locations and alpha-spectrometry results from Nevares Spring tufa mound	[a] 10-11/93, p. 64	N [6]
3	Sr isotope data for VH-2 and elsewhere in Tertiary aquifer	[a] 08/92, p 94	Y
4	XRF mass spec. analyses and SR/SR ratios of VH-1	[a] 08/92, p. 94	Y
5	Sr/Sr ratios from Franklin Lake Playa	[a] 08/92, p. 94	Y
6	Sr concentrations for Nevares Spring tufa	[a] 08/92, p. 95	Y
7	Sr content and isotopic comp. of high-Si rhyolite samples from UE25A#1	[a] 09-92, p. 13	Y
8	Sr composition from Nevares Spring	[a] 09/92, p. 8	Y
9	Sr composition from Pyramid Lake	[a] 09/92, p. 89	N [1]
10	Sr isotopes for precip. sample from Yucca Crest	[a] 01/93, P. 63	Y
11	Sr/Sr and Rb/Sr rations of rhyolite in G-4	[a] 10-11/ 93(?), p. 16	Y
12	Sr/Sr ratios of precip. samples for 08/11/92, 03/92, and 02/92	[a] 10-11/ 93(?), p. 90	Y

ENCLOSURE 2

Item Number	Requested Data	Source	Data Included (Y/N)
13	Sr isotopic anal. of outcrop samples, Southern Yucca Mtn.	[b] 04/15/92	Y
14	Sr content and isotopic comp. from high-Si rhyolite from UE25a#1	[b] 10/16/92	Y
	Fluid Inclusion		
15	Results from fluid inclusion studies for USW - G-1 and G-2	[a] 01/93, p. 87	N
16	Results of fluid inclusion studies of calcite from USW G-2, GU-3, G-4, UE25UZ-16, A-4, A-5, A-7	[a] 01/93, p. 70	N
	Carbon and Oxygen		
17	^{13}C and $^{18}0$ values of calcite from site 106	[a] 07/92, p. 105	N
18	^{13}C and ^{18}O values from Site 199	[a] 07/92, p. 106	N
19	^{13}C and ^{18}O values from trenches CFS-E, CF-1, 2, and 8	[a] 07/92, p. 106	N
20	^{13}C and ^{18}O values from Tonopah RR in Ash Meadows	[a] 07/92, p. 106	N
21	^{13}C and ^{18}O values from Trench 14 calcites and calcrete	[a] 07/92, p. 106	N
22	^{13}C and ^{18}O values from Nevares Spring	[a] 07/92, p. 107	N
23	^{18}O results from Trench-14	[a] 08/92, p. 100	N
24	^{18}O values of opal/chalcedony from drill core	[a] 08/92, p. 100	N
25	^{14}C ages of calcites from USW G-1 and other drill holes.	[a] 01/93, p. 71	N
26	^{13}C and ^{18}O values from Site 106 and Wahmonie	[a] 10-11/93 (?), p. 92	N

Item Number	Requested Data	Source	Data Included (Y/N)
27	^{13}C and ^{18}O values from Travertine, Nevares, and Grapevine springs	[a] 10-11/ 93(?), p. 92	N[5]
28	^{13}C and ^{18}O values from Busted Butte, Eleanna Trench, Trenches 1 and 16, Yucca Crest	[a] 10-11/ 93(?), p. 92	N[5]
29	^{13}C and ^{18}O values from Site 106 and Wahmonie	[a] 12/93, p. 68	N[5]
30	^{13}C and ^{18}O values from Nevares and Grapevine springs	[a] 12/93, p. 68	N[5]
31	^{13}C and ^{18}O values from UE25-RF-9	a 12/93, p. 68	N[5]
32	^{13}C and ^{18}O values from Yucca Crest	a 12/93, p 68	N[5]
33	^{13}C and ^{18}O values from Sites 106 and 199, Trenches CFS-E, CF-1, 2, and 8, Tonopah RR, Trench 14, and Nevares Spring	[b] 08/11/92	N[5]
34	^{13}C and ^{18}O values from USW G-1 and 2, UE-25 A-5, RF-3, and USW GU-3	[b] 03/10/93	N[5]
	Other Data		
35	Nd/Nd values of calcite fracture-fillings from USW G-2, 3, and 4	[a] 01/92, p. 83	N[2]
36	Results of XRF trace-element analyses	[a] 10-11/93, p. 15	N[3]
37	Location and results of isotope analysis on samples from Raven Canyon and results from JF-3	[a] 10-11/93, p. 15	Y
38	Results from tufa mound samples at Nevares Spring	[a] 0-11/93, p. 89	N[6]
39	Chemistry results from VH-2	[a] 10-11/93, p. 94	Y
40	Vapor-phase inclusion results from USW G-1	[a] 10-11/93, p. 93	N[5]
41	Analyses of faunal samples from Modern Springs	[b] 03/11/92, p. 6	N[4]

Item Number	Requested Data	Source	Data Included (Y/N)
42	Isotopic composition of carbonate from Site 106, Wahmonie, Nevares, and Grapevine springs, UE25 RF-9, UEA-6, Yucca Crest, and USW G-4	[b] 01/13/93	N [5]

[a] USGS, YMP, Monthly Highlights and Status Report
[b] Letters to Carl Gertz from U.S. Department of Interior

[1] Unable to respond to this request. This study by Larry Benson (USGS-WRD, Boulder, CO) was funded from a Geologic Division account.
[2] No data available. Samples were originally obtained from LANL and had been irradiated for neutron activation analysis. The neodymium isotopic compositions had been affected by the irradiation, and the analyses were determined to be invalid.
[3] Request cannot be met - unable to specifically identify the data wanted from the wording in the request.
[4] Octracodes were observed in the samples as described on page 11 of the data request, however no identification of species was made.
[5] Available November 22, 1993
[6] Available January 31, 1994

Department of Energy
Yucca Mountain Site Characterization
Project Office
P. O. Box 98608
Las Vegas, NV 89193-8608

WBS 1.2.5.3
QA: N/A

DEC 2 0 1993

Robert R. Loux
Executive Director
Agency for Nuclear Projects
State of Nevada
Evergreen Center, Suite 252
1802 North Carson Street
Carson City, NV 89710

SECOND INSTALLMENT OF DATA REPORTED IN U.S. GEOLOGICAL SURVEY (USGS) MONTHLY REPORTS (SCP: N/A)

References: (1) Ltr, Loux to Gertz, dtd 8/31/93
(2) Ltr, Gertz to Loux, dtd 10/1/93

Enclosed is the second installment of information requested by the State of Nevada for data, data sets, and preliminary interpretations mentioned in the USGS monthly reports of ongoing work (Reference 1). The data noted by Y^5 in the table entitled "Data Request" are enclosed. The data tracking numbers associated with data enclosed with this letter are GS931008315215215.030, GS931008315215215.034, and GS931008315215215.035.

The data denoted by N^6 are scheduled to be sent to the USGS Local Records Center on January 31, 1994. Within 15 days of this date, data will be furnished to the U.S. Department of Energy (DOE) and within another 15 days, DOE will release the data to the state.

If you have any questions, please contact either Ardyth M. Simmons at (702) 794-7998 or Thomas W. Bjerstedt at (702) 794-7950.

Robert M. Nelson, Jr.
Acting Project Manager

RSED:AMS-1160

Enclosure:
Partial Transmittal of
Requested Data

cc w/encl:
A. B. Benson, HQ (RW-5.2) FORS
S. J. Brocoum, HQ (RW-22) FORS
L. J. Desell, HQ (RW-331) FORS
C. E. Einberg, HQ (RW-331) FORS
A. A. Boulton, SAIC, Denver, CO
B. E. Reilly, SAIC, Las Vegas, NV
P. W. McKinley, USGS, Denver, CO

ENCLOSURE 3

DATA REQUEST

(Summary)

Agency for Nuclear Projects, Nuclear Waste Project Office

Request Dated: August 31, 1993
Request Received: September 9, 1993

Item Number	Requested Data	Source	Data Included (Y/N)
	Strontium		
1	Location and analysis of carbonate-rich samples	[a] 01/93, p. 64	N [6]
2	Locations and alpha-spectrometry results from Nevares Spring tufa mound	[a] 10-11/93, p. 64	N [6]
3	Sr isotope data for VH-2 and elsewhere in Tertiary aquifer	[a] 08/92, p 94	Y
4	XRF mass spec. analyses and SR/SR ratios of VH-1	[a] 08/92, p. 94	Y
5	Sr/Sr ratios from Franklin Lake Playa	[a] 08/92, p. 94	Y
6	Sr concentrations for Nevares Spring tufa	[a] 08/92, p. 95	Y
7	Sr content and isotopic comp. of high-Si rhyolite samples from UE25A#1	[a] 09-92, p. 13	Y
8	Sr composition from Nevares Spring	[a] 09/92, p. 8	Y
9	Sr composition from Pyramid Lake	[a] 09/92, p. 89	N [1]
10	Sr isotopes for precip. sample from Yucca Crest	[a] 01/93, P. 63	Y
11	Sr/Sr and Rb/Sr rations of rhyolite in G-4	[a] 10-11/ 93(?), p. 16	Y
12	Sr/Sr ratios of precip. samples for 08/11/92, 03/92, and 02/92	[a] 10-11/ 93(?), p. 90	Y

ENCLOSURE

Item Number	Requested Data	Source	Data Included (Y/N)
13	Sr isotopic anal. of outcrop samples, Southern Yucca Mtn.	[b] 04/15/92	Y
14	Sr content and isotopic comp. from high-Si rhyolite from UE25a#1	[b] 10/16/92	Y
	Fluid Inclusion		
15	Results from fluid inclusion studies for USW - G-1 and G-2	[a] 01/93, p. 87	Y\S
16	Results of fluid inclusion studies of calcite from USW G-2, GU-3, G-4, UE25UZ-16, A-4, A-5, A-7	[a] 01/93, p. 70	Y\S
	Carbon and Oxygen		
17	^{13}C and $^{18}0$ values of calcite from site 106	[a] 07/92, p. 105	Y\S
18	^{13}C and ^{18}O values from Site 199	[a] 07/92, p. 106	Y\S
19	^{13}C and ^{18}O values from trenches CFS-E, CF-1, 2, and 8	[a] 07/92, p. 106	Y\S
20	^{13}C and ^{18}O values from Tonopah RR in Ash Meadows	[a] 07/92, p. 106	Y\S
21	^{13}C and ^{18}O values from Trench 14 calcites and calcrete	[a] 07/92, p. 106	Y\S
22	^{13}C and ^{18}O values from Nevares Spring	[a] 07/92, p. 107	Y\S
23	^{18}O results from Trench-14	[a] 08/92, p. 100	Y\S
24	^{18}O values of opal/chalcedony from drill core	[a] 08/92, p. 100	Y\S
25	^{14}C ages of calcites from USW G-1 and other drill holes.	[a] 01/93, p. 71	Y\S
26	^{13}C and ^{18}O values from Site 106 and Wahmonie	[a] 10-11/93 (?), p. 92	Y\S

Item Number	Requested Data	Source	Data Included (Y/N)
27	^{13}C and ^{18}O values from Travertine, Nevares, and Grapevine springs	[a] 10-11/ 93(?), p. 92	Y[5]
28	^{13}C and ^{18}O values from Busted Butte, Eleanna Trench, Trenches 1 and 16, Yucca Crest	[a] 10-11/ 93(?), p. 92	Y[5]
29	^{13}C and ^{18}O values from Site 106 and Wahmonie	[a] 12/93, p. 68	Y[5]
30	^{13}C and ^{18}O values from Nevares and Grapevine springs	[a] 12/93, p. 68	Y[5]
31	^{13}C and ^{18}O values from UE25-RF-9	a 12/93, p. 68	Y[5]
32	^{13}C and ^{18}O values from Yucca Crest	a 12/93, p 68	Y[5]
33	^{13}C and ^{18}O values from Sites 106 and 199, Trenches CFS-E, CF-1, 2, and 8, Tonopah RR, Trench 14, and Nevares Spring	[b] 08/11/92	Y[5]
34	^{13}C and ^{18}O values from USW G-1 and 2, UE-25 A-5, RF-3, and USW GU-3	[b] 03/10/93	Y[5]
	Other Data		
35	Nd/Nd values of calcite fracture-fillings from USW G-2, 3, and 4	[a] 01/92, p. 83	N[2]
36	Results of XRF trace-element analyses	[a] 10-11/93, p. 15	N[3]
37	Location and results of isotope analysis on samples from Raven Canyon and results from JF-3	[a] 10-11/93, p. 15	Y
38	Results from tufa mound samples at Nevares Spring	[a] 0-11/93, p. 89	N[6]
39	Chemistry results from VH-2	[a] 10-11/93, p. 94	Y
40	Vapor-phase inclusion results from USW G-1	[a] 10-11/93, p. 93	Y[5]
41	Analyses of faunal samples from Modern Springs	[b] 03/11/92, p. 6	N[4]

Item Number	Requested Data	Source	Data Included (Y/N)
42	Isotopic composition of carbonate from Site 106, Wahmonie, Nevares, and Grapevine springs, UE25 RF-9, UEA-6, Yucca Crest, and USW G-4	[b] 01/13/93	Y [5]

[a] USGS, YMP, Monthly Highlights and Status Report
[b] Letters to Carl Gertz from U.S. Department of Interior

[1] Unable to respond to this request. This study by Larry Benson (USGS-WRD, Boulder, CO) was funded from a Geologic Division account.
[2] No data available. Samples were originally obtained from LANL and had been irradiated for neutron activation analysis. The neodymium isotopic compositions had been affected by the irradiation, and the analyses were determined to be invalid.
[3] Request cannot be met - unable to specifically identify the data wanted from the wording in the request.
[4] Octracodes were observed in the samples as described on page 11 of the data request, however. no identification of species was made.
[5] Available December 7, 1993
[6] Available February 15, 1994

HD #	Drill Hole	SPC #	Depth (ft)	Tcrush (C)	Thomog (C)
HD-318	G1	00016017	425.5	95,90,-90	
HD-319	G1	00016018	491.8	-60,60	
HD-322	G1	00016021	669.2	-100,99.5,76,92	81
HD-325	G1	00016024	959.8	94,-82	
HD-326	G1	00016025	1029.0	82,82,82,-82	
HD-338	G	00016037	3588.5		99,103.114
HD-343	G1	00016042	3867.3		74,86
HD-348	G1	00016047	5348.6		87,96,92,91
HD-359	G2	00016060	858.2		57,59
HD-368	G2	00016068	1137.6		81>72
HD-369	G2	00016069	1169.8		104,103
HD-274	G2	00004688	1562.2	94,92	
HD-579	G2	00016083	4162.8		78,-80,82,80,79
HD-582	G2	00016086	4912.8		org(?)-240-260
HD-583	G2	00016087	5107.3		215,216,242-245

Request numbers 15 and 16 for fluid inclusion are a part of TDIF.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-150-1	Site 106		359-C-7	-3.6	22.7	00002931
☒ Yes	HD-150-1A	Site 106		2C1	-3.8	22.5	00002931
☒ Yes	HD-151-2	Site 106		359-C-8	-3.9	22.7	00002932
☒ Yes	HD-151-2A	Site 106		2C2	-4.1	22.5	00002932
☒ Yes	HD-151-3A	Site 106		2C3	-4.1	22.1	00002932
☒ Yes	HD-153-1	Site 106		359-C-9	-4.7	21.4	00002934
☒ Yes	HD-153-1A	Site 106		2C5	-5.1	20.4	00002934
☒ Yes	HD-153-1JFW	Site 106		394-C-9	-4.9	20.8	00002934
☒ Yes	HD-153-1RJM	Site 106		395-C-1	-5.2	20.4	00002934
☒ Yes	HD-153-1RJM	Site 106		13C-10	-5.1	20.2	00002934
☒ Yes	HD-153-1RJM	Site 106		17C-9	-5.0	20.8	00002934
☒ Yes	HD-155-1	Site 106		359-C-10	-4.2	22.5	00002936
☒ Yes	HD-155-1A	Site 106		2C6	-4.3	22.1	00002936
☒ Yes	HD-156-1A	Site 106		2C7	-4.5	21.7	00002937
☒ Yes	HD-156-2A	Site 106		2C8	-4.6	21.8	00002937
☒ Yes	HD-159-1	Site 106		360-C-1	-3.7	23.9	00002940
☒ Yes	HD-159A	Site 106		2C10	-3.8	23.5	00002940
☒ Yes	HD-160-1	Site 106		360-C-2	-4.1	23.5	00002941
☒ Yes	HD-160A	Site 106		3C1	-4.3	23.2	00002941
☒ Yes	HD-161A	Site 106		3C2	-5.6	30.7	00002942
☒ Yes	HD-162-1	Site 106		360-C-4	-4.4	24.3	00002943
☒ Yes	HD-162-1JFW	Site 106		394-C-7	-4.6	23.8	00002943
☒ Yes	HD-162-1RJM	Site 106		394-C-8	-4.6	24.1	00002943
☒ Yes	HD-163-1	Site 106		360-C-5	-3.8	22.1	00002944
☒ Yes	HD-163A	Site 106		3C5	-4.0	22.2	00002944

Request numbers 17, 26, 33 and 42.

C-13 and O-18 values of calcite from site 106.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exta Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-164-2	Site 199		360-C-6	-2.8	18.9	00002945
☒ Yes	HD-164-2A	Site 199		3C6	-2.8	18.8	00002945
☒ Yes	HD-166-1	Site 199		360-C-7	-1.3	20.5	00002947
☒ Yes	HD-166-3A	Site 199		3C7	-1.0	20.4	00002947
☒ Yes	HD-167A	Site 199		3C8	-2.1	20.1	00002947
☒ Yes	HD-168-1A	Site 199		3C9	-1.5	21.5	00002949
☒ Yes	HD-169-1	Site 199		360-C-8	-1.1	21.3	00002950
☒ Yes	HD-169-1A	Site 199		3C10	-1.0	21.4	00002950

Request number 18 and 33.

C-13 and O-18 data from site 199.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-171A	Trench CFS-E		4C9	-3.7	19.6	00002952

Request number 19 and 33.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-195-1	Trench CF1		6C10	-5.5	20.1	00002981
☒ Yes	HD-196-1	Trench CF1		7C1	-3.9	20.8	00002982
☒ Yes	HD-197-2	Trench CF1		7C2	-5.0	19.9	00002983
☒ Yes	HD-198-1	Trench CF1		7C3	-4.7	20.6	00002984
☒ Yes	HD-199-1	Trench CF1		7C4	-4.4	21.6	00002985
☒ Yes	HD-201A	Trench CF1		7C5	-4.1	21.3	00002987
☒ Yes	HD-202A	Trench CF1		7C7	-3.6	21.5	00002988

Request number 19 and 33.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-209-1A	Trench CF2		7C9	-5.3	23.0	00002995

Request number 19 and 33.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exts Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-181-1A1	Trench 8		5C7	-5.5	19.3	00002967
☒ Yes	HD-181-2A1	Trench 8		5C8	-5.7	19.2	00002967
☒ Yes	HD-181-3A1	Trench 8		5C9	-5.3	19.4	00002967
☒ Yes	HD-181-4A1	Trench 8		5C10	-5.6	19.2	00002967
☒ Yes	HD-181-6A1	Trench 8		6C2	-6.0	21.8	00002967
☒ Yes	HD-184-1	Trench 8		6C3	-5.8	21.0	00002970
☒ Yes	HD-186-1	Trench 8		6C5	-5.5	21.8	00002972
☒ Yes	HD-189A	Trench 8		6C7	-5.9	19.4	00002975
☒ Yes	HD-190A	Trench 8		6C8	-6.2	19.3	00002976
☒ Yes	HD-191A	Trench 8		6C9	-6.3	19.8	00002977

Request number 19 and 33.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exta Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-175-2	Tonopah Railroad		5C1	-0.9	16.7	00002961
☒ Yes	HD-176-2A	Tonopah Railroad		5C2	0.3	22.2	00002962
☒ Yes	HD-177A	Tonopah Railroad		5C3	-0.9	16.3	00002963
☒ Yes	HD-178A	Tonopah Railroad		5C4	-1.1	17.5	00002964
☒ Yes	HD-179A	Tonopah Railroad		5C5	-0.7	15.7	00002965

Request number 20 and 33.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-1	Trench 14		283-C-8	-6.7	20.8	00003618
☒ Yes	HD-1	Trench 14		320-C-1	-6.2	21.1	00003618
☒ Yes	HD-1	Trench 14		321-C-1	-6.1	21.2	00003618
☒ Yes	HD-10	Trench 14		284-C-2	-5.6	19.7	00003626
☒ Yes	HD-10	Trench 14		321-C-5	-5.6	19.6	00003626
☒ Yes	HD-11	Trench 14		321-C-6	-5.9	20.4	00003627
☒ Yes	HD-12	Trench 14		321-C-7	-6.0	20.2	00003628
☒ Yes	HD-15-3-2	Trench 14		1C3	-5.3	19.5	00003695
☒ Yes	HD-15-3-3	Trench 14		1C4	-4.5	20.3	00003695
☒ Yes	HD-15-3-4	Trench 14		1C5	-6.4	19.5	00003695
☒ Yes	HD-2	Trench 14		283-C-9	-6.9	20.5	00003617
☒ Yes	HD-2	Trench 14		286-C-4	-6.9	20.3	00003617
☒ Yes	HD-2	Trench 14		320-C-2	-6.9	20.3	00003017
☒ Yes	HD-20-1	Trench 14		285-C-3	-7.6	20.0	00003698
☒ Yes	HD-20-1	Trench 14		322-C-4	-7.5	20.2	00003698
☒ Yes	HD-20-2	Trench 14		285-C-2	-6.4	21.2	00003698
☒ Yes	HD-22-1	Trench 14		285-C-1	-6.9	19.8	00003634
☒ Yes	HD-22-3	Trench 14		284-C-9	-6.1	19.9	00003634
☒ Yes	HD-22-4	Trench 14		284-C-10	-7.1	19.5	00003634
☒ Yes	HD-22-4	Trench 14		322-C-5	-7.1	19.6	00003634
☒ Yes	HD-23-1A	Trench 14		1C6	-5.3	20.3	00003635
☒ Yes	HD-24-1A	Trench 14		1C7	-5.5	20.3	00003636
☒ Yes	HD-25-1A	Trench 14		1C8	-5.6	20.9	00003637
☒ Yes	HD-26-1A	Trench 14		1C9	-5.6	20.4	00003638
☒ Yes	HD-27-1A	Trench 14		1C10	-5.9	19.6	00003639
☒ Yes	HD-28-2	Trench 14		285-C-6	-6.0	19.5	00003640
☒ Yes	HD-3	Trench 14		320-C-3	-6.1	20.6	00003619
☒ Yes	HD-31-1	Trench 14		285-C-7	-6.5	19.9	00003643
☒ Yes	HD-31-2	Trench 14		286-C-6	-6.1	20.4	00003643
☒ Yes	HD-39-2	Trench 14		285-C-8	-6.6	20.4	00003649
☒ Yes	HD-4	Trench 14		322-C-1	-6.1	19.9	00003620
☒ Yes	HD-41-1-A	Trench 14		287-C-1	-7.4	19.7	00003650
☒ Yes	HD-41-1-B	Trench 14		287-C-3	-7.2	20.0	00003650
☒ Yes	HD-42-10	Trench 14		282-C-3	-6.1	20.3	00003651
☒ Yes	HD-42-10	Trench 14		284-C-3	-6.1	20.6	00003651
☒ Yes	HD-42-10	Trench 14		286-C-5	-6.1	20.5	00003651
☒ Yes	HD-42-11	Trench 14		284-C-4	-6.7	20.3	00003651
☒ Yes	HD-42-12	Trench 14		284-C-5	-7.1	20.0	00003651
☒ Yes	HD-42-13	Trench 14		283-C-1	-7.0	19.7	00003651
☒ Yes	HD-42-13	Trench 14		284-C-6	-7.0	19.9	00003651
☒ Yes	HD-42-14	Trench 14		282-C-9	-6.1	20.5	00003651
☒ Yes	HD-42-15	Trench 14		283-C-6	-6.5	20.5	00003651
☒ Yes	HD-42-16	Trench 14		284-C-7	-6.5	20.7	00003651

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-5	Trench 14		283-C-3	-5.5	20.7	00003621
☒ Yes	HD-54-1	Trench 14a		286-C-7	-6.9	21.4	00003659
☒ Yes	HD-54-1	Trench 14a		322-C-6	-6.9	21.5	00003659
☒ Yes	HD-54-3	Trench 14a		286-C-1	-7.1	20.3	00003659
☒ Yes	HD-54-5	Trench 14a		283-C-4	-6.4	21.1	00003659
☒ Yes	HD-6	Trench 14		283-C-10	-5.[illegible]	19.8	00003622
☒ Yes	HD-7	Trench 14		321-C-2	-5.8	19.8	00003623
☒ Yes	HD-8	Trench 14		321-C-3	-5.6	19.8	00003624
☒ Yes	HD-9	Trench 14		282-C-1	-5.9	20.1	00003625
☒ Yes	HD-9	Trench 14		284-C-1	-5.9	20.4	00003625
☒ Yes	HD-9	Trench 14		321-C-4	-5.9	20.3	00003625
☒ Yes	HD-963-03A	Trench 14c		119C-7	-6.4	20.3	00005405
☒ Yes	HD-963-03B	Trench 14c		119C-8	-5.4	20.1	00005405
☒ Yes	HD-963-04A	Trench 14c		119C-10	-6.2	20.4	00005406
☒ Yes	HD-963-04C	Trench 14c		120C-1	-5.9	19.2	00005406
☒ Yes	HD-963-05A	Trench 14c		120C-3	-5.7	20.1	00005407
☒ Yes	HD-963-06A	Trench 14c		120C-5	-6.6	20.3	00005408
☒ Yes	HD-963-07A	Trench 14c		120C-6	-6.5	19.6	00005409
☒ Yes	HD-963-08A	Trench 14c		120C-7	-6.9	19.9	00005410
☒ Yes	HD-963-08B	Trench 14c		121C-1	-6.3	19.4	00005410
☒ Yes	HD-963-09A	Trench 14c		121C-2	-6.3	20.8	00005411
☒ Yes	HD-963-09B	Trench 14c		121C-3	-6.4	20.7	00005411
☒ Yes	HD-963-10A	Trench 14c.		121C-5	-6.7	20.3	00005412
☒ Yes	HD-963-11A	Trench 14c		121C-6	-6.9	19.7	00005413
☒ Yes	HD-963-15A	Trench 14c		122C-1	-5.4	20.5	00005417
☒ Yes	HD-963-16A	Trench 14c		122C-2	-6.3	20.2	00005418
☒ Yes	HD-963-17A	Trench 14c		122C-3	-5.8	19.6	00005419
☒ Yes	HD-963-18A	Trench 14c		122C-4	-5.8	19.6	00005551
☒ Yes	HD-963-19A	Trench 14c		122C-5	-6.1	20.5	00005552
☒ Yes	HD-963-20A	Trench 14c		123C-3	-5.7	20.5	00005553

Request numbers 21 and 33.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exts Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-494-A	Nevares Spring		17C-5	-1.0	25.1	00003730
☒ Yes	HD-495A	Nevares Spring		7C10	-2.5	15.4	00003731
☒ Yes	HD-496-A	Nevares Spring		18C-4	-2.5	15.6	00003732
☒ Yes	HD-496-A	Nevares Spring		18C-8	-2.1	15.6	00003732
☒ Yes	HD-499-A	Nevares Spring		18C-9	-1.5	17.6	00003735
☒ Yes	HD-500-A	Nevares Spring		19C-1	-1.3	18.9	00003736
☒ Yes	HD-501-A	Nevares Spring		19C-2	-1.6	17.0	00003737
☒ Yes	HD-502-A	Nevares Spring		19C-3	-1.9	15.8	00003738
☒ Yes	HD-502A	Nevares Spring		21C-10	-1.9	15.9	00003738
☒ Yes	HD-503-A	Nevares Spring		19C-4	-1.4	15.3	00003739
☒ Yes	HD-503-A	Nevares Spring		19C-5	-1.4	15.3	00003739

Request number 22, 27, 33 and 42.

Sample #	Locality	SPC #	Depth (ft)	Yield (umole/mg)	d18O smow
HD-306C	UE-25 a#1	00016005	253	18.51	18.60
HD-351B	USW G-2	00016051	92.2	16.80	26.60
HD-355A	USW G-2	00016055	236.7	16.46	20.70
HD-355A	USW G-2	00016055	236.7	16.92	20.50
HD-356A	USW G-2	00016056	240.7	17.22	21.70
HD-358A	USW G-2	00016058	257.8	17.15	24.10
HD-362A	USW G-2	00016062	280.2	17.10	21.20
HD-929A	UE-25 A-5	00019109	92.2	17.16	23.30
HD-926A	UE-25 A-5	00019106	85.2	16.65	21.90
HD-941A	Beatty	00005451		16.45	24.60
HD-700A	USW G-4	00005542	74.2	17.10	24.10

Request number 24.

14C YMP ages

HD #	Drill Hole	SPC #	Depth (ft)	LLNL #	GRPT #	14C Age	Age error	Fm	Fm error	mg of Carbon
HD-325c	G1	00016024	579.4	CAMS-4056	219	39,970	1,940	0.0069	0.0017	0.51
HD-674d	G4	00004866	352.4	CAMS-4677	292	41,950	950	0.0054	0.0006	0.77
HD-388a	GU3	00016108	204.9	CAMS-4678	293	33,360	360	0.0157	0.0007	0.46
HD-359a	G2	00016060	858.2	CAMS-4679	295	45,260	1850	0.0036	0.0008	0.88
HD-322c	G1	00016021	669.2	CAMS-4925	327	20,910	90	0.0740	0.0007	0.50
HD-676a	G4	00004864	554	CAMS-4926	328	>54,000		0.0002	0.0005	0.79
HD-385a	GU3	00016105	149.6	CAMS-4927	329	37,390	470	0.0095	0.0006	0.55
HD-320c	G1	00016019	579.4	CAMS-4928	330	>51,000		0.0008	0.0005	0.88
HD-351a	G2	00016051	302.5	CAMS-4929	333	43,500	970	0.0044	0.0005	0.85
HD-272a	G2	00004686	1448	CAMS-4930	334	39,510	610	0.0073	0.0005	0.92
HD-702a	G4	00005540	259.4	CAMS-4931	336	38,950	580	0.0078	0.0006	0.90
HD-328b	G1	00016027	1134.1	CAMS-4932	337	40,300	660	0.0066	0.0005	0.76
HD-383a	GU3	00016103	47.7	CAMS-4933	338	40,260	680	0.0067	0.0006	0.67
HD-352a	G2	00016052	314.5	CAMS-4934	340	>51,000		0.0008	0.0005	0.75
Harding				CAMS-4689	273	49,290	380	0.0022	0.0001	1.03
Harding				CAMS-4913	331	55,870	1550	0.0010	0.0002	0.91
Harding				CAMS-4690	274	48,330	480	0.0024	0.0001	0.86
Harding				CAMS-5341	401	54,600	880	0.0011	0.0001	0.85
Harding				CAMS-4914	332	50,090	590	0.0020	0.0001	0.78
Harding				CAMS-4057	222	46,520	3280	0.0031	0.0012	0.63
Harding				CAMS-4686	294	48,190	470	0.0025	0.0001	0.61
Harding				CAMS-4688	291	45,750	390	0.0034	0.0002	0.60
Harding				CAMS-4687	290	48,780	500	0.0023	0.0001	0.59
Harding				CAMS-5340	400	49,450	1120	0.0021	0.0003	0.47
Harding				CAMS-5343	406	44,500	2700	0.0039	0.0013	0.26
Harding				CAMS-5342	402	30,280	580	0.0231	0.0017	0.08

Request number 25

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-443-4-A	Wahmonie		13C-2	-5.0	18.1	00001981
☒ Yes	HD-443-5-A	Wahmonie		13C-3	-4.8	23.6	00001981

Request number 26.

Site 106 data can be found under request number 17.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-505-1	Grapevine Spring		19C-7	0.4	15.5	00003741
☒ Yes	HD-505-2	Grapevine Spring		19C-8	0.5	14.7	00003741
☒ Yes	HD-505-3	Grapevine Spring		19C-9	0.3	13.9	00003741
☒ Yes	HD-505-3	Grapevine Spring		19C-10	0.3	13.7	00003741
☒ Yes	HD-505-3	Grapevine Spring		22C-1	0.2	13.6	00003741
☒ Yes	HD-505-4	Grapevine Spring		20C-1	0.0	14.1	00003741
☒ Yes	HD-505-5	Grapevine Spring		20C-2	0.0	14.0	00003741
☒ Yes	HD-505-5	Grapevine Spring		43C-3	0.1	14.1	00003741
☒ Yes	HD-506-1	Grapevine Spring		20C-3	-0.2	15.9	00003742
☒ Yes	HD-506-1	Grapevine Spring		43C-4	-0.2	16.1	00003742
☒ Yes	HD-506-2	Grapevine Spring		20C-4	-0.7	16.0	00003742
☒ Yes	HD-507-1-A	Grapevine Spring		20C-5	-0.1	17.1	00003743
☒ Yes	HD-507-1-A	Grapevine Spring		22C-3	-0.1	17.2	00003743
☒ Yes	HD-507-1-A	Grapevine Spring		43C-5	-0.1	17.2	00003743
☒ Yes	HD-507-1-B	Grapevine Spring		22C-4	-0.5	17.1	00003743
☒ Yes	HD-507-2-C	Grapevine Spring		20C-8	0.1	16.6	00003743
☒ Yes	HD-507-2-C	Grapevine Spring		20C-9	0.1	16.5	00003743
☒ Yes	HD-507-3-D	Grapevine Spring		21C-1	0.7	16.9	00003743
☒ Yes	HD-507-3-D	Grapevine Spring		22C-5	0.7	16.9	00003743
☒ Yes	HD-507-3-D	Grapevine Spring		43C-6	0.7	16.8	00003743
☒ Yes	HD-507-3-E	Grapevine Spring		21C-2	0.2	14.6	00003743
☒ Yes	HD-507-4-F	Grapevine Spring		21C-3	-0.6	15.5	00003743
☒ Yes	HD-507-4-G	Grapevine Spring		21C-4	-0.1	14.2	00003743
☒ Yes	HD-508-1	Grapevine Spring		21C-5	0.1	13.8	00003744
☒ Yes	HD-508-1	Grapevine Spring		22C-6	0.1	14.3	00003744
☒ Yes	HD-508-2	Grapevine Spring		21C-6	-0.1	15.8	00003744
☒ Yes	HD-508-2	Grapevine Spring		20C-7	-0.1	15.7	00003744
☒ Yes	HD-508-2	Grapevine Spring		43C-9	0.0	16.0	00003744
☒ Yes	HD-510-1	Grapevine Spring		22C-7	-0.7	17.6	00003746
☒ Yes	HD-510-2	Grapevine Spring		22C-8	-4.5	18.9	00003746
☒ Yes	HD-510-3	Grapevine Spring		22C-9	-3.6	18.4	00003746
☒ Yes	HD-510-4	Grapevine Spring		22C-10	-3.4	18.6	00003746
☒ Yes	HD-510-5	Grapevine Spring		23C-1	-4.4	17.8	00003746
☒ Yes	HD-510-5	Grapevine Spring		45C-7	4:4	17:9	00003746
☒ Yes	HD-511	Grapevine Spring		43C-10	-0.5	18.8	00003747
☒ Yes	HD-511-A	Grapevine Spring		23C-2	-0.6	18.7	00003747

Request number 27.

Nevares Spring data is listed with request number 22.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-483-1-A	Travertine Point		17C-1	0.2	15.0	00003719
☒ Yes	HD-483-A	Travertine Point		16C-10	0.2	15.7	00003719
☒ Yes	HD-484-A	Travertine Point		17C-2	0.5	16.6	00003720
☒ Yes	HD-485-A	Travertine Point		17C-3	1.3	15.4	00003721

Request number 27.

Nevares Spring data is listed with request number 22.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-444-A	Eleanna Trench		13C-4	-6.1	18.7	00001982
☒ Yes	HD-445-A	Eleanna Trench		13C-5	-4.8	19.5	00001983

Request number 28 data are listed on next 6 pages.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exln Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-1178A	Busted Butte		114C-7	-3.8	24.1	00005184
☒ Yes	HD-1179A	Busted Butte		114C-8	-3.7	20.4	00005183
☒ Yes	HD-1450A	Busted Butte		117C-2	-5.4	19.1	00500387
☒ Yes	HD-1450B	Busted Butte		117C-3	-5.8	18.5	00500387
☒ Yes	HD-1450C	Busted Butte		117C-4	-5.8	18.4	00500387
☒ Yes	HD-1454-LA	Busted Butte		117C-9	-5.3	20.0	00500391
☒ Yes	HD-1454-LB	Busted Butte		117C-10	-5.7	21.5	00500391
☒ Yes	HD-1454-UA	Busted Butte		117C-6	-6.6	21.8	00500391
☒ Yes	HD-1454-UB	Busted Butte		117C-7	-5.5	20.8	00500391
☒ Yes	HD-1454-UC	Busted Butte		117C-8	-6.3	21.9	00500391
☒ Yes	HD-1456-LA	Busted Butte		118C-7	-5.4	20.0	00500393
☒ Yes	HD-1456-LA	Busted Butte		12C-7	-5.5	19.9	00500393
☒ Yes	HD-1456-LB	Busted Butte		118C-8	-4.9	20.1	00500393
☒ Yes	HD-1456-LB	Busted Butte		122C-8	-5.0	20.0	00500393
☒ Yes	HD-1456-LC	Busted Butte		118C-9	-4.2	19.5	00500393
☒ Yes	HD-1456-LC	Busted Butte		122C-9	-4.1	19.7	00500393
☒ Yes	HD-1456-UA	Busted Butte		118C-10	-4.7	20.2	00500393
☒ Yes	HD-1456-UA	Busted Butte		123C-1	-4.7	20.2	00500393
☒ Yes	HD-1456-UB	Busted Butte		119C-1	-5.2	19.4	00500393
☒ Yes	HD-240-01-A	Busted Butte		395-C-5	-5.0	19.8	00003025
☒ Yes	HD-240-01-B	Busted Butte		395-C-6	-4.9	20.2	00003025
☒ Yes	HD-240-02-A	Busted Butte		395-C-7	-4.2	20.4	00003025
☒ Yes	HD-240-02-A	Busted Butte		13C-9	-4.3	20.5	00003025
☒ Yes	HD-240-03-A	Busted Butte		395-C-9	-2.2	21.4	00003025
☒ Yes	HD-240-03-A	Busted Butte		13C-8	-2.2	21.4	00003025
☒ Yes	HD-240-04-A	Busted Butte		395-C-10	-5.4	19.6	00003025
☒ Yes	HD-241-01-A	Busted Butte		396-C-1	-3.3	21.0	00003026
☒ Yes	HD-241-01-A	Busted Butte		15C-4	-3.3	21.3	00003026
☒ Yes	HD-241-01-A	Busted Butte		18C-1	-3.1	21.3	00003026
☒ Yes	HD-241-02-A	Busted Butte		12C-2	-3.9	20.9	00003026
☒ Yes	HD-241-02-A	Busted Butte		12C-3	-3.8	20.8	00003026
☒ Yes	HD-241-03-A	Busted Butte		12C-4	-3.6	19.6	00003026
☒ Yes	HD-241-03-B	Busted Butte		12C-6	-4.9	20.5	00003026
☒ Yes	HD-243-02-A	Busted Butte		12C-8	-4.6	20.4	00003028
☒ Yes	HD-243-03-A	Busted Butte		12C-9	-3.9	20.1	00003028
☒ Yes	HD-446-1-A	Busted Butte		15C-5	-3.7	21.6	00001984
☒ Yes	HD-446-3A	Busted Butte		9C1	-4.0	21.2	00001984
☒ Yes	HD-446-4A	Busted Butte		9C2	-5.2	20.3	00001984
☒ Yes	HD-446-A	Busted Butte		13C-6	-4.9	20.7	00001984
☒ Yes	HD-447A	Busted Butte		9C3	-4.4	21.0	00001985
☒ Yes	HD-448A	Busted Butte		9C4	-3.6	21.5	00001986
☒ Yes	HD-451A	Busted Butte		9C7	-4.8	21.5	00001989
☒ Yes	HD-56-5	Busted Butte		285-C-4	-5.1	19.6	00003661

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exta Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-56-6	Busted Butte		321-C-8	-5.7	20.2	00003661
☒ Yes	HD-56-7	Busted Butte		286-C-2	-5.1	19.9	00003661
☒ Yes	HD-56-7	Busted Butte		321-C-9	-5.0	19.9	00003661
☒ Yes	HD-56-8	Busted Butte		282-C-6	-6.1	19.3	00003661
☒ Yes	HD-56-8	Busted Butte		283-C-7	-6.2	19.3	00003661
☒ Yes	HD-56-9	Busted Butte		285-C-5	-5.8	19.7	00003661
☒ Yes	HD-57	Busted Butte		323-C-3	-5.2	20.4	00003662
☒ Yes	HD-58	Busted Butte		323-C-4	-4.8	22.1	00003663
☒ Yes	HD-63-3	Busted Butte		282-C-10	-3.1	21.4	00003667
☒ Yes	HD-63-4	Busted Butte		285-C-9	-3.7	21.1	00003667
☒ Yes	HD-74-1-A	Busted Butte		287-C-2	-7.0	19.6	0000367
☒ Yes	HD-75	Busted Butte		323-C-5	-4.8	20.2	0000367
☒ Yes	HD-76	Busted Butte		323-C-6	-4.6	22.1	00003679
☒ Yes	HD-954B	Busted Butte		114C-9	-5.1	20.5	00005594
☒ Yes	HD-955AB	Busted Butte		115C-1	-5.7	19.5	00005595
☒ Yes	HD-955B-B	Busted Butte		123C-2	-5.6	19.8	00005595
☒ Yes	HD-955BB	Busted Butte		115C-2	-5.5	20.1	00005595
☒ Yes	HD-956A	Busted Butte		115C-6	-4.8	20.6	00005596
☒ Yes	HD-956B	Busted Butte		115C-7	-4.8	21.4	00005596
☒ Yes	HD-957A	Busted Butte		115C-8	-4.7	20.8	00005597
☒ Yes	HD-957B	Busted Butte		115C-9	-4.5	20.7	00005597
☒ Yes	HD-957C	Busted Butte		115C-10	-4.0	19.9	00005597
☒ Yes	HD-958A	Busted Butte		115C-3	-8.8	22.1	00005598
☒ Yes	HD-959B	Busted Butte		115C-4	-5.3	20.3	00005599
☒ Yes	HD-960A	Busted Butte		116C-1	-4.3	21.1	00005600
☒ Yes	HD-960B	Busted Butte		116C-5	-4.8	20.0	00005600
☒ Yes	HD-961-B	Busted Butte		119C-2	-5.2	19.9	00005401
☒ Yes	HD-961A	Busted Butte		116C-6	-4.9	19.7	00005401
☒ Yes	HD-961B	Busted Butte		116C-7	-5.3	19.3	00005401
☒ Yes	HD-961C	Busted Butte		116C-8	-5.4	18.8	00005401
☒ Yes	HD-961D	Busted Butte		116C-9	-4.8	19.7	00005401
☒ Yes	HD-962-B	Busted Butte		119C-3	-5.7	20.4	00005402
☒ Yes	HD-962A	Busted Butte		116C-10	-6.3	20.0	00005402
☒ Yes	HD-962B	Busted Butte		117C-1	-5.2	20.4	00005402

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-453A	Yucca Crest		9C8	-5.8	18.8	00001990
☒ Yes	HD-454A	Yucca Crest		9C9	-6.6	20.0	00001991
☒ Yes	HD-455A	Yucca Crest		9C10	-5.8	19.9	00001992
☒ Yes	HD-456A	Yucca Crest		15C-6	-5.8	20.4	00001993
☒ Yes	HD-462-2-A	Yucca Crest		16C-4	-6.5	20.1	00001999
☒ Yes	HD-463-B	Yucca Crest		16C-5	-6.0	21.4	00002000
☒ Yes	HD-464-A	Yucca Crest		16C-7	-5.3	21.3	00004656

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-457-A	Trench One		15C-7	2.2	19.8	00001994
☒ Yes	HD-458-A	Trench One		15C-10	-6.4	17.0	00001995
☒ Yes	HD-460-A	Trench One		16C-1	-5.6	19.8	00001997
☒ Yes	HD-461-A	Trench One		16C-2	-6.3	19.0	00001998

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-254-2	Trench 16		395-C-3	-5.3	21.4	00003035
☒ Yes	HD-254-1	Trench 16		395-C-2	-5.6	19.6	00003035

See request number 27 for data form request numbers 29 and 30.

See request number 28 for data from request number 32.

Data for request number 33 are found with the following:

request number 17 for site 106
18 for site 199
19 for Trench CFS-E
19 for Trench CF-1
19 for Trench CF-2
19 for Trench 8
20 for Tonopah RR
21 for Trench 14
22 for Nevares Spring

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-863-A	UE-25 RF-9	16.4	24C-4	-4.3	19.4	00019196
☒ Yes	HD-864-A	UE-25 RF-9	18.3	24C-5	-5.4	19.1	00019197
☒ Yes	HD-865-A	UE-25 RF-9	20.1	24C-7	-5.0	21.2	00019198
☒ Yes	HD-865-A	UE-25 RF-9	20.1	44C-1	-5.0	21.2	00019198
☒ Yes	HD-866-A	UE-25 RF-9	22.0	44C-2	-6.3	16.6	00019199

Request number 31.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exts Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-280A	USW G-1	885.4	347-C-6	-9.5	14.2	00004694
☒ Yes	HD-280A	USW G-1	885.5	34C-9	-9.4	14.4	00004694
☒ Yes	HD-280A	USW G-1	885.4	46C-8	-9.5	14.0	00004694
☒ Yes	HD-317A	USW G-1	97.7	34C-10	-5.5	17.4	00016016
☒ Yes	HD-317A	USW G-1	97.7	46C-9	-5.7	16.9	00016016
☒ Yes	HD-317B	USW G-1	97.7	35C-1	-6.1	17.1	00016016
☒ Yes	HD-317B	USW G-1	97.7	46C-10	-6.1	17.1	00016016
☒ Yes	HD-318A	USW G-1	129.7	35C-2	-4.8	14.6	00016017
☒ Yes	HD-318A	USW G-1	129.7	47C-1	-4.9	14.5	00016017
☒ Yes	HD-318A	USW G-1	129.7	47C-1	-4.9	14.4	00016017
☒ Yes	HD-318B	USW G-1	129.7	38C-2	-6.8	16.2	00016017
☒ Yes	HD-318B	USW G-1	129.7	47C-2	-6.8	16.0	00016017
☒ Yes	HD-319A	USW G-1	149.9	38C-3	-5.4	14.6	00016018
☒ Yes	HD-319A	USW G-1	149.9	38C-3	-5.4	14.7	00016018
☒ Yes	HD-319A	USW G-1	149.9	38C-3	-5.4	14.7	00016018
☒ Yes	HD-319A	USW G-1	149.9	47C-4	-5.4	14.3	00016018
☒ Yes	HD-319B	USW G-1	149.9	38C-4	-2.4	14.2	00016018
☒ Yes	HD-319B	USW G-1	149.9	80C-3	-2.4	14.3	00016018
☒ Yes	HD-319C	USW G-1	149.9	38C-6	3.7	13.9	00016018
☒ Yes	HD-319C	USW G-1	149.9	38C-6	3.5	13.6	00016018
☒ Yes	HD-319C	USW G-1	149.9	47C-6	3.4	13.3	00016018
☒ Yes	HD-319D	US	149.9	39C-4	2.0	13.7	00016018
☒ Yes	HD-319D	US	149.9	39C-4	2.1	13.7	00016018
☒ Yes	HD-319D	USW G-1	149.9	47C-7	2.1	13.6	00016018
☒ Yes	HD-319E	USW G-1	149.9	38C-8	-1.4	15.3	00016018
☒ Yes	HD-319E	USW G-1	149.9	47C-8	-1.5	15.2	00016018
☒ Yes	HD-320A	USW G-1	176.6	38C-10	-6.8	15.2	00016019
☒ Yes	HD-320A	USW G-1	176.6	38C-10	-6.9	15.1	00016019
☒ Yes	HD-320A	USW G-1	176.6	38C-10	-6.7	15.5	00016019
☒ Yes	HD-320A	USW G-1	176.6	47C-10	-6.8	15.3	00016019
☒ Yes	HD-320B	USW G-1	176.6	39C-1	-6.9	16.4	00016019
☒ Yes	HD-320B	USW G-1	176.6	39C-1	-6.9	16.2	00016019
☒ Yes	HD-320B	USW G-1	176.6	39C-1	-6.8	16.6	00016019
☒ Yes	HD-320B	USW G-1	176.6	45C-8	-6.8	16.5	00016019
☒ Yes	HD-320B	USW G-1	176.6	48C-1	-6.8	16.4	00016019
☒ Yes	HD-320C	USW G-1	176.6	45C-9	-7.7	17.0	00016019
☒ Yes	HD-320C	USW G-1	176.6	48C-2	-8.0	17.0	00016019
☒ Yes	HD-322A	USW G-1	204.0	39C-2	-0.6	14.5	00016021
☒ Yes	HD-322A	USW G-1	204.0	39C-2	-0.7	14.5	00016021
☒ Yes	HD-322A	USW G-1	204.0	39C-2	-0.5	14.7	00016021
☒ Yes	HD-322A	USW G-1	204.0	48C-3	-0.7	14.5	00016021
☒ Yes	HD-322B	USW G-1	204.0	39C-5	-4.9	14.6	00016021
☒ Yes	HD-322B	USW G-1	204.0	48C-4	-5.1	14.5	00016021

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-322C	USW G-1	204.0	46C-2	-4.6	14.8	00016021
☒ Yes	HD-322C	USW G-1	204.0	48C-5	-5.2	15.0	00016021
☒ Yes	HD-325A	USW G-1	292.5	46C-3	-7.3	15.8	00016024
☒ Yes	HD-325A	USW G-1	292.5	48C-6	-7.3	15.8	00016024
☒ Yes	HD-326A	USW G-1	313.6	39C-6	-6.8	15.6	00016025
☒ Yes	HD-326A	USW G-1	313.6	48C-8	-6.8	15.6	00016025
☒ Yes	HD-327A	USW G-1	310.1	46C-5	-8.2	16.6	00016026
☒ Yes	HD-327A	USW G-1	310.1	48C-10	-7.9	16.6	00016026
☒ Yes	HD-327B	USW G-1	310.1	39C-10	-4.2	15.0	00016026
☒ Yes	HD-327B	USW G-1	310.1	49C-1	-4.5	14.8	00016026
☒ Yes	HD-327C	USW G-1	310.1	49C-2	-7.8	16.2	00016026
☒ Yes	HD-328A	USW G-1	345.7	49C-3	-7.5	16.3	00016027
☒ Yes	HD-328A	USW G-1	345.7	80C-4	-7.6	16.3	00016027
☒ Yes	HD-328B	USW G-1	345.7	49C-4	-7.1	15.5	00016027
☒ Yes	HD-329A	USW G-1	353.7	40C-2	-1.7	14.6	00016028
☒ Yes	HD-329A	USW G-1	353.7	49C-6	-1.6	14.2	00016028
☒ Yes	HD-330A	USW G-1	365.4	40C-3	-7.6	16.5	00016029
☒ Yes	HD-330A	USW G-1	365.4	49C-7	-7.5	16.5	00016029
☒ Yes	HD-330B	USW G-1	365.4	49C-8	-6.5	16.4	00016029
☒ Yes	HD-330B	USW G-1	365.4	52C-8	-6.4	16.8	00016029
☒ Yes	HD-331A	USW G-1	385.7	49C-9	-5.4	12.7	00016030
☒ Yes	HD-331A	US	385.7	80C-6	-5.5	13.1	00016030
☒ Yes	HD-334A	US	895.3	50C-1	4.4	11.8	00016033
☒ Yes	HD-334A	USW G-1	895.3	80C-7	4.2	11.9	00016033
☒ Yes	HD-336A	USW G-1	1090.3	50C-2	1.9	10.3	00016035
☒ Yes	HD-337A	USW G-1	1090.7	50C-3	1.7	10.0	00016036
☒ Yes	HD-337B	USW G-1	1090.7	50C-4	1.9	10.3	00016036
☒ Yes	HD-338A	USW G-1	1093.8	50C-5	2.1	10.0	00016037
☒ Yes	HD-339A	USW G-1	1109.8	50C-6	3.3	11.9	00016038
☒ Yes	HD-339A	USW G-1	1109.8	52C-9	3.3	11.9	00016038
☒ Yes	HD-340A	USW G-1	1112.7	50C-7	2.1	10.2	00016039
☒ Yes	HD-341A	USW G-1	1120.7	50C-9	2.3	10.1	00016040
☒ Yes	HD-341A	USW G-1	1120.7	53C-5	2.3	10.0	00016040
☒ Yes	HD-342D	USW G-1	1164.9	50C-8	3.3	11.3	00016041
☒ Yes	HD-343B	USW G-1	1178.8	50C-10	2.3	10.7	00016042
☒ Yes	HD-343C	USW G-1	1178.9	51C-6	1.9	11.0	00016042
☒ Yes	HD-343D	USW G-1	1178.8	51C-7	2.5	10.2	00016042
☒ Yes	HD-344B	USW G-1	1187.4	51C-8	1.4	9.6	00016043
☒ Yes	HD-345B	USW G-1	1427.0	51C-9	0.5	3.9	00016044
☒ Yes	HD-345B	USW G-1	1427.0	80C-8	0.4	4.0	00016044
☒ Yes	HD-346A	USW G-1	1550.0	51C-10	-0.2	3.4	00016045
☒ Yes	HD-346A	USW G-1	1550.0	80C-9	-0.3	3.4	00016045
☒ Yes	HD-347A	USW G-1	1618.8	52C-2	0.1	9.5	00016046

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-347A	USW G-1	1618.8	80C-10	0.0	9.6	00016046
☒ Yes	HD-348A	USW G-1	1630.3	52C-3	0.1	2.4	00016047
☒ Yes	HD-348B	USW G-1	1630.3	52C-4	0.4	4.2	00016047
☒ Yes	HD-349A	USW G-1	1636.3	52C-5	0.4	1.3	00016048
☒ Yes	HD-350A	USW G-1	1654.6	52C-6	-0.4	6.9	00016050
☒ Yes	HD-350A	USW G-1	1654.6	52C-6	-0.4	6.9	00016050
☒ Yes	HD-350B	USW G-1	1654.6	53C-6	0.2	8.2	00016050

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-261A	USW G-2	1279.9	54C-4	0.0	4.1	00004675
☒ Yes	HD-261A	USW G-2	1279.9	71C-4	-0.1	3.9	00004675
☒ Yes	HD-261B	USW G-2	1279.9	350-C-4	-0.6	7.8	00004675
☒ Yes	HD-262A	USW G-2	1459.4	350-C-7	-1.5	7.8	00004676
☒ Yes	HD-262B	USW G-2	1459.4	350-C-8	-1.0	8.1	00004676
☒ Yes	HD-263A	USW G-2	1636.8	350-C-9	1.1	9.4	00004677
☒ Yes	HD-264A	USW G-2	1639.5	347-C-8	1.9	12.9	00004678
☒ Yes	HD-264B	USW G-2	1639.5	347-C-9	0.7	6.2	00004678
☒ Yes	HD-264C	USW G-2	1639.5	349-C-7	-0.4	8.9	00004678
☒ Yes	HD-265A	USW G-2	1756.3	351-C-1	-0.8	7.1	00004679
☒ Yes	HD-265B	USW G-2	1756.3	351-C-2	-0.4	8.6	00004679
☒ Yes	HD-265C	USW G-2	1756.3	351-C-3	-0.5	9.7	00004679
☒ Yes	HD-266A	USW G-2	1794.1	349-C-9	1.4	10.8	00004680
☒ Yes	HD-272A	USW G-2	441.4	348-C-5	-5.7	14.7	00004686
☒ Yes	HD-272B	USW G-2	441.4	348-C-6	-8.2	15.6	00004686
☒ Yes	HD-272B	USW G-2	441.4	349-C-6	-8.3	15.6	00004686
☒ Yes	HD-272B	USW G-2	441.4	71C-6	-8.4	15.4	00004686
☒ Yes	HD-272D	USW G-2	441.4	348-C-7	-3.6	14.5	00004686
☒ Yes	HD-273A	USW G-2	463.9	348-C-1	-7.9	17.1	00004687
☒ Yes	HD-273B	USW G-2	463.9	348-C-2	-6.0	15.1	00004687
☒ Yes	HD-273C	USW G-2	463.9	348-C-3	-7.9	17.3	00004687
☒ Yes	HD-273D	USW G-2	463.9	348-C-4	-4.1	14.7	00004687
☒ Yes	HD-273E	USW G-2	463.9	350-C-5	-6.8	15.5	00004687
☒ Yes	HD-273E	USW G-2	463.9	71C-10	-7.0	15.4	00004687
☒ Yes	HD-273F	USW G-2	463.9	350-C-6	-7.3	15.7	00004687
☒ Yes	HD-274A	USW G-2	476.1	348-C-8	-1.5	14.4	00004688
☒ Yes	HD-274B	USW G-2	476.1	348-C-9	-0.9	13.8	00004688
☒ Yes	HD-274C	USW G-2	476.1	348-C-10	-4.7	15.9	00004688
☒ Yes	HD-274D	USW G-2	476.1	349-C-1	-7.5	18.3	00004688
☒ Yes	HD-274E	USW G-2	476.1	349-C-2	-8.2	18.3	00004688
☒ Yes	HD-275B	USW G-2	477.3	350-C-1	-2.0	14.8	00004689
☒ Yes	HD-275C	USW G-2	477.3	350-C-2	-0.2	14.0	00004689
☒ Yes	HD-275D	USW G-2	477.3	53C-8	-1.7	14.1	00004689
☒ Yes	HD-351A	USW G-2	92.2	53C-9	-7.6	20.7	00016051
☒ Yes	HD-351C	USW G-2	92.2	53C-10	-6.8	20.5	00016051
☒ Yes	HD-352A	USW G-2	95.9	54C-1	-5.9	19.8	00016052
☒ Yes	HD-352A	USW G-2	95.9	54C-5	-5.9	19.7	00016052
☒ Yes	HD-352A	USW G-2	95.9	56C-3	-5.9	19.8	00016052
☒ Yes	HD-353A	USW G-2	196.9	54C-2	-8.2	19.5	00016053
☒ Yes	HD-353A	USW G-2	196.9	54C-6	-8.2	19.5	00016053
☒ Yes	HD-353B	USW G-2	196.9	54C-7	-8.4	18.9	00016053
☒ Yes	HD-354A	USW G-2	204.3	54C-8	-7.5	17.2	00016054
☒ Yes	HD-355B	USW G-2	236.7	54C-9	-7.7	17.9	00016055

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-355B	USW G-2	236.7	55C-4	-7.7	17.9	00016055
☒ Yes	HD-356B	USW G-2	240.7	54C-10	-7.9	19.0	00016056
☒ Yes	HD-357A	USW G-2	248.0	55C-2	-8.7	19.0	00016057
☒ Yes	HD-358B	USW G-2	257.8	55C-3	-7.5	17.4	00016058
☒ Yes	HD-359A	USW G-2	178.4	55C-5	-7.7	18.3	00016060
☒ Yes	HD-360A	USW G-2	258.2	55C-6	-8.0	19.3	00016059
☒ Yes	HD-361A	USW G-2	280.2	55C-7	-8.4	19.1	00016061
☒ Yes	HD-362B	USW G-2	280.2	55C-8	-8.3	18.7	00016062
☒ Yes	HD-366A	USW G-2	304.2	56C-1	-7.8	18.1	00016066
☒ Yes	HD-366B	USW G-2	304.2	56C-2	-8.0	18.8	00016066
☒ Yes	HD-366C	USW G-2	304.2	56C-5	-8.0	19.0	00016066
☒ Yes	HD-367A	USW G-2	324.5	56C-7	-6.9	16.7	00016067
☒ Yes	HD-367C	USW G-2	324.5	56C-6	-7.2	17.2	00016067
☒ Yes	HD-368A	USW G-2	346.7	57C-9	-8.1	18.3	00016068
☒ Yes	HD-368B	USW G-2	346.7	57C-10	-7.4	16.8	00016068
☒ Yes	HD-370A	USW G-2	360.8	57C-2	-7.9	19.1	00016070
☒ Yes	HD-370B	USW G-2	360.8	57C-3	-7.9	19.0	00016070
☒ Yes	HD-577A	USW G-2	1254.7	57C-4	-7.6	15.8	00016081
☒ Yes	HD-578A	USW G-2	1256.2	57C-5	0.4	4.0	00016082
☒ Yes	HD-579A	USW G-2	1268.8	57C-7	-0.2	4.7	00016083
☒ Yes	HD-579B	USW G-2	1268.8	57C-6	-0.1	6.3	00016083
☒ Yes	HD-580A	USW G-2	1272.3	57C-8	-0.2	8.8	00016084
☒ Yes	HD-581B	USW G-2	1493.6	57C-10	-0.7	6.6	00016085
☒ Yes	HD-582A	USW G-2	1497.4	58C-1	-2.1	6.5	00016086
☒ Yes	HD-582B	USW G-2	1497.4	58C-2	-0.6	6.9	00016086
☒ Yes	HD-583A	USW G-2	1556.7	58C-5	1.1	2.0	00016087
☒ Yes	HD-583A	USW G-2	1556.7	72C-3	1.1	2.0	00016087
☒ Yes	HD-584A	USW G-2	1559.6	58C-6	1.8	4.9	00016088
☒ Yes	HD-585A	USW G-2	1618.0	58C-7	1.2	8.5	00016089
☒ Yes	HD-586A	USW G-2	1624.7	58C-8	0.9	9.9	00016090
☒ Yes	HD-587B	USW G-2	1651.7	58C-10	1.3	8.9	00016091
☒ Yes	HD-588A	USW G-2	1655.4	59C-1	1.2	8.2	00016092
☒ Yes	HD-588A	USW G-2	1655.4	61C-6	1.2	8.4	00016092
☒ Yes	HD-589A	USW G-2	1668.7	59C-2	0.6	9.2	00016093
☒ Yes	HD-590A	USW G-2	1717.8	59C-3	-1.4	5.8	00016094
☒ Yes	HD-590A	USW G-2	1717.8	59C-4	-1.5	5.8	00016094
☒ Yes	HD-591A	USW G-2	1732.2	59C-5	-1.9	8.8	00016095
☒ Yes	HD-591B	USW G-2	1732.2	59C-6	-1.4	9.0	00016095
☒ Yes	HD-593A	USW G-2	1757.1	61C-8	0.0	8.1	00016097
☒ Yes	HD-594A	USW G-2	1760.7	60C-4	-0.2	6.8	00016098
☒ Yes	HD-595A	USW G-2	1763.4	60C-7	-0.8	7.5	00016099
☒ Yes	HD-595A	USW G-2	1763.4	61C-5	-0.8	7.7	00016099
☒ Yes	HD-595C	USW G-2	1763.4	60C-9	-0.3	8.4	00016099

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-596A	USW G-2	1786.9	60C-10	0.4	9.9	00016100
☒ Yes	HD-597A	USW G-2	1792.2	61C-2	-0.1	7.3	00016101
☒ Yes	HD-597B	USW G-2	1792.2	61C-3	1.1	10.8	00016101

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-926B	UE-25 A-5	85.2	63C-9	-6.3	17.8	00019106
☒ Yes	HD-926C	UE-25 A-5	85.2	63C-10	-6.4	17.7	00019106
☒ Yes	HD-927A	UE-25 A-5	85.9	64C-1	-2.8	14.7	00019107
☒ Yes	HD-927B	UE-25 A-5	85.9	64C-2	-6.7	17.8	00019107
☒ Yes	HD-927C	UE-25 A-5	85.9	64C-4	-6.4	17.7	00019107
☒ Yes	HD-928A	UE-25 A-5	86.9	64C-5	-7.5	18.6	00019108
☒ Yes	HD-928B	UE-25 A-5	86.9	64C-6	-6.5	18.3	00019108
☒ Yes	HD-929B	UE-25 A-5	92.2	64C-7	-5.8	17.9	00019109
☒ Yes	HD-931A	UE-25 A-5	104.8	64C-8	-6.8	17.8	00019111
☒ Yes	HD-932A	UE-25 A-5	108.5	64C-10	-5.2	15.9	00019112
☒ Yes	HD-933A	UE-25 A-5	110.9	65C-1	-6.2	17.6	00019113
☒ Yes	HD-935A	UE-25 A-5	140.2	65C-3	-5.9	17.3	00019115
☒ Yes	HD-936A	UE-25 A-5	143.2	66C-5	-6.2	17.5	00019116
☒ Yes	HD-937A	UE-25 A-5	145.8	66C-6	-6.0	15.2	00019117
☒ Yes	HD-937B	UE-25 A-5	145.8	65C-7	-6.0	16.2	00019117
☒ Yes	HD-938B	UE-25 A-5	147.7	65C-9	-6.1	16.8	00019118

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-904A	UE-25 RF-3	3.4	62C-2	-6.5	19.6	00019210
☒ Yes	HD-905A	UE-25 RF-3	4.3	62C-3	-6.3	19.3	00019211
☒ Yes	HD-906A	UE-25 RF-3	4.7	62C-4	-5.8	19.0	00019212
☒ Yes	HD-907A	UE-25 RF-3	5.7	62C-5	-6.0	18.6	00019213
☒ Yes	HD-908A	UE-25 RF-3	9.3	62C-6	-5.3	19.3	00019214
☒ Yes	HD-909A	UE-25 RF-3	11.6	62C-7	-5.5	19.6	00019215
☒ Yes	HD-910A	UE-25 RF-3	15.9	62C-8	-4.7	19.5	00019216
☒ Yes	HD-911A	UE-25 RF-3	19.9	62C-9	-6.0	18.9	00019217
☒ Yes	HD-912A	UE-25 RF-3	25.9	63C-8	-6.1	19.0	00019218
☒ Yes	HD-913A	UE-25 RF-3	30.8	63C-1	-5.6	21.4	00019219

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Exta Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-267A	USW G-3/GU-3)	313.0	351-C-10	-4.3	18.9	00004681
☒ Yes	HD-267B	USW G-3/GU-3)	313.0	352-C-1	-4.8	19.2	00004681
☒ Yes	HD-268A	USW G-3/GU-3)	1309.7	352-C-4	2.2	10.9	00004682
☒ Yes	HD-268B	USW G-3/GU-3)	1309.7	352-C-5	2.2	10.6	00004682
☒ Yes	HD-268C	USW G-3/GU-3)	1309.7	352-C-6	2.4	11.4	00004682
☒ Yes	HD-268D	USW G-3/GU-3)	1309.7	352-C-7	2.3	9.5	00004682
☒ Yes	HD-269A	USW G-3/GU-3)	1346.0	352-C-8	2.0	11.7	00004683
☒ Yes	HD-269B	USW G-3/GU-3)	1346.0	352-C-9	0.6	10.2	00004683
☒ Yes	HD-270A	USW G-3/GU-3)	1464.0	351-C-6	1.7	7.5	00004684
☒ Yes	HD-276A	USW G-3/GU-3)	294.7	351-C-8	-3.9	18.7	00004690
☒ Yes	HD-276B	USW G-3/GU-3)	294.7	351-C-9	-5.2	19.2	00004690
☒ Yes	HD-277A	USW G-3/GU-3)	296.3	351-C-7	-5.4	19.4	00004691
☒ Yes	HD-277A	USW G-3/GU-3)	296.3	67C-10	-5.4	19.2	00004691
☒ Yes	HD-278A	USW G-3/GU-3)	346.9	357-C-9	-6.4	19.1	00004692
☒ Yes	HD-278B	USW G-3/GU-3)	346.9	357-C-10	-5.7	18.9	00004692
☒ Yes	HD-278C	USW G-3/GU-3)	346.9	358-C-1	-6.2	19.0	00004692
☒ Yes	HD-279A	USW G-3/GU-3)	357.8	352-C-2	-5.9	18.9	00004693
☒ Yes	HD-279B	USW G-3/GU-3)	357.8	352-C-3	-5.7	19.4	00004693
☒ Yes	HD-382A	USW G-3/GU-3)	11.5	65C-10	-5.8	19.6	00016102
☒ Yes	HD-383B	USW G-3/GU-3)	14.6	66C-1	-5.6	20.9	00016103
☒ Yes	HD-383C	USW G-3/GU-3)	14.5	66C-2	-6.4	21.0	00016103
☒ Yes	HD-384A	USW G-3/GU-3)	31.5	66C-3	-6.4	20.7	00016104
☒ Yes	HD-385B	USW G-3/GU-3)	45.6	66C-6	-6.5	21.1	00016105
☒ Yes	HD-386A	USW G-3/GU-3)	50.3	66C-8	-6.4	20.7	00016106
☒ Yes	HD-387A	USW G-3/GU-3)	60.7	66C-9	-5.3	20.7	00016107
☒ Yes	HD-388B	USW G-3/GU-3)	62.5	66C-10	-6.4	20.1	00016108
☒ Yes	HD-388C	USW G-3/GU-3)	62.5	67C-2	-5.5	20.7	00016108
☒ Yes	HD-390A	USW G-3/GU-3)	73.5	67C-4	-6.6	20.3	00016110
☒ Yes	HD-390B	USW G-3/GU-3)	73.5	67C-5	-6.4	20.9	00016110
☒ Yes	HD-390C	USW G-3/GU-3)	73.5	67C-6	-6.8	20.5	00016110
☒ Yes	HD-390D	USW G-3/GU-3)	73.5	67C-7	-4.8	20.0	00016110
☒ Yes	HD-390E	USW G-3/GU-3)	73.5	67C-8	-6.7	20.4	00016110
☒ Yes	HD-391A	USW G-3/GU-3)	75.8	67C-9	-6.1	20.3	00016111
☒ Yes	HD-392A	USW G-3/GU-3)	82.8	68C-2	-6.5	20.2	00016112
☒ Yes	HD-392B	USW G-3/GU-3)	82.8	68C-3	-5.4	20.4	00016112
☒ Yes	HD-392B	USW G-3/GU-3)	82.8	69C-6	-5.5	20.4	00016112
☒ Yes	HD-395A	USW G-3/GU-3)	100.6	68C-6	-6.0	20.3	00016115
☒ Yes	HD-395B	USW G-3/GU-3)	100.6	68C-7	-5.6	19.9	00016115
☒ Yes	HD-397A	USW G-3/GU-3)	112.1	68C-10	-5.4	20.7	00016117
☒ Yes	HD-397B	USW G-3/GU-3)	112.1	69C-1	-6.6	19.6	00016117
☒ Yes	HD-398A	USW G-3/GU-3)	131.4	69C-2	-5.3	19.9	00016118
☒ Yes	HD-400B	USW G-3/GU-3)	146.2	69C-5	-5.4	20.0	00016120
☒ Yes	HD-401A	USW G-3/GU-3)	151.9	69C-7	-4.2	20.0	00016121

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-403A	USW G-3/GU-3)	168.6	69C-8	-4.1	19.3	00016123
☒ Yes	HD-406A	USW G-3/GU-3)	192.0	69C-9	-5.8	20.0	00016126
☒ Yes	HD-421A	USW G-3/GU-3)	341.7	70C-1	-5.3	18.4	00016141
☒ Yes	HD-422A	USW G-3/GU-3)	349.8	71C-2	-6.0	18.1	00016142
☒ Yes	HD-422A	USW G-3/GU-3)	349.6	70C-2	-6.0	18.2	00016142
☒ Yes	HD-424A	USW G-3/GU-3)	521.4	70C-3	-5.7	15.8	00016144
☒ Yes	HD-598A	USW G-3/GU-3)	893.6	71C-5	2.1	9.6	00016157
☒ Yes	HD-599A	USW G-3/GU-3)	897.9	72C-1	2.4	9.1	00016158
☒ Yes	HD-599B	USW G-3/GU-3)	897.9	72C-4	3.2	8.9	00016158
☒ Yes	HD-600A	USW G-3/GU-3)	900.3	72C-6	3.3	9.0	00016159
☒ Yes	HD-601A	USW G-3/GU-3)	903.6	72C-7	2.2	9.2	00016160
☒ Yes	HD-602B	USW G-3/GU-3)	908.5	72C-9	2.7	9.2	00016161
☒ Yes	HD-606A	USW G-3/GU-3)	938.5	73C-1	3.7	9.4	00016165
☒ Yes	HD-606B	USW G-3/GU-3)	938.5	73C-2	2.0	9.5	00016165
☒ Yes	HD-608A	USW G-3/GU-3)	946.9	73C-4	3.2	9.0	00016167
☒ Yes	HD-610A	USW G-3/GU-3)	1315.6	73C-5	2.3	7.1	00016169
☒ Yes	HD-610B	USW G-3/GU-3)	1315.6	73C-6	2.3	11.0	00016169
☒ Yes	HD-610C	USW G-3/GU-3)	1315.6	73C-7	2.6	7.7	00016169
☒ Yes	HD-611A	USW G-3/GU-3)	1324.8	73C-8	1.6	10.0	00016170
☒ Yes	HD-612A	USW G-3/GU-3)	1330.5	73C-9	1.0	8.3	00016171
☒ Yes	HD-613A	USW G-3/GU-3)	1343.0	73C-10	1.4	11.0	00016172
☒ Yes	HD-614A	USW G-3/GU-3)	1349.5	74C-2	2.1	11.0	00016173
☒ Yes	HD-614B	USW G-3/GU-3)	1349.5	74C-3	1.9	11.2	00016173
☒ Yes	HD-615A	USW G-3/GU-3)	1407.9	74C-4	1.6	7.8	00016174
☒ Yes	HD-617A	USW G-3/GU-3)	1456.2	74C-6	0.9	12.0	00016176
☒ Yes	HD-619A	USW G-3/GU-3)	1521.0	74C-8	2.3	10.6	00016178
☒ Yes	HD-620A	USW G-3/GU-3)	1530.0	74C-10	0.9	8.9	00016179
☒ Yes	HD-722A	USW G-3/GU-3)	13.3	70C-4	-6.6	20.6	00005520
☒ Yes	HD-723A	USW G-3/GU-3)	14.4	70C-7	-6.6	20.7	00005519
☒ Yes	HD-723B	USW G-3/GU-3)	14.4	70C-8	-6.1	20.9	00005519
☒ Yes	HD-724A	USW G-3/GU-3)	17.3	70C-9	-6.6	20.9	00005518
☒ Yes	HD-725A	USW G-3/GU-3)	22.1	70C-10	-6.4	20.2	00005517
☒ Yes	HD-726A	USW G-3/GU-3)	27.4	71C-1	-6.3	20.4	00005516

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CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-674A	USW G-4	107.4	365-C-4	4.9	16.0	00004866
☒ Yes	HD-674B	USW G-4	107.4	365-C-5	0.6	16.6	00004866
☒ Yes	HD-674C	USW G-4	107.4	26C-7	-4.4	17.1	00004866
☒ Yes	HD-674D	USW G-4	107.4	75C-1	-7.6	17.7	00004866
☒ Yes	HD-676A	USW G-4	168.9	75C-2	-3.5	16.0	00004864
☒ Yes	HD-677	USW G-4	180.9	286-C-8	-6.7	17.4	00004863
☒ Yes	HD-677A	USW G-4	180.9	26C-8	-5.7	16.7	00004863
☒ Yes	HD-677B	USW G-4	180.9	75C-3	-6.7	17.2	00004863
☒ Yes	HD-678	USW G-4	204.2	256-C-9	-7.9	17.6	00004862
☒ Yes	HD-678A	USW G-4	204.2	75C-4	-8.0	17.6	00004862
☒ Yes	HD-679A	USW G-4	265.5	365-C-1	-7.0	16.8	00004861
☒ Yes	HD-679A	USW G-4	265.5	36C-10	-7.0	16.9	00004861
☒ Yes	HD-679A	USW G-4	265.5	36C-10	-7.0	16.9	00004861
☒ Yes	HD-679C	USW G-4	265.5	27C-7	4.7	19.9	00004861
☒ Yes	HD-679C	USW G-4	265.5	75C-5	-8.0	15.8	00004861
☒ Yes	HD-681	USW G-4	401.1	365-C-6	-9.0	16.1	00004859
☒ Yes	HD-689A	USW G-4	841.6	28C-3	-5.6	13.8	00004851
☒ Yes	HD-701AA	USW G-4	75.6	75C-10	-6.7	17.6	00005541
☒ Yes	HD-703A	USW G-4	114.4	28C-6	-6.8	17.3	00005539
☒ Yes	HD-704A	USW G-4	124.5	28C-7	-6.6	17.4	00005538
☒ Yes	HD-704B	USW G-4	124.5	28C-8	-7.0	17.5	00005538
☒ Yes	HD-706BB	US	166.9	76C-1	-6.5	17.3	00005536
☒ Yes	HD-707B	US	168.9	36C-8	-6.5	17.5	00005535
☒ Yes	HD-707B	USW G-4	168.9	36C-8	-6.5	17.5	00005535
☒ Yes	HD-709A	USW G-4	179.9	32C-7	-0.5	15.7	00005533
☒ Yes	HD-709A	USW G-4	179.9	32C-9	-0.5	15.6	00005533
☒ Yes	HD-709B	USW G-4	179.9	32C-10	2.4	15.2	00005533
☒ Yes	HD-709C	USW G-4	179.9	33C-1	-6.3	16.4	00005533
☒ Yes	HD-711A	USW G-4	204.2	33C-2	-7.4	17.1	00005531
☒ Yes	HD-712A	USW G-4	376.5	33C-3	-7.6	16.6	00005530
☒ Yes	HD-713A	USW G-4	400.9	36C-9	-8.7	16.6	00005529
☒ Yes	HD-713A	USW G-4	400.9	36C-9	-8.7	16.6	00005529

Request number 42.

See the following request for the remaining data.
#17 for site 106, #26 for Wahmonie,
#22 for Nevares Spring, #27 for Grapevine Spring,
#31 for UE 25 RF-9, #28 for Yucca Crest.

CALCITE/SILICA - CARBONATE STABLE ISOTOPES

Accept?	HD #	Locality	Depth : m	Extn Log #	d13C pdb	d18O smow	SPC #
☒ Yes	HD-871-A	UE-25 A-6	35.8	25C-2	-7.6	18.8	00019121
☒ Yes	HD-872-A	UE-25 A-6	40.6	25C-3	-6.8	18.4	00019122
☒ Yes	HD-872A	UE-25 A-6	40.6	45C-10	-6.8	18.7	00019122
☒ Yes	HD-875-A	UE-25 A-6	114.4	25C-5	-5.5	16.7	00019125
☒ Yes	HD-876-A	UE-25 A-6	119.2	25C-6	-6.2	16.2	00019126
☒ Yes	HD-877-A	UE-25 A-6	121.6	25C-7	-7.0	17.9	00019127
☒ Yes	HD-877A	UE-25 A-6	121.6	46C-4	-7.0	17.9	00019127
☒ Yes	HD-878-A	UE-25 A-6	125.5	26C-2	-7.2	17.9	00019128
☒ Yes	HD-879-A	UE-25 A-6	132.6	26C-3	-6.6	17.8	00019129

Request number 42.

See the following request for the remaining data.
#17 for site 106, #26 for Wahmonie,
#22 for Nevares Spring, #27 for Grapevine Spring,
#31 for UE 25 RF-9, #28 for Yucca Crest.

DEPARTMENT OF ENERGY

Office of Civilian Radioactive Waste Management
Office of Geologic Disposal
Yucca Mountain Site Characterization Project Office
P.O. Box 98608
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WBS 1.2.5.3
QA: N/A

FEB 18 1994

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FINAL INSTALLMENT OF DATA REPORTED IN U.S. GEOLOGICAL SURVEY (USGS) MONTHLY REPORTS (SCP: N/A)

References: (1) Ltr, Loux to Gertz, dtd 8/31/93
(2) Ltr, Gertz to Loux, dtd 10/1/93

Enclosed is the third and final installment of information requested by the State of Nevada for data, data sets, and preliminary interpretations mentioned in USGS monthly reports of ongoing work (reference 1). The data noted by Y^6 in the table titled "Data Request" are enclosed. The data tracking number for data enclosed with this letter is GS940108315215.003.

The alpha spectrometry results are from a single carbonate sample from the Pahrump Valley palustrine deposits and three carbonate samples from the Nevares Spring mound. The Sample Management Facility (SMF) code numbers for the samples covered by this submittal are SCP00003731, SCP00003733, SCP00003735, and SCP00005125. Column B of the enclosed data table relates the sample analysis with the last four numbers of the SMF code number.

If you have any questions, please contact either Ardyth M. Simmons at (702) 794-7998 or Thomas W. Bjerstedt at (702) 794-7590.

Robert M. Nelson, Jr.
Acting Project Manager

RSED:AMS-2014

Enclosure:
Partial Transmittal of Requested Data

ENCLOSURE 4

cc w/encl:
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S. J. Brocoum, HQ (RW-22) FORS
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cc w/o encl:
S. J. Bodnar, M&O/TRW, Las Vegas, NV
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Z. E. Peterman, USGS, Denver, CO
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J. F. Whelan, USGS, Denver, CO
R. W. Craig, USGS, Las Vegas, NV
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DATA REQUEST

(Summary)
Agency for Nuclear Projects, Nuclear Waste Project Office

Request Dated: August 31, 1993
Request Received: September 9, 1993

Item Number	Requested Data	Source	Data Included (Y/N)
	Strontium		
1	Location and analysis of carbonate-rich samples	[a] 01/93, p. 64	Y[b]
2	Locations and alpha-spectrometry results from Nevares Spring tufa mound	[a] 10-11/93, p. 64	Y[b]
3	Sr isotope data for VH-2 and elsewhere in Tertiary aquifer	[a] 08/92, p 94	Y
4	XRF mass spec. analyses and SR/SR ratios of VH-1	[a] 08/92, p. 94	Y
5	Sr/Sr ratios from Franklin Lake Playa	[a] 08/92, p. 94	Y
6	Sr concentrations for Nevares Spring tufa	[a] 08/92, p. 95	Y
7	Sr content and isotopic comp. of high-Si rhyolite samples from UE25A#1	[a] 09-92, p. 13	Y
8	Sr composition from Nevares Spring	[a] 09/92, p. 8	Y
9	Sr composition from Pyramid Lake	[a] 09/92, p. 89	N[1]
10	Sr isotopes for precip. sample from Yucca Crest	[a] 01/93, P. 63	Y
11	Sr/Sr and Rb/Sr rations of rhyolite in G-4	[a] 10-11/ 93(?), p. 16	Y
12	Sr/Sr ratios of precip. samples for 08/11/92, 03/92, and 02/92	[a] 10-11/ 93(?), p. 90	Y

ENCLOSURE

Item Number	Requested Data	Source	Data Included (Y/N)
13	Sr isotopic anal. of outcrop samples, Southern Yucca Mtn.	[b] 04/15/92	Y
14	Sr content and isotopic comp. from high-Si rhyolite from UE25a#1	[b] 10/16/92	Y
	Fluid Inclusion		
15	Results from fluid inclusion studies for USW - G-1 and G-2	[a] 01/93, p. 87	Y[S]
16	Results of fluid inclusion studies of calcite from USW G-2, GU-3, G-4, UE25UZ-16, A-4, A-5, A-7	[a] 01/93, p. 70	Y[S]
	Carbon and Oxygen		
17	^{13}C and $^{18}0$ values of calcite from site 106	[a] 07/92, p. 105	Y[S]
18	^{13}C and ^{18}O values from Site 199	[a] 07/92, p. 106	Y[S]
19	^{13}C and ^{18}O values from trenches CFS-E, CF-1, 2, and 8	[a] 07/92, p. 106	Y[S]
20	^{13}C and ^{18}O values from Tonopah RR in Ash Meadows	[a] 07/92, p. 106	Y[S]
21	^{13}C and ^{18}O values from Trench 14 calcites and calcrete	[a] 07/92, p. 106	Y[S]
22	^{13}C and ^{18}O values from Nevares Spring	[a] 07/92, p. 107	Y[S]
23	^{18}O results from Trench-14	[a] 08/92, p. 100	Y[S]
24	^{18}O values of opal/chalcedony from drill core	[a] 08/92, p. 100	Y[S]
25	^{14}C ages of calcites from USW G-1 and other drill holes.	[a] 01/93, p. 71	Y[S]
26	^{13}C and ^{18}O values from Site 106 and Wahmonie	[a] 10-11/93 (?), p. 92	Y[S]

Item Number	Requested Data	Source	Data Included (Y/N)
27	^{13}C and ^{18}O values from Travertine, Nevares, and Grapevine springs	[a] 10-11/ 93(?), p. 92	Y[5]
28	^{13}C and ^{18}O values from Busted Butte, Eleanna Trench, Trenches 1 and 16, Yucca Crest	[a] 10-11/ 93(?), p. 92	Y[5]
29	^{13}C and ^{18}O values from Site 106 and Wahmonie	[a] 12/93, p. 68	Y[5]
30	^{13}C and ^{18}O values from Nevares and Grapevine springs	[a] 12/93, p. 68	Y[5]
31	^{13}C and ^{18}O values from UE25-RF-9	a 12/93, p. 68	Y[5]
32	^{13}C and ^{18}O values from Yucca Crest	a 12/93, p 68	Y[5]
33	^{13}C and ^{18}O values from Sites 106 and 199, Trenches CFS-E, CF-1, 2, and 8, Tonopah RR, Trench 14, and Nevares Spring	[b] 08/11/92	Y[5]
34	^{13}C and ^{18}O values from USW G-1 and 2, UE-25 A-5, RF-3, and USW GU-3	[b] 03/10/93	Y[5]
	Other Data		
35	Nd/Nd values of calcite fracture-fillings from USW G-2, 3, and 4	[a] 01/92, p. 83	N[2]
36	Results of XRF trace-element analyses	[a] 10-11/93, p. 15	N[3]
37	Location and results of isotope analysis on samples from Raven Canyon and results from JF-3	[a] 10-11/93, p. 15	Y
38	Results from tufa mound samples at Nevares Spring	[a] 0-11/93, p. 89	Y[6]
39	Chemistry results from VH-2	[a] 10-11/93, p. 94	Y
40	Vapor-phase inclusion results from USW G-1	[a] 10-11/93, p. 93	Y[5]
41	Analyses of faunal samples from Modern Springs	[b] 03/11/92, p. 6	N[4]

Item Number	Requested Data	Source	Data Included (Y/N)
42	Isotopic composition of carbonate from Site 106, Wahmonie, Nevares, and Grapevine springs, UE25 RF-9, UEA-6, Yucca Crest, and USW G-4	[b] 01/13/93	Y [5]

[a] USGS, YMP, Monthly Highlights and Status Report
[b] Letters to Carl Gertz from U.S. Department of Interior

[1] Unable to respond to this request. This study by Larry Benson (USGS-WRD, Boulder, CO) was funded from a Geologic Division account.
[2] No data available. Samples were originally obtained from LANL and had been irradiated for neutron activation analysis. The neodymium isotopic compositions had been affected by the irradiation, and the analyses were determined to be invalid.
[3] Request cannot be met - unable to specifically identify the data wanted from the wording in the request.
[4] Octracodes were observed in the samples as described on page 11 of the data request, however no identification of species was made.
[5] Available December 7, 1993
[6] Available February 15, 1994

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1		ACQUIRED U & Th ISOTOPIC DATA PLUS CONCENTRATION, ACTIVITY-RATIO AND ERROR CORRELATION CALCULATIONS																					
2		Spring Discharge sites: Evaluation of Past Discharge													Date Printed:		1/24/94						
3		Data reduced with new cali			All errors in percent 2 sigma																		
4																							
5			Spike 8	±2s%	Spike 7	±2s%																	
6	U calib =		18.62	0.58	36.29	0.27																	
7	232Th calib =		65.40324		101.5584		3.0562																
8	230Th calib =		21.40	1.07	33.23	0.60																	
9	Additional error =			0.5		0.50																	
10		SMF	Sample	Spike	Cumulative Counts												Activity equivalencies						
11	Sample Name	Code #	Wt.	Wt.	238	± 2s%	236	± 2s%	234	± 2s%	232	± 2s%	230	± 2s%	229	± 2s%	ug 238	±2s%	uge 236	±2s%	uge 234	±2s%	uge 232
12	HD1065-AL	5125	2.4715	0.2713	2747	3.82	3108	3.59	5123	2.79	1334	5.476	3146	3.566	9258	2.079	4.4649	5.30	5.05161	0.63	8.3267	4.62	0.83657
13	HD1065-AR	5125	0.5447	0.0802	13349	1.73	12384	1.80	15476	1.61	2397	4.085	3582	3.342	2492	4.006	1.6097	2.75	1.49332	1.05	1.86617	2.68	1.65085
14	HD1065-AW	5125	3.233	0.3224	5271	2.75	4718	2.91	8946	2.11	8125	2.219	12219	1.809	17091	1.530	6.7067	4.09	6.00309	0.62	11.3827	3.69	3.27993
15	HD1665-AW2	5125	2.01263	0.422	21887	1.35	44797	0.94	33764	1.09	1230	5.703	2039	4.429	5184	2.778	3.8391	1.83	7.85764	0.60	5.92239	1.64	2.14272
16	HD1065-BW	5125	3.0468	0.3345	32906	1.10	55338	0.85	50769	0.89	1694	4.859	2916	3.704	4293	3.052	3.7036	1.60	6.22839	0.62	5.71414	1.46	2.82464
17	HD1065-AL3	5125	1.6638	0.1673	16363	1.56	20394	1.40	29429	1.17	1499	5.166	3049	3.622	5837	2.618	2.4994	2.27	3.11513	0.72	4.4952	2.02	0.91944
18	HD1065-AR3	5125	0.3341	0.0667	14837	1.64	18878	1.46	16393	1.56	5102	2.800	5804	2.625	7481	2.312	0.9761	2.55	1.24195	1.20	1.07847	2.50	0.97347
19	HD1065-AL4	5125	1.6577	0.1681	21691	1.36	27365	1.21	39227	1.01	2071	4.395	4646	2.934	8997	2.109	2.4810	2.02	3.13002	0.91	4.4868	1.80	0.82806
20	HD1065-AR4	5125	0.3057	0.067	9207	2.08	12731	1.77	10036	2.00	7462	2.315	8668	2.148	11151	1.894	0.9022	3.03	1.24754	1.19	0.98345	2.97	0.95947
21	HD495-1AL	3731	3.8459	0.4196	19503	1.43	154596	0.51	34495	1.08	2148	4.315	3965	3.176	69384	0.759	1.9210	1.63	15.2273	0.32	3.39764	1.33	0.43166
22	HD495-1AR	3731	0.1428	0.0265	4456	3.00	9030	2.10	5537	2.69	4829	2.878	6433	2.494	5741	2.640	0.4746	4.55	0.96169	2.66	0.58968	4.35	0.74071
23	HD497-1AL	3733	3.2865	0.3579	16543	1.55	115597	0.59	30038	1.15	3043	3.626	15232	1.621	80140	0.706	1.8587	1.77	12.9882	0.33	3.37499	1.43	0.45159
24	HD497-1AR	3733	0.021	0.0075	477	9.16	1521	5.13	484	9.09	887	6.715	895	6.685	2141	4.322	0.0854	14.06	0.27218	9.34	0.08661	14.01	0.10325
25	HD499-1AL	3735	3.9663	0.4486	12483	1.79	135118	0.54	21023	1.38	1212	5.745	5568	2.680	128814	0.557	1.5040	1.96	16.2797	0.31	2.53296	1.60	0.14026
26																							

	A	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ
1																					
2																					
3																					
4																					
5																					
6	U																				
7	232Th																				
8	230Th																				
9	Additiona																				
10		*Activity equivalencies*					*Concentrations*				*Activity Ratios*								*Correlation coefficients*		
11	Sample Name	*±2s%*	*uge 230*	*±2s%*	*uge 229*	*±2s%*	*U (ppm)*	*±err*	*Th (ppm)*	*±err*	*230/232*	*±err*	*230/238*	*±err*	*232/238*	*±err*	*234/238*	*±err*	*rho(08-48)*	*rho(08-28)*	*rho(48-28)*
12	HD1065-AL	5.98	1.9729	4.30	5.80582	1.10	1.820	5.28	1.034	5.98	2.35832	6.53	0.44187	6.83	0.18737	7.99	1.86494	4.73	0.4511	0.5822	0.3853
13	HD1065-AR	5.91	2.46698	5.42	1.71628	1.38	2.977	2.75	9.262	5.91	1.49437	5.28	1.53258	6.08	1.02557	6.52	1.15934	2.36	0.2087	0.5624	0.1946
14	HD1065-AW	2.95	4.93261	2.66	6.89936	1.09	2.090	4.07	3.100	2.95	1.50388	2.86	0.73547	4.87	0.48905	5.04	1.69721	3.47	0.4483	0.7493	0.4335
15	HD1665-AW2	6.45	3.55204	5.36	9.0308	1.08	1.921	1.82	3.254	6.45	1.65772	7.22	0.92523	5.66	0.55813	6.71	1.54265	1.74	0.1859	0.2747	0.1570
16	HD1065-BW	5.86	4.86224	4.95	7.1583	1.09	1.224	1.60	2.833	5.86	1.72137	6.11	1.31283	5.20	0.76267	6.08	1.54285	1.42	0.1651	0.3561	0.1413
17	HD1065-AL3	5.93	1.87015	4.64	3.58022	1.15	1.513	2.27	1.689	5.93	2.03402	6.31	0.74824	5.17	0.36786	6.35	1.79851	1.95	0.2425	0.3433	0.1975
18	HD1065-AR3	3.96	1.10741	3.84	1.42738	1.50	2.943	2.55	8.904	3.97	1.13759	3.84	1.13452	4.61	0.99730	4.71	1.10487	2.27	0.2581	0.4681	0.2526
19	HD1065-AL4	5.03	1.85765	3.82	3.59734	1.15	1.508	2.01	1.527	5.03	2.24336	5.28	0.74874	4.32	0.33376	5.42	1.80845	1.69	0.2521	0.3307	0.2010
20	HD1065-AR4	3.38	1.11453	3.27	1.4338	1.50	2.973	3.02	9.592	3.40	1.16162	3.16	1.23533	4.46	1.06346	4.54	1.09004	2.89	0.3378	0.5476	0.3317
21	HD495-1AL	4.54	0.7968	3.48	13.9433	1.08	0.503	1.63	0.343	4.54	1.84590	5.36	0.41479	3.84	0.22471	4.83	1.76870	1.79	0.2981	0.1558	0.2372
22	HD495-1AR	4.86	0.98674	4.64	0.8806	2.85	3.348	4.56	15.852	4.91	1.33216	3.81	2.07928	6.50	1.56083	6.66	1.24259	4.03	0.3431	0.4707	0.3350
23	HD497-1AL	3.88	2.26047	2.14	11.893	1.09	0.570	1.76	0.420	3.88	5.00559	3.97	1.21614	2.77	0.24296	4.27	1.81575	1.94	0.4505	0.2759	0.2927
24	HD497-1AR	12.34	0.10418	12.32	0.24923	9.39	4.094	14.40	15.026	13.23	1.00902	9.48	1.22056	18.69	1.20965	18.70	1.01468	12.90	0.3476	0.3685	0.3474
25	HD499-1AL	5.89	0.64436	2.99	14.907	1.08	0.382	1.95	0.108	5.89	4.59406	6.34	0.42842	3.57	0.09326	6.21	1.68413	2.26	0.3969	0.1718	0.2281
26																					

Department of Energy
Yucca Mountain Site Characterization
Project Office
P. O. Box 98608
Las Vegas, NV 89193-8608

WBS 1.2.5.3
QA: N/A

DEC 1 5 1993

Carl A. Johnson
Administrator of Technical Projects
Agency for Nuclear Projects
State of Nevada
Evergreen Center, Suite 252
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Carson City, NV 89710

WINDY WASH SEISMIC REFRACTION SURVEY DATA (SCP: N/A)

Enclosed are the Windy Wash seismic refraction survey data requested by the State of Nevada. The data include basic data and field seismograms generated from the seismic refraction survey across the southern end of Windy Wash (enclosure 1). The seismograph utilized in this experiment did not have the capability to record digitally; therefore, only paper copies exist, and we are providing the best available copies.

Field seismograms consist of wave traces produced by a source and recorded by each geophone. In the seismic refraction technique, the time measurement of the first seismic motion (first arrival) recorded on the seismogram provides the necessary information for the interpretation. Pertinent field data for each geophone array and source point are recorded on each seismograph and in the enclosed field notebook (enclosure 2). Please refer to the enclosed copy of Technical Procedure NWM-USGS-SP-18, Revision 0, Seismic Refraction Technique for Shallow Subsurface Exploration, for a complete description of the methods employed.

If you have any questions, please contact either Ardyth M. Simmons at (702) 794-7998 or J. Timothy Sullivan at (702) 794-7915.

Robert M. Nelson, Jr.
Acting Project Manager

RSED:AMS-1073

Enclosures:
1. Windy Wash Seismic Refraction Survey Data, 1993
2. Field Notebook Pages
3. Technical Procedure NWM-USGS-SP-18

YMP-5

ENCLOSURE 5

DEC 1 5 1993

cc w/encls:
J. T. Sullivan, YMP, NV

cc w/o encls:
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R. W. Craig, USGS, Las Vegas, NV
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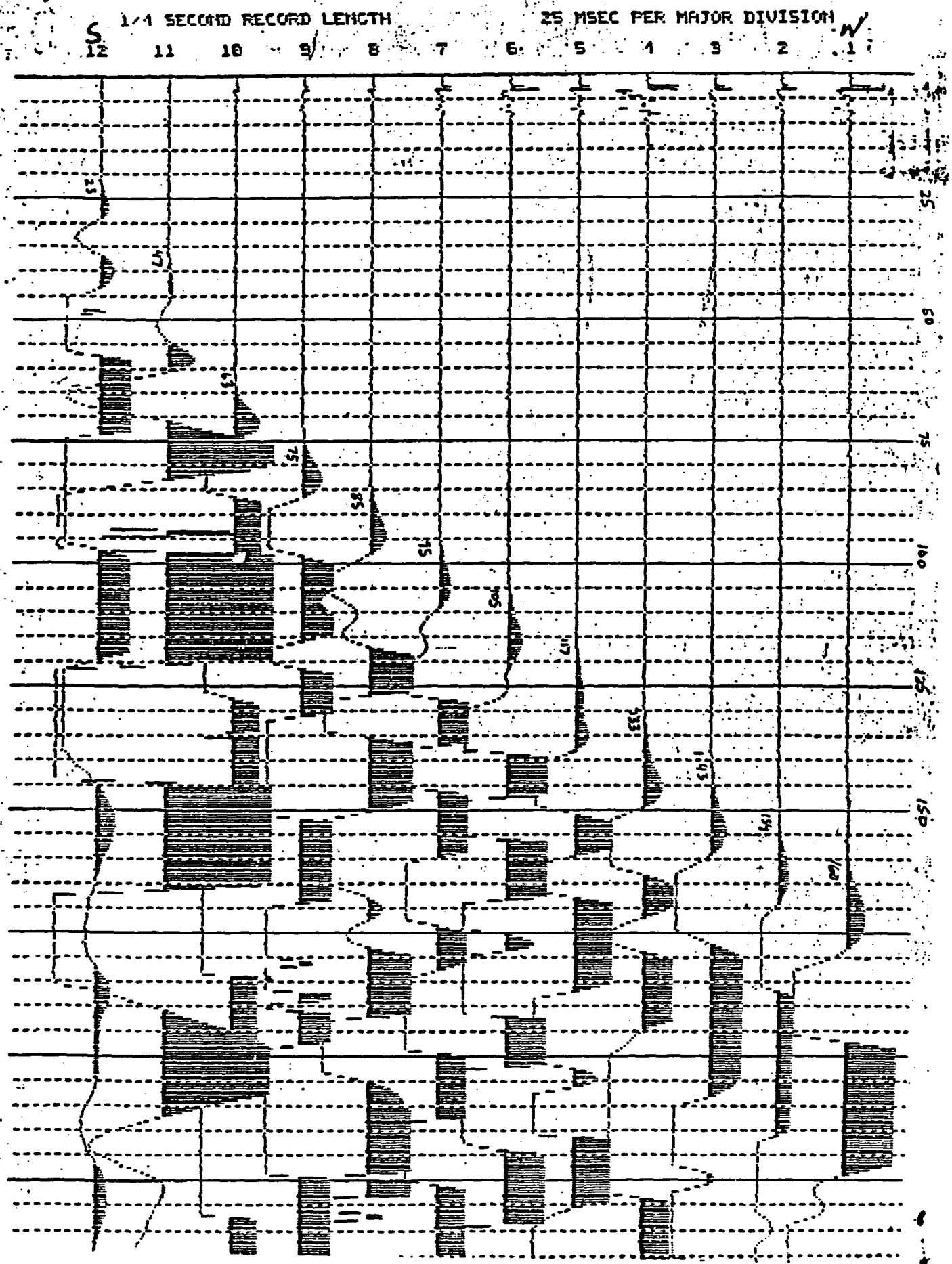
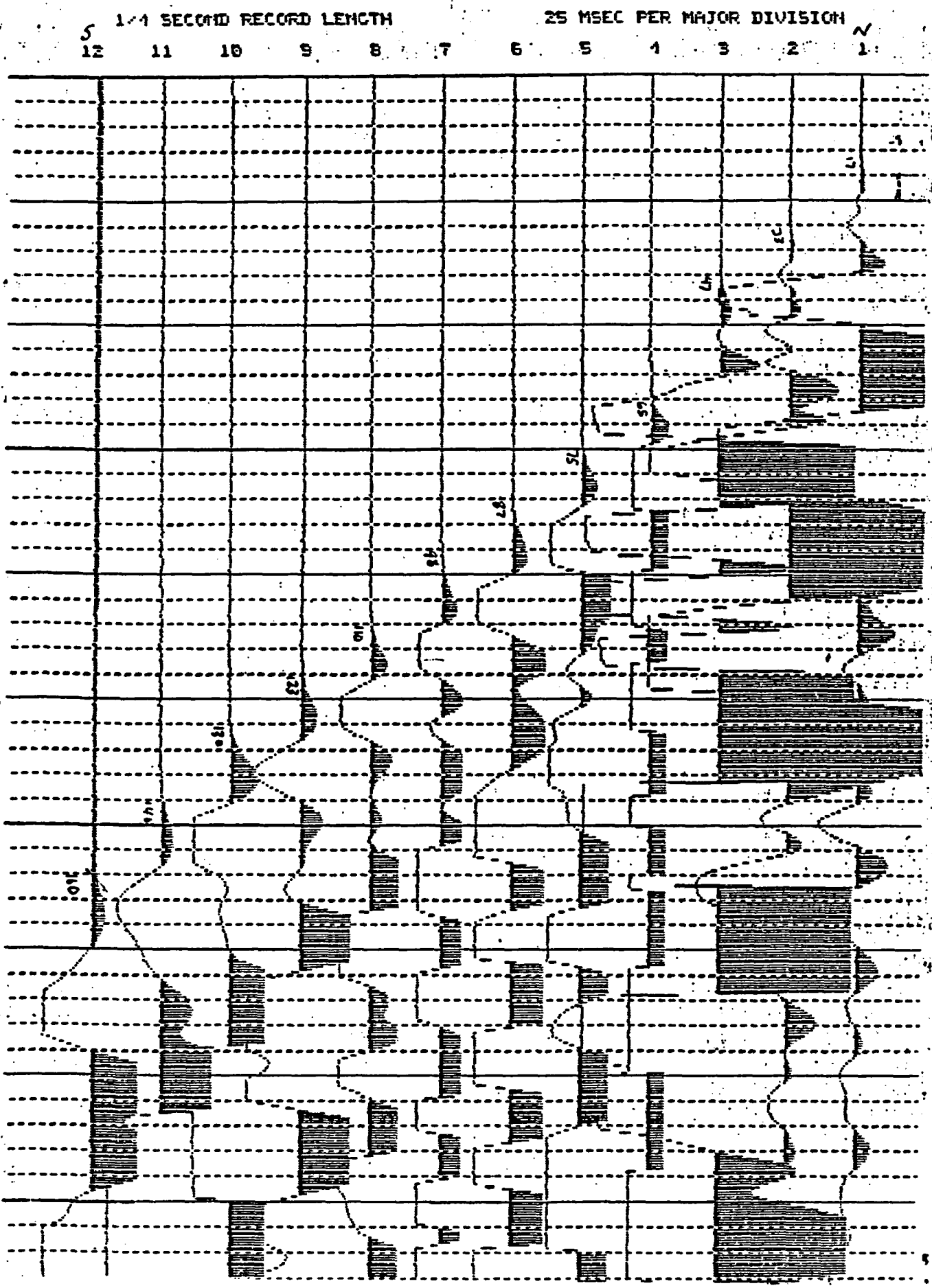
J. W. Whitney, USGS, Denver, CO
J. S. Stuckless, USGS, Denver, CO
G. L. Ducret, USGS, Denver, CO
T. M. Mendez-Vigo, SAIC, Denver, CO
B. E. Reilly, SAIC, Las Vegas, NV

6/24/95 Windy Wash Line 3 spread 1 36012 Page 1
50 ft ph z=3' 2 lbs
d=50' S→N



ENCLOSURE 1

6/24/93 Windy Wash Line 3 spread 1 shot 2 Page 2
50 ft ph z=2.5 21bs
d=50' N→S



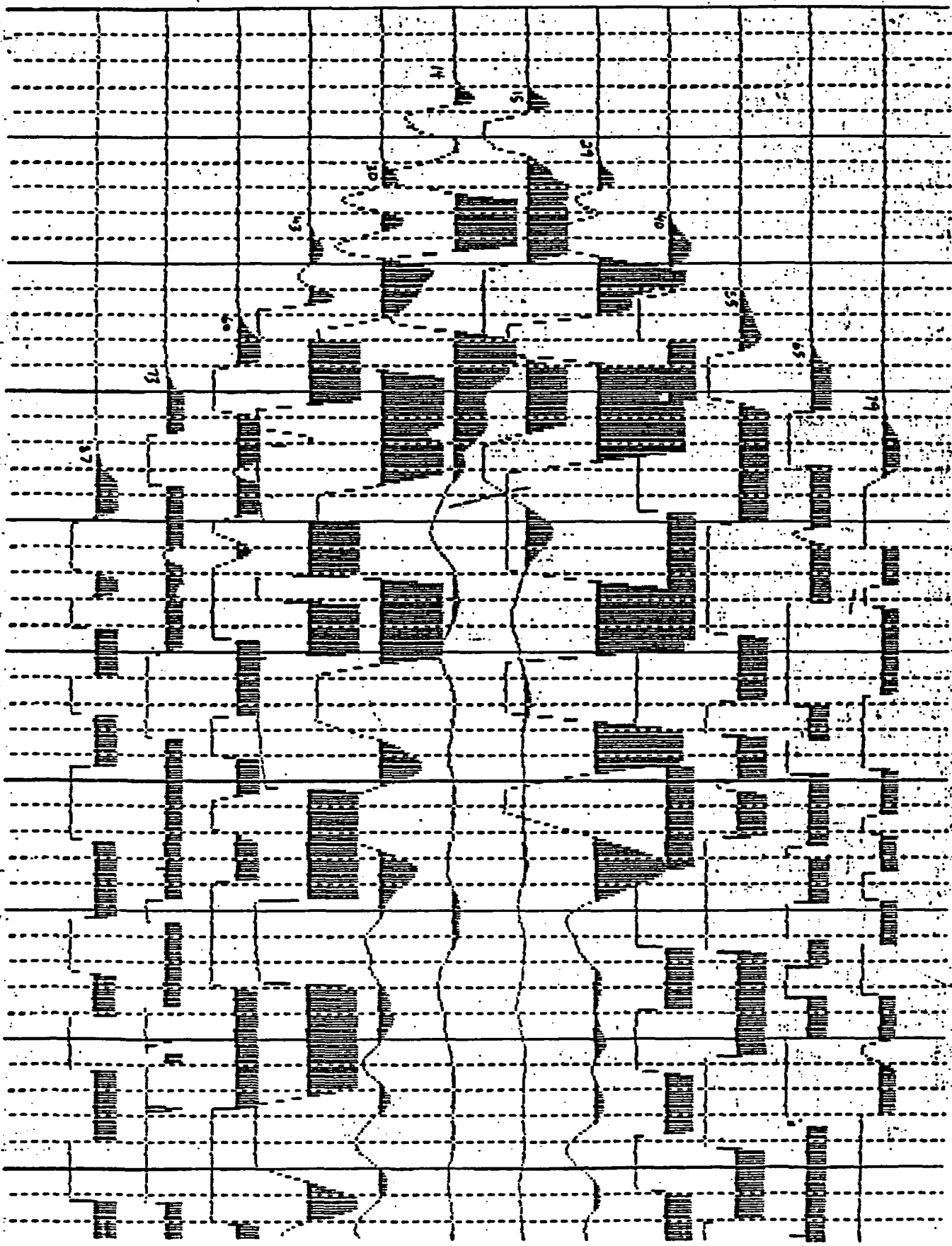
6/24/93 Windy Wash Line 3 spread 1 shot 3 PAGE 3

150' ft z=25'

d=25' center shot

1-1 SECOND RECORD LENGTH 25 MSEC PER MAJOR DIVISION

S 12 11 10 9 8 7 6 5 4 3 2 1 N

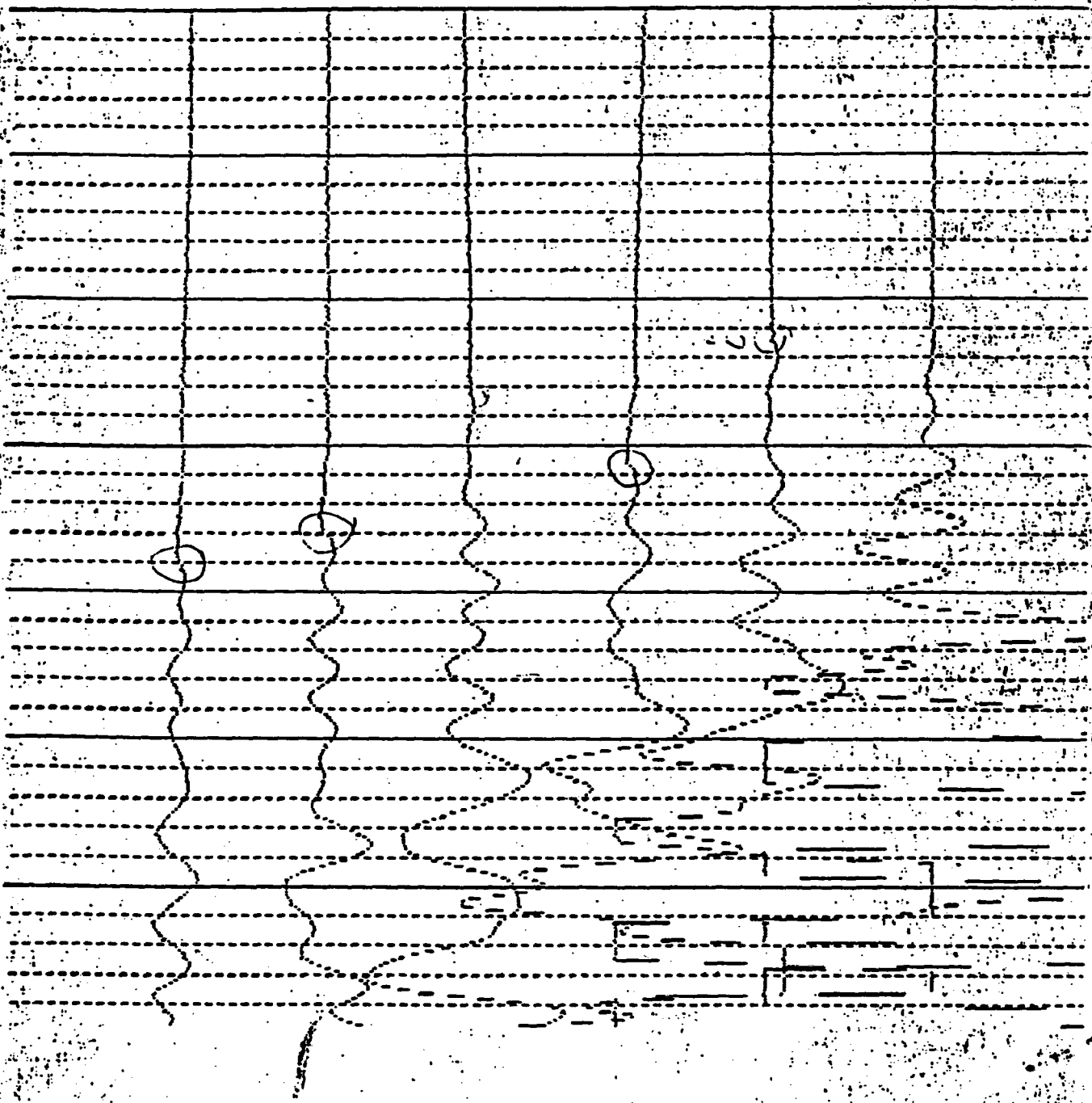


6/25/93 Windy Wash Line 4 Shot 3 scroll 1 PAGE 4
dt=100' phsp 900'
2225

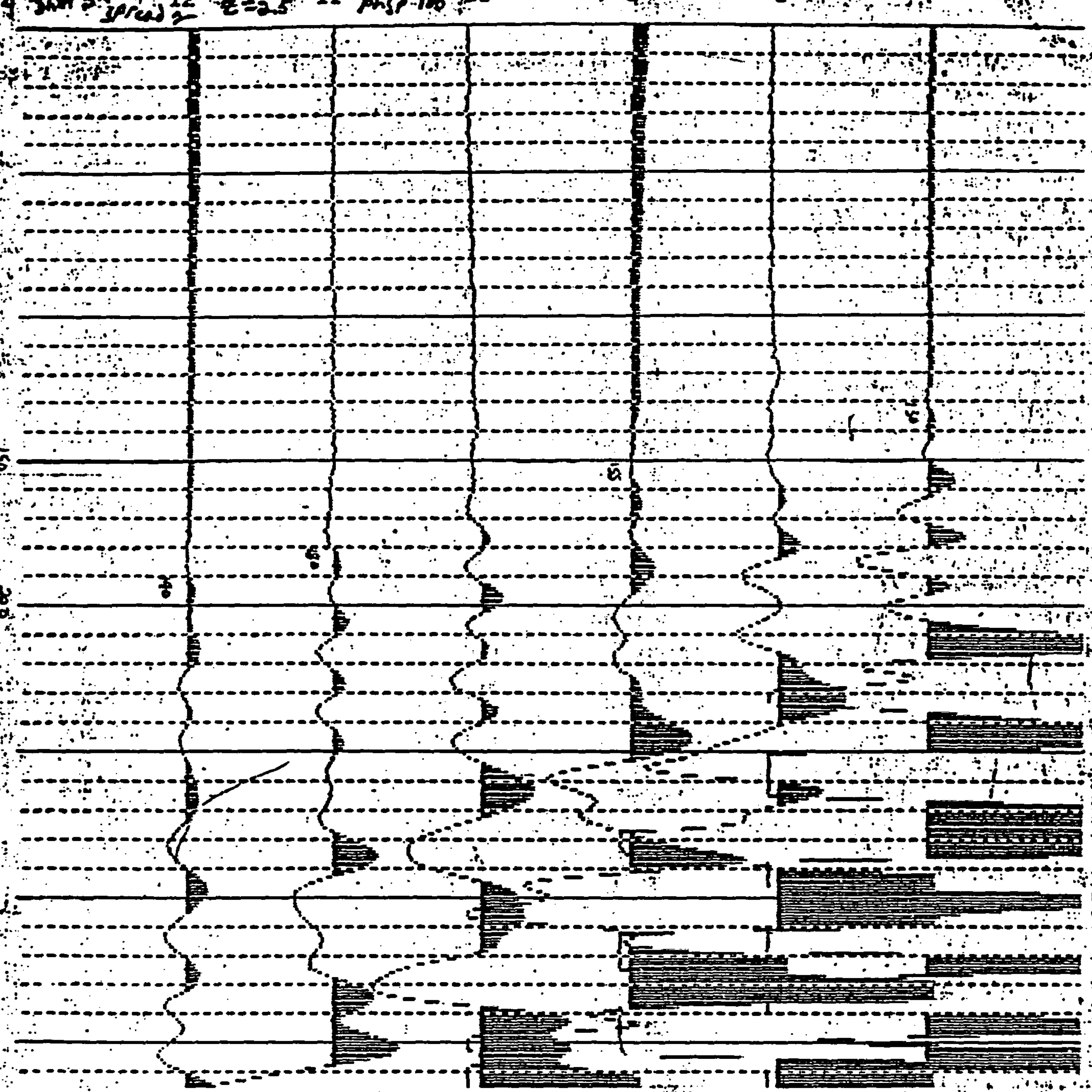
1/2 SECOND RECORD LENGTH

50 MSEC PER MAJOR DIVISION

12 11 10 9 8



6/25/93 Windy Wash 2 SECOND RECORD LENGTH j=100 W→E 50 MSEC PER MAJOR DIVISION
Line 9 Shot 5 spread 2 z=2.5 phsp-100

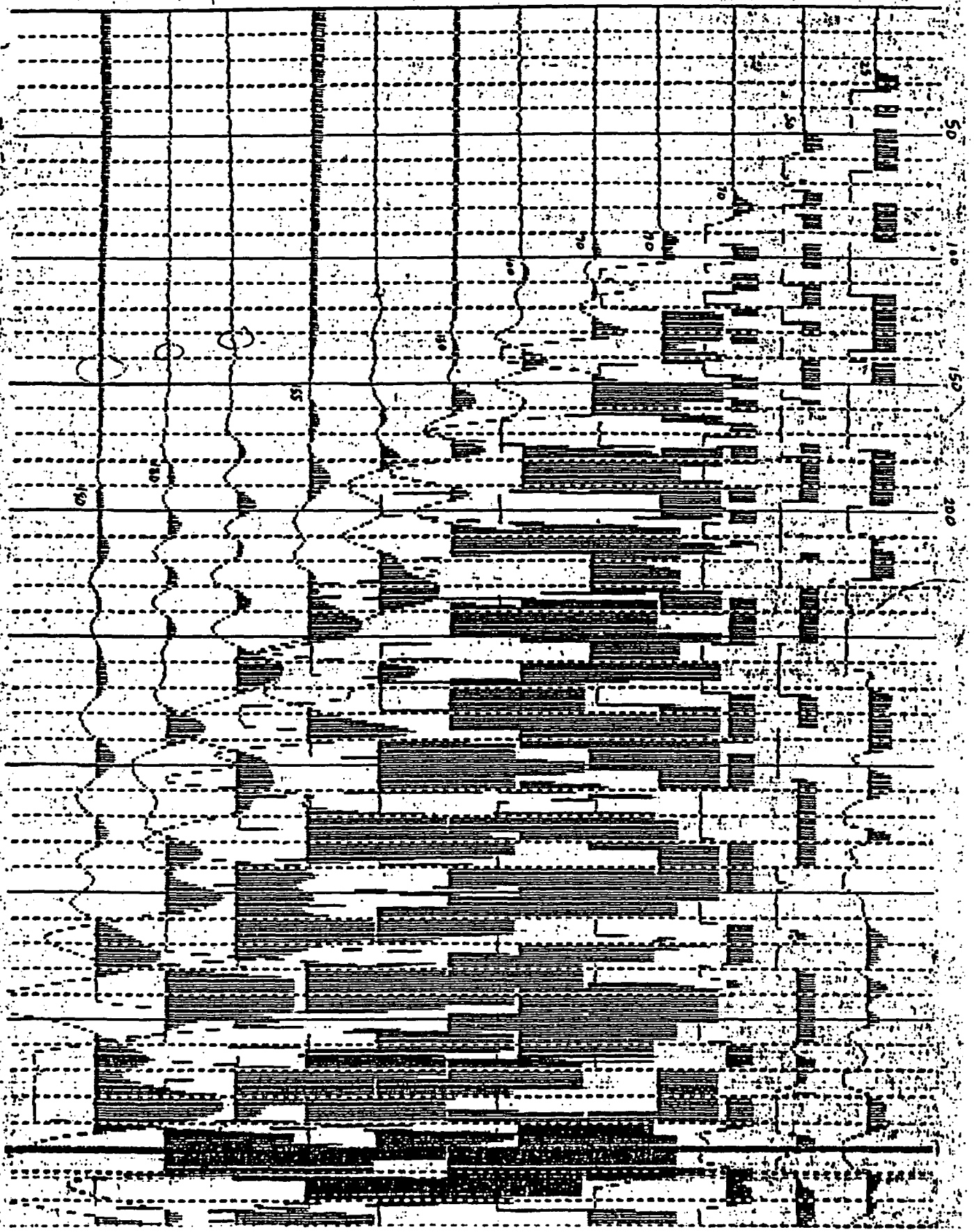


6/25/93 Windy Wash Line 4 Shot 3 W→E
d=100' ph sp =100'
Z=7.5

Spread #1

E 1/2 SECOND RECORD LENGTH — 50 MSEC PER MAJOR DIVISION W

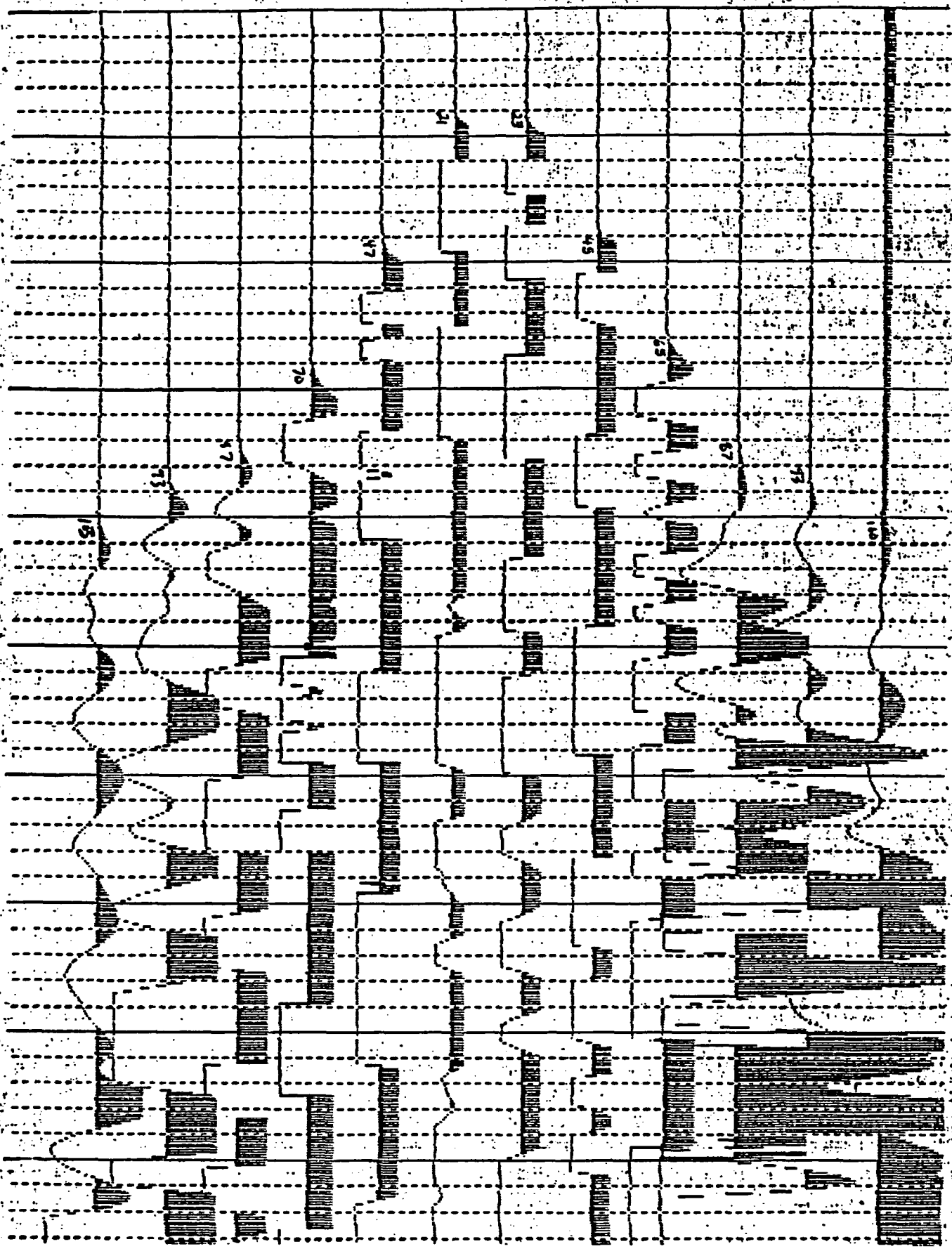
12 11 10 9 8 7 6 5 4 3 2 1



6/23/93 "Windy, Wash Shot 4 center mine 9
d=5.0 phsp=100' spread 1
z=2.5 y offset = 15' to South

E 1/4 SECOND RECORD LENGTH 25 MSEC PER MAJOR DIVISION W

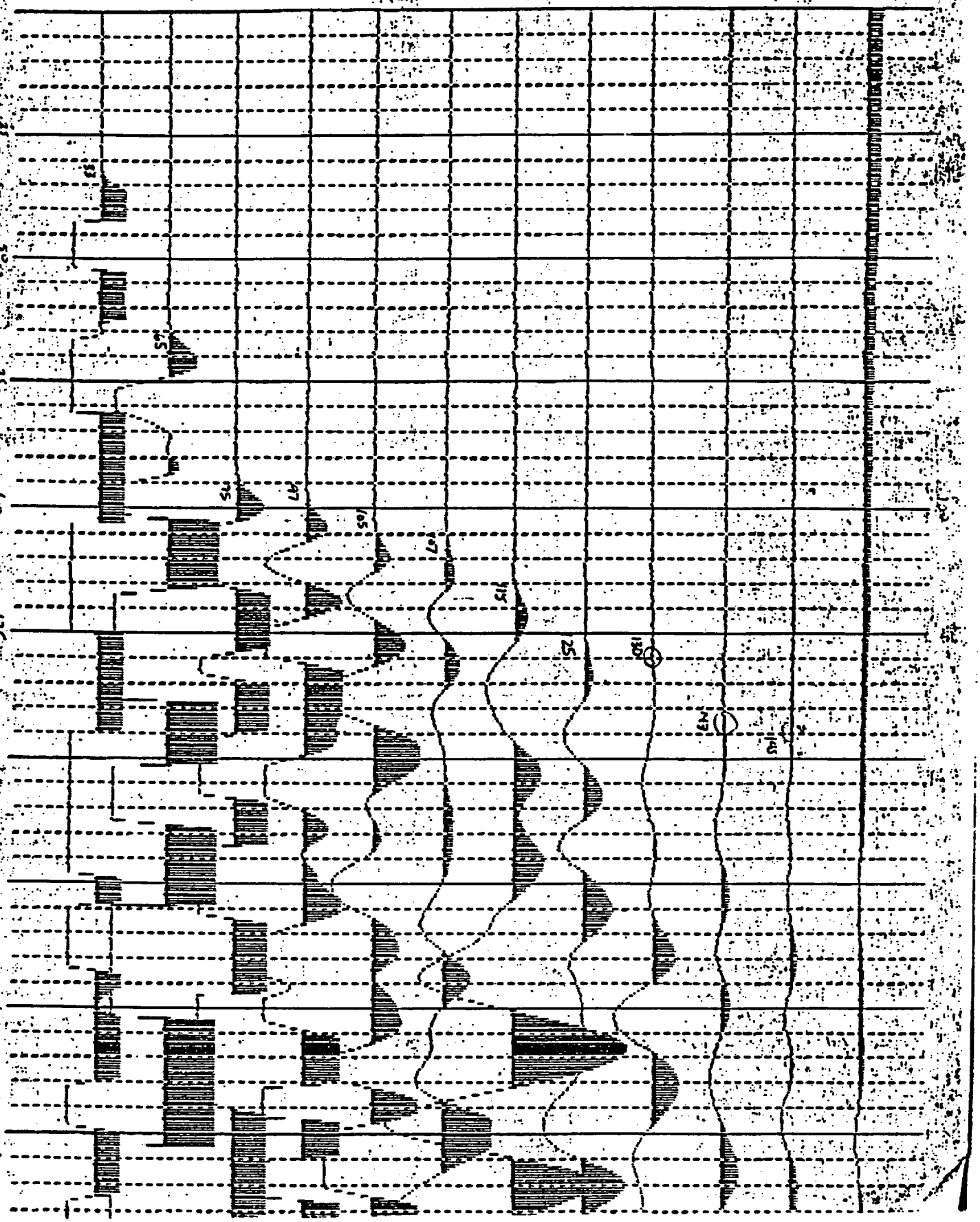
12 11 10 9 8 7 6 5 4 3 2 1



Windy Wash Line 4 Shot 5 E→W
Δ=100' Z=[illegible] phisp=100' Z=2.5
6/25/93 spread 1

1-1 SECOND RECORD LENGTH 25 MSEC PER MAJOR DIVISION

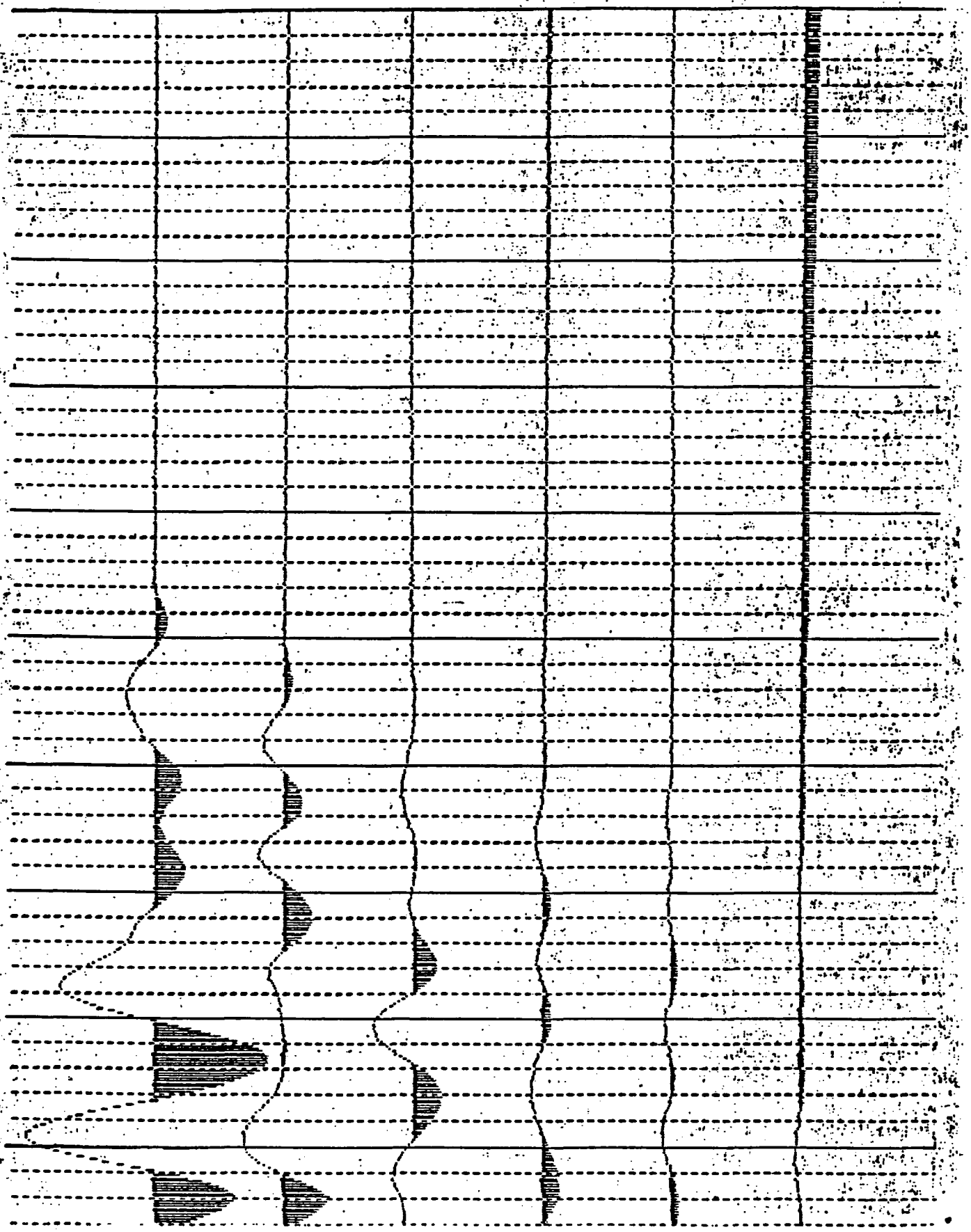
12 11 10 9 8 7 6 5 4 3 2 1



Windy wash Line 4 shot 5 E→W
dt=10' z=1' ph3p=100'
6/25/93 Spread 3

1/4 SECOND RECORD LENGTH 25 MSEC PER MAJOR DIVISION

6 5 4 3 2 1

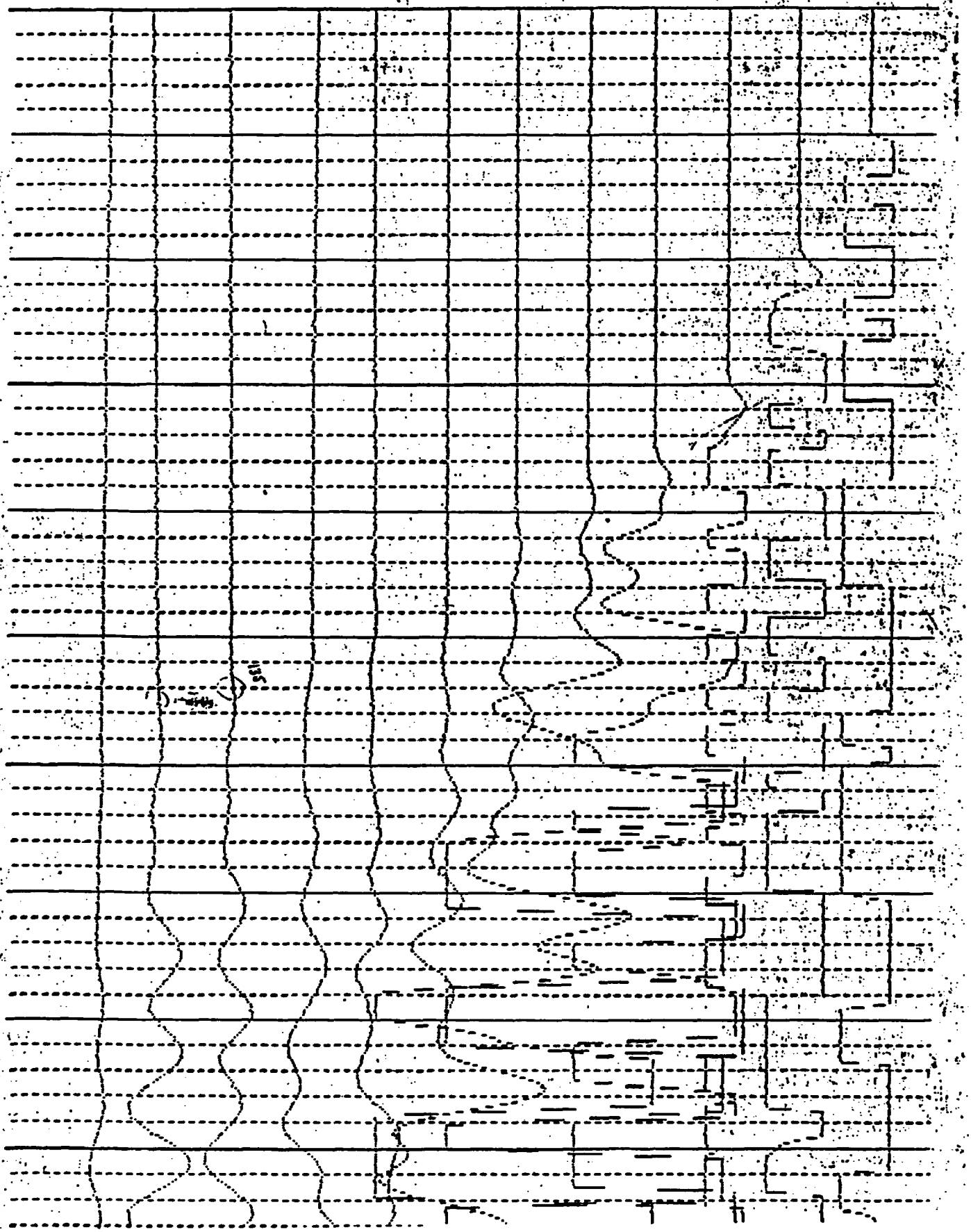


Line 4 Shot 6

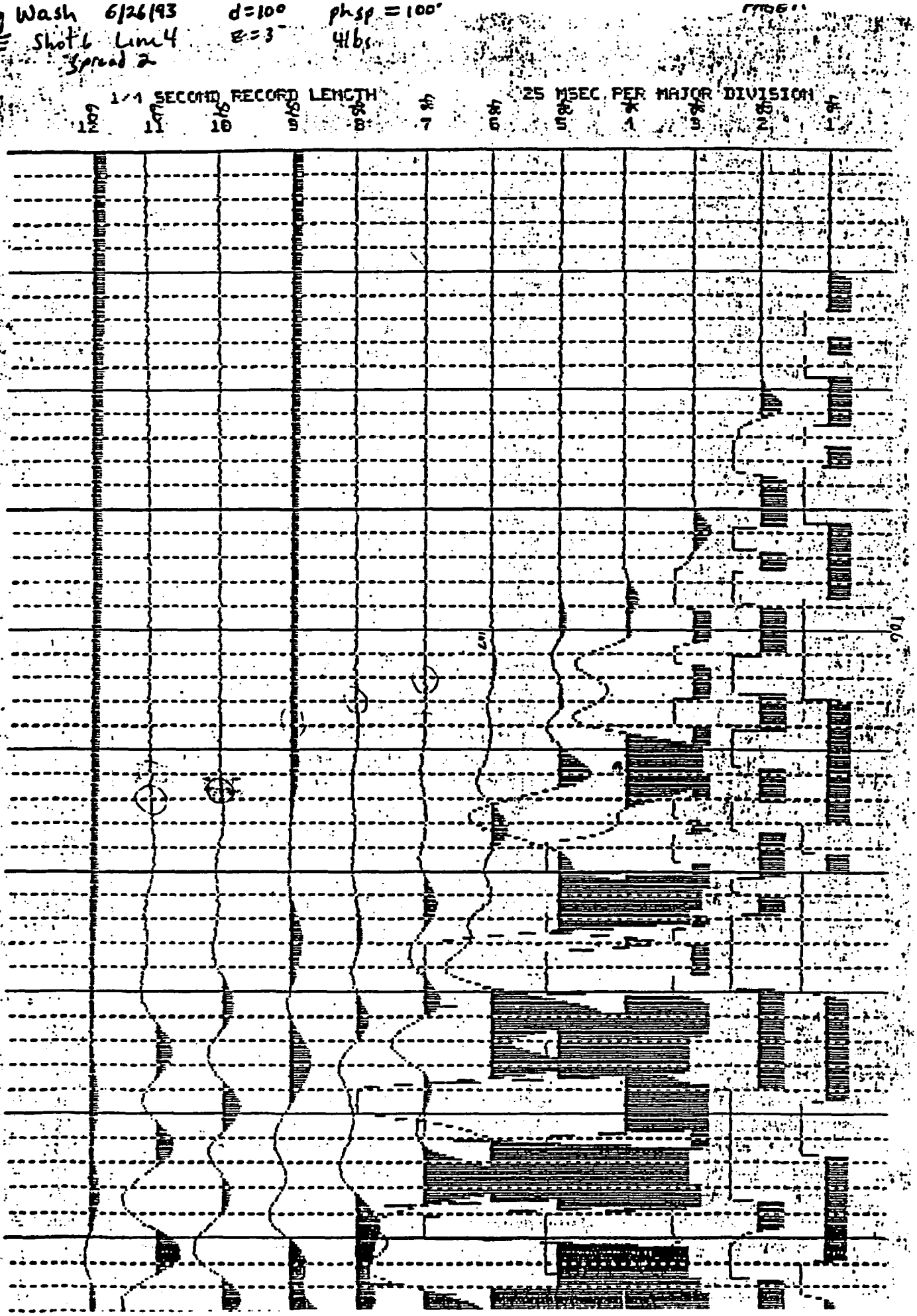
1/4 SECOND RECORD LENGTH

25 MSEC PER MAJOR DIVISION

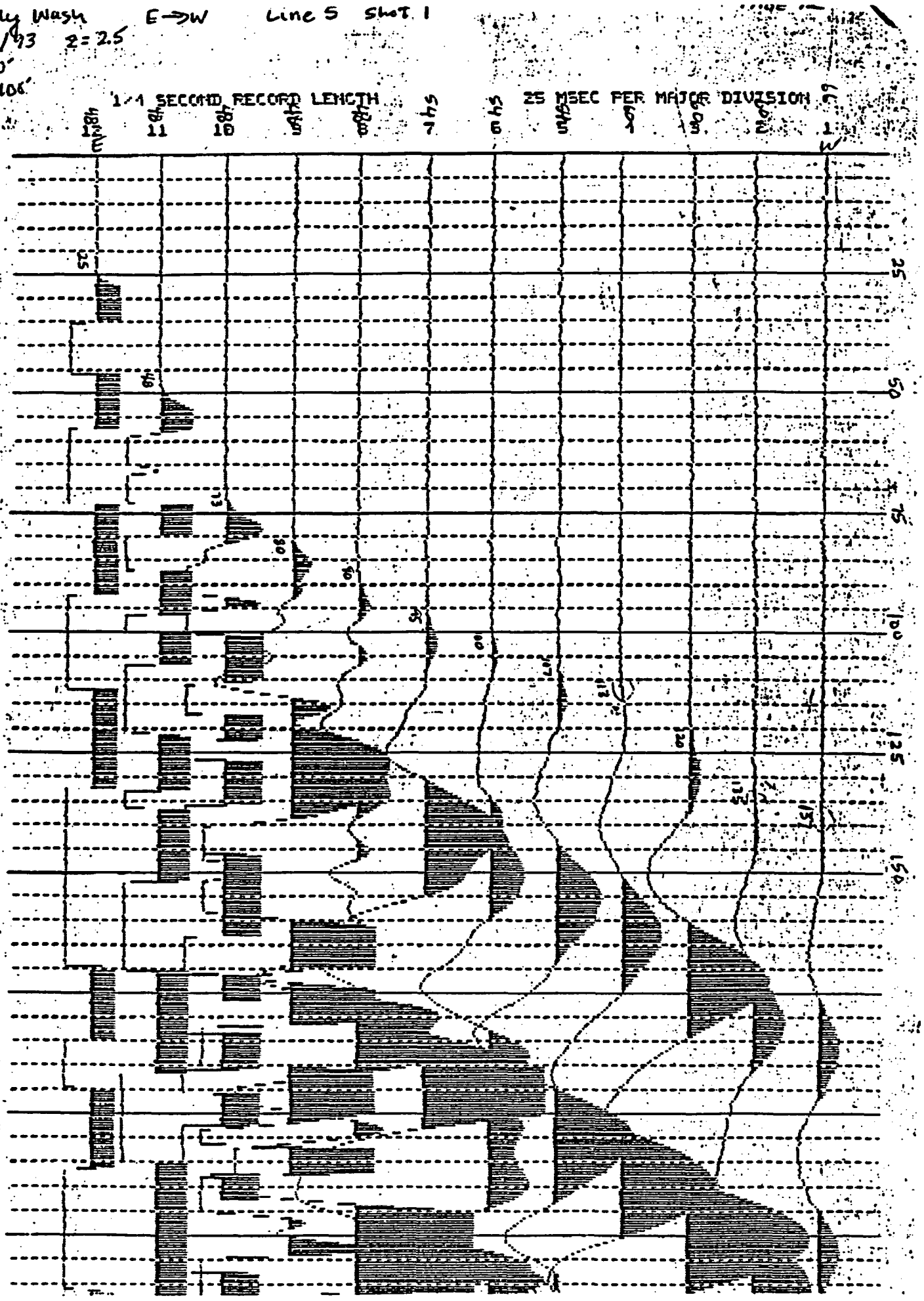
12 11 10 9 8 7 6 5 4 3 2 1



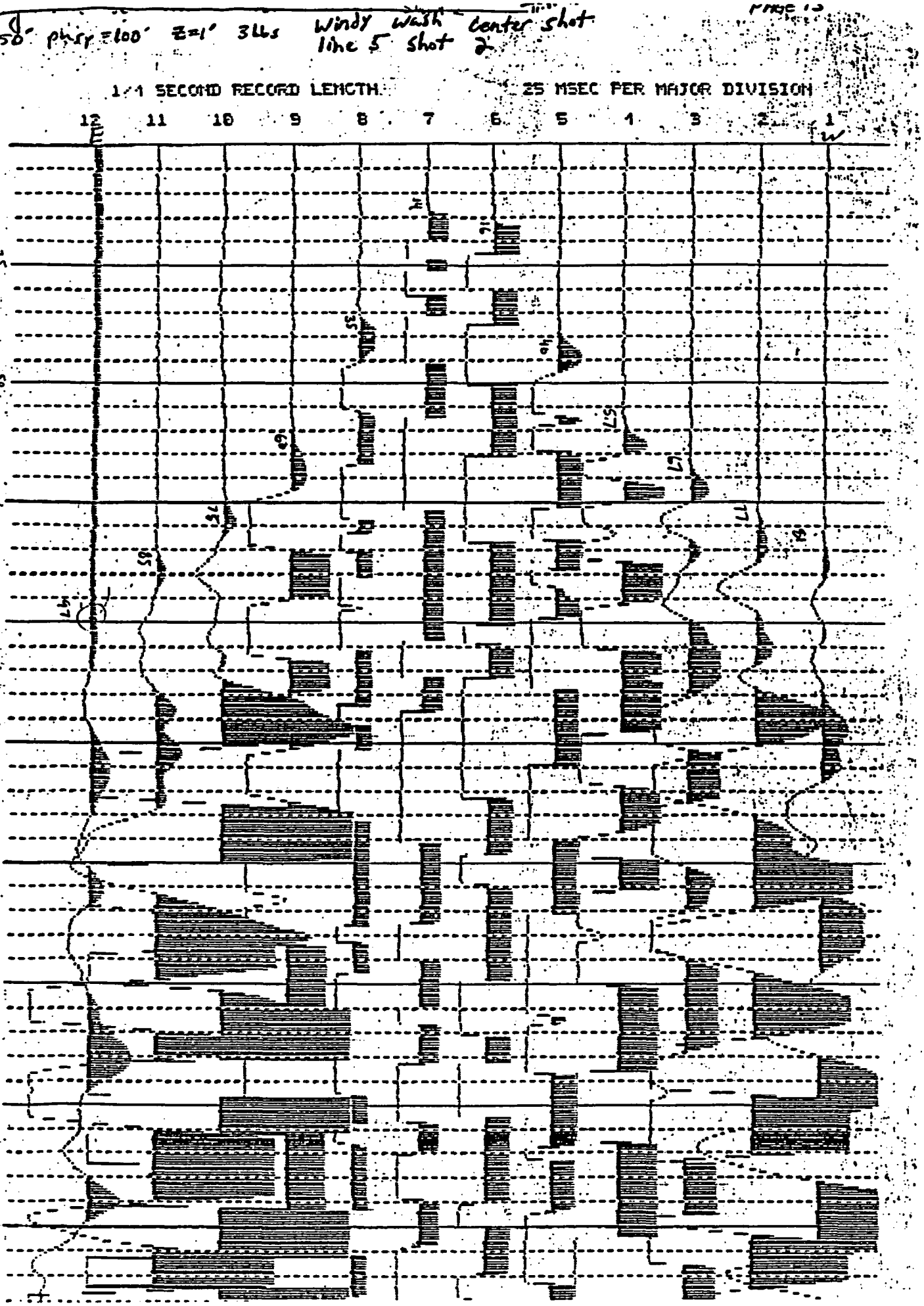
Windy Wash 6/26/93 d=100 phsp = 100°
W>E Shot 6 Line 4 E=3 4lbs
Spread 2



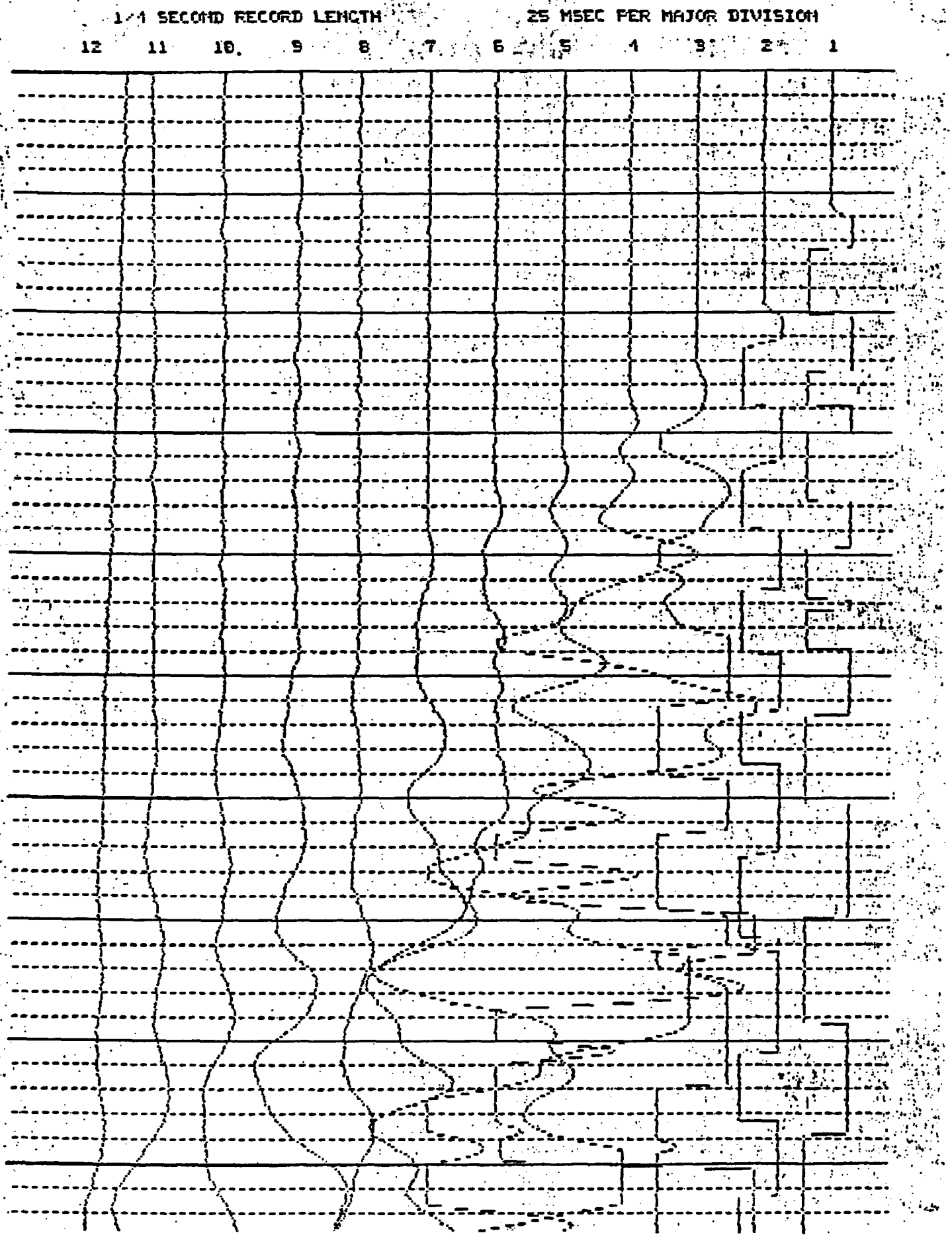
Windy Wash E→W Line 5 Shot 1
6/26/93 z=2.5
d=100'
phsy 106'
4 lbs



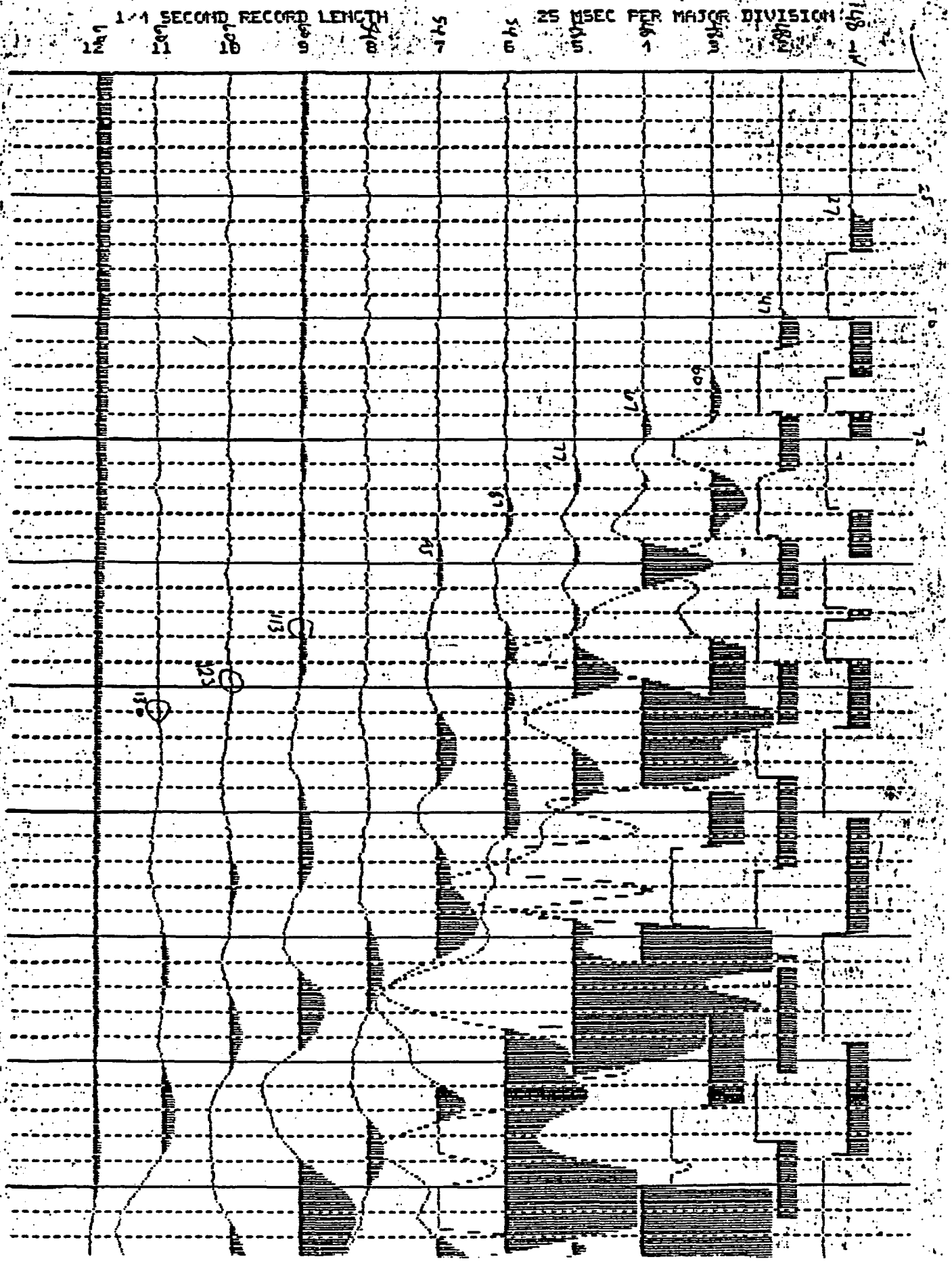
d=50' phsy=100' Z=1' 3lbs Windy Wash Center Shot
line 5 shot 2
6/26/93



Windy Wash 6/26/93 W→E Line 5 Shots PAGE 14
d=100' phisp=100' z=25' 4lbs



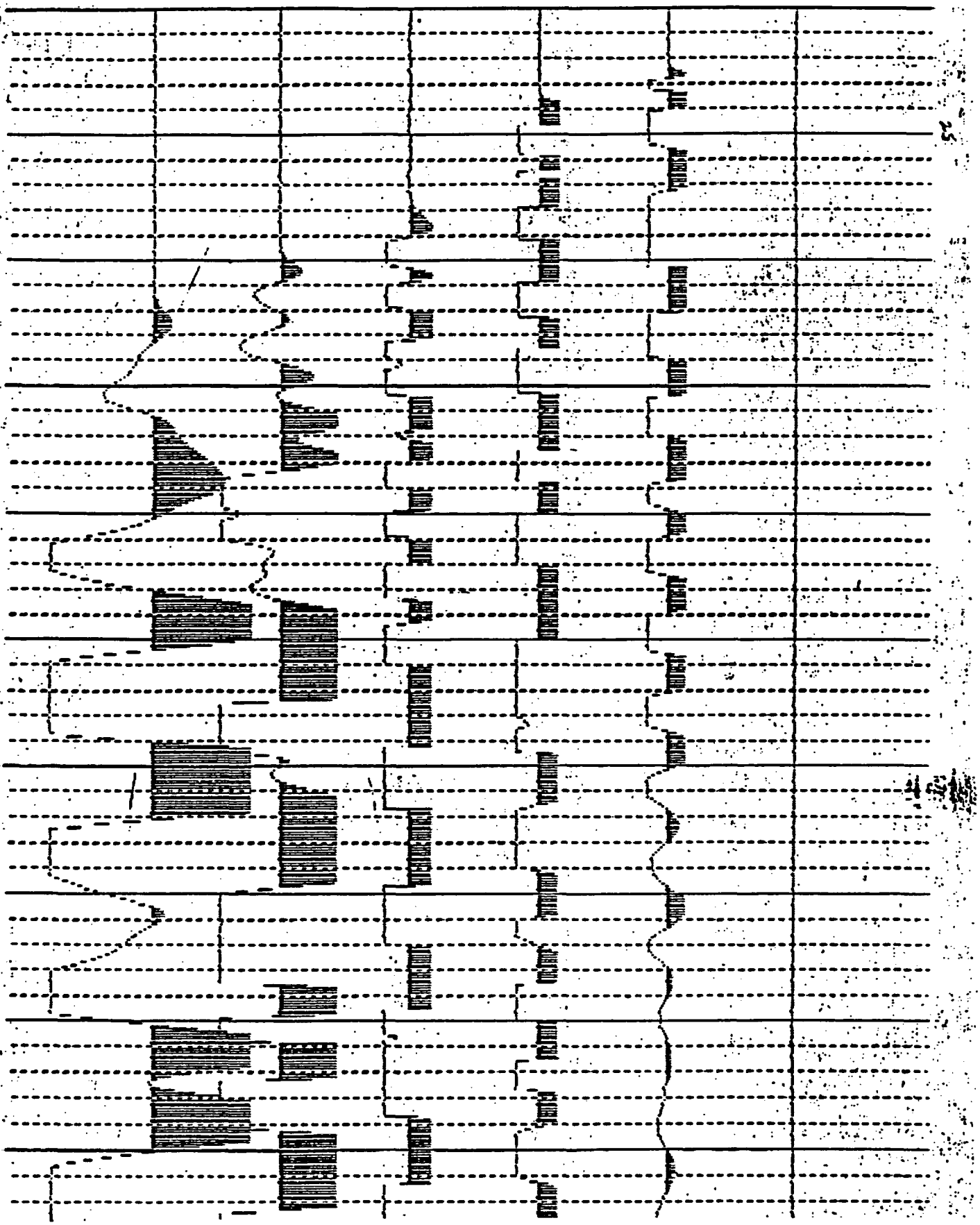
Windy Wash W→E lines Shot 3 6/26/95
d=100' phase=180' e=2.5' 4Hz



6-27-93 Line 6 shot 1 W=E
Windy Wash Z215 316s
d=50'
plug=50-100'

1/4 SECOND RECORD LENGTH — 25 MSEC PER MAJOR DIVISION

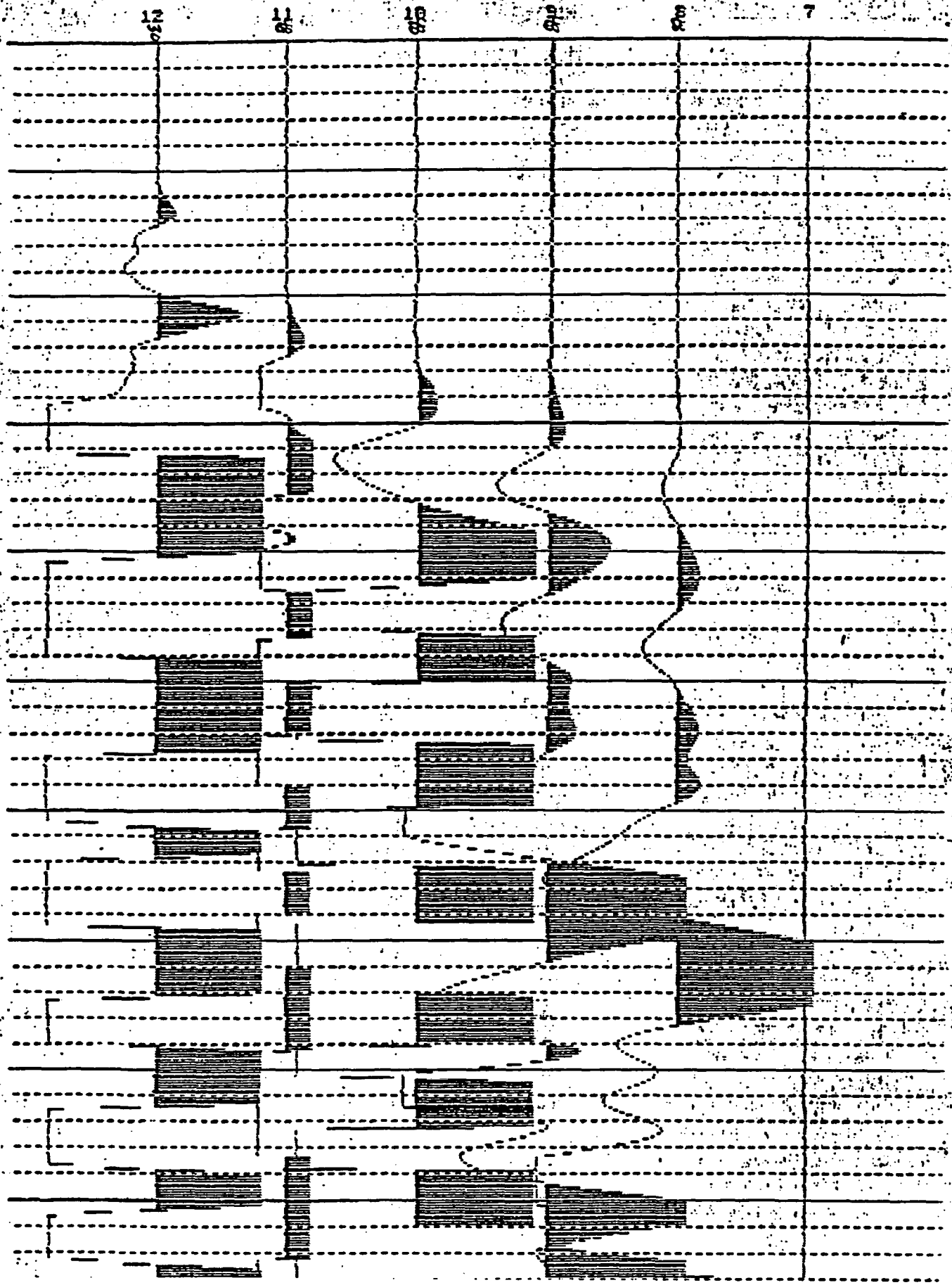
12 11 10 9 8 7



6/27/93 Line6 Stat2 E→W
d=100 z=25°
sph-sp=100 216₂

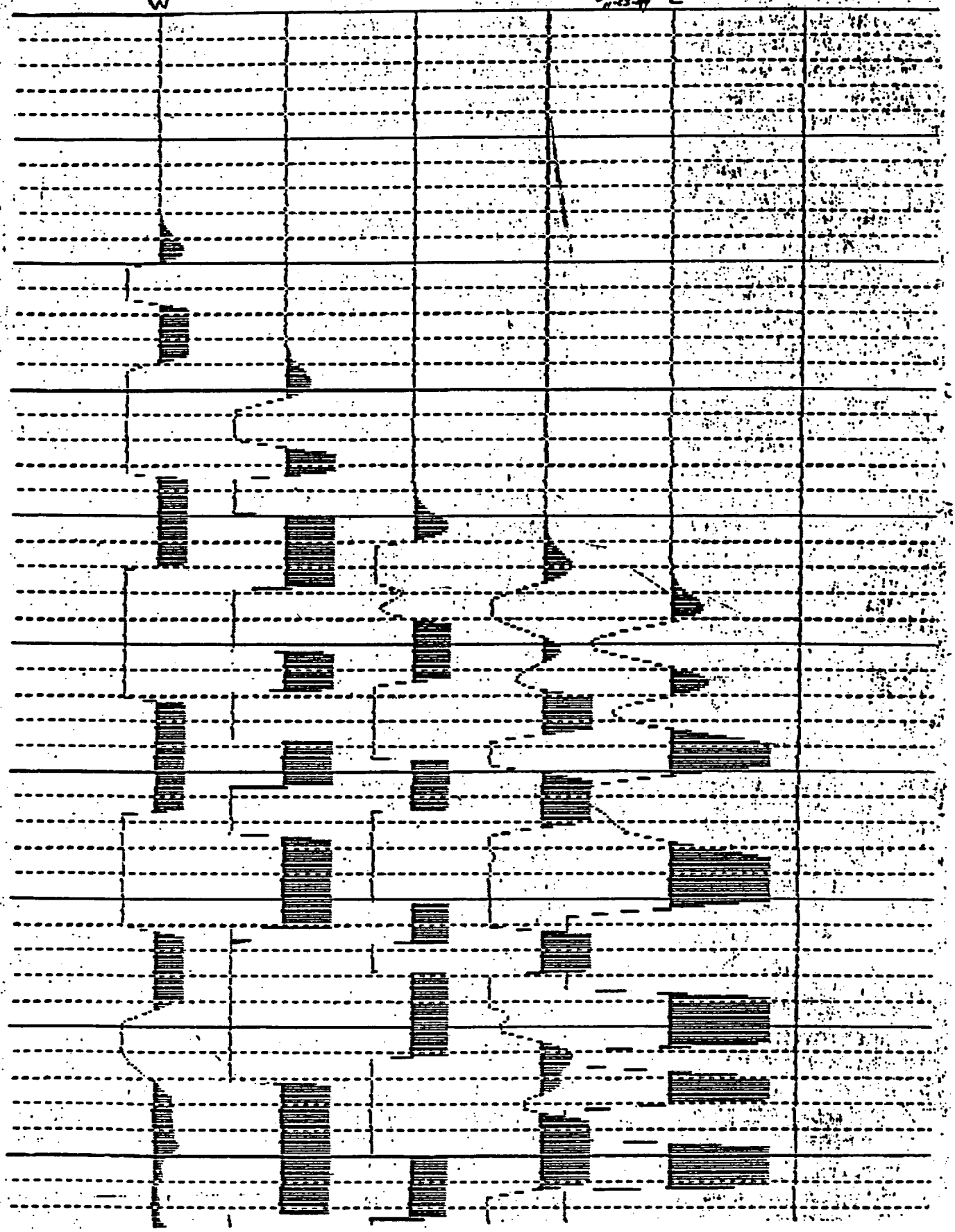
PAGE 17

1/4 SECOND RECORD LENGTH 25 MSEC PER MAJOR DIVISION

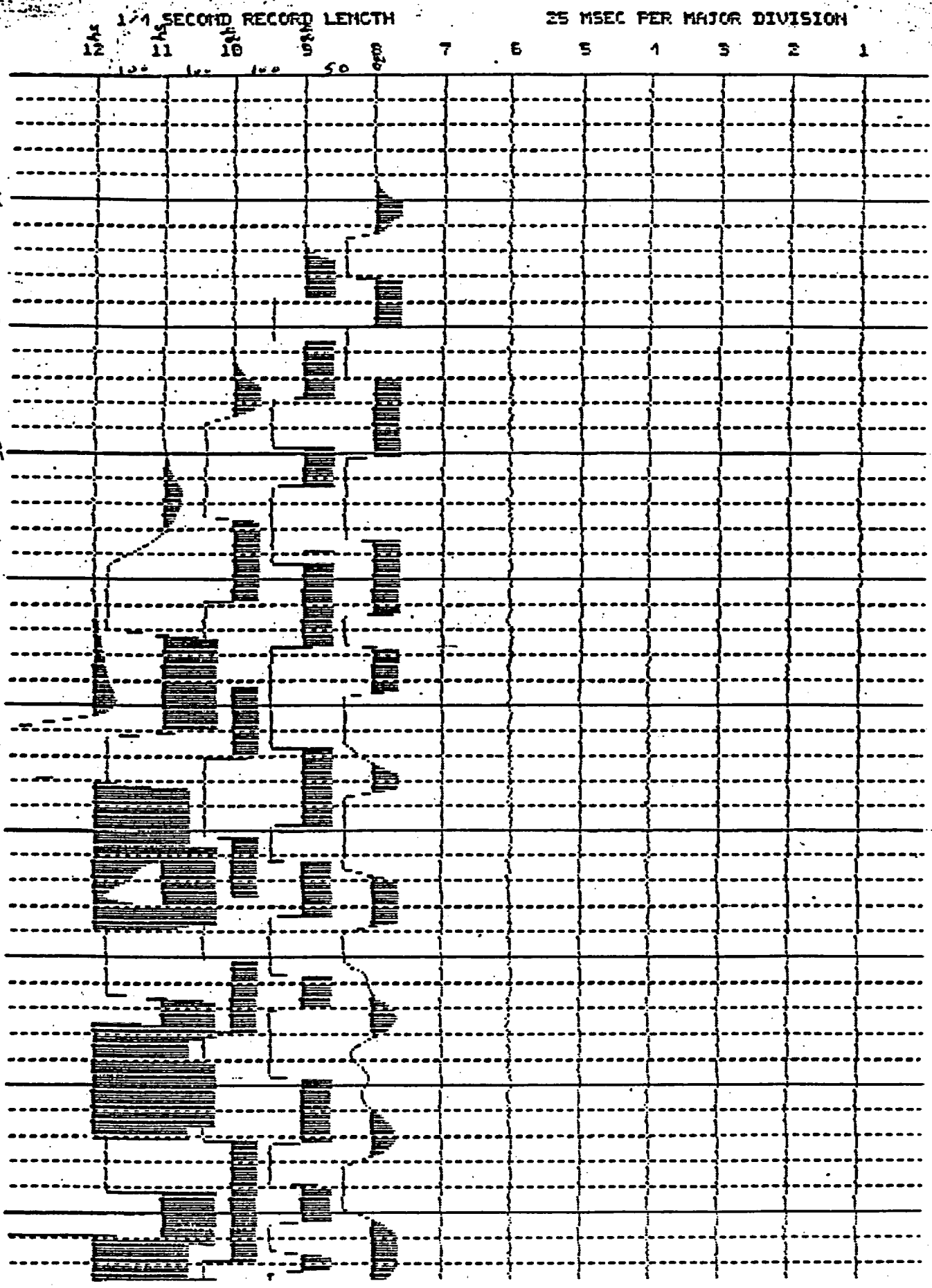


Windy Wash 6/27/93 Line 4 eastend extension (spread 2)
Shot 1
W → E
d = 100'
Z = 2'

1/1 SECOND RECORD LENGTH
125 MSEC PER MAJOR DIVISION



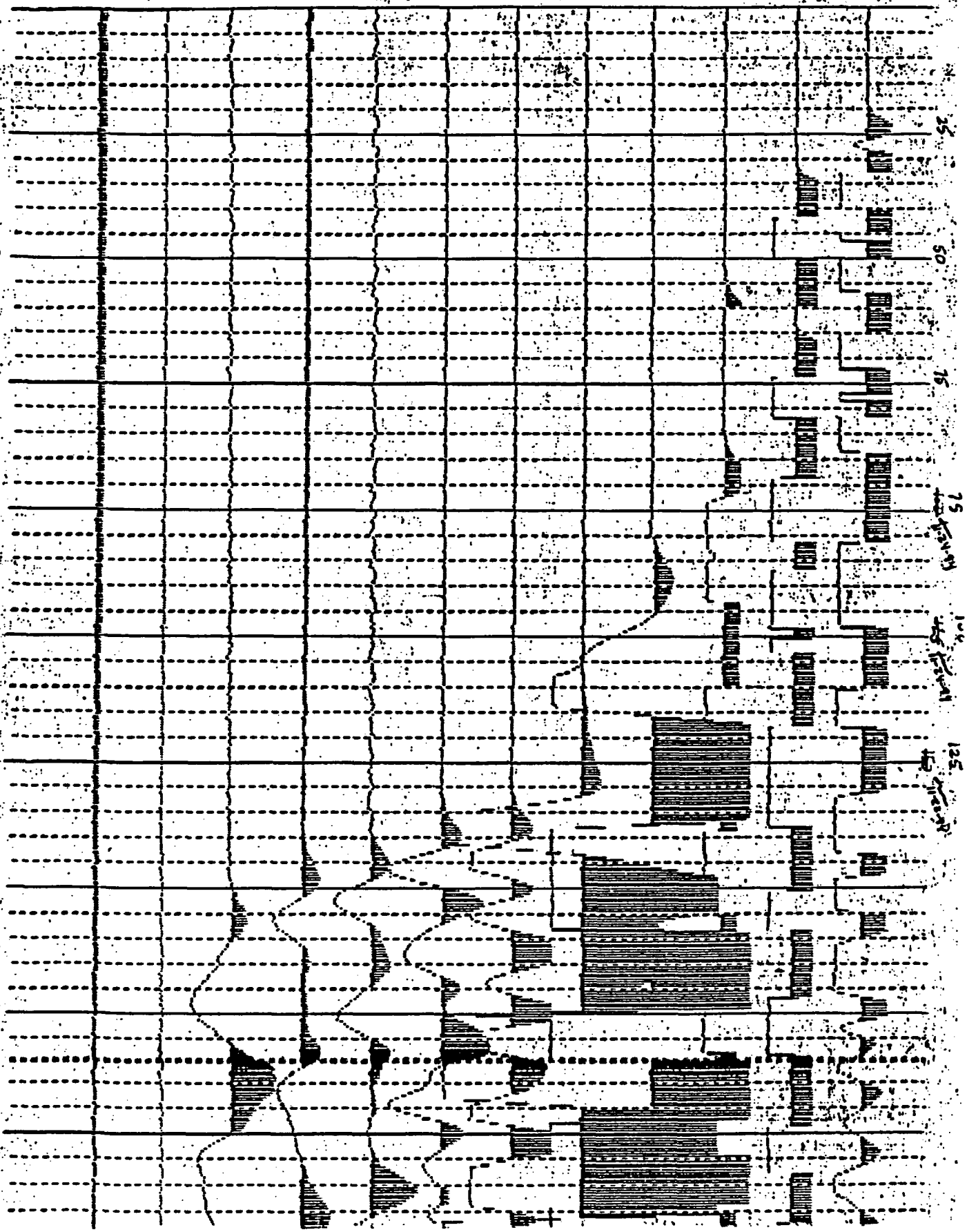
Windy Wash 6/24/93 Line 4 ~~SW NE~~ (Spread 2)
Z=2-1 E→W d=60' Shot 2 Eastern Extention



Windy Wash E→W 6/27/93 Line 4 Shot 3 extend explosive spread 2)
d=50' 22'

1/4 SECOND RECORD LENGTH — 25 MSEC PER MAJOR DIVISION

12 11 10 9 8 7 6 5 4 3 2 1



d=100' z=25' 4lbs
Windy wash 6/27/93 line 3 spread 2 shot 1 S→N

1/4 SECOND RECORD LENGTH — 25 MSEC PER MAJOR DIVISION

12 11 10 9 8 7 6 5 4 3 2 1

100

150

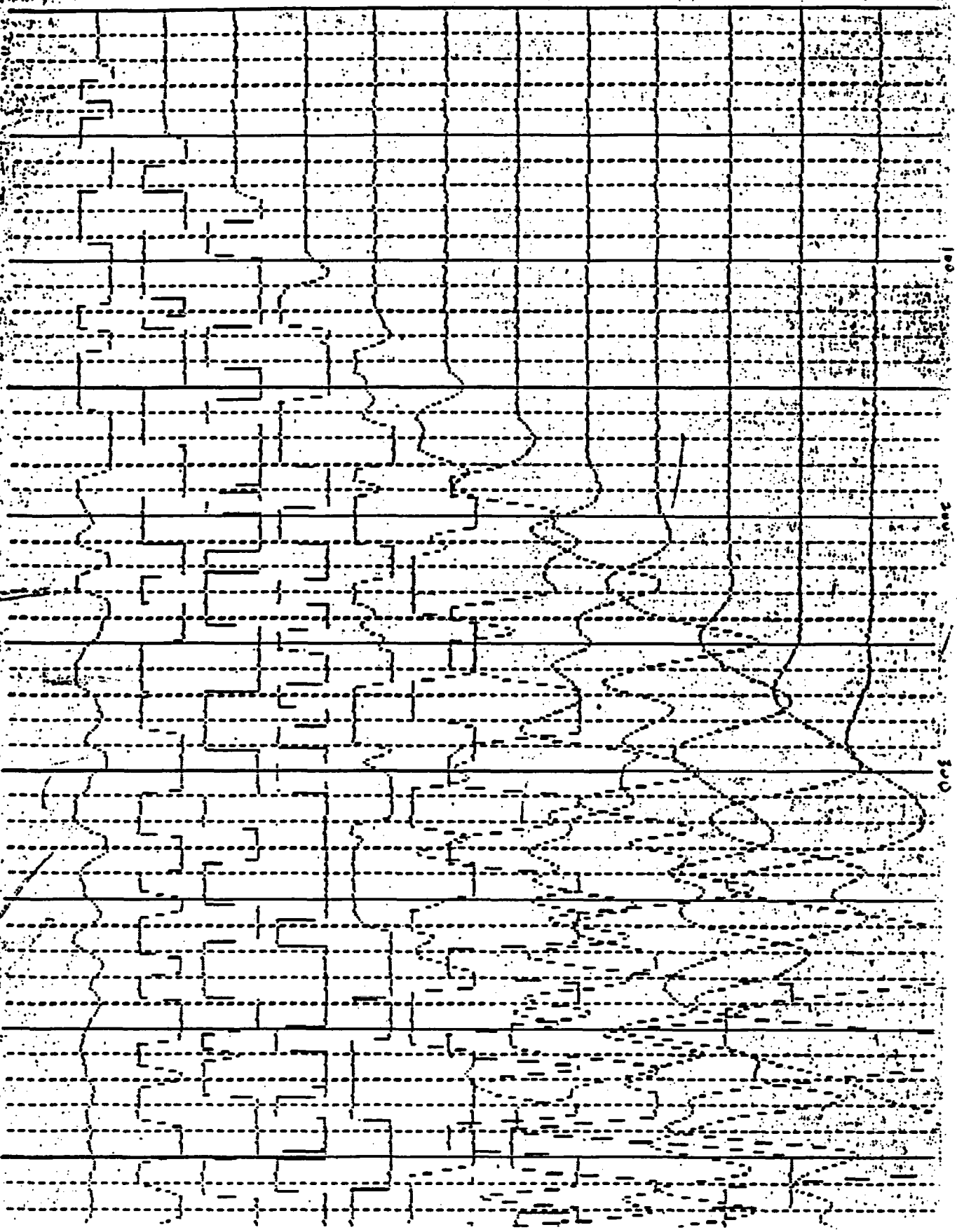
200

Line 3 Spread 2 Shot 2 6/27/93 windy wash

S→N Z=3' d=50'

1/2 SECOND RECORD LENGTH — 50 MSEC PER MAJOR DIVISION

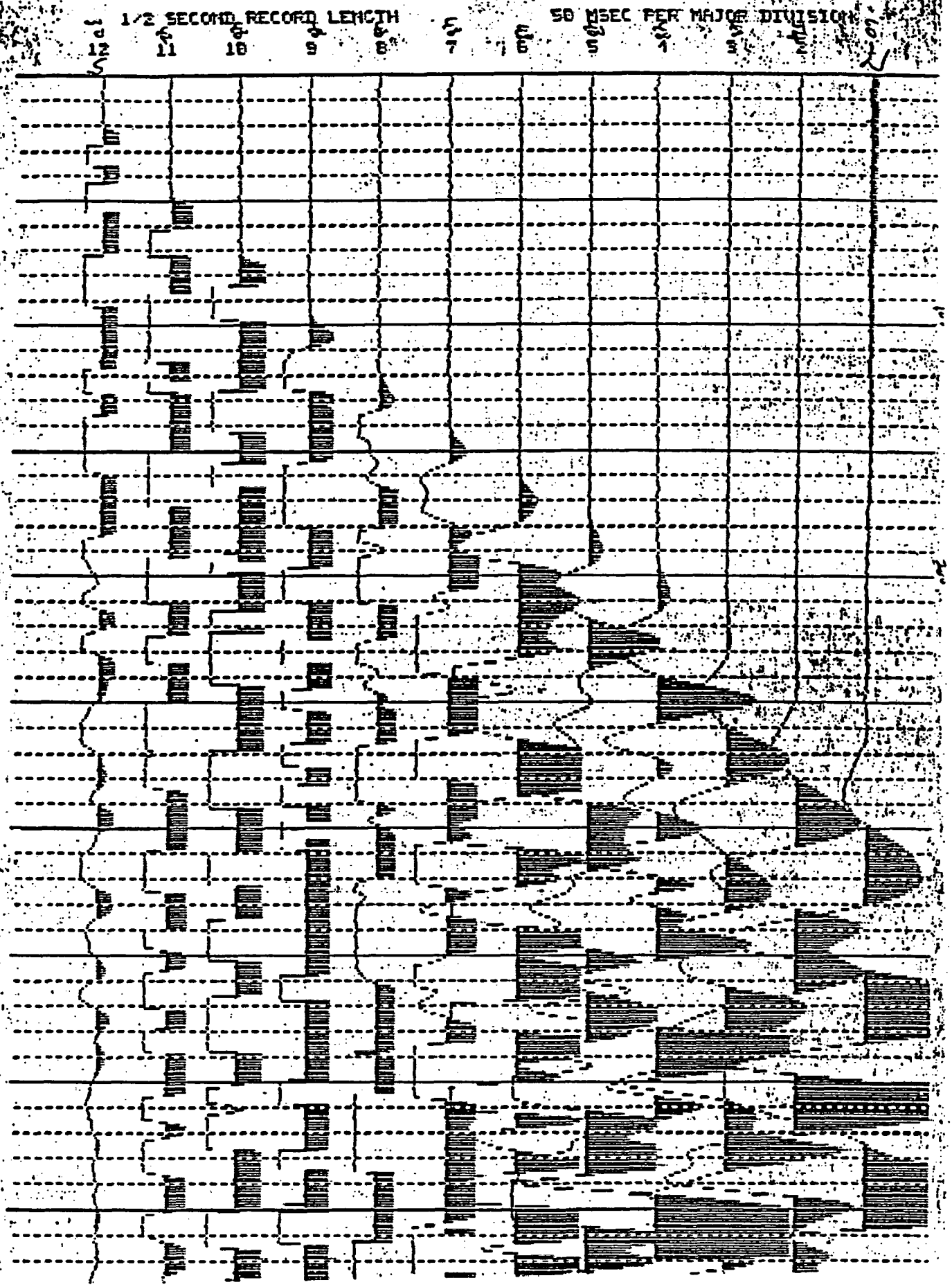
12 11 10 9 8 7 6 5 4 3 2 1



Line 3 Spread 2 Shot 2 6/27/93 Windy Wash

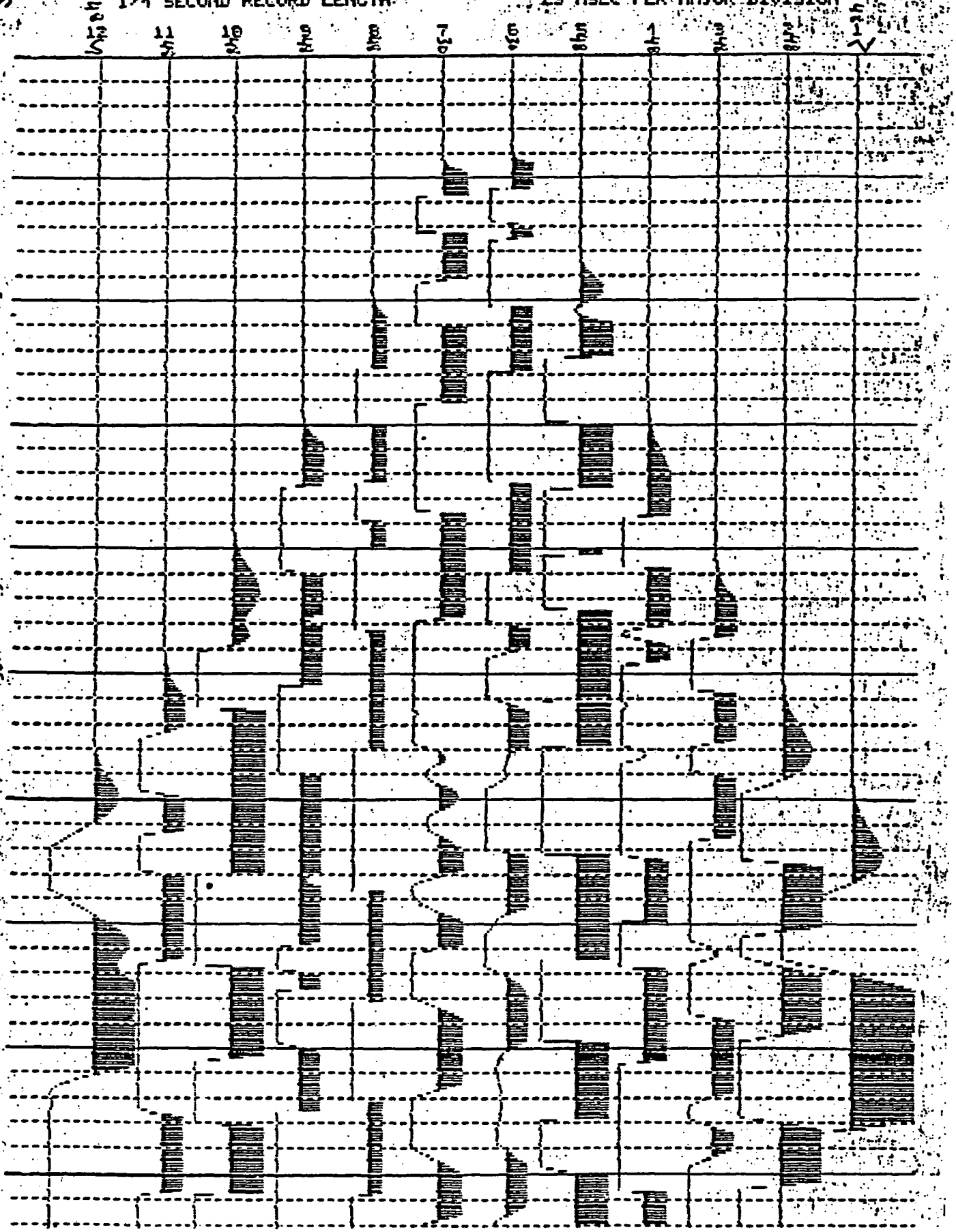
d=50 S⇒N 4/6s

e=5'



Windy Wash 6/28/93
Drill 3 spread 2 sht 3 center
2.5' d=50'
316

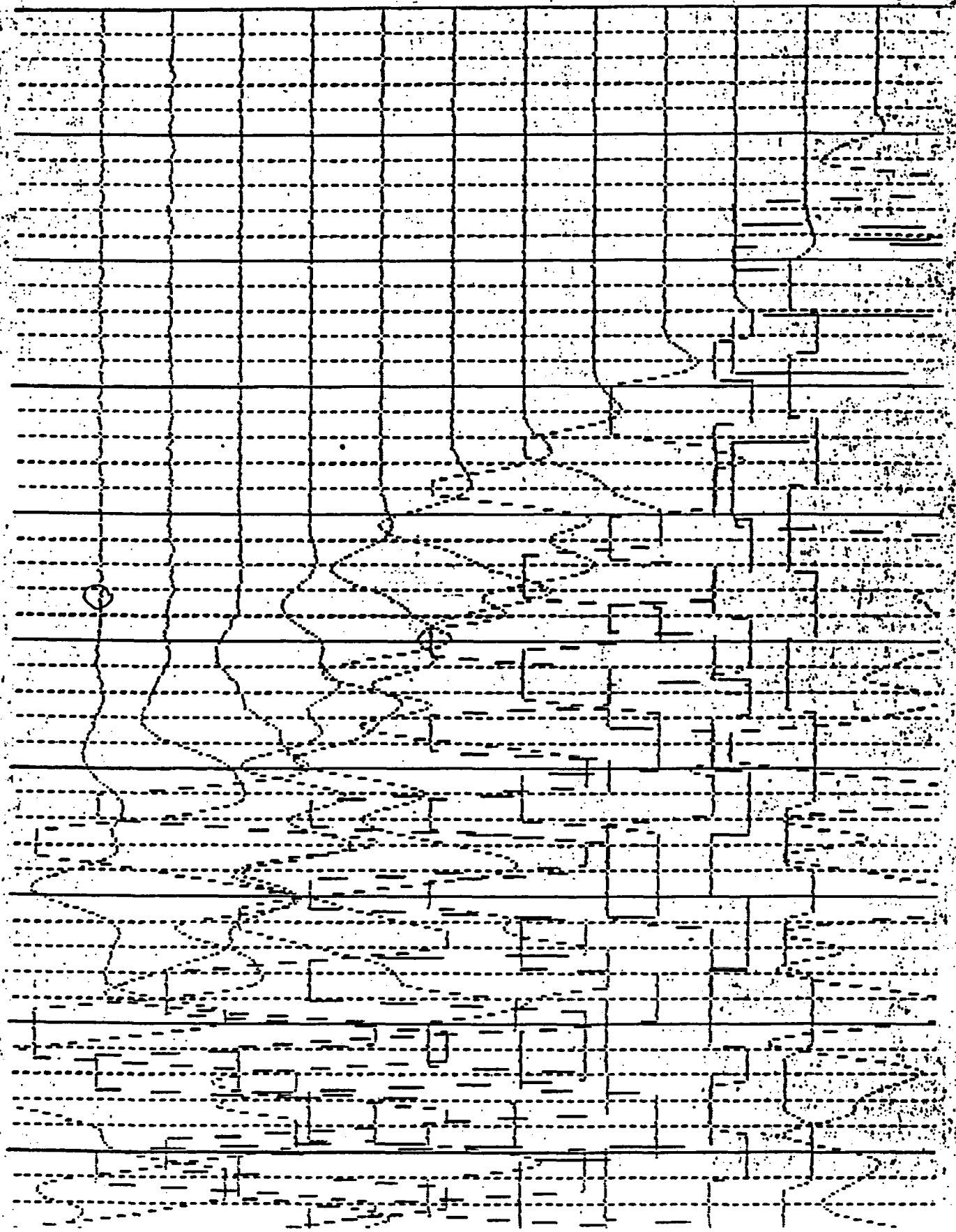
PAGE 24



Wendy Welch 6/29/93
Lewis Spread 2 shot 4
N→S Z=2.75' d=100'

1/2 SECOND RECORD LENGTH 50 MSEC PER MAJOR DIVISION

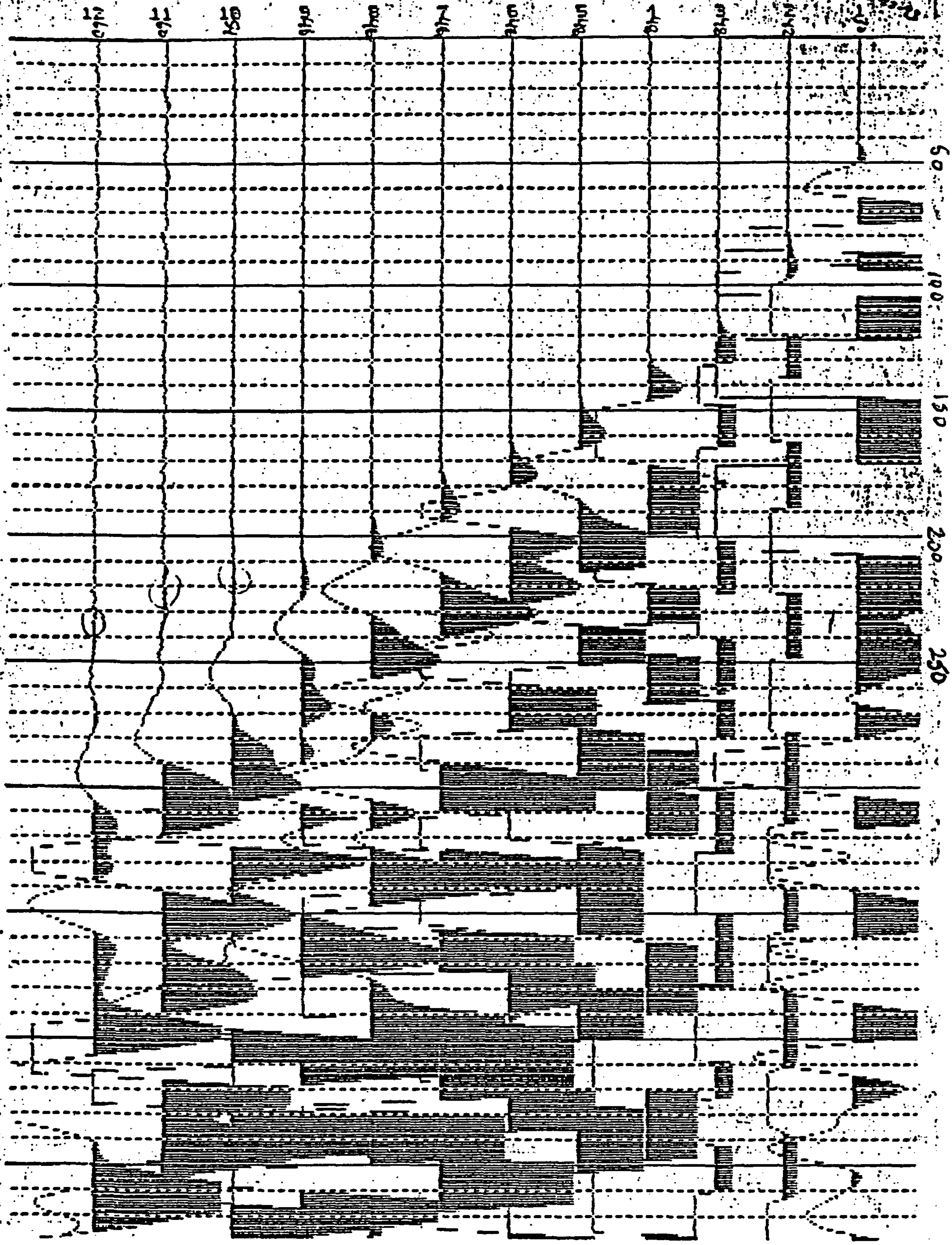
12 11 10 9 8 7 6 5 4 3 2 1



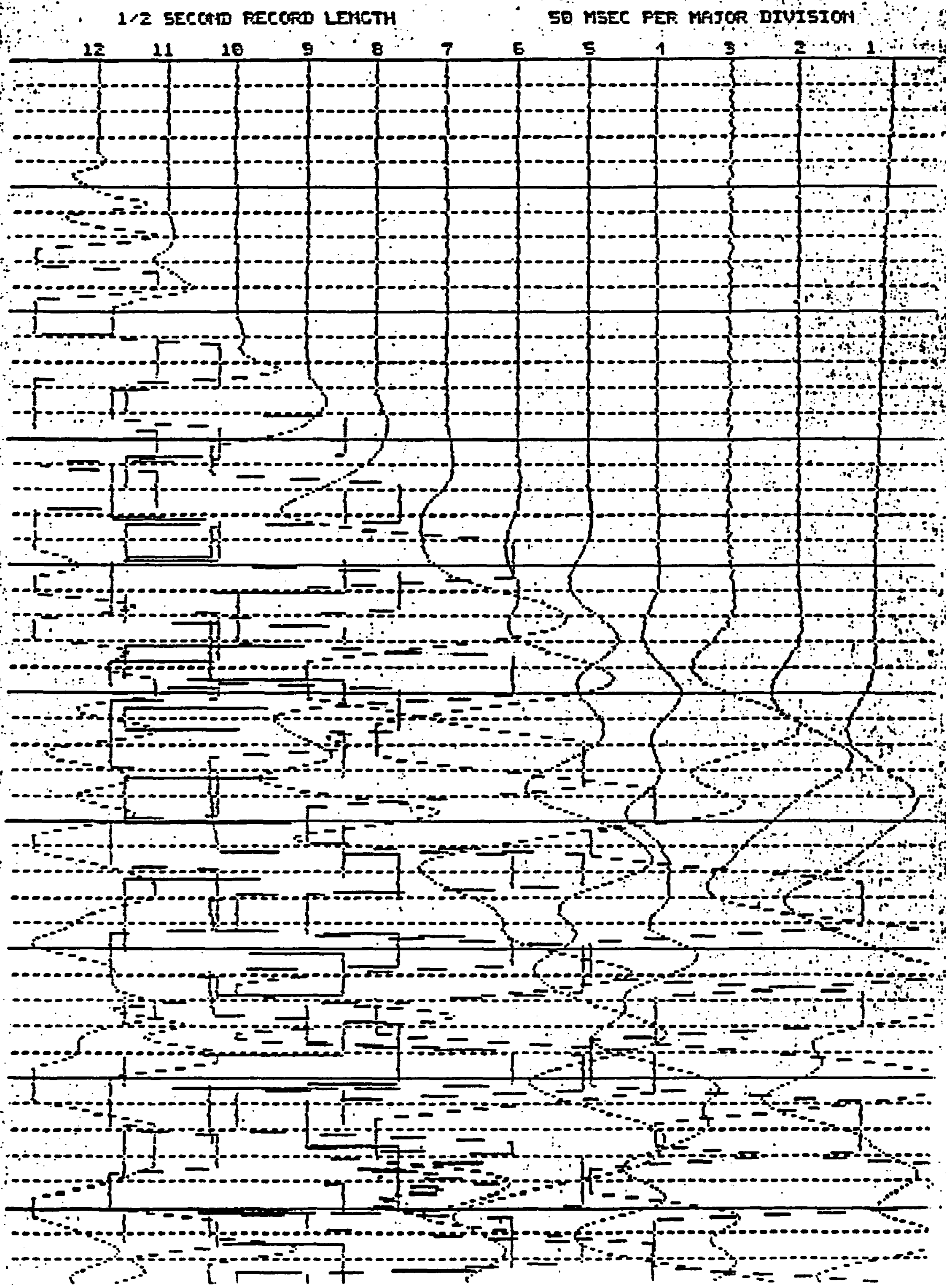
Windy Wash 6/28/93 1^{us}/100
Line 3 Spread 2 Shot 4
~~2-7.7~~ 2=2.5'
PAGE 26

1/2 SECOND RECORD LENGTH

50 MSEC PER MAJOR DIVISION

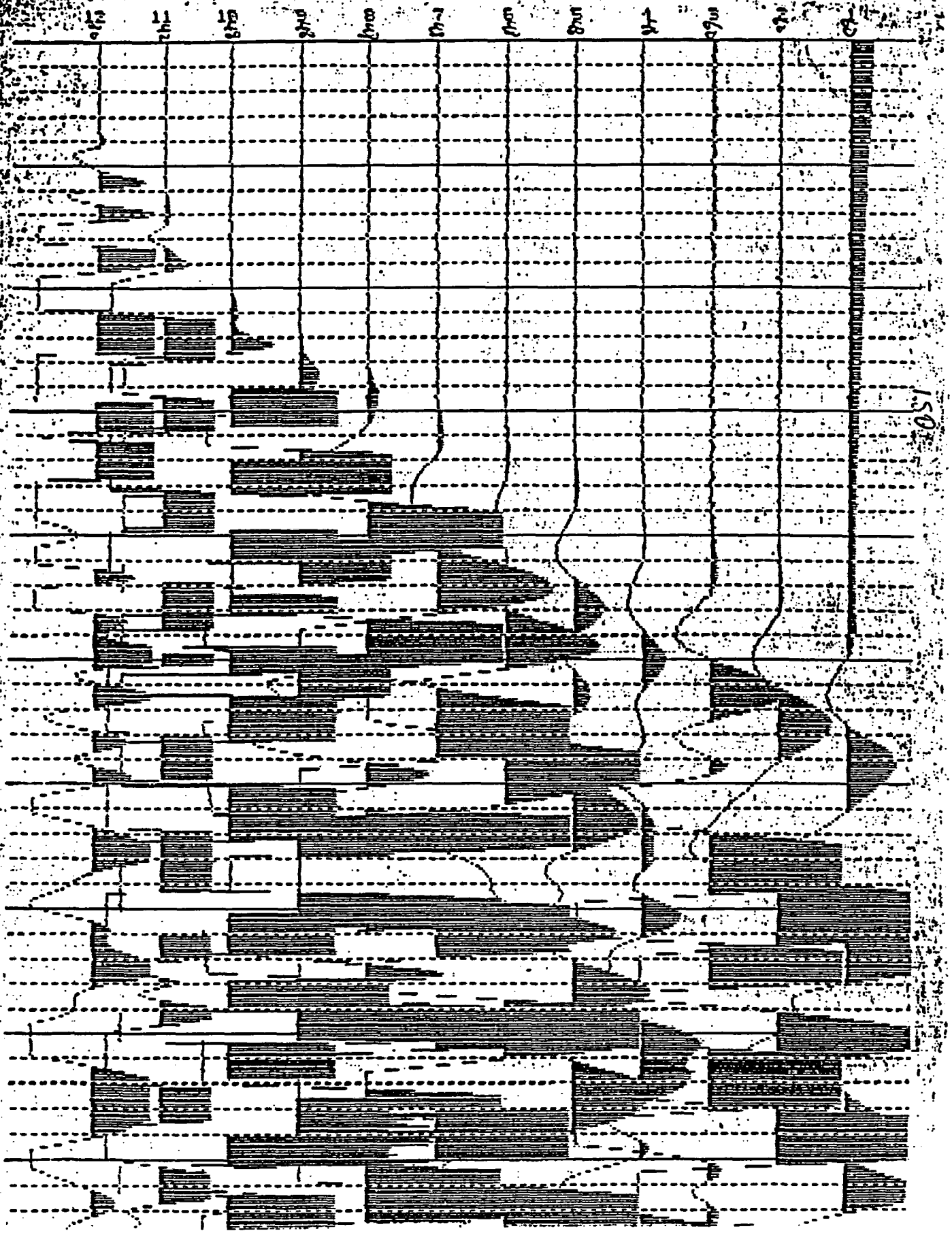


Windy Vash 6/28/93 L=16' S→N
Line 3 spread 3 SLA1 Z=2.5 4lbs



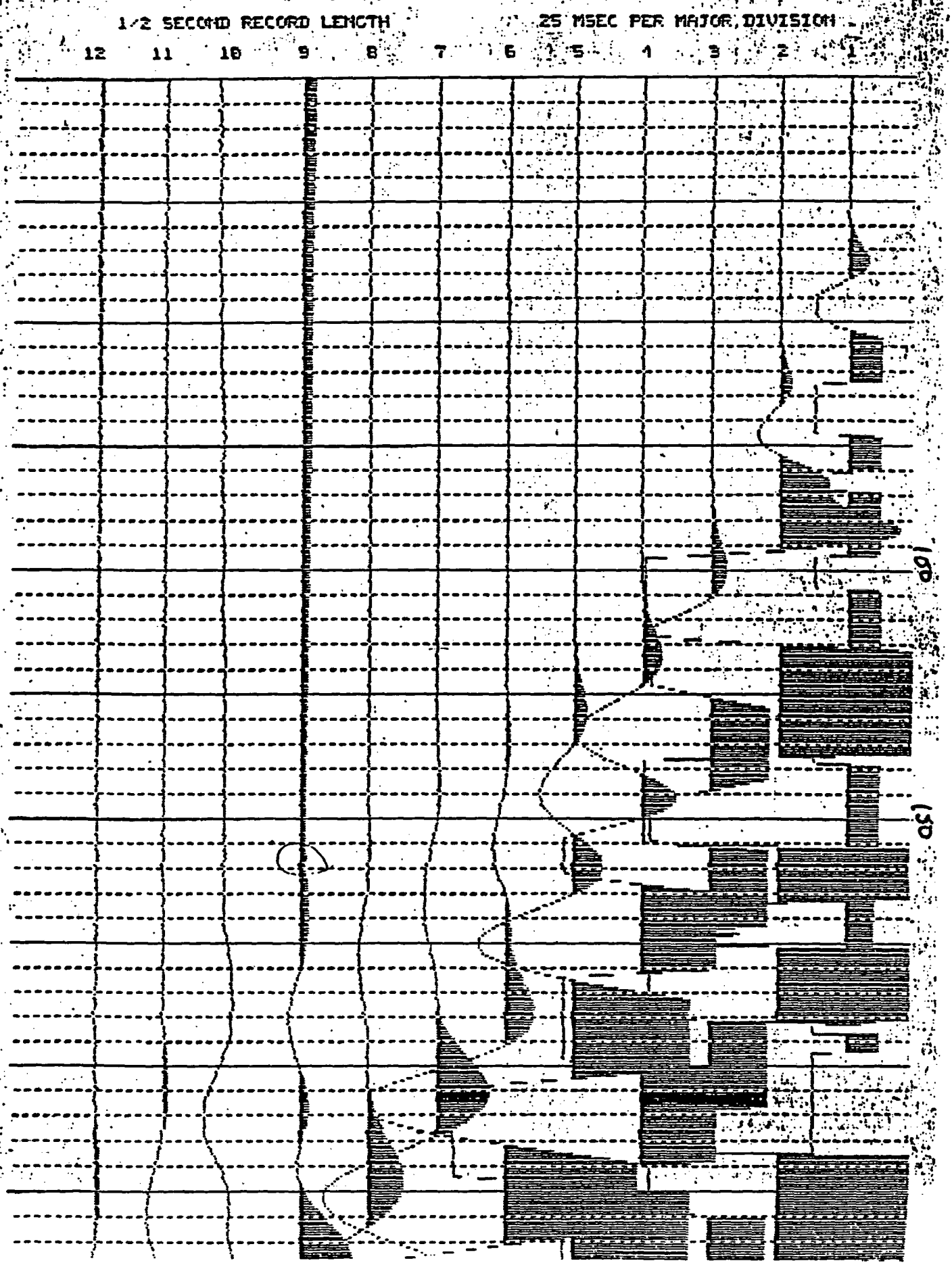
Windy Wash: 6/28/93 $\delta = 110°$ $\delta \rightarrow N$
Line 3, shot 1 spread 3 $\theta = 25°$ 4125

1/2 SECOND RECORD LENGTH 50 MSEC PER MAJOR DIVISION



6/28/93 Line 3 spread 3 shot 2 ~75

Windy Wash d=100' ℓ=2.5'



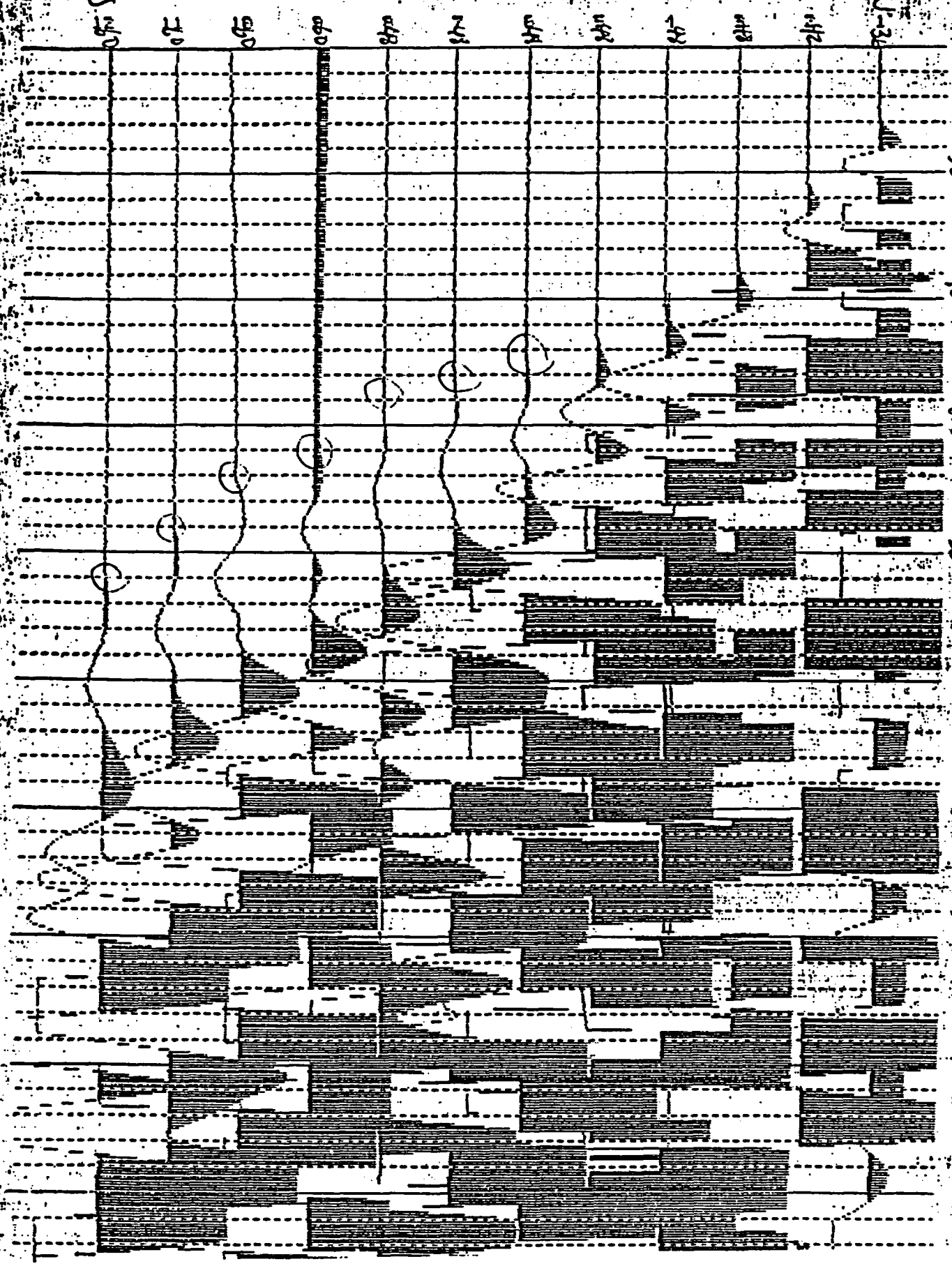
4/28/93. Line 3 spread 3 shot 2 N-75 Z=2.6 41.6

d = 140 ft. 100 ft/dip

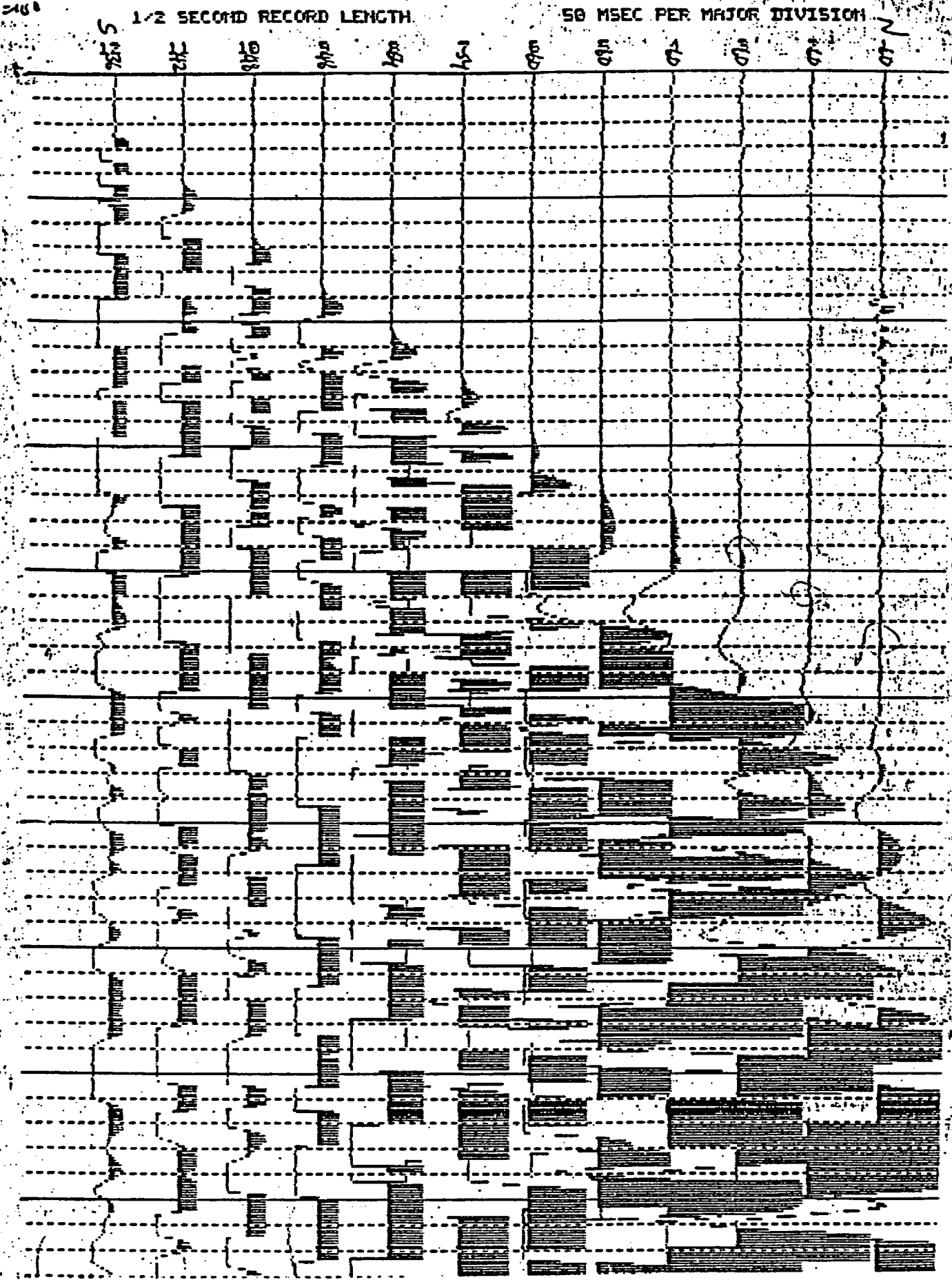
Windy Wash

1/2 SECOND RECORD LENGTH

50 MSEC PER MAJOR DIVISION



Windy Wash
Line 1 shot 1 S→N
d=101' zzz'
6/28/93
Spread 1



Windy wash
Line 1, Shot 1 S⇒N
d=100' Z=2'
spread

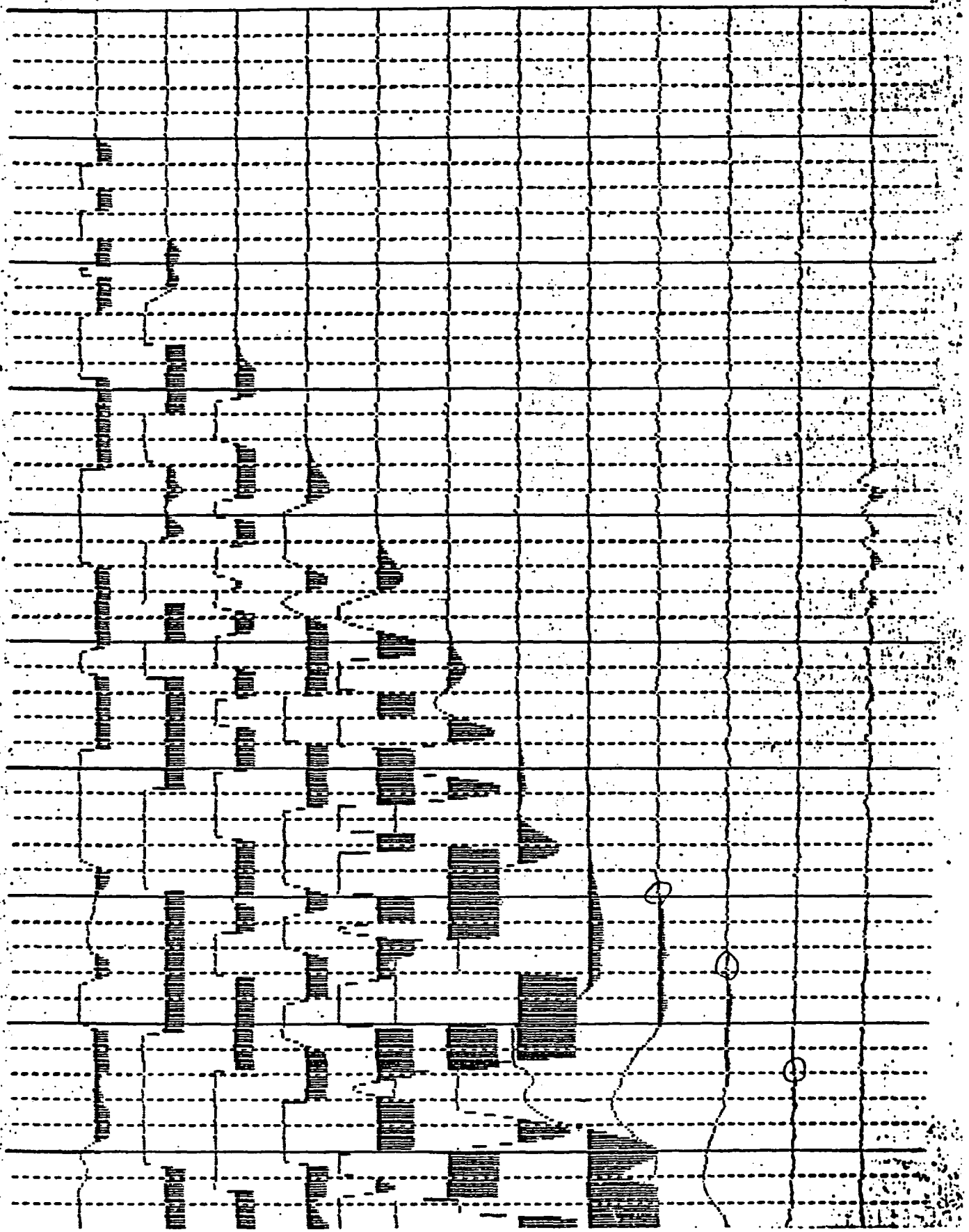
6/28/93

PAGE 32

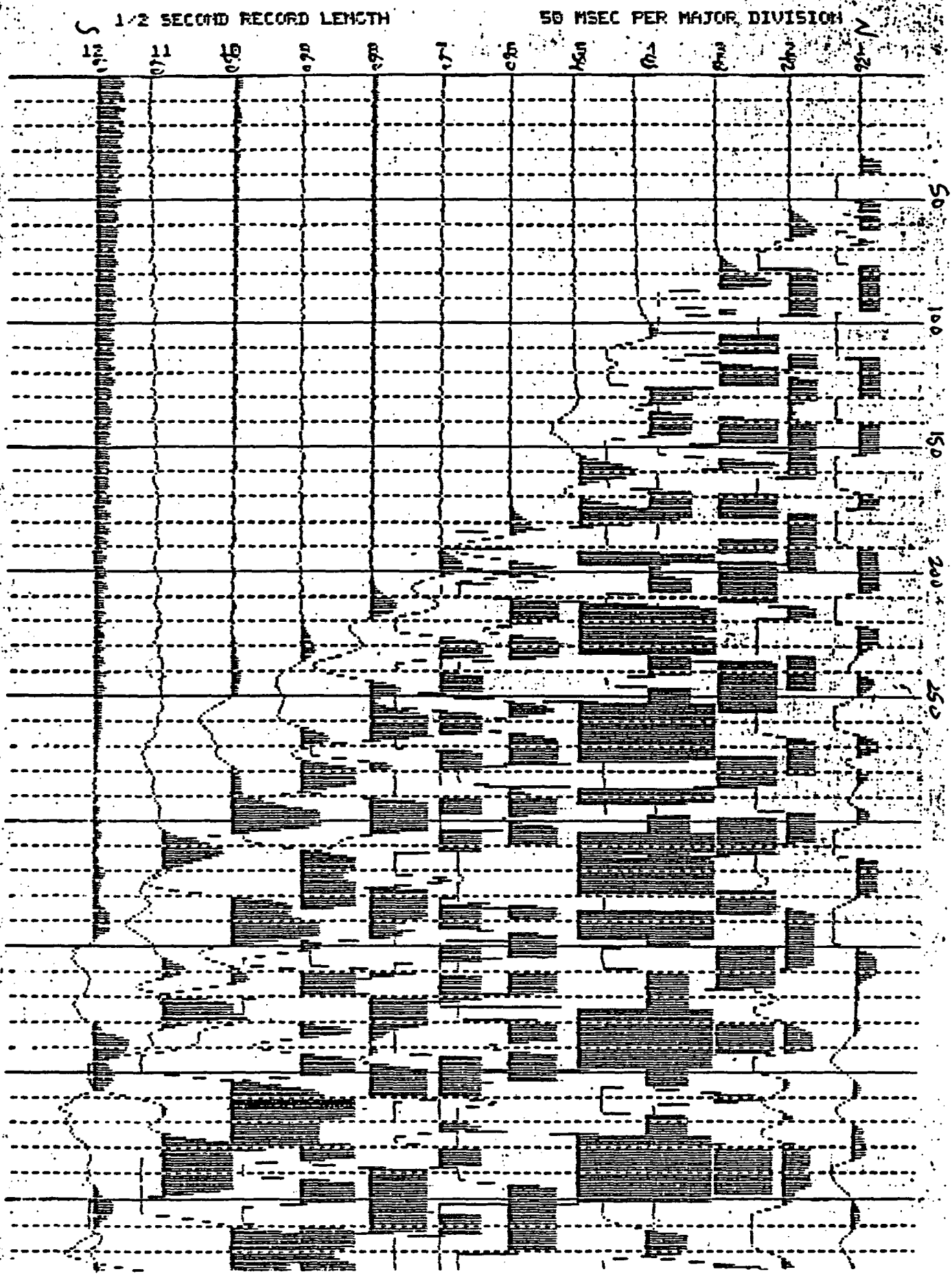
1/2 SECOND RECORD LENGTH

25 MSEC PER MAJOR DIVISION

12 11 10 9 8 7 6 5 4 3 2 1

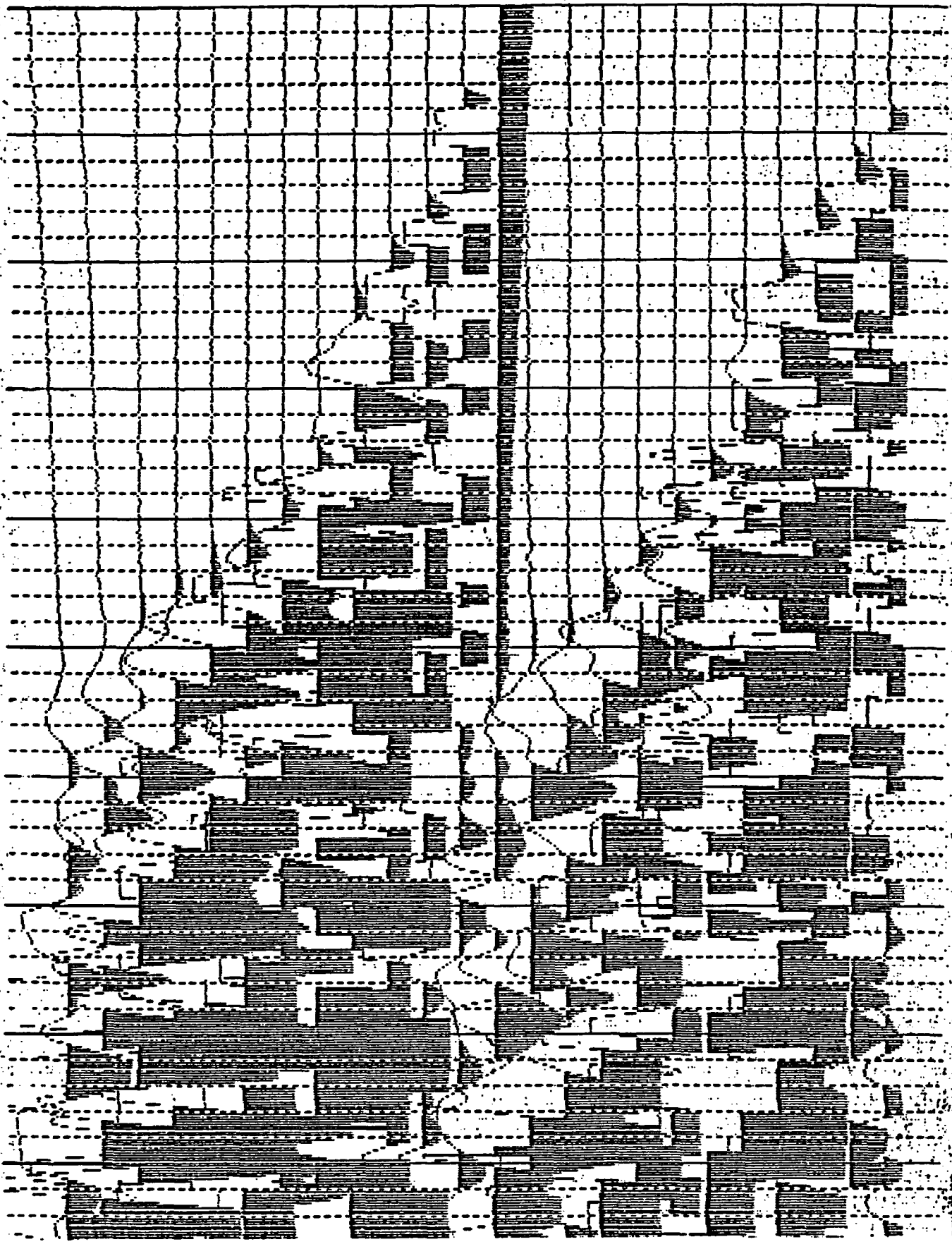


Windy Wash 6/29/93 5lbs Line1 spread 1
NE-SW shot 2 Z=2.5'



Windy Wash 6/29/93 hw/=100 Spread 1/
Line1 shot3 d=100 d=100
z=2.25 spread2 yoffset=100

1/2 SECOND RECORD LENGTH .50 MSEC PER MAJOR DIVISION

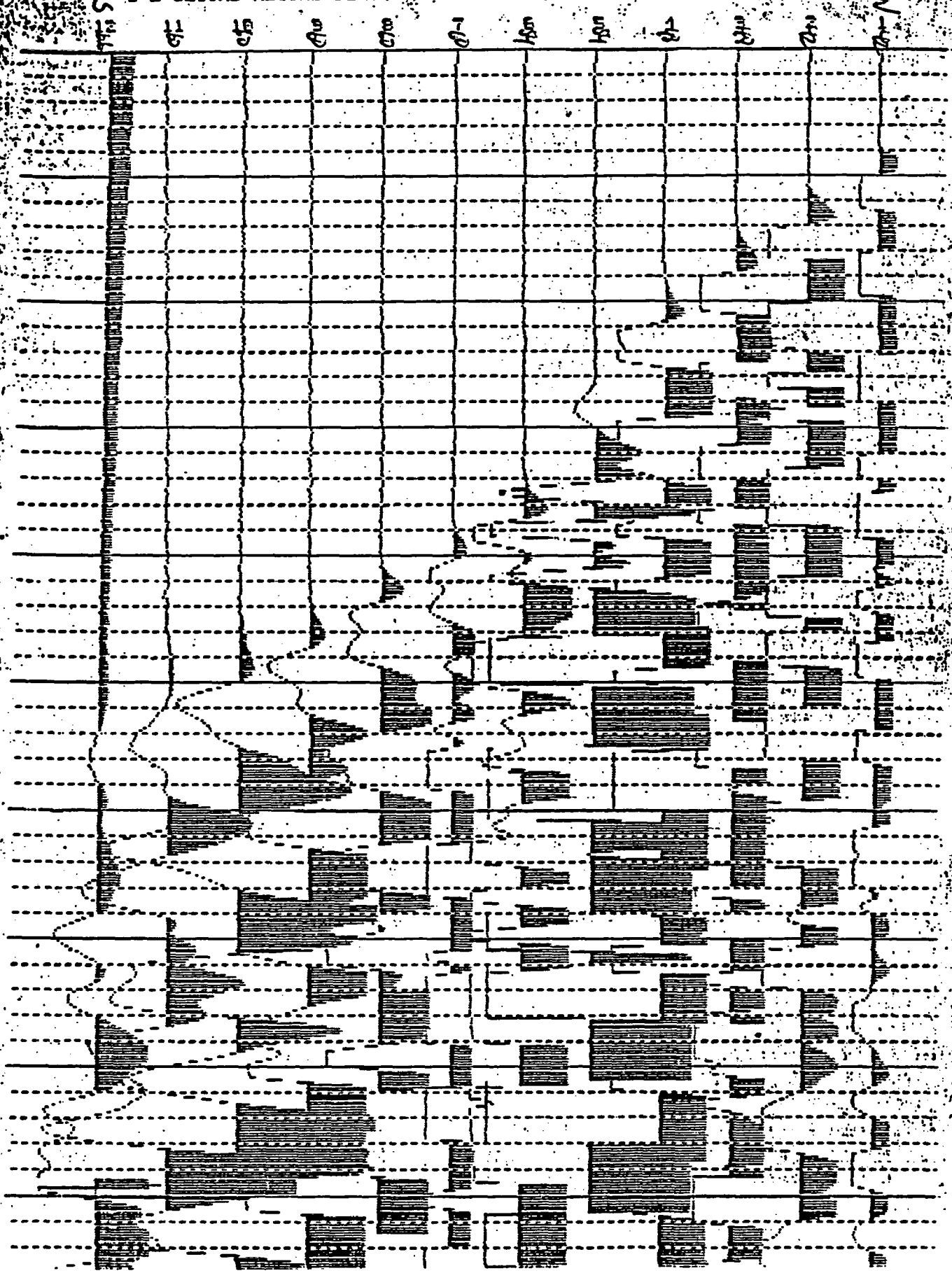


final shot 3 squad 1 6/29/93 winsr wash

d=100 ty offset=100 N75

Z=2.25

1/2 SECOND RECORD LENGTH 50 MSEC PER MAJOR DIVISION

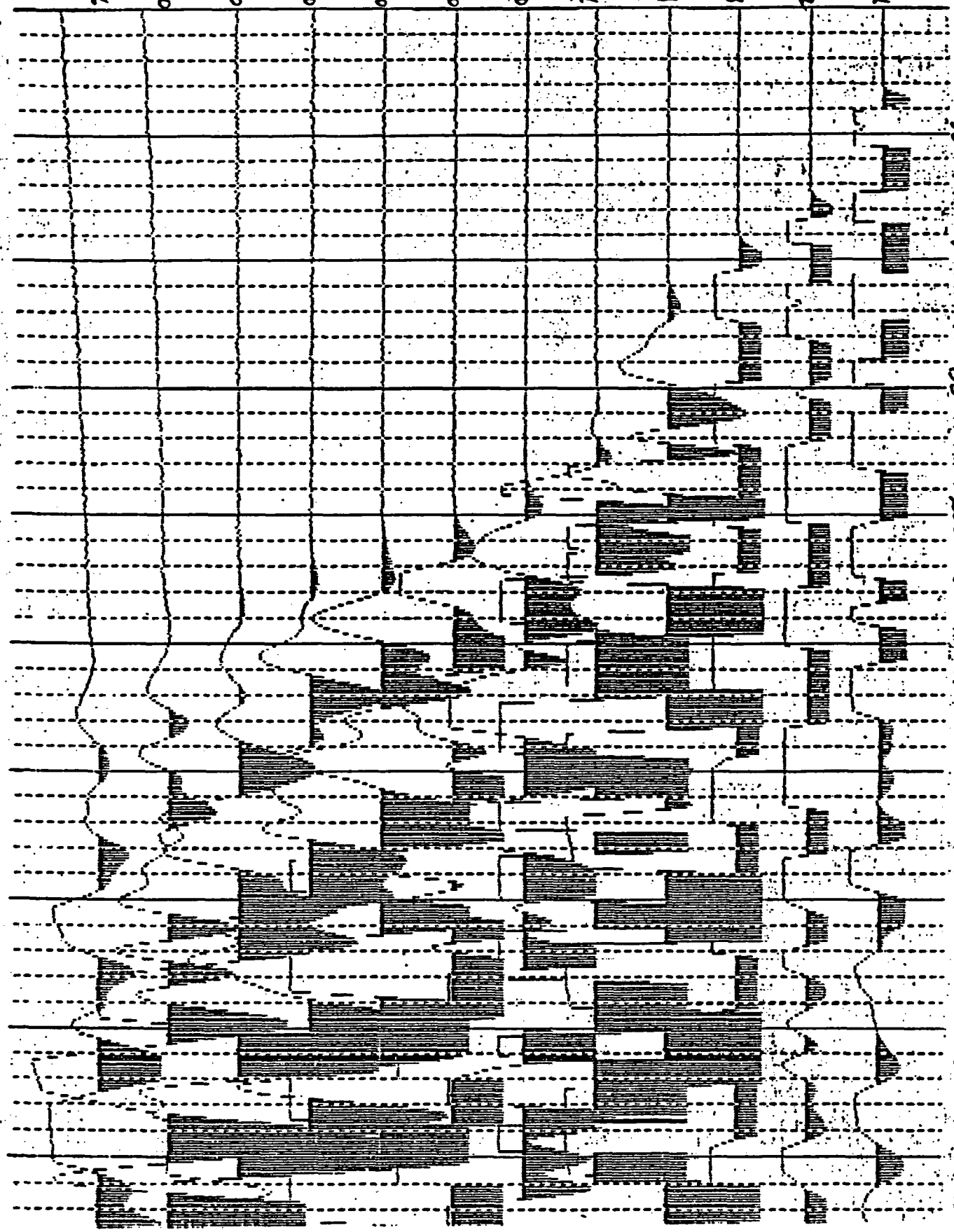


Level shots spread 2 windy wash 6/29/93 PAGE 3/4

drive Z=2.25

N→S

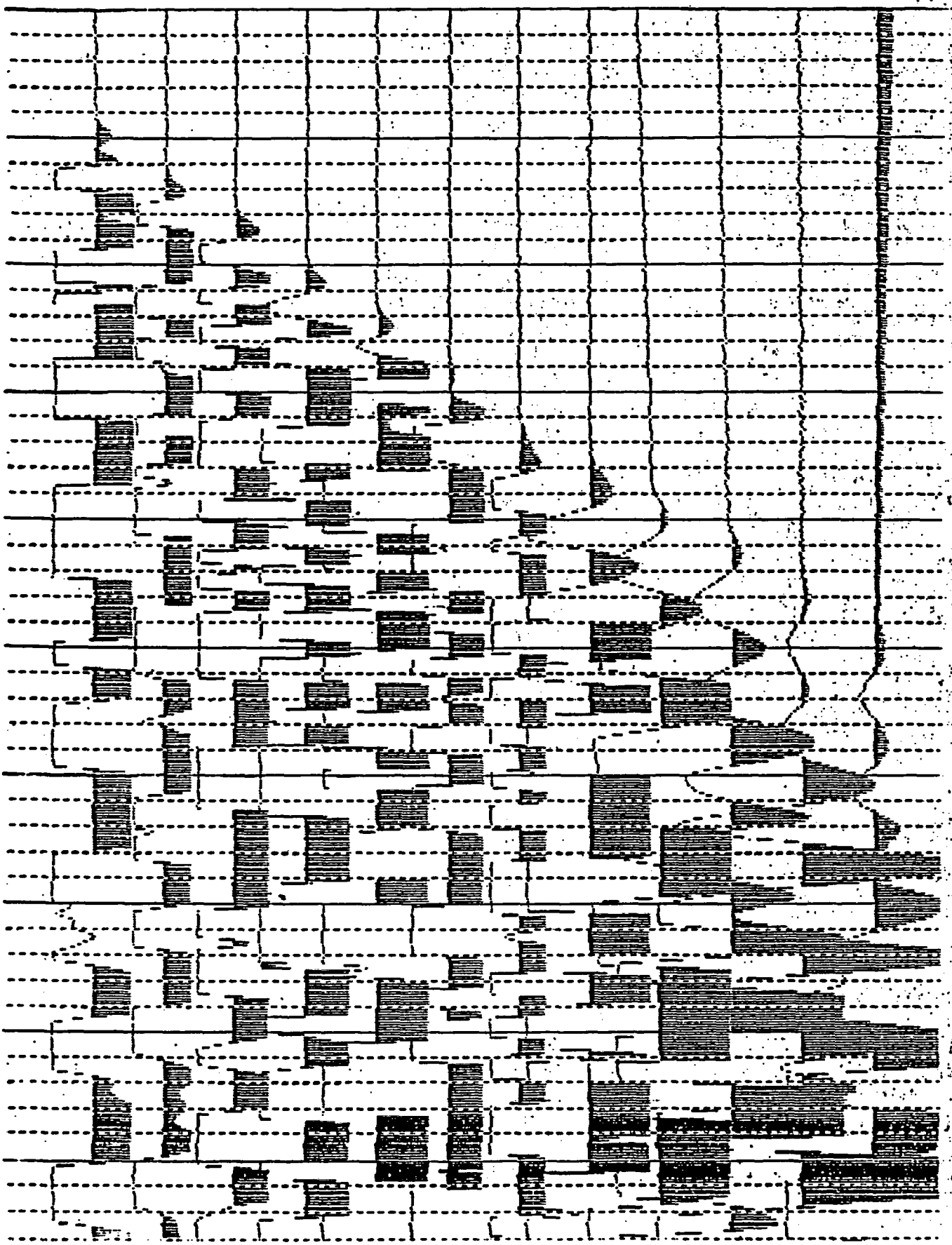
1/2 SECOND RECORD LENGTH 50 MSEC PER MAJOR DIVISION



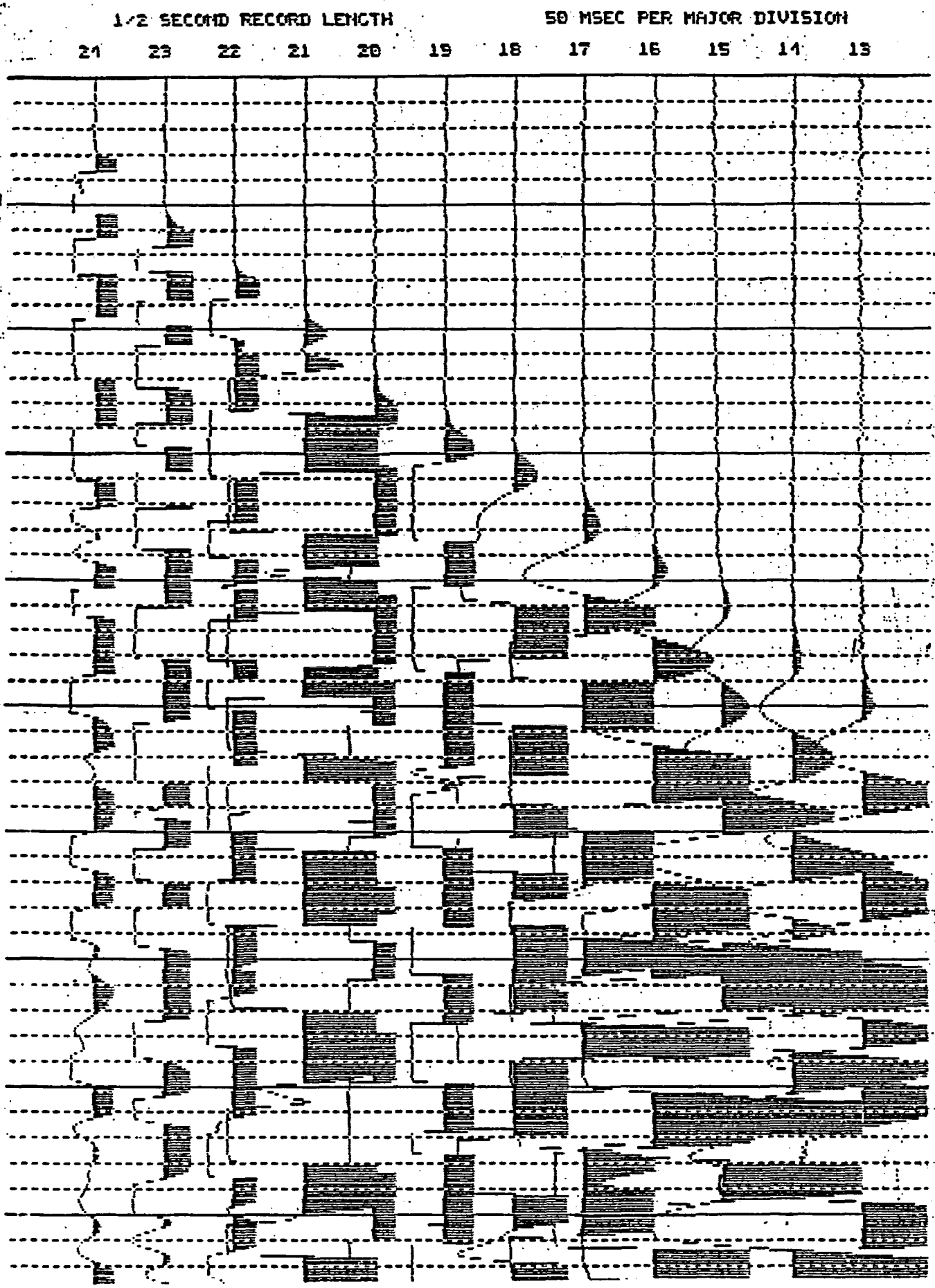
Line 1 spread 1 dz10' yoffset 20' shot# windy wash 6/29/93
E=25' S→N

1/2 SECOND RECORD LENGTH 50 MSEC PER MAJOR DIVISION

12 11 10 9 8 7 6 5 4 3 2 1



Line 1 spread 2 d=100' shot 4 windy wash 6/29/93
Z=2.5' S→N



Windy Wash 6/24/93 Line 1 Spread 1+2

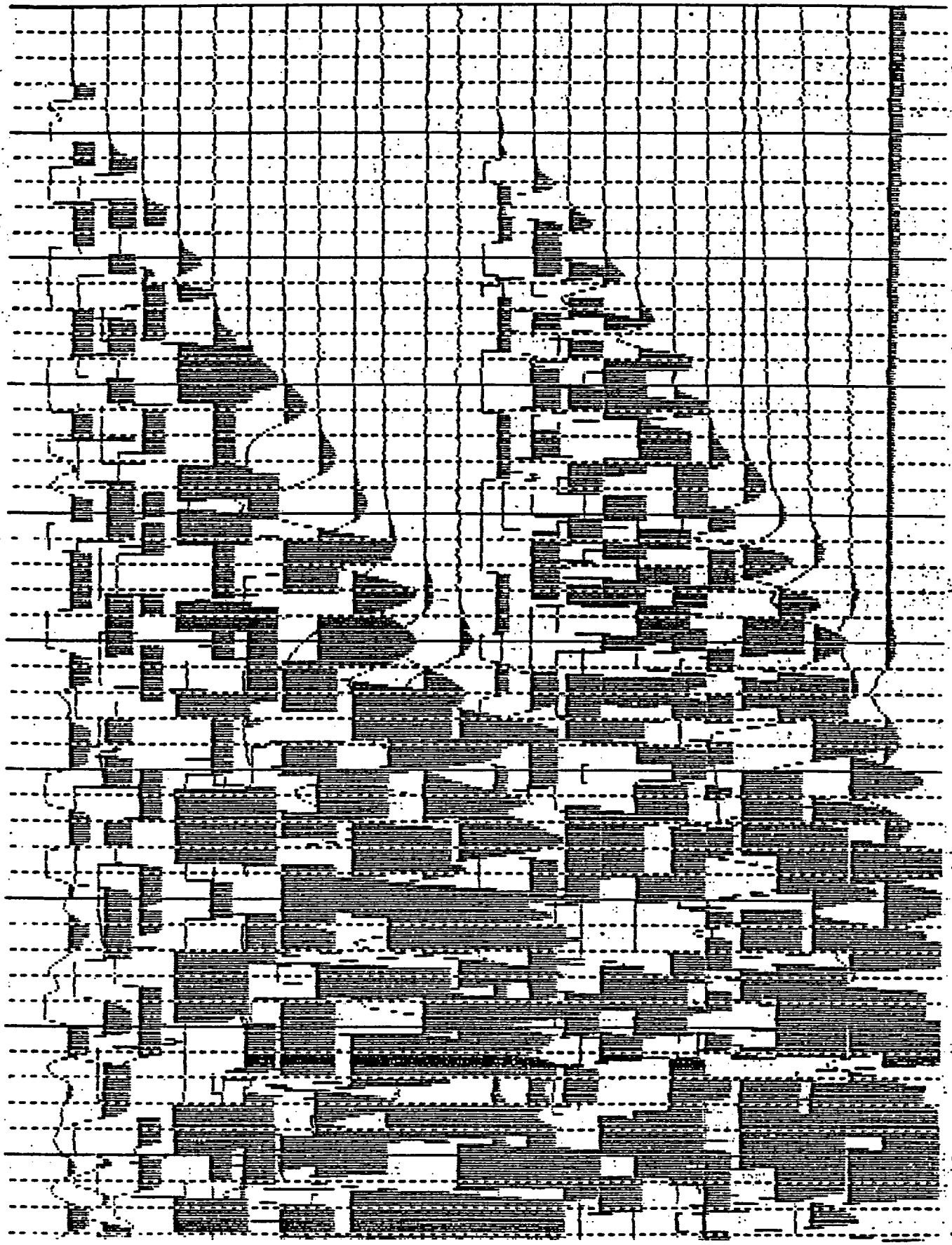
Z = 2.5' d = 100'

Shot 4

Y = 100' offset

S 1/2 SECOND RECORD LENGTH N S 50 MSEC PER MAJOR DIVISION N

24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

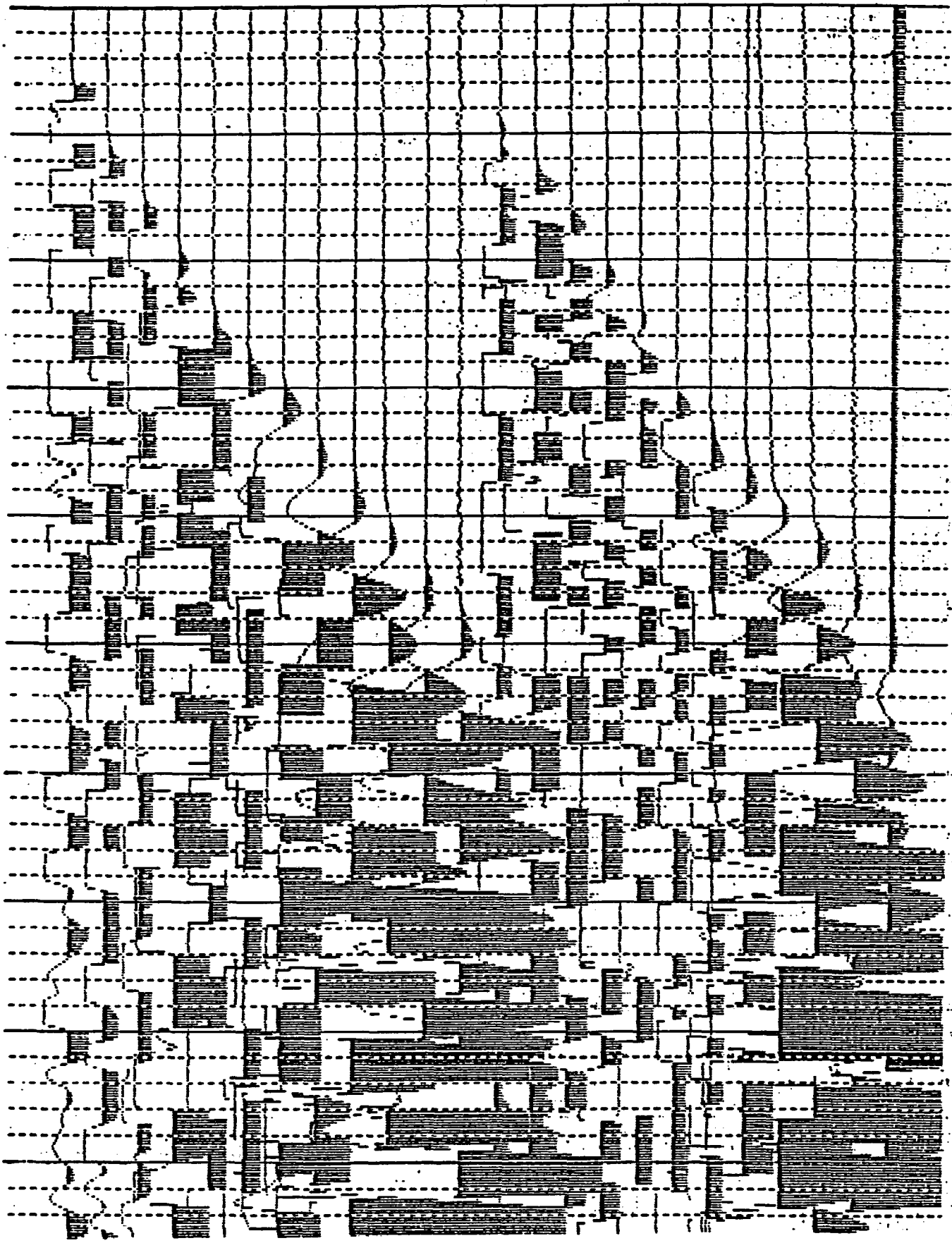


Windy Wash 6/2-993 line1 z=25' 100'/hop Shot4

Spread2 d=10' Spread1 d=10' 100'-offset

1/2 SECOND RECORD LENGTH N S 50 MSEC PER MAJOR DIVISION N

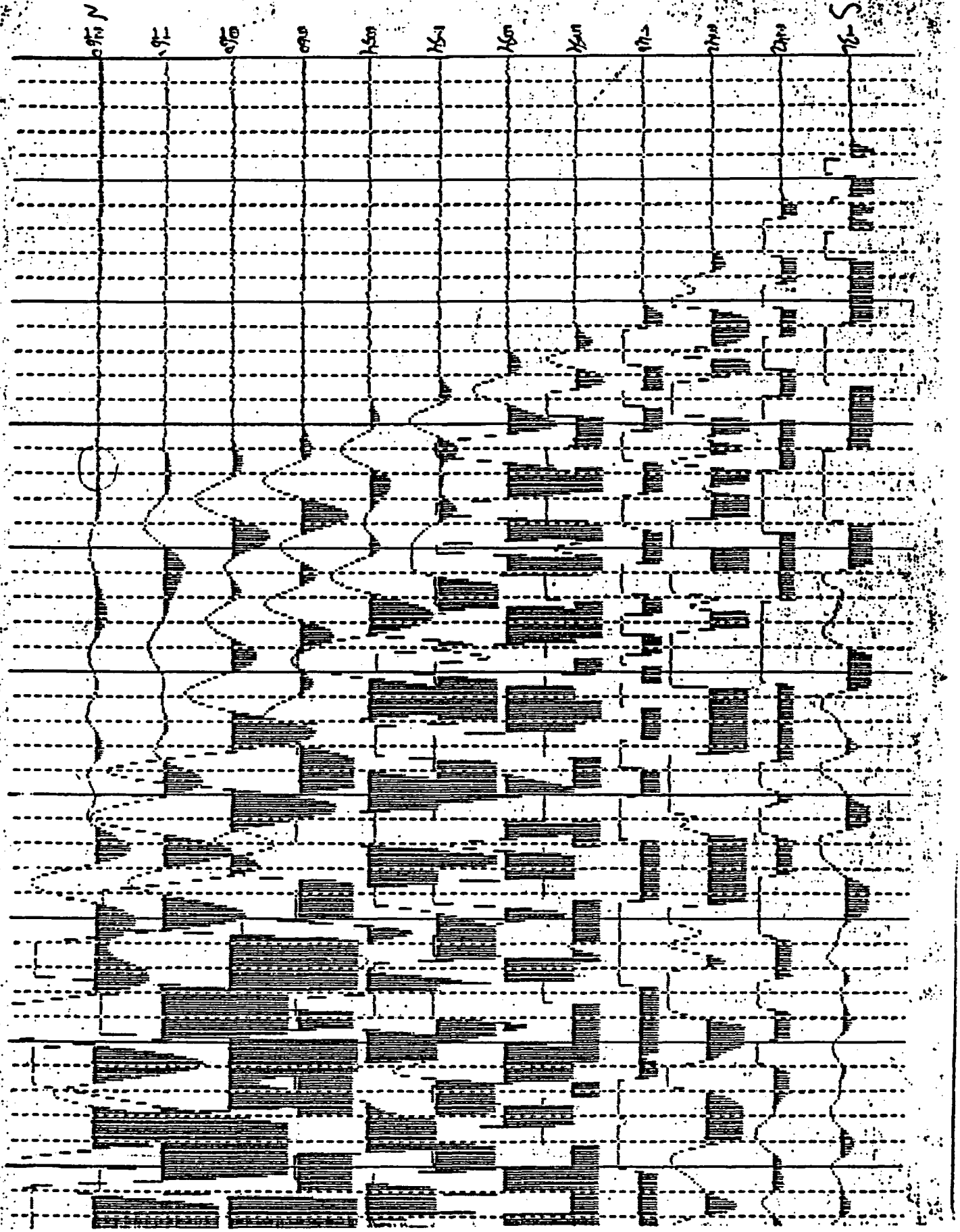
S 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1



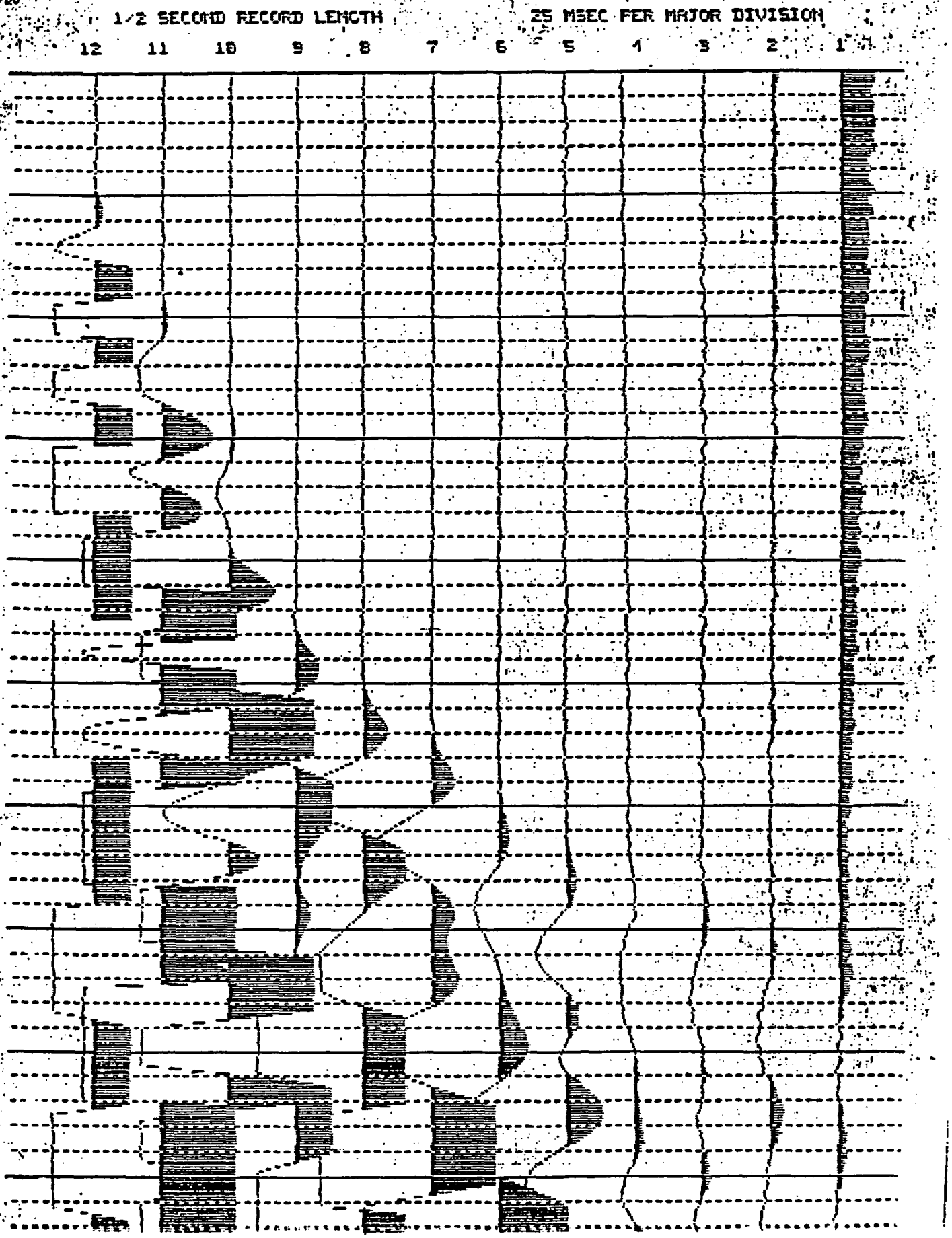
Windy Wash 6/29/93
Line 2 shot 1 S→N d=100'
2-2

1/2 SECOND RECORD LENGTH

50 MSEC PER MAJOR DIVISION

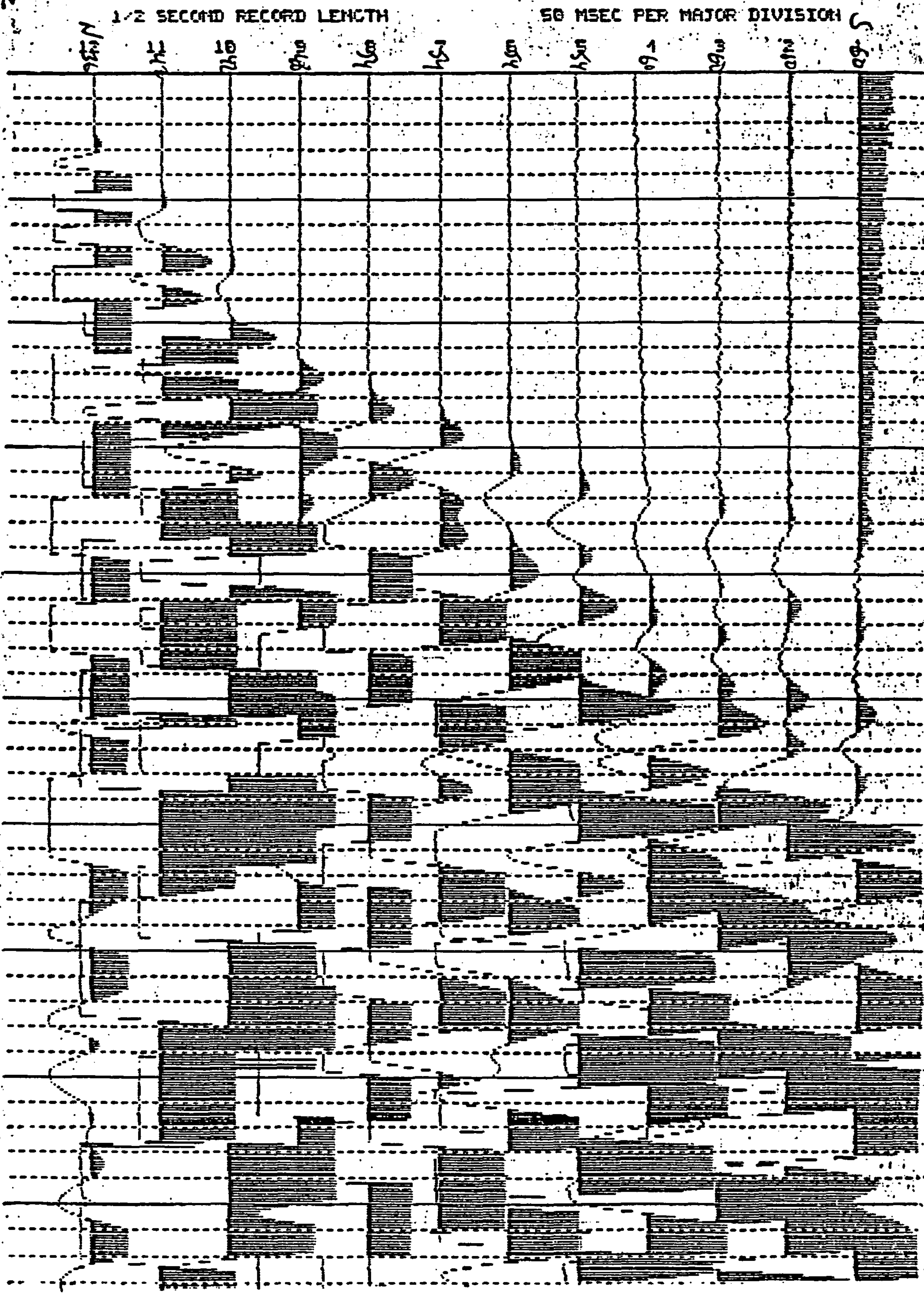


Windy Wash 6/29/93 Z=2.5'
Line 2 shot 2 NOS
Z=10'

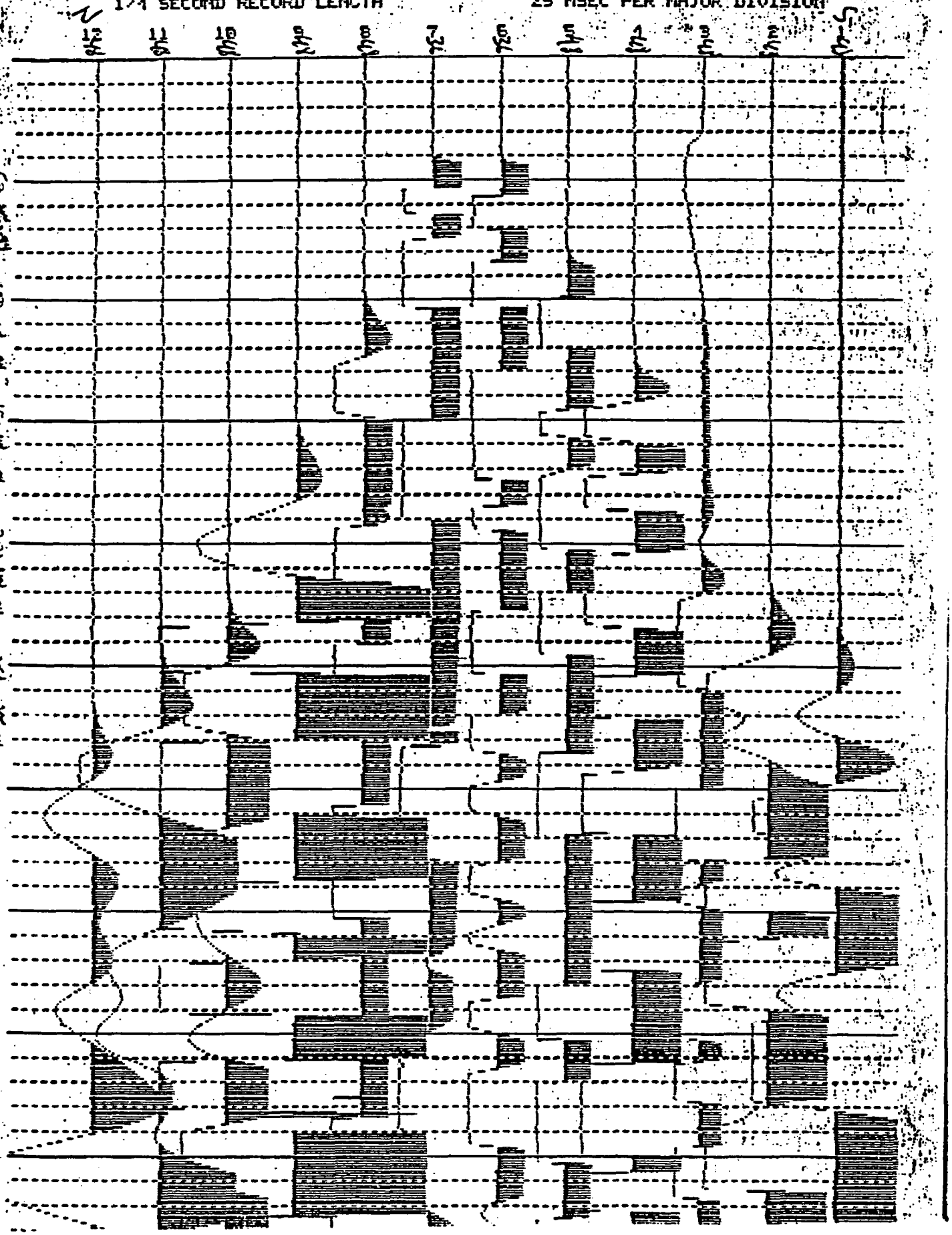


Windy Wash 6/29/93 Line 2 shot 2 N→S
d=10'

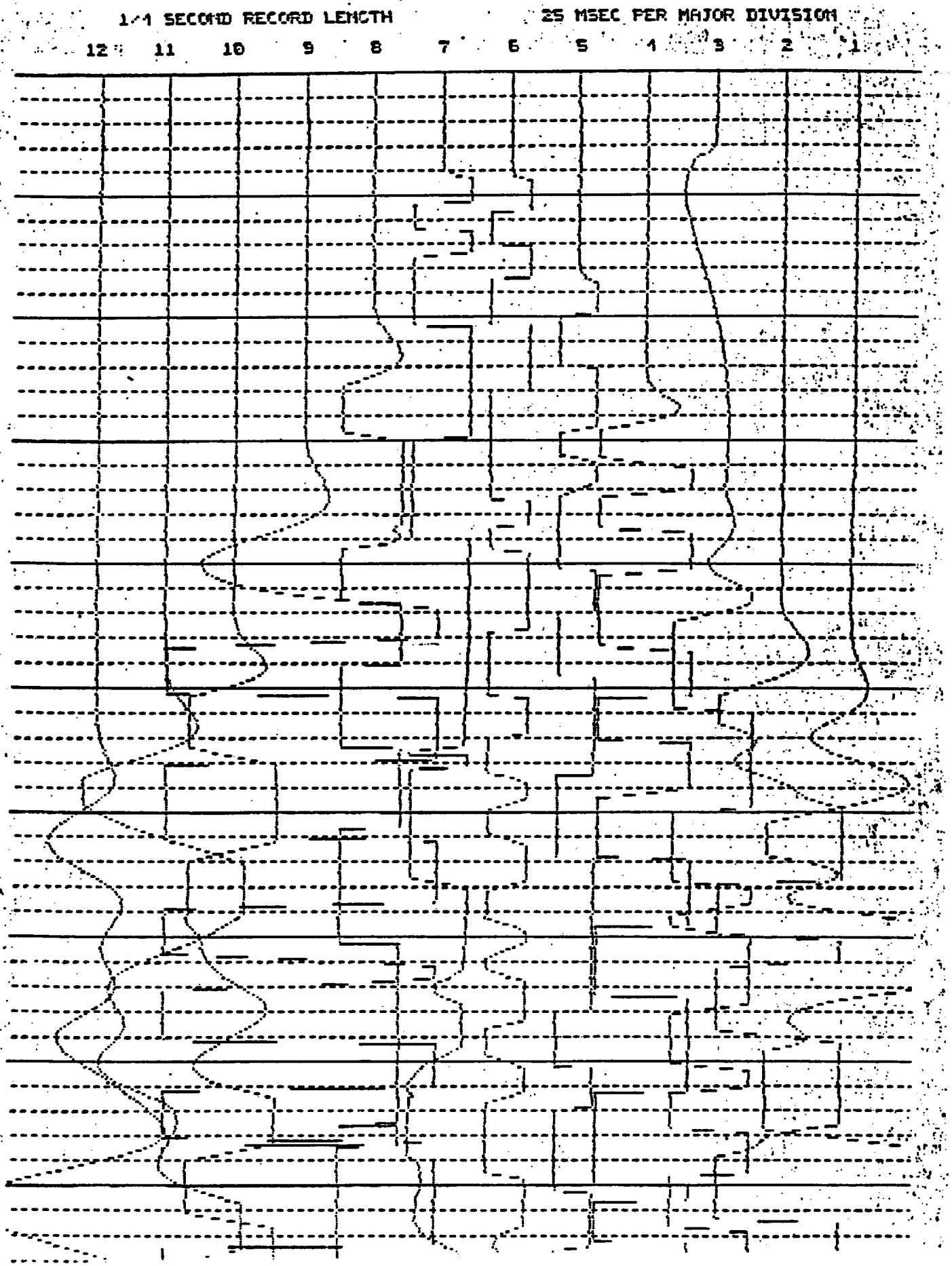
n_{rr}=100
z=2.5



Windy Wash shot 3 center line 6/29/93
y-offset = 12' to east Z=1' d=50'



Windy Wash Shot 3 center line 2 6/24/93
y offset = 12' to east z=1' d=50'



UNITED STATES
DEPARTMENT OF THE INTERIOR

Nature of record Seismic Refraction Survey near Windy Wash fault

Book No. 1 of 1

State Nevada

Quadrangles

Chief of party Berger

Computer N/A

Date 3/16/93 –

ENCLOSURE 2

3/16/93 (home)

Review and revise preliminary draft (02/23/93) of "Seismic-Refraction Field Procedures", USGS Technical Procedure SP-1B. Required reading read.

3/28/93 (home)

Diff0...

4/14/93

Recieved fax from Karen Burgess-Kohn - this reminded me that I needed to return Reading Assignment completion form - will mail tomorrow.

4/15/93

Faxed & mailed Reading Ass. form to Karen Kohn
Worked on technical procedures (home)

4/27/93

Received PO # 162404-93 from Greg Braun for seismograph calibration
Sent seismograph today to E&E

4/30/93

Worked on Technical Procedures 8 hrs @ office

5/3/93

Worked on Technical Procedures 8hrs @ office

5/4/93

Completed 1st draft of Technical procedure 6 hrs office

5/5/93

Gave Technical Procedure to supervisor & colleague for informal review. Incl

5/6/93

mailed technical Procedures to Tony at SAIC

5/10/93

Recieved calibrated seismograph & documentation of software

5/29/93

Responded to Tom Brocher's technical review comments, read more "required" reading.

David J. Bruga

2

6/7/93

Responsed to Pete Hanchi's technical procedure comments and FED's my response and Hanchi's comment to Tom Bracher.

6/14/93

Worked on VETA

6/15/93

Mail veta (FedEx'ed) to Tracy

6/17/93

Reviewed final draft copy of tech. procedure, call Patricia Reilly's office for verbal correction

left message w/ Dan Soeder about the use of Explosives

6/23/93

Left DC @ 10Am arrive Beatty @ 4Pm

David V Bergen

6/24/93 time 8:00 - 18:30

Line 3

Spread 1 50' phone spacing (Shallow velocity check)

Shot 1 S ⇒ N

d = 50' Z = 3' 2 lbs

Shot 2 N ⇒ S

d = 50' Z = 2.5' 2 lbs

Shot 3 ~~d = 50'~~ Center shot

d = 25 Z = 2.5' 1 1/3 lbs

Harold T Bergen

6/25/93 time 7:30 - 18:00

Line 4 100' ph spacing

Shot 1 E → W 4 lbs

d = 100', z = 2.5' 1/2 record length

- Sushino graph didn't trigger - Re shot w/ same geometry

Shot 2 E → W 4 lbs

d = 100' z = 2.5' 1/2 sec. record length

- hand blaster appears to be faulty - use radio blaster

Shot 3 W → E 4 lbs

d = 100' z = 2.5 1/2 sec. record length

Shot 4 Center shot 4 lbs

d = 50' z = 2.5 y offset = 15 to South

geoph 10-1 = 48 db (ph 2 = 54 db)
11-12 = 42 db

1/4 record length

David Berger

Shot 5 E → W

d = 100' z = 2.5 4.5 lbs

ph 1-10 = 48 2 = 54 db
11-12 = 42

David Berger

6/22/93 Time 11:30 - 17:00

Line 4

Shot 6 W→E 4 lbs

d=100' Z=3' 1/4 record length

phs. 1-8 = 48 db
9-10 = 54 db
11-12 = 60 db

Line 5 100' ph spacing
2 ph overlap w/ Line 4

Shot 1 E→W 4 lbs

d=100' Z=2.5'

phs 12-8 = 48 db
7-5 = 54 db
4-2 = 60 db
1 = 66 db

Shot 2 Center 3 lbs

d=50' Z=1'

all phs = 48 db

Shot 3 W→E 4 lbs

d=100' Z=2.5' 1/4 sec record length

ph 1-5 = 48 db
6-8 = 54 db
9-12 = 60 db

6

6/20/23 Hours 6:30 - 17:30

Line 6 100' ph spacing except between 8 & 9
2 phone overlap w/ line 5

Shot 1 W → E 3lbs
d = 50' Z = 1.5'
ph 7-12 = 48 db
8 = 30 db
- exposed basalt <100' west of shot 1 line 6

Shot 2 E → W 2lbs
d = 100' Z = 2.5'
ph 8-11 = 48 db
12 = 30 db

Line 4 eastern extention
100' ph spacing except between 8 & 9
ph 11 & 12 overlap with 1 line 4
ph 8 ~240' west of suspected fault

Shot 1 W → E 3lbs
d = 100' Z = 2
ph 12 = 30 db
11 = 48 db
10 = 48 db
8-9 = 54

Wm H Bby

Line 4 (continued from pg. 6)

Shot 2 E⇒W 3lbs
d=50' z=2'
ph 8 = 30
9-10 = 48
11-12 = 54

Shot 3 E⇒W 3lbs planting 100'
- added 5 ph to west at 100' spacing
d=50' 50 between 1 & 2

Line 3

spread 2
100' ph spacing
- Middle of spread same as spread 1 and about 200' west of surface exposure of basalt.

Shot 1 S⇒N 4lbs
d=100' z=2.5'
ph 12 = 36 db
11 = 42 db
10-3 = 48 db
2-1 = 54

Shot 2 S⇒N 4lbs 1/2 record length
d=50' z=3'
Gain settings equal shot 1 except increase ph 1 to 45 db

Richard Stage

6/28/93 time 7:00 AM - 18:00

Line 3 spread 2 continued

Shot 3 center shot 3lb 1/4 record length
d = 50' z = 2.5 y offset = 10'
pre 6 & 7 30db used drivers

Shot 4 N → S 4lb
d = 100' z = 2.5'
pre 1 = 30 db 1/2 record length
2 = 42 "
3-9 = 48 "
10 = 54 "
11-12 = 60 "

Spread 3
- two pre overlaps to route on line 3 spread

Shot 1 S → N 4lbs
d = 100' 50' y offset to east
z = 2.5' 12 = 30 db 1/2 sec record length
11 = 42
10-4 = 48
3-1 = 60

David Berger

Line 3 continued

Shot 2 N→S

d=100' z=2.5' 4#lbs 1/2 sec record length

ph 1 = 56 db
2 = 40
3-8 = 48
9-12 = 60

Line 1 100' phone spacing
- end of surface exposure of thrust
270' east of geoph 5.

Shot 1 S→N 4#lbs
d=100' z=2'

ph 12 = 30 db
11 = 42 "
9-10 = 48 "
8-7 = 54 "
6-1 = 60

Howard L Berger

6/29/93 time 7:00 - 1830

Line 1 spread 1

Shot 2 N→S 5 lbs

d=100' z=2.5

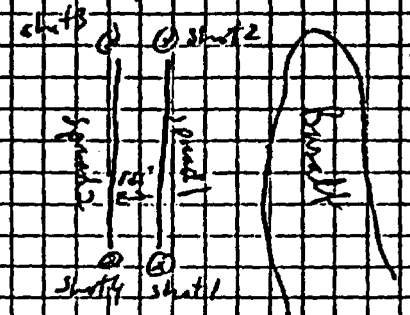
1/2 rec length

ph 1 = 36 db
2 = ~~46~~ 42
3-4 = 48
5-6 = 54
7-12 = 60

Line 1 spread 2

- spreads 1 & 2 recorded simultaneously

spread 2 parallels spread 1, 100' west



Shot 3 N→S
spread 2 d=100' z=27"
spread 1 d=100' y offset =100'

spread 1 gain same as shot 2 except 12=66, 1=42

spread 2 19-23 = 60 24 = 66
17-18 = 54 13 = 36
15-16 = 48
14 = 42

David Berger

Line 1 spread 2 #1

Shot 4 S⇒N

spread 1 d=100' goffset = 100'

spread 2 d=150' z = 25' 4lbs

2-1 = 60
7-8 = 54
9-10 = 48
11 = 42
12 = 42

24 = 36
23 = 42
21-22 = 48
20-24 = 54
19-14 = 60
13 = 66

Line 2

plus = 150'

Shot 1 d=100' S⇒N pl 1 = 36
z = 25' 4lbs 2-3 = 42
4 = 48
5-8 = 54
9-12 = 60

Shot 2 N⇒S d=150'
z = 27'
pl 12 = 36
11-10 = 42
9 = 48
8-5 = 54
4-1 = 60

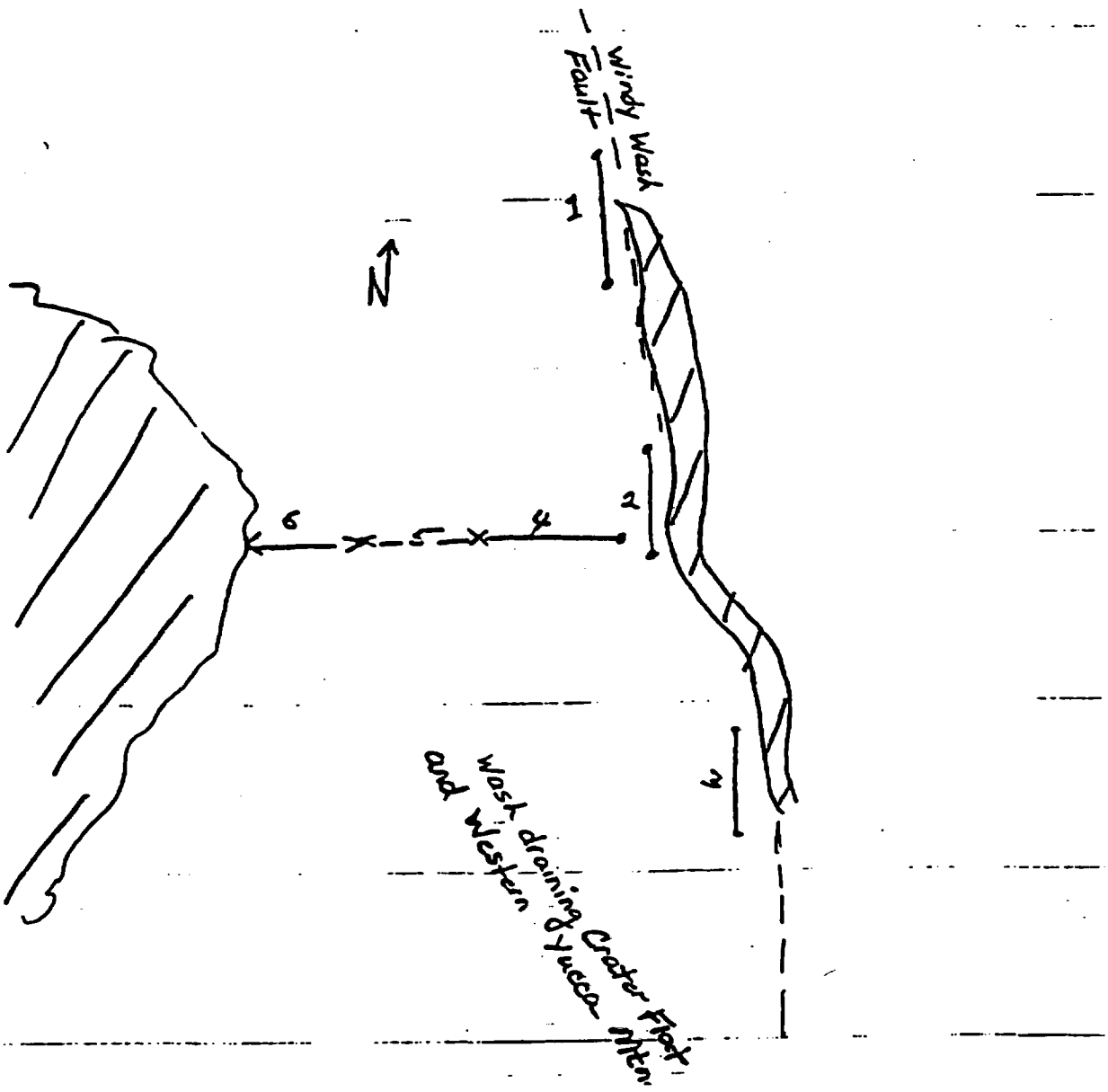
Shot 3 Center
d = 150' goffset = 12' to center
4lbs z = 1
plus 6-7 = 36
all = 48

Edward Berg

Shallow Seismic Reflection Study - Windy Wash

Line Coordinates Taken with a Magellan GPS Recievre

Line 1 (Spread 1)	South End	36° 45'. 91 N	116° 50'. 51 W	Altitude	735 m
	North End	36° 46'. 08 N	116° 30'. 44 W	Altitude	981 m
Line 1 (Spread 2)	South End	36° 95'. 92 N	116° 30'. 53 W	Altitude	745 m
	North End	36° 46'. 09 N	116° 30'. 45 W	Altitude	968 m
Line 2 -	South End	36° 45'. 23 N	116° 30'. 68 W	Altitude	864 m
	North End	36° 45'. 40 N	116° 30'. 66 W	Altitude	913 m
Line 3 -	South End	36° 44'. 65 N	116° 30'. 55 W	Altitude	1079 m
	North End	36° 44'. 81 N	116° 30'. 56 W	Altitude	850 m
Line 4, 5, 6 -	East End	36° 45'. 25 N	116° 30'. 61 W	Altitude	867 m
	West End	36° 45'. 11 N	116° 31'. 12 W	Altitude	967 m



USGS TECHNICAL PROCEDURE SP-18, Rev 0

Seismic-Refraction Technique for Shallow Subsurface Exploration

Prepared by D.L. Berger

1.0 PURPOSE.

1.1 To assure the accuracy, validity, and applicability of the methods used to collect shallow seismic-refraction data, this procedure is a guide for U.S. Geological Survey (USGS) personnel and contractors performing the described activity. The information used to prepare this procedure was obtained, in part, from Haeni (1988).

1.2 This procedure describes the components of the work, the principles of the methods used, and their limits. It also describes the detailed methods to be used for calibration, operation, and performance verification of any equipment, if needed. In addition, it defines the requirements for data acceptance, documentation, and control; and it provides a means of data traceability.

2.0 SCOPE OF COMPLIANCE.

2.1 This procedure applies to all YMP-USGS personnel and their contractors who may perform work referred to in Para. 1.1, or use data obtained from this procedure.

2.2 For all technical activities, data collected from using this procedure and any equipment calibrations or recalibrations that may be required shall be in accordance with this technical procedure. Variations are allowed only if and when this procedure is formally revised, or otherwise modified, as described in Para. 8.

3.0 PERSONNEL RESPONSIBILITIES. The Principal Investigator (PI) is responsible for assuring full compliance with this procedure. The PI shall require that all personnel assigned to work to this procedure shall have the necessary qualifications and training to adequately perform the procedure; and they shall have a working knowledge of the YMP-USGS QA Program. Responsibilities of others including the reviewer(s); contributing investigators; Chief, Geologic Studies Program (GSP); QA Office; and the Chief, Yucca Mountain Project Branch (YMPB) are as described in Para. 4, YMP-USGS-QMP-5.01. When procedure-specific responsibilities are to be delegated to contributing investigators or other personnel, the details of these responsibilities are as stated in this procedure. Special qualifications and/or training unique to the conduct of this procedure are as follows: a solid understanding of the physics underlying the seismic-refraction technique and certification in the handling and use of explosives, if explosives are needed. All ongoing investigations shall be identified, at the location of the scientific investigation, to preclude inadvertent interruption and to ensure compatibility of the investigations.

4.0 DETAILED PROCEDURE. Applied seismology is based on measured traveltimes of artificially generated waves of elastic energy as they propagate through the

earth. The refraction technique is one of two general types of seismic methods and is based on the theory of elasticity, Snell's Law of refraction, and Huygen's principle of wave propagation.

Elastic waves are generated in the earth upon impact from an energy source. In general, two types of waves are produced, surface waves (ground roll) and body waves. The seismic-refraction technique depends on the increase of seismic-velocity within the subsurface and therefore, only body waves, which travel through the earth, are of any interest under this procedure.

Two types of body waves are generally used in the seismic-refraction technique, compressional and shear. Compressional waves, in which the ground motion moves parallel to the direction of the wave, are detectable using non-azimuthal vertical geophones. Ground motion created by shear-wave propagation is perpendicular to the direction of the wave in both the horizontal and vertical sense. Commonly, in seismic-refraction surveys, only compressional-wave traveltimes are measured, and this procedure will be limited to this type of wave.

The elastic energy emanating from a point source at land surface, is propagated in the earth as hemispherical wave fronts. When the waves encounter a velocity contrast or interface they will refract according to Snell's Law, with some energy returning to the surface. The refracting interface represents an increase in seismic-wave velocity and the depth of this interface can be determined using wave path geometry and recorded traveltimes of the refracted waves. Field data therefore, consists of known geophone to source geometries and measured seismic-wave traveltimes. From this information, time-distance curves are developed and depths to various velocity contrasts (refractors) within the subsurface can be determined. The results of this work will assist in the study of ages and recurrence of fault movement in the site area of the proposed high-level nuclear waste repository.

4.1 Objective: The objectives of the seismic-refraction survey is to determine the depth and dip of a particular refractor. This information will allow investigators to calculate long-term rate of movement on faults in the Yucca Mountain area and compare them to known late Quaternary rates.

4.2 Methods Used: Seismic-refraction surveys involve continuous profiling of velocity contrasts within the subsurface that may represent some hydrologic or geologic interface, such as saturated basin fill or the top of consolidated rock. To determine depths to these interfaces, refracted seismic energy returning to land surface is detected by an array of geophones. The time that the wave energy reaches each geophone is called the first arrival and is recorded by a seismograph attached to the array.

Configurations of geophone arrays or spreads and distances between source and receivers may vary depending on the target depth, available area of study, and method of interpretation used. A geophone array may consist of 12 or more geophones, spaced up to 100 ft or more along a cable attached to a seismograph. Records of travel times are made from both ends of the array at several offset distances and from the center. This concept of "reverse-profile shooting" should be practiced routinely in all seismic-refraction surveys.

4.2.1 FIELD PROCEDURE: To conduct a seismic-refraction survey, in general, the following field procedures are to be followed after the locations

of the seismic profiles have been determined. Because of the potential for long geophone to source distances, two vehicles are recommended to conduct the survey. Truck A, where the PI works from and represents the control truck, houses the seismograph, associated equipment and the encoder portion of the radio. Truck B, contains the geophone-cable reels and geophones, tools for source placement, and the decoder portion of the radio.

1. Upon reaching the study site, the locations of the geophones are chained and staked at the desired geophone spacing, up to 100 feet. Then geophone cables are laid out along the proposed profile. The cables should be positioned as straight as possible.

2. Geophones are then planted firmly in the ground along the cable adjacent to each take out. A shovel may be needed to remove the upper layer of soil for firm placement. Depending on ambient wind noise, a shovel of soil may also be placed over each geophone and over sections of the cable. Once the geophones are firmly placed, they are attached to the cable at each take out. If loose material is unavoidable and sections along the geophone array encounters topographic relief, these areas should be noted and reported to the PI. In addition, it may be necessary to survey the relative elevations and positions of each geophone and source point.

3. Each truck is positioned at opposite ends of the geophone array, the seismograph equipment is set up and checked, and radio communication between the two trucks is established. At this time, the continuity of the geophones is checked and corrected if necessary. Background noise is monitored and attenuation controls and filters are set accordingly.

4. The site is then set up for the sound source. Distance of source location from the end of the geophone array and depth of the source are relayed to the PI and recorded. Nonexplosive sound sources commonly used in seismic-refraction surveys include hammer, weight-drop, and shotgun. A hammer and striker plate are used for very shallow investigations. Best results are obtained when the striker plate is placed on firm ground and the signal is stacked 3 to 5 times. Weight-drop and shotgun systems provide intermediate energy levels. Explosives generally will be needed under the following conditions: 1) target refractors are 100 ft or deeper, 2) unsaturated material, 30 to 40 ft thick overlies the target refractor.

5. If explosives are to be used, the PI shall ensure compliance with the requirements of AP-8.1, Land Access and Environmental Compliance, (when applicable) and shall contact the DOE Site Manager prior to the use of explosives on the Nevada Test Site.

   The following sequence of events should be followed if explosives are used.

   a. Mix the two-part component of the explosives following manufacturer's instructions and procedures. Allow enough time between mixing and source placement so that the explosives are completely mixed.

b. Attach the detonator, with tape, to the explosives.

c. Backfill and tamp the shot hole, prevent large rocks from striking the detonator and the explosives during back filling.

d. Remove, if possible, loose rocks and digging tools away from the shot hole and place a blast mat of some type over the shot to prevent the occurrence of fly rock. At this point the PI or his designee secures the shot-hole area. The leggings of the detonator shall be shunted at the free end prior to installation. Continuity of the detonator is checked with a blasters galvanometer prior to connection to the explosives.

e. Crew members return to their designated positions and prepare for a systems check. After the systems check is completed, the PI or his designation attaches the detonating-cap leggings to the blast wire, ensuring that the connection is secure and the two wires are separated. The person wiring the explosives shall ensure that the shot cannot be fired during this process.

SAFETY NOTES:

-- Personnel handling explosives shall have special training and may need to be certified.

-- Do not handle electric detonators during electric storms.

-- Do not place explosives in a hole that is still hot from drilling.

-- Use only a wooden tamping pole and fill the shot hole with dirt or sand, avoiding rocks and boulders.

-- Mix only that amount of explosives needed for the present shot just prior to loading the hole and be sure detonator is securely taped to explosives.

-- Check the cap with a blasters galvanometer, never with a standard voltmeter or multimeter.

-- Do not allow smoking near explosives.

Additional explosive safety information can be found in the Institute of Makers of Explosives (1978) and Safety and Environmental Health Handbook, U.S. Department of the Interior, Geological Survey, (1989), Chapter 20.

6. A final continuity check of the geophones and detonator is made. Acknowledgement is then made between both trucks communicating that there is fire in the hole and the immediate area is clear to shoot.

7. The final step is the firing of the shot or sound source. When the PI transmits a radio tone to instantaneously fire the shot or sound source, this time break (when time = zero seconds) is also simultaneously used to signal the seismograph to start to record data. This

time break system provides sufficient timing accuracy for the shallow refraction method.

8. After the shot is fired and an acceptable signal is obtained, the field personnel reel up the blast wire and prepare for the next shot.

9. Once the PI determines, based on rough approximations calculated in the field, that there is sufficient data to define the depth and apparent dip of the target refractors, the field crew picks up the geophone array and moves to the next site.

4.2.2 FIELD INTERPRETATION AND CALCULATIONS: Field calculations and rough estimates of refractor depths should be made following the completion of each shot and before the geophone array is picked up and moved. These preliminary estimates can be made from travel-time data plotted in the field and using either the intercept-time or crossover-distance formulas on a hand-held calculator. These formulas, do not correct for dipping interfaces, but will suffice as field calculations to determine geophone geometries and are not for the final interpretation of the data.

4.2.3 FIELD RECORDS: The following information shall be recorded by the PI for each geophone array in a field book and labeled on each paper copy of the recorded travel times.

1. Spread number and azimuth of geophone array. In addition, the arrays should be plotted on a field map.

2. Position of the source relative to the array and number of the shot used to produce the data set.

3. Distance between geophones and source offsets.

4. If conditions are such, relative elevations and positions of each geophone and source location should be recorded (in field book).

5. Depth of shot hole and explosives and the amount of explosives used.

6. Remarks, as applicable, of the condition of geophone placement and topographic relief along the geophone array (in field book).

4.3 Materials/Equipment Required: Special handling may be required if explosives are used, otherwise no special handling, storage and/or shipping is required unless noted. The equipment necessary to carry out a seismic-refraction survey includes the following:

- Seismograph, wiring harness, and power supply.
- Geophones and geophone cables with reels.
- Portable radios.
- Field vehicles, one equipped with small auger rig if necessary.
- Surveying equipment, compass, distance wheel or 100-ft or longer measuring tape.
- Blasters galvanometer.
- Hand-held calculator, graph paper, and straight edge.
- Extra rolls of black electricians tape and seismograph paper.
- Sound source, which may include explosives and associated materials.

- o If explosives are used, they shall be stored in appropriate storage containers and labeled.
- o Blast wire and reels.
- o Some type of blast mat, such as sand bags or a canvas tarpaulin should be carried to prevent fly rock.
- o Miscellaneous hand tools and shovels.

4.4 Assumptions Affecting the Procedure: The main assumptions inherent in the application of the seismic-refraction technique is the requirement that seismic velocity within the subsurface must increase with depth and that sufficient contrasts in seismic velocity exists between geologic or hydrologic boundaries. In addition, seismic velocity is assumed to be constant within each layer.

4.5 Data Information: Field seismograms collected by a seismograph consists of wave traces produced by a signal source and recorded by each geophone. In the seismic-refraction technique, the time measurement of the first seismic motion (first arrival) recorded on the seismogram, provides the necessary information for the interpretation. Although first arrivals are generally the only data used in seismic refraction, the seismogram records other wave-form information that may be useful. The seismograms may be in the form of paper copies and/or digital format. Pertinent field data for each geophone array and source point will be recorded with the associated seismogram and entered in the field book.

4.5.1 QUANTITATIVE/QUALITATIVE CRITERIA: Depth estimates of velocity-contrast interfaces determined from the interpretation of seismic-refraction data are generally within 10 percent of the true depth. Depth interpretations can be no better than the assumptions made concerning probable conditions within the subsurface.

4.6 Limitations: The most significant limitations in the success of a seismic-refraction survey are the inability of the technique to detect layers that have insufficient thickness or seismic-velocity contrast and the assumption that seismic velocity increases with depth. Other limitations include ambient noise conditions and lateral variations in seismic velocity, however both can compensated for by filter adjustment, increased source strength, and in some cases, adjustment of geophone geometries.

4.7 Other: None.

5.0 CALIBRATION REQUIREMENTS. Calibration is required as a part of this technical procedure. All instruments and/or instrument systems shall be calibrated in compliance with the YMP-USGS-QMP-12.01, Instrument Calibration for producing data under graded QA controls.

5.1 Calibration Responsibility: The PI is responsible for calibrations required by this procedure. Calibration shall be in accordance with procedures described or referenced in Para. 5.2. Maintenance of all calibration records described in Para. 5.3 may be done by a contributing investigator under the direct supervision of the PI.

5.2 Calibration Procedures: All calibrations, unless otherwise specified, shall be performed according to manufacturer's range and accuracy specifications. The seismograph requires calibration.

5.2.1 CALIBRATION OF THE SEISMOGRAPH: Calibration of the seismograph shall be completed to manufacturer's specifications by an approved vender on an annual basis.

5.3 Calibration Records: In compliance with YMP-USGS-QMP-12.01. calibration data will be entered, signed and dated. into a notebook or other organized documentation. Notebooks and other documents shall be protected and submitted to the LRC in accordance with YMP-USGS-QMP-17.01 (YMP-USGS Records Management).

5.4 Labeling of Equipment Calibration Status: Labeling of equipment shall be in compliance with YMP-USGS-QMP-12.01.

6.0 IDENTIFICATION AND CONTROL OF SAMPLES. Samples will not be collected or handled as part of this procedure.

7.0 QUALITY ASSURANCE RECORDS. Documents and data will be prepared and submitted per appropriate governing project procedures.

7.1 Anticipated documents and data generated from implementation of this procedure may include the following: Seismograms and field book.

7.2 Notebooks, forms, or other organized documentation shall be prepared, as appropriate, by the PI or a contributing investigator to record data from this procedure and shall include the unique identifier of equipment used to collect/record the data and any information considered by the originator to be pertinent. When in loose-leaf form, each page shall be numbered consecutively and chronologically. All documents shall be signed (or initialed) and dated by the investigator as entries are made. Any revisions shall be lined out, initialed, and dated. Notations by pencil shall be submitted in legible photocopy form.

8.0 MODIFICATIONS. When modifications become necessary, the PI shall fully document the changes in compliance with YMP-USGS-QMP-5.01 and submit the documentation for review, signature, and distribution process as indicated.

9.0 REFERENCES CITED.

Haeni, F.P., 1988, Application of seismic-refraction techniques to hydrologic studies: Techniques of Water Resources Investigations of the U.S. Geological Survey, Book 2, Chapter D2, 86 p.

Safety and environmental health handbook, 1989, U.S. Department of the Interior, Geological Survey.

10.0 ATTACHMENTS. None.

11.0 SUPERSEDED DOCUMENTS. None.

12.0 APPROVALS AND EFFECTIVE DATE.

EFFECTIVE DATE: 6/23/93

for PI: C.M. Menges — Date 6/16/93

YMP-USGS QA Manager — Date 6/18/93

Tech. Reviewer: T.M. Brocher — Date 6/17/93

for Chief, YMPB — Date 6/18/93

GSP Chief: J.S. Stuckless — Date 6/14/93