SEISMIC VELOCITY SURVEY
AND
LOG CALIBRATION

HUSKY OIL NPR OPERATIONS, INC.
OPERATOR FOR OFFICE OF
NATIONAL PETROLEUM RESERVE ALASKA
LISBURNE TEST NO. 1
NATIONAL PETROLEUM RESERVE, NORTH SLOPE, ALASKA

CONDUCTED
FOR
HUSKY OIL NPR OPERATIONS, INC.

BY

Birdwell Division
Seismograph Service Corporation
A SUBSIDIARY OF RAYTHEON COMPANY
P.O. BOX 1590 • TULSA, OKLAHOMA 74102

CONTENTS

INTRODUCTION

A Seismic Velocity survey was conducted for Husky Oil NPR Operations, Inc. in their Lisburne Test No. 1 well located in National Petroleum Reserve, North Slope, Alaska. The survey was conducted by the Birdwell Division of Seismograph Service Corporation on July 25, November 24, 1979, and May 27, 1980.

A borehole compensated Sonic Log, digitized and integrated from 190 ft. K.B. to 13650 ft. K.B., was calibrated to the geophone survey data.

OPERATIONS STATISTICS

Location:	798' FSL and 2411' FEL S17 T11S R16W UM
Surface conditions:	Favorable
K.B. elevation:	1862 ft.
Seismic datum elevation:	1700
Survey based on:	K.B. elevation
Casing Depth:	13650 ft. K.B.
Well total depth:	16992 ft. K.B.
Shotpoint locations:	See shooting plat

Number of holes drilled:	44
Normal charge depth:	30-75 ft.
Normal charge:	2-40 lbs.
Number of levels tested:	27
Upper geophone level:	250 ft. K.B.
Deepest geophone level:	16942 ft. K.B.
Quality of geophone breaks:	Good to Poor
Elevation velocity:	10000 ft./sec.

INSTRUMENTATION

Energy Source:	Explosives
Downhole Detector:	Six 15 Hz. geophones connected in parallel
Downhole Amplification:	62 db
Borehole Coupling:	Surface controlled locking arm
Surface Amplification:	Floating poing amplifier
Recording:	SSC model IDPC-1100 floating point digital recording system
Tape Format:	9 track, 800 bpi, IBM compatible
Sample Rate:	1 millisecond
Trace polarity:	
Digital tape playouts:	Time breaks: down Geophone breaks: down

FIELD PROCEDURE

Standard practice, using the wall-coupled geophone, is to lower the instrument to the level to be tested, open the coupling device, slacken the cable, shoot, pick up the slack, retract the coupling device and then move to the next level where the cycle is repeated. Slackening the cable while the phone is coupled to the borehole wall minimizes the effect of cable-borne energy.

RESULTS AND INTERPRETATION

Seismic

An elevation velocity (V_e) of 10000 ft./sec. was used for datum corrections.

The digital tape data have been edited and arranged according to depth producing a Digital Record Display. A copy of this display is included in the report pocket. The data used for calculation consists of the times picked from this display for each level. These time data are tabulated with the velocities and calculation steps on the velocity calculation sheets found in the appendix. A computer plot of time-depth, average and interval velocities, with a reduced scale plot of the calibrated velocity log is included in the report pocket.

Velocity Log

The time depth values obtained from the velocity survey are used to calibrate the raw velocity log. The measured time intervals from the survey are compared with the corresponding integrated time intervals from the raw velocity log. A plot is made indicating the differences between the geophone data and the log, and from this plot adjustments are determined and applied to the log. This plot is labelled Deviation Plot, and is included in the report pocket. The adjustments determined from the Deviation Plot are applied by moving the raw velocity log curve laterally in such a way that when reintegrated the log times will agree closely with the well geophone times. The lateral adjustments consist of a linear or differential shift.

Linear shifts are calculated using the equation:

$$\text{Shift} = \frac{t_{A2} - t_{A1}}{D_1 - D_2} \times 10^6$$

where D is the depth of the adjustment point, and t_A is the amount of time adjustment indicated by the adjustment point. The result is expressed in microseconds/ft. The linear shifts are applied only when the equation is positive as the log error in the case is assumed to be instrumental in origin. When the equation is negative a differential shift is used.

Differential shifts are calculated using the equation:

$$\% \text{ Shift} = \frac{(t_L - t_A)_2 - (t_L - t_A)_1}{t_{L2} - t_{L1}} \times 100$$

where t_L is the travel time from the raw velocity log at the adjustment point, and t_A is the amount of time adjustment indicated by the adjustment point. Differential shifts are applied whenever the calibration data indicates a shift towards higher velocities. The lower velocities, due to borehole effects, are assumed to have contributed more transit time error than higher velocities. Therefore, lower velocity sections of the log recieve larger corrections than higher velocity sections. Differential shifts are expressed as a percentage of the raw velocity log values. In both equations above, subscript 1 corresponds to the shallow adjustment point and subscript 2 corresponds to the deep adjustment point. (See Deviation Plot)

The adjustments to the log interval time data are listed on the calibrated log heading, and have been absorbed into the natural velocity contrasts as recorded on the velocity log. The total travel times for the geophone levels as shown by the calibrated log and indicated time differences between the geophone and calibrated log data are listed on the calibrated velocity log data sheets in the appendix. The time differences are minimal.

Three copies of the calibrated velocity log are included in the report pocket: One at a linear depth scale of 1" = 100', one at a linear time scale of 2 1/2" per second, two way time and one at a linear time scale of 5" per second, two way time. A computer printout of the calibrated log data, listing one and two way travel times, depth, interval and average velocities, is included in the appendix.

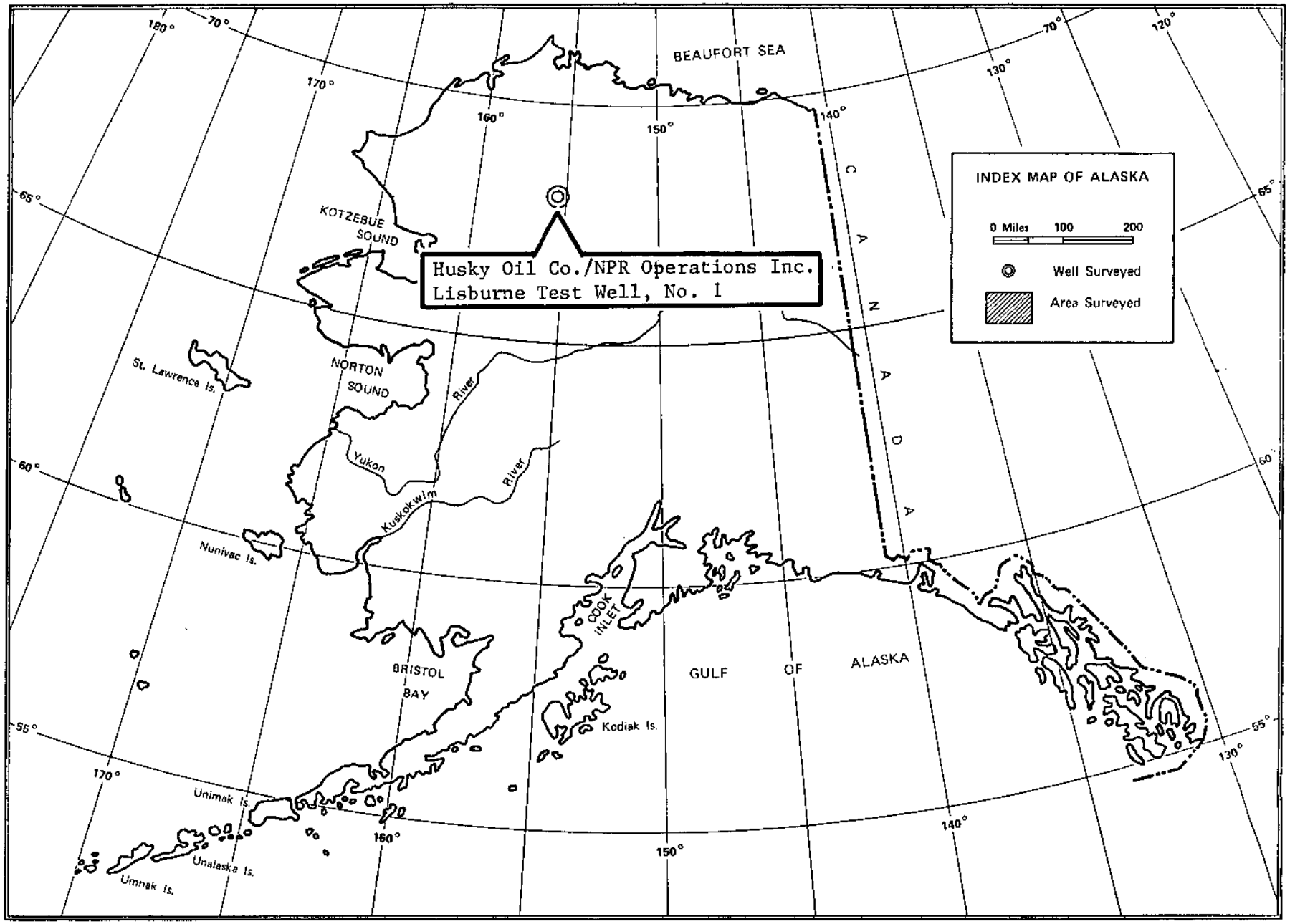
The results from the combined survey and velocity log are good, and the data are considered reliable.

Respectfully submitted,

Birdwell Division of
Seismograph Service Corporation

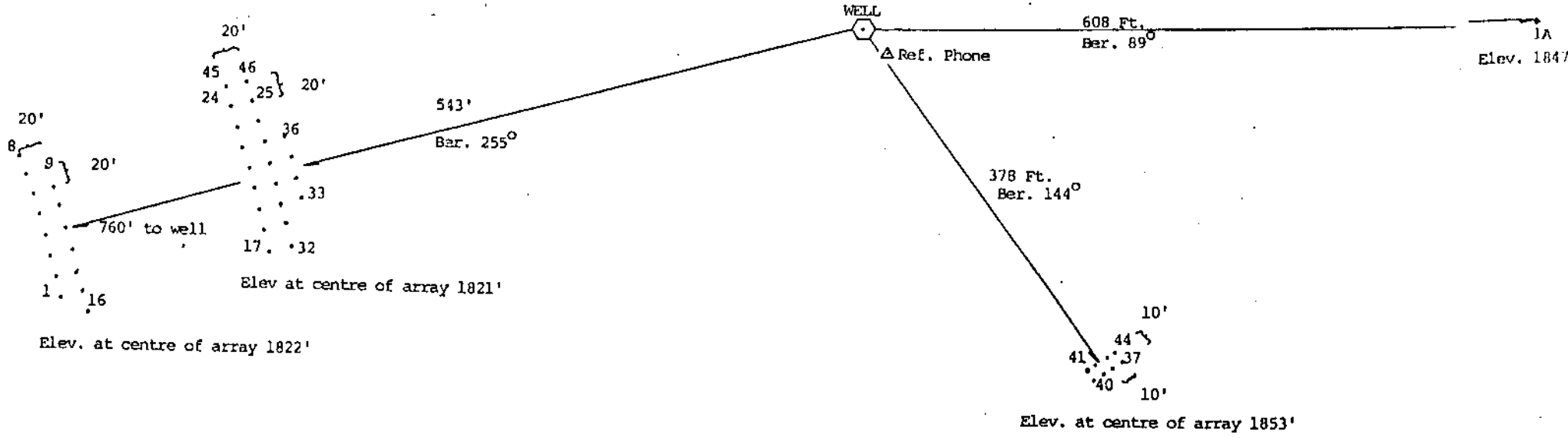
Date_____ By_____
Elaine Kimberley (Interpreter)

Date_____ _____
Macaulay O. Akata
(Assistant Manager)


BEAUFORT SEA
Husky Oil Co./NPR Operations Inc.
Lisburne Test Well, No. 1
INDEX MAP OF ALASKA
0 Miles 100 200
Well Surveyed
Area Surveyed
KOTZEBUE SOUND
NORTON SOUND
St. Lawrence Is.
Yukon River
Kuskokwim River
Nunivac Is.
BRISTOL BAY
COOK INLET
GULF OF ALASKA
Kodiak Is.
Unimak Is.
Unalaska Is.
Umnak Is.
CANADA
180°
170°
160°
150°
140°
130°
120°
70°
65°
60°
55°

HUSKY OIL NPR OPERATIONS, INC.
Operator for Office of National
Petroleum Reserve
Lisburne Test No. 1
National Petroleum Reserve
North Slope, Alaska

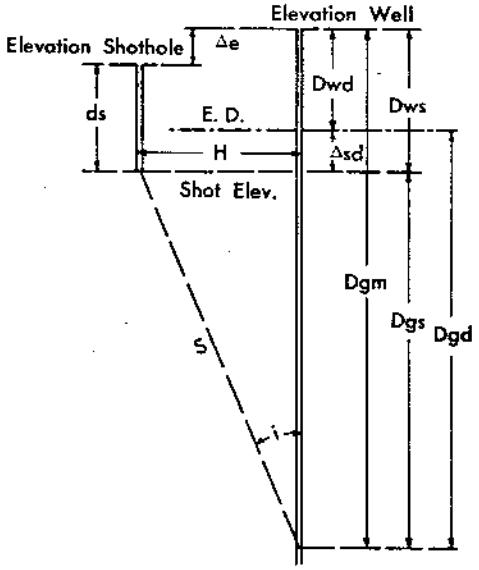
For elevation and distance
information see next page.



SHOOTING PLAT INFORMATION

SHOTPOINT	ELEVATION	DISTANCE FROM WELL
3	1823'	780'
4	1823'	780'
5	1823'	780'
6	1823'	780'
7	1823'	781'
8	1823'	781'
9	1823'	761'
10	1823'	760'
11	1823'	760'
12	1823'	760'
13	1823'	760'
14	1823'	760'
15	1823'	761'
16	1823'	761'
28	1821'	563'
29	1821'	563'
30	1821'	564'
31	1821'	565'
32	1821'	567'
33	1821'	544'
34	1821'	543'
37	1853'	388'
38	1853'	388'
39	1853'	388'
40	1853'	388'
41	1853'	378'
42	1853'	378'
43	1853'	378'
44	1853'	378'

CROSS-SECTION AND DEFINITION OF TERMS



Dgm	=	Geophone depth below well elevation
Dwd	=	Difference between well elevation and elevation datum = Ew − ED
Dgd	=	Geophone depth below elevation datum = Dgm − Dwd
ts	=	Uphole time in shothole
tr	=	Refraction time from reference geophone
ds	=	Depth of shot
H	=	Horizontal distance from well to shothole
Δsd	=	Difference between shot elevation and elevation datum = Es − ds − ED
Dgs	=	Geophone depth below shot elevation = Dgd + Δsd
cos i	=	$Dgs / \sqrt{H^2 + Dgs^2}$
T	=	Observed travel time from shot to well geophone
Gr	=	Quality grade of well geophone "break"
Tgs	=	Travel time for Dgs distance = T cos i
Δsd/ve	=	Time correction from shot to elevation datum
Tgd	=	Travel time for Dgd distance = Tgs − Δsd/ve
va	=	Average velocity to depth Dgd = Dgd/Tgd
ΔDgd	=	Interval distance = $Dgd_n - Dgd_m$
ΔTgd	=	Interval time for ΔDgd distance = $Tgd_n - Tgd_m$
vi	=	Interval velocity = ΔDgd/ΔTgd
S	=	Direct diagonal distance from shot to geophone = Dgs/cos i
ED	=	Elevation or reference datum
ve	=	Elevation correction velocity
Δe	=	Difference between well elevation and shothole elevation = Ew − Es

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EXPLOSIVE SEISMIC VELOCITY SURVEY

Husky Oil NPR Operations, Inc.
Operator for Office Of National Petroleum Reserve Alaska
Lisburne Test No. 1 National Petroleum Reserve, North Slope Alaska

ELEV.	Dwd	TOTAL DEPTH	CSG DEPTH	ELEV. DATUM	ELEV. VEL., Ve	DATE
K.B. = + 1862 ft.	+ 162 ft.	16992 ft. K.B.	13650 ft. K.B.	1700 ft.	10000 ft./sec.	May 27, 1980 July 25, Nov. 24, 79

LEVEL	FILE OR RECORD NO.	S.P. NO.	Chg.	t_s	t_r	MEASURED Dgm	VERTICAL Dgm	Dgd	+(S.P. Elev. − Dat. Elev. − d_s = Δ_{sd}) =	Dgs	H Dist.	Cos i	Avg. T	Gr.	Tgs	$\frac{\Delta_{sd}}{Ve}$	Tgd	Avg. Tgd	Ve	Δ Dgd	Δ Tgd	Vi
A	11	44	2#	.005	.038	250	250	88	1853 1700 30 123	211	378	.4874	.045	G	.0219	+.0123	.0096	.0096	9166*			
B	10	43	2#	.005	.038	500	500	338	1853 1700 30 123	461	378	.7733	.061	G	.0472	+.0123	.0349	.0349	9685*	838	0817	10257
C	9	42	2#	.005	.038	750	750	588	1853 1700 30 123	711	378	.8830	.081	G	.0715	+.0123	.0592	.0592	9932*			
D	8	41	2#	.005	.038	1000	1000	838	1853 1700 30 123	961	378	.9306	.101	G	.0940	+.0123	.0817	.0817	10257			
E	7	40	5#	.005	.038	1250	1250	1088	1853 1700 30 123	1211	388	.9523	.120	G	.1143	+.0123	.1020	.1020	10667	250	.0203	12315
F	6	39	5#	.005	.038	1490	1490	1328	1853 1700 30 123	1451	388	.9661	.140	G	.1353	+.0123	.1230	.1230	10798	240	.0210	11429
G	5	38	5#	.005	.039	1950	1950	1788	1853 1700 30 123	1911	388	.9800	.172	F	.1686	+.0123	.1563	.1563	11440	460	.0333	13814
H	4	37	5#	.007	.055	2902	2902	2740	1853 1700 30 123	2863	388	.9909	.241	G	.2388	+.0123	.2265	.2265	12097	952	.0702	13561
I	3	33	10#	.008	.058	4400	4400	4238	1821 1700 60 61	4299	544	.9921	.350	G	.3472	+.0061	.3411	.3411	12424	1498	.1146	13072
J	11	34	10#	.007	.058	4500	4500	4338	1821 1700 60 61	4399	543	.9925	.357	P	.3543	+.0061	.3482	.3482	12458	100	.0071	14084
K	12	32	20#	.007	.060	6170	6170	6008	1821 1700 60 61	6069	567	.9957	.484	P	.4819	+.0061	.4758	.4758	12627	1670	.1276	13088
L	13	31	20#	.008	.060	6895	6895	6733	1821 1700 60 61	6794	565	.9966	.537	F	.5352	+.0061	.5291	.5291	12725	725	.0533	13602
M	15	30	20#	.008	.059	7395	7395	7233	1821 1700 60 61	7294	564	.9970	.565	P	.5633	+.0061	.5572	.5572	12981	500	.0281	17794
N	16	28	20#	.008	.090	8025	8025	7863	1821 1700 60 61	7924	563	.9975	.600	P	.5985	+.0061	.5924	.5924	13273	630	.0352	17897
O	251	3	40#	.012	.090	10894	10894	10732	1823 1700 75 48	10780	780	.9974	.755	G	.7530	+.0048	.7482	.7482	14344	2869	.1558	18415
P	82	4	40#	.010	.090	11095	11095	10933	1823 1700 75 48	10981	780	.9975	.764	F	.7621	+.0048	.7573	.7573	14437	201	.0091	22088
Q	84	5	40#	.008	.090	11328	11328	11166	1823 1700 75 48	11214	780	.9976	.777	F	.7751	+.0048	.7703	.7703	14496	233	.0130	17923
R	86	7	40#	.009	.085	12412	12412	12250	1823 1700 75 48	12298	781	.9980	.830	F	.8283	+.0048	.8235	.8235	14876	1084	.0532	20376
S	87	8	40#	.008	.083	13295	13295	13133	1823 1700 75 48	13181	781	.9982	.878	G	.8764	+.0048	.8716	.8716	15068	883	.0481	18358
T	88	9	40#	.010	.010	13600	13600	13438	1823 1700 75 48	13486	761	.9983	.894	F	.8925	+.0048	.8877	.8877	15138	305	.0161	18944
U	89	10	40#	.009	.085	13736	13736	13574	1823 1700 75 48	13622	760	.9984	.900	G	.8986	+.0048	.8938	.8938	15187	136	.0061	22295
V	92	11	40#	.009	.086	14475	14475	14313	1823 1700 75 48	14361	760	.9986	.940	F	.9387	+.0048	.9339	.9339	15326	739	.0401	18429
W	93	12	40#	.009	.085	15312	15312	15150	1823 1700 75 48	15198	760	.9988	.985	G	.9838	+.0048	.9790	.9790	15475	837	.0451	18550
X	94	13	40#	.009	.088	15398	15398	15236	1823 1700 75 48	15284	760	.9988	.990	F	.9888	+.0048	.9840	.9840	15484	86	.0050	17200
Y	95	14	40#	.009	.087	16250	16250	16088	1823 1700 75 48	16136	760	.9989	?	P		+.0075				1526	.0765	19439
Z	96	15	40#	.009	.085	16880	16880	16718	1823 1700 75 48	16766	761	.9990	?	P		+.0075						

* Not used to compute velocity to top of log due to large horizontal component

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ELEV.	Dwd	TOTAL DEPTH	CSG DEPTH	ELEV. DATUM	ELEV. VEL., V_e	DATE
K.B. = + 1862 ft.	+ 162 ft.	16992 ft. K.B.	13650 ft. K.B.	1700 ft.	10000 ft./sec.	May 27, 1980 July 25 Nov. 24, 19[illegible]

LEVEL	FILE OR RECORD NO.	S.P. NO.	Chg.	t_s	t_r	MEASURED Dgm	VERTICAL Dgm	Dgd + (S.P. Elev. − Dat. Elev. − d_s = Δ_{sd}) =	Dgs	H Dist.	Cos I	Avg. T	Gr.	Tgs	$\frac{\Delta_{sd}}{V_e}$	Tgd	Avg. Tgd	Ve	Δ Dgd	Δ Tgd	Vi
AA	97	16	40#	.009	.085	16942	16942	16780 1823 1700 75 48	16828	761	.9990	1.062	F	1.0598	+.0048	1.0550	1.0550	15905	1526	.0785	19439
							Levels U-AA are below End of Log.														

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
1	2	10.3	10257	10257
2	4	20.5	10257	10257
3	6	30.7	10144	10219
4	8	39.3	8660	9829
5	10	48.5	9216	9707
6	12	57.1	8575	9518
7	14	64.3	7193	9186
8	16	71.8	7467	8971
9	18	79.9	8166	8882
10	20	86.9	6980	8691
11	22	94.7	7741	8605
12	24	102.8	8149	8567
13	26	110.9	8055	8528
14	28	119.0	8145	8500
15	30	127.7	8721	8515
16	32	136.1	8378	8506
17	34	145.3	9177	8546
18	36	154.3	9048	8574
19	38	164.5	10197	8659
20	40	174.1	9533	8703
21	42	183.3	9274	8730
22	44	192.1	8778	8732
23	46	202.6	10534	8811
24	48	213.5	10893	8897
25	50	222.0	8460	8880
26	52	230.8	8756	8875
27	54	239.3	8506	8862
28	56	248.7	9469	8883
29	58	258.6	9845	8916
30	60	268.4	9846	8947
31	62	277.2	8739	8941
32	64	286.7	9524	8959
33	66	297.9	11167	9026
34	68	309.5	11672	9104
35	70	320.6	11027	9159
36	72	331.8	11297	9218
37	74	343.9	12057	9295
38	76	356.1	12215	9372
39	78	367.3	11153	9417
40	80	378.6	11342	9465
41	82	390.6	12013	9528
42	84	401.3	10714	9556
43	86	412.6	11227	9595
44	88	423.7	11087	9629
45	90	435.4	11698	9675
46	92	447.0	11599	9716
47	94	459.0	12051	9766
48	96	470.4	11406	9800
49	98	482.6	12238	9850
50	100	495.1	12431	9902

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
51	102	506.6	11551	9934
52	104	516.4	9733	9930
53	106	524.9	8567	9904
54	108	533.3	8409	9877
55	110	542.8	9501	9870
56	112	553.9	11043	9891
57	114	565.2	11297	9915
58	116	576.8	11664	9946
59	118	585.9	9092	9931
60	120	597.2	11286	9954
61	122	607.5	10289	9969
62	124	618.0	10518	9968
63	126	628.2	10160	9971
64	128	636.3	8128	9942
65	130	647.4	11090	9960
66	132	659.5	12090	9992
67	134	670.4	10907	10006
68	136	683.4	12952	10049
69	138	696.6	13291	10096
70	140	708.4	11778	10120
71	142	722.1	13687	10171
72	144	733.6	11470	10189
73	146	743.9	10311	10190
74	148	756.6	12676	10224
75	150	769.2	12597	10256
76	152	779.5	10327	10256
77	154	790.9	11400	10271
78	156	802.0	11157	10283
79	158	813.3	11215	10294
80	160	822.7	9464	10284
81	162	831.5	8740	10265
82	164	839.9	8484	10243
83	166	848.4	8482	10222
84	168	859.5	11062	10232
85	170	871.0	11462	10247
86	172	882.3	11300	10259
87	174	893.5	11218	10270
88	176	904.8	11322	10282
89	178	915.7	10952	10289
90	180	926.9	11151	10299
91	182	938.2	11310	10310
92	184	950.1	11909	10327
93	186	961.3	11139	10336
94	188	973.1	11868	10352
95	190	985.5	12393	10374
96	192	997.7	12146	10392
97	194	1010.7	12991	10419
98	196	1023.4	12791	10443
99	198	1035.7	12271	10462
100	200	1047.4	11686	10474

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
101	202	1059.7	12299	10492
102	204	1071.0	11332	10500
103	206	1082.9	11864	10514
104	208	1094.7	11793	10526
105	210	1106.3	11634	10536
106	212	1118.5	12132	10551
107	214	1130.4	11940	10564
108	216	1144.5	14064	10597
109	218	1158.4	13939	10628
110	220	1172.4	14004	10658
111	222	1185.9	13479	10684
112	224	1199.3	13455	10708
113	226	1212.4	13012	10729
114	228	1226.6	14217	10759
115	230	1240.3	13771	10786
116	232	1254.5	14172	10815
117	234	1268.2	13729	10840
118	236	1281.9	13626	10863
119	238	1295.0	13105	10882
120	240	1308.1	13171	10901
121	242	1322.0	13812	10925
122	244	1336.3	14391	10954
123	246	1349.6	13226	10972
124	248	1361.1	11573	10977
125	250	1371.7	10573	10974
126	252	1383.4	11674	10979
127	254	1396.6	13192	10997
128	256	1410.8	14222	11022
129	258	1426.4	15641	11058
130	260	1442.1	15659	11093
131	262	1455.4	13290	11110
132	264	1467.1	11710	11114
133	266	1477.7	10597	11111
134	268	1489.6	11932	11117
135	270	1501.7	12085	11124
136	272	1513.9	12222	11132
137	274	1525.0	11028	11131
138	276	1538.7	13760	11150
139	278	1552.9	14147	11172
140	280	1566.7	13792	11191
141	282	1578.3	11668	11194
142	284	1589.4	11048	11193
143	286	1603.9	14492	11216
144	288	1616.1	12186	11223
145	290	1628.5	12475	11231
146	292	1642.2	13667	11248
147	294	1656.6	14372	11269
148	296	1670.6	13972	11288
149	298	1683.0	12400	11295
150	300	1694.4	11499	11296

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
151	302	1706.0	11577	11298
152	304	1717.5	11519	11300
153	306	1731.3	13742	11316
154	308	1745.0	13759	11331
155	310	1758.3	13205	11344
156	312	1768.8	10508	11338
157	314	1778.7	9911	11329
158	316	1788.9	10204	11322
159	318	1800.0	11090	11321
160	320	1811.7	11746	11323
161	322	1823.2	11501	11324
162	324	1838.6	15358	11349
163	326	1851.4	12782	11358
164	328	1867.7	16360	11388
165	330	1883.9	16233	11418
166	332	1900.5	16514	11449
167	334	1916.9	16437	11478
168	336	1933.3	16447	11508
169	338	1949.8	16498	11538
170	340	1966.6	16748	11568
171	342	1982.9	16270	11596
172	344	1998.1	15272	11617
173	346	2012.1	14011	11631
174	348	2026.5	14379	11647
175	350	2041.1	14624	11664
176	352	2055.9	14760	11681
177	354	2068.6	12717	11687
178	356	2080.7	12067	11689
179	358	2095.0	14314	11704
180	360	2107.7	12730	11710
181	362	2119.7	12002	11711
182	364	2129.5	9788	11701
183	366	2141.6	12082	11703
184	368	2152.3	10647	11697
185	370	2165.4	13192	11705
186	372	2179.5	14019	11718
187	374	2190.6	11157	11715
188	376	2203.2	12574	11719
189	378	2216.9	13740	11730
190	380	2230.5	13562	11739
191	382	2244.6	14080	11752
192	384	2258.1	13482	11761
193	386	2271.4	13311	11769
194	388	2284.4	12997	11775
195	390	2296.8	12456	11779
196	392	2310.1	13296	11786
197	394	2323.8	13691	11796
198	396	2337.0	13183	11803
199	398	2350.7	13730	11813
200	400	2365.1	14389	11826

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
201	402	2378.6	13494	11834
202	404	2391.3	12700	11838
203	406	2405.1	13780	11848
204	408	2418.4	13269	11855
205	410	2430.7	12371	11857
206	412	2444.2	13519	11865
207	414	2457.4	13204	11872
208	416	2470.6	13119	11878
209	418	2483.1	12517	11881
210	420	2495.6	12527	11884
211	422	2509.5	13883	11893
212	424	2523.6	14071	11904
213	426	2537.1	13578	11911
214	428	2551.9	14715	11925
215	430	2565.7	13889	11934
216	432	2579.3	13555	11941
217	434	2592.9	13628	11949
218	436	2605.3	12406	11951
219	438	2619.7	14318	11962
220	440	2634.7	15004	11976
221	442	2649.2	14565	11987
222	444	2663.0	13793	11996
223	446	2677.0	14007	12005
224	448	2691.6	14576	12016
225	450	2706.0	14413	12027
226	452	2720.1	14107	12036
227	454	2734.1	14012	12045
228	456	2746.9	12754	12048
229	458	2762.4	15505	12063
230	460	2776.4	13976	12071
231	462	2791.5	15092	12084
232	464	2805.6	14096	12093
233	466	2820.8	15261	12107
234	468	2834.5	13684	12113
235	470	2848.8	14269	12122
236	472	2862.2	13478	12128
237	474	2875.0	12744	12131
238	476	2889.1	14079	12139
239	478	2903.4	14285	12148
240	480	2917.5	14168	12156
241	482	2930.9	13417	12162
242	484	2944.5	13540	12167
243	486	2957.8	13281	12172
244	488	2971.2	13400	12177
245	490	2985.7	14545	12187
246	492	2999.1	13430	12192
247	494	3012.2	13091	12195
248	496	3026.1	13873	12202
249	498	3040.2	14121	12210
250	500	3053.1	12924	12213

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
251	502	3065.2	12062	12212
252	504	3078.9	13700	12218
253	506	3092.7	13829	12224
254	508	3106.8	14031	12231
255	510	3120.1	13325	12236
256	512	3133.5	13459	12240
257	514	3147.6	14033	12247
258	516	3161.9	14304	12255
259	518	3175.7	13782	12261
260	520	3189.0	13381	12266
261	522	3203.0	13916	12272
262	524	3216.2	13205	12275
263	526	3229.7	13539	12280
264	528	3243.4	13738	12286
265	530	3256.4	12964	12288
266	532	3269.8	13342	12292
267	534	3283.2	13433	12297
268	536	3296.1	12960	12299
269	538	3309.6	13406	12303
270	540	3322.9	13329	12307
271	542	3336.1	13242	12310
272	544	3349.1	13011	12313
273	546	3362.9	13746	12318
274	548	3376.6	13686	12323
275	550	3389.0	12450	12324
276	552	3400.9	11933	12322
277	554	3414.1	13166	12325
278	556	3426.6	12478	12326
279	558	3438.8	12177	12325
280	560	3449.9	11135	12321
281	562	3461.0	11090	12317
282	564	3472.6	11643	12314
283	566	3485.2	12600	12315
284	568	3497.2	11938	12314
285	570	3509.7	12512	12315
286	572	3522.0	12320	12315
287	574	3534.4	12396	12315
288	576	3546.4	11982	12314
289	578	3558.8	12369	12314
290	580	3571.5	12770	12316
291	582	3583.5	11960	12314
292	584	3596.5	13024	12317
293	586	3609.7	13166	12320
294	588	3622.4	12766	12321
295	590	3635.1	12644	12322
296	592	3647.9	12853	12324
297	594	3660.8	12838	12326
298	596	3673.7	12896	12328
299	598	3687.8	14090	12334
300	600	3700.5	12745	12335

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
301	602	3713.5	12996	12337
302	604	3726.7	13182	12340
303	606	3739.2	12558	12341
304	608	3752.4	13151	12343
305	610	3765.3	12867	12345
306	612	3778.0	12725	12346
307	614	3790.4	12380	12346
308	616	3803.5	13096	12349
309	618	3817.6	14111	12355
310	620	3830.7	13171	12357
311	622	3843.2	12406	12357
312	624	3855.8	12622	12358
313	626	3869.2	13465	12362
314	628	3881.7	12490	12362
315	630	3894.4	12707	12363
316	632	3907.5	13067	12366
317	634	3921.1	13564	12369
318	636	3934.3	13217	12372
319	638	3947.5	13212	12375
320	640	3960.9	13377	12378
321	642	3974.5	13601	12382
322	644	3987.9	13445	12385
323	646	4001.3	13342	12388
324	648	4014.2	12939	12390
325	650	4027.4	13197	12392
326	652	4040.4	13011	12394
327	654	4053.2	12790	12395
328	656	4066.5	13327	12398
329	658	4080.0	13448	12401
330	660	4092.8	12778	12402
331	662	4105.6	12825	12404
332	664	4119.2	13657	12407
333	666	4134.5	15297	12416
334	668	4150.0	15429	12425
335	670	4164.0	14090	12430
336	672	4178.6	14579	12436
337	674	4191.5	12834	12438
338	676	4205.4	13897	12442
339	678	4218.1	12737	12443
340	680	4231.1	13024	12444
341	682	4245.0	13915	12449
342	684	4258.7	13660	12452
343	686	4271.9	13231	12455
344	688	4285.5	13558	12458
345	690	4299.9	14462	12464
346	692	4313.8	13892	12468
347	694	4327.0	13159	12470
348	696	4341.2	14165	12475
349	698	4354.2	13000	12476
350	700	4366.0	11821	12474

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
351	702	4378.6	12578	12475
352	704	4389.5	10962	12470
353	706	4401.4	11840	12468
354	708	4415.2	13788	12472
355	710	4427.4	12283	12472
356	712	4441.0	13568	12475
357	714	4453.3	12312	12474
358	716	4464.1	10761	12469
359	718	4476.0	11908	12468
360	720	4489.3	13296	12470
361	722	4501.4	12167	12469
362	724	4513.7	12274	12469
363	726	4524.2	10499	12463
364	728	4537.4	13221	12465
365	730	4551.1	13676	12469
366	732	4564.4	13334	12471
367	734	4578.2	13799	12475
368	736	4590.9	12615	12475
369	738	4603.6	12784	12476
370	740	4616.3	12688	12477
371	742	4628.6	12229	12476
372	744	4641.6	13014	12477
373	746	4654.8	13203	12479
374	748	4668.2	13415	12482
375	750	4682.0	13834	12485
376	752	4694.9	12884	12486
377	754	4708.9	13986	12490
378	756	4722.6	13670	12494
379	758	4736.1	13524	12496
380	760	4750.2	14121	12501
381	762	4763.6	13338	12503
382	764	4777.5	13902	12506
383	766	4791.6	14138	12511
384	768	4805.7	14145	12515
385	770	4819.3	13520	12518
386	772	4832.4	13121	12519
387	774	4844.8	12423	12519
388	776	4856.4	11609	12517
389	778	4869.5	13082	12518
390	780	4882.0	12474	12518
391	782	4893.2	11224	12515
392	784	4906.0	12832	12515
393	786	4919.3	13302	12517
394	788	4929.5	10148	12511
395	790	4940.3	10859	12507
396	792	4954.6	14255	12512
397	794	4966.6	12005	12510
398	796	4977.1	10502	12505
399	798	4988.6	11532	12503
400	800	4999.8	11187	12500

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
401	802	5012.4	12613	12500
402	804	5024.3	11859	12498
403	806	5038.9	14633	12504
404	808	5051.7	12829	12504
405	810	5063.0	11227	12501
406	812	5076.4	13423	12503
407	814	5092.0	15564	12511
408	816	5106.8	14832	12517
409	818	5119.6	12766	12517
410	820	5133.0	13450	12520
411	822	5147.7	14718	12525
412	824	5162.4	14647	12530
413	826	5175.3	12957	12531
414	828	5189.5	14151	12535
415	830	5203.0	13522	12537
416	832	5219.0	16010	12546
417	834	5233.8	14820	12551
418	836	5247.9	14115	12555
419	838	5262.7	14753	12560
420	840	5279.1	16396	12569
421	842	5292.8	13745	12572
422	844	5303.5	10667	12568
423	846	5315.2	11665	12565
424	848	5326.1	10899	12561
425	850	5337.7	11590	12559
426	852	5351.2	13516	12561
427	854	5363.1	11914	12560
428	856	5377.0	13857	12563
429	858	5390.2	13231	12565
430	860	5401.5	11288	12562
431	862	5413.7	12255	12561
432	864	5427.7	13959	12564
433	866	5440.5	12824	12565
434	868	5453.1	12582	12565
435	870	5467.9	14800	12570
436	872	5482.2	14305	12574
437	874	5495.0	12776	12574
438	876	5507.6	12579	12574
439	878	5520.1	12503	12574
440	880	5532.4	12386	12574
441	882	5545.2	12738	12574
442	884	5559.3	14131	12578
443	886	5574.0	14663	12582
444	888	5587.7	13716	12585
445	890	5602.2	14501	12589
446	892	5615.8	13615	12591
447	894	5629.2	13397	12593
448	896	5641.9	12714	12594
449	898	5655.8	13938	12596
450	900	5668.9	13130	12598

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
451	902	5681.4	12503	12597
452	904	5693.8	12420	12597
453	906	5705.9	12105	12596
454	908	5717.1	11196	12593
455	910	5729.2	12107	12592
456	912	5741.6	12373	12591
457	914	5755.3	13745	12594
458	916	5769.2	13845	12596
459	918	5781.7	12544	12596
460	920	5795.2	13435	12598
461	922	5809.0	13843	12601
462	924	5822.4	13390	12603
463	926	5835.5	13139	12604
464	928	5849.4	13917	12607
465	930	5863.3	13887	12609
466	932	5877.2	13903	12612
467	934	5888.4	11200	12609
468	936	5901.6	13142	12610
469	938	5913.6	12015	12609
470	940	5924.4	10831	12605
471	942	5935.0	10529	12601
472	944	5948.0	13094	12602
473	946	5962.3	14208	12605
474	948	5976.7	14413	12609
475	950	5992.3	15665	12615
476	952	6008.0	15660	12622
477	954	6022.5	14478	12626
478	956	6035.1	12607	12626
479	958	6049.1	14007	12629
480	960	6061.8	12678	12629
481	962	6075.9	14096	12632
482	964	6089.5	13643	12634
483	966	6103.8	14318	12637
484	968	6119.4	15546	12643
485	970	6135.9	16509	12651
486	972	6152.2	16281	12659
487	974	6168.7	16527	12667
488	976	6184.1	15408	12672
489	978	6199.4	15303	12678
490	980	6214.8	15409	12683
491	982	6230.1	15265	12689
492	984	6247.4	17316	12698
493	986	6262.7	15313	12703
494	988	6274.4	11734	12701
495	990	6286.8	12364	12701
496	992	6300.7	13873	12703
497	994	6314.4	13747	12705
498	996	6328.4	13971	12708
499	998	6342.6	14160	12711
500	1000	6357.3	14792	12715

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
501	1002	6370.8	13457	12716
502	1004	6382.6	11838	12714
503	1006	6395.2	12547	12714
504	1008	6407.9	12704	12714
505	1010	6420.9	13048	12715
506	1012	6433.2	12268	12714
507	1014	6445.8	12608	12714
508	1016	6460.0	14145	12716
509	1018	6474.2	14280	12720
510	1020	6489.2	14936	12724
511	1022	6503.2	14040	12726
512	1024	6517.8	14610	12730
513	1026	6532.9	15026	12735
514	1028	6547.7	14831	12739
515	1030	6562.1	14469	12742
516	1032	6577.0	14816	12746
517	1034	6589.4	12394	12745
518	1036	6602.3	12913	12746
519	1038	6614.3	11979	12744
520	1040	6625.2	10947	12741
521	1042	6636.0	10834	12737
522	1044	6646.1	10084	12732
523	1046	6655.4	9273	12725
524	1048	6666.2	10793	12722
525	1050	6679.4	13170	12723
526	1052	6693.9	14591	12726
527	1054	6708.3	14394	12729
528	1056	6723.7	15388	12734
529	1058	6738.7	14967	12739
530	1060	6754.5	15851	12744
531	1062	6770.3	15736	12750
532	1064	6785.9	15657	12756
533	1066	6803.7	17777	12765
534	1068	6822.2	18440	12776
535	1070	6839.8	17603	12785
536	1072	6858.8	18993	12796
537	1074	6876.9	18124	12806
538	1076	6895.1	18225	12816
539	1078	6914.1	18976	12828
540	1080	6933.5	19462	12840
541	1082	6952.2	18681	12851
542	1084	6969.6	17370	12859
543	1086	6986.6	16995	12867
544	1088	7004.7	18152	12876
545	1090	7022.9	18164	12886
546	1092	7040.2	17263	12894
547	1094	7056.9	16770	12901
548	1096	7073.8	16874	12908
549	1098	7090.8	17023	12916
550	1100	7106.9	16067	12922

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
551	1102	7123.3	16371	12928
552	1104	7139.5	16241	12934
553	1106	7153.1	13617	12935
554	1108	7167.3	14166	12937
555	1110	7182.4	15130	12941
556	1112	7198.6	16154	12947
557	1114	7214.0	15457	12952
558	1116	7229.4	15346	12956
559	1118	7244.9	15533	12960
560	1120	7264.3	19417	12972
561	1122	7283.3	18952	12983
562	1124	7302.6	19340	12994
563	1126	7322.1	19432	13005
564	1128	7341.7	19648	13017
565	1130	7360.6	18860	13028
566	1132	7379.5	18933	13038
567	1134	7398.3	18853	13048
568	1136	7416.8	18442	13058
569	1138	7435.1	18324	13067
570	1140	7453.1	17988	13076
571	1142	7471.2	18109	13084
572	1144	7489.7	18492	13094
573	1146	7506.2	16455	13100
574	1148	7525.3	19187	13110
575	1150	7545.7	20395	13123
576	1152	7565.5	19802	13135
577	1154	7584.6	19028	13145
578	1156	7602.7	18179	13154
579	1158	7622.3	19563	13165
580	1160	7641.5	19226	13175
581	1162	7660.4	18858	13185
582	1164	7679.5	19080	13195
583	1166	7699.2	19700	13206
584	1168	7718.2	18982	13216
585	1170	7737.1	18908	13226
586	1172	7755.5	18433	13235
587	1174	7773.1	17641	13242
588	1176	7793.4	20227	13254
589	1178	7814.6	21248	13268
590	1180	7835.6	20995	13281
591	1182	7855.0	19430	13291
592	1184	7875.9	20816	13304
593	1186	7895.7	19881	13315
594	1188	7918.4	22699	13331
595	1190	7939.8	21337	13344
596	1192	7961.8	22036	13359
597	1194	7983.9	22108	13373
598	1196	8005.6	21730	13387
599	1198	8024.9	19274	13397
600	1200	8046.2	21314	13410

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
601	1202	8067.8	21597	13424
602	1204	8087.5	19695	13434
603	1206	8106.0	18478	13443
604	1208	8124.7	18693	13451
605	1210	8141.9	17223	13458
606	1212	8158.0	16033	13462
607	1214	8173.4	15402	13465
608	1216	8188.8	15441	13468
609	1218	8204.3	15452	13472
610	1220	8220.4	16126	13476
611	1222	8237.2	16778	13481
612	1224	8255.9	18721	13490
613	1226	8277.3	21376	13503
614	1228	8298.1	20841	13515
615	1230	8319.0	20905	13527
616	1232	8339.9	20866	13539
617	1234	8360.6	20758	13550
618	1236	8381.5	20867	13562
619	1238	8401.3	19779	13572
620	1240	8422.1	20806	13584
621	1242	8441.6	19566	13594
622	1244	8455.7	14091	13594
623	1246	8470.0	14239	13595
624	1248	8482.9	12963	13594
625	1250	8494.2	11259	13591
626	1252	8506.2	12000	13588
627	1254	8518.8	12573	13587
628	1256	8531.2	12476	13585
629	1258	8547.7	16449	13589
630	1260	8560.0	12338	13587
631	1262	8570.6	10554	13583
632	1264	8580.6	9994	13577
633	1266	8591.0	10412	13572
634	1268	8603.9	12912	13571
635	1270	8616.4	12503	13569
636	1272	8626.5	10107	13564
637	1274	8636.9	10368	13559
638	1276	8648.0	11160	13555
639	1278	8661.9	13909	13555
640	1280	8675.5	13547	13555
641	1282	8691.0	15485	13558
642	1284	8706.9	15952	13562
643	1286	8722.0	15078	13565
644	1288	8738.5	16523	13569
645	1290	8754.1	15536	13572
646	1292	8770.7	16600	13577
647	1294	8788.0	17300	13583
648	1296	8804.6	16662	13587
649	1298	8821.3	16622	13592
650	1300	8837.0	15778	13595

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
651	1302	8853.1	16093	13599
652	1304	8869.7	16619	13604
653	1306	8887.0	17233	13609
654	1308	8905.4	18460	13617
655	1310	8923.6	18159	13624
656	1312	8940.6	17002	13629
657	1314	8958.5	17905	13635
658	1316	8976.3	17815	13642
659	1318	8992.9	16627	13646
660	1320	9010.1	17121	13652
661	1322	9028.6	18518	13659
662	1324	9047.6	19064	13667
663	1326	9065.8	18193	13674
664	1328	9083.3	17490	13680
665	1330	9101.2	17909	13686
666	1332	9118.8	17572	13692
667	1334	9136.2	17389	13697
668	1336	9153.8	17570	13703
669	1338	9171.2	17443	13709
670	1340	9188.9	17738	13715
671	1342	9206.8	17807	13721
672	1344	9225.3	18518	13728
673	1346	9244.0	18722	13736
674	1348	9262.1	18123	13742
675	1350	9279.6	17476	13748
676	1352	9295.4	15846	13751
677	1354	9311.5	16022	13754
678	1356	9327.9	16437	13758
679	1358	9344.3	16363	13762
680	1360	9361.1	16866	13766
681	1362	9377.8	16698	13771
682	1364	9394.4	16584	13775
683	1366	9411.1	16652	13779
684	1368	9425.9	14796	13780
685	1370	9441.7	15806	13783
686	1372	9459.1	17455	13789
687	1374	9476.2	17058	13794
688	1376	9492.7	16491	13797
689	1378	9509.7	17072	13802
690	1380	9529.5	19755	13811
691	1382	9550.9	21397	13822
692	1384	9573.1	22221	13834
693	1386	9594.2	21094	13844
694	1388	9616.6	22384	13857
695	1390	9638.8	22254	13869
696	1392	9660.2	21402	13880
697	1394	9681.6	21357	13890
698	1396	9703.7	22109	13902
699	1398	9724.7	21015	13912
700	1400	9745.5	20758	13922

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
701	1402	9766.4	20932	13932
702	1404	9787.1	20636	13942
703	1406	9807.8	20761	13951
704	1408	9827.9	20110	13960
705	1410	9849.0	21112	13970
706	1412	9870.4	21368	13981
707	1414	9891.4	21039	13991
708	1416	9912.8	21390	14001
709	1418	9933.6	20744	14011
710	1420	9954.6	21052	14021
711	1422	9975.8	21167	14031
712	1424	9996.8	21004	14040
713	1426	10017.5	20702	14050
714	1428	10037.8	20347	14059
715	1430	10057.6	19759	14067
716	1432	10079.0	21352	14077
717	1434	10100.3	21337	14087
718	1436	10121.6	21318	14097
719	1438	10141.7	20092	14105
720	1440	10162.1	20417	14114
721	1442	10183.8	21628	14124
722	1444	10205.1	21371	14135
723	1446	10225.6	20519	14143
724	1448	10246.4	20795	14153
725	1450	10267.6	21133	14162
726	1452	10287.4	19814	14170
727	1454	10308.1	20725	14179
728	1456	10329.9	21769	14189
729	1458	10350.8	20933	14199
730	1460	10371.6	20770	14208
731	1462	10393.4	21847	14218
732	1464	10415.3	21843	14229
733	1466	10437.0	21727	14239
734	1468	10457.8	20795	14248
735	1470	10478.2	20447	14256
736	1472	10498.6	20391	14264
737	1474	10519.7	21076	14274
738	1476	10540.5	20831	14283
739	1478	10561.1	20525	14291
740	1480	10582.2	21147	14300
741	1482	10603.5	21293	14310
742	1484	10625.0	21446	14319
743	1486	10645.4	20477	14328
744	1488	10666.2	20780	14336
745	1490	10687.1	20904	14345
746	1492	10707.0	19902	14353
747	1494	10726.9	19914	14360
748	1496	10743.1	16146	14362
749	1498	10758.3	15196	14364
750	1500	10774.5	16245	14366

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
751	1502	10792.1	17582	14370
752	1504	10808.9	16815	14374
753	1506	10826.0	17040	14377
754	1508	10842.6	16683	14380
755	1510	10858.9	16282	14383
756	1512	10876.7	17820	14387
757	1514	10895.6	18902	14393
758	1516	10915.6	19939	14400
759	1518	10935.4	19789	14408
760	1520	10955.1	19779	14415
761	1522	10975.2	20007	14422
762	1524	10994.7	19534	14429
763	1526	11014.2	19523	14435
764	1528	11034.2	19965	14443
765	1530	11054.4	20197	14450
766	1532	11073.5	19145	14456
767	1534	11092.1	18628	14462
768	1536	11110.8	18686	14467
769	1538	11130.4	19522	14474
770	1540	11149.2	18834	14479
771	1542	11167.4	18205	14484
772	1544	11185.2	17809	14489
773	1546	11204.1	18924	14494
774	1548	11222.4	18324	14499
775	1550	11240.8	18347	14504
776	1552	11258.3	17501	14508
777	1554	11276.3	18011	14513
778	1556	11293.7	17390	14516
779	1558	11309.6	15951	14518
780	1560	11327.5	17813	14522
781	1562	11345.0	17515	14526
782	1564	11362.1	17092	14530
783	1566	11379.8	17708	14534
784	1568	11400.4	20654	14541
785	1570	11421.7	21318	14550
786	1572	11443.5	21780	14559
787	1574	11463.3	19774	14566
788	1576	11483.7	20431	14573
789	1578	11504.5	20740	14581
790	1580	11525.9	21429	14590
791	1582	11547.8	21934	14599
792	1584	11568.5	20614	14607
793	1586	11589.6	21181	14615
794	1588	11611.2	21548	14624
795	1590	11632.5	21344	14632
796	1592	11653.8	21290	14640
797	1594	11674.8	20995	14648
798	1596	11696.3	21480	14657
799	1598	11718.2	21927	14666
800	1600	11739.9	21659	14675

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
801	1602	11761.4	21498	14683
802	1604	11783.8	22449	14693
803	1606	11805.9	22061	14702
804	1608	11828.3	22376	14712
805	1610	11850.9	22595	14722
806	1612	11873.4	22525	14731
807	1614	11895.9	22522	14741
808	1616	11918.1	22197	14750
809	1618	11940.5	22435	14760
810	1620	11962.6	22059	14769
811	1622	11984.3	21671	14777
812	1624	12005.5	21227	14785
813	1626	12027.8	22323	14794
814	1628	12050.1	22305	14804
815	1630	12072.3	22180	14813
816	1632	12094.6	22310	14822
817	1634	12117.1	22470	14831
818	1636	12139.3	22210	14840
819	1638	12161.8	22514	14850
820	1640	12183.4	21648	14858
821	1642	12205.2	21791	14866
822	1644	12227.3	22025	14875
823	1646	12248.9	21597	14883
824	1648	12266.5	17633	14887
825	1650	12285.4	18906	14891
826	1652	12305.1	19675	14897
827	1654	12324.6	19529	14903
828	1656	12343.3	18677	14907
829	1658	12362.0	18686	14912
830	1660	12381.0	19026	14917
831	1662	12399.3	18341	14921
832	1664	12418.5	19198	14926
833	1666	12438.8	20285	14933
834	1668	12458.0	19209	14938
835	1670	12477.6	19548	14943
836	1672	12497.3	19748	14949
837	1674	12517.0	19631	14955
838	1676	12536.7	19707	14960
839	1678	12556.3	19634	14966
840	1680	12576.6	20263	14972
841	1682	12595.7	19167	14977
842	1684	12614.9	19216	14982
843	1686	12633.8	18889	14987
844	1688	12652.6	18763	14991
845	1690	12672.2	19581	14997
846	1692	12691.0	18828	15001
847	1694	12710.5	19457	15006
848	1696	12728.5	18066	15010
849	1698	12745.6	17068	15012
850	1700	12764.3	18685	15017

INTEGRATED ONE-WAY TIME (MS)	INTEGRATED TWO-WAY TIME (MS)	DEPTH BELOW DATUM (FEET)	INTERVAL VELOCITY (FEET/SEC)	AVERAGE VELOCITY (FEET/SEC)
851	1702	12783.4	19088	15022
852	1704	12801.6	18192	15025
853	1706	12820.3	18701	15030
854	1708	12838.8	18540	15034
855	1710	12857.4	18626	15038
856	1712	12875.2	17754	15041
857	1714	12894.4	19231	15046
858	1716	12912.6	18241	15050
859	1718	12930.3	17641	15053
860	1720	12946.6	16266	15054
861	1722	12964.6	18035	15058
862	1724	12982.3	17744	15061
863	1726	13000.8	18430	15065
864	1728	13019.6	18875	15069
865	1730	13037.6	17929	15072
866	1732	13055.7	18098	15076
867	1734	13074.1	18434	15080
868	1736	13092.6	18459	15084
869	1738	13111.1	18531	15088
870	1740	13129.2	18137	15091
871	1742	13147.3	18032	15094
872	1744	13165.7	18450	15098
873	1746	13182.8	17122	15101
874	1748	13200.3	17460	15103
875	1750	13216.7	16416	15105
876	1752	13233.6	16844	15107
877	1754	13249.9	16324	15108
878	1756	13266.5	16599	15110
879	1758	13283.5	16988	15112
880	1760	13301.0	17524	15115
881	1762	13317.9	16884	15117
882	1764	13334.3	16433	15118
883	1766	13351.0	16657	15120
884	1768	13367.6	16639	15122
885	1770	13384.0	16356	15123
886	1772	13401.1	17161	15125
887	1774	13417.8	16634	15127
888	1776	13433.9	16111	15128
889	1778	13448.7	14789	15128
890	1780	13464.2	15578	15128
891	1782	13480.4	16126	15129

Well CALIBRATED VELOCITY SURVEY DATA SHEET

HUSKY OIL NPR OPERATIONS
LISBURNE TEST NO.1
NATIONAL PET. RESERVE N.SLOPE ALASKA

ELE.	ELEV. DAT.	T.D.	DATE
K.B.=+1,862Ft.	1,700Ft.	16,992Ft.K.B.	May 27, 1980 July 25,Nov. 24,1979

DEPTH BELOW K.B.	DEPTH BELOW DATUM	ITEM	LOG Tgd	GEO. Tgd	DIFF.
250	88	Geophone Level	0.0101	0.0096	+.0005
500	338	Geophone Level	0.0365	0.0349	+.0016
750	588	Geophone Level	0.0592	0.0592	+.0000
1,000	838	Geophone Level	0.0818	0.0817	+.0001
1,250	1,088	Geophone Level	0.1034	0.1020	+.0014
1,490	1,328	Geophone Level	0.1214	0.1230	-.0016
1,950	1,788	Geophone Level	0.1579	0.1563	+.0016
2,902	2,740	Geophone Level	0.2275	0.2265	+.0010
4,400	4,238	Geophone Level	0.3405	0.3411	-.0006
4,500	4,338	Geophone Level	0.3478	0.3482	-.0004
6,170	6,008	Geophone Level	0.4760	0.4758	+.0002
6,895	6,733	Geophone Level	0.5286	0.5291	-.0005
7,395	7,233	Geophone Level	0.5582	0.5572	+.0010
8,025	7,863	Geophone Level	0.5914	0.5924	-.0010
10,894	10,732	Geophone Level	0.7473	0.7482	-.0009
11,095	10,933	Geophone Level	0.7589	0.7573	+.0016
11,328	11,166	Geophone Level	0.7709	0.7703	+.0006
12,412	12,250	Geophone Level	0.8231	0.8235	-.0004
13,295	13,133	Geophone Level	0.8702	0.8716	-.0014
13,600	13,438	Geophone Level	0.8883	0.8877	+.0006
13,736	13,574	Geophone Level	*	0.8938	*
14,475	14,313	Geophone Level	*	0.9339	*
15,312	15,150	Geophone Level	*	0.9790	*
15,398	15,236	Geophone Level	*	0.9480	*
16,250	16,088	Geophone Level	*	?	?

? = Depth Questionable * = Below Log

Birdwell CALIBRATED VELOCITY LOG

HUSKY OIL NPR OPERATIONS
LISBURNE TEST NO.1
NATIONAL PET. RESERVE N.SLOPE ALASKA

ELEV.	ELEV. DAT.	T.D.	DATE
K.B.=+1,862Ft.	1,700Ft.	16,992Ft.K.B.	May 27, 1980 July 25, Nov.,197[illegible]

DEPTH BELOW K.B.	DEPTH BELOW DATUM	ITEM	LOG Tgd	−	GEO. Tgd	=	DIFF.
16,880	16,718	Geophone Level	*		?		?
16,942	16,780	Geophone Level	*		1.0550		*
	? = Depth Questionable		* = Below Log				