GEOVision
geophysical services

B-2305 CALIPER FIELD LOG

SITE: EXELON VICTORIA COUNTY COL DATE: 11/18/07
CLIENT: MACTEC JOB: 7501
AUTHOR: ~~C. CARTER~~ R. STELLER 11/18/07 PAGE 1 OF 2

CONTACT: STEVE CRISENZO _OFFICE_ PHONE: 361-972-0198
CELL PHONE: 919-949-1707
CONTACT: ALLAN SHAW _CELL_ PHONE: 301-704-2684
_____ PHONE: _____
CONTACT: _____ _____ PHONE: _____
_____ PHONE: _____
CONTACT: _____ _____ PHONE: _____
_____ PHONE: _____
DRILLER: _____ _____ PHONE: _____
COMPANY: _____ _____ PHONE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: B-2305 LOCATION: _____

COUNTY: VICTORIA RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASED ✓
DIAMETERS AND DEPTH RANGES: 5" 0 TO 305' ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 305
CONDUCTOR CASING?: YES ____ DEPTH TO BOTTOM OF CASING _____; NO ✓
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ≈ 45'
BOREHOLE FLUID: WATER ____; FRESH WATER MUD ✓; SALT WATER MUD ____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: ≈ 1½ HR

LOGGING CREW: ~~C. CARTER~~ R. STELLER 11/18/07
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: VICTORIA, TX DEPARTURE TIME: 09:30
ARRIVED ON SITE: 10:00
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 18:05 LOGGING COMPLETED: 18:52

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

SITE: EXELON VICTORIA COUNTY COL B-2305 DATE: 11/18/07
CLIENT: MACTEC JOB: 7501
AUTHOR: ~~G. CARTER~~ R. STELLER 11/18/07 PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER_____ OYO_____ RG ✓ OTHER_____
MICROLOGGER 5310_____ 5772 ✓ OTHER_____
CALIPER PROBE 5368 ✓ OTHER_____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX
MINUS CASING STICK-UP	1.71
DEPTH REF. OFFSET AT START	5.12'
DEPTH REF. OFFSET AT END	5.10
AFTER SURVEY DEPTH ERROR	-0.02' LESS THAN 0.4%? YES

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2305CALTEST01	0	18:05	0	18:07
B2305 CALLP01	230.0'	18:19	5.1	18:42
B2305 CALTEST02	0	18:50	0	18:52

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.507 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B2305CALTEST01	2.02	3.94	8.04	4.54
AS MEAS.	B2305CALTEST02	2.01	3.91	8.01	4.54
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

GEOVision
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B-2306 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE:_EXELON-VICTORIA_____ DATE:_11/16/07_____
CLIENT:_MACTEC_____ JOB:_7501_____
AUTHOR:_C. CARTER_____ PAGE 1 OF 1

CONTACT:_STEVE CRISENZO_____ PHONE:_361-972-0198_

BOREHOLE CONSTRUCTION: CASED____ UNCASED_X_
DIAMETERS AND DEPTH RANGES: _5"_____ 0 TO _360 ft_____; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_310 ft_____
CONDUCTOR CASING?: YES_X_ DEPTH TO BOTTOM OF CASING_2'_____; NO____
DEPTH TO BEDROCK:_N/A_____
BOREHOLE FLUID: WATER_____; FRESH WATER MUD_X_____; SALT WATER MUD _____;

LOGGING CREW:_C. Carter_____

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES cc 11/16/07
ELOG	B2306ELOG TEST01		11/16/07	4:39 - 5:07pm 4:18 - 4:19pm
ELOG	B2306 ELOGUP01	308.9 - 39.85 ft	"	4:39 - 5:07pm
P-S velocity	B2306USPDOWN01	2.1m - 90.5m	"	5:20 - 6:45pm
Caliper	B2306caltest01		"	7:20 - 7:21
Caliper	B2306calUP01	306.25 - 5.75 ft	"	7:40 - 8:11pm
Caliper	B2306caltest02		"	8:16 - 8:17pm
Deviation	B2306DUUP01	307.1 - 3.47 ft	11/16/07	8:38 - 8:52pm

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B-2306 ELOG FIELD LOG

SITE: EXELON VICTORIA DATE: 11/16/07
CLIENT: MACTEC JOB: 7501
AUTHOR: C. CARTER PAGE 1 OF 2

CONTACT: STEVE CRISENZO _OFFICE PHONE: 361-972-0198
_CELL PHONE: 919-949-1707
CONTACT: _OFFICE PHONE:
_____ PHONE:
CONTACT: _____ PHONE:
_____ PHONE:
CONTACT: _____ PHONE:
_____ PHONE:
DRILLER: _____ PHONE:
COMPANY: _____ PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-2306 LOCATION: Perimeter

COUNTY: VICTORIA RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 310 ft ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 310 ft
CONDUCTOR CASING?: YES ___ DEPTH TO BOTTOM OF CASING _____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ϕ TIME SINCE LAST CIRCULATION: 3:45pm

LOGGING CREW: C. CARTER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: Victoria, TX DEPARTURE TIME: 2:30pm
ARRIVED ON SITE: 3:00pm
STANDBY TIME: _____ CAUSE: _____
LOGGING STARTED: 4:39pm LOGGING COMPLETED: 5:07pm

SITE:_EXELON VICTORIA B-2306 DATE: 11/16/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER X OYO_____ RG_____ OTHER_____
MICROLOGGER 5310 X 5772___ OTHER_____
ELOG PROBE 5490 X OTHER_____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	32.8	
MINUS CASING STICK-UP	1.25'	
DEPTH REF. OFFSET AT START	39.75	
DEPTH REF. OFFSET AT END	39.85	
AFTER SURVEY DEPTH ERROR	0.10	LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2306 ELOG TEST01		4:18 pm		4:19 pm
B2306 ELOG UP01	308.9 ft	4:39 pm	39.85 ft	5:07 pm

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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P-S SUSPENSION VELOCITY FIELD LOG

SITE:_EXELON VICTORIA_B2306_____ DATE:_11/16/07_____
CLIENT:_MACTEC_____ JOB:_7501_____
AUTHOR:_C. CARTER_____ PAGE 1 OF _7_

CONTACT:_STEVE CRISENZO_____ _OFFICE_ PHONE:_361-972-0198_____
_CELL___ PHONE:_919-949-1707_____
CONTACT:_____ _OFFICE_ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
DRILLER:_____ _____ PHONE:_____
COMPANY:_____ _____ PHONE:_____

DIRECTIONS TO SITE:_____

GENERAL SITE CONDITIONS/LOCATION:_____

EA#:_____
BOREHOLE DESIGNATION:_B-2306_____ LOCATION:_Perimeter_____
COUNTY:_VICTORIA_ RANGE:_____ TOWNSHIP:_____ SECTION:_____
BOREHOLE CONSTRUCTION: CASED_____ UNCASED_X_____
DIAMETERS AND DEPTH RANGES: _5"_____ 0 TO _310 ft_____ ;_____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_310 ft_____
CONDUCTOR CASING?: YES_X_ DEPTH TO BOTTOM OF CASING_2'_____; NO___
DEPTH TO BEDROCK:_NA_____ DEPTH TO WATER TABLE:_NA_____
BOREHOLE FLUID: WATER_____; FRESH WATER MUD_X_____; SALT WATER MUD _____;
OTHER:_____
DEPTH TO BOREHOLE FLUID:_0_____ TIME SINCE LAST CIRCULATION:_3:45pm_____

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SITE:_EXELON VICTORIA_B-2306 DATE:_11/16/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 7

LOGGING CREW:_C. CARTER
VEHICLE(S) USED AND MILEAGE: _RENTAL
MOBILIZED FROM:_Victoria, TX DEPARTURE TIME:_2:30pm
ARRIVED ON SITE:_3pm
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_5:20 LOGGING COMPLETED:_6:45pm
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_____ LOGGING COMPLETED:_____
DEMOBILIZED TO:_____ ARRIVAL TIME:_____
ADDITIONAL DEMOB TIME:_____ REASON:_____

BATTERIES CHANGED BEFORE LOGGING: YES_X_; NO____; 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 ☐		

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

COMMENTS: Top of casing = 0.38m 2.48 - .38 = 2.1m = RP
2.10m @ 7:08pm

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: EXELON VICTORIA B2306 DATE: 11/16/07

CLIENT: MACTEC JOB: 7501

AUTHOR: C. CARTER PAGE 3 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56	001		5:20 pm
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE:_EXELON VICTORIA_B2306 DATE:_11/16/07

CLIENT:_MACTEC_ JOB:_7501_

AUTHOR:_C. CARTER_ PAGE_4_OF_7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE:_EXELON VICTORIA_B-2306 DATE:_11/16/07

CLIENT:__MACTEC_____ JOB:_7501_____

AUTHOR:_C. CARTER_____ PAGE_5_OF_7_____

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE:_EXELON VICTORIA_B-2306 DATE:_11/16/07

CLIENT:_MACTEC JOB:_7501

AUTHOR:_C. CARTER PAGE_6 OF_7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		
75.5	247.70	148		
76.0	249.34	149		
76.5	250.98	150		
77.0	252.62	151		
77.5	254.27	152		
78.0	255.91	153		
78.5	257.55	154		
79.0	259.19	155		
79.5	260.83	156		
80.0	262.47	157		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: EXELON VICTORIA B-2306 DATE: 4/16/07

CLIENT: MACTEC JOB: 7501

AUTHOR: C. CARTER PAGE 7 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
80.5	264.11	158		
81.0	265.75	159		
81.5	267.39	160		
82.0	269.03	161		
82.5	270.67	162		
83.0	272.31	163		
83.5	273.95	164		
84.0	275.59	165		
84.5	277.23	166		
85.0	278.87	167		
85.5	280.51	168		
86.0	282.15	169		
86.5	283.79	170		
87.0	285.43	171		
87.5	287.07	172		
88.0	288.71	173		
88.5	290.35	174		
89.0	291.99	175		
89.5	293.64	176		
90.0	295.28	177		
90.5	296.92	178		6:45pm
91.0	298.56			
91.5	300.20			
92.0	301.84			
92.5	303.48			
93.0	305.12			
93.5	306.76			
94.0	308.40			
94.5	310.04			
95.0	311.68			
95.5	313.32			
96.0	314.96			
96.5	316.60			
97.0	318.24			
97.5	319.88			
98.0	321.52			
98.5	323.16			
99.0	324.80			
99.5	326.44			
100.0	328.08			

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B-2306 CALIPER FIELD LOG

SITE:_EXELON VICTORIA COUNTY COL_____ DATE:_11/16/07
CLIENT:_MACTEC_____ JOB:_7501_____
AUTHOR:_C. CARTER_____ PAGE 1 OF 2

CONTACT:_STEVE CRISENZO_____ _OFFICE__ PHONE:_361-972-0198_____
_CELL____ PHONE:_919-949-1707_____
CONTACT:ALLAN SHAW_____ _CELL____ PHONE:__301-704-2684_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
DRILLER:_____ _____ PHONE:_____
COMPANY:_____ _____ PHONE:_____

GENERAL SITE CONDITIONS/LOCATION:_____

BOREHOLE DESIGNATION:_B-2306_____LOCATION:_Perimeter_____

COUNTY:_VICTORIA__RANGE:_____TOWNSHIP:_____SECTION:_____
BOREHOLE CONSTRUCTION: CASED_____ UNCASED_X___
DIAMETERS AND DEPTH RANGES: _5"___ 0 TO _310 ft___; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_310 ft_____
CONDUCTOR CASING?: YES_X__ DEPTH TO BOTTOM OF CASING_2'___; NO____
DEPTH TO BEDROCK:_NA_____ DEPTH TO WATER TABLE:_NA_____
BOREHOLE FLUID: WATER_____; FRESH WATER MUD_X___; SALT WATER MUD _____;
OTHER:_____
DEPTH TO BOREHOLE FLUID:_0_____ TIME SINCE LAST CIRCULATION:_3:45pm_

LOGGING CREW:_C. CARTER_____
VEHICLE(S) USED AND MILEAGE: _RENTAL_____
MOBILIZED FROM:_VICTORIA, TX_____ DEPARTURE TIME:_2:30pm_____
ARRIVED ON SITE:_3:00pm_____
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_7:40pm_____ LOGGING COMPLETED:_8:11pm_____

SITE:_EXELON VICTORIA COUNTY COL B2306 DATE: 11/16/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER X OYO_____ RG_____ OTHER_____
MICROLOGGER 5310 X 5772___ OTHER_____
CALIPER PROBE 5368 X OTHER_____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	1.25	
DEPTH REF. OFFSET AT START	5.57	
DEPTH REF. OFFSET AT END	5.65	
AFTER SURVEY DEPTH ERROR	.08	LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2306cal test 01		7:20 pm		7:21 pm
B2306calstup01	306.25'	7:40 pm	5.75'	8:11 pm
B2306cal test02		8:16 pm		8:17 pm

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.500 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B2306 cal test01	2.629	3.993	8.050	4.561
AS MEAS.	B2306cal test02	1.949	3.948	8.036	4.536
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

cc 11/16/07

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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B-2306 DEVIATION FIELD LOG

SITE: EXELON VICTORIA COUNTY COL DATE: 11/16/07
CLIENT: MACTEC JOB: 7501
AUTHOR: C. CARTER PAGE 1 OF 2

CONTACT: STEVE CRISENZO _OFFICE__ PHONE: 361-972-0198
_CELL____ PHONE: 919-949-1707
CONTACT: _____ _OFFICE__ PHONE: _____
_____ PHONE: _____
CONTACT: _____ _____ PHONE: _____
_____ PHONE: _____
CONTACT: _____ _____ PHONE: _____
_____ PHONE: _____
DRILLER: _____ _____ PHONE: _____
COMPANY: _____ _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: B-2306 LOCATION: Perimeter

COUNTY: VICTORIA RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 310 ft ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 310 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 2' ; NO____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: ~20 ft TIME SINCE LAST CIRCULATION: 3:45pm

GEOVision
geophysical services

SITE:_EXELON VICTORIA COUNTY COL B-2306 DATE: 11/16/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 2

LOGGING CREW:_C. CARTER
VEHICLE(S) USED AND MILEAGE: _RENTAL
MOBILIZED FROM: Victoria, Tx DEPARTURE TIME: 2:30pm
ARRIVED ON SITE: 3pm
STANDBY TIME: CAUSE:
LOGGING STARTED: 8:38pm LOGGING COMPLETED: 8:52

WINCH: COMPROBE___ SILVER X OYO___ RG___ OTHER___
MICROLOGGER 5310 X 5772___ OTHER___
TELEVIEWER 5174 X OTHER___

1 PROBE TILT TEST 8.5 BRUNTON TILT 8.6
2 PROBE TILT TEST 14.8 BRUNTON TILT 15
3 PROBE TILT TEST 10.3 BRUNTON TILT 11 After log
1 PROBE AZIMUTH TEST 234.3 BRUNTON AZIMUTH 230
2 PROBE AZIMUTH TEST 144.1 BRUNTON AZIMUTH 145
3 PROBE AZIMUTH TEST 29.7 BRUNTON AZIMUTH 31 After log

PROBE OFFSET	1.44M(4.72FT)	
MINUS CASING STICK-UP	1.25'	
DEPTH REF. OFFSET AT START	3.47	
DEPTH REF. OFFSET AT END	3.47	
AFTER SURVEY DEPTH ERROR	0	LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2306AUUP01	307.1'	8:38 pm	3.47	8:52 pm

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

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B-2307 BORING GEOPHYSICS FIELD LOG SUMMARY

SITE:_EXELON-VICTORIA_____ DATE:_11/18/07_____
CLIENT:_MACTEC_____ JOB:_7501_____
AUTHOR:_C. CARTER_____ PAGE 1 OF 1

CONTACT:_STEVE CRISENZO_____ PHONE:_361-972-0198_

BOREHOLE CONSTRUCTION: CASED____ UNCASED_X_
DIAMETERS AND DEPTH RANGES: _5"_____ 0 TO _310 ft_____; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_310 ft_____
CONDUCTOR CASING?: YES_X_ DEPTH TO BOTTOM OF CASING_2'_____; NO____
DEPTH TO BEDROCK:_N/A_____
BOREHOLE FLUID: WATER____; FRESH WATER MUD_X_; SALT WATER MUD ____;

LOGGING CREW:_C. Carter_____

LOG TYPE	FILE NAME	DEPTH RANGE	DATE	TIMES
ELOG	B2307ELOGTEST01		11/18/07	11:59 - 12:01 pm
ELOG	B2307ELOGUP01	309.35 - 39.5 ft	11/18/07	12:50 - 1:18 pm
CALIPER	B2307CALTEST01			1:26 - 1:28 pm
CALIPER	B2307CALUP01	304.2 - 5.6 ft	11/18/07	1:44 - 2:13 pm
CALIPER	B2307CALTEST02			2:18 - 2:19 pm
~~Bad~~ P-Svelocity	001.org - 178.org	2.0 - 90.5 m	11/18/07	2:49 - 4:31 pm
Deviation	B2307DUUP01	303.2 - 3.5 ft	11/18/07	5:34 - 5:47 pm

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B-2307 ELOG FIELD LOG

SITE: EXELON VICTORIA DATE: 11/18/07
CLIENT: MACTEC JOB: 7501
AUTHOR: C. CARTER PAGE 1 OF 2

CONTACT: STEVE CRISENZO _OFFICE_ PHONE: 361-972-0198
CELL PHONE: 919-949-1707
CONTACT: _OFFICE_ PHONE:
_____ PHONE:
CONTACT: _____ PHONE:
_____ PHONE:
CONTACT: _____ PHONE:
_____ PHONE:
DRILLER: _____ PHONE:
COMPANY: _____ PHONE:

GENERAL SITE CONDITIONS/LOCATION:

BOREHOLE DESIGNATION: B-2307 LOCATION:

COUNTY: VICTORIA RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 310 ft ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED: 310 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 2' ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ϕ TIME SINCE LAST CIRCULATION: 11:45 am

LOGGING CREW: C. CARTER
VEHICLE(S) USED AND MILEAGE: RENTAL
MOBILIZED FROM: Victoria DEPARTURE TIME: 10:00 am
ARRIVED ON SITE: 10:30 am
STANDBY TIME: CAUSE:
LOGGING STARTED: 12:50 pm LOGGING COMPLETED: 1:18 pm

SITE:_EXELON VICTORIA_B-2307_____ DATE:_11/18/07_____
CLIENT:_MACTEC_____ JOB:_7501_____
AUTHOR:_C. CARTER_____ PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER_X_____ OYO_____ RG_____ OTHER_____
MICROLOGGER 5310_X_ 5772___ OTHER_____
ELOG PROBE 5490_X_ OTHER_____

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)	32.8	
MINUS CASING STICK-UP	1.2	
DEPTH REF. OFFSET AT START	39.8	
DEPTH REF. OFFSET AT END	39.75	
AFTER SURVEY DEPTH ERROR	.05	LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2307 ELOGTEST01		11:59am		12:01pm
B2307ELOGUP01	309.35'	12:30pm	39.5'	1:18pm

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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P-S SUSPENSION VELOCITY FIELD LOG

SITE:_EXELON VICTORIA B-2307 DATE: 11/18/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 1 OF 7

CONTACT:_STEVE CRISENZO _OFFICE_ PHONE:_361-972-0198
_CELL___ PHONE:_919-949-1707
CONTACT:_____ _OFFICE_ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
DRILLER:_____ _____ PHONE:_____
COMPANY:_____ _____ PHONE:_____

DIRECTIONS TO SITE:_____

GENERAL SITE CONDITIONS/LOCATION:_____

EA#:_____
BOREHOLE DESIGNATION: B-2307 LOCATION: Perimeter
COUNTY:_VICTORIA__RANGE:_____TOWNSHIP:_____SECTION:_____
BOREHOLE CONSTRUCTION: CASED____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 310 ft ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 310 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 2' ; NO____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER:_____
DEPTH TO BOREHOLE FLUID: 0 TIME SINCE LAST CIRCULATION: 11:45am

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SITE:_EXELON VICTORIA B-2307 DATE: 11/18/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 7

LOGGING CREW:_C. CARTER
VEHICLE(S) USED AND MILEAGE: _RENTAL
MOBILIZED FROM:_Victoria, TX DEPARTURE TIME: 10:00am
ARRIVED ON SITE: 10:30am
STANDBY TIME: CAUSE:
LOGGING STARTED: 2:49 LOGGING COMPLETED: 4:31pm
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:
DEMOBILIZED TO: ARRIVAL TIME:
ADDITIONAL DEMOB TIME: REASON:

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 ☐		

MAINTENANCE PERFORMED ON SITE:

EQUIPMENT PROBLEMS OR FAILURES:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: Top of ~~dad~~ casing = .37m RP = 1.63m
1.61m @ 4:51

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE:_EXELON VICTORIA_B2307_ DATE:_11/18/07_
CLIENT:_MACTEC_ JOB:_7501_
AUTHOR:_C. CARTER_ PAGE_3_ OF_7_

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56	001		2:49
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	7		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		new paper
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: EXELON VICTORIA B-2357 DATE: 11/18/07

CLIENT: MACTEC JOB: 7501

AUTHOR: C. CARTER PAGE 4 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
20.5	67.26	38		
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76		
40.0	131.23	77		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE:_EXELON VICTORIA B-2307 DATE: 11/18/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 5 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
40.5	132.87	78		
41.0	134.51	79		
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		
46.5	152.56	90		
47.0	154.20	91		
47.5	155.84	92		
48.0	157.48	93		
48.5	159.12	94		
49.0	160.76	95		
49.5	162.40	96		
50.0	164.04	97		
50.5	165.68	98		
51.0	167.32	99		
51.5	168.96	100		Disk change
52.0	170.60	101		
52.5	172.24	102		
53.0	173.88	103		
53.5	175.52	104		
54.0	177.17	105		
54.5	178.81	106		
55.0	180.45	107		
55.5	182.09	108		
56.0	183.73	109		
56.5	185.37	110		
57.0	187.01	111		
57.5	188.65	112		
58.0	190.29	113		
58.5	191.93	114		
59.0	193.57	115		
59.5	195.21	116		
60.0	196.85	117		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE:_EXELON VICTORIA B-2307 DATE: 11/18/07

CLIENT:__MACTEC JOB:_7501

AUTHOR:_C. CARTER PAGE 6 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
60.5	198.49	118		
61.0	200.13	119		
61.5	201.77	120		
62.0	203.41	121		
62.5	205.05	122		
63.0	206.69	123		
63.5	208.33	124		
64.0	209.97	125		
64.5	211.61	126		
65.0	213.25	127		
65.5	214.90	128		
66.0	216.54	129		
66.5	218.18	130		
67.0	219.82	131		
67.5	221.46	132		
68.0	223.10	133		
68.5	224.74	134		
69.0	226.38	135		
69.5	228.02	136		
70.0	229.66	137		
70.5	231.30	138		
71.0	232.94	139		
71.5	234.58	140		
72.0	236.22	141		
72.5	237.86	142		
73.0	239.50	143		
73.5	241.14	144		
74.0	242.78	145		
74.5	244.42	146		
75.0	246.06	147		new paper
75.5	247.70	149		
76.0	249.34	150		
76.5	250.98	151		
77.0	252.62	152		
77.5	254.27	153		
78.0	255.91	154		
78.5	257.55	155		
79.0	259.19	156		
79.5	260.83	157		
80.0	262.47	157		

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: EXELON VICTORIA B-2307 DATE: 11/18/07

CLIENT: MACTEC JOB: 7501

AUTHOR: C. CARTER PAGE 7 OF 7

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
80.5	264.11	158		
81.0	265.75	159		
81.5	267.39	160		
82.0	269.03	161		
82.5	270.67	162		
83.0	272.31	163		
83.5	273.95	164		
84.0	275.59	165		
84.5	277.23	166		
85.0	278.87	167		
85.5	280.51	168		
86.0	282.15	169		
86.5	283.79	170		
87.0	285.43	171		
87.5	287.07	172		
88.0	288.71	173		
88.5	290.35	174		
89.0	291.99	175		
89.5	293.64	176		
90.0	295.28	177		
90.5	296.92	178		4:31
91.0	298.56			
91.5	300.20			
92.0	301.84			
92.5	303.48			
93.0	305.12			
93.5	306.76			
94.0	308.40			
94.5	310.04			
95.0	311.68			
95.5	313.32			
96.0	314.96			
96.5	316.60			
97.0	318.24			
97.5	319.88			
98.0	321.52			
98.5	323.16			
99.0	324.80			
99.5	326.44			
100.0	328.08			

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B-2307 CALIPER FIELD LOG

SITE:_EXELON VICTORIA COUNTY COL_____ DATE:_11/18/07_____
CLIENT:_MACTEC_____ JOB:_7501_____
AUTHOR:_C. CARTER_____ PAGE 1 OF 2

CONTACT:_STEVE CRISENZO_____ _OFFICE__ PHONE:_361-972-0198_____
_CELL____ PHONE:_919-949-1707_____
CONTACT:ALLAN SHAW_____ _CELL____ PHONE:__301-704-2684_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
DRILLER:_____ _____ PHONE:_____
COMPANY:_____ _____ PHONE:_____

GENERAL SITE CONDITIONS/LOCATION:_____

BOREHOLE DESIGNATION:_B-2307_____LOCATION:_Perimeter_____

COUNTY:_VICTORIA__RANGE:_____TOWNSHIP:_____SECTION:_____
BOREHOLE CONSTRUCTION: CASED____ UNCASED_X___
DIAMETERS AND DEPTH RANGES: _5"___ 0 TO _310 ft_____; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_310 ft_____
CONDUCTOR CASING?: YES_X_ DEPTH TO BOTTOM OF CASING_3'_____; NO____
DEPTH TO BEDROCK:_NA_____ DEPTH TO WATER TABLE:_NA_____
BOREHOLE FLUID: WATER_____; FRESH WATER MUD__X_; SALT WATER MUD _____;
OTHER:_____
DEPTH TO BOREHOLE FLUID:_0_____ TIME SINCE LAST CIRCULATION:_11:45am_____

LOGGING CREW:_C. CARTER_____
VEHICLE(S) USED AND MILEAGE: _RENTAL_____
MOBILIZED FROM:_VICTORIA, TX_____ DEPARTURE TIME:_10:00 am_____
ARRIVED ON SITE:_10:30 am_____
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_1:44 pm_____ LOGGING COMPLETED:_2:13 pm_____

SITE:_EXELON VICTORIA COUNTY COL B-2307 DATE: 11/18/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 2

WINCH: COMPROBE_____ SILVER X OYO_____ RG_____ OTHER_____
MICROLOGGER 5310 X 5772___ OTHER_____
CALIPER PROBE 5368 X OTHER_____

PROBE OFFSET	2.08M(6.82 FT) 12 IN MAX	
MINUS CASING STICK-UP	1.2	
DEPTH REF. OFFSET AT START	5.62	
DEPTH REF. OFFSET AT END	5.60	
AFTER SURVEY DEPTH ERROR	.02	LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2307CALTEST01		1:26 pm		1:28 pm
B2307CALUP01	304.2'	1:44 pm	5.6'	2:13 pm
B2307CALTEST02		2:18 pm		2:19 pm

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.500 IN cc
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.	B2307CALTEST01	2.025	3.948	8.050	4.567
AS MEAS.	B2307CALTEST02	2.02	3.952	8.036	4.567
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

11/18/07

MAINTENANCE PERFORMED ON SITE:_____

EQUIPMENT PROBLEMS OR FAILURES:_____

SUGGESTIONS, ADDITIONS, CHANGES:_____

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B-2307 DEVIATION FIELD LOG

SITE: EXELON VICTORIA COUNTY COL DATE: 11/18/07
CLIENT: MACTEC JOB: 7501
AUTHOR: C. CARTER PAGE 1 OF 2

CONTACT: STEVE CRISENZO _OFFICE_ PHONE: 361-972-0198
CELL PHONE: 919-949-1707
CONTACT: _____ _OFFICE_ PHONE: _____
_____ PHONE: _____
CONTACT: _____ _____ PHONE: _____
_____ PHONE: _____
CONTACT: _____ _____ PHONE: _____
_____ PHONE: _____
DRILLER: _____ _____ PHONE: _____
COMPANY: _____ _____ PHONE: _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

BOREHOLE DESIGNATION: B-2307 LOCATION: Perimeter

COUNTY: VICTORIA RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED _____ UNCASED X
DIAMETERS AND DEPTH RANGES: 5" 0 TO 310 ft ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED: 310 ft
CONDUCTOR CASING?: YES X DEPTH TO BOTTOM OF CASING 2' ; NO _____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER _____; FRESH WATER MUD X ; SALT WATER MUD _____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: ∅ TIME SINCE LAST CIRCULATION: 11:45 am

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SITE:_EXELON VICTORIA COUNTY COL B-2307 DATE: 11/18/07
CLIENT:_MACTEC JOB:_7501
AUTHOR:_C. CARTER PAGE 2 OF 2

LOGGING CREW:_C. CARTER
VEHICLE(S) USED AND MILEAGE: _RENTAL
MOBILIZED FROM: Victoria, TX DEPARTURE TIME: 10:00 am
ARRIVED ON SITE: 10:30 am
STANDBY TIME: CAUSE: cc 11/18/07
LOGGING STARTED: 5:34 pm LOGGING COMPLETED: ~~5:47~~ 5:47 pm

WINCH: COMPROBE___ SILVER X OYO___ RG___ OTHER___
MICROLOGGER 5310 X 5772___ OTHER___
TELEVIEWER 5174 X OTHER___

1 PROBE TILT TEST 60.1 BRUNTON TILT 30
2 PROBE TILT TEST 96.9 BRUNTON TILT 6
3 PROBE TILT TEST 31.76 BRUNTON TILT 59 After log
1 PROBE AZIMUTH TEST 173.7 BRUNTON AZIMUTH 175
2 PROBE AZIMUTH TEST 242.9 BRUNTON AZIMUTH 239
3 PROBE AZIMUTH TEST 171.6 BRUNTON AZIMUTH 175 After Log

PROBE OFFSET	1.44M(4.72FT)
MINUS CASING STICK-UP	1.2
DEPTH REF. OFFSET AT START	3.52
DEPTH REF. OFFSET AT END	3.50
AFTER SURVEY DEPTH ERROR	.02 LESS THAN 0.4%?

LOG NAME	START DEPTH	START TIME	END DEPTH	END TIME
B2307AUUP01	303.2'	5:34	3.5ft	5:47

MAINTENANCE PERFORMED ON SITE:
EQUIPMENT PROBLEMS OR FAILURES:
SUGGESTIONS, ADDITIONS, CHANGES:

GEOVision Geophysical Services *1151 Pomona Road, Unit P, Corona, CA 92882* *Ph (951) 549-1234 Fx (951) 549-1236*

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.

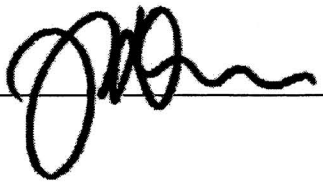
In Figure 2, the time difference over the 1-meter interval of 1.70 millisecond is equivalent to a SH-wave velocity of 588 m/sec. Whenever possible, time differences are determined from several phase points on the S_H -wave pulse trains to verify the data obtained from the first arrival of the S_H -wave 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 Antony Mart 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

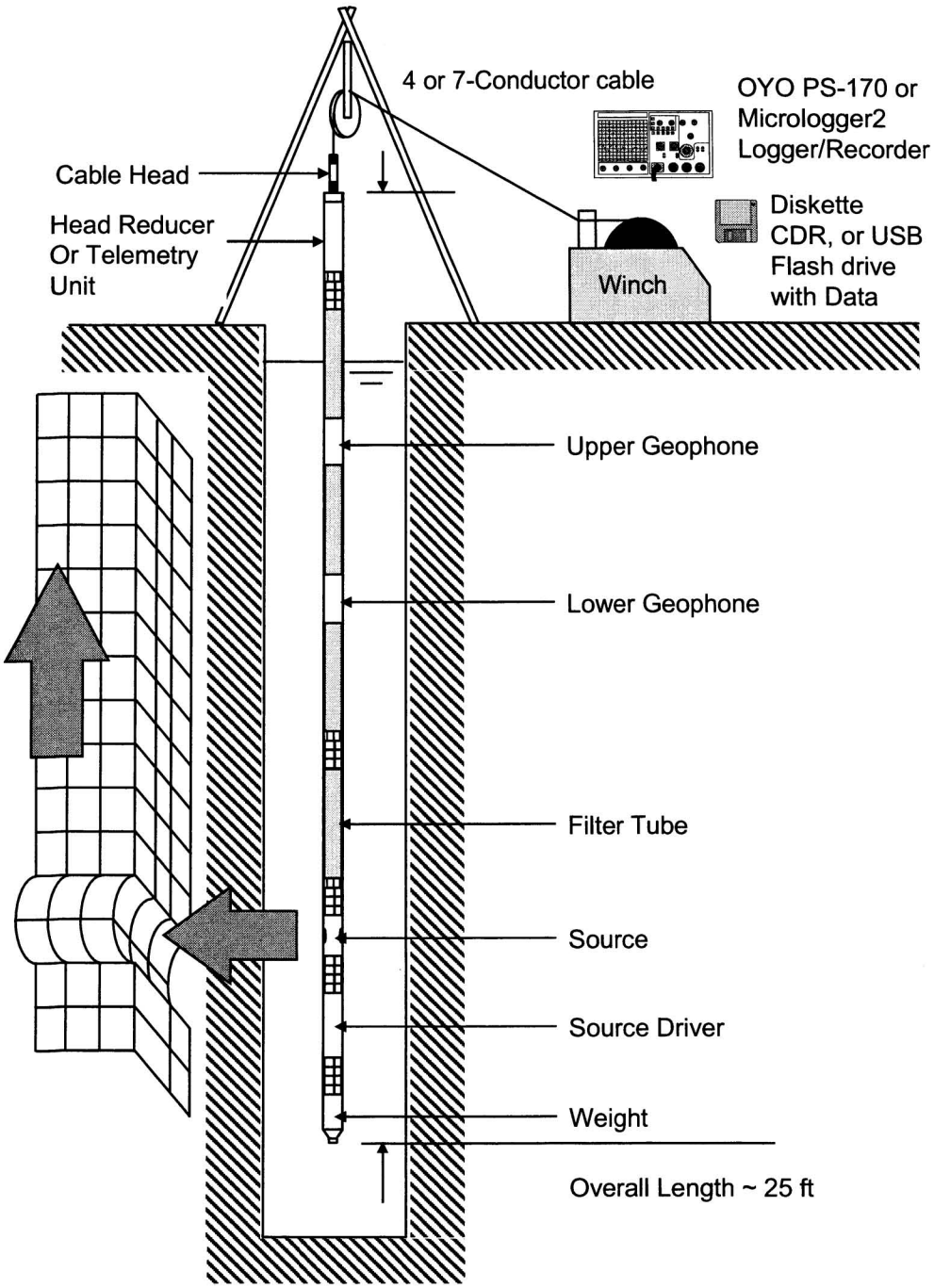


Figure 1. Suspension PS logging method setup

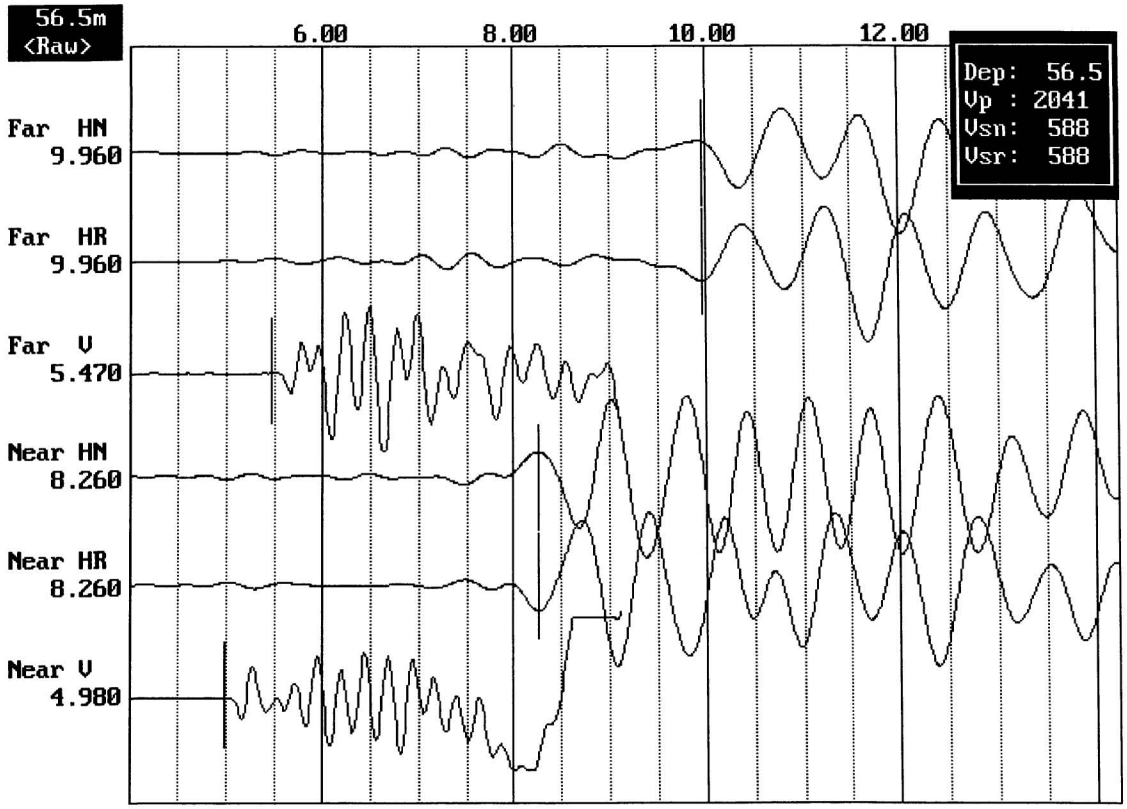


Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner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

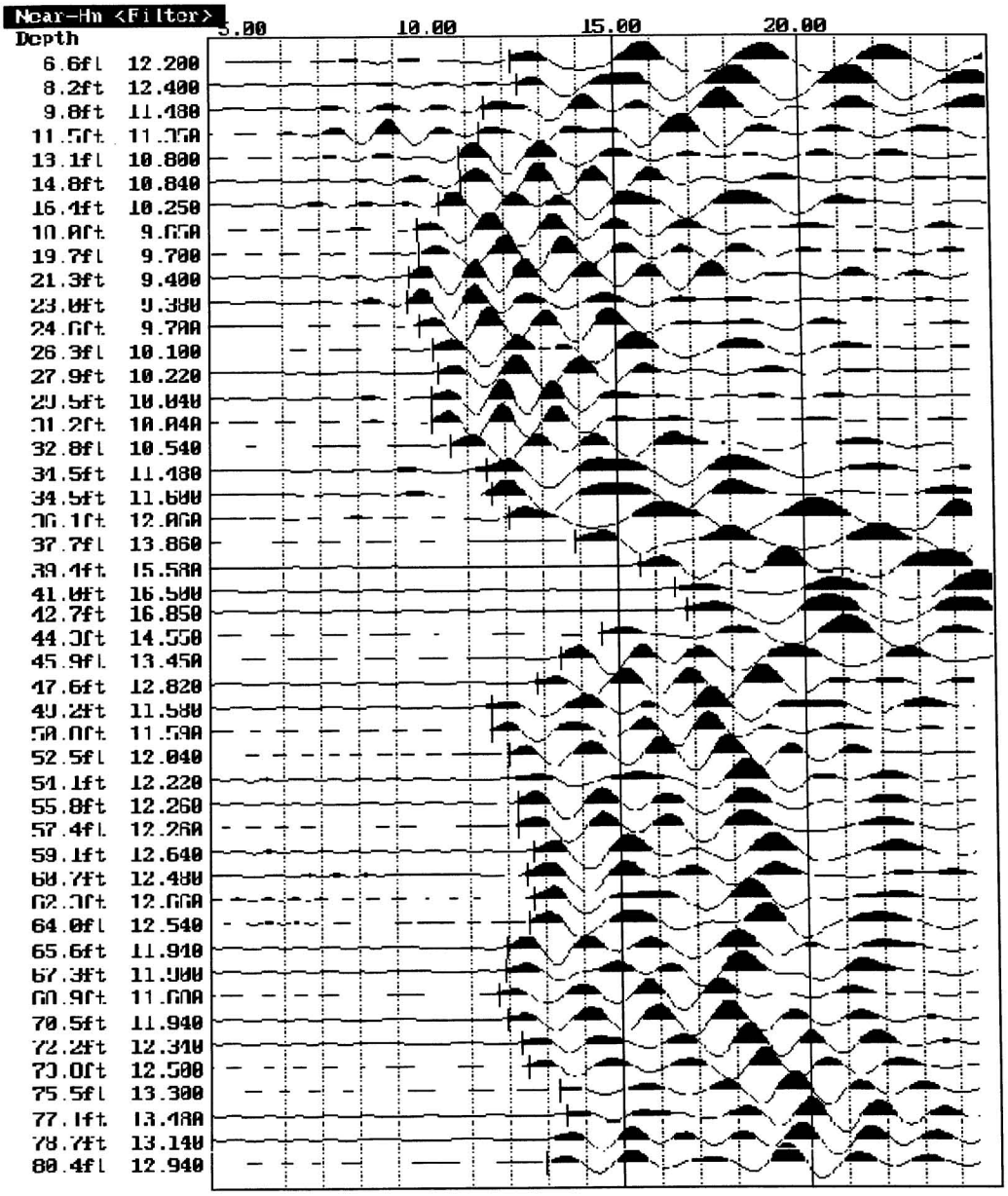


Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole

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P-S SUSPENSION VELOCITY FIELD LOG

SITE:_____ DATE:_____
CLIENT:_____ JOB:_____
AUTHOR:_____ PAGE 1 OF _____

CONTACT:_____ OFFICE PHONE:_____
_____ PHONE:_____
CONTACT:_____ OFFICE PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
CONTACT:_____ _____ PHONE:_____
_____ PHONE:_____
DRILLER:_____ _____ PHONE:_____
COMPANY:_____ _____ PHONE:_____

DIRECTIONS TO SITE:_____
_____
_____
_____
_____

GENERAL SITE CONDITIONS/LOCATION:_____
_____

EA#:_____
BOREHOLE DESIGNATION:_____LOCATION:_____
_____
COUNTY:_____RANGE:_____TOWNSHIP:_____SECTION:_____
BOREHOLE CONSTRUCTION: CASED_____ UNCASED_____
DIAMETERS AND DEPTH RANGES: _____ 0 TO _____ ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED:_____
CONDUCTOR CASING?: YES____ DEPTH TO BOTTOM OF CASING_____; NO____
DEPTH TO BEDROCK:_____ DEPTH TO WATER TABLE:_____
BOREHOLE FLUID: WATER_____; FRESH WATER MUD_____; SALT WATER MUD _____;
OTHER:_____
DEPTH TO BOREHOLE FLUID:_____ TIME SINCE LAST CIRCULATION:_____

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SITE:_____ DATE:_____
CLIENT:_____ JOB:_____
AUTHOR:_____ PAGE 2 OF _____

LOGGING CREW:_____
VEHICLE(S) USED AND MILEAGE: _____
MOBILIZED FROM:_____ DEPARTURE TIME:_____
ARRIVED ON SITE:_____
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_____ LOGGING COMPLETED:_____
STANDBY TIME:_____ CAUSE:_____
LOGGING STARTED:_____ LOGGING COMPLETED:_____
DEMOBILIZED TO:_____ ARRIVAL TIME:_____
ADDITIONAL DEMOB TIME:_____ REASON:_____

BATTERIES CHANGED BEFORE LOGGING: YES_____; NO_____; 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 ☐				

MAINTENANCE PERFORMED ON SITE:_____
_____
_____
_____

EQUIPMENT PROBLEMS OR FAILURES:_____
_____
_____

SUGGESTIONS, ADDITIONS, CHANGES:_____
_____
_____

COMMENTS:_____
_____
_____
_____
_____
_____

GEOVision Geophysical Services 1151 Pomona Road, Suite P, Corona, CA 92882 Ph (951) 549-1234 Fx (951) 549-1236

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____

CLIENT: _____ JOB: _____

AUTHOR: _____ PAGE _____ OF

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	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			
3.0	9.84			
3.5	11.48			
4.0	13.12			
4.5	14.76			
5.0	16.40			
5.5	18.04			
6.0	19.69			
6.5	21.33			
7.0	22.97			
7.5	24.61			
8.0	26.25			
8.5	27.89			
9.0	29.53			
9.5	31.17			
10.0	32.81			
10.5	34.45			
11.0	36.09			
11.5	37.73			
12.0	39.37			
12.5	41.01			
13.0	42.65			
13.5	44.29			
14.0	45.93			
14.5	47.57			
15.0	49.21			
15.5	50.85			
16.0	52.49			
16.5	54.13			
17.0	55.77			
17.5	57.41			
18.0	59.06			

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE: _____ DATE: _____

CLIENT: _____ JOB: _____

AUTHOR: _____ PAGE _____ OF _____

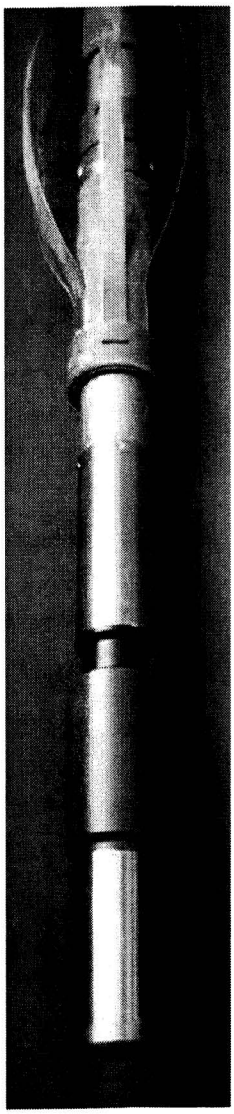
DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO.	FILTERED FILE NO.	COMMENTS CASING, WATER, ROCK, ETC
18.5	60.70			
19.0	62.34			
19.5	63.98			
20.0	65.62			
20.5	67.26			
21.0	68.90			
21.5	70.54			
22.0	72.18			
22.5	73.82			
23.0	75.46			
23.5	77.10			
24.0	78.74			
24.5	80.38			
25.0	82.02			
25.5	83.66			
26.0	85.30			
26.5	86.94			
27.0	88.58			
27.5	90.22			
28.0	91.86			
28.5	93.50			
29.0	95.14			
29.5	96.78			
30.0	98.43			
30.5	100.07			
31.0	101.71			
31.5	103.35			
32.0	104.99			
32.5	106.63			
33.0	108.27			
33.5	109.91			
34.0	111.55			
34.5	113.19			
35.0	114.83			
35.5	116.47			
36.0	118.11			

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.