

FIELD CROSSHOLE DATA REPORT

Crosshole Sismic Tests at the Vogtle Test Fill- Phase I

for

MACTEC, Engineering and Consulting, Inc.
396 Plasters Ave.
Atlanta, GA 30324

by

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1. Overview

All data that were collected during the crosshole seismics tests at the Vogtle Test Fill – Phase I are presented in this summary. Appendix A contains the sketch showing the locations of the boreholes used in the crosshole tests and the resulting compression- and shear-wave velocities in both graphical and tabular forms. Appendices B through E contain the recorded waveforms for given source-to-receiver and receiver-to-receiver travel paths for a given wave type. In each appendix, the waveforms are first shown as waterfall plots and then as individually expanded records of the 3-component geophone at each test depth. Wave arrivals are identified in each waveform by solid dots, “•”, that have been added to the records.

Appendices B through E contain the following results:

- (1) Appendix B: direct shear wave measurements using the source in Borehole CIIB-2 over depths of 2 to 10 ft.
- (2) Appendix C: direct compression wave measurements using the source in Borehole CHB-2 over depths of 2 to 10 ft.
- (3) Appendix D: direct and interval shear wave measurements using the source in Borehole CIIB-3 over depths of 6 to 38 ft.
- (4) Appendix E: direct and interval compression wave measurements using the source in Borehole CHB-3 over depths of 6 to 38 ft

Appendix F contains the calibration documentation including field evaluations of the trigger calibration and recorder timing calibration.

APPENDIX A

Compression- and Shear-wave Velocities Profiles

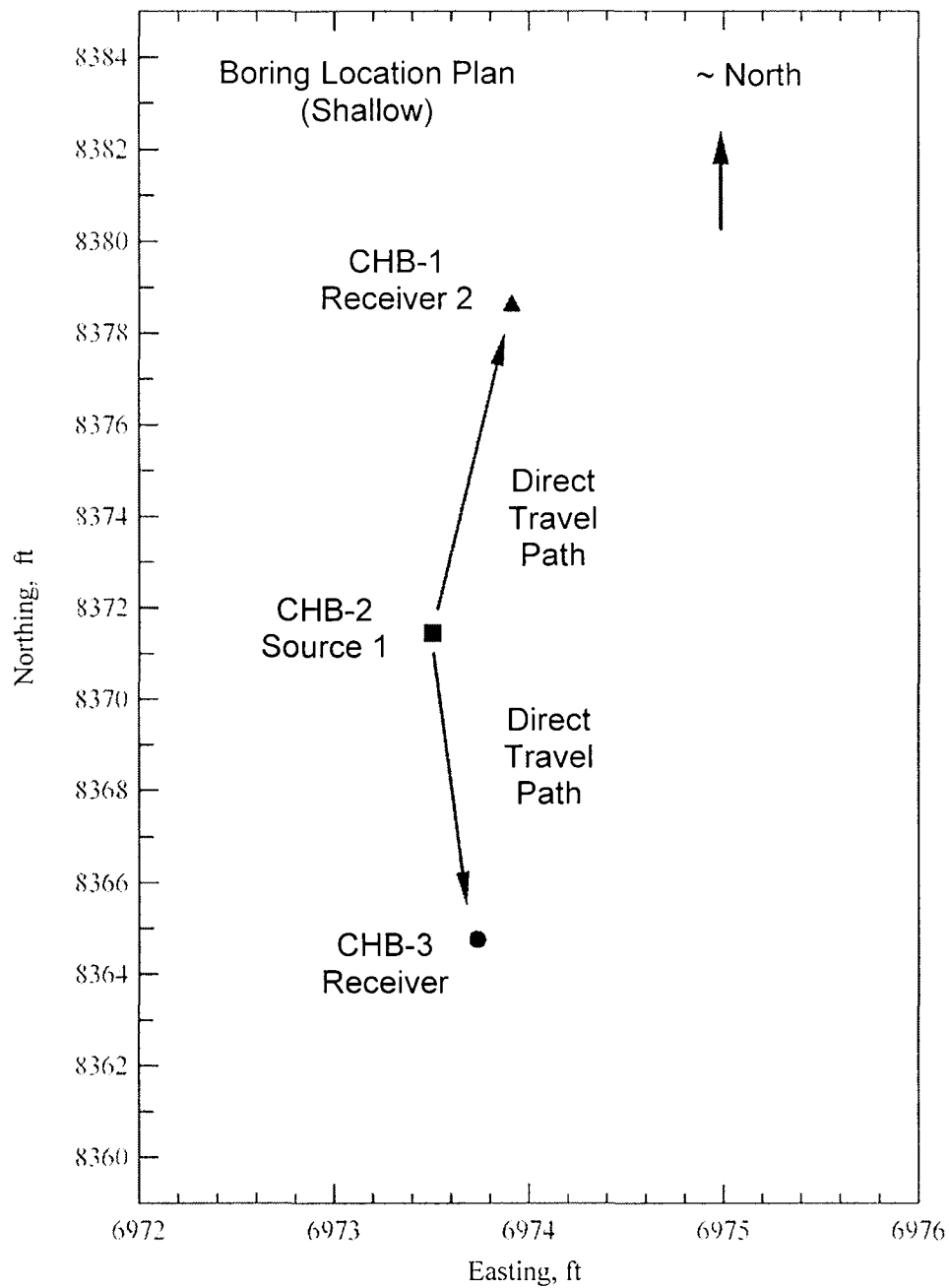


Figure 2 Locations of Crosshole Boreholes on the Footprint of the Test Fill (Depth Range: 2 to 10 ft)

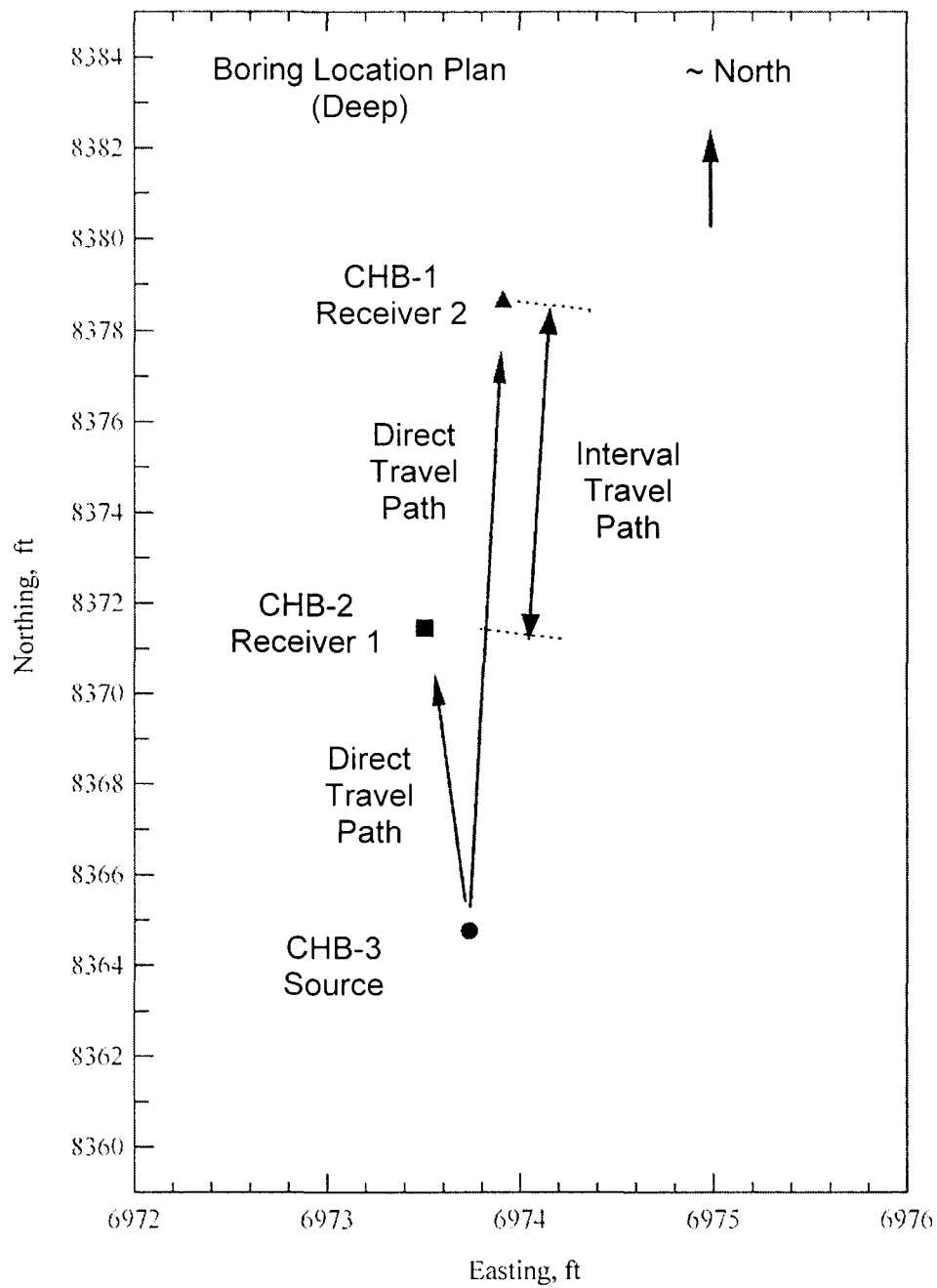


Figure 3 Locations of Crosshole Boreholes on the Footprint of the Test Fill (Depth Range: 6 to 38 ft)

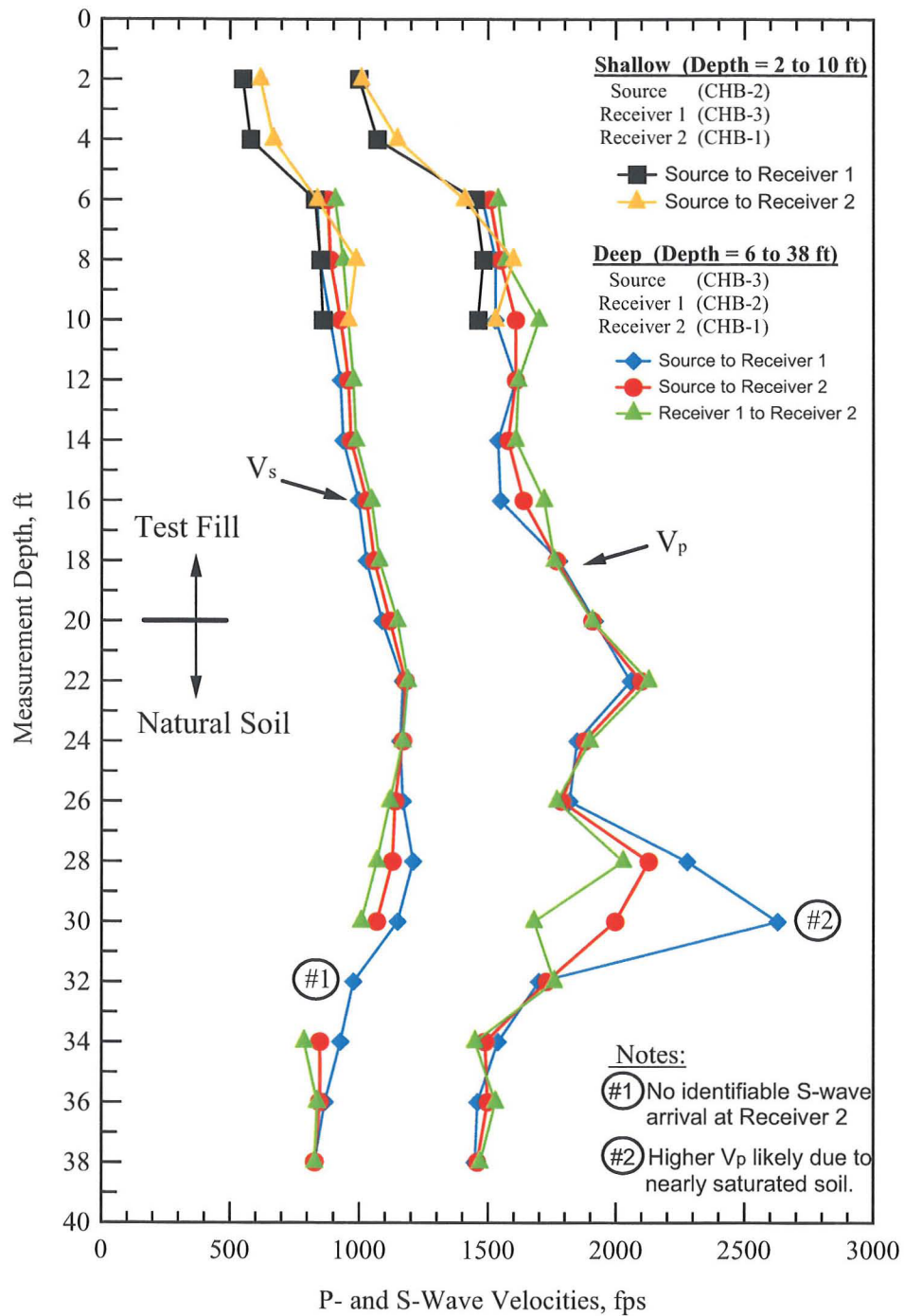


Figure 4 V_s and V_p Profiles from Crosshole Seismic Testing of the Compacted Test Fill (Boreholes CHB-1 ,CHB-2 and CHB-3)

Table A.1 Crosshole Seismic Wave Velocities(V_s) at Boreholes CHB-2 and CHB-3

Wave Velocities from Source Borehole CHB-2 to Receiver Borehole CHB-3
Vogtle Test Fill - Phase 1

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.244	0.133

Meas. Depth	Path Length ¹	Corrected Path Length ²	S-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
2	6.68	6.22	11.20	11.31	550
4	6.66	6.20	10.59	10.70	580
6	6.63	6.18	7.32	7.43	830
8	6.61	6.15	7.14	7.25	850
10	6.58	6.13	6.97	7.08	860

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : MinJae Jung
 Checked by : K. H. Stober
 Date : 02-06-2008

Table A.2 Crosshole Seismic Wave Velocities(V_s) at Boreholes CHB-1 and CHB-2

Wave Velocities from Source Borehole CHB-2 to Receiver Borehole CHB-1
Vogtle Test Fill - Phase 1

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.244	0.133

Meas. Depth	Path Length ¹	Corrected Path Length ²	S-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
2	7.16	6.70	11.37	11.48	620
4	7.15	6.69	10.60	10.72	670
6	7.15	6.69	8.36	8.47	840
8	7.15	6.70	7.13	7.24	990
10	7.16	6.70	7.39	7.50	960

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : MinJae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

Table A.3 Crosshole Seismic Wave Velocities(V_s) at Boreholes CHB-2 and CHB-3

Wave Velocities from Source Borehole CHB-3 to Receiver Borehole CHB-2
Vogtle Test Fill - Phase I

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.244	0.133

Meas. Depth	Path Length ¹	Corrected Path Length ²	S-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
6	6.63	6.18	7.26	7.34	840
8	6.61	6.15	7.17	7.25	850
10	6.58	6.13	6.81	6.88	890
12	6.56	6.10	6.47	6.55	930
14	6.53	6.07	6.38	6.46	940
16	6.49	6.04	5.95	6.03	1000
18	6.46	6.00	5.74	5.81	1030
20	6.41	5.96	5.40	5.48	1090
22	6.40	5.94	5.00	5.08	1170
24	6.36	5.90	5.00	5.08	1160
26	6.31	5.85	4.94	5.02	1170
28	6.26	5.80	4.73	4.81	1210
30	6.20	5.74	4.91	4.99	1150
32	6.13	5.67	5.74	5.81	980
34	6.07	5.61	5.98	6.06	930
36	6.04	5.59	6.38	6.46	870
38	6.03	5.57	6.65	6.73	830

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokstad
 Date : 02-06-2004

Table A.4 Crosshole Seismic Wave Velocities(V_s) at Boreholes CHB-1 and CHB-3

Wave Velocities from Source Borehole CHB-3 to Receiver Borehole CHB-1
Vogtle Test Fill - Phase I

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.244	0.133

Meas. Depth	Path Length ¹	Corrected Path Length ²	S-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
6	13.77	13.31	15.08	15.15	880
8	13.75	13.29	14.80	14.88	890
10	13.73	13.28	14.25	14.33	930
12	13.72	13.26	13.79	13.87	960
14	13.71	13.25	13.61	13.69	970
16	13.69	13.23	12.79	12.86	1030
18	13.66	13.21	12.39	12.47	1060
20	13.63	13.17	11.69	11.77	1120
22	13.61	13.15	11.05	11.12	1180
24	13.56	13.10	11.14	11.22	1170
26	13.50	13.04	11.35	11.43	1140
28	13.44	12.98	11.44	11.52	1130
30	13.36	12.90	12.02	12.10	1070
32	13.27	12.81	- ⁵	- ⁵	- ⁵
34	13.20	12.74	14.98	15.06	850
36	13.12	12.66	14.83	14.91	850
38	13.04	12.58	15.08	15.15	830

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)
5. Could Not Interpret S-wave Velocity at a Depth of 32 ft.

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

Table A.5 Crosshole Seismic Wave Velocities(V_s) at Boreholes CHB-1 and CHB-2

Wave Velocities from Source Borehole CHB-2 to Receiver Borehole CHB-1
Vogtle Test Fill - Phase 1

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.244	0.133

Meas. Depth	Path Length ¹	S-Wave	
		Measured Travel Time	Velocity ²
(ft)	(ft)	(ms)	(fps)
6	7.14	7.81	910
8	7.14	7.63	940
10	7.15	7.45	960
12	7.16	7.32	980
14	7.18	7.23	990
16	7.19	6.84	1050
18	7.21	6.65	1080
20	7.21	6.29	1150
22	7.21	6.04	1190
24	7.20	6.13	1170
26	7.19	6.41	1120
28	7.18	6.71	1070
30	7.16	7.11	1010
32	7.14	- ³	- ³
34	7.12	9.00	790
36	7.08	8.45	840
38	7.01	8.42	830

Notes:

1. Path Lengths are Provided by MACTEC
2. Velocity = (Corrected Path Length) / (Corrected Travel Time)
3. Could Not Interpret S-wave Velocity at a Depth of 32 ft.

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

Table A.6 Crosshole Seismic Wave Velocities(V_p) at Boreholes CHB-2 and CHB-3

Wave Velocities from Source Borehole CHB-2 to Receiver Borehole CHB-3
Vogtle Test Fill - Phase 1

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.282	0.067

Meas. Depth	Path Length ¹	Corrected Path Length ²	P-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
2	6.68	6.22	6.01	6.23	1000
4	6.66	6.20	5.60	5.81	1070
6	6.63	6.18	4.04	4.26	1450
8	6.61	6.15	3.94	4.15	1480
10	6.58	6.13	3.98	4.20	1460

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokstad
 Date : 02-06-2008

Table A.7 Crosshole Seismic Wave Velocities(V_p) at Boreholes CHB-1 and CHB-2

Wave Velocities from Source Borehole CHB-2 to Receiver Borehole CHB-1
Vogtle Test Fill - Phase I

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.282	0.067

Meas. Depth	Path Length ¹	Corrected Path Length ²	P-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
2	7.16	6.70	6.42	6.64	1010
4	7.15	6.69	5.62	5.83	1150
6	7.15	6.69	4.55	4.76	1410
8	7.15	6.70	3.97	4.18	1600
10	7.16	6.70	4.17	4.38	1530

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : MinJae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

Table A.8 Crosshole Seismic Wave Velocities(V_p) at Boreholes CHB-2 and CHB-3

Wave Velocities from Source Borehole CHB-3 to Receiver Borehole CHB-2
Vogtle Test Fill - Phase I

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.282	0.067

Meas. Depth	Path Length ¹	Corrected Path Length ²	P-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
6	6.63	6.18	3.97	4.17	1480
8	6.61	6.15	3.81	4.01	1530
10	6.58	6.13	3.81	4.01	1530
12	6.56	6.10	3.60	3.80	1610
14	6.53	6.07	3.75	3.95	1540
16	6.49	6.04	3.69	3.89	1550
18	6.46	6.00	3.17	3.37	1780
20	6.41	5.96	2.90	3.10	1920
22	6.40	5.94	2.69	2.88	2060
24	6.36	5.90	2.99	3.19	1850
26	6.31	5.85	3.02	3.22	1820
28	6.26	5.80	2.35	2.55	2280
30	6.20	5.74	1.98	2.18	2630
32	6.13	5.67	3.14	3.34	1700
34	6.07	5.61	3.45	3.65	1540
36	6.04	5.59	3.63	3.83	1460
38	6.03	5.57	3.63	3.83	1450

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length -- (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time -- (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity -- (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

Table A.9 Crosshole Seismic Wave Velocities(V_p) at Boreholes CHB-1 and CHB-3

Wave Velocities from Source Borehole CHB-3 to Receiver Borehole CHB-1
Vogtle Test Fill - Phase 1

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.282	0.067

Meas. Depth	Path Length ¹	Corrected Path Length ²	P-Wave		
			Measured Travel Time	Corrected Travel Time ³	Velocity ⁴
(ft)	(ft)	(ft)	(ms)	(ms)	(fps)
6	13.77	13.31	8.61	8.80	1510
8	13.75	13.29	8.36	8.56	1550
10	13.73	13.28	8.03	8.22	1610
12	13.72	13.26	8.03	8.22	1610
14	13.71	13.25	8.21	8.41	1580
16	13.69	13.23	7.87	8.07	1640
18	13.66	13.21	7.26	7.46	1770
20	13.63	13.17	6.68	6.88	1910
22	13.61	13.15	6.07	6.27	2100
24	13.56	13.10	6.77	6.97	1880
26	13.50	13.04	7.08	7.28	1790
28	13.44	12.98	5.89	6.09	2130
30	13.36	12.90	6.26	6.45	2000
32	13.27	12.81	7.20	7.40	1730
34	13.20	12.74	8.36	8.56	1490
36	13.12	12.66	8.27	8.47	1500
38	13.04	12.58	8.39	8.59	1460

Notes:

1. Path Lengths are Provided by MACTEC
2. Corrected Path Length = (Path Length) - (4 inch) - (1.5 inch)
3. Corrected Travel Time = (Measured travel time) - (Calibration Time) - (Travel Time in Grouting)
4. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2006

Table A.10 Crosshole Seismic Wave Velocities(V_p) at Boreholes CHB-1 and CHB-2

Wave Velocities from Source Borehole CHB-2 to Receiver Borehole CHB-1
Vogtle Test Fill - Phase I

Calibration Time	Travel Time in Grouting
(ms)	(ms)
-0.282	0.067

Meas. Depth	Path Length ¹	P-Wave	
		Measured Travel Time	Velocity ²
(ft)	(ft)	(ms)	(fps)
6	7.14	4.64	1540
8	7.14	4.55	1570
10	7.15	4.21	1700
12	7.16	4.43	1620
14	7.18	4.46	1610
16	7.19	4.18	1720
18	7.21	4.09	1760
20	7.21	3.78	1910
22	7.21	3.39	2130
24	7.20	3.78	1900
26	7.19	4.06	1770
28	7.18	3.54	2030
30	7.16	4.27	1680
32	7.14	4.06	1760
34	7.12	4.91	1450
36	7.08	4.64	1530
38	7.01	4.76	1470

Notes:

1. Path Lengths are Provided by MACTEC
2. Velocity = (Corrected Path Length) / (Corrected Travel Time)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

APPENDIX B

Shear-Wave Travel Time Records from Crosshole Seismic Testing
Between Source Borehole CHB-2 and
Receiver Boreholes CHB-1 and CHB-3
(Depth Range: 2 to 10 ft)

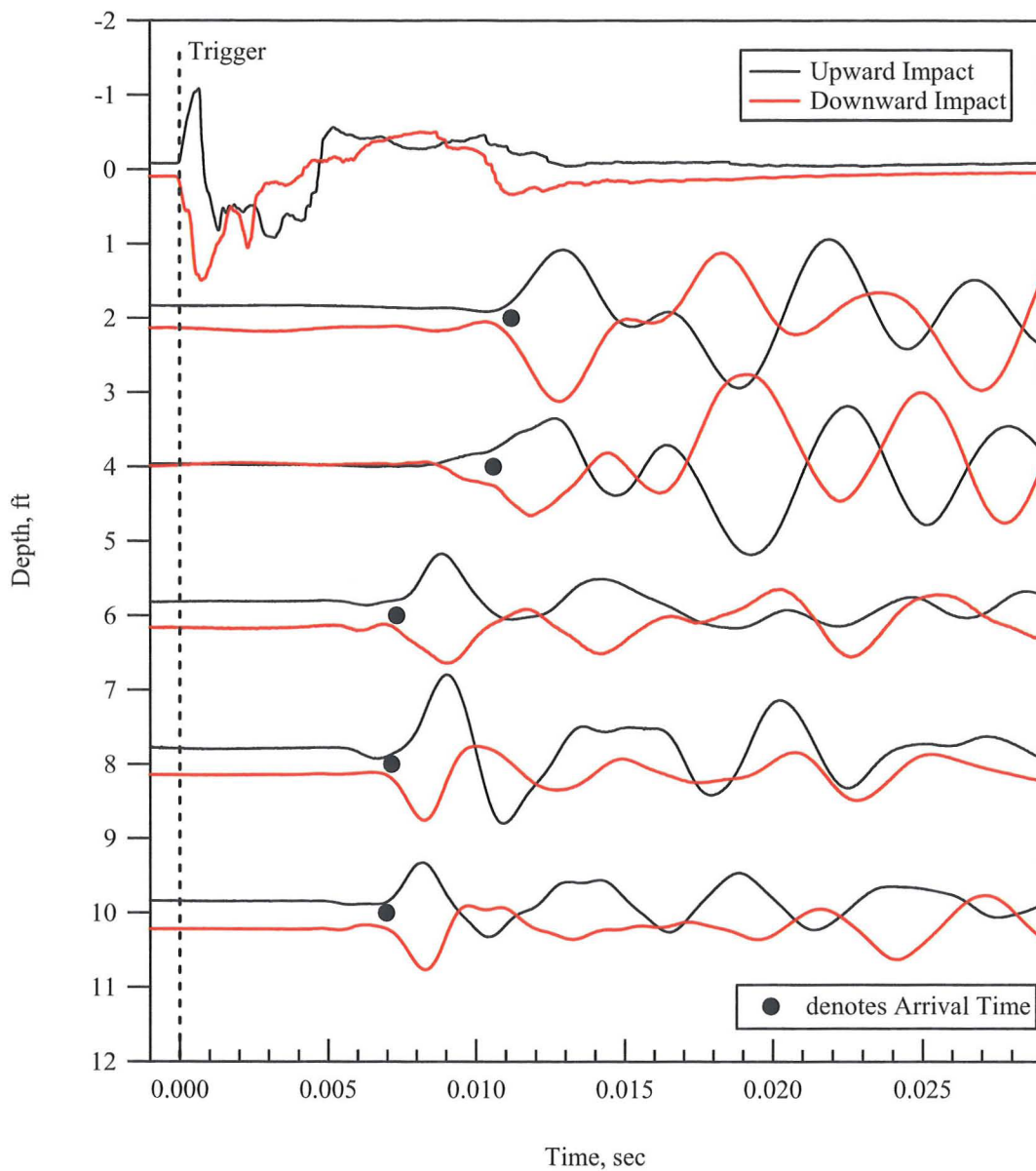


Figure B.1 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-2 and Receiver Borehole CHB-3; Full Record Length and 2- to 10-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

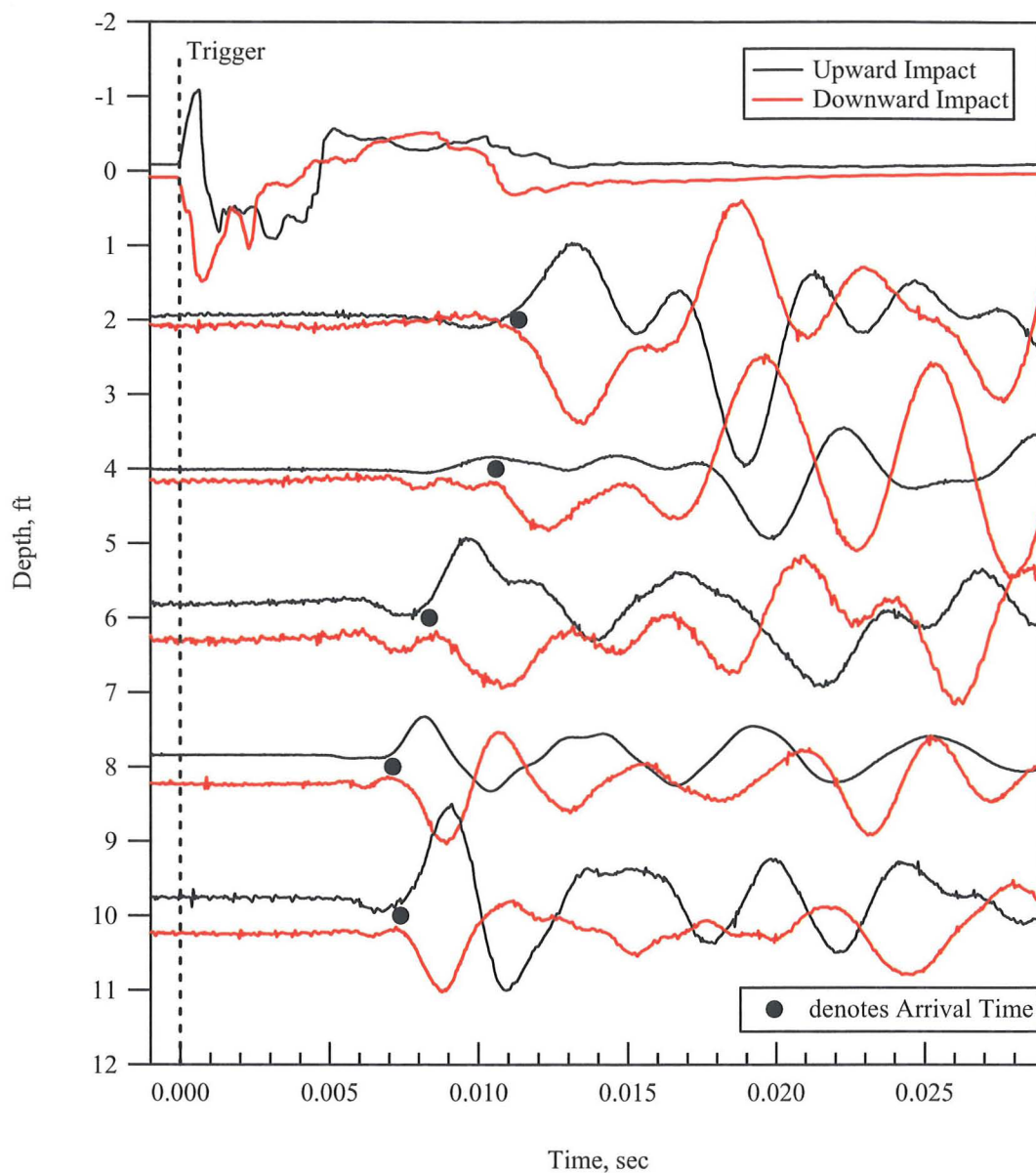


Figure B.2 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-2 and Receiver Borehole CHB-1; Full Record Length and 2- to 10-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : MinJae Jung
 Checked by : K. H. Stokstad
 Date : 02-06-2008

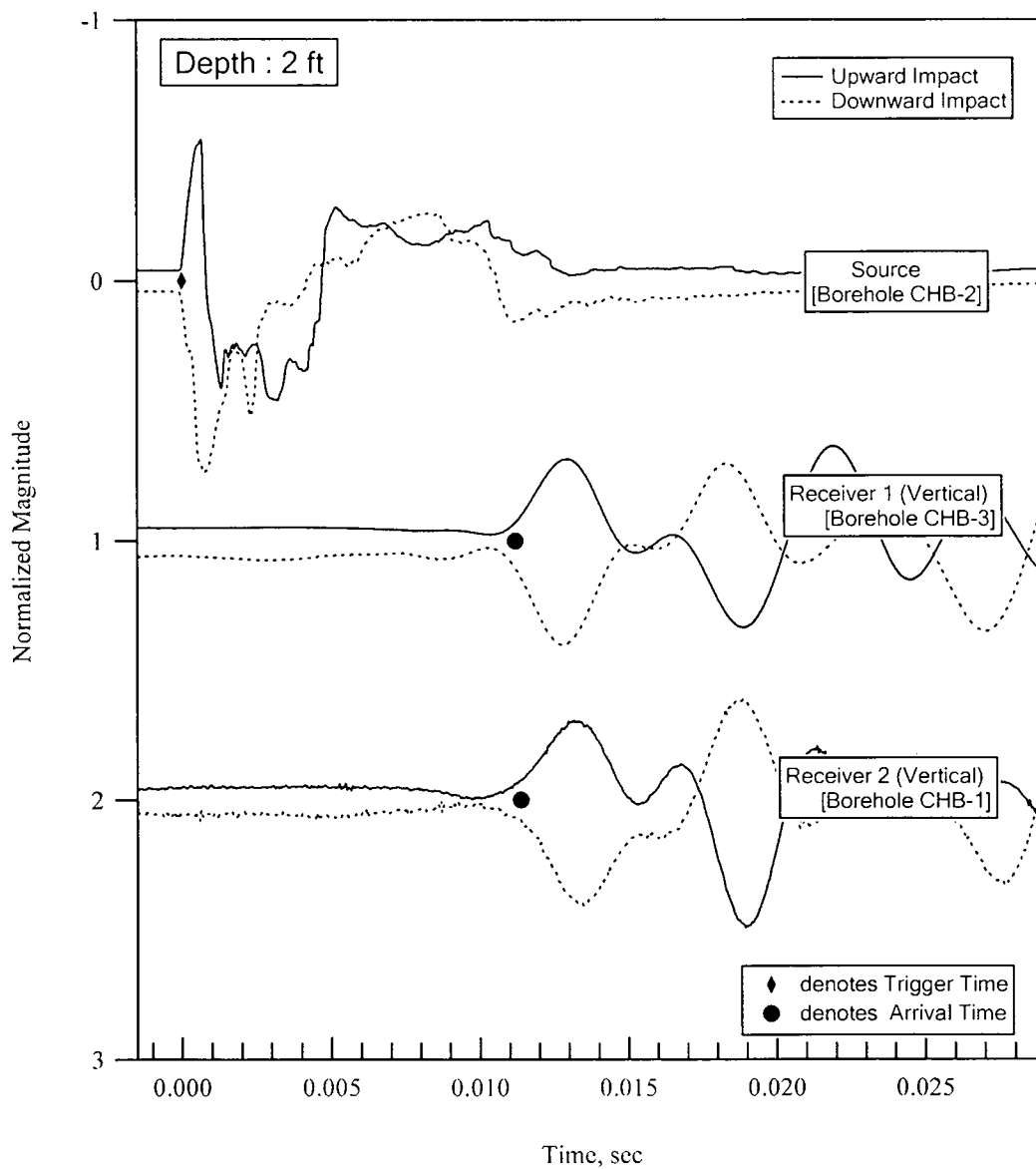


Figure B.3 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 2 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

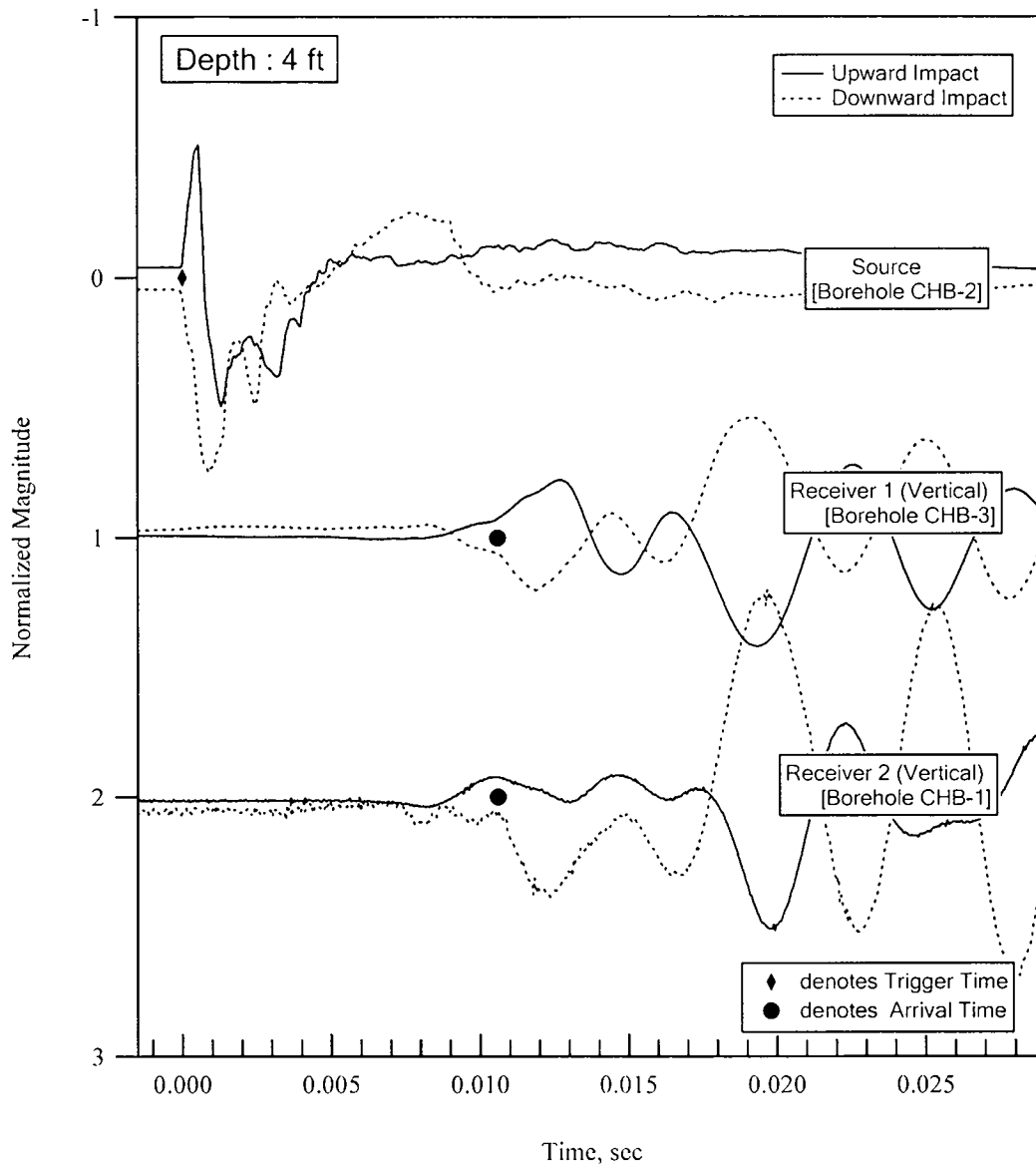


Figure B.4 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 4 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2008

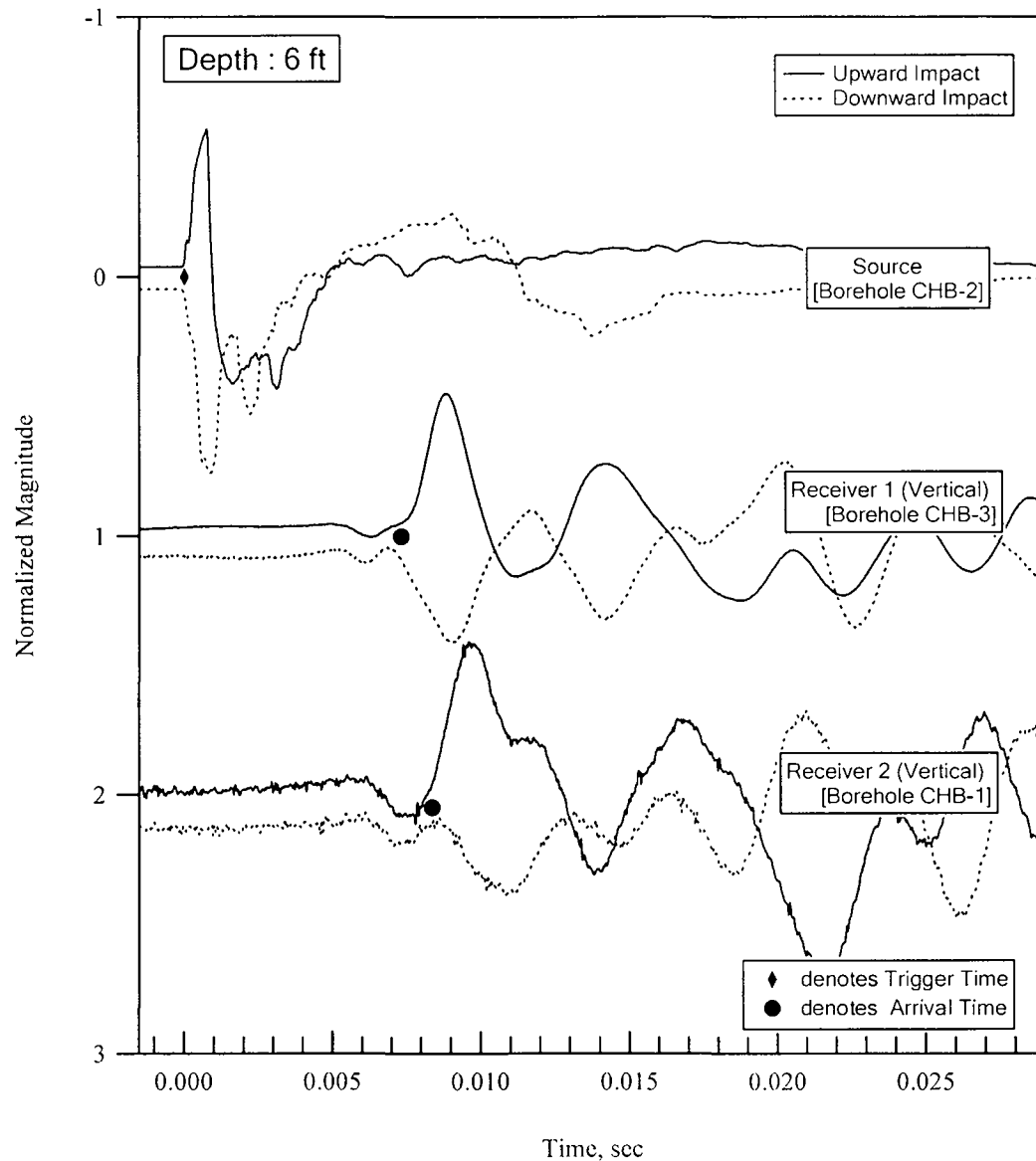


Figure B.5 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 6 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2004

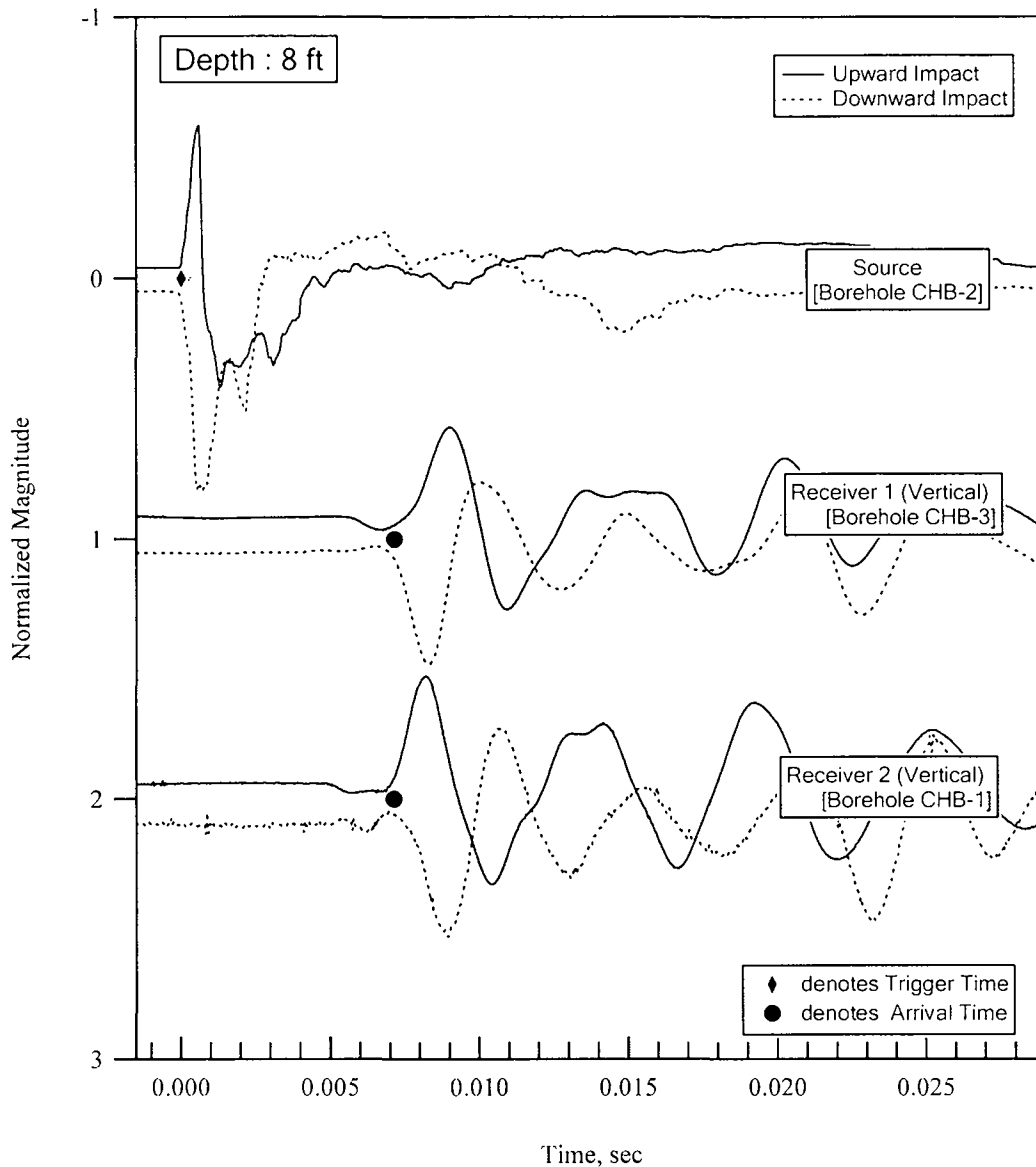


Figure B.6 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 8 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2006

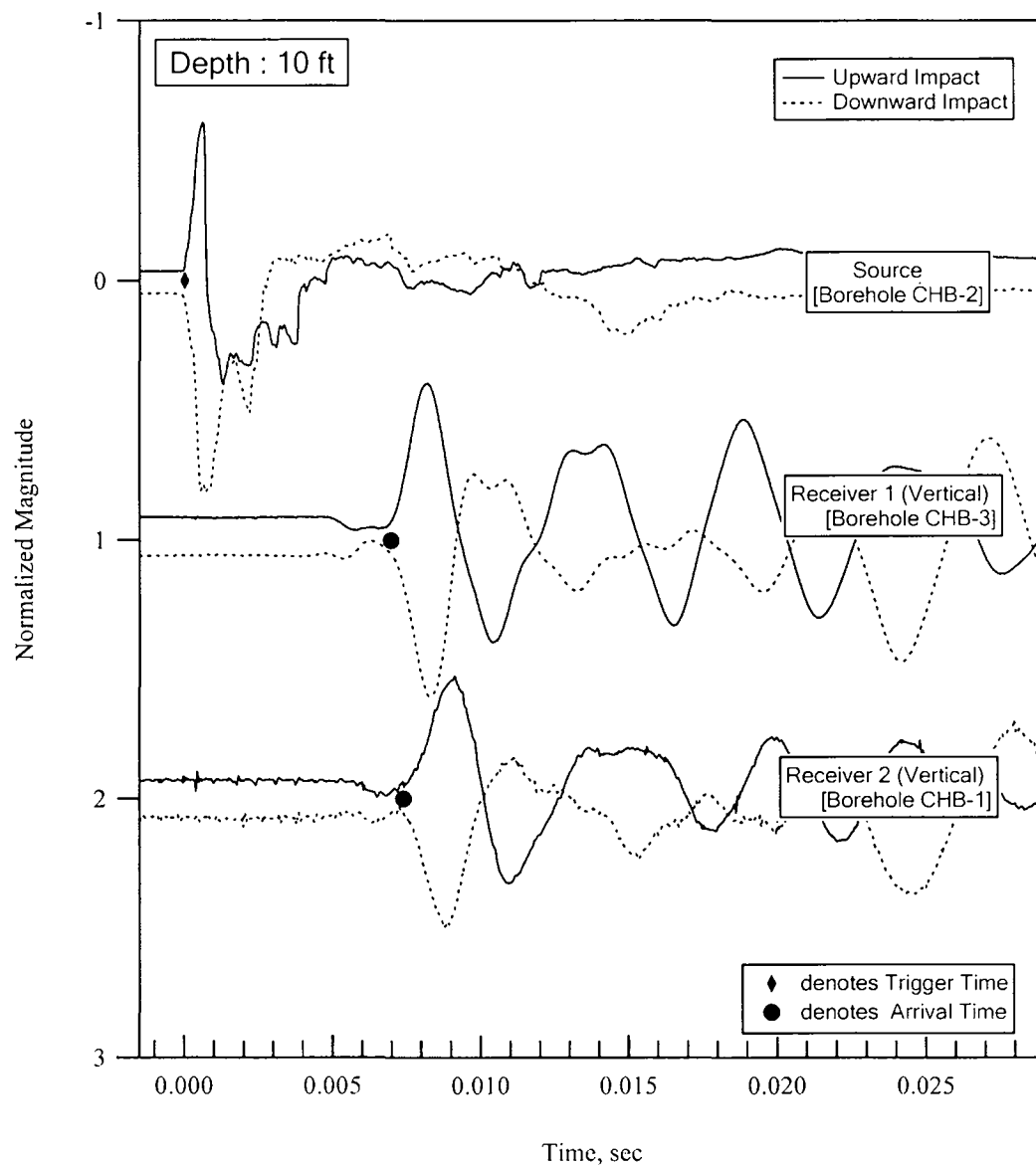


Figure B.7 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 10 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

APPENDIX C

Compression-Wave Travel Time Records from Crosshole Seismic Testing
Between Source Borehole CHB-2 and
Receiver Boreholes CHB-1 and CHB-3
(Depth Range: 2 to 10 ft)

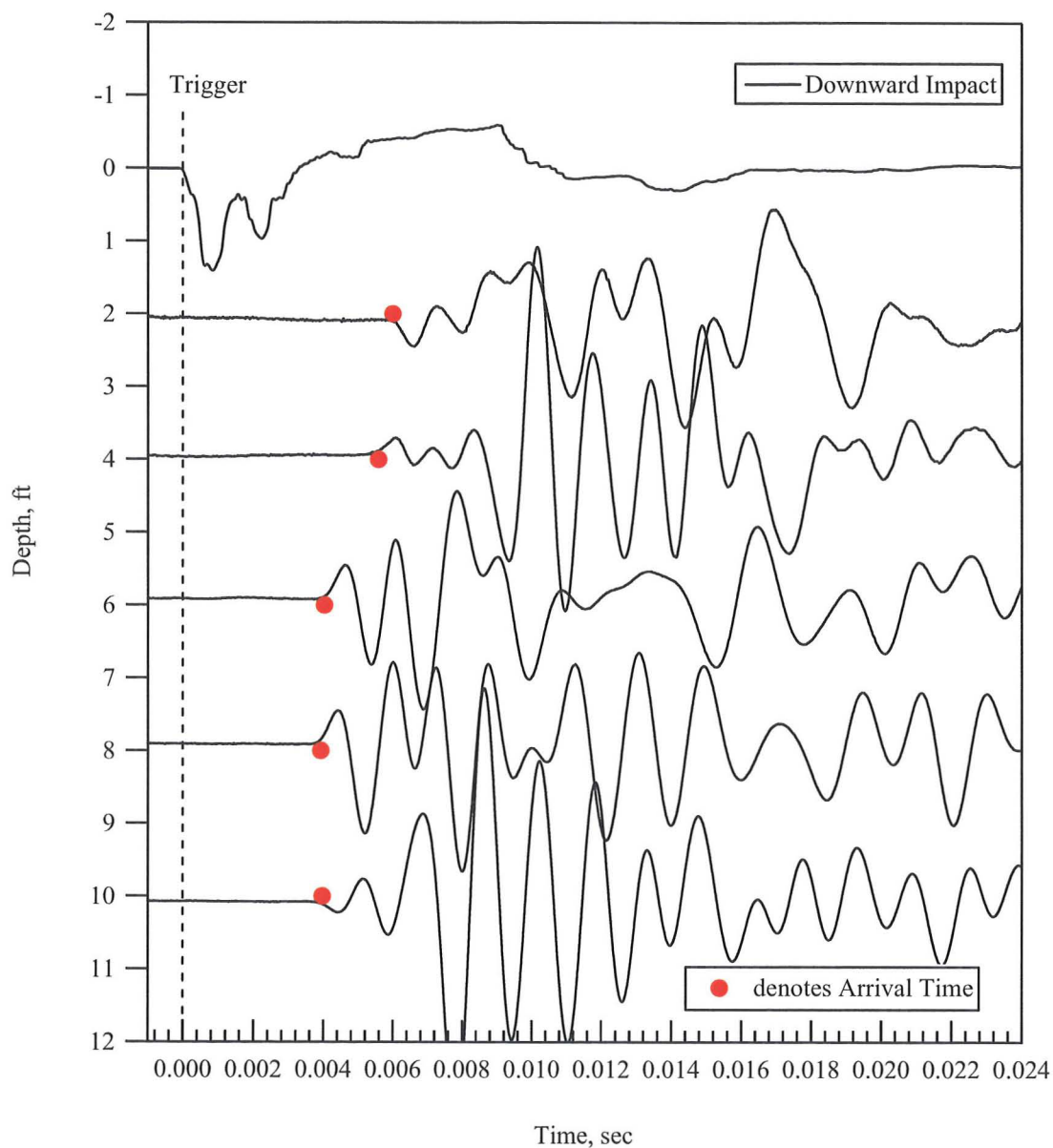


Figure C.1 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-2 and Receiver Borehole CHB-3; Full Record Length and 2- to 10-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokstad
 Date : 02-06-2008

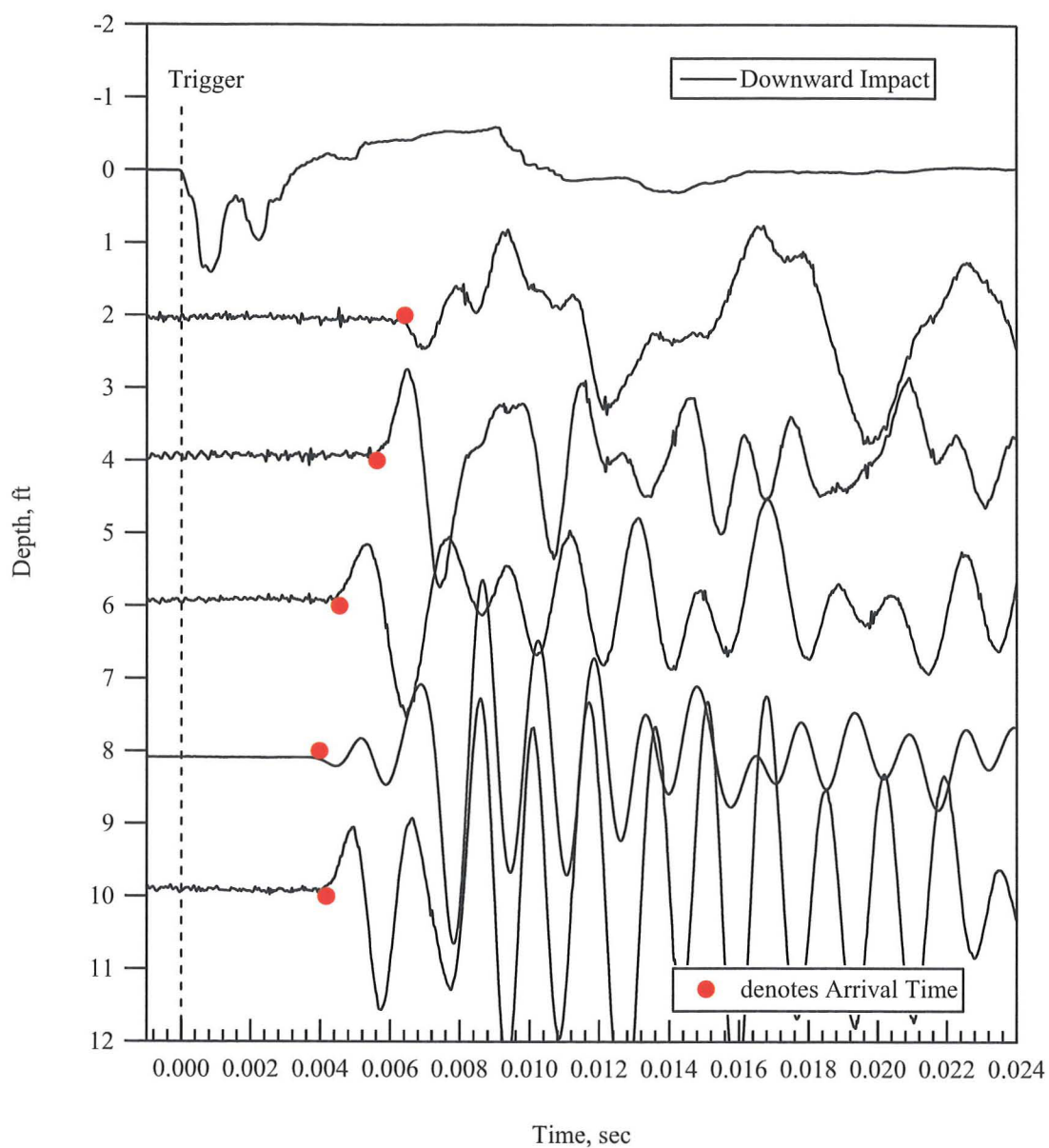


Figure C.2 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-2 and Receiver Borehole CHB-1; Full Record Length and 2- to 10-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

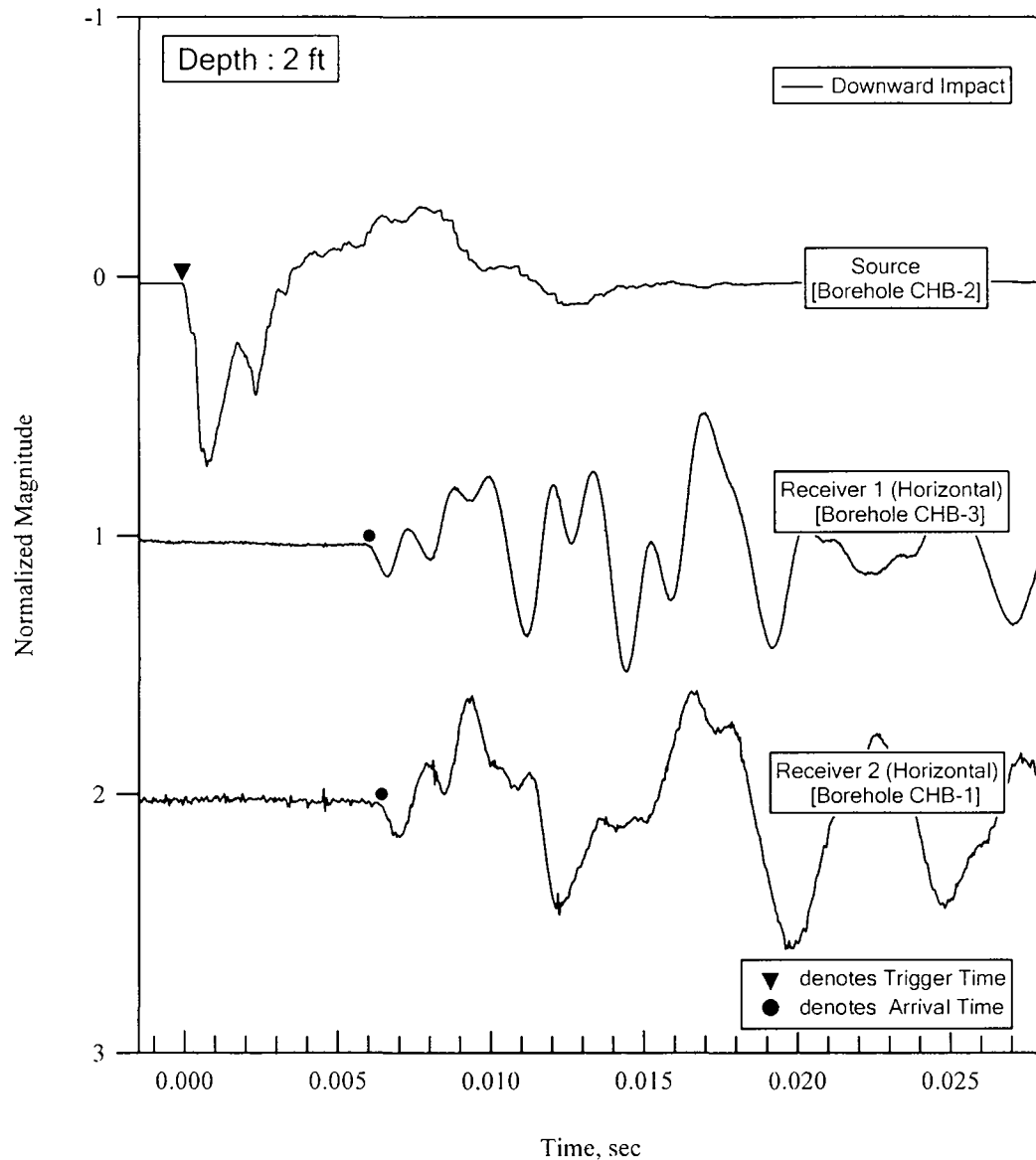


Figure C.3 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 2 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2004

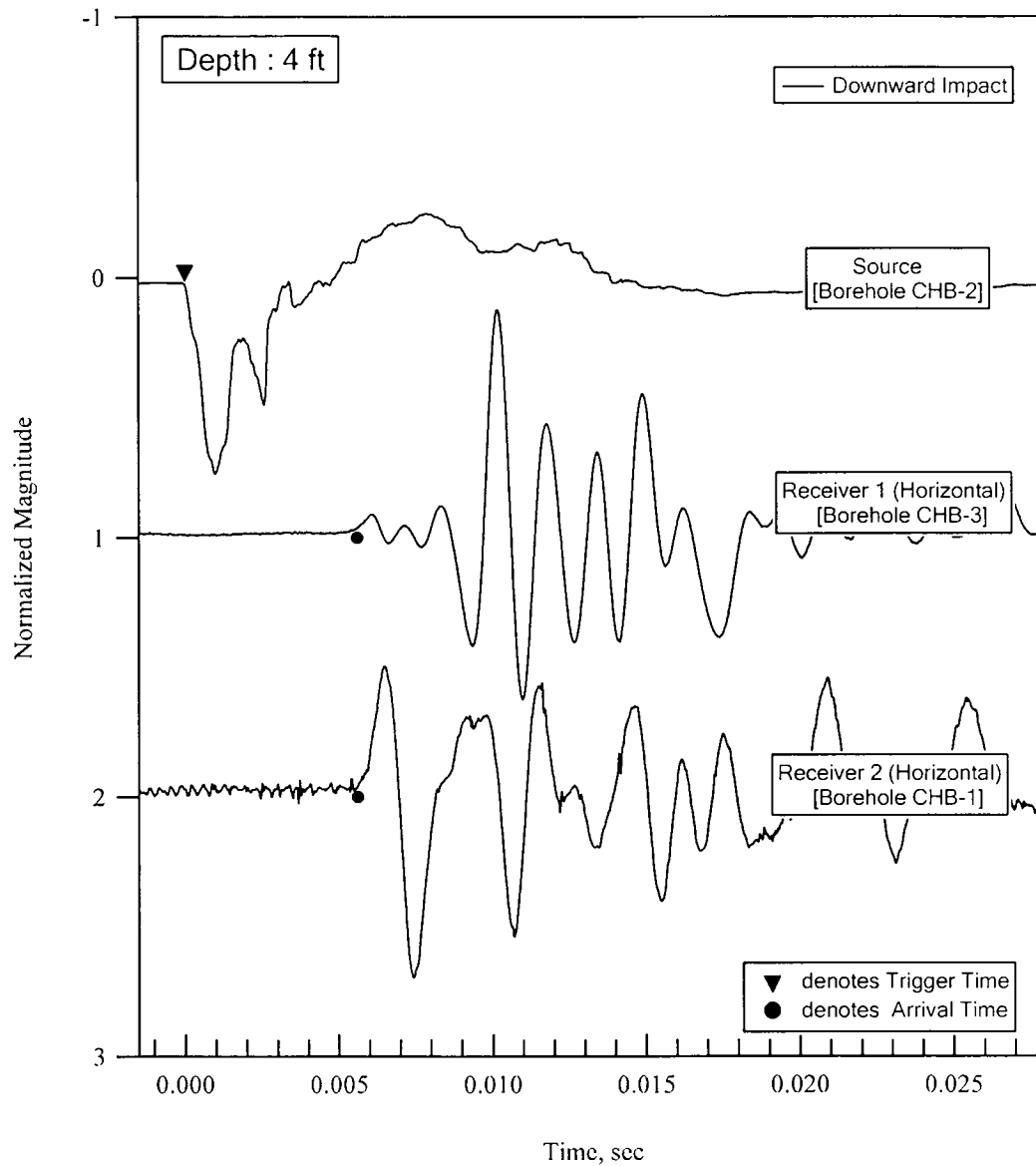


Figure C.4 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 4 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokroff
 Date : 02-06-2006

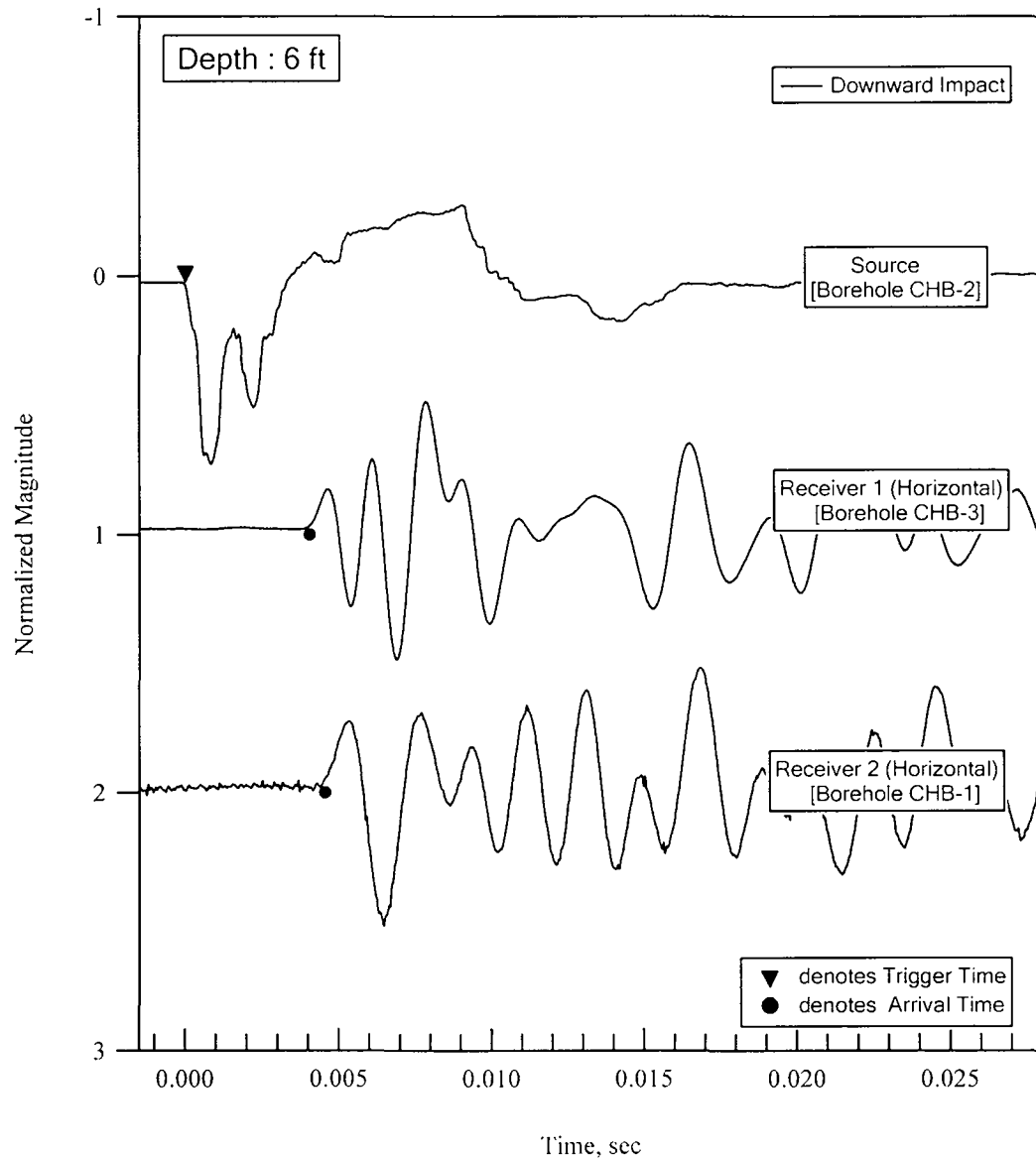


Figure C.5 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 6 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2004

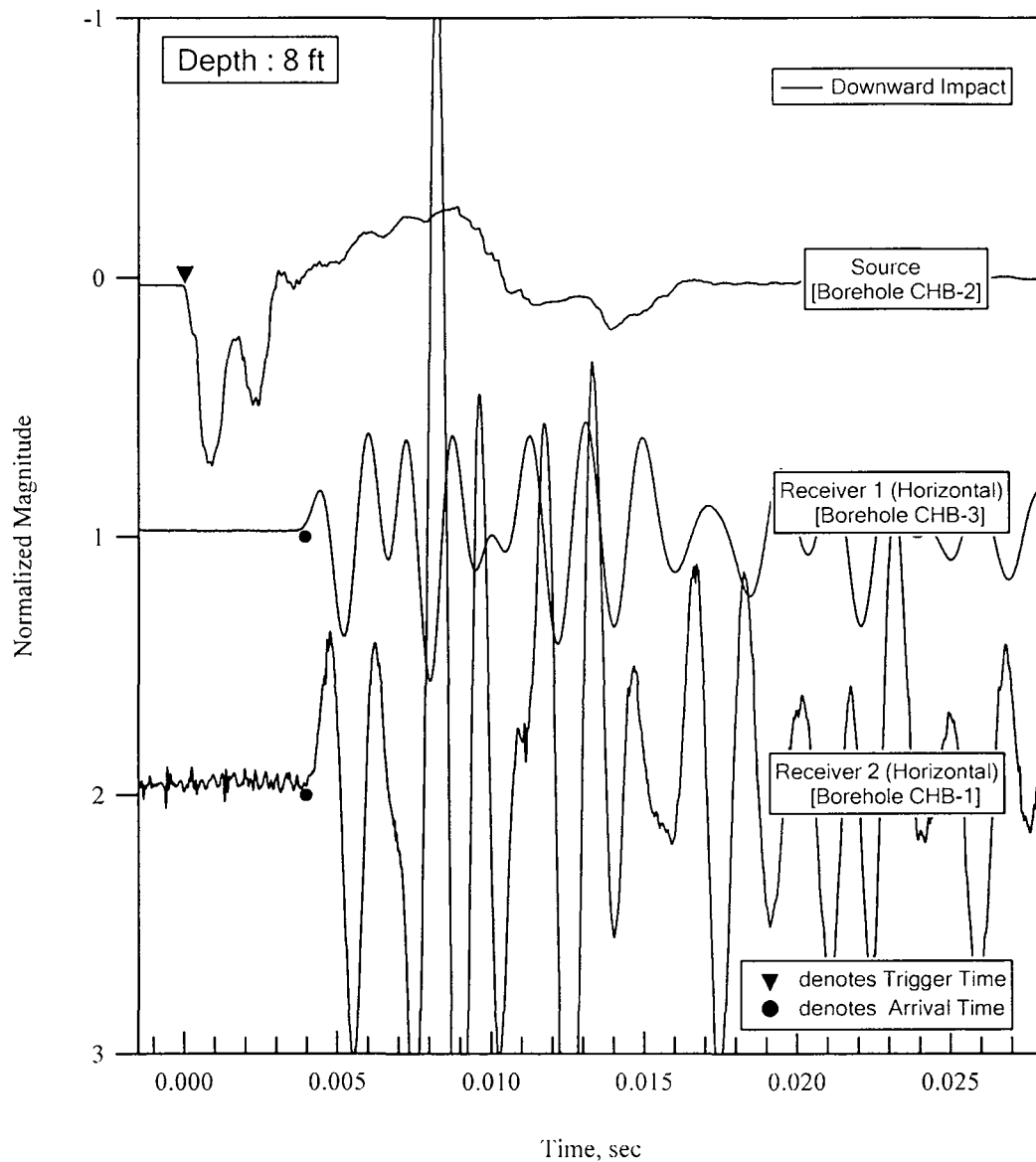


Figure C.6 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 8 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2004

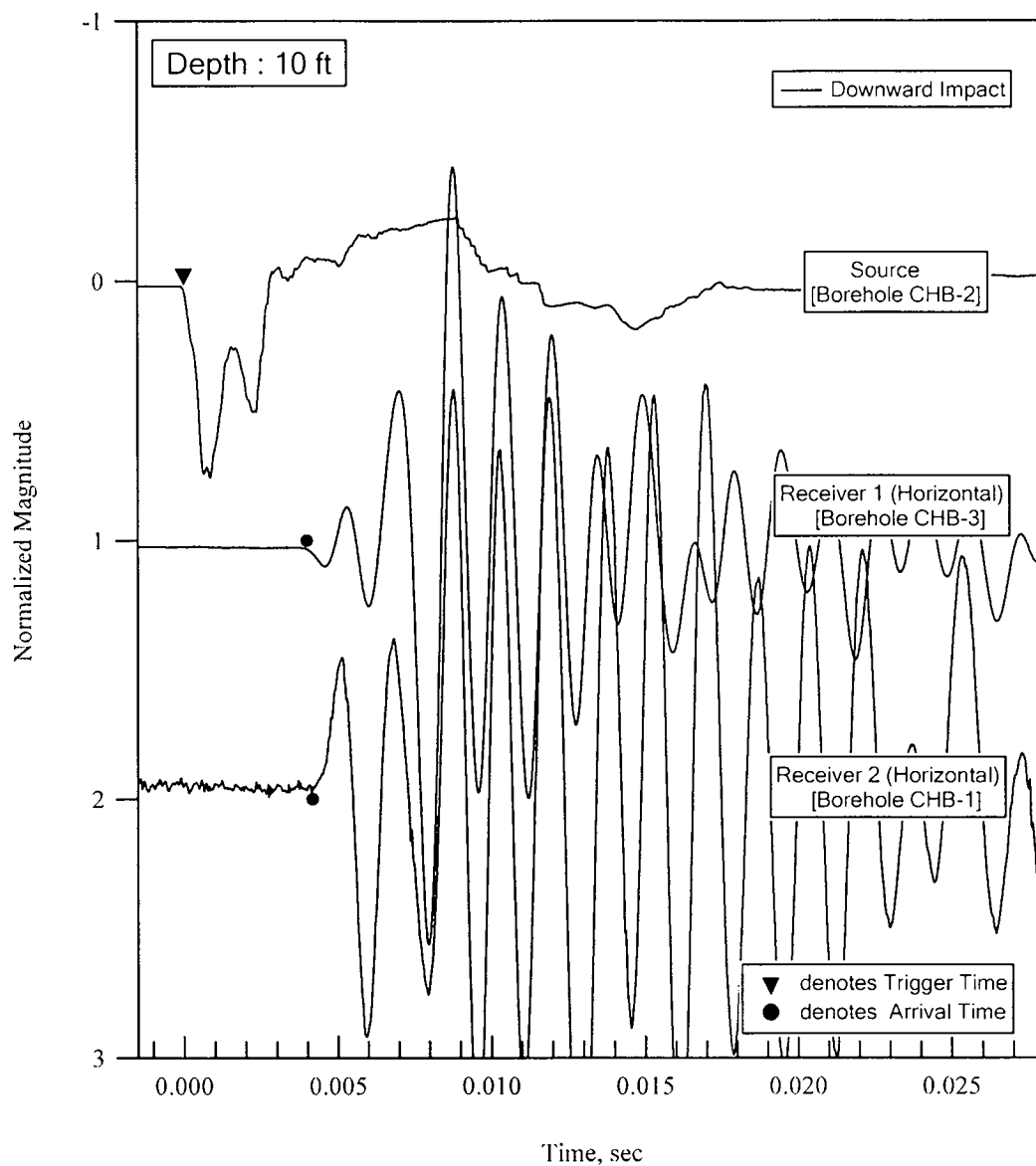


Figure C.7 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 10 ft; Source Borehole CHB-2 and Receiver Boreholes CHB-1 and CHB-3

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

APPENDIX D

Shear-Wave Travel Time Records from Crosshole Seismic Testing
Between Source Borehole CHB-3 and
Receiver Boreholes CHB-1 and CHB-2
(Depth Range: 6 to 38 ft)

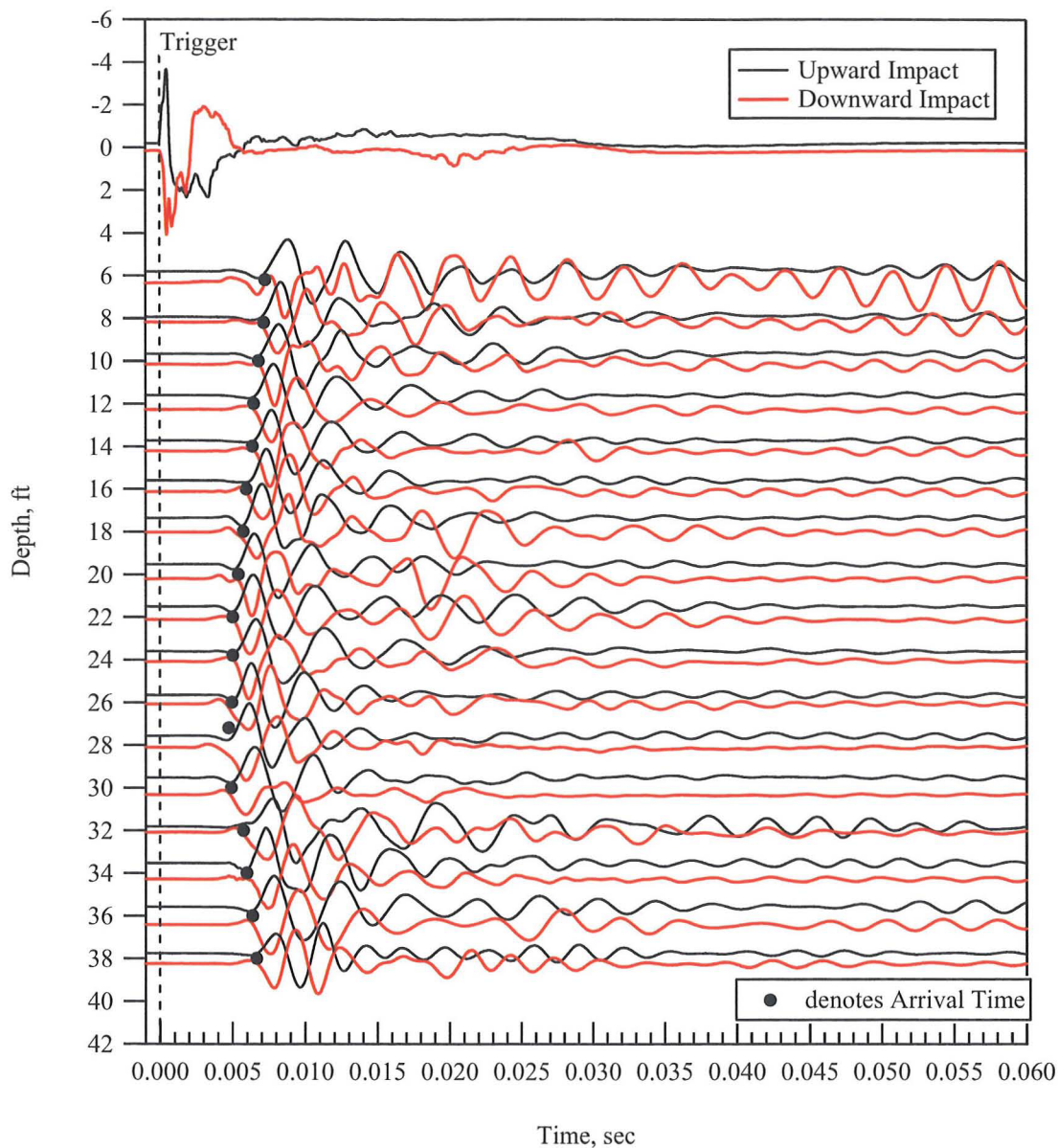


Figure D.1 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-3 and Receiver Borehole CHB-2; Full Record Length and 6- to 38-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokstad
 Date : 02-06-2008

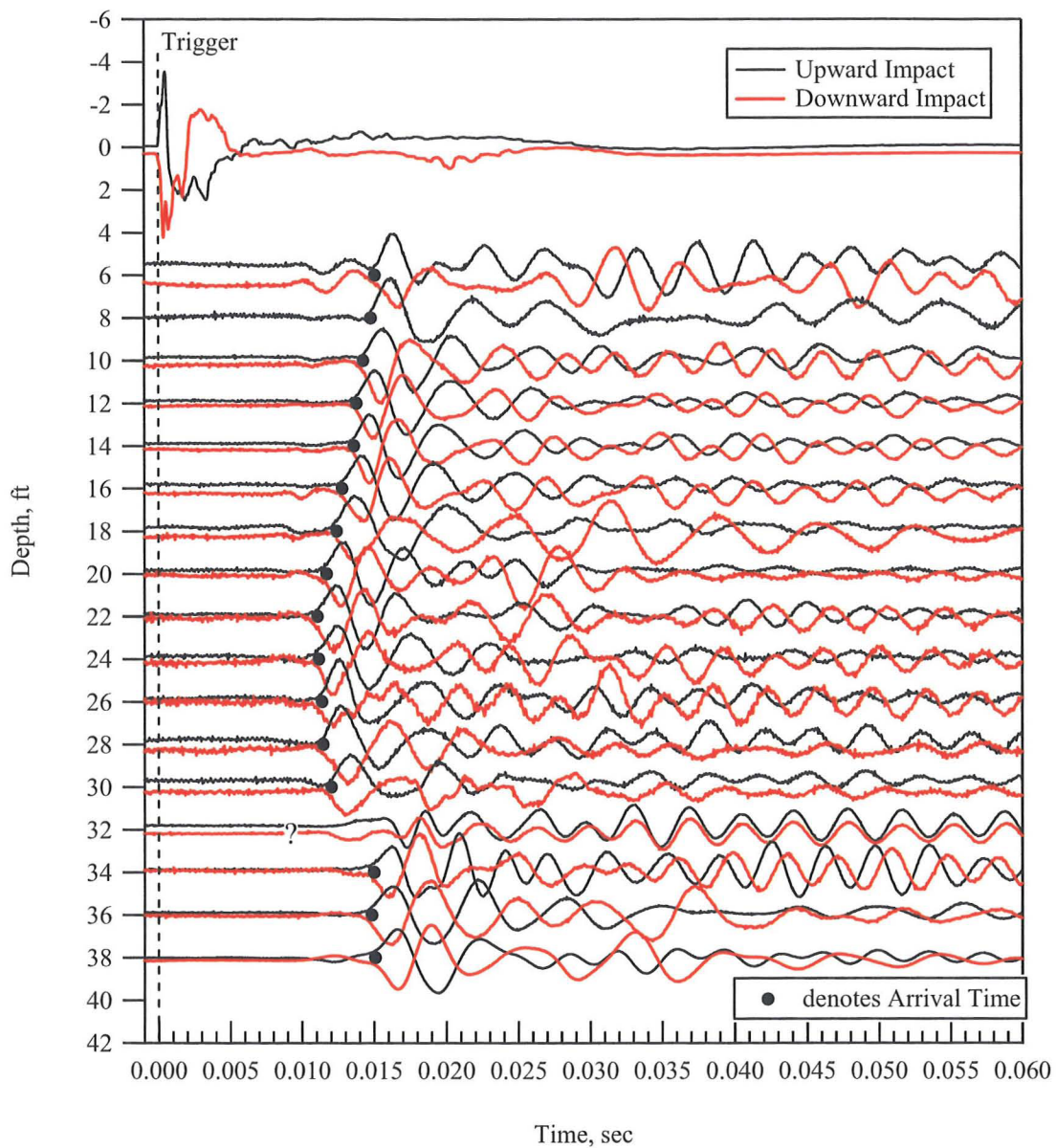


Figure D.2 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-3 and Receiver Borehole CHB-1; Full Record Length and 6- to 38-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoltz
 Date : 02-06-2008

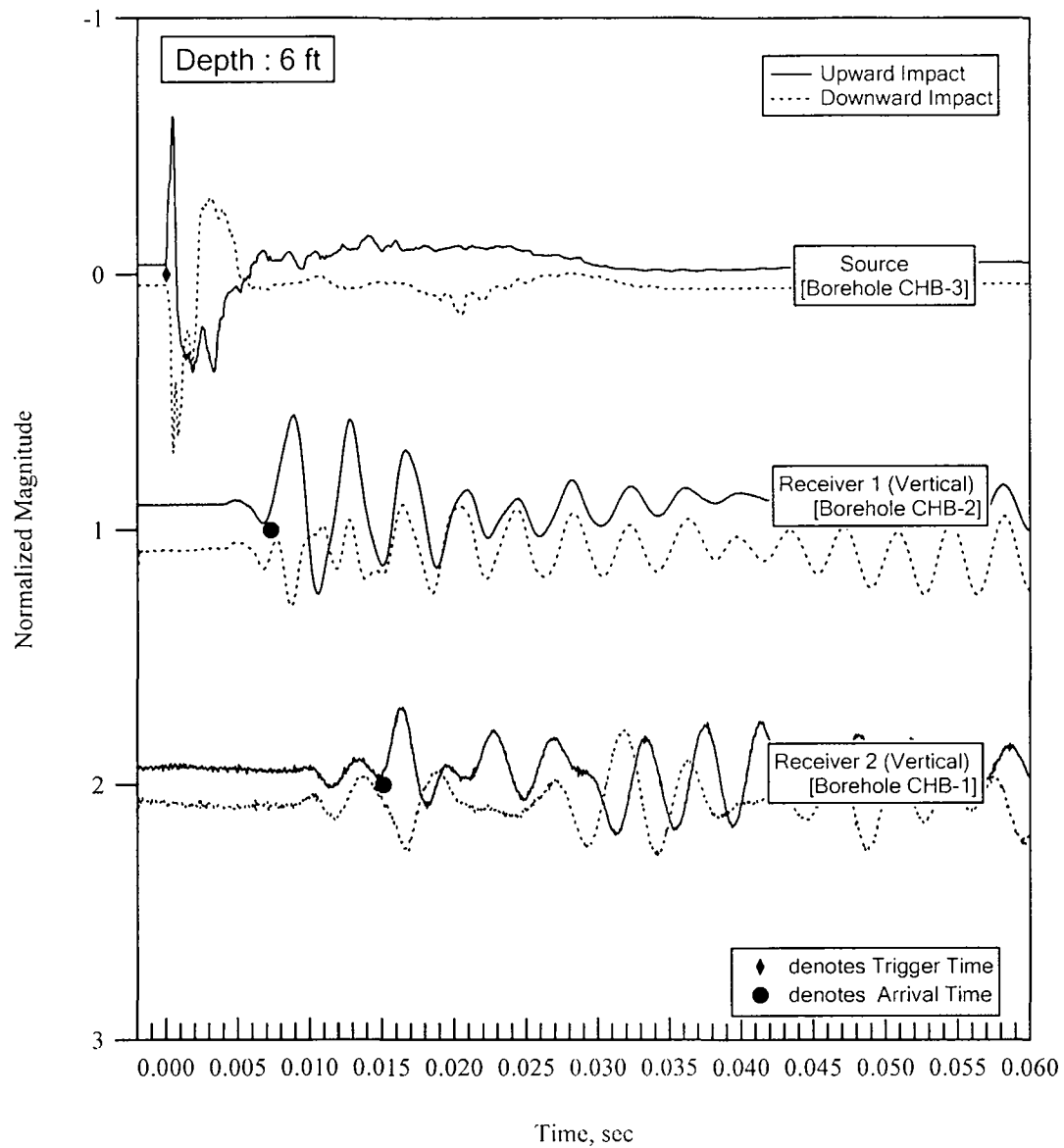


Figure D.3 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 6 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokroff
 Date : 02-06-2008

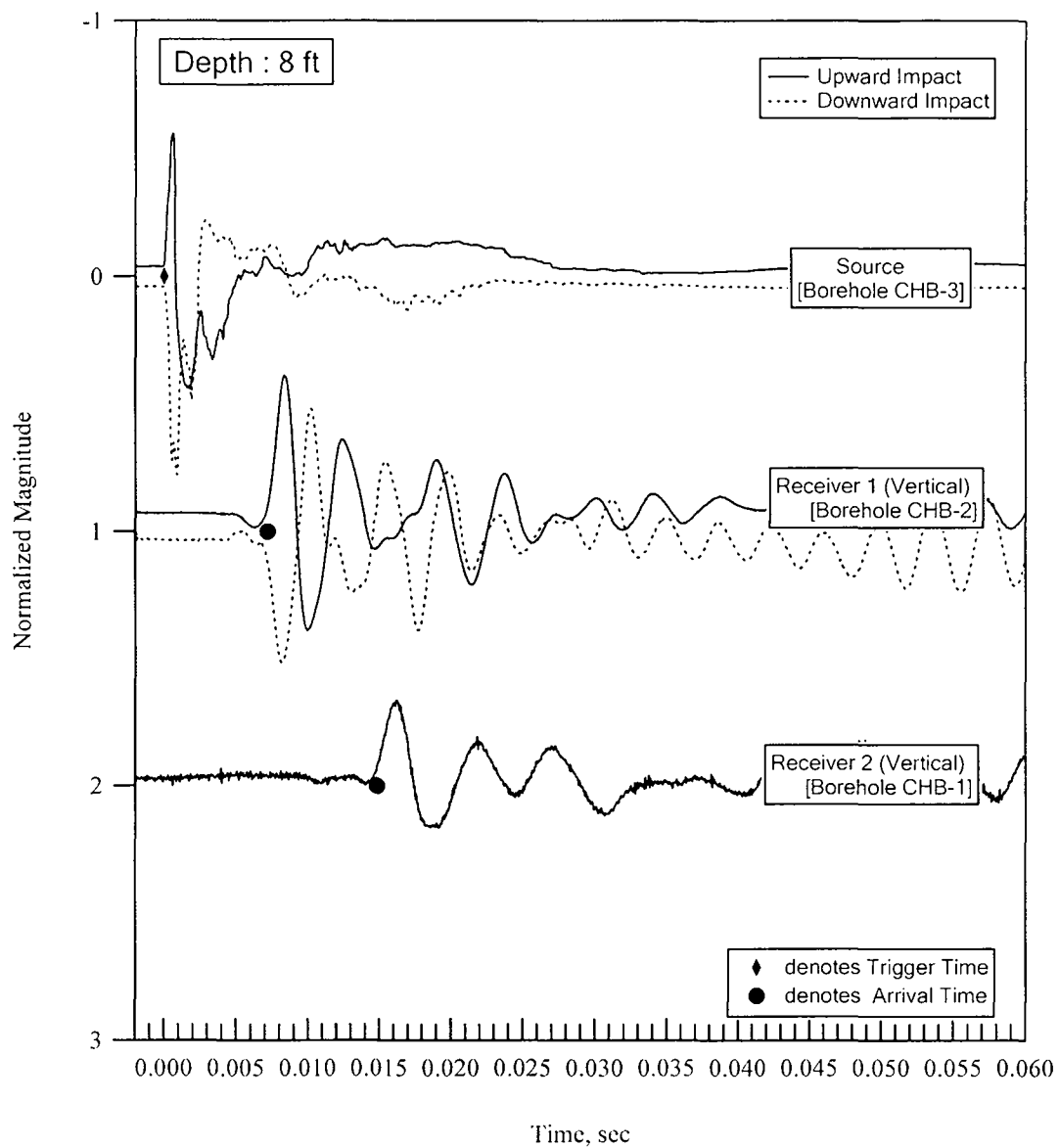


Figure D.4 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 8 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2008

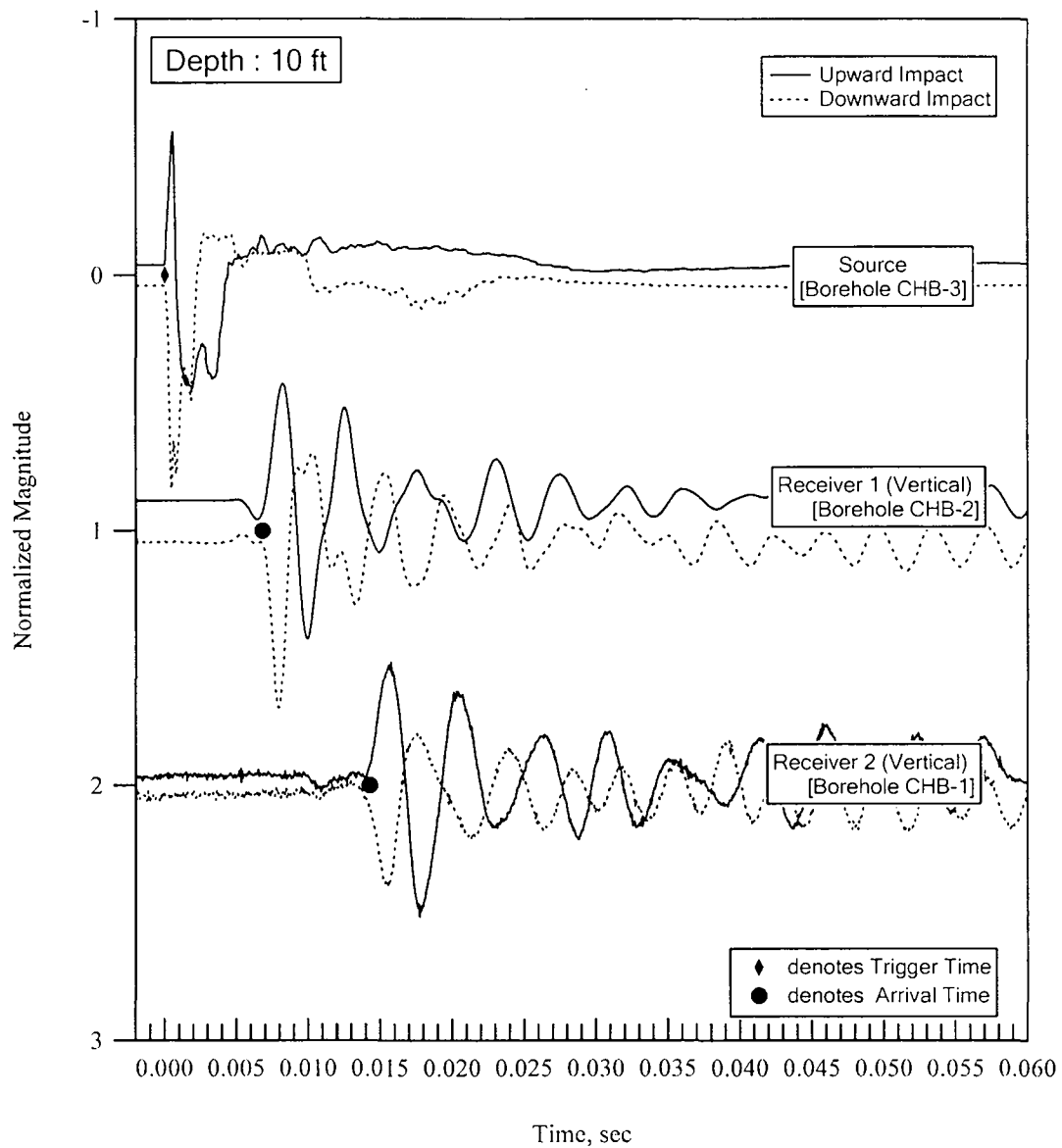


Figure D.5 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 10 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

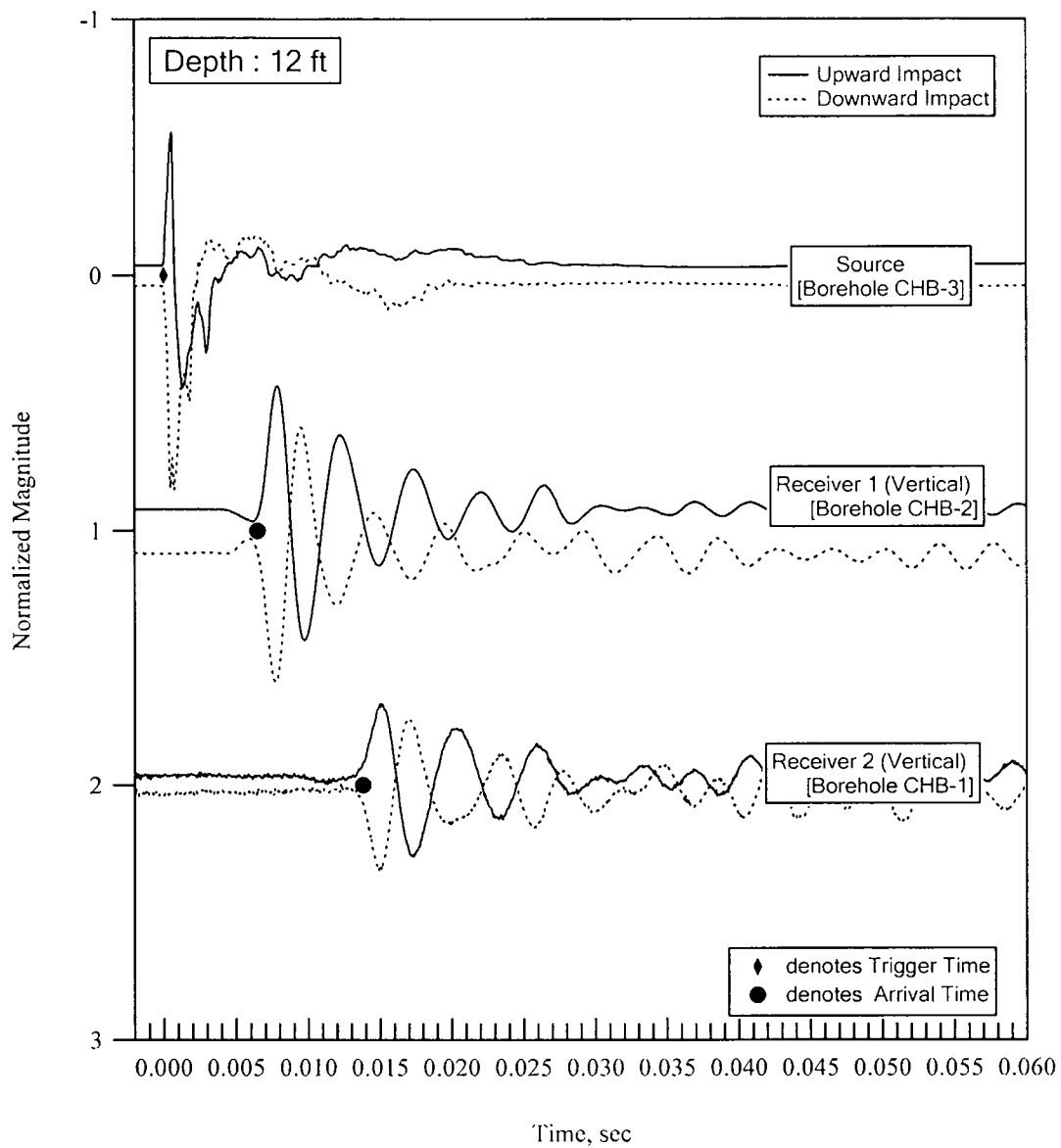


Figure D.6 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 12 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : MinJae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2006

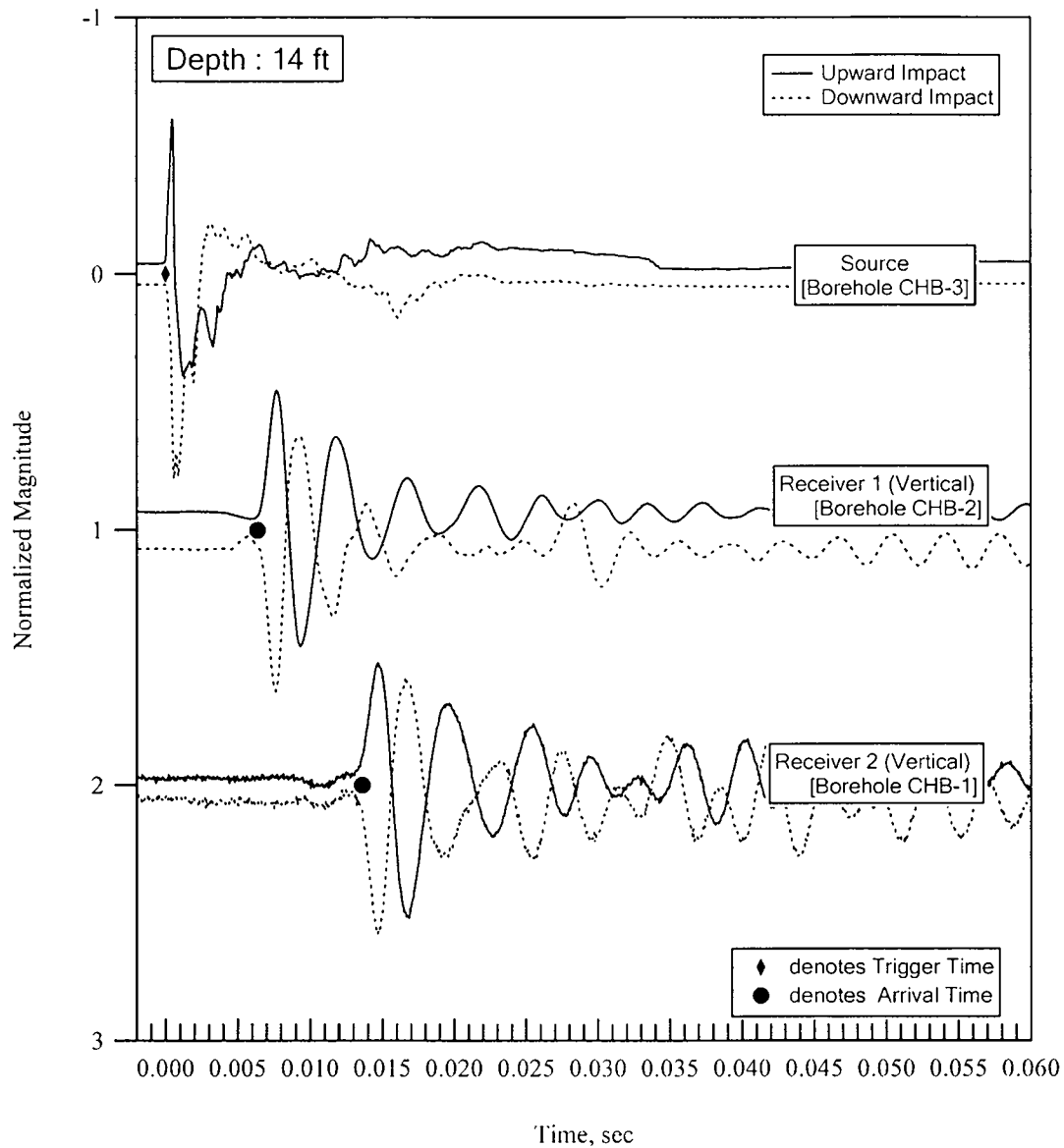


Figure D.7 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 14 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2008

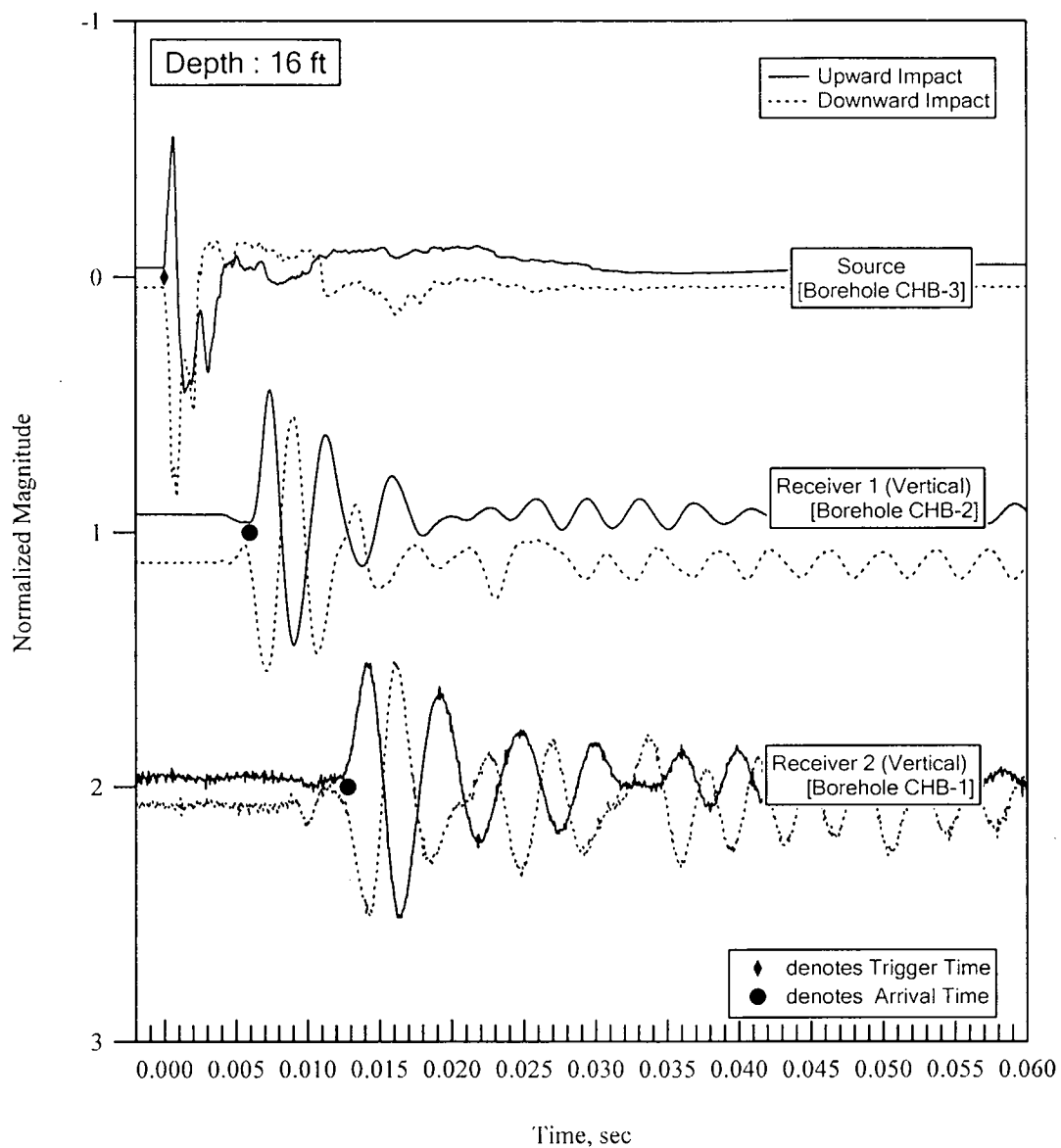


Figure D.8 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 16 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2004

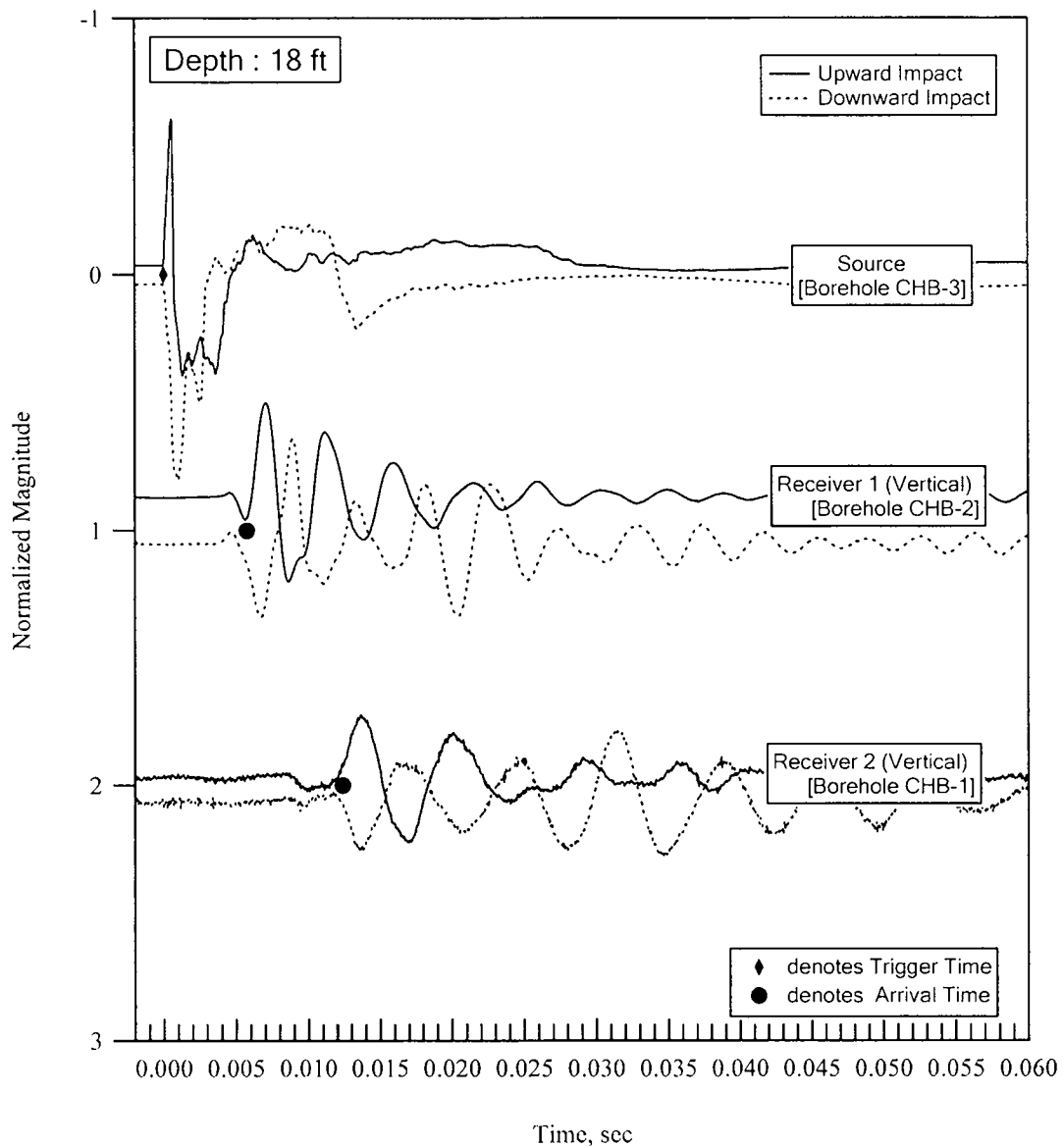


Figure D.9 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 18 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

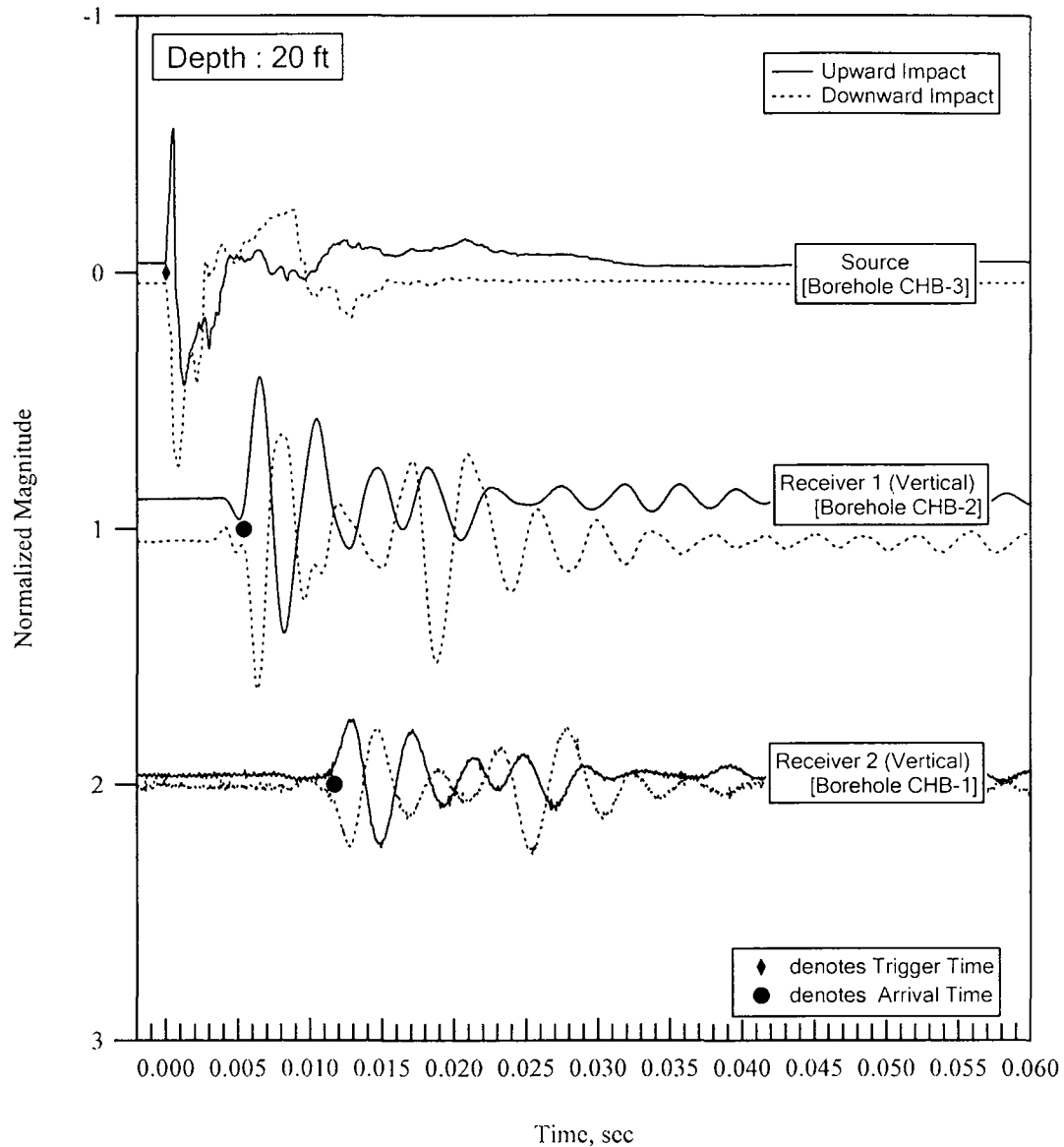


Figure D.10 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 20 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

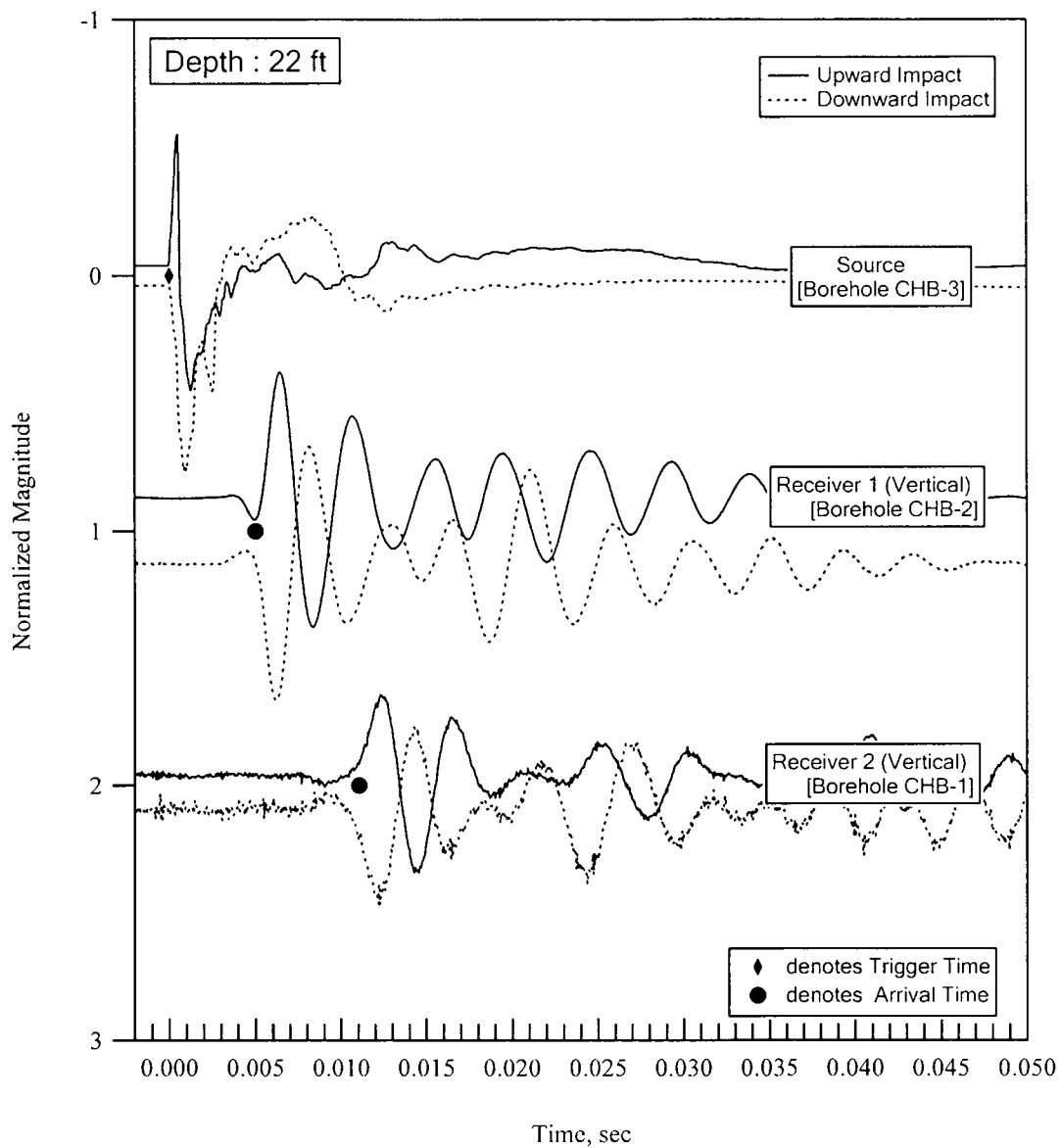


Figure D.11 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 22 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2006

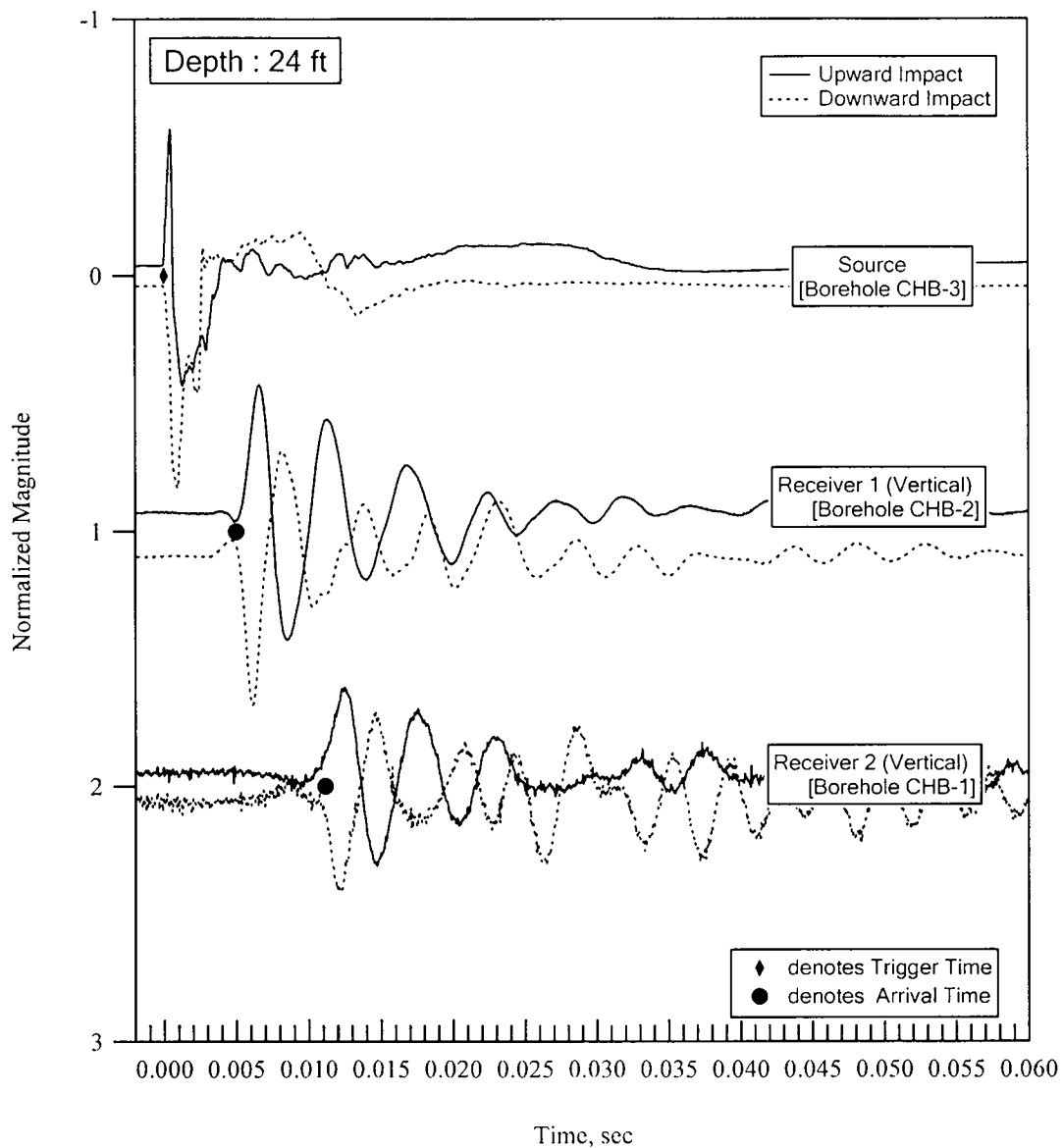


Figure D.12 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 24 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : MinJae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

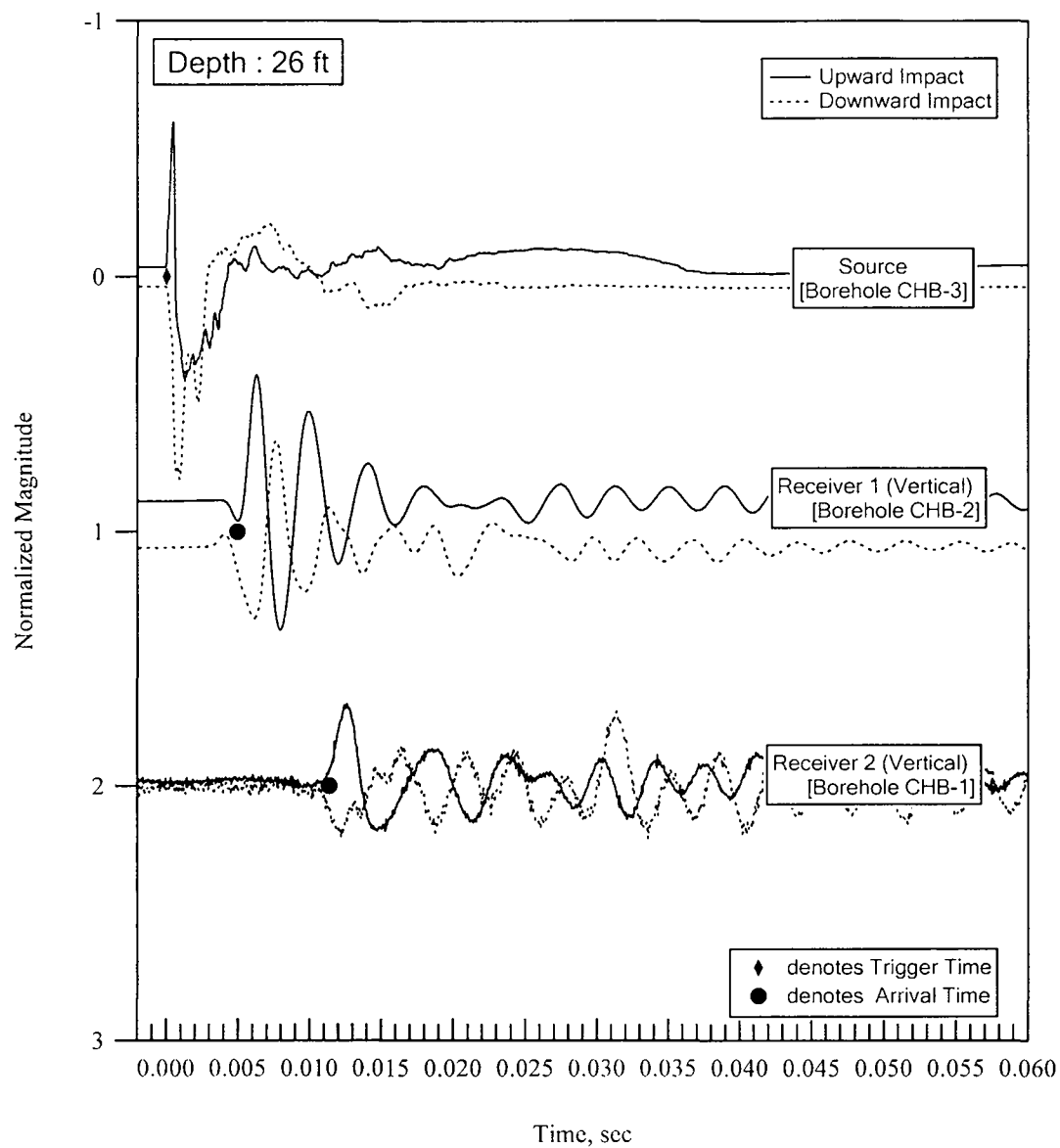


Figure D.13 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 26 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2004

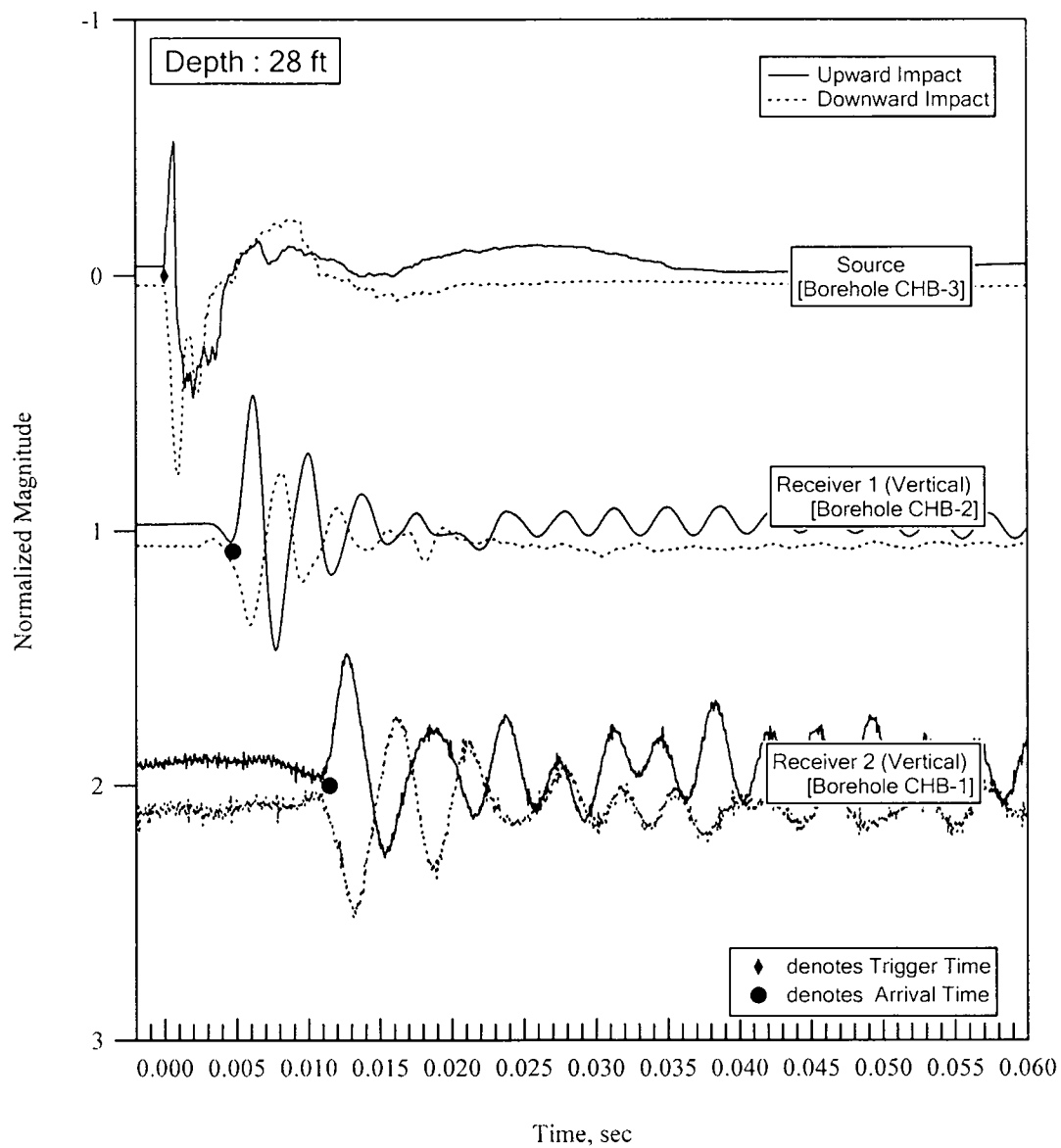


Figure D.14 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 28 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2008

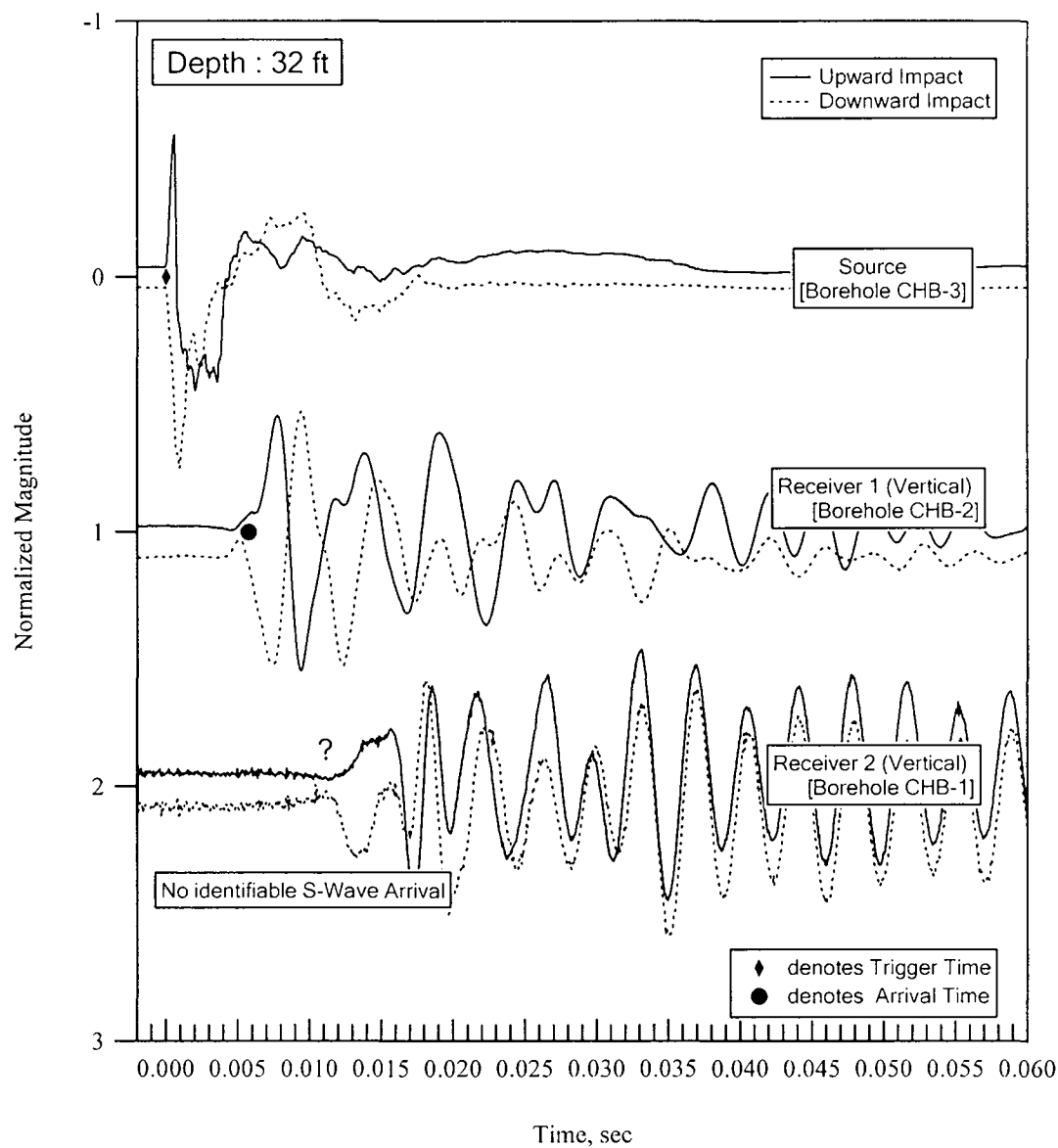


Figure D.15 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 30 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

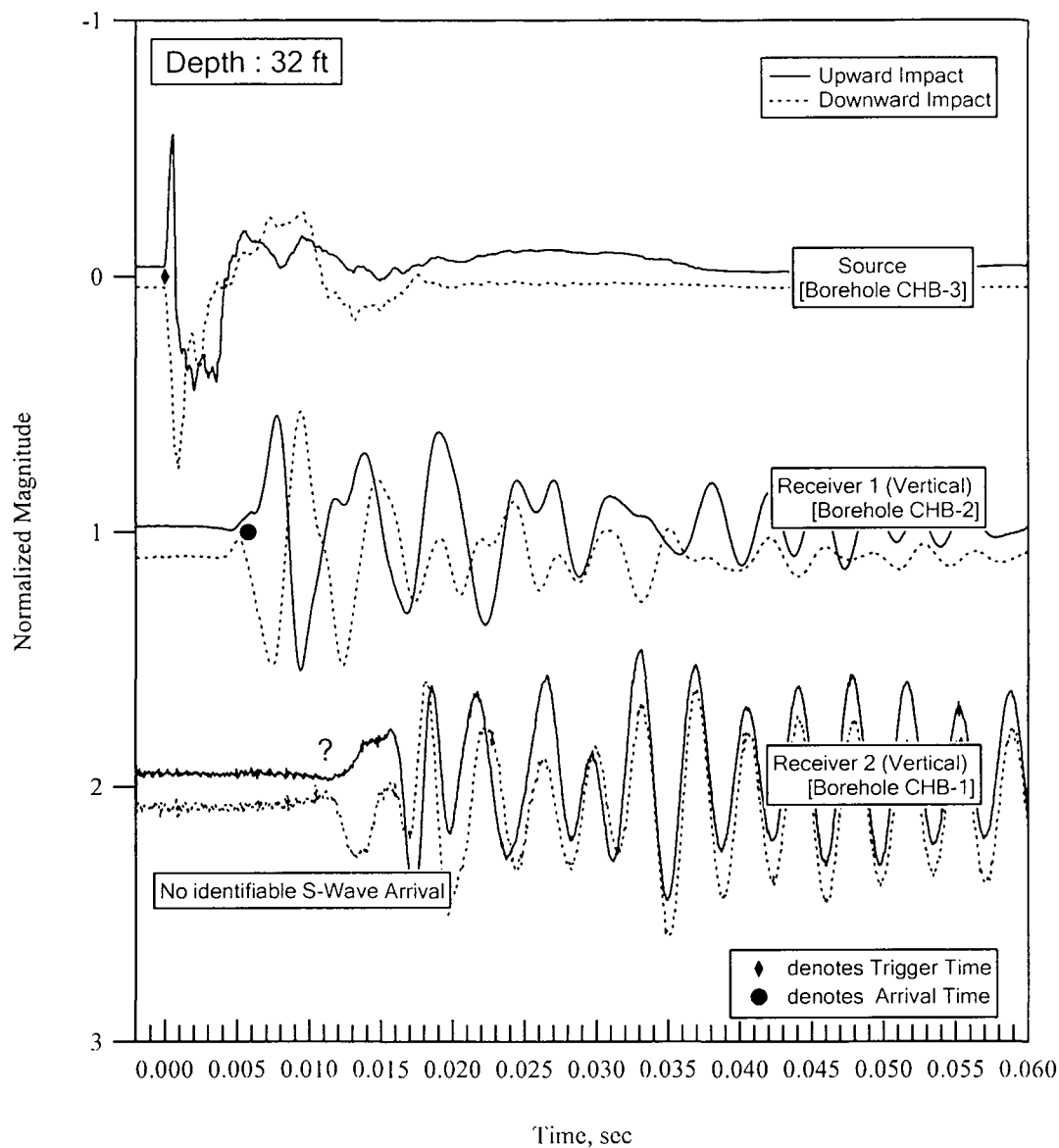


Figure D.16 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 32 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2006

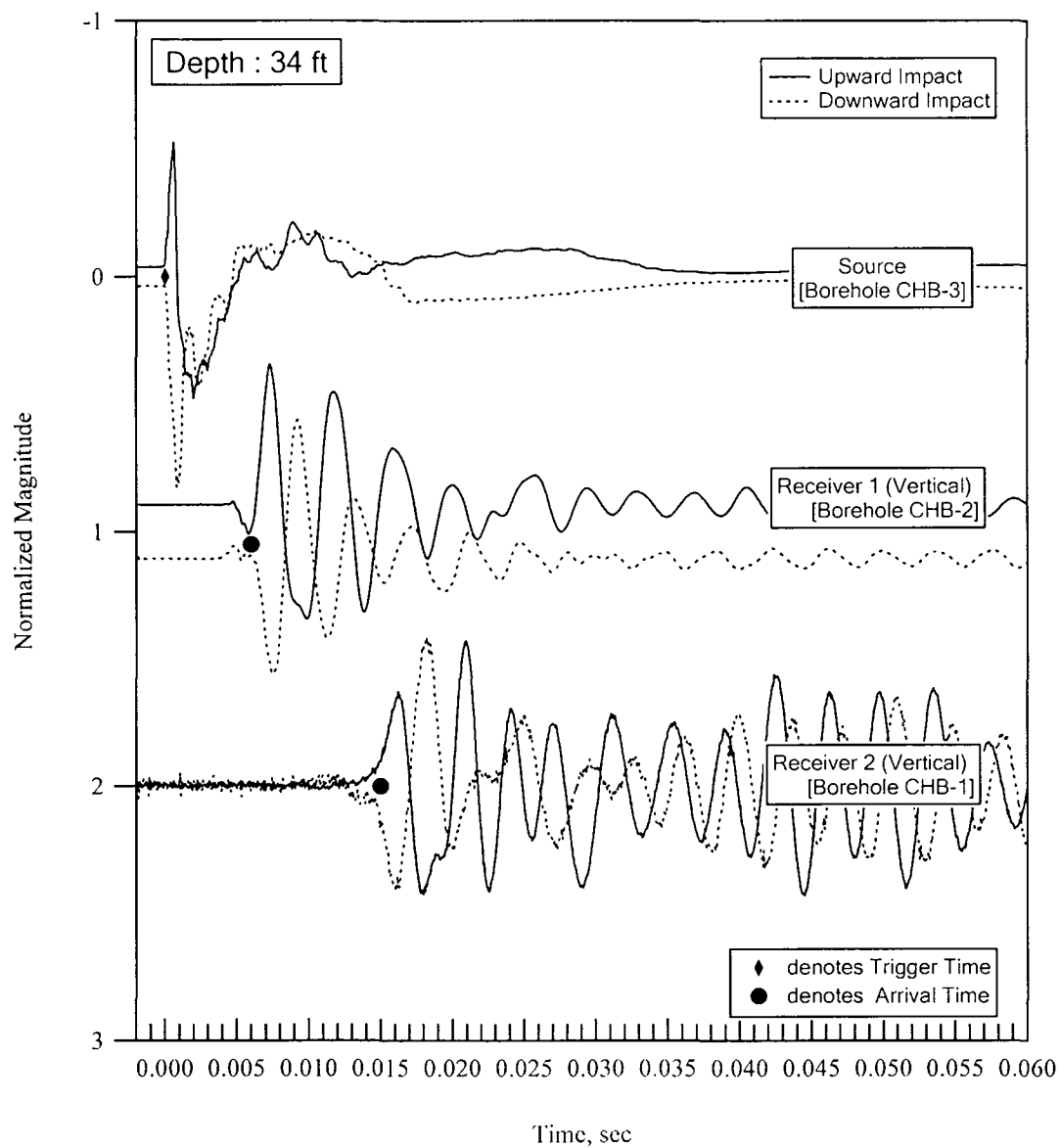


Figure D.17 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 34 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

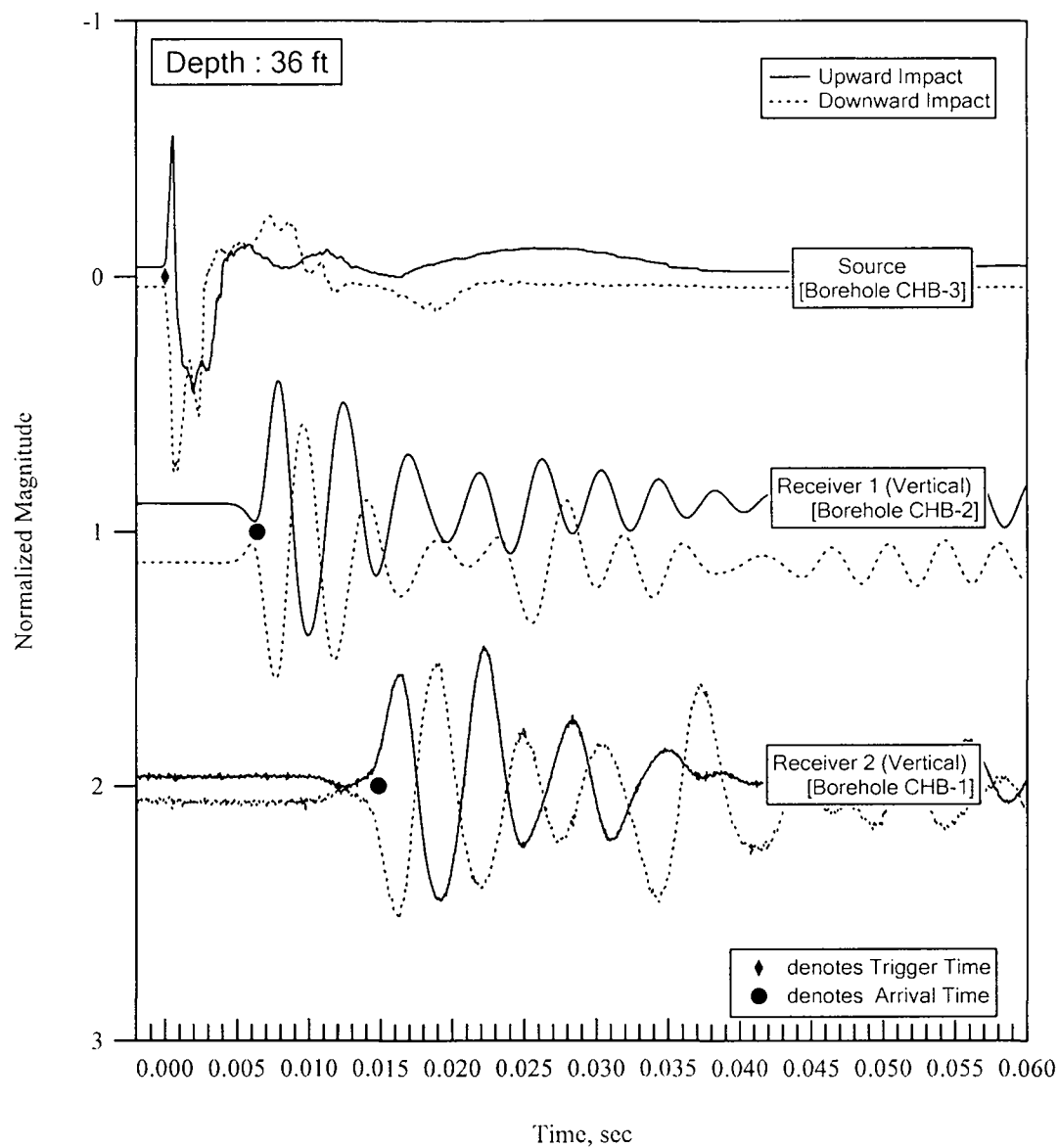


Figure D.18 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 36 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2004

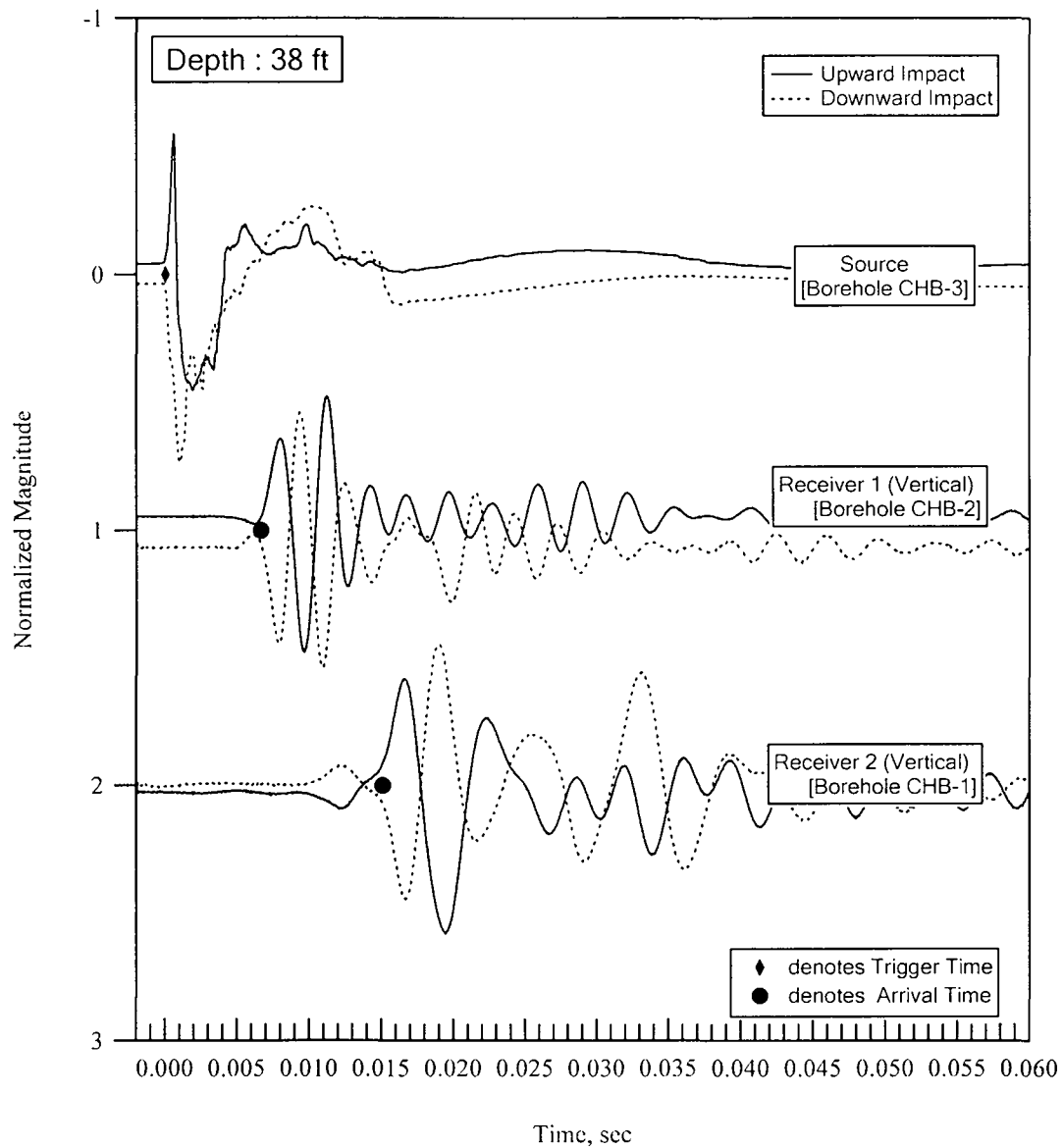


Figure D.19 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 38 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jee Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

APPENDIX E

Compression-Wave Travel Time Records from Crosshole Seismic Testing
Between Source Borehole CHB-3 and
Receiver Boreholes CHB-1 and CHB-2
(Depth Range: 6 to 38 ft)

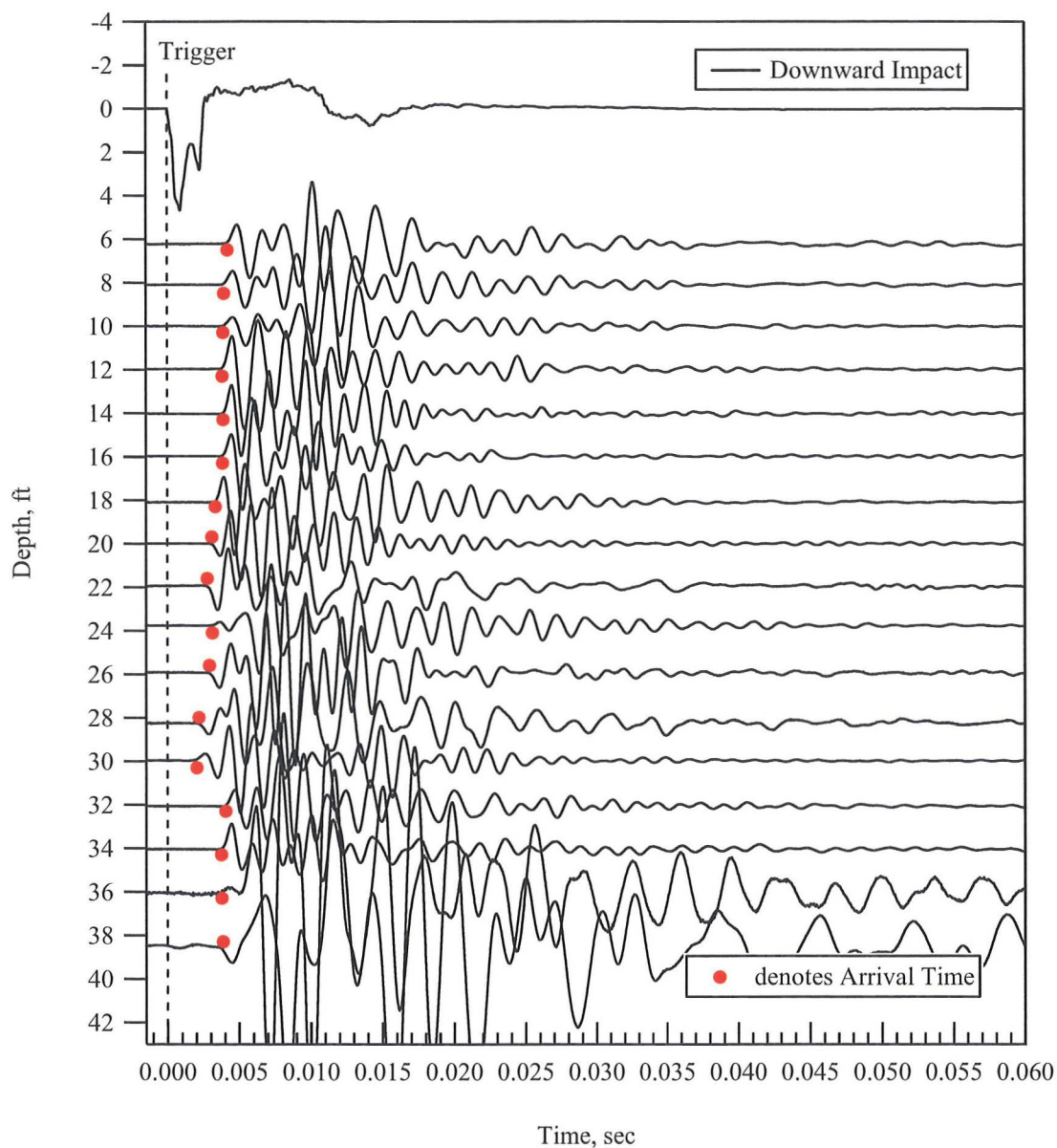


Figure E.1 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-3 and Receiver Borehole CHB-2; Full Record Length and 6- to 38-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : Min Jae Jung

Checked by : K. H. Stoker

Date : 02-06-2008

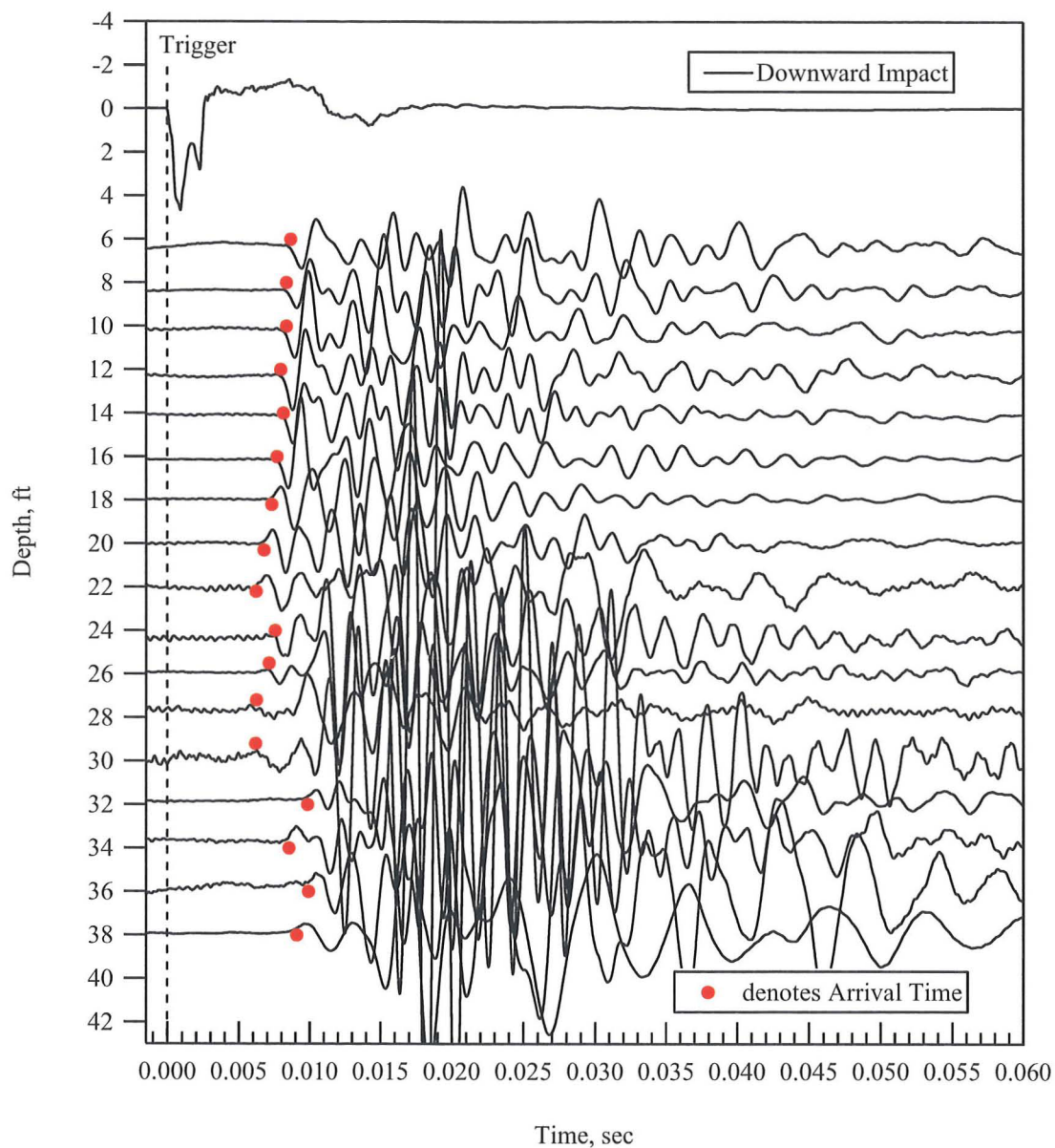


Figure E.2 Waterfall Plot of Shear-Wave Travel Time Records for Measurements Between Source Borehole CHB-3 and Receiver Borehole CHB-1; Full Record Length and 6- to 38-ft Depth Range (Note: Arrivals Picked on Individually Expanded Records)

Analyzed by : MinJae Jung
 Checked by : K. H. Stober
 Date : 02-06-2008

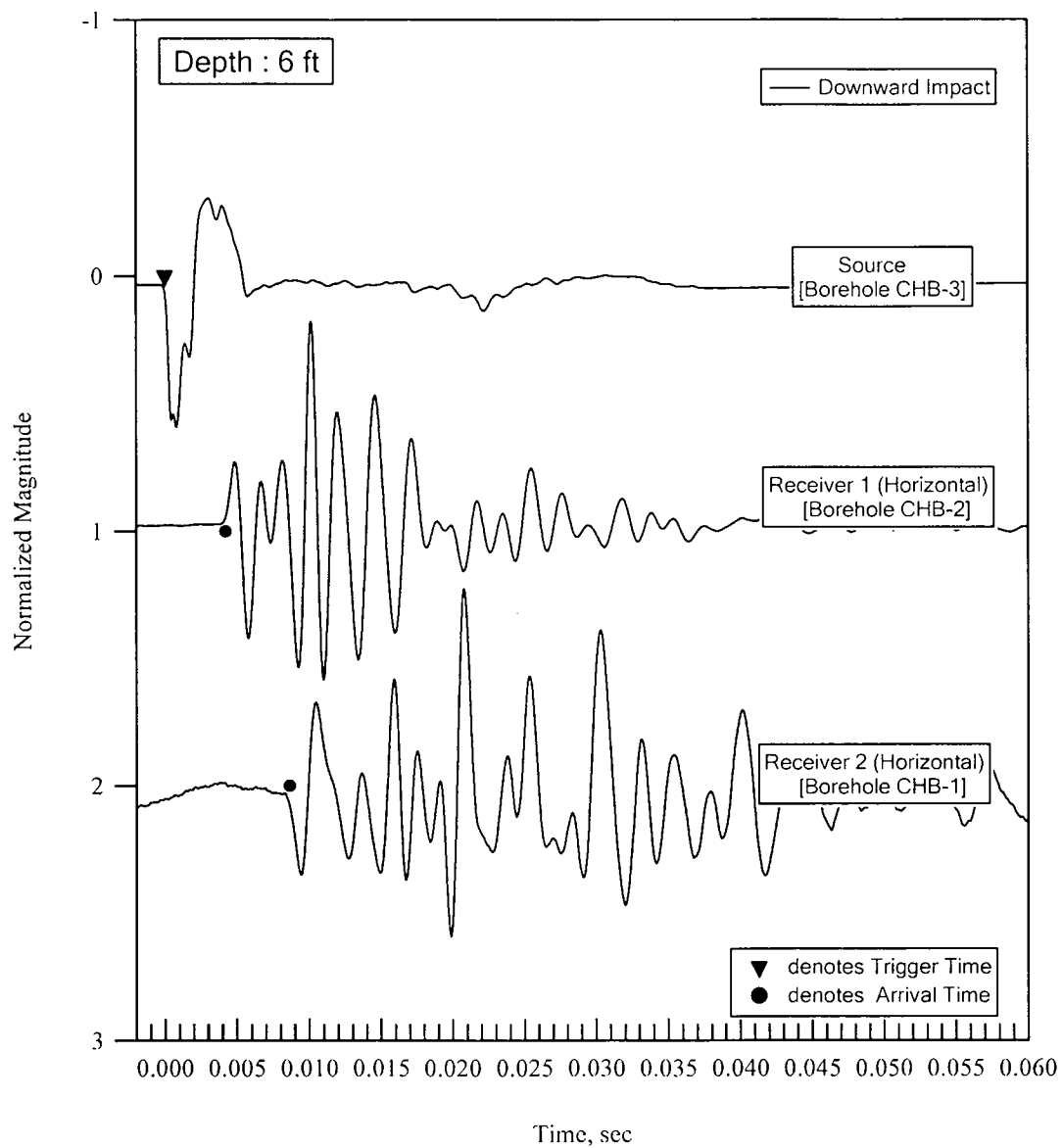


Figure E.3 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 6 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

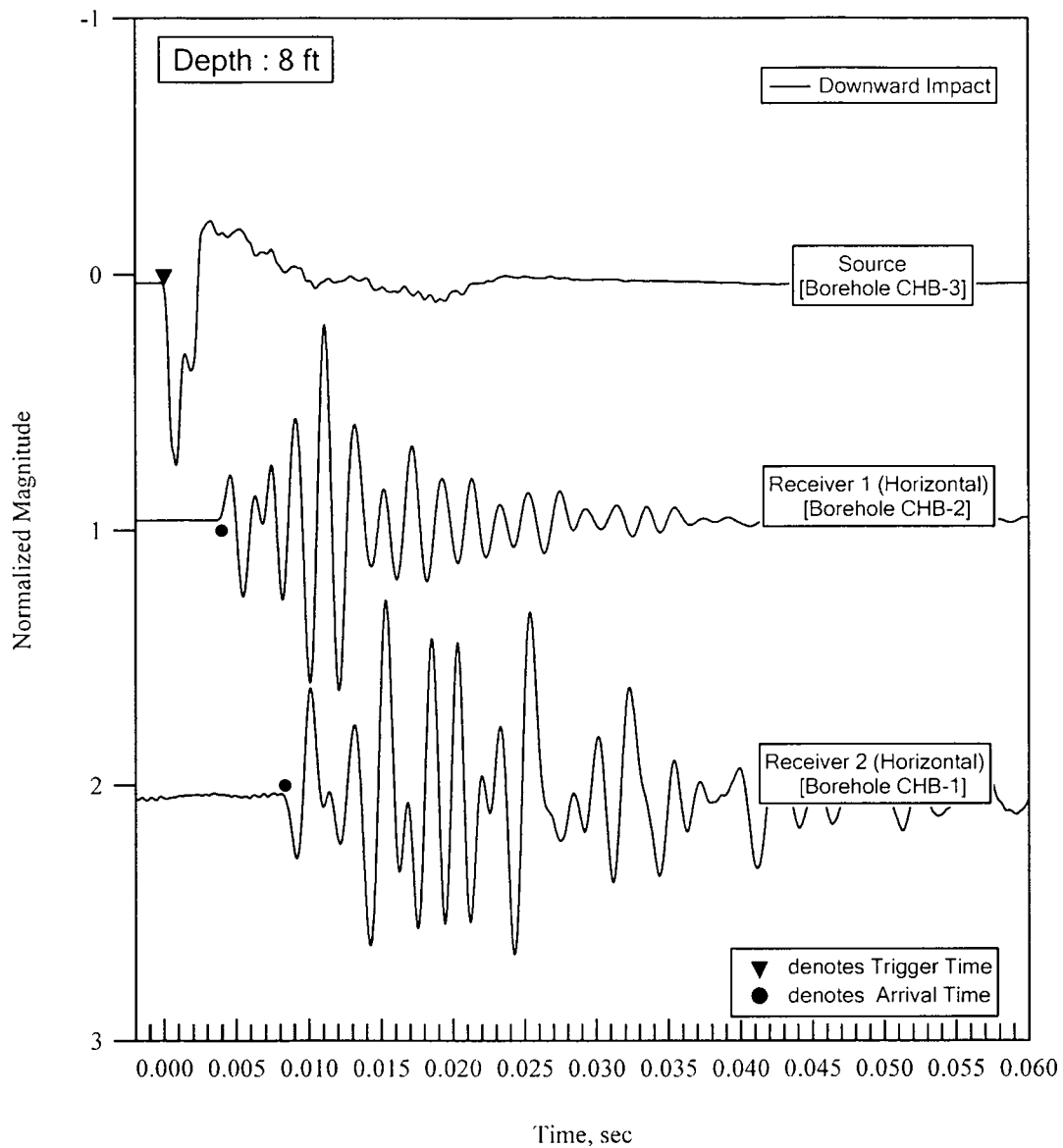


Figure E.4 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 8 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2004

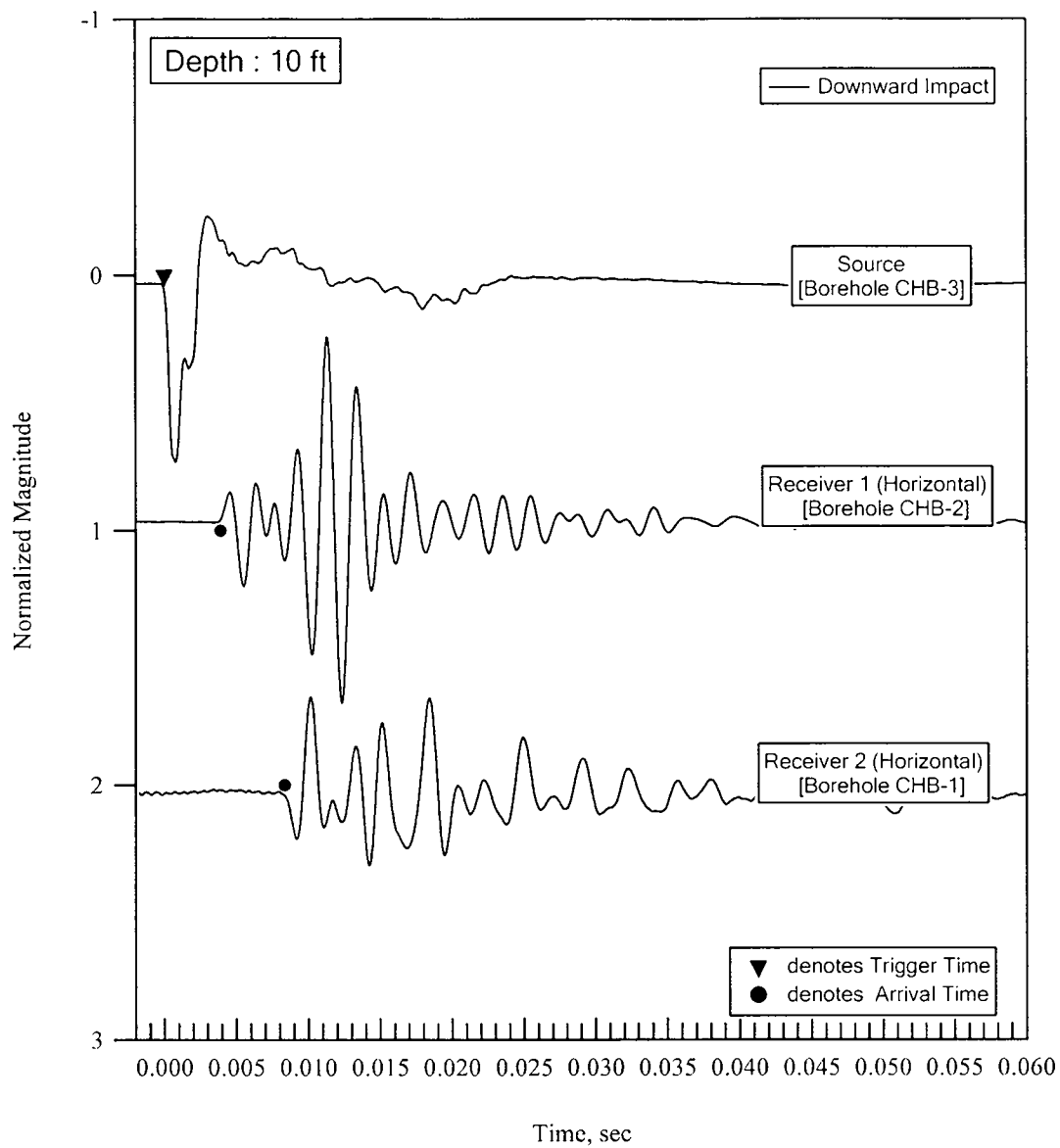


Figure E.5 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 10 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : MinJae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2006

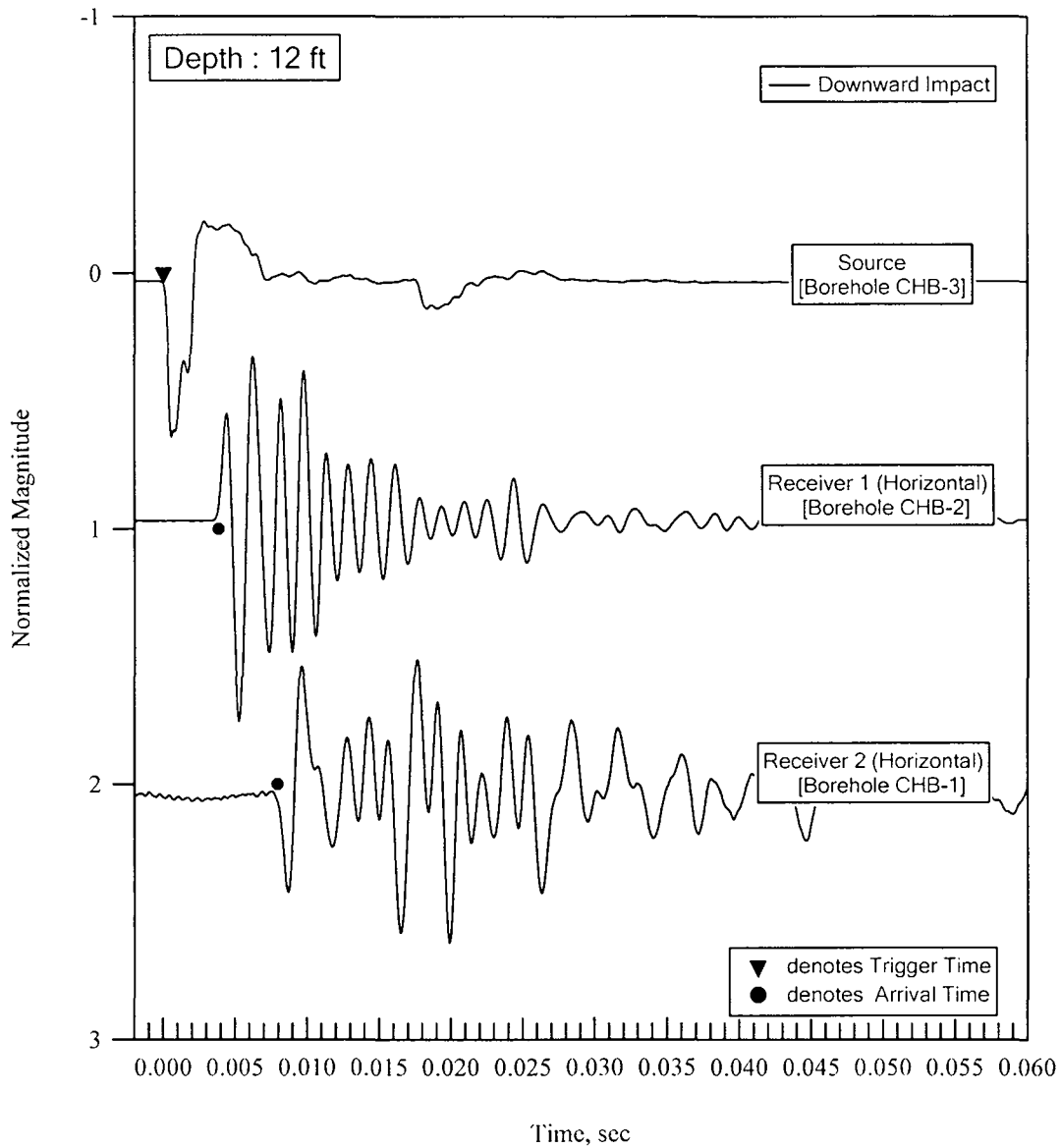


Figure E.6 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 12 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

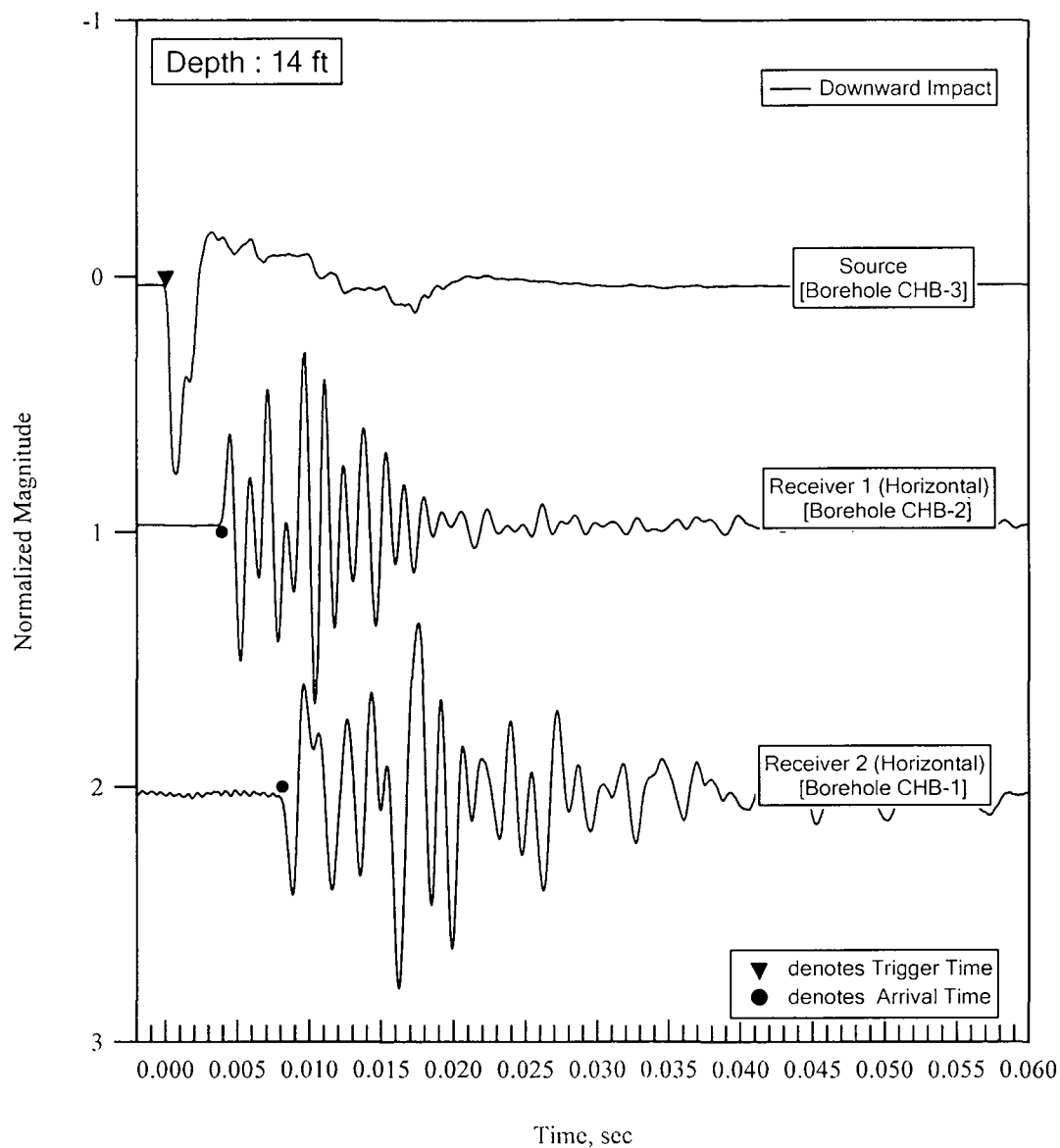


Figure E.7 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 14 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jee Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2008

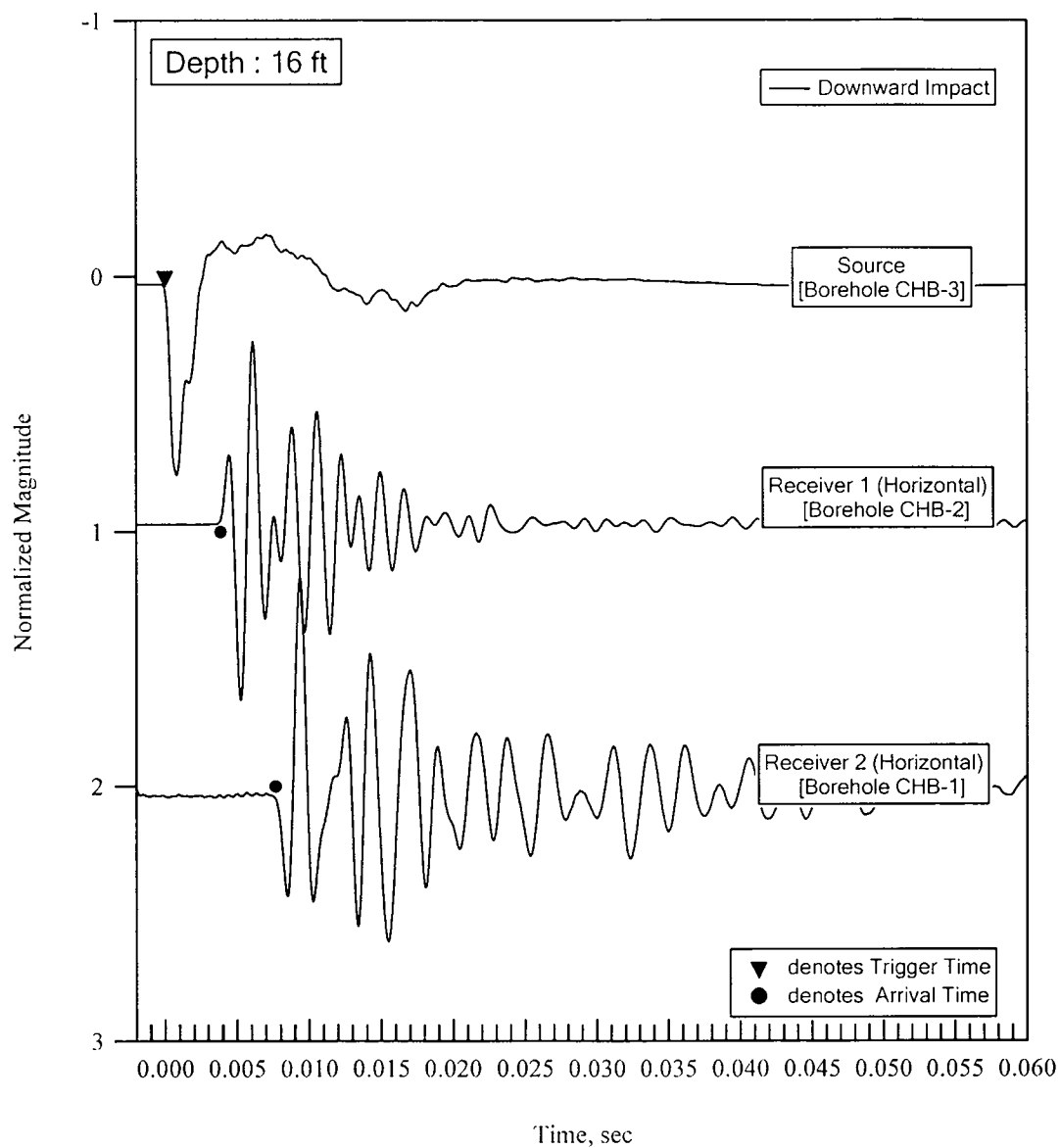


Figure E.8 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 16 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : MinJae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

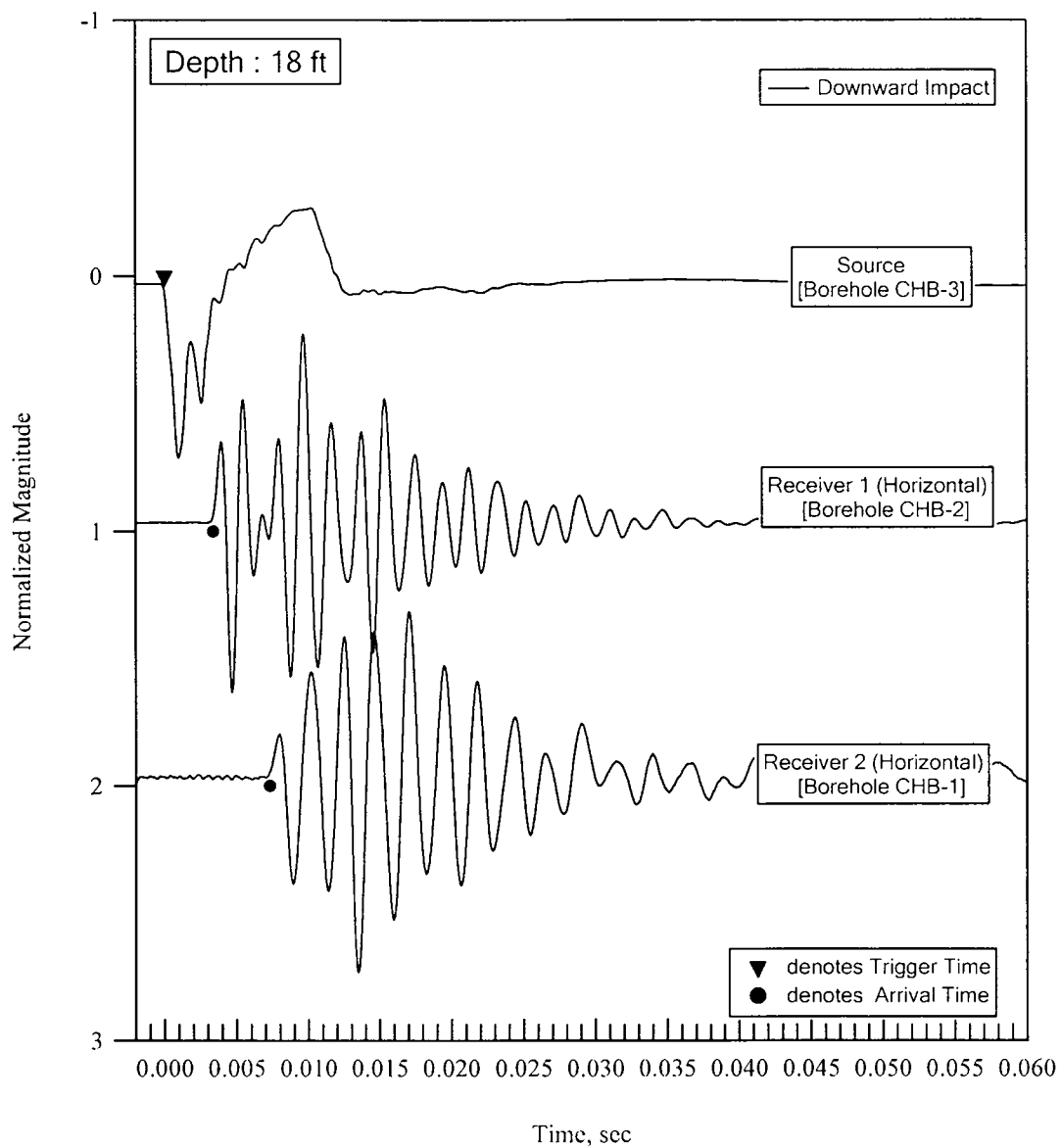


Figure E.9 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 18 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2008

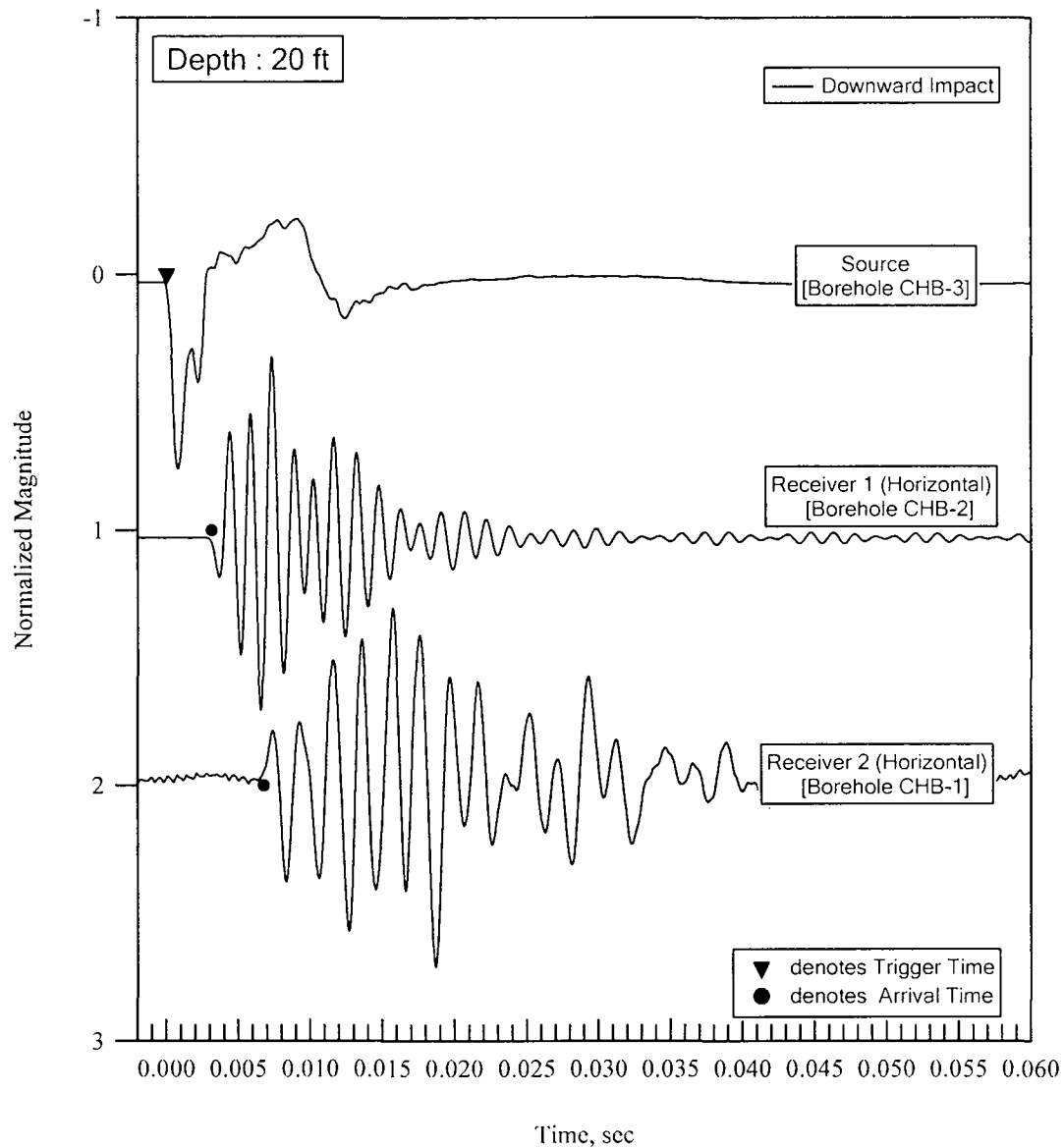


Figure E.10 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 20 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stober
 Date : 02-06-2004

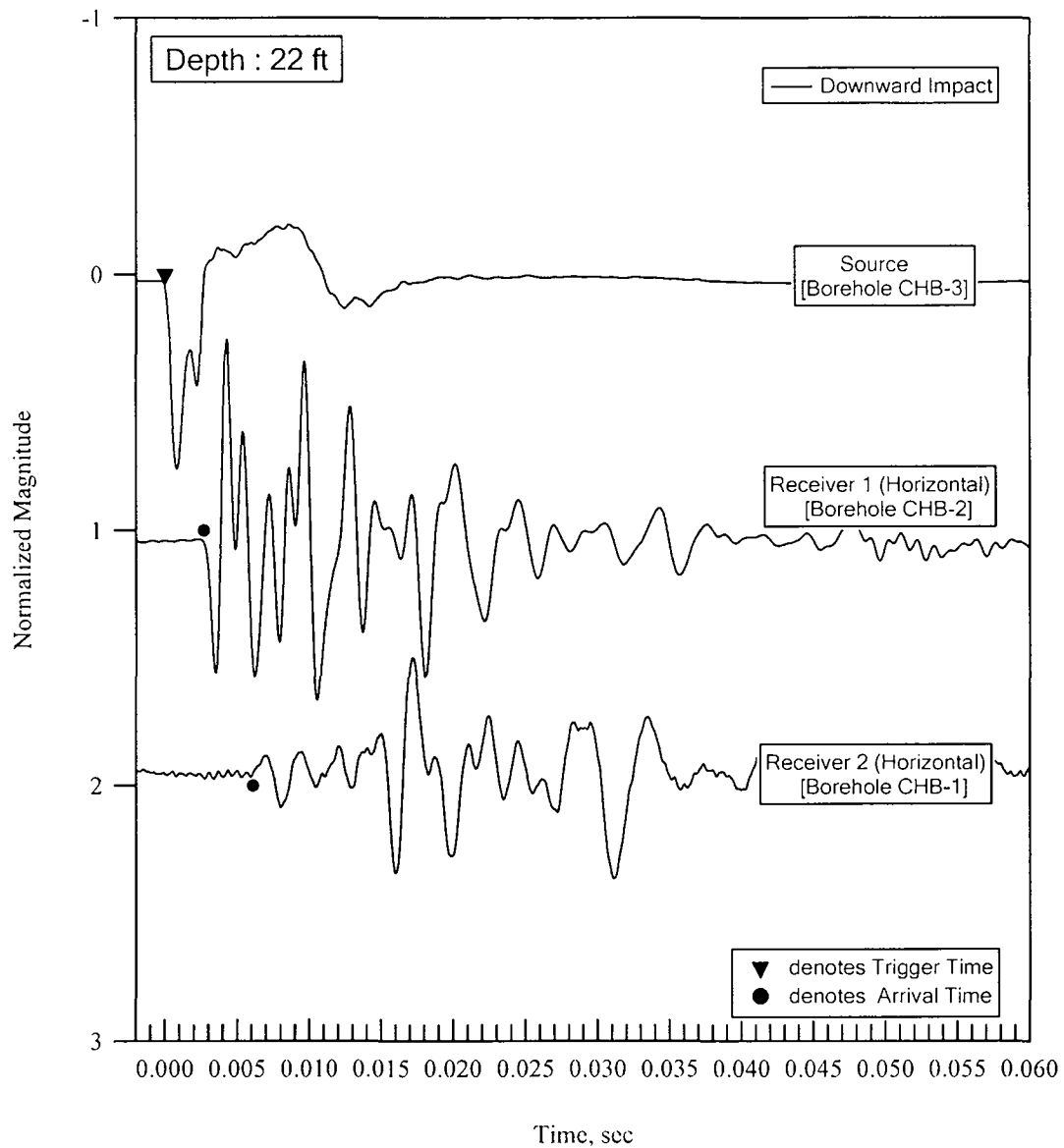


Figure E.11 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 22 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

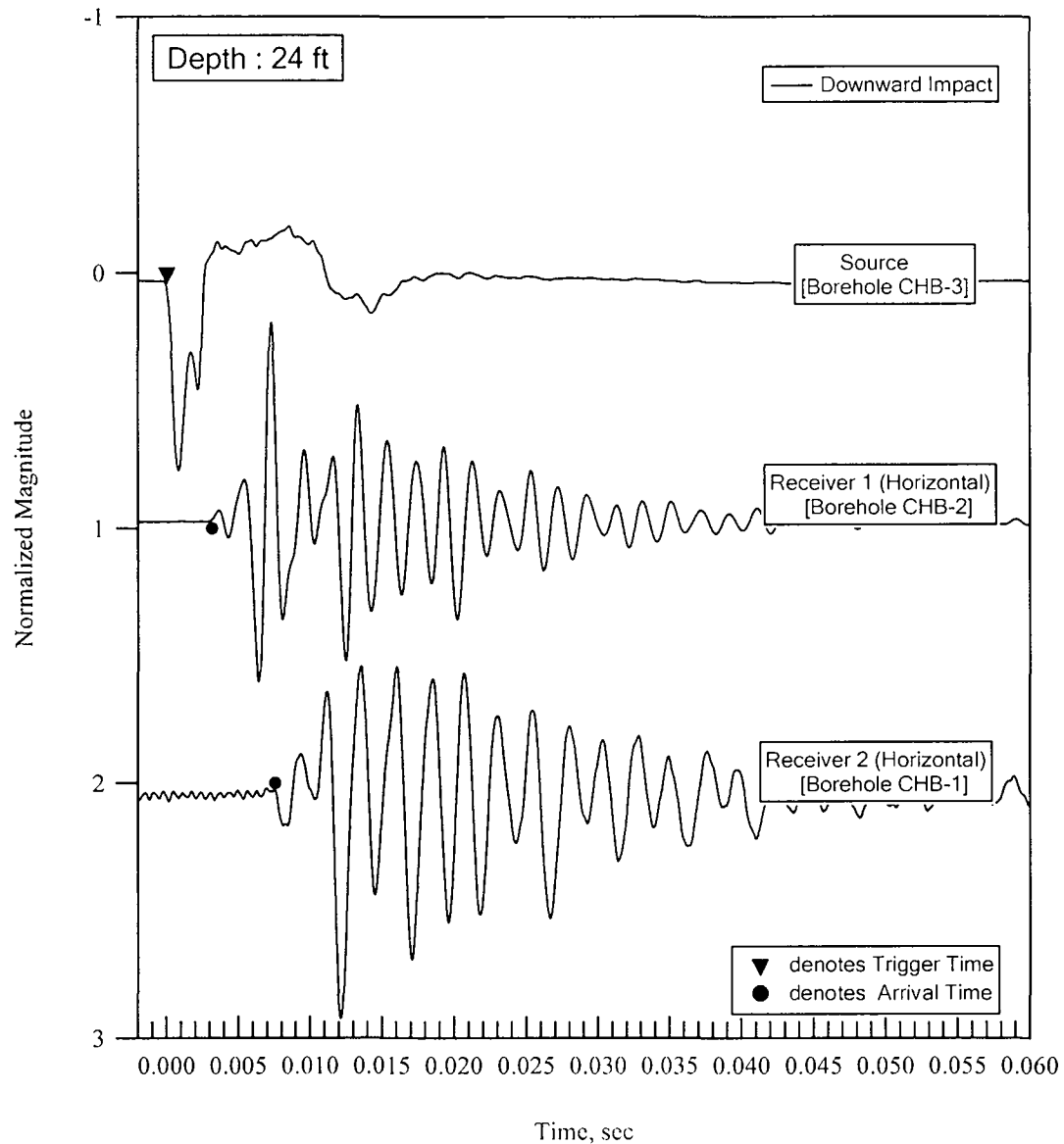


Figure E.12 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 24 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2004

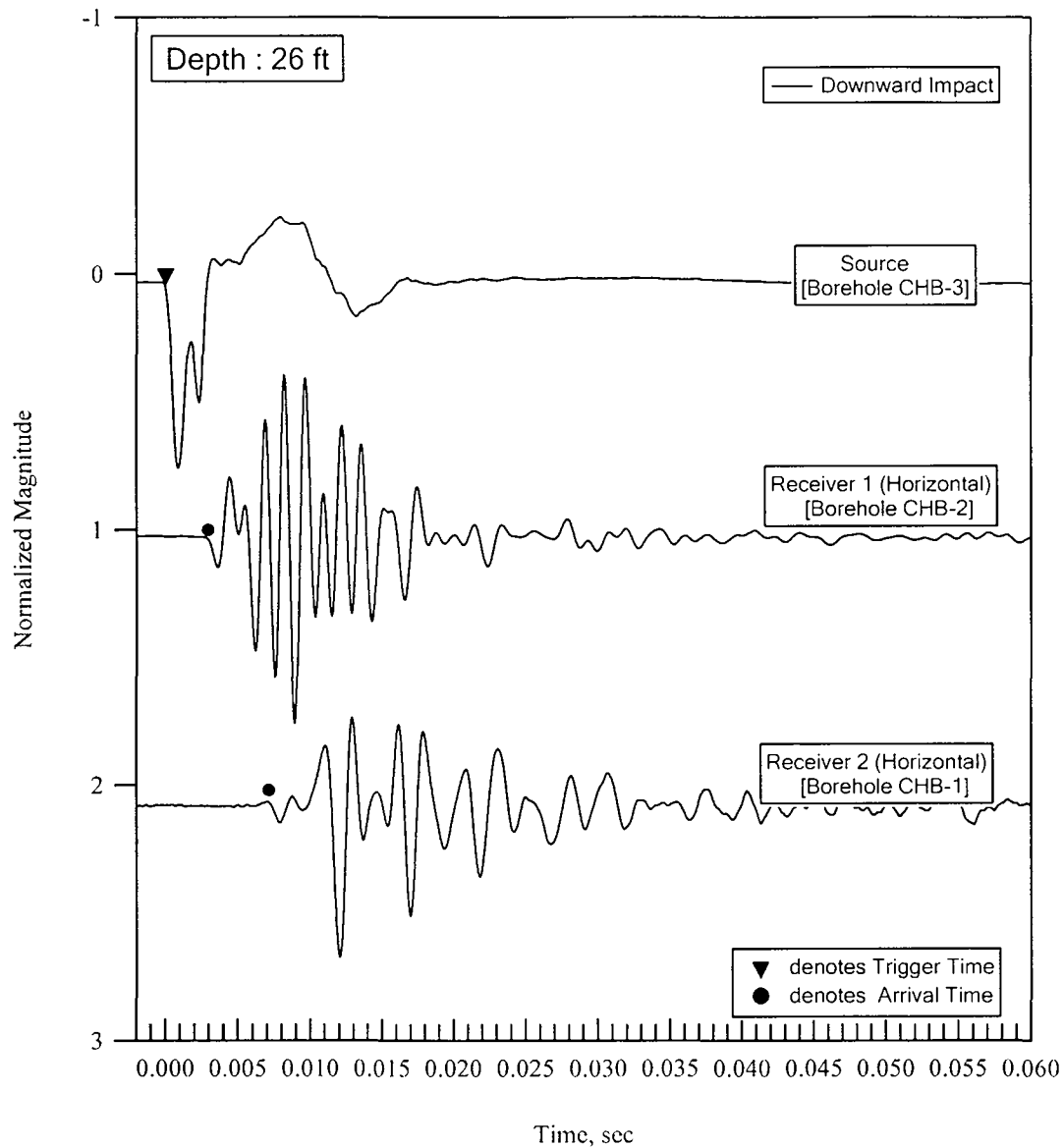


Figure E.13 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 26 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2004

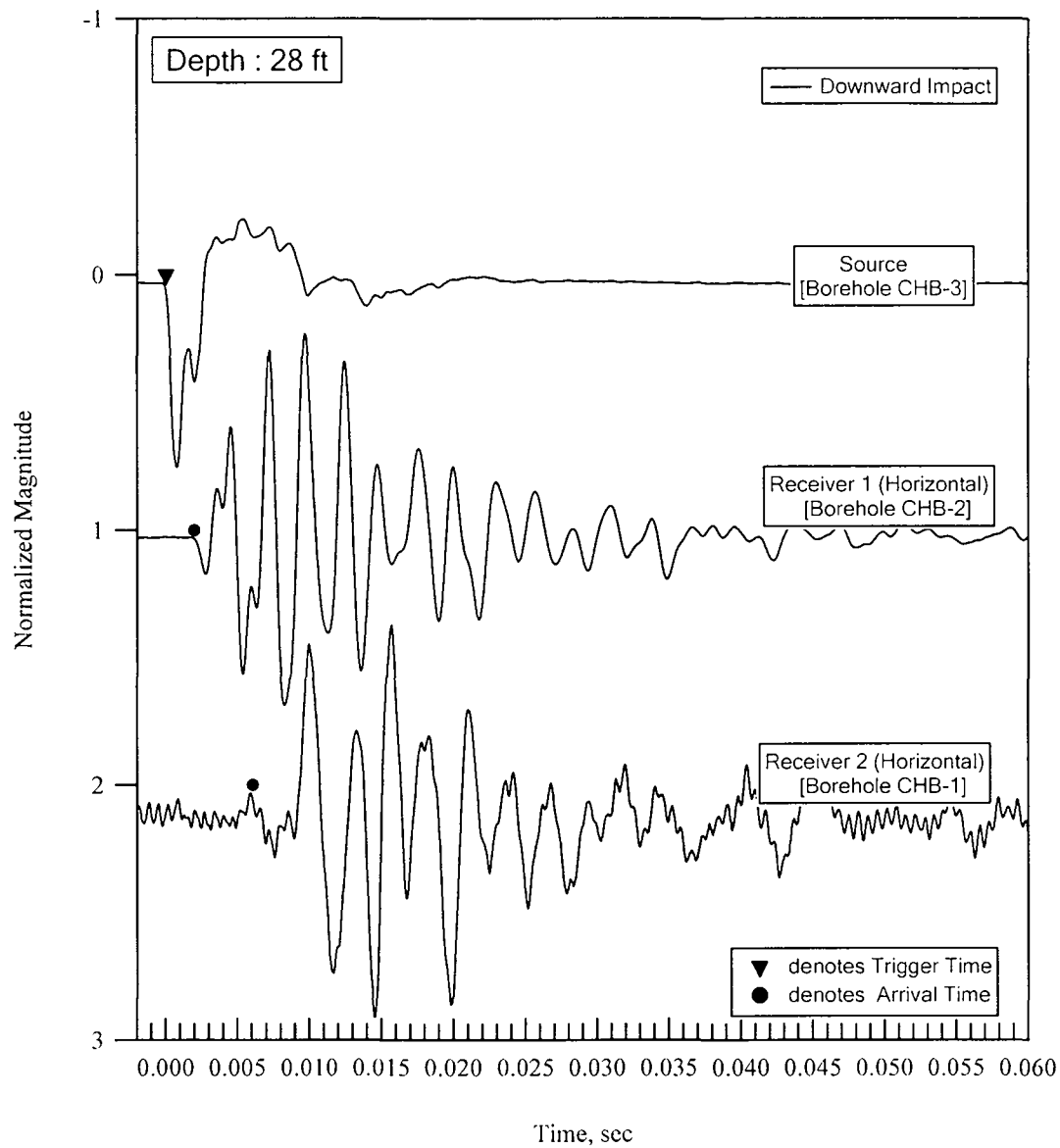


Figure E.14 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 28 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jee Jung
 Checked by : K. H. Stoker II
 Date : 02-06-2004

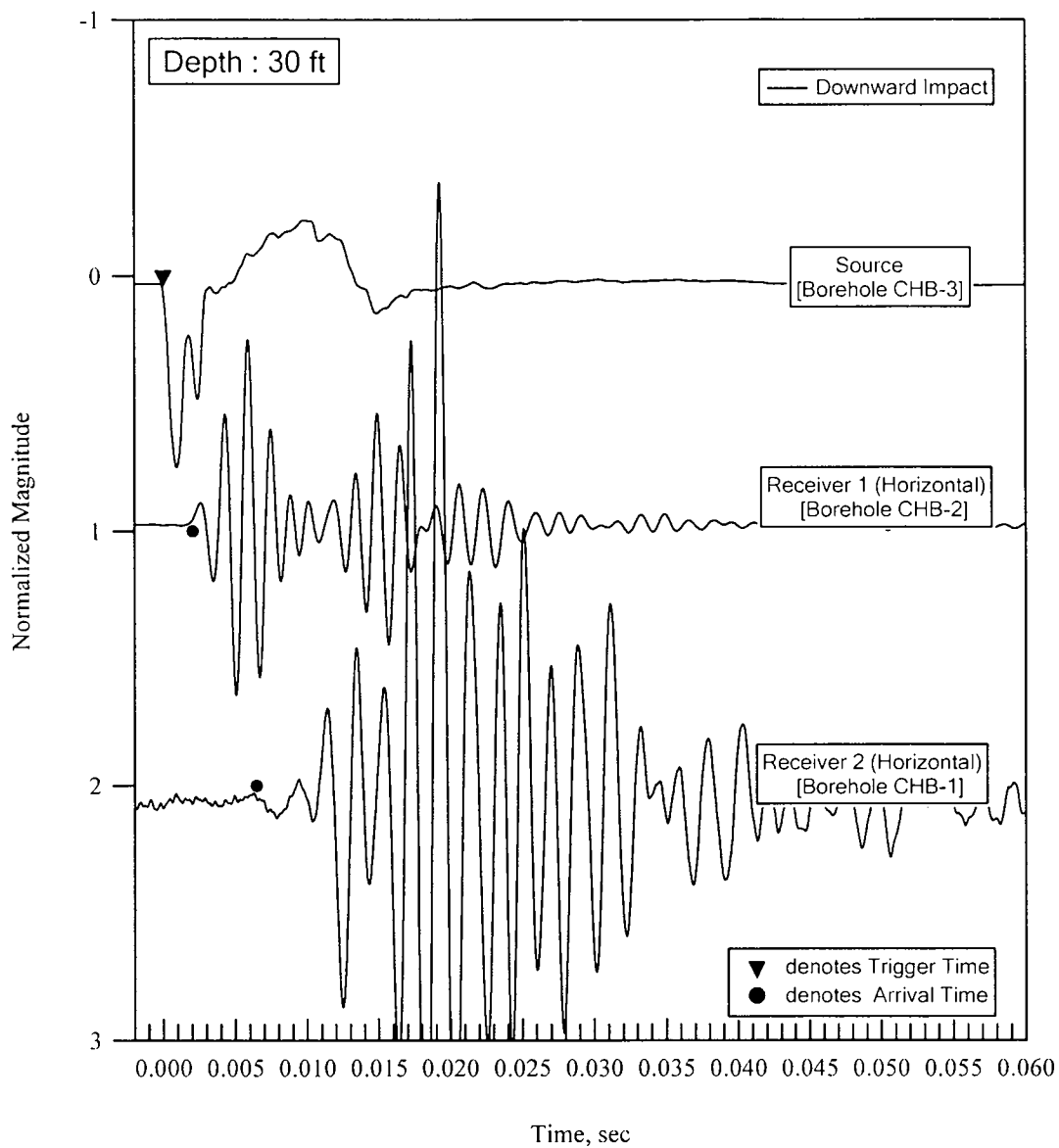


Figure E.15 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 30 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

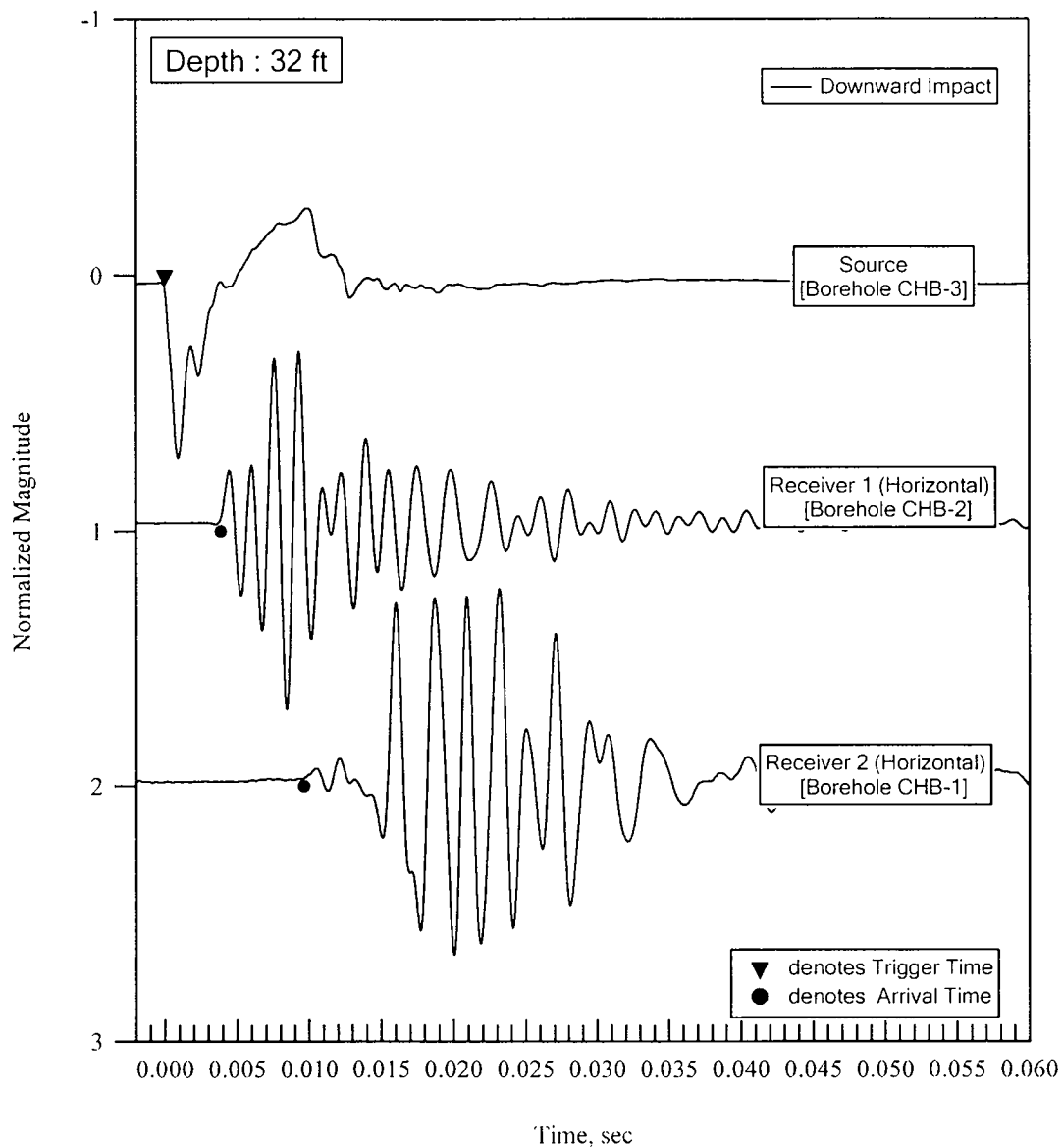


Figure E.16 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 32 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stoker
 Date : 02-06-2004

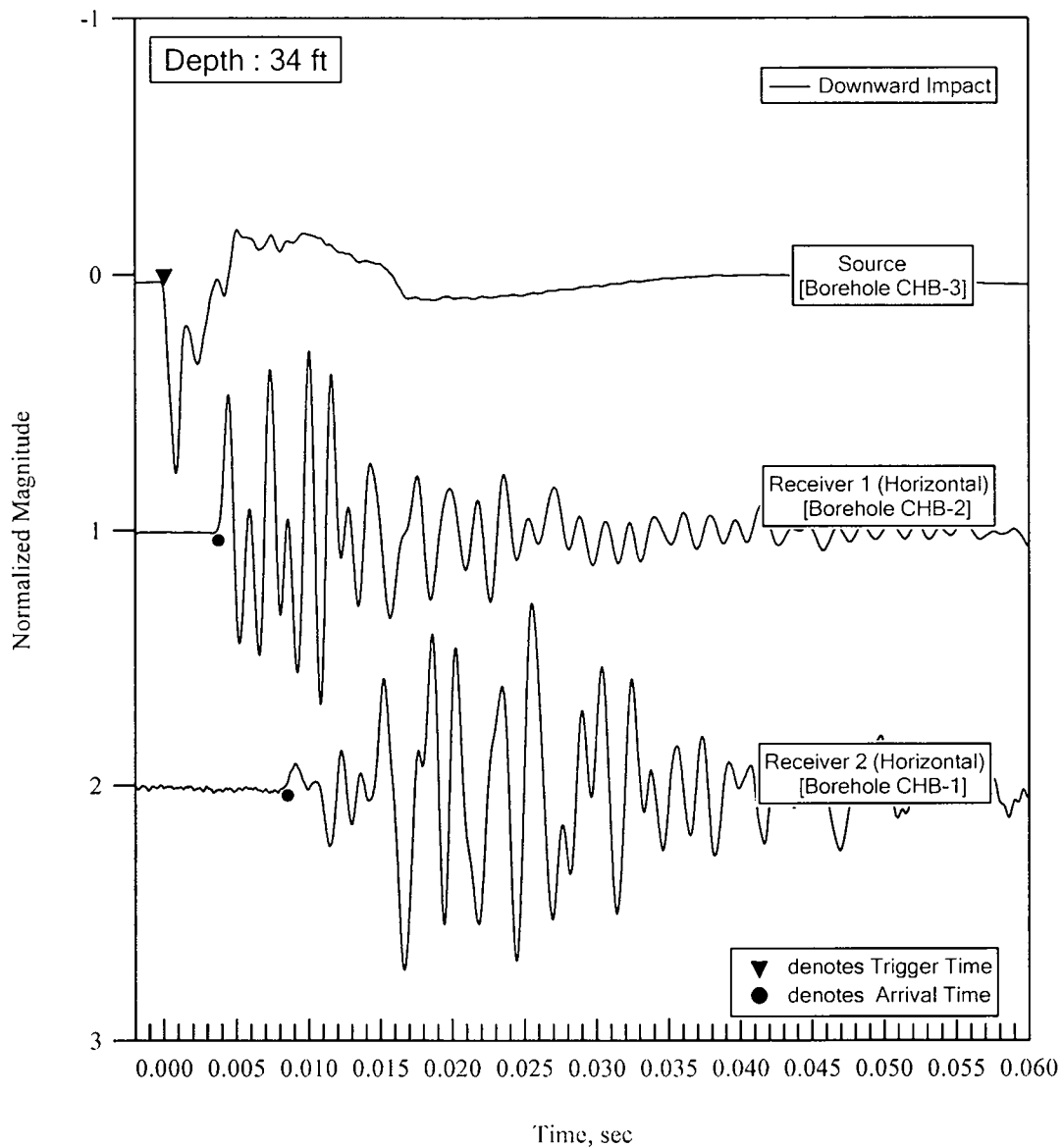


Figure E.17 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 34 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jee Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

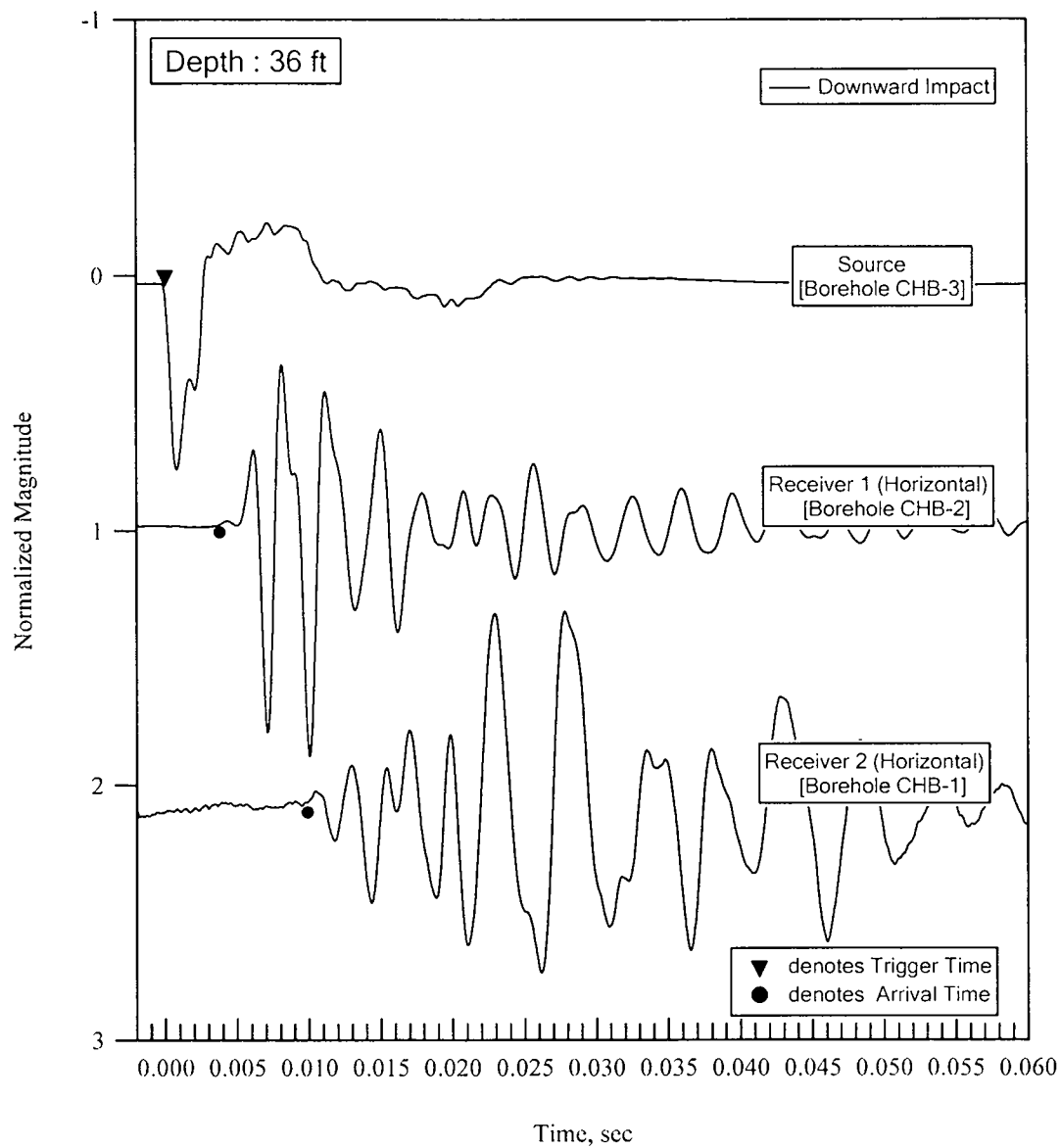


Figure E.18 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 36 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokor
 Date : 02-06-2008

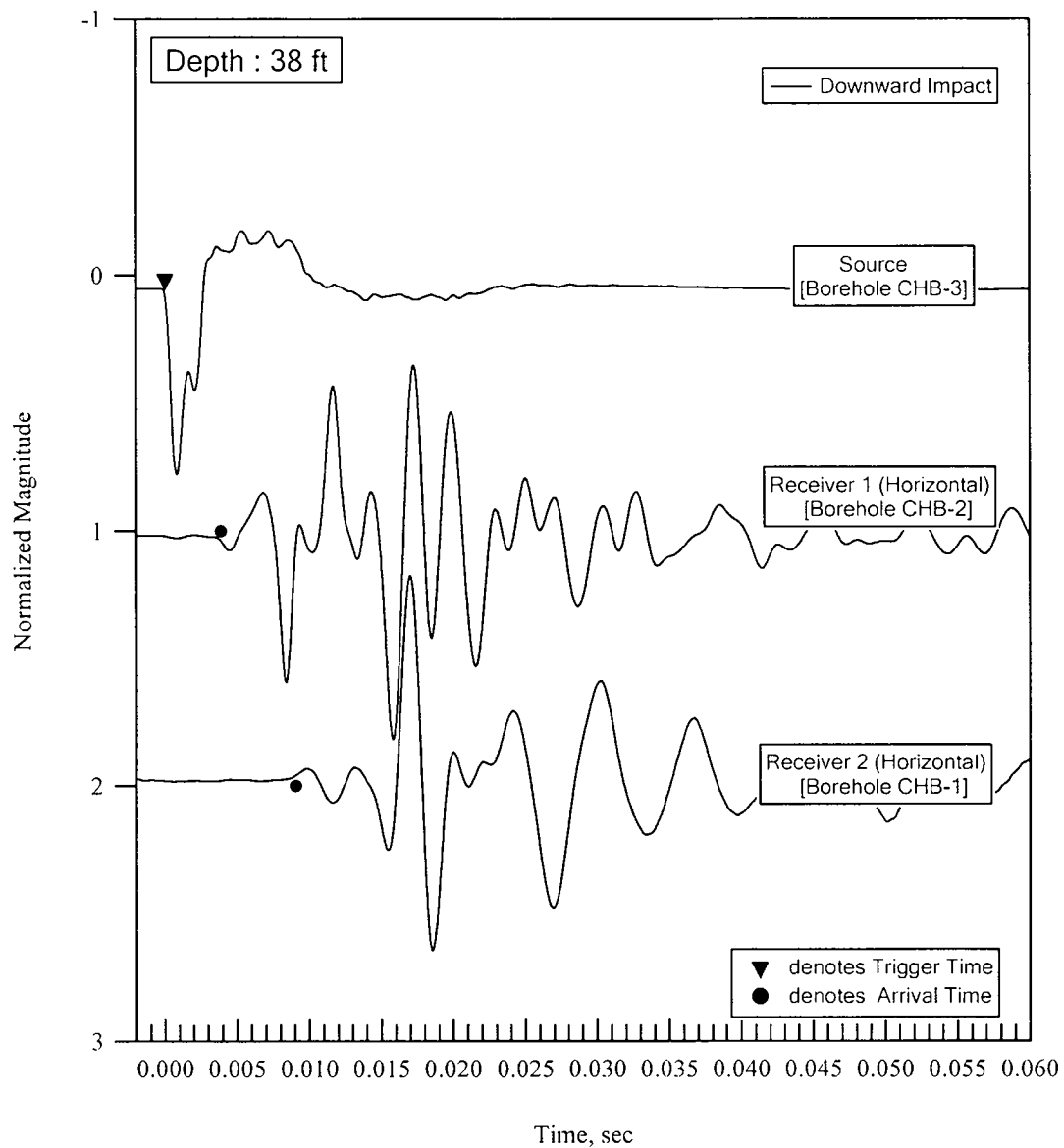


Figure E.19 Individual Crosshole Record of Trigger and 3-Component Receiver at a Depth of 38 ft; Source Borehole CHB-3 and Receiver Boreholes CHB-1 and CHB-2

Analyzed by : Min Jae Jung
 Checked by : R. H. Stoker
 Date : 02-06-2004

APPENDIX F

Calibration Procedures and Documentation

F.1 Source/Receiver Calibration

The mechanical source and 3-D receivers were calibrated in the field to determine the time between the triggering of the geophone or accelerometer on the source and the initiation of seismic energy around the borehole casing. The delay time, or the calibration factor, is subtracted from the direct time measured in the source-to-receiver tests.

The general in-field source and receiver calibration procedure is illustrated in Figure F.1. The source is placed in a piece of casing, the same type used in the crosshole boreholes and a 3-D receiver is securely pressed against the casing at the same elevation. The casing is approximately 3 ft (~1 m) long. The source is then impacted and the response of the trigger geophone or accelerometer and the vertical and horizontal receiver geophones are simultaneously monitored on the dynamic signal analyzer.

Two 3-D receivers were used in the crosshole testing. Calibration of the source and receiver was performed in the field following the same procedure discussed above. The dynamic signal analyzer was used to record the output signals.

Figure F.2 shows the records collected from this calibration procedure using the trigger geophone and receiver. Figure F.2a shows the calibration time records for upward impacts and Figure F.2b shows the calibration time records for downward impacts. In these figures, the top record shows the output of the source trigger; the second record shows the output of the vertical geophone, and the lower two records show the output of the two horizontal geophones. Results of the calibration of the source and the receiver performed in the field are presented in Table F.1.

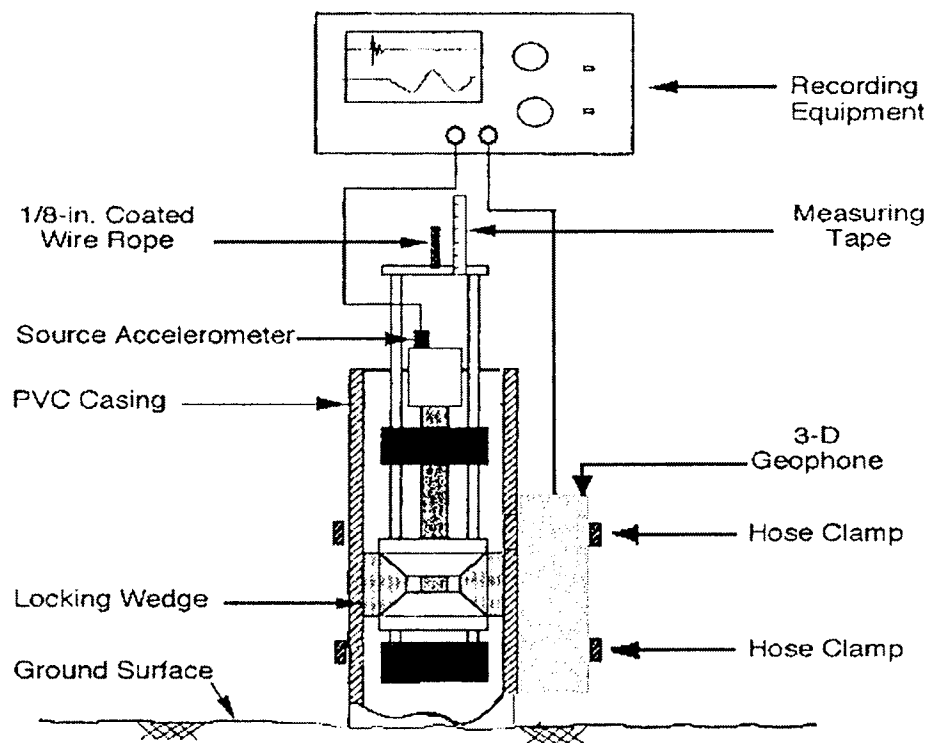
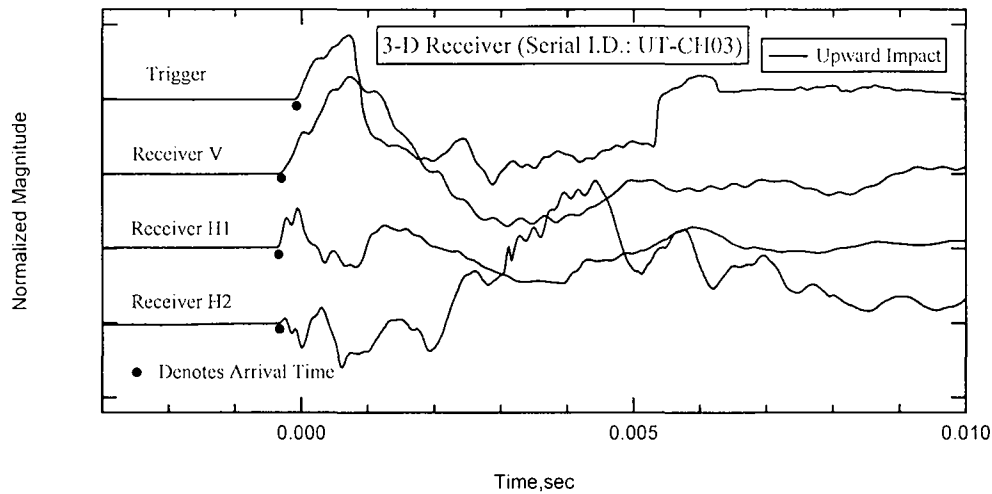
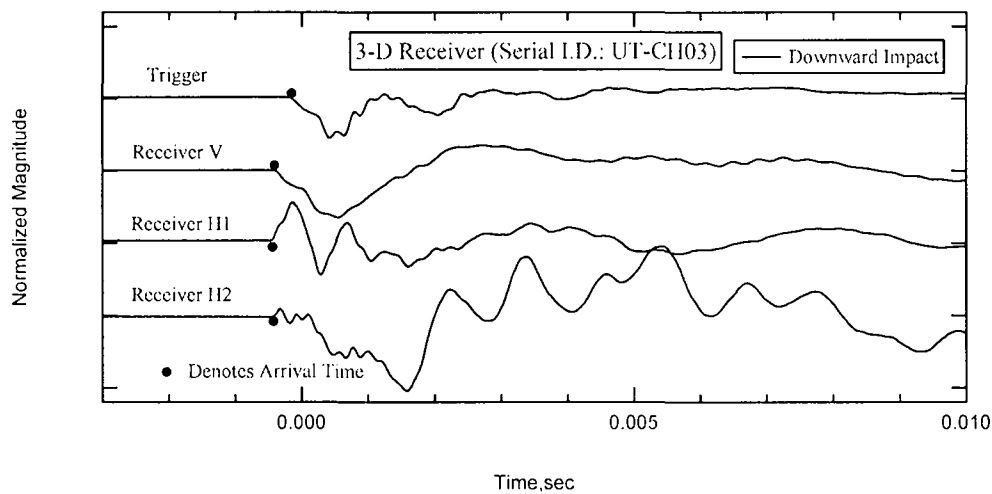


Figure F.1 Illustration of Field Calibration of Seismic Source and Receivers Used in Crosshole Tests.



(a)



(b)

Figure F.2 Calibration Travel Time Records for Receiver UT2005-CH03 for Crosshole Testing; (a) calibration record for upward impact, (b) calibration record for downward impact; January 25, 2008

Analyzed by : MinJae Jung
 Checked by : K. H. Spokor
 Date : 01-25-2008

Table F.1 Source/Receiver Calibration Factors; January 25, 2008

3-D Receiver	Source Trigger	Direction of Impact	Geophone Orientation	Calibration Factor (ms)
UT2005-CH03	Geophone	Up	Vertical	-0.228
			Horizontal 1	-0.274
			Horizontal 2	-0.259
		Down	Vertical	-0.259
			Horizontal 1	-0.289
			Horizontal 2	-0.274

Analyzed by : MinJae Jung
 Checked by : K. H. Stokroff
 Date : 01-25-2008

F.2 Dynamic Signal Analyzer Calibration

The Agilent 4-Channel Dynamic Signal Analyzer (Serial Number: MY41005676) was calibrated for timing accuracy prior to crosshole seismic testing at the Vogtle test fill in December 2007. This calibration was performed on December 9, 2007 using Wavetek Model FG2A function generator (Serial Number: 912022, Calibration I.D. Number: M501399-1) and Wavetek Model UC10A Universal Counter (Serial Number: 812012, Calibration I.D. Number: M501399-2) calibrated by Applied Technical Services (NIST traceable through May 18, 2008). The calibration was performed by inputting a square wave from the function generator into four channels of the Agilent 4-Channel Dynamic Signal Analyzer and measuring the time duration between cycles. This measured time duration was then compared with the expected time duration for the given input frequency. Square waves with frequencies of 5 Hz, 10 Hz, 50 Hz, 100 Hz and 500 Hz were used as input, and the frequency span of the analyzer was set to the same value typically used in the field for crosshole testing. Figures F.3 through F.7 show the waveforms recorded by four channels of the Agilent 4-Channel Dynamic Signal Analyzer for input square waves with frequencies of 5 Hz, 10 Hz, 50 Hz, 100 Hz and 500 Hz. The results from square wave calibration are tabulated in Table F.2 for channels 1 through 4. These calibrations indicate that any differences in the timing measurements of each channel are less than 0.01 ms, which is within the tolerance for this work.

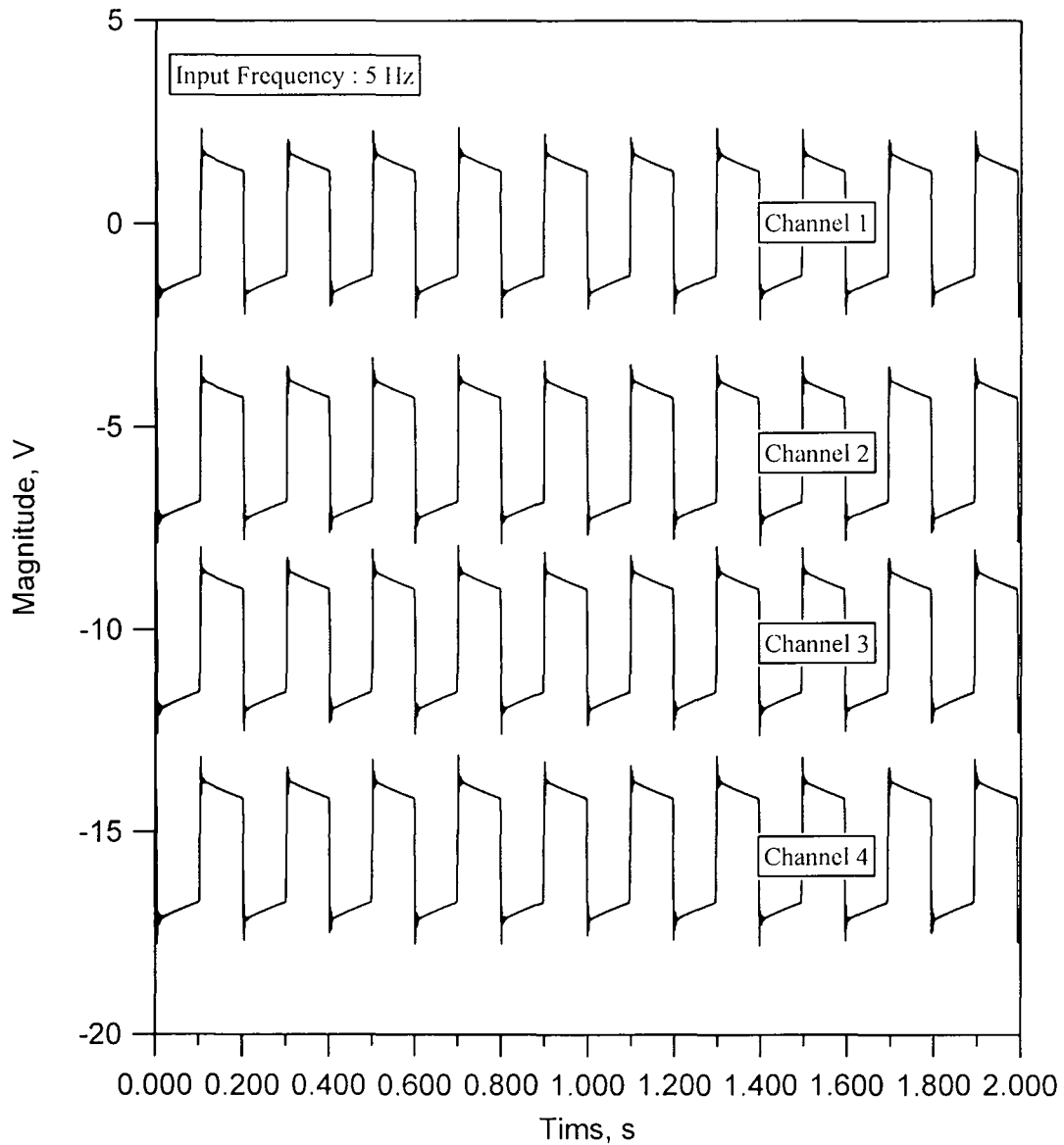


Figure F.3 Calibration Records for the Agilent 4-Channel Dynamic Signal Analyzer Channels 1 through 4; 5 Hz Square Wave Input; December 09, 2007

Analyzed by : Min Jae Jung
 Checked by : K. H. S. Park
 Date : 12-12-2007

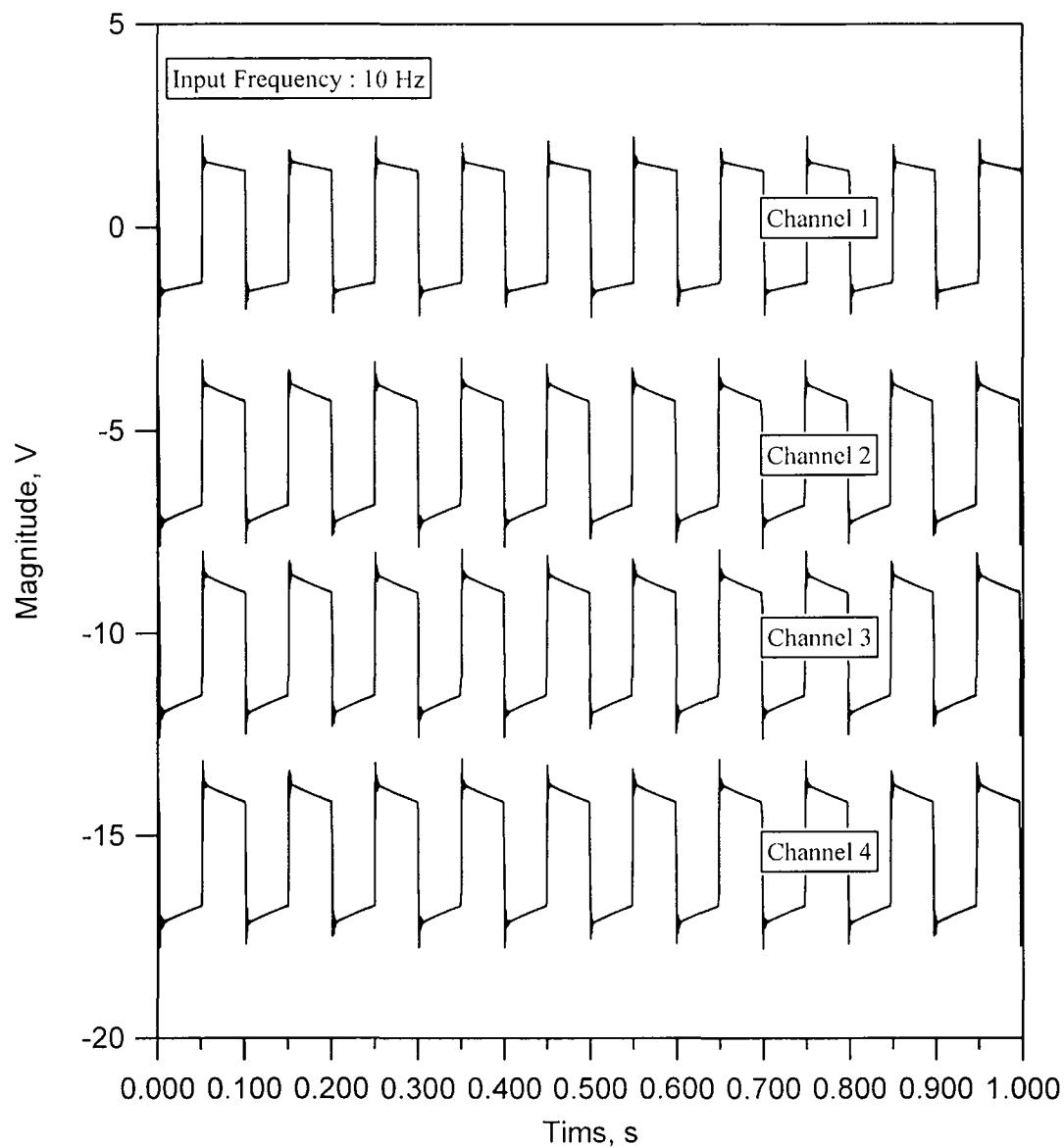


Figure F.4 Calibration Records for the Agilent 4-Channel Dynamic Signal Analyzer Channels 1 through 4; 10 Hz Square Wave Input; December 09, 2007

Analyzed by : Min Jae Jung
 Checked by : K. H. Stokred
 Date : 12-12-2007

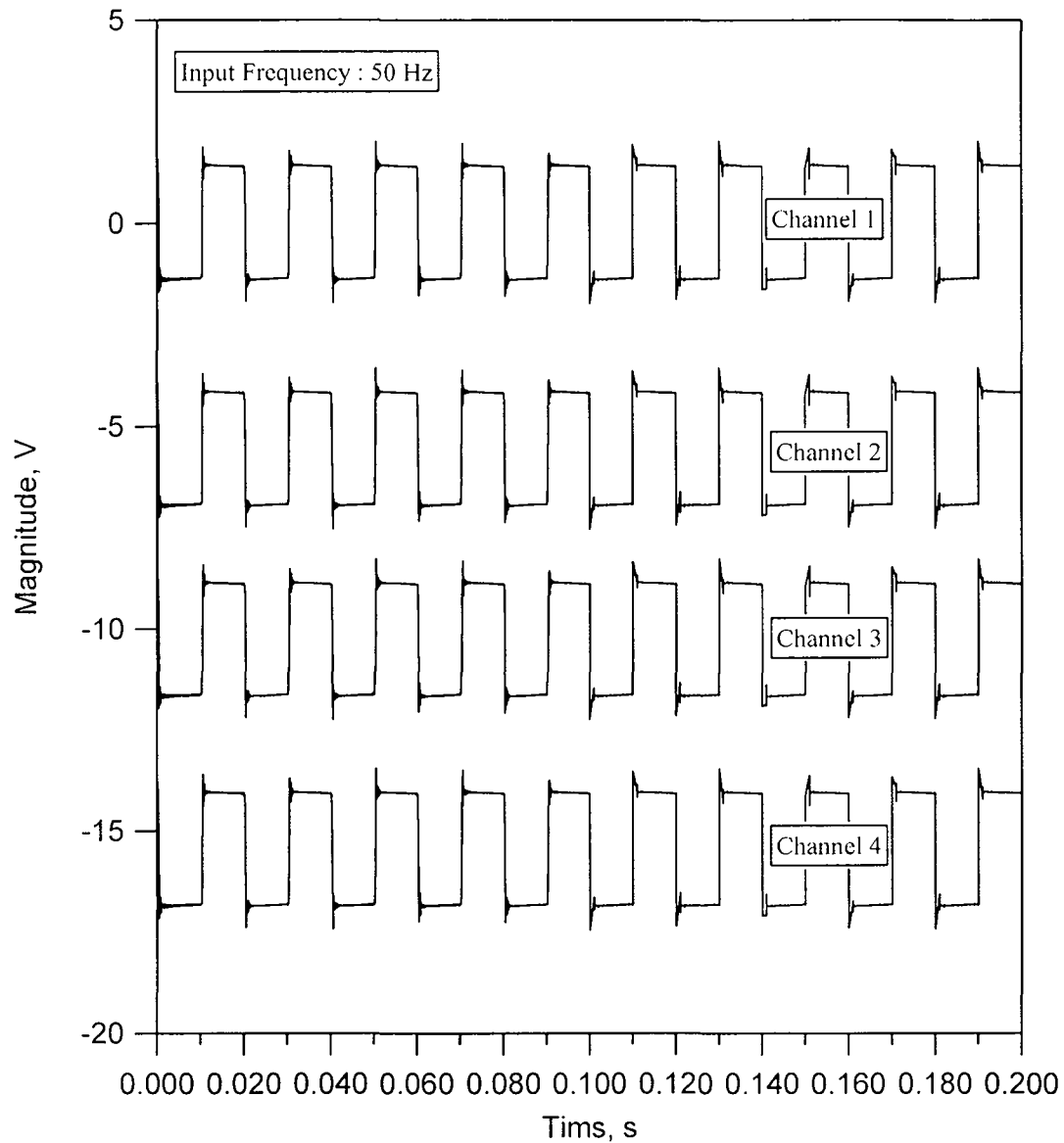


Figure F.5 Calibration Records for the Agilent 4-Channel Dynamic Signal Analyzer Channels 1 through 4; 50 Hz Square Wave Input; December 09, 2007

Analyzed by : Min Jae Jung
 Checked by : K. H. S. J. K. S. J.
 Date : 12-12-2007

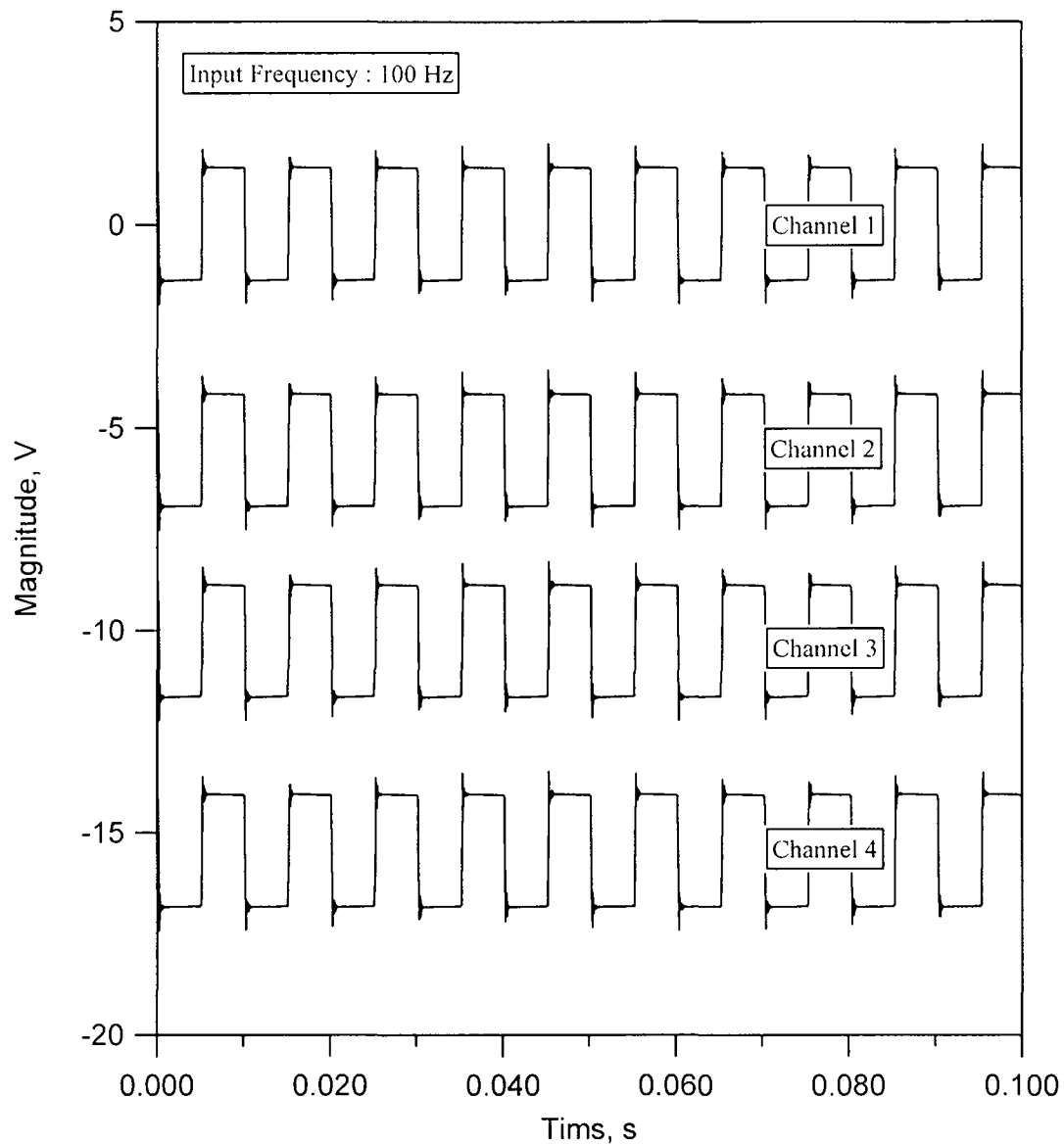


Figure F.6 Calibration Records for the Agilent 4-Channel Dynamic Signal Analyzer Channels 1 through 4; 100 Hz Square Wave Input; December 09, 2007

Analyzed by : Min Joe Jung
 Checked by : K. H. Stokrood
 Date : 12-12-2007

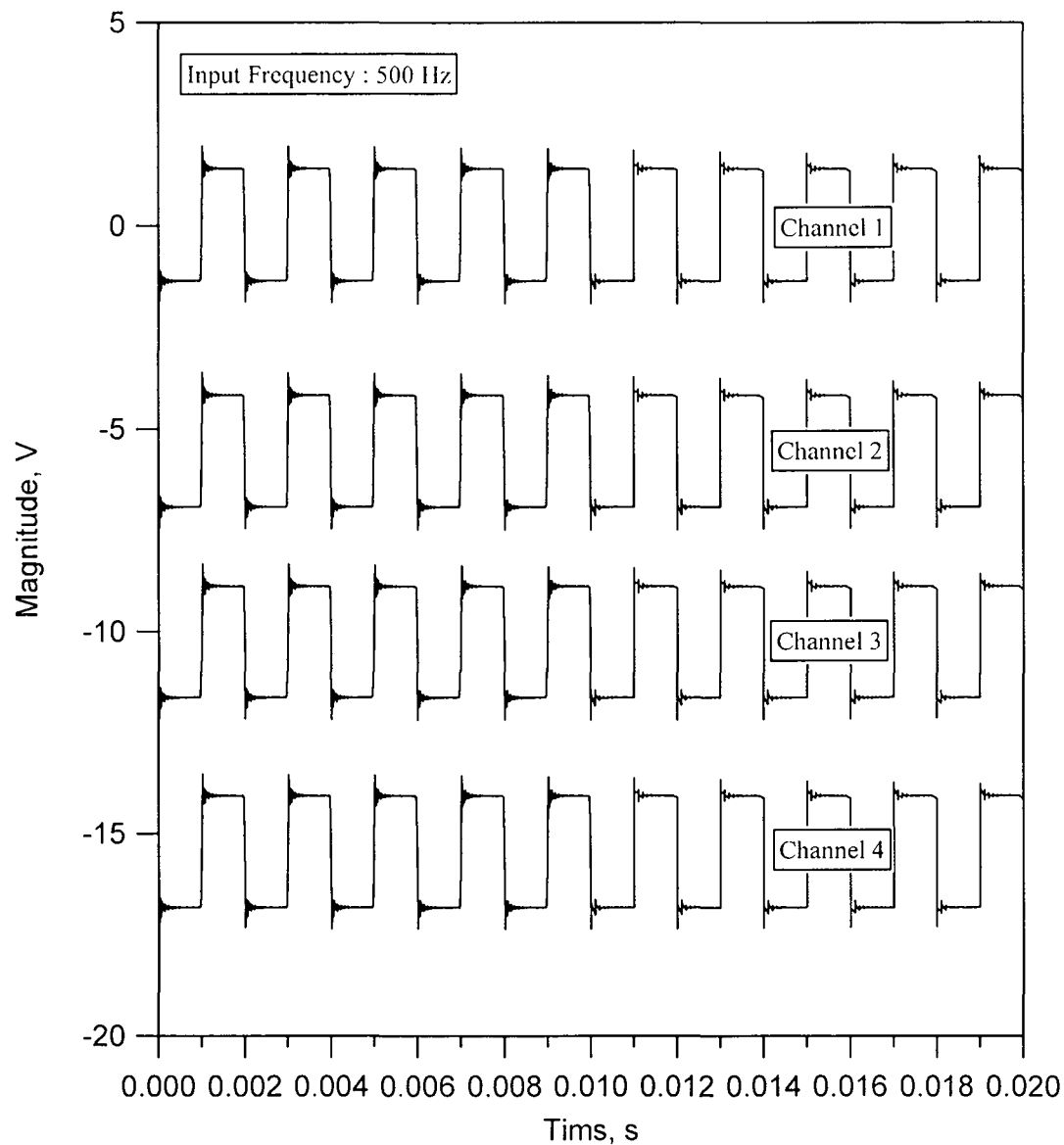


Figure F.7 Calibration Records for the Agilent 4-Channel Dynamic Signal Analyzer Channels 1 through 4; 500 Hz Square Wave Input; December 09, 2007

Analyzed by : Min Jae Jung
 Checked by : K. H. S. / 6/2007
 Date : 12-12-2007

Table F.2 Calibration Results of Time Domain (Agilent Dynamic Signal Analyzer)
December 9, 2007

Instrument	4 Channel Dynamic Signal Analyzer Agilent, Serial No.: MY41005676			
Equipment Used	Wavetek Function Generator Model FG2A, Serial No. 912022 NIST Traceable Calibration through 5/18/2008			
Calibration Date	12/9/2007			
Input Frequency	Square Wave 5 Hz			
Channel No.	Frequency	Input Amplitude	Expected Δt	Measured Δt
	Hz	V	ms	ms
1	5	3	200	199
2	5	3	200	199
3	5	3	200	199
4	5	3	200	199
Input Frequency	Square Wave 10 Hz			
Channel No.	Frequency	Input Amplitude	Expected Δt	Measured Δt
	Hz	V	ms	ms
1	10	3	100	100
2	10	3	100	100
3	10	3	100	100
4	10	3	100	100
Input Frequency	Square Wave 50 Hz			
Channel No.	Frequency	Input Amplitude	Expected Δt	Measured Δt
	Hz	V	ms	ms
1	50	3	20.0	20.1
2	50	3	20.0	20.1
3	50	3	20.0	20.1
4	50	3	20.0	20.1
Input Frequency	Square Wave 100 Hz			
Channel No.	Frequency	Input Amplitude	Expected Δt	Measured Δt
	Hz	V	ms	ms
1	100	3	10.0	10.0
2	100	3	10.0	10.0
3	100	3	10.0	10.0
4	100	3	10.0	10.0
Input Frequency	Square Wave 500 Hz			
Channel No.	Frequency	Input Amplitude	Expected Δt	Measured Δt
	Hz	V	ms	ms
1	500	3	2.00	2.00
2	500	3	2.00	2.00
3	500	3	2.00	2.00
4	500	3	2.00	2.00

Analyzed by : Min Joe Jung
 Checked by : K. H. Stewart
 Date : 12-12-2007



COLLEGE OF ENGINEERING
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1 University Station C1700 • Austin, Texas 78712-0273 • (512) 471-4921 • FAX (512) 471-0592

20 March 2008

Mr. Wm. Allen Lancaster
MACTEC Engineering and Consulting, Inc.
396 Plasters Avenue
Atlanta, Georgia 30324

RE: Field Crosshole Data Report
DCN: GR08-07
Revision 0, February 22, 2008
Vogtle Units 3 & 4 Project
MACTEC Project No. 6141060286

Dear Mr. Lancaster:

The University of Texas at Austin/Kenneth H. Stokoe, II, Ph.D. issued the Field Crosshole Data Report, DCN GR08-07 for inclusion as Attachment E to MACTEC Engineering and Testing, Inc's Data Report, Vogtle Units 3 & 4 Engineered Fill Below Grade Test Pad Phase 1.

The Field Crosshole Data Report was prepared by and reviewed by Min Jae Jung and Kenneth H. Stokoe, II. During preparation of the report in MS Word format, electronic copies of signature blocks were placed on 71 of the 86 pages of the report to document the analysis and review of the data on the individual pages. Three separate electronic signature blocks were used in the report as follows:

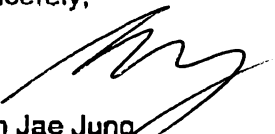
Analyzed by : <u>Min Jae Jung</u>	Analyzed by : <u>Min Jae Jung</u>	Analyzed by : <u>Min Jae Jung</u>
Checked by : <u>K. H. Stokoe</u>	Checked by : <u>K. H. Stokoe</u>	Checked by : <u>K. H. Stokoe</u>
Date : <u>02-06-2008</u>	Date : <u>01-25-2008</u>	Date : <u>12-12-2007</u>

The signature block dated 02-06-2008 was placed on 63 pages, the block dated 01-25-2008 was placed on two pages and the block dated 12-12-2007 was place on six pages of the report.

This letter is written to certify that all data contained in DCN GR08-07 has been analyzed by Min Jae Jung and checked by Kenneth H. Stokoe, II. The electronic data stamps placed into the report are true representations of the documentation of the analysis and review of the data contained in this report.

Please let us know if you have questions.

Sincerely,


Min Jae Jung
Graduate Research Assistant
Kenneth H. Stokoe, II, Ph. D, P.E.
Jennie C. and Milton T. Graves Chair
In Engineering

KHS:ttb

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