ACOUSTIC TELEVIEWER LOG COVER 1.0a.pdf

GEOVision
geophysical services

B-3270A0 ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a

Borehole*

SITE*: Exelon Victoria_COL DATE*: 2/20/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE 2 OF 2

WINCH: COMPROBE____ SILVER X OYO____ OTHER____
MICROLOGGER* 5310 X 5772____
TELEVIEWER* ACOUSTIC #5174 X OTHER____
SHEAVE* COMPROBE____ OYO 101____ 102____ 103 X RG____

PROBE TILT TEST* 89.90 BRUNTON TILT* 90
PROBE TILT TEST* 18.46 BRUNTON TILT* 19
PROBE TILT TEST* 16.17 BRUNTON TILT* 16 AFTER LOG* yes
PROBE AZIMUTH TEST* 51.50 BRUNTON AZIMUTH* 56
PROBE AZIMUTH TEST* 355.40 BRUNTON AZIMUTH* 352
PROBE AZIMUTH TEST* 344.7 BRUNTON AZIMUTH* 345 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.33	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.39	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.39	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	ϕ	

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B3270A0AUUP01	311.2 ft	8:47	3.3 ft	9:03pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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BORING SUMMARY LOG REV 1.1a.pdf

B-3285AO BORING GEOPHYSICS FIELD LOG SUMMARY

Borehole*

SITE*: Exelon Victoria COL
CLIENT*: MACTEC
AUTHOR*: C. Carter
CONTACT:
DATE*: 2/19/09
JOB*: 9054
PAGE*: 1 OF 1
PHONE:

BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 265 ft ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED*: 265 ft
SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 3 ft ; NO ____
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
ELOG	B3285AOELOGTEST01		2/19/09	2:01 - 2:02 pm
ELOG	B3285AOELOGUP01	266.25 - 39.45 ft	2/19/09	3:37 - 3:57 pm
P-S velocity	B3285AOSUSPDATA01	2.5 - 76.5 m	2/19/09	4:25 - 5:39 pm
Caliper	B3285AOCALTEST01		2/19/09	6:19 - 6:21 pm
Caliper/gamma	B3285AOCALUP01	260.7 - 4.4 ft	2/19/09	6:42 - 7:06 pm
Caliper	B3285AOCALTEST01		2/19/09	7:18 - 7:20 pm
Deviation	B3285AODVUP01	261.2 - 2.7 ft	2/19/09	7:56 - 8:09 pm

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

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ELOG FIELD LOG REV 1.1a

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B - 328SAO
Borehole*

ELOG FIELD LOG

SITE*: Exelon Victoria COL
CLIENT*: MACTEC
AUTHOR*: C. Carter

DATE*: 2/19/09
JOB*: 9054
PAGE: 1 OF 2

CONTACT: ______ PHONE: Off Cell

CONTACT: ______ PHONE: Off Cell

CONTACT: ______ PHONE: Off Cell

CONTACT: ______ PHONE: Off Cell
COMPANY: ______

GENERAL SITE CONDITIONS/LOCATION: ______

COUNTY: ______ RANGE: ______ TOWNSHIP: ______ SECTION: ______
BOREHOLE CONSTRUCTION: CASED ______ UNCASED x
DIAMETERS AND DEPTH RANGES: 5" 0 TO 265 ft ; ______, ______ TO ______

BOREHOLE TOTAL DEPTH AS DRILLED*: 265 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 3 ft ; NO ______
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~ 50 ft
BOREHOLE FLUID: WATER ______; FRESH WATER MUD X ; SALT WATER MUD ______;
OTHER: ______
DEPTH TO BOREHOLE FLUID: 2 ft TIME SINCE LAST CIRCULATION: 3 pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: ______
MOBILIZED FROM: Victoria, TX DEPARTURE TIME: 12:30pm
ARRIVED ON SITE: 1pm
STANDBY TIME: ______ CAUSE: ______

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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ELOG FIELD LOG REV 1.1a

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B-328SA0 ELOG FIELD LOG
Borehole*

SITE*: Exelon Victoria COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE: PAGE 2 OF 2

WINCH: COMPROBE___ SILVER X OYO___ RG___ OTHER___
MICROLOGGER* 5310 [X] 5772 [ ] OTHER
ELOG PROBE* 5490 [X] OTHER
SHEAVE* COMPROBE [ ] OYO 101[ ] 102[ ] 103[X] RG[ ]

PROBE LENGTH	2.50M(8.20 FT)
PLUS YOKE 10.0M (32.8 FT)*	32.8
MINUS CASING STICK-UP*	-1.08
DEPTH REF. OFFSET AT START*	39.92
DEPTH REF. OFFSET AT END*	39.80
AFTER SURVEY DEPTH ERROR*	.12

REF TO GROUND SURFACE

LOG NAME*	START DEPTH*	START TIME	END DEPTH*	END TIME
B328SA0ELOGTEST01		2:01		2:02pm
B328SA0ELOGUP01	266.25 ft	3:37	39.45 ft	3:57pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

GEOVision geophysical services

B-3285A6 **P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a**
Borehole

SITE*: Excelon Victoria COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE 1 OF * 6

CONTACT: ______ PHONE: Off Cell ______

CONTACT: ______ PHONE: Off Cell ______

CONTACT: ______ PHONE: Off Cell ______

CONTACT: ______ PHONE: Off Cell ______

DIRECTIONS TO SITE: ______

GENERAL SITE CONDITIONS/LOCATION: ______

COUNTY: ______ RANGE: ______ TOWNSHIP: ______ SECTION: ______
BOREHOLE CONSTRUCTION*: CASED ______ UNCASED X
DIAMETERS AND DEPTH RANGES*: 5" 0 TO 265 ft ; ______, ______ TO ______
BOREHOLE TOTAL DEPTH AS DRILLED*: 265 ft
SURFACE CASING?: yes DEPTH TO BOTTOM OF CASING 3 ft ; NO ______
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~50 ft
BOREHOLE FLUID: WATER ______; FRESH WATER MUD X ; SALT WATER MUD; ______
OTHER: ______
DEPTH TO BOREHOLE FLUID*: 1' TIME SINCE LAST CIRCULATION: 3pm

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

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B-328540 P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a

Borehole*

SITE*: Exelon Victoria COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE 2 OF * 6

LOGGING CREW*: C. Carter
MOBILIZED FROM: Victoria, TX DEPARTURE TIME: 12:30pm
ARRIVED ON SITE: 1pm
STANDBY TIME: CAUSE:
LOGGING STARTED: 4:25pm LOGGING COMPLETED: 5:39pm

BATTERIES CHANGED BEFORE LOGGING: YES____; NO X; STORED WITH NEW____
WINCH COMPROBE ☐ GREY ☒ OYO ☐ RG ☐ OTH ____
INSTRUMENT* OYO 12004 ☐ 15014 ☐ 19029 ☐ RG 160023 ☐ 160024 ☒
RECEIVER S/N* 12008 ☐ 20042 ☐ 26066 ☐ 11001 ☐ 23053 ☐ 30086 ☒
ISOLATION TUBE S/N* 300083 ☒ 24053 ☐ 28068 ☐ 28072 ☐ 2M ____
SHEAVE* COMPROBE ☐ OYO 101 ☐ 102 ☐ 103 ☒ RG ☐
MICROLOGGER* 5310 ☒ 5772 ☐ NOT APPLICABLE (OYO) ☐
PROBE OFFSET* OYO 2.0M ☐ RG 2.5M ☒
MINUS CASING STICK-UP* .33
DEPTH REF. OFFSET AT START* 2.17
DEPTH REF. OFFSET AT END* 2.16
AFTER SURVEY DEPTH ERROR* .01
} REF TO GROUND SURFACE

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B3285A0SUSP00NO1	2.5m	4:25pm	76.5m	5:39pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:
COMMENTS:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

B-3285AO GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Exelon Victoria COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE* 3 OF 6

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56			
2.5	8.20	001		4:25 pm
3.0	9.84	2		
3.5	11.48	3		
4.0	13.12	4		
4.5	14.76	5		
5.0	16.40	6		
5.5	18.04	7		
6.0	19.69	8		
6.5	21.33	9		
7.0	22.97	10		
7.5	24.61	11		
8.0	26.25	12		
8.5	27.89	13		
9.0	29.53	14		
9.5	31.17	15		
10.0	32.81	16		
10.5	34.45	17		
11.0	36.09	18		
11.5	37.73	19		
12.0	39.37	20		
12.5	41.01	21		
13.0	42.65	22		
13.5	44.29	23		
14.0	45.93	24		
14.5	47.57	25		
15.0	49.21	26		
15.5	50.85	27		
16.0	52.49	28		
16.5	54.13	29		
17.0	55.77	30		
17.5	57.41	31		
18.0	59.06	32		
18.5	60.70	33		
19.0	62.34	34		
19.5	63.98	35		
20.0	65.62	36		

P-S FIELD LOG REV V1.31a

B-3285A0 **GEOVISION SUSPENSION LOGGING FIELD NOTES**

SITE*: Exelon Victoria COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE* 4 OF 6

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	37		
21.0	68.90	38		
21.5	70.54	39		
22.0	72.18	40		
22.5	73.82	41		
23.0	75.46	42		
23.5	77.10	43		
24.0	78.74	44		
24.5	80.38	45		
25.0	82.02	46		
25.5	83.66	47		
26.0	85.30	48		
26.5	86.94	49		
27.0	88.58	50		
27.5	90.22	51		
28.0	91.86	52		
28.5	93.50	53		
29.0	95.14	54		
29.5	96.78	55		
30.0	98.43	56		
30.5	100.07	57		
31.0	101.71	58		
31.5	103.35	59		
32.0	104.99	60		
32.5	106.63	61		
33.0	108.27	62		
33.5	109.91	63		
34.0	111.55	64		
34.5	113.19	65		
35.0	114.83	66		
35.5	116.47	67		
36.0	118.11	68		
36.5	119.75	69		
37.0	121.39	70		
37.5	123.03	71		
38.0	124.67	72		
38.5	126.31	73		
39.0	127.95	74		
39.5	129.59	75		
40.0	131.23	76		

B-3285AO

P-S FIELD LOG REV V1.31a

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*:_Exelon Victoria COL DATE*: 2/19/09
CLIENT*:MACTEC JOB*:_9054
AUTHOR*:_C. Carter PAGE* 5 OF 6

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	77		
41.0	134.51	78		
41.5	136.15	79		
42.0	137.80	80		
42.5	139.44	81		
43.0	141.08	82		
43.5	142.72	83		
44.0	144.36	84		
44.5	146.00	85		
45.0	147.64	86		
45.5	149.28	87		
46.0	150.92	88		
46.5	152.56	89		
47.0	154.20	90		
47.5	155.84	91		
48.0	157.48	92		
48.5	159.12	93		
49.0	160.76	94		
49.5	162.40	95		
50.0	164.04	96		
50.5	165.68	97		
51.0	167.32	98		
51.5	168.96	99		
52.0	170.60	100		
52.5	172.24	101		
53.0	173.88	102		
53.5	175.52	103		
54.0	177.17	104		
54.5	178.81	105		
55.0	180.45	106		
55.5	182.09	107		
56.0	183.73	108		
56.5	185.37	109		
57.0	187.01	110		
57.5	188.65	111		
58.0	190.29	112		
58.5	191.93	113		
59.0	193.57	114		
59.5	195.21	115		
60.0	196.85	116		

P-S FIELD LOG REV V1.31a

B-3285AD GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Exelon Victoria COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE* 6 OF 6

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	117		
61.0	200.13	118		
61.5	201.77	119		
62.0	203.41	120		
62.5	205.05	121		
63.0	206.69	122		
63.5	208.33	123		
64.0	209.97	124		
64.5	211.61	125		
65.0	213.25	126		
65.5	214.90	127		
66.0	216.54	128		
66.5	218.18	129		
67.0	219.82	130		
67.5	221.46	131		
68.0	223.10	132		
68.5	224.74	133		
69.0	226.38	134		
69.5	228.02	135		
70.0	229.66	136		
70.5	231.30	137		
71.0	232.94	138		
71.5	234.58	139		
72.0	236.22	140		
72.5	237.86	141		
73.0	239.50	142		
73.5	241.14	143		
74.0	242.78	144		
74.5	244.42	145		
75.0	246.06	146		
75.5	247.70	147		
76.0	249.34	148		
76.5	250.98	149		5:39 pm
77.0	252.62			
77.5	254.27			
78.0	255.91			
78.5	257.55			
79.0	259.19			
79.5	260.83			
80.0	262.47			

CALIPER FIELD LOG REV ..1a.PDF

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B-3285A0 CALIPER FIELD LOG
Borehole*

SITE*: Excelon Victoria COL
CLIENT*: MACTEC
AUTHOR*: C. Carter

DATE*: 2/19/09
JOB*: 9054
PAGE: 1 OF 2

CONTACT: ______ PHONE: Off Cell ______

CONTACT: ______ PHONE: Off Cell ______

CONTACT: ______ PHONE: Off Cell ______

DRILLER COMPANY: ______ PHONE: Off Cell ______

GENERAL SITE CONDITIONS/LOCATION: ______

COUNTY: ______ RANGE: ______ TOWNSHIP: ______ SECTION: ______
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 265 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 265 ft

SURFACE CASING?: YES ✓ DEPTH TO BOTTOM OF CASING 3 ft ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~50 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER: ______
DEPTH TO BOREHOLE FLUID: 5 ft TIME SINCE LAST CIRCULATION: 3pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: ______
MOBILIZED FROM: Victoria, TX DEPARTURE TIME: 12:30pm
ARRIVED ON SITE: 1pm
STANDBY TIME: ______ CAUSE: ______

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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CALIPER FIELD LOG REV 1.1a.PDF

GEOVision geophysical services

B-3285AO (Borehole*) CALIPER FIELD LOG

SITE*:	Excelon Victoria COL	DATE*:	2/19/09
CLIENT*:	MACTEC	JOB*:	9019
AUTHOR*:	C. Carter	PAGE:	PAGE 2 OF 2

WINCH: COMPROBE___ SILVER X OYO___ RG___ OTHER___
MICROLOGGER* 5310 [X] 5772 [ ] OTHER
CALIPER PROBE* 5368 [X] OTHER
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 103 [X] RG [ ]

PROBE OFFSET	2.08M(6.82 FT)	12 IN MAX
MINUS CASING STICK-UP*	1.08	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	5.74	
DEPTH REF. OFFSET AT END*	5.55	
AFTER SURVEY DEPTH ERROR*	.19	

LOG NAME*	START DEPTH*	START TIME*	END DEPTH*	END TIME*
B3285AOCALTEST01		6:19pm		6:21pm
B3285AOCALUP01	260.7 ft	6:42pm	4.4 ft	7:06pm
B3285AOCALTEST02		7:18pm		7:20pm

CALIBRATION PLATE S/N 201

	FILE NAME	AS BUILT 1.968 IN (50 MM)	3.937 IN (100 MM)	8.000 IN (203.2 MM)	PVC FITTING ~~4.510 IN~~ 4.504" (114.3 MM)
AS MEAS.*	B3285AOCALTEST01	1.97	3.91	7.95	4.502
AS MEAS.*	B3285AOCALTEST02	1.95	3.93	7.95	4.49
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

cc 2/19/09

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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ACOUSTIC TELEVIEWER LOG COVER 1.0a.pdf

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B-3285A0 ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a
Borehole*

SITE*: Exelon Victoria_COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER COMPANY: PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 265 ft ; , TO

BOREHOLE TOTAL DEPTH AS DRILLED*: 265 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 3 ft ; NO
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~50 ft
BOREHOLE FLUID: WATER ; FRESH WATER MUD X ; SALT WATER MUD ;
OTHER:
DEPTH TO BOREHOLE FLUID: 17 ft TIME SINCE LAST CIRCULATION: ~~6~~ 3 pm
cc 2/20/09

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Victoria, TX DEPARTURE TIME: 12:30 pm
ARRIVED ON SITE: 1:00 pm
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-3285A0 ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a

Borehole*

SITE*: Exelon Victoria_COL DATE*: 2/19/09
CLIENT*: MACTEC JOB*: 9054
AUTHOR*: C. Carter PAGE 2 OF 2

WINCH: COMPROBE____ SILVER x OYO____ OTHER____
MICROLOGGER* 5310 x 5772____
TELEVIEWER* ACOUSTIC #5174 x OTHER____
SHEAVE* COMPROBE____ OYO 101____ 102____ 103 x RG____

PROBE TILT TEST* 90.78 BRUNTON TILT* 90
PROBE TILT TEST* 18.55 BRUNTON TILT* 19
PROBE TILT TEST* 13.82 BRUNTON TILT* 13 AFTER LOG* yes
PROBE AZIMUTH TEST* 339.10 BRUNTON AZIMUTH* 335
PROBE AZIMUTH TEST* 63.70 BRUNTON AZIMUTH* 69
PROBE AZIMUTH TEST* 340.90 BRUNTON AZIMUTH* 338 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.08	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.64	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.58	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.06	

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B3285A0AUVP01	261.2 ft	7:56pm	2.7ft	8:09pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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APPENDIX E

BORING GEOPHYSICAL LOGGING

FIELD MEASUREMENT PROCEDURES

PROCEDURE FOR

OYO P-S SUSPENSION SEISMIC VELOCITY LOGGING

Background

This procedure describes a method for measuring shear and compressional wave velocities in soil and rock. The OYO P-S Suspension Method is applied by generating shear and compressional waves in a borehole using the OYO P-S Suspension Logger borehole tool and measuring the travel time between two receiver geophones or hydrophones located in the same tool.

Objective

The outcome of this procedure is a plot and table of P and S_H wave velocity versus depth for each borehole. Standard analysis is performed on receiver to receiver data. Data is presented in report format, with digital data files transmitted in Excel, Word or ASCII format.

Instrumentation

1. OYO Model 170 Digital Logging Recorder or equivalent
2. OYO P-S Suspension Logger probe or equivalent, including two sets horizontal and vertical geophones, seismic source, and power supply for the source and receivers
3. Winch and winch controller, with logging cable
4. Batteries to operate P-S Logger and winch

The Suspension P-S Logger system, manufactured by OYO Corporation, or the Robertson Digital P-S Suspension Probe with the Robertson Micrologger2 are currently the only commercially available suspension logging systems. As shown in Figure 1, these systems consists of a borehole probe suspended by a cable and a recording/control electronics package on the surface.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave generator (S_H) and compressional-wave generator (P), joined to two biaxial geophones by a flexible isolation cylinder. The separation of the two geophones is one meter, allowing average wave velocity in the region between the geophones to be determined by inversion of the wave travel time between the two geophones. The total length of the probe is approximately 7 meters; the center point of the geophones is approximately 4 meters above the bottom end of the probe.

The probe receives control signals from, and sends the amplified geophone signals to, the instrumentation package on the surface via an armored 4 or 7 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured by a rotary encoder to provide probe depth data.

The entire probe is suspended by the cable and may be centered in the borehole by nylon “whiskers.” Therefore, source motion is not coupled directly to the borehole walls; rather, the source motion creates a horizontally propagating pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave produces a horizontal displacement of the soil forming the wall of the borehole. This displacement propagates up and down the borehole wall, in turn causing a pressure wave to be generated in the fluid surrounding the geophones as the soil displacement wave passes their location.

Environmental Conditions

The OYO P-S Suspension Logging Method can be used in either cased or uncased boreholes. For best results, the uncased borehole must be between 10 and 20 cm in diameter, or 4 to 8 inches. A cased borehole may be as small as 3 inches, if properly grouted (see below) and the grout annulus does not exceed 1 inch.

Uncased boreholes are preferred because the effects of the casing and grouting are removed. It is recommended that the borehole be drilled using the rotary mud method. This method does little damage to the borehole wall, and the drilling fluid coats and seals the borehole wall reducing fluid loss and wall collapse. The borehole fluid is required for the logging, and must be well circulated prior to logging.

If the borehole must be cased, the casing must be PVC and properly installed and grouted. Any voids in the grout will cause problems with the data. Likewise, large grout bulbs used to fill cavities will also cause problems. The grout must be set before testing. This means the grouting must take place at least 48 hours before testing.

For borehole casing, applicable preparation procedures are presented in ASTM Standard D4428/D4428M-91 Section 4.1 (see ASTM website for copy).

Calibration

Calibration of the digital recorder is required. Calibration is limited to the timing accuracy of the recorder. GEOVision’s Seismograph Calibration Procedure or equivalent should be used. Calibration must be performed on an annual basis.

Measurement Procedure

The entire probe is lowered into the borehole to a specific measurement depth by the winch. A measurement sequence is then initiated by the operator from the instrumentation package control panel. No further operator intervention is then needed to complete the measurement sequence described below.

The system electronics activates the SH-wave source in one direction and records the output of the two horizontally oriented geophone axes which are situated parallel to the axis of motion of the source. The source is then activated in the opposite direction, and the horizontal output signals are again recorded, producing a SH-wave record of polarity opposite to the previous record. The source is finally actuated in the first direction again, and the responses of the vertical geophone axes to the resultant P-wave are recorded during this sampling.

The data from each geophone during each source activation is recorded as a different channel on the recording system. The seismograph has at least six channels (two simultaneous recording channels), each with at least a 12 bit 1024 sample record. Newer seismographs may have longer record lengths. The recorded data is displayed on a CRT or LCD display and possibly on paper tape output as six channels with a common time scale. Data is stored on digital media for further processing. Up to 8 sampling sequences can be stacked (averaged) to improve the signal to noise ratio of the signals.

Review of the data on the display or paper tape allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and stacking number in order to optimize the quality of the data before recording. In the case of the Model 170, printed data is verified by the operator prior to moving the probe. In the case of the Robertson Micrologger2, storage on the hard disk should be verified from time-to-time, certainly before exiting the borehole.

Typical depth spacing for measurements is 1.0 meters, or 3.3 feet. Alternative spacing is 0.5 meter, or 1.6 feet.

Required Field Records

1) Field log for each borehole showing
   a) Borehole identification
   b) Date of test
   c) Tester or data recorder

d) Description of measurement

e) Any deviations from test plan and action taken as a result

f) QA Review

2) Paper output records are no longer required, since the Micrologger2 cannot generate them. However, data must be stored in at least 2 places prior to leaving the site

3) List of record ID numbers (for data on digital media) and corresponding depth

4) Diskettes, CDRom, or USB flash drives with backup copies of data on hard disk, labeled with borehole designation, record ID numbers, date, and tester name.

An example Field Log is attached to this procedure.

Analysis

Following completion of field work, the recorded digital records are processed by computer using the OYO Corporation software program PSLOG and interactively analyzed by an experienced geophysicist to produce plots and tables of P and S_H wave velocity versus depth.

The digital time series records from each depth are transferred to a personal computer for analysis. Figure 2 shows a sample of the data from a single depth. These digital records are analyzed to locate the first minima on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between these arrivals is used to calculate the P-wave velocity for that 1-meter interval. When observable, P-wave arrivals on the horizontal axis records are used to verify the velocities determined from the vertical axis data. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

The digital records are studied to establish the presence of clear SH-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the SH-wave signals from the ‘normal’ and ‘reverse’ source pulses are very nearly inverted images of each other. Digital FFT – IFFT lowpass filtering are used to remove the higher frequency P-wave signal from the SH-wave signal.

The first maxima are picked for the ‘normal’ signals and the first minima are picked for the 'reverse' signals. The absolute arrival time of the ‘normal’ and ‘reverse’ signals may vary by +/- 0.2 milliseconds, due to differences in actuation time of the solenoid source caused by constant mechanical bias in the source or by borehole inclination. This variation does not affect the velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

In Figure 2, the time difference over the 1-meter interval of 1.70 millisecond is equivalent to a SH-wave velocity of 588 m/sec. Whenever possible, time differences are determined from several phase points on the S_H -wave pulse trains to verify the data obtained from the first arrival of the S_H -wave pulse. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

Figure 3 is a sample composite plot of the far normal horizontal geophone records for a range of depths. This plot shows the waveforms at each depth, clearly showing the S-wave arrivals. This display format is used during analysis to observe trends in velocity with changing depth.

Once the proper picks are entered in PSLOG, the picks are transferred to an Excel spreadsheet where Vs and Vp are calculated. The spreadsheet allows output for presentation in charts and tables.

Standard analysis is performed on receiver 1 to receiver 2 data, with separate analysis performed on source to receiver data as a quality assurance procedure.

Registered Geophysicist______________________ Date 9/11/06

QA Review______________________ Date 9/11/06

References:

1. "In Situ P and S Wave Velocity Measurement", Ohya, S. 1986. Proceedings of In-Situ '86, *Use of In-Situ Tests In Geotechnical Engineering*, an ASCE Specialty Conference sponsored by the Geotechnical Engineering Division of ASCE and co-sponsored by the Civil Engineering Dept of Virginia Tech.

2. Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

3. "Standard test Methods for Crosshole Seismic Testing", ASTM Standard D4428/D4428M-91, July 1991, Philadelphia, PA

OYO SUSPENSION P-S VELOCITY LOGGING SETUP

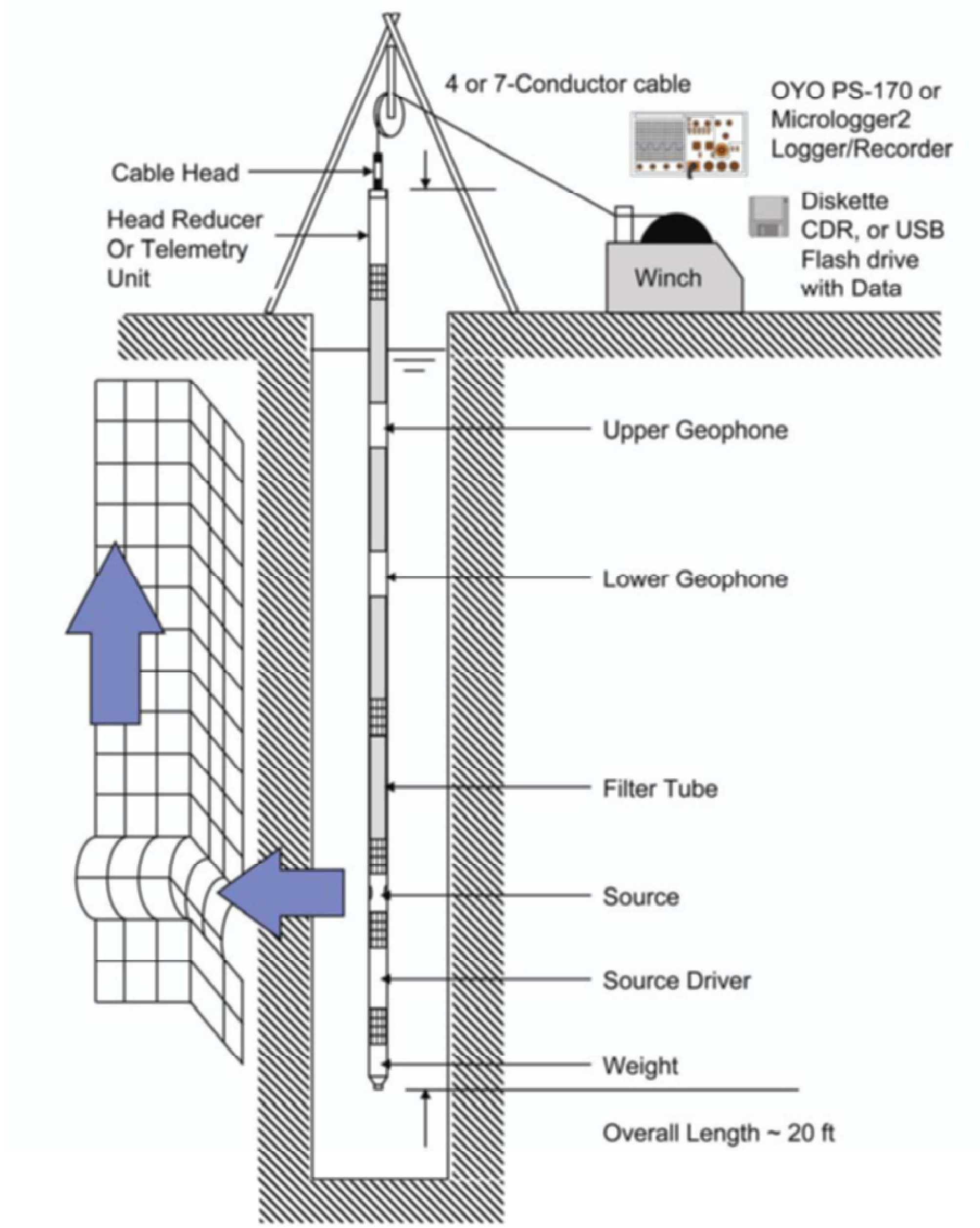


Figure 1. Suspension PS logging method setup

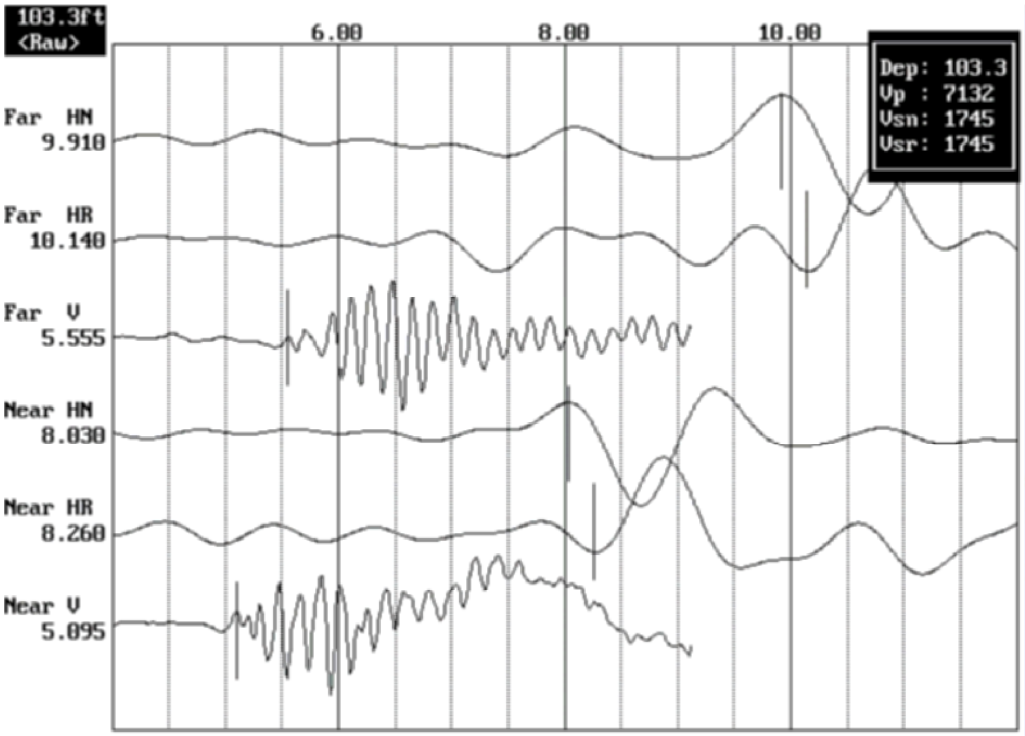


Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner shows the depth in the borehole and the velocities calculated based on the picks.

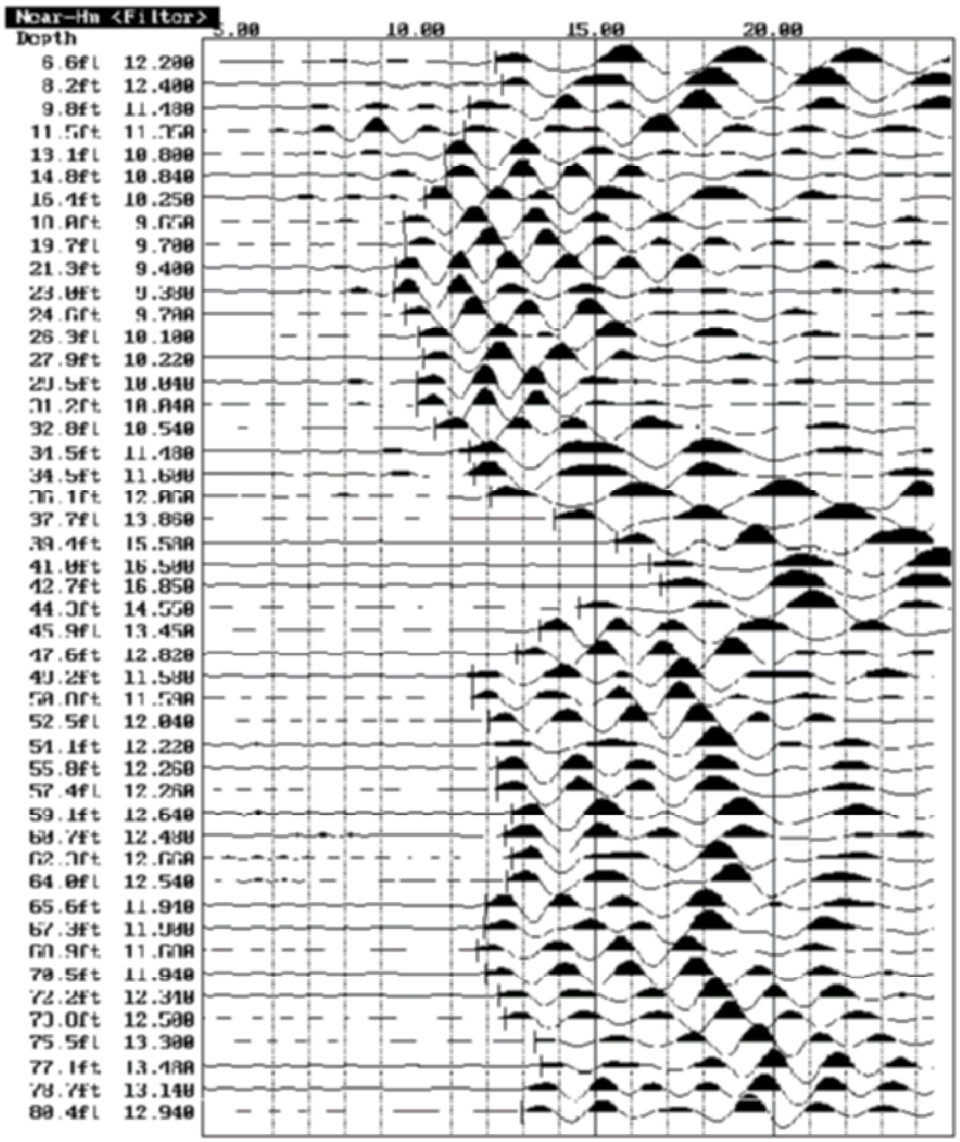


Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole

PROCEDURE FOR USING THE ROBERTSON GEOLOGGING HI-RESOLUTION ACOUSTIC TELEVIEWER (HiRAT)

Reviewed 2/13/06

Background

The acoustic televiewer is a device for producing a qualitative image of the wall of a borehole. Because it uses ultrasound rather than visible light it is able to work in dirty or opaque borehole fluids, although heavy drilling mud will cause excessive dispersion of the acoustic beam. The picture below shows the sonde's lower nylon section, and one of the bowspring attachments which are used to centralize the sonde in the borehole.

Pulses of ultrasound (0.5 - 1.5MHz) are generated by a piezo-electric resonator. The pulses are transmitted through the oil in which the resonator is immersed, through the wall of the acoustic housing, then propagate through the borehole fluid and are reflected from the wall of the borehole. The reflected energy is picked up by the same transducer, from which is recorded both the ***amplitude*** of the returned pulse and the ***travel-time*** which have elapsed. Blanking must be applied to prevent the transducer from registering reflections from the inside surface of the acoustic housing. The material of the housing is chosen so that its acoustic properties are similar to the oil which fills it. The housing is not designed to withstand borehole fluid pressures, but has a piston device to allow equalization between inside and outside pressure.

The ***amplitude*** of the returned pulse is a function of the acoustic reflectivity of the borehole wall. If the beam strikes a hard borehole wall normally to the surface the energy will be returned to the transducer and a strong return will be recorded. If the formation is softer, then less energy will be reflected. Also, if the surface of the borehole is rough, or effectively missing because of the presence of a fracture or other structure, then energy will be dispersed and a poor return will be recorded.

The ***travel-time*** is a simple function of the diameter of the borehole and the velocity of sound in the borehole fluid (typically 1.5Km/sec). An A/D converter monitors the output from the transducer once the blanking period has expired and a comparator is used to detect the peak amplitude during the sampling window.

The coaxially-mounted transducer has a planar radiating surface, but the vibration characteristics are such that the acoustic pulse is emitted as a 'pencil' beam. The emitted beam is deflected by a planar mirror so that it leaves the acoustic housing at right angles to the sonde axis. The mirror is rotated to scan the borehole wall. The ultrasound pulses are synchronized with rotation of the mirror so that up to 360 pulses are emitted in every revolution. Because of the time which must elapse for the two-way transit of the borehole fluid, there is an upper limit upon the number of radial samples that may be acquired from a borehole of a particular radius. In larger boreholes, therefore, it may be necessary to reduce the number of radial samples. The sonde is able to operate at 90, 180 or 360 samples per revolution.

An image of the borehole wall is produced by moving the sonde along the borehole axis while it is scanning radially. By the same logic as shown above, it can be seen that any horizontal point will be imaged by more than one sweep of the acoustic beam so long as the axial movement of the sonde during one complete sweep is no greater than the beam diameter. An upper limit is therefore imposed upon the logging speed which will be a function of the rotational speed of the transducer, the radial sampling interval and borehole diameter.

Objective

The objective of this procedure is to provide a pseudo "core" of the borehole, and map the orientation and angles of cracks and voids in rock boreholes.

Instrumentation

This procedure is written specifically for the Robertson Geologging High-Resolution Acoustic Televiewer (HiRAT). The required equipment includes:

1. The Robertson High-Resolution Acoustic Televiewer (HiRAT) sonde with centralizers
2. A 4-conductor wire-line winch with cable at least 30m (100ft) longer than the depth of the borehole (RG Smart Winch or equivalent. GEOVision has adapted all our 4-conductor winches)
3. A sheave with depth encoder with minimum 500 pulse/revolution
4. A Robertson Geologging Micrologger II
5. A laptop with Winlogger installed and the following minimum system requirements:
    - Windows 98SE or above
    - 64M System memory
    - 800x600x24 SVGA Display with DirectX 8.0
    - 500Mhz CPU
    - USB 2.0 connection
6. Battery power supply with cables

Environmental Conditions

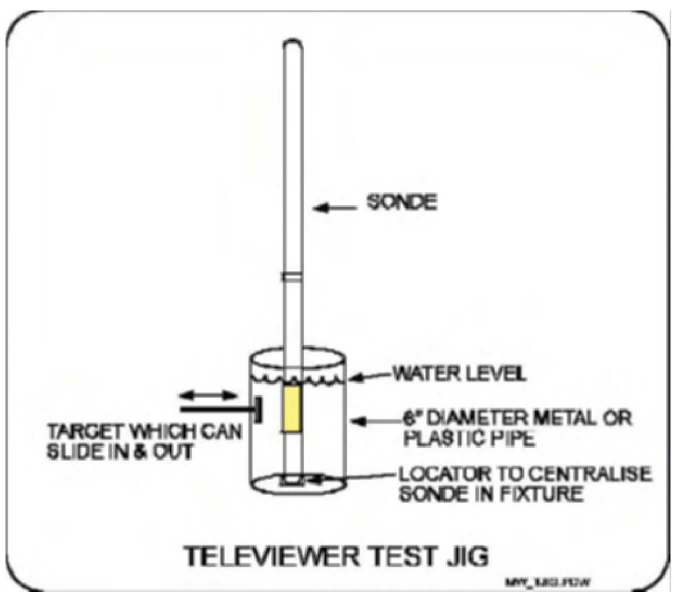
This tool is designed for fluid-filled boreholes between 67 and 150mm (3-6in) in rock. Since fine cracks are usually not visible in the walls of soil borings, the televiewers add very little information from a soil boring than a simple video. Now if the boring has soil AND rock, televiewer visuals in the soil may still be useful.

Calibration

The acoustic televiewer uses the variability in reflectance and the travel time to make an image of the borehole wall, mostly resulting from relative differences of materials and the physical characteristics of the wall. Since these are relative measurements, no field calibration of the sonde is required. However, it is important that the same location in the borehole be checked at the start and finish of the logging to make sure that the response or functionality haven't changed during the measurement.

A test fixture may be used to check function of the acoustic televiewer prior to use. This test fixture should comprise a plastic pipe, with a known internal diameter between 3 and 6 inches. This should be filled with water and the sonde stood upright in the fixture. A target made of metal or metal foil is glued on the inside of the container, or optionally on a seal and shaft so that it can be moved in and out on a line radial to the center-line of the pipe. A representation of this is shown in the figure below.

The purpose of this test fixture is to check the ability of the sonde to differentiate between materials of different acoustic reflectances, and different travel times, and to check the calibration of the caliper function of the sensor using the measured diameter of the pipe. However, if calibrated caliper measurements are required, it is recommended that a mechanical 3-arm caliper tool be used for this purpose because it can be calibrated in the field prior to use. The HiRAT will give very accurate results but this procedure does not cover calibration.

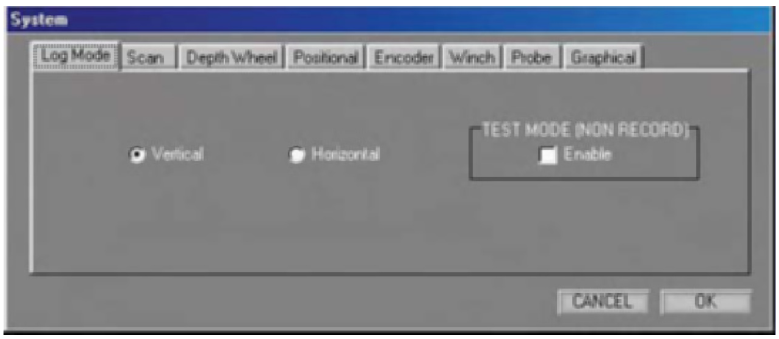


Hi-RAT Field Procedure

Because the logging software is a standalone module, there are a number of settings which must be initialized independently of the WinLogger software. These include the depth measurement subsystem and sonde operating modes. Click on 'System' on the menu bar to show the following dialog boxes:

1.0 Log Mode

The sonde can operate in three distinct modes:



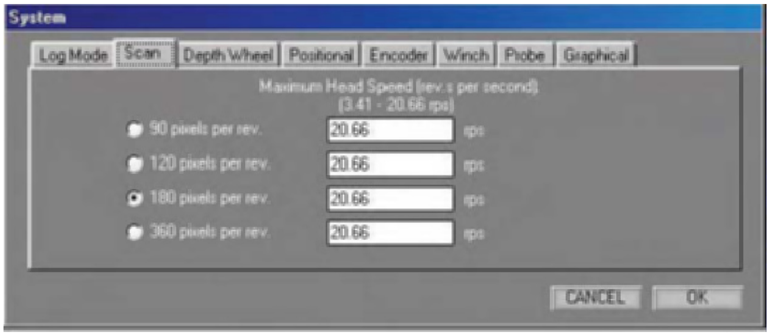
- Vertical mode is used for boreholes which are drilled from the surface and are deviated at less than 70 degrees from the vertical. Most exploration boreholes will fall into this class. In this mode the image is orientated according to compass directions (magnetic co-ordinates).

- Horizontal mode is used for boreholes which are sub-horizontal so their inclination will probably exceed 70 degrees from the vertical. Boreholes in this class would normally be drilled as part of ground investigations for tunneling and mining, drilling ahead of a drive to determine the nature and extent of fracturing. In this mode the image is orientated according to gravitational coordinates (up/down) since there is no unique point of the image circle which can be orientated to North with any precision.

- Test mode is used to exercise all sonde functions without creating a log. The image will scroll on the screen in the normal fashion, and orientation readouts will be refreshed continuously.

2.0 Scan Parameters

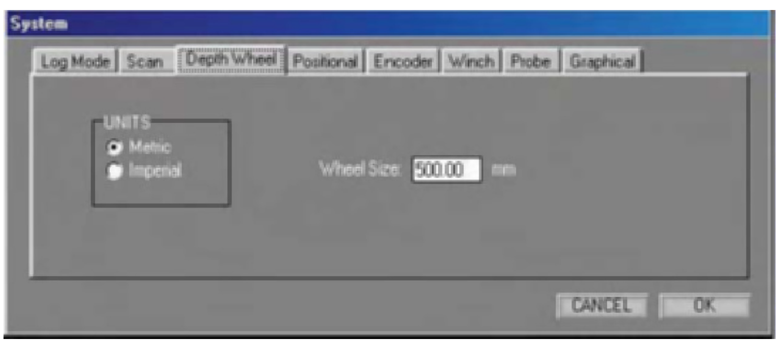
The scan parameters control the radial sampling of the borehole. The values will be retained between logging sessions, so the sonde will be initialized correctly at power-on. There are three parameters in the dialog:



- The radial sampling rate can be set to one of 90, 120, 180, 360 samples per revolution. There is a relationship between the logging speed and the radial sampling rate, since the time taken to send the dataset to the surface depends upon its length. The size of the log file is also determined by the radial sampling rate. The probe will always try to use the maximum head speed entered. If limited by a low Baud rate or a large 'window' setting then the probe will reduce its head speed automatically to compensate - see sonde operation section.

3.0 Depth Wheel Configuration

The depth measurement system is dependent upon the combination of depth measurement wheel with its calibrated groove, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. Two parameters are therefore required: depth wheel circumference and encoder pulse rate. The encoder parameters are covered in a subsequent topic.

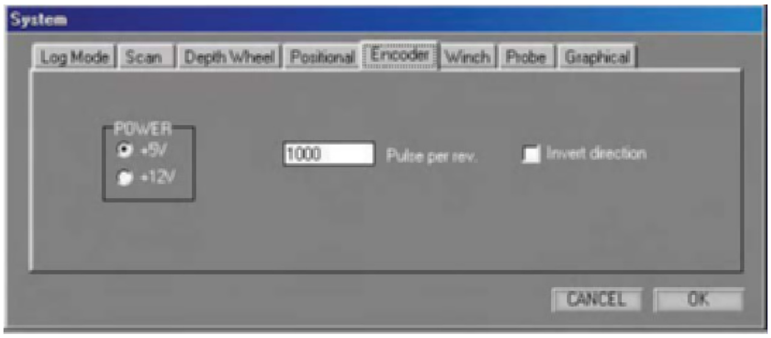


- Select Metric or Imperial depth measurement units from the left-hand pane.

- Type the circumference of the depth measurement wheel into the 'wheel size' box. The standard sizes of GEOVision wheels are 1000mm. If you are measuring in Imperial units (or changing back to metric units), the standard wheel size can be converted automatically by clicking the left mouse button and choosing the appropriate conversion. The size is always specified in units of 1/1000 of the depth unit i.e. millimetres (mm) or millifeet (mft).

4.0 Encoder Configuration

The depth measurement system is dependent upon the combination of depth measurement wheel with its calibrated groove, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. The depth wheel circumference is covered in a previous topic. In order to accommodate a variety of encoders, their operational characteristics can be configured in the software.



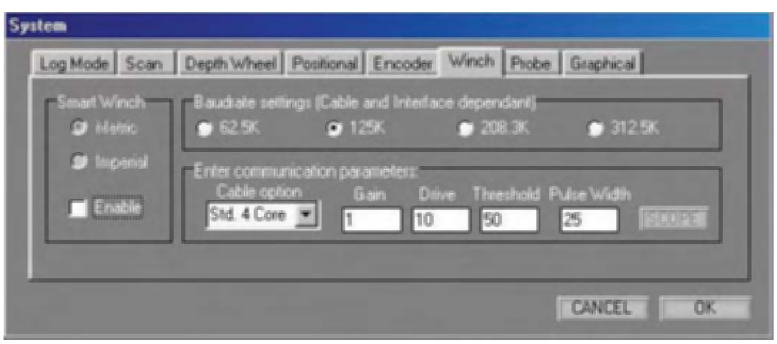
- Select supply voltage from the radio buttons in the left-hand pane. The options are 5 Volt and 12 Volt. GEOVision encoders are always specified for 5 Volt operation.

- Type the number of pulses emitted per revolution into the central box. The standard values for all GEOVision winches are 500 pulses/rev.

- The logical direction of movement can be reversed if required to accommodate the directional characteristics (phase lead or lag) of the different encoder types.

5.0 Winch and Cable Configuration

Support for remote control of the RG Smart Winch is provided, and can be enabled by checking the ***Enable*** control in the left-hand Smart Winch pane. If the Smart Winch control is enabled, it is also necessary to select the measure units in force - select ***Metric*** or ***Imperial*** from the radio buttons on offer.



The Baud settings can be chosen to match the *quality* of the communication channel. The channel will be effected by cable type and length. Typically a Baudrate of 312.5K is used. The remaining controls in the dialog relate to the communications parameters. The operation is entirely compatible with the WinLogger software operation and the values would be expected to be the same as those in force for logging six-channel type sondes with that software. (Certain probe types may be fitted with a digital interface that does not require set-up and in this case the parameter edit boxes will not appear.)

- ***Cable Option*** is used to select the logging cable type which is available on the winch. The options are *Not Connected*, *Std. 4 Core*, *Differential* and *Monocable*. The only cable types used in GEOVision systems is Std. 4 Core. Select the appropriate type from the drop-down menu box. Note this value can only be changed when the probe power is turned off.

- ***Gain*** is related to cable length and uphole signal attenuation. Gain values range from 0-3 and control the amplification applied to the incoming signal. Use the *Scope* dialog to visualize the incoming signals. Gain should be set so that the signal reaches between 70% and 100% of the height of the display, generally obtained with a setting of 0 for GEOVision winches. If the peak height exceeds this level, clipping will result in artifacts which will be detected erroneously. Click *Apply* to set the parameters before proceeding to the *Scope* dialog.

- ***Threshold*** is the level at which the incoming signals are detected. Gain and Threshold are related, and can be visualized using the *Scope* dialog. Set the gain so that the signal reaches between 70% and 100% of the height of the display. Then adjust the threshold so that it is between 50% and 70% of the height of the pulses displayed and clear of any region of 'overshoot' of the positive and negative pulses. This will ensure that peaks are detected and noise is ignored. Generally a setting of 25 is used for GEOVision winches. When the scope dialog is displayed, the position of the mouse is reported as a threshold value to make it simpler to infer the correct setting. The scope option is greyed out when the probe power is turned off.

- ***Drive*** sets the strength of the downhole signal. It is not possible to visualize the downhole signal, but the effect of insufficient drive is to disable downhole communication, which will result in the commands being ignored by the sonde. Values range from 0 -127, and for GEOVision winches will be around 10. Increase the drive for longer cables.

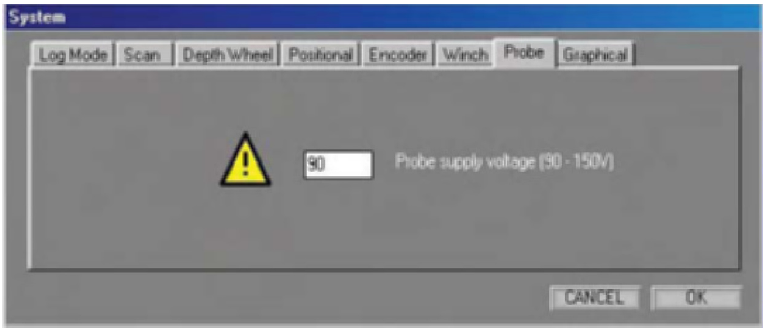
- ***Pulse Width*** This is the width of the transmitted communication pulses in 100nS steps. The default is 25 equivalent to 2.5uS. The range is from 8 to 64. The pulse width can be reduced to prevent signal overshoot on short cables. The default value is used in most cases. Note any changes only come into effect during a log. (Note setting too large a pulse width when using the highest Baud rates will automatically be prevented within the probe and the pulse width reduced.)

IMPORTANT Please note the effects of changing 'Baud' will not appear until the first new log is made. The setting for 'threshold' may be effected by an increase in the 'Baud' rate please recheck 'threshold' if 'Baud' is altered using the 'Scope' function after making a short test log.

The parameters which are entered will be applied automatically if you close the dialog with ***OK***. The above parameters once set correctly will be remembered by the system and should never need to be altered.

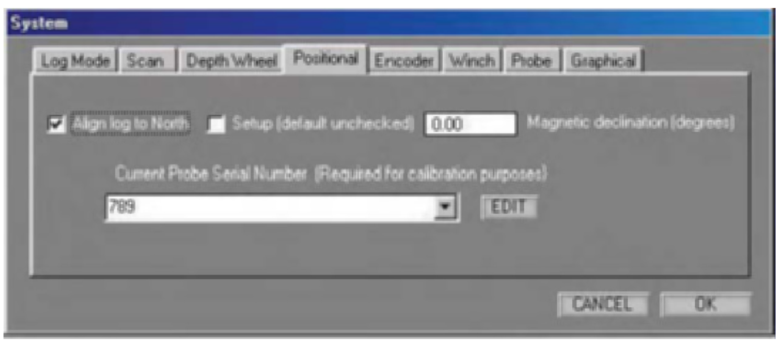
6.0 Probe Configuration

The probe is normally energized at 90 Volts from the surface. However, it may be necessary to compensate for voltage drop on longer cables due to the higher power draw of this sonde. The voltage at the surface may be increased in order to deliver 90 Volts at the sonde. Simply type the value into the text box provided. The voltage should be set at 90V for all GEOVision winches. Values outside the indicated range will be rejected.



7.0 Positional Configuration

The probe includes a 3-axis orientation package, and is capable of producing a borehole image aligned to geographic North. This is achieved by determining and applying two image rotation parameters:



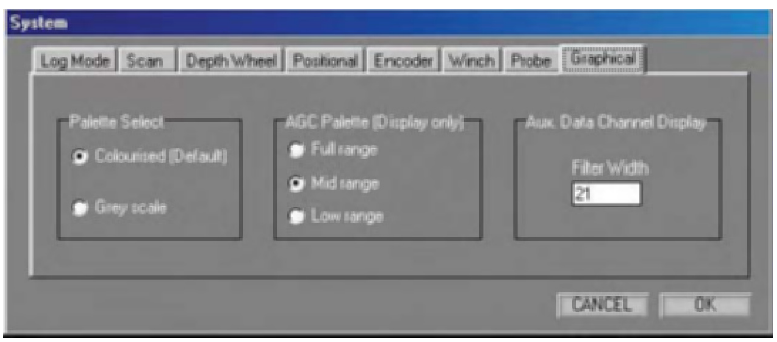
- ***Magnetic Declination*** is used to correct for the difference between Magnetic North and True North. The value varies from place to place, so the local value must be inserted here if you wish to perform this correction during data collection. This correction may also be made during processing. If the value is zero, the log will be referred to Magnetic North.
- ***Align to North*** is a check-box used to select image rotation to start at Magnetic North. If in addition a value is set for Magnetic Declination (see above) the image will be rotated to start at True North. If the box is not checked, the image will not be oriented to geographic co-ordinates, but will use the local co-ordinate frame of the sonde (X, Y, Z axis of the orientation module). This mode may be used to inspect the inside of magnetic casing, where an orientated image would be subjected to random effects caused by the metalwork.
- Set-up mode is selected by checking the ***Setup*** box, and is used to determine the required image rotation offset to correct for the angle between the axis of the orientation package and the index mark of the rotating transducer section. In set-up mode the normal sonde azimuth display is modified, and will instead show the 'relative bearing' which is measured between the high side of the borehole and the orientation sensor index. Check ***Setup***, then OK to close the dialog. The icon adjacent to the sonde azimuth readout at the top of the screen is modified with the legend CAL when the system is in set-up mode. The sonde must now be placed in a stand or jig so that it

is inclined at about 20 degrees to the vertical, and adjacent to a target fixed to the jig so that it is directly above the transducer in the vertical plane. Lower the sonde with its attachment into a large bucket of water so that the transducer and target are fully immersed. Start the radial amplitude display, when it will be possible to see the strong signal returning from the target. Rotate the sonde so that the image of the target moves to the top of the display. When the two are coincident, the 'relative bearing' reads out the image rotation offset. This value is fixed for the sonde unless it is disassembled and rebuilt, at which point the procedure MUST be repeated. Please see the additional topic on the Radial Amplitude Display for further details.

- The ***Serial Number*** list box is used to select the sonde which is in use. When the appropriate sonde is selected, the image rotation offset determined by the above procedure is selected. To edit the image offset click the '***Edit***' and enter the new offset. Several serial numbers and associated offsets can be stored and selected as required.

8.0 Graphical

The palette can be changed between a colored and grey scale setting. The changes affect the log screen palette display and are also applied when replaying a log. Selecting Full range in the 'AGC Palette' will cause the software to spread the palette over the full 16bit signal. 'Mid range' will spread the palette over the first quarter of the 16bit range and 'Low range' will spread the palette over the first eighth of the 16 bit range. In most cases the 'Low range' selection is used. Note these settings do not affect the stored log data in any way. The 'Filter Width' is applied to the Natural Gamma trace data and is a simply running average filter. The range of the filter width is from 1 to 50 (x 10 millidepth units ie. mm or mft).



9.0 Sonde Operation

When the operations specified above have been reviewed and the correct settings have been selected, the system is ready for use. The main screen area is divided into 3 horizontal elements. At the top is the depth and orientation readout, together with the scale headings for the scrolling display of unwrapped borehole image.

On the left side of the depth track is the travel time display, with text boxes for sonde inclination, azimuth and head temperature.

On the right side is the display of amplitude and indication of current operating mode. Located in the center above the depth track are the text boxes for depth and cable speed (computed at the surface). The ranges for the 'Natural Gamma' channel overlay (optional) are shown above the Amplitude.

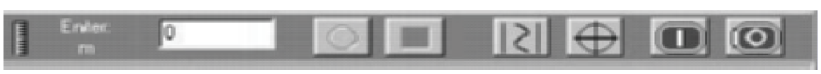
The central area is utilized for the scrolling display of unwrapped borehole data. The display is orientated with the left edge corresponding to North point of the aligned image data (if orientation is selected) according to the outputs of the sonde's orientation package.

The lower area has controls for the winch (applicable to RG Smart Winch only), depth initialization and sonde control.

The winch control area is only displayed when RG SmartWinch operation is enabled - see section 5 - and has four controls. Set Target Speed by typing the required speed into the window and pressing Enter.

Cable movement is initiated by clicking on either the UP or DOWN arrow control.

Cable movement is halted by clicking on the square STOP control.



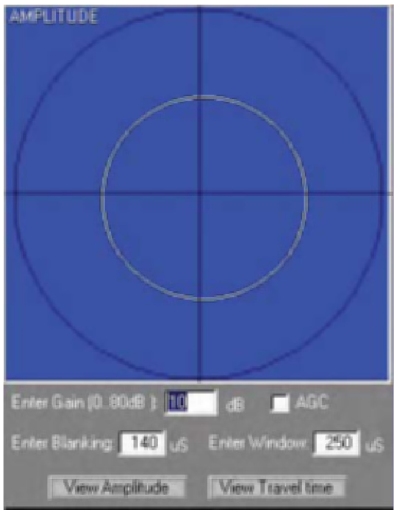
Depth is initialized by typing the required value into the entry box and pressing Enter. The entry box is not available at times when the system is in logging mode and the depth should not be changed by user entry.

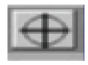
Sonde power is applied by clicking on the green-colored 1 button. Power is turned off by clicking on the red-colored 0 button. There is no indicator for the state of the power supply on the desktop, so the external indicators should be observed for this purpose.

To make a log ensure that the Test Mode is disabled - see section 1, Log Mode setting. Click File|New Log and select a filename. Old logs may be overwritten if necessary -TAKE CARE. The header editor will be started automatically. A previous set of header data may be loaded by clicking LOAD and choosing a template.

To start logging, click on the red Record (circle) control. The log data will start to scroll down the screen after a brief pause for synchronization. The messages "DSP2: Detecting data stream" and "Updating probe settings" will be observed at the bottom of the screen during this process. Note that the screen scrolling direction is not affected by the actual direction of movement of the sonde. To cease logging, click on the black STOP control (square). The data should be immediately backed up to a USB drive, CD, or other data storage prior to beginning another log.

If the data display from a probe which is properly connected appears to occupy only half of the track area, with the remainder filled with random colors such as green which are not part of the regular palette, then it is most likely that the downhole data communication is not functioning properly. This symptom is due to the fact that the probe settings cannot be communicated properly, and it is operating in its default power-up mode. If this is the case, the Drive setting of the System|Winch dialog should be increased or decreased accordingly. See section 5 for full details.



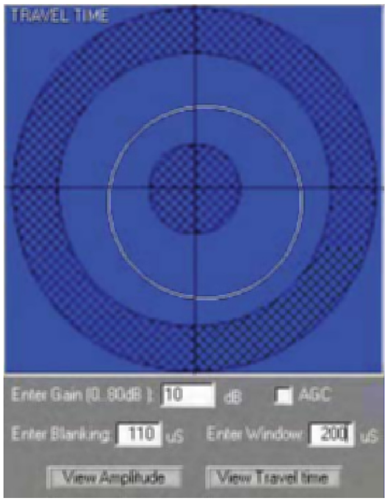

To adjust the sonde gain it is necessary to use the Radial Amplitude plot, which is enabled by clicking on the circle with cross-hairs symbol. When the dialog is active a new window will open on top of the unwrapped data display. In this display, the data is presented as a 'polar' plot. Press the 'View Amplitude' button to display the amplitude plot. This plot shows amplitude increasing towards the outside of the circle and the compass direction following the sweep of the transducer. The line indicating the data is drawn in the regular palette, so that high amplitudes are drawn in white and low amplitudes in black/brown. The picture here shows the image of the inside of a cylinder.

If the data is concentrated in a small circle at the center, the gain is too low and should be increased. If the data is obviously clipped at the outside of the circle, then the gain should be reduced. Type the new gain value into the entry box and press Enter. The ideal would be to set a gain value which allows the peak values to be displayed without clipping, with the majority of the data around the half-way level. It may also be necessary to adjust the blanking to ensure that internal reflections from the acoustic housing are not detected at the new gain value. This will be apparent in the unwrapped data display as pronounced patterning unrelated to the true target. The AGC option causes the probe to set gain automatically thus preventing signal saturation in most cases. (The gain is varied in 6dB steps

Blanking Period and window length can be set independently. Blanking is set to avoid reflections from the housing of the acoustic transducer or random reflections from a rugose borehole, and window length is set to accommodate the range of borehole radius that might be expected. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. The default value for the blanking period is 145 microseconds, which is the minimum required for the two-way transit from the transceiver to the outer surface of the acoustic housing. It is not advisable to reduce this value beyond the default setting, although it may be increased for larger boreholes at the rate of 1.5mm of one-way travel per microsecond.

Window Length (sample time) defines the period during which the arrival gate remains open to detect the returned acoustic pulse. The acoustic pulse will travel in water at a speed of approximately 1.5mm per microsecond. The default window length is 150 microseconds, which is equivalent to 225 mm of (two-way) travel in the borehole fluid, or approximately 110mm of borehole diameter. If this is added to the default blanking period, which is equivalent to the outside diameter of the acoustic housing, it can be seen that the default set-up will be correct for boreholes up to 150mm. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. Choose your window setting to best match the borehole diameter.

Pressing the 'View Travel time' button changes the display to that shown below:



The unhatched ring between the two cross hatched zones represents the sample window. The width of this ring will vary with window length value. The profile of a cylinder is represented here appearing as a circle in the sample window.

Pressing this button displays the following dialog box:

This box allows you to enable the Natural Gamma option by checking the 'Enable Overlay' check box. The Overlay appears as a trace upon the Amplitude plot. The trace range and color can also be set by this dialog. The level of filtering can also be altered (see section 8) (note that any displayed trace data is automatically aligned with the acoustic scan data but only when logging up. The Natural Gamma sensor occupies a higher position in the probe so sufficient data has to be prebuffered so that the acoustic data can depth aligned with gamma. The prebuffering results in a delay at the start of a log before correct gamma data appears this is normal.)

Data Analysis and Interpretation

RG-DIP, the manufacturer's image interpretation package, offers manual and automatic feature recognition options. Feature orientations (dip/strike and azimuth) are automatically calculated. Display options include stereographic projections of zone axes, orientation frequency plots and 'synthetic cores' for comparison with real core data. The last option is invaluable for orientating core samples, particularly in the case of incomplete recovery.

Reporting

The final report will include the objective and scope of the survey, location of the boreholes, discussion of instrumentation and procedures in the field and lab. For each borehole there will be a plot showing the dip/strike and azimuth of features. The next page shows an example.

Assumptions and limitations of the results will be discussed. Supporting references will be listed as necessary

Required Field Records

Field log for each borehole showing

a) Location and description of the borehole

b) Date of test

c) Field personnel

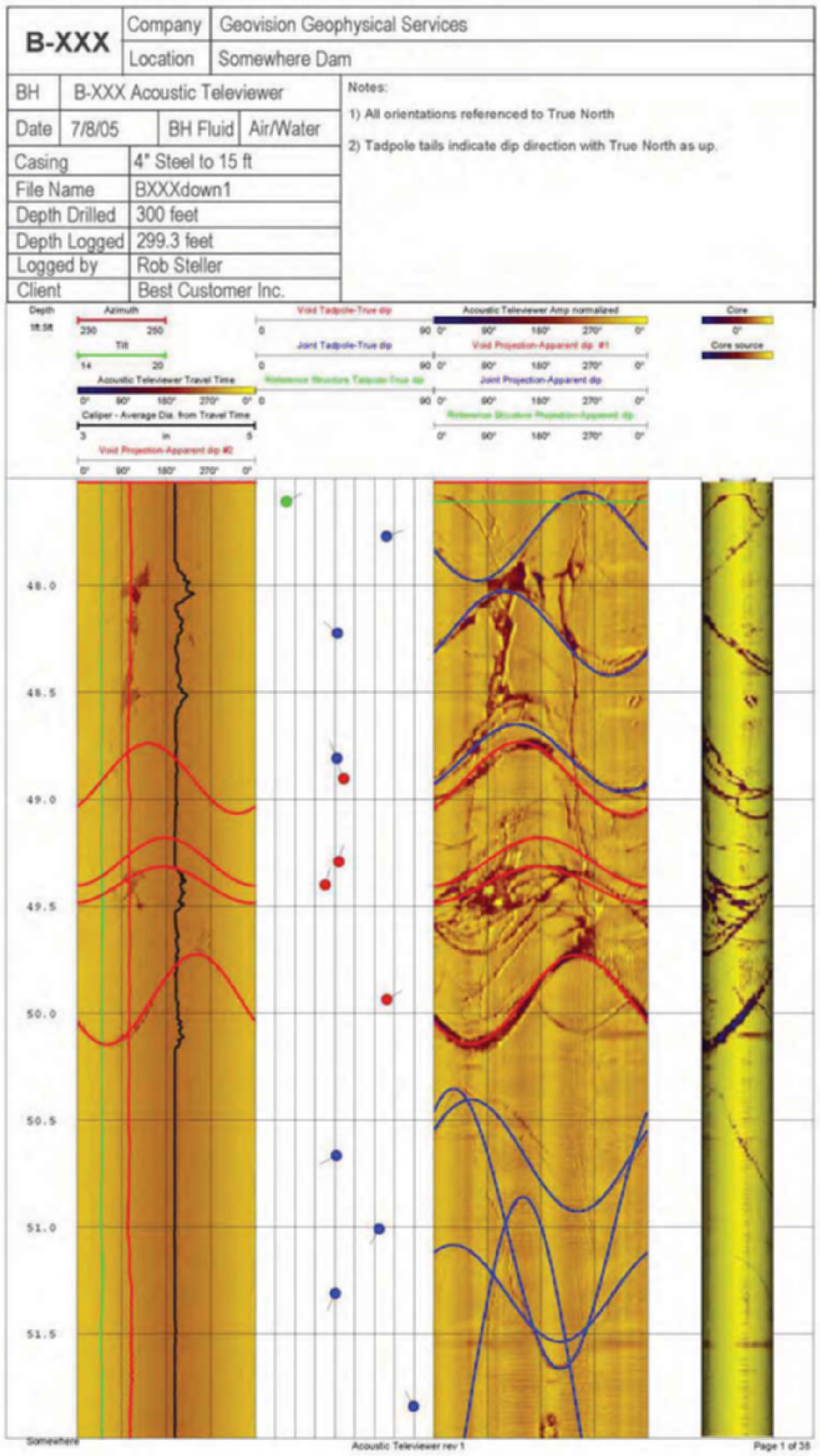
d) Instrumentation

e) Any deviations from test plan and action taken as a result

This procedure has been reviewed and approved by the undersigned:

Professional Geophysicist______________________________Date___Feb 13. 2006___

QA Review ______________________________Date____Feb 13. 2006_


B-XXX
Company
Geovision Geophysical Services
Location
Somewhere Dam
BH
B-XXX Acoustic Televiewer
Date
7/8/05
BH Fluid
Air/Water
Casing
4" Steel to 15 ft
File Name
BXXXdown1
Depth Drilled
300 feet
Depth Logged
299.3 feet
Logged by
Rob Steller
Client
Best Customer Inc.
Notes:
1) All orientations referenced to True North
2) Tadpole tails indicate dip direction with True North as up.
48.0
48.5
49.0
49.5
50.0
50.5
51.0
51.5
Acoustic Televiewer rev 1
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