

| 8-2305 C | ALIPER | FIELD LOG |
|--|-----------|---------------------------------|
| SITE:_EXELON VICTORIA COUNTY COL | * | DATE: 11/18/07 |
| | | |
| CLIENT:_MACTEC_ AUTHOR:_C. CARTER_R. STELLER !!/A; | خعا | PAGE 1 OF 2 |
| CONTACT:_STEVE CRISENZO | _OFFICE_ | PHONE:_361-972-0198 |
| | _CELL | PHONE:_919-949-1707 |
| CONTACT:ALLAN SHAW | | PHONE:301-704-2684 |
| CONTACT: | | PHONE: |
| | | PHONE: |
| CONTACT: | | PHONE: |
| | | PHONE: |
| DRILLER: | | PHONE: |
| COMPANY: | | PHONE: |
| BOREHOLE DESIGNATION: R-2305 | | |
| COUNTY:_VICTORIA_RANGE:TOWNS | SHIP: | SECTION: |
| BOREHOLE CONSTRUCTION: CASEDUN | CASED_ | |
| BOREHOLE CONSTRUCTION: CASEDUNO DIAMETERS AND DEPTH RANGES:0 TO BOREHOLE TOTAL DEPTH AS DRILLED: | 3051 | ;, TO |
| BOREHOLE TOTAL DEPTH AS DRILLED: | 305 | : |
| | | |
| DEPTH TO BEDROCK: NA | DEPTH TO | WATER TABLE: 245/ |
| DEPTH TO BEDROCK: NA BOREHOLE FLUID: WATER ; FRESH WATER OTHER: | R MUD/ | _; SALT WATER MUD; |
| DEPTH TO BOREHOLE FLUID: | TIME SING | CE LAST CIRCULATION: 5 1 1/2 HR |
| , | 1 1 | |
| LOGGING CREW: C. CARTER R. SIELLER | 11/18/07 | |
| VEHICLE(S) USED AND MILEAGE: _RENTAL | ', ' | |
| MOBILIZED FROM:_VICTORIA, TX | DEPARTU | JRE TIME: 09:30 |
| ARRIVED ON SITE: 10:00 | | |
| STANDBY TIME: | CAUSE:_ | |
| LOGGING STARTED: 18:05 | LOGGING | COMPLETED: 18:52 |

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

GEOVision Geophysical Services

| SITE:_EXELON VICTORIA COUNTY COL 8-2305 DATE:_U/18/07 | | | | | | |
|--|---------------------|--|-------------------|--|-------------|--|
| WINCH: COMPR MICROLOGGER CALIPER PROBE | RG | OTHER | | | | |
| PROBE OFFSET MINUS CASING STICK- DEPTH REF. OFFSET DEPTH REF. OFFSET AFTER SURVEY DEPT | 10.4%? YES | | | | | |
| LOG NAME | START DEPTH Ø | START TIME | END DEPTH Ø | END TIME 18:07 | . : | |
| 82305CAUTESTOI | 230.01 | 18:19 | 5,1 | 18:42 | | |
| B2305 CALLIPOI | 0 | | 0 | | | |
| 62305 CALTESTOR | 4 | 18:50 | - | 18:52 | | |
| | | | | | 1 | |
| | | | | | | |
| | | | ļ | ļ | 1 | |
| | | | | | · | |
| | | | L | <u></u> | | |
| | | | | | | |
| 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. \$ 2305CAL | | 2.02 | 3.44 | B.04 | 4.54 | |
| AS MEAS. 62305 CAL | | 2.81 | 3.91 | 8.01 | 4.54 | |
| AS MEAS. | e few kine | | | | 1 7 | |
| AS MEAS. | | | † | | | |
| AS MEAS. | | | | | | |
| AS MEAS. | | | 1 | | | |
| MAINTENANCE PERFORMED ON SITE: | | | | | | |
| EQUIPMENT PROBLEMS OR FAILURES: | | | | | | |
| SUGGESTIONS, ADDITIONS, CHANGES: | | | | | | |

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| | VICTORIA_ | | | DATE: 11/18/07 |
|-------------------------------|------------------|--|-----------|----------------------|
| CLIENT:_MACT AUTHOR:_C. C/ | - | JOB:_7501 PAGE 1 OF 1 | | |
| OTHORC. C | SKI EK | | | PAGE 1 OF 1 |
| _ | EVE CRISENZO | | | PHONE:_361-972-0198_ |
| CONDUCTOR C | ASING?: YES X | EDUNCASED0 TO360 LED:3/6-Ft DEPTH TO BOTTOM RESH WATER MUD | OF CASING | TO 2 |
| .OGGING CRE | N:_C. Carter | | | |
| OG TYPE | FILE NAME | DEPTH RANGE | DATE | TIMES ec uliclot |
| EL06 | B2306EL06 1E570/ | | 11/16/17 | 4:39 - 5:07pm 4:16 |
| EL06 | B2306 ELOGUANI | 308.9-39.85 Ft | 1) | 4139 - 5107pm |
| >-svelocity | B23065USPDEWNOI | 2.1m - 90,5m | 1) | 5:20 - 6:45pm |
| Caliper | B2306caltest of | | 1) | 7:20 - 7:21 |
| Carliner | | 306,25-5.75 ft | i, | 7:40-8:11pm |
| Caliper | B2306caltesta | | n, | 8:16 - 8:17pm |
| Deviation | B2306AUUP01 | 307.1-3.475 | 11/16/07 | 8:38 - 8:52pm |
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| B-2306 | ELOG FIELD LOG |
|---------------------------------------|--|
| SITE: EXELON VICTORIA | DATE: 11/16/07 |
| SITE:_EXELON VICTORIA CLIENT:_MACTEC | JOB: 7501 |
| AUTHOR:_C. CARTER | PAGE 1 OF 2 |
| | 17102 1 01 2 |
| CONTACT:_STEVE CRISENZO | OFFICEPHONE:_361-972-0198 |
| | _CELL PHONE:_919-949-1707 |
| CONTACT: | _OFFICEPHONE: |
| | PHONE: |
| CONTACT: | PHONE: |
| | PHONE: |
| CONTACT: | 1170112 |
| | PHONE: |
| DRILLER: | PHONE: |
| COMPANY: | PHONE: |
| BOREHOLE DESIGNATION: R-2304 | LOCATION: Perimeter |
| | |
| BOREHOLE CONSTRUCTION: CASED | OWNSHIP:SECTION: UNCASEDX |
| DIAMETERS AND DEPTH RANGES: 5" | 0.TO 310 ft . TO |
| BOREHOLE TOTAL DEPTH AS DRILLED: | +1015 |
| CONDUCTOR CASINGS: YES DEPTH 1 | TO BOTTOM OF CASING; NO_X |
| DEPTH TO BEDROCK: A/A | DEPTH TO WATER TARIE: A/A |
| BOREHOLE FLUID: WATER FRESH V | DEPTH TO WATER TABLE:N.4 WATER MUDK_; SALT WATER MUD; |
| OTHER | |
| DEPTH TO BOREHOLE FLUID: Ø | TIME SINCE LAST CIRCULATION: 3:45pm |
| | Time office and office the transfer |
| LOGGING CREW:_C. CARTER | |
| VEHICLE(S) USED AND MILEAGE: _RENTA | L |
| MOBILIZED FROM: Victoria TX | |
| ARRIVED ON SITE: 3:00 pm | |
| | CAUSE: |
| STANDBY TIME:LOGGING STARTED: 4:39 mm | LOGGING COMPLETED: Siotma |

1151 Pomona Road, Unit P, Corona, CA 92882

Ph (951) 549-1234 Fx (951) 549-1236

| SITE:_EXELON VICTO CLIENT:_MACTEC AUTHOR:_C. CARTER | | | | | DATE: | |
|---|---------------------------|--|-------------|--------------------------|-----------------------------------|-------|
| WINCH: COMPI MICROLOGGER ELOG PROBE | ROBE 5310_X 5490_X | SILVER 5772 OTHER | <u>x</u> | OYO OTHER | RG | OTHER |
| PROBE LENGTH PLUS YOKE 10.0M (32 MINUS CASING STICK DEPTH REF. OFFSET DEPTH REF. OFFSET AFTER SURVEY DEPT | -UP AT START AT END | 2.50M(8.20 32.8 1.25 39.75 39.85 0.10 | - - - | LESS THAN | l 0.4%? | |
| LOG NAME B2366 ELOGIESTOI B2366 ELOGUPOI MAINTENANCE PERFO | START DEPTH 308.94 | START TIME 4:18 pm 4:39 pm | | END DEPTH 39.85.44 | END TIME 4119 pm 5:07 pm | |
| EQUIPMENT PROBLEM | AS OR FAIL | URES: | | | | · |
| SUGGESTIONS, ADDITIONS, CHANGES: | | | | | | |



P-S SUSPENSION VELOCITY FIELD LOG

| SITE:_EXELON VICTORIA_ 323.6 | | DATE: 11/16/07 | |
|---|-----------|---------------------------|-------------|
| CLIENT:_MACTEC | | JOB:_7501 | - |
| AUTHOR:_C. CARTER | | PAGE 1 OF | |
| CONTACT:_STEVE CRISENZO | OFFICE_ | _PHONE:_361-972-0198 | |
| | _CELL | PHONE:_919-949-1707 | |
| CONTACT: | OFFICE | PHONE: | |
| | | PHONE: | |
| CONTACT: | | | |
| | | PHONE: | * |
| | | PHONE: | |
| | | PHONE: | |
| DRILLER: | | PHONE: | |
| COMPANY: | | PHONE: | |
| GENERAL SITE CONDITIONS/LOCATION: | | | |
| EA#:BOREHOLE DESIGNATION:_ %-2306 | LOCA | TION: Perimeter | <u>-</u> '. |
| COUNTY:_VICTORIARANGE:TO | WNSHIP: | SECTION: | - |
| BOREHOLE CONSTRUCTION: CASED DIAMETERS AND DEPTH RANGES: BOREHOLE TOTAL DEPTH AS DRILLED: | UNCASED | <u>×</u> | |
| DIAMETERS AND DEPTH RANGES: | 0 TO 310+ | ₹,TO | |
| BOREHOLE TOTAL DEPTH AS DRILLED: | 31044 | | |
| CONDUCTOR CASING?: YES_K DEPTH T | O BOTTOM | OF CASING 2 NO | |
| DEPTH TO BEDROCK: | DEPTH TO | WATER TABLE: NA | |
| BOREHOLE FLUID: WATER; FRESH W. OTHER: | | | : |
| DEPTH TO BOREHOLE FLUID: | TIME SING | E LAST CIRCULATION: 3:45m | |

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| SITE:_EXELON VICTORIA_B-2306 | DATE: 11/16/67 |
|--|---|
| CLIENT:_MACTECAUTHOR:_C. CARTER | JOB:_7501 PAGE 2 OF _7 |
| AUTHORC. OARTER | PAGE 2 OI |
| LOGGING CREW:_C. CARTER | |
| VEHICLE(S) USED AND MILEAGE: _RENTAL_ | |
| MOBILIZED FROM:_Victoria, TX | |
| ARRIVED ON SITE: 3 pm | DEL ACTORE TIME. |
| | CAUSE: |
| LOGGING STARTED: 5126 | CAUSE: |
| STANDBY TIME: | CAUSE: |
| | LOGGING COMPLETED: |
| | ARRIVAL TIME: |
| | REASON: |
| | |
| BATTERIES CHANGED BEFORE LOGGING: Y WINCH COMPROBE I INSTRUMENT OYO 12004 15014 RECEIVER S/N 12008 20042 5 | GREY X OYO RG OTH 19029 RG 160023 X 160024 |
| MAINTENANCE PERFORMED ON SITE: | |
| | |
| | |
| EQUIPMENT PROBLEMS OR FAILURES: | |
| | |
| | |
| SUGGESTIONS, ADDITIONS, CHANGES: | |
| 7 , | 0.38m 2.4838 = 2.1m = RP |
| COMMENTS: Top of caring = | |
| | 2.10m @ 7:08m |
| | |
| | |
| | |
| GEOVision Geophysical Services 1151 Pomona Ro | ad, Suite P, Corona, CA 92882 Ph (951) 549-1234 Fx (951) 549-1236 |

| SITE:_EXELON VICTORIA_ \$2306 | DATE: 11/18/07 |
|-------------------------------|----------------|
| CLIENT: MACTEC | _JOB:_7501 |
| AUTHOR:_C. CARTER | PAGE 3 OF 7 |

| AUTHOR. | _0, 0, | " \ | | |
|---------|--------|------------|----------|--------------------------|
| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS |
| METERS | | FILE NO. | FILE NO. | CASING, WATER, ROCK, ETC |
| | | | | |
| 0.5 | 1.64 | · · | T | |
| 1.0 | 3.28 | | | |
| 1.5 | 4.92 | | | |
| 2.0 | 6.56 | 601 | | 5:20 pm |
| 2.5 | 8.20 | 2 | | |
| 3.0 | 9.84 | 3 | | |
| 3.5 | 11.48 | ч | | |
| 4.0 | 13.12 | 5 | | |
| 4.5 | 14.76 | 6 | | |
| 5.0 | 16.40 | 1 | | |
| 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 | T. | |
| 11.5 | 37.73 | 20 | | |
| 12.0 | 39.37 | 21 | T | |
| 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 | 37 | | |
| 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 | | |
| | 50,02 | | | |

| SITE:_EXELON VICTORIA_ 8 2306 | DATE: 11/16/67 |
|-------------------------------|----------------|
| CLIENT:MACTEC | JOB:_7501 |
| AUTHOR:_C. CARTER | PAGEOF |

| AUTHOR: | _0. 0/1111 | -1\ | | PAGEOF |
|---------|------------|-------------|---------------------------------------|--------------------------|
| | DEDTIL | LINEU TERES | EII TEDED | COMMENTS |
| | DEPTH | UNFILTERED | FILTERED | COMMENTS |
| METERS | FEET | FILE NO. | FILE NO. | 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 | <u> </u> | |
| 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 | 1 | |
| 26.0 | 85.30 | 49 | | |
| 26.5 | 86.94 | 50 | | |
| 27.0 | 88.58 | SI | | |
| 27.5 | 90.22 | 52 | | |
| 28.0 | 91.86 | \$3 | | |
| 28.5 | 93.50 | 54 | | |
| 29.0 | 95.14 | 55 | | |
| 29.5 | 96.78 | 56 | | , |
| 30.0 | 98.43 | . 57 | | |
| 30.5 | 100.07 | 2.8 | | |
| 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. | | |
| | 119.75 | 70 | | |
| 36.5 | | 71 | | |
| 37.0 | 121.39 | 72 | | |
| 37.5 | 123.03 | | - | |
| 38.0 | 124.67 | 73 | | |
| 38.5 | 126.31 | | | |
| 39.0 | 127.95 | 75 | + | |
| 39.5 | 129.59 | | | |
| 40.0 | 131.23 | 77 | | |

| GEOVISION SUSPENSION I | | | | OGGING FIELD NOTES | | | |
|-------------------------------|-------------------|------------|----------|--------------------------|--|--|--|
| SITE:_EXELON VICTORIA_ B-2306 | | | | DATE: 116667 | | | |
| CLIENT:MACTEC | | | | JOB:_7501 | | | |
| | AUTHOR:_C. CARTER | | | PAGE S OF 7 | | | |
| | _ | | | | | | |
| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS | | | |
| METERS | FEET | FILE NO. | FILE NO. | CASING, WATER, ROCK, ETC | | | |
| | | | | | | | |
| | | | | | | | |
| 40.5 | 132.87 | 78 | | | | | |
| 41.0 | 134.51 | 79 | | | | | |
| 41.5 | 136.15 | 86 | | 3 | | | |
| 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 | 150 | | | | | |
| 52.0 | 170.60 | 101 | | | | | |
| 52.5 | 172.24 | 107 | | | | | |
| 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 | | | | | |
| EEE | 192.00 | 108 | | | | | |

109

110

111

112

113

114

115 116

117

183.73

185.37

187.01

188.65

190.29

191.93

193.57

195.21

196.85

56.0 56.5

57.0

57.5

58.0

58.5 59.0

59.5

60.0

| SITE:_E | XELON VIO | CTORIA 8-2306 | DATE: 11/16/07 | | | | |
|--|-----------|---------------|----------------|---------------|----|--|--|
| CLIENT: | MACTE | C | | JOB:_7501 | | | |
| the state of the state of the state of | R:_C. CAR | | | PAGE 6 | OF | | |
| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS | | | |

| 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 65.0 213.25 127 66.5 214.90 128 66.0 216.54 129 66.5 218.18 170 67.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 132 66.5 221.46 133 66.5 221.46 134 134 134 134 134 134 134 134 134 134 | |
|--|-------------------|
| 61.0 200.13 114 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 66.5 218.18 129 66.5 221.46 132 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 73.0 239.50 143 73.5 241.14 144 74.0 242.78 145 74.0 242.78 145 | |
| 61.0 200.13 114 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 66.5 218.18 129 66.5 221.46 132 68.0 223.10 133 68.5 224.74 134 69.0 226.38 135 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 73.0 239.50 143 73.5 241.14 144 74.0 242.78 145 74.0 242.78 145 | |
| 61.5 201.77 126 62.0 203.41 121 62.5 205.05 122 63.0 206.69 1223 63.5 208.33 124 64.0 209.97 12.5 64.5 211.61 126 65.0 213.25 127 65.5 214.90 128 66.0 216.54 129 66.5 218.18 1726 66.5 218.18 1726 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 73.0 242.78 145 74.0 242.78 145 74.0 242.78 145 74.0 242.78 145 74.0 242.78 145 | |
| 62.0 203.41 ITA 62.5 205.05 ITA 63.0 206.69 IZ-3 63.5 208.33 IZ-4 64.0 209.97 IZ-5 64.5 211.61 IZ-6 65.0 213.25 IZ-7 65.5 214.90 IZ-8 66.0 216.54 IZ-9 66.5 218.18 IZ-6 67.0 219.82 IZ-7 68.0 223.10 IZ-7 68.0 223.10 IZ-7 68.0 224.74 IZ-7 69.0 226.38 IZ-7 69.0 226.38 IZ-7 70.5 231.30 IZ-7 70.5 231 | |
| 62.5 205.05 122 63.0 206.69 12-3 63.5 208.33 12-4 64.0 209.97 12-5 64.5 211.61 12-6 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 17-9 67.0 219.82 131 67.5 221.46 13-2 68.0 223.10 13-3 68.5 224.74 13-9 69.5 228.02 13-6 70.0 229.66 13-7 70.5 231.30 13-8 71.0 232.94 13-9 71.5 234.58 14-0 72.0 236.22 14-1 72.5 237.86 14-2 73.0 239.50 14-3 73.5 241.14 14-9 74.0 242.78 14-5 | |
| 63.0 206.69 12.3 63.5 208.33 12.4 64.0 209.97 12.5 64.5 211.61 12.6 65.0 213.25 12.7 65.5 214.90 12.8 66.0 216.54 12.9 66.5 218.18 17.0 67.0 219.82 131 68.0 223.10 13.3 68.6 224.74 13.4 69.0 226.38 13.5 69.5 228.02 13.6 70.0 229.66 13.7 70.5 231.30 13.8 71.0 232.94 13.9 71.5 234.58 14.0 72.0 236.22 14.1 72.5 237.86 14.2 73.0 239.50 14.3 73.5 241.14 14.4 74.0 242.78 14.5 | |
| 63.5 208.33 124 64.0 209.97 12.5 64.5 211.61 12.6 65.0 213.25 127 65.5 214.90 128 66.0 216.54 129 66.5 218.18 132 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 13.6 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 | |
| 64.0 209.97 12.5 64.5 211.61 12.6 65.0 213.25 12.7 65.5 214.90 12.8 66.0 216.54 12.9 66.5 218.18 17.0 67.0 219.82 131 67.5 221.46 13.2 68.0 223.10 13.3 68.5 224.74 13.4 69.0 226.38 13.5 69.5 228.02 13.6 70.0 229.66 13.7 70.5 231.30 13.8 71.0 232.94 13.9 71.5 234.58 14.0 72.5 237.86 14.2 73.0 239.50 14.3 73.5 241.14 14.4 74.0 242.78 14.5 74.5 244.42 14.6 | |
| 64.5 211.61 12-6 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 17-0 67.0 219.82 13} 67.5 221.46 13-2 68.0 223.10 13-3 68.5 224.74 13-9 69.0 226.38 13-5 69.5 228.02 13-6 70.0 229.66 13-7 70.5 231.30 13-8 71.0 232.94 13-9 71.5 234.58 14-0 72.0 236.22 14-1 72.5 237.86 14-2 73.0 239.50 14-3 74.0 242.78 14-5 74.0 242.78 14-5 74.5 244.42 14-6 | |
| 65.0 213.25 127 65.5 214.90 128 66.0 216.54 129 66.5 218.18 170 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 | |
| 65.5 214.90 428 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 | |
| 66.0 216.54 129 66.5 218.18 130 67.0 219.82 (3) 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 | |
| 66.5 218.18 13 b 67.0 219.82 (3) 67.5 221.46 (3) L 68.0 223.10 (3) 68.5 224.74 (3) Y 69.0 226.38 (3) S 69.5 228.02 (3) B 70.0 229.66 (3) T 70.5 231.30 (3) B 71.0 232.94 (3) P 71.5 234.58 (4) P 72.0 236.22 (4) P 72.5 237.86 (4) L 73.0 239.50 (4) T 73.5 241.14 (4) P 74.0 242.78 (4) S 74.5 244.42 (4) B | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 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 | |
| 72.0 236.22 41 72.5 237.86 42 73.0 239.50 43 73.5 241.14 144 74.0 242.78 145 74.5 244.42 146 | |
| 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 | |
| 73.5 241.14 144 74.0 242.78 145 74.5 244.42 146 | |
| 73.5 241.14 144 74.0 242.78 145 74.5 244.42 146 | |
| 74.0 242.78 145 74.5 244.42 146 | |
| 1.00 | |
| 75.0 246.06 [11] | |
| 10.0 270.00 171 | |
| 75.5 247.70 148 | HIGH THE BOOKSTON |
| 76.0 249.34 149 | |
| 76.5 250.98 15 0 | |
| 77.0 252.62 ¹⁵ 1 | |
| 77.5 254.27 152 | |
| 78.0 255.91 is3 | |
| 78.5 257.55 154 | |
| 79.0 259.19 155 | |
| 79.5 260.83 156 | |
| 80.0 262.47 157 | |

| | | | JSPENSION L | OGGING FIELD NOTES | |
|-------------------------------|------------------|--------------|---------------------------------------|---------------------------------------|----------|
| SITE:_EX | ELON VIC | TORIA 8-2306 | | DATE: 11 /16/67 | |
| | MACTEC | | | JOB: 7501 | _ |
| 10.000 | C. CARTI | | | JOB:_7501 PAGEOF | |
| | | | | | _ |
| CONTRACTOR OF THE PROPERTY OF | DEPTH | UNFILTERED | FILTERED | COMMENTS | ٦ |
| METERS | FEET | FILE NO. | FILE NO. | CASING, WATER, ROCK, ETC | |
| | | | | | |
| | | | · · · · · · · · · · · · · · · · · · · | | _ |
| 80.5 | 264.11 | 158 | | | _ |
| 81.0 | 265.75 | 159 | | | _ |
| 81.5 | 267.39 | | | | 4 |
| 82.0 | 269.03 | 161 | | | 4 |
| 82.5 | 270.67 | 162 | | | 4 |
| 83.0 | 272.31 273.95 | 163 | | | \dashv |
| 83.5 | | 164 | | | ᅴ |
| 84.0 84.5 | 275.59 277.23 | 166 | | | ᅴ |
| 85.0 | 278.87 | 167 | | | \dashv |
| 85.5 | 280.51 | 168 | | | \dashv |
| 86.0 | 282.15 | 169 | | | \dashv |
| 86.5 | 283.79 | 170 | | | \dashv |
| 87.0 | 285.43 | 171 | | | \dashv |
| 87.5 | 287.07 | 172 | | | ᅱ |
| 88.0 | 288.71 | 173 | | | \dashv |
| 88.5 | 290.35 | 174 | | | ᅥ |
| 89.0 | 291.99 | 175 | | | ٦ |
| 89.5 | 293.64 | 176 | | | \dashv |
| 90.0 | 295.28 | 177 | | | ┪ |
| 90.5 | 296.92 | 178 | | 6:45pm | \neg |
| 91.0 | 298.56 | * | | | |
| 91.5 | 300.20 | | | | |
| 92.0 | 301.84 | 3 | | | |
| 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 | <u> </u> | | | |
| 96.5 | 316.60 | | | | |
| 97.0 | 318.24 | | | | |
| 97.5 | 319.88 | | | | |
| 98.0 | 321.52 | | * | · · · · · · · · · · · · · · · · · · · | _ |
| 98.5 | 323.16 | | | | |
| 99.0 | 324.80 | | ł | | |

326.44 328.08

99.5

100.0



| B-2306 | _CALIPER FIELD LOG |
|--|--|
| SITE:_EXELON VICTORIA COUNTY COL | |
| CLIENT: MACTECAUTHOR: _C. CARTER | JOB:_7501 PAGE 1 OF 2 |
| CONTACT:_STEVE CRISENZO | OFFICEPHONE:_361-972-0198 |
| CONTACT:ALLAN SHAW | _CELL PHONE:_919-949-1707 CELL PHONE:301-704-2684 |
| CONTACT: | PHONE:PHONE: |
| CONTACT: | PHONE:PHONE: |
| | PHONE: |
| DRILLER:COMPANY: | PHONE:PHONE: |
| GENERAL SITE CONDITIONS/LOCATION: | |
| | |
| BOREHOLE DESIGNATION: 8-2306 | LOCATION: Perimeter |
| COUNTY:_VICTORIA_RANGE:TO BOREHOLE CONSTRUCTION: CASED_ DIAMETERS AND DEPTH RANGES: 5" | OWNSHIP: SECTION: SECTION: TO SOURCE |
| CONDUCTOR CASING?: YES <u>►</u> DEPTH 1 | TO BOTTOM OF CASING 2'; NO DEPTH TO WATER TABLE: M |
| BOREHOLE FLUID: WATER; FRESH W | ATER MUDX; SALT WATER MUD; |
| DEPTH TO BOREHOLE FLUID: 6 | TIME SINCE LAST CIRCULATION: 3:45 |
| LOGGING CREW:_C. CARTER VEHICLE(S) USED AND MILEAGE: _RENTAL | |
| MOBILIZED FROM:_VICTORIA, TX | |
| ARRIVED ON SITE: 3.00 p~~ | CAUSE: |
| LOGGING STARTED: 7140mm | LOGGING COMPLETED: 8:11m~ |

1151 Pomona Road, Unit P, Corona, CA 92882

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| CLIENT:_N | LON VICTOR NACTEC C. CARTER | | Y COL_B2306 | | DATE: 116 JOB: 7501 PAGE 2 OF 2 | 107 | - |
|-----------------------------------|---|---------------------------|--|--------------------------|--|-------------------------|-------------|
| MICROLOG | COMPF GGER PROBE | 5310 <u>X</u> | SILVER_X 5772 OTHER | OYO OTHER | RG | OTHER | _ |
| MINUS CAS DEPTH RE DEPTH RE | FSET SING STICK F. OFFSET F. OFFSET RVEY DEPT | -UP AT START AT END | 2.08M(6.82 FT 1.25 5.57 5.65 .08 |) 12 IN MAX LESS THAI | N 0.4%? | | |
| LOG N B2306Cal B2306Cal | e text of | START DEPTH 306.257 | START TIME 7:20 pm 7:40 pm 8:16 pm | END DEPTH 5.75' | END TIME 7:21pm 8:11pm 8:11pm | | |
| CALIBRATI | ON PLATE S | S/NL 201 | | AC DUBLIT | | IDVO SITTIVO | J |
| CALIBRATI | ONFLATE | 5/IN ZU I | 1.968 IN | AS BUILT 3.937 IN | 8.000 IN | PVC FITTING 4.500 IN | ce uliblo |
| | | NAME | (50 MM) | (100 MM) | (203.2 MM) | (114.3 MM) | 1 |
| AS MEAS. | B2306 Cal | | 2.629 | 3,993 | 8.050 | 4,561 | |
| AS MEAS. | B2306cal | tustoz | 1.949 | 3.848 | 8.036 | 4.536 | |
| AS MEAS. | | | | | | | 4 |
| AS MEAS. | | | | | | | 4 |
| AS MEAS. | | | | | | | 727 |
| | NCE PERFO | RMED ON | SITE: | | | | - - |
| EQUIPMEN | T PROBLEM | IS OR FAIL | URES: | | | | |
| SUGGESTI | ONS, ADDIT | IONS, CHA | NGES: | | | | |
| | | | | | | | |

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GEOVision Report 7534-01 Exelon COL Victoria Boring Geophysical Logging rev 0



| B-2306 | _DEVIATION FIELD LOG |
|--|---|
| SITE:_EXELON VICTORIA COUNTY COL_ CLIENT:_MACTEC AUTHOR:_C. CARTER | JOB:_7501 |
| CONTACT:STEVE CRISENZOCONTACT: | |
| CONTACT: | PHONE: |
| DRILLER:COMPANY: | PHONE: |
| DIRECTIONS TO SITE: | |
| GENERAL SITE CONDITIONS/LOCATION: | |
| BOREHOLE DESIGNATION: B-2306 | LOCATION: Perimeter |
| BOREHOLE TOTAL DEPTH AS DRILLED: CONDUCTOR CASING?: YES X DEPT | UNCASED X O TO 310 St ; TO TO |
| | |

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geophysical services

| SITE:_EXELON VICTOR | NA COUNTY OO | 10-2366 | , | DATE:_/ | lula | |
|---------------------|----------------|-----------|------------|----------|-------------------|---|
| CLIENT: MACTEC | RIA COUNTY CO | r Page | | | | |
| AUTHOR:_C. CARTER | | | | JOB:_750 | | - |
| AUTHORC. GARTER_ | | | | PAGE 2 C | JF 2 | |
| LOGGING CREW:_C. C | ARTER | | | | | |
| VEHICLE(S) USED AND | | NTAL | | | | |
| MOBILIZED FROM: Vic | | | EDARTIIR | E TIME: | 2:30pm | * |
| ARRIVED ON SITE: | | | EFARTOR | E HIVE | 2.30/100 | |
| STANDBY TIME: | 7,000 | | AUSE: | | | |
| LOGGING STARTED:_ | 2:38am | | | OMPLET | ED: 8:52 | |
| 200011001711125 | - 6 | | OGGING C | OWIFEET | ED | |
| WINCH: COMPR | OBESILVE | R X O | YO | RG | ÓTHER | |
| | 5310 X 5772 | | THER | | OIIILI\ | |
| | 5174 × OTHE | | | | | |
| | | | | | | |
| PROBE TILT TEST | 8'S BRUN | TON TILT | 86 | | | |
| | | TON TILT | | | | |
| | | TON TILT | | Aft | er leg | |
| PROBE AZIMUTH TEST | | | | | 0 | |
| PROBE AZIMUTH TEST | | TON AZIMI | | | | |
| PROBE AZIMUTH TEST | | TON AZIMI | | AF | er log ter log | |
| | | | <u> </u> | | ð | |
| PROBE OFFSET | 1.44M | (4.72FT) | | | | |
| MINUS CASING STICK- | | 5' | | | | |
| DEPTH REF. OFFSET | | 7 | | | | |
| DEPTH REF. OFFSET | | | | | Sa | |
| AFTER SURVEY DEPTI | | | ESS THAN | 0.4%? | 3 | |
| | | | 200 111111 | 0.4701 | | |
| | START STAR | T E | ND . | END | | |
| LOG NAME | DEPTH TIME | | EPTH | TIME | | |
| B23064UUPO1 | | | 3.47 | D. 50 | m | |
| | | 0 7 | - | - | | |
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| | | | | | | |
| MAINTENANCE PERFO | RMED ON SITE | | | | | |
| | | | | | | |
| EQUIPMENT PROBLEM | IS OR FAILURES | S: | | | | |
| | | | | | | |
| SUGGESTIONS, ADDIT | IONS, CHANGE | S: | | | | |
| | | | | | | |
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| B-2307 | _BORING G | EOPHYSICS F | FIELD LOG | SUMMARY | | | |
|--|---|-----------------|-----------|---|--|--|--|
| CLIENT:_MACTE | SITE:_EXELON-VICTORIA DATE:_nlglo7 CLIENT:_MACTEC JOB:_7501 AUTHOR:_C. CARTER PAGE 1 OF 1 | | | | | | |
| CONTACT:_STE | VE CRISENZO | | | PHONE:_361-972-0198_ | | | |
| BOREHOLE CONSTRUCTION: CASEDUNCASEDUNCASED | | | | | | | |
| LOGGING CREW | :_C. Carter | | - | * 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 | | | |
| LOG TYPE | FILE NAME | DEPTH RANGE | DATE | TIMES | | | |
| ELOG | B23076-06155701 | ž | nliston | 11:59-12:01 pm | | | |
| ELOG | B2307EL06UPD1 | 309.35 -39.5-61 | 11/18/07 | 12:50-1:18pm | | | |
| CALIPER | BZ307CALTESTOI | | | 1:26 - 1:28 pm | | | |
| CALIPER | B230768WP01 | 304.2-5.6 ft | 11/18/07 | | | | |
| CALIPER | B2307CALTESTOZ | | <u> </u> | 1:44-2:13 pm 2:18-2:19 pm | | | |
| Dev P-suelocity | ool.org - 178.org | 2.0 - 90.5m | n 118607 | 2149 - 4131pm | | | |
| Deviation | B2307AUUPOL | 303.2 - 3.5ft | 1118607 | 5134-5147pm | | | |
| M 6 | | | | | | | |
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Ph (951) 549-1234 Fx (951) 549-1236

GEOVision Geophysical Services

1151 Pomona Road, Unit P, Corona, CA 92882

| GE Vis | ion |
|----------------------|-----|
| geophysical services | |

| <u>R-2307</u> E | LOG FIE | LD LOG |
|--|----------|------------------------------|
| SITE:_EXELON VICTORIA | | DATE: 11/18/07 |
| CLIENT: MACTEC | | JOB: 7501 |
| AUTHOR:_C. CARTER | | PAGE 1 OF 2 |
| CONTACT:_STEVE CRISENZO | | PHONE: 361-972-0198 |
| 00/1///01/_01/201/120 | | PHONE:_919-949-1707 |
| CONTACT: | OFFICE | PHONE: |
| · . | | PHONE: |
| CONTACT: | | PHONE:PHONE: |
| | | PHONE: |
| CONTACT: | | PHONE: |
| | | PHONE: |
| DRILLER: | | PHONE:PHONE: |
| COMPANY: | | PHONE: |
| BOREHOLE DESIGNATION: 3-2307 LOCA | TION: | |
| COUNTY:_VICTORIA_RANGE:TOWN BOREHOLE CONSTRUCTION: CASEDUN DIAMETERS AND DEPTH RANGES: 5 " 0 TO BOREHOLE TOTAL DEPTH AS DRILLED: 3 | SHIP: | SECTION: |
| DIAMETERS AND DEPTH RANGES: 5" 0 T | 0 310 ft | _;,TO |
| BOREHOLE TOTAL DEPTH AS DRILLED: 34 | 19 24 | |
| CONDUCTOR CASING?: YES X DEPTH TO BO | | |
| DEPTH TO BEDROCK: NA BOREHOLE FLUID: WATER FRESH WATE | DEPTH TO | O WATER TABLE: NA |
| OTUED. | | |
| DEPTH TO BOREHOLE FLUID: | TIME SIN | CE LAST CIRCULATION: 11:45am |
| LOGGING CREW:_C. CARTER | | |
| VEHICLE(S) USED AND MILEAGE: _RENTAL | | |
| MOBILIZED FROM: Victoria | DEPART | JRE TIME: 10:00 am |
| ARRIVED ON SITE: 10:30 am | | |
| | CAUSE:_ | |
| LOGGING STARTED: 12:50 mm | LOGGING | COMPLETED: 1:18 mm |

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1151 Pomona Road, Unit P, Corona, CA 92882

| SITE:_EXELON VICTORIA | | | | DATE: <u>u/18</u> JOB: 7501 PAGE 2 OF 2 | lon |
|---|---------------------------|--|--------------|--|----------------|
| 7.0 [1 0 11_0 0 11 11 11 | | | | The time about the control of the co | |
| WINCH: COMPI MICROLOGGER ELOG PROBE | 5310 <u>×</u> | 5772 | OTHER | | OTHER |
| PROBE LENGTH PLUS YOKE 10.0M (32 MINUS CASING STICK DEPTH REF. OFFSET DEPTH REF. OFFSET AFTER SURVEY DEPT | -UP AT START AT END | 2.50M(8.20 FT) 32.8 1.7 39.8 39.15 .05 | LESS THA | N 0.4%? | |
| | | | | | |
| LOG NAME | START DEPTH | START TIME | END DEPTH | END TIME | |
| B2307 ELOGIESTO1 | 309.35 | 11:51am | 39.5' | 12:01pm | 4 |
| 32307ELUGUPOI | 301.57 | 12:50 pm | 37.5 | 1.10 | ; |
| | | | | 9 | |
| | | | | | _ |
| | | | | | . |
| | <u> </u> | | <u> </u> | | |
| MAINTENANCE PERF | ORMED ON | SITE: | | | |
| EQUIPMENT PROBLE | MS OR FAIL | URES: | | | N. 03-111, 13- |
| SUGGESTIONS, ADDI | TIONS, CHA | NGES: | | | |



P-S SUSPENSION VELOCITY FIELD LOG

| SITE:_EXELON VICTORIA | | DATE: | 11/18/07 | |
|---|-----------|--------------|---------------------------------------|-----|
| CLIENT:_MACTEC | | JOB: 7501 | | • |
| AUTHOR: C. CARTER | | PAGE 1 OF | 7 | |
| AOTHOR. O. WITER | | - I AOL I OI | | 3-3 |
| CONTACT:_STEVE CRISENZO | _OFFICE_ | PHONE:_36 | 1-972-0198 | |
| | _CELL | PHONE:_91 | 9-949-1707 | |
| CONTACT: | OFFICE_ | PHONE: | | |
| | | PHONE: | | |
| CONTACT: | | PHONE: | | |
| | | PHONE: | | |
| CONTACT: | | | | |
| | | | | |
| DRILLER: | | | | |
| COMPANY: | | PHONE: | | , |
| DIRECTIONS TO SITE: | | | | |
| | | | · · · · · · · · · · · · · · · · · · · | |
| GENERAL SITE CONDITIONS/LOCATION: | | | Bayranga canggh | _ |
| EA#:BOREHOLE DESIGNATION:\(\overline{\overline{13}}\) -2307 | | Pare | ter | 140 |
| BOREHOLE DESIGNATION: 13-2307 | LOCAT | TION: TOVE | | |
| COUNTY:_VICTORIA_RANGE:TOVE BOREHOLE CONSTRUCTION: CASED DIAMETERS AND DEPTH RANGES:C | UNCASED | X | | |
| PODEUOI E TOTAL DEDTU AS DOLLIED. 3. | /D 4 5 | | | |
| CONDUCTOR CASING?: YES CONDUCTOR CASING. | BOTTOM | OF CASING | 2' : NO | |
| DEPTH TO BEDROCK: NA ' | DEPTH TO | WATER TA | BLE: 15A | |
| BOREHOLE FLUID: WATER; FRESH WA | ATER MUD_ | X ; SALT | WATER MUD; | |
| DEPTH TO BOREHOLE FLUID: | TIME SINC | E LAST CIR | CULATION: 11:45am | |

GEOVision Geophysical Services

GEOVision Report 7534-01 Exelon COL Victoria Boring Geophysical Logging rev 0

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April 29, 2008

Page 506 of 543



| SITE: EXELON VICTORIA 13-2307 | DATE: 11/18/07 |
|---|--|
| CLIENT:_MACTEC | JOB: 7501 |
| | PAGE 2 OF |
| 7.011.01.1.20.00.11.11.1 | 17,02201 |
| | |
| LOGGING CREW:_C. CARTER | |
| VEHICLE(S) USED AND MILEAGE: _RENTAL_ | |
| MOBILIZED FROM:_Victoria, TX | DEPARTURE TIME: 10:00 am |
| ARRIVED ON SITE: 10:30am | <u>-</u> |
| STANDBY TIME: | CAUSE: |
| LOGGING STARTED: 2149 | LOGGING COMPLETED: 4:31m |
| STANDBY TIME: LOGGING STARTED: 2:49 STANDBY TIME: | CAUSE: |
| LOGGING STARTED: | LOGGING COMPLETED: |
| DEMOBILIZED TO: | |
| ADDITIONAL DEMOB TIME: | |
| 25 | |
| | ES; NO_X_; STORED WITH NEW |
| | |
| | |
| EQUIPMENT PROBLEMS OR FAILURES: | |
| | |
| | |
| SUGGESTIONS, ADDITIONS, CHANGES: | |
| | |
| | |
| COMMENTS: Top of de Casing | 3.37m RP: 1.63m 0 4:51 |
| | The state of the s |
| | |
| | |
| CEOVinian Coophysical Services 4454 Demons Bosonia | |

| SITE:_EXELON VICTORIA | DATE: u/18/07 |
|-----------------------|---------------|
| CLIENT:MACTEC | JOB:_7501 |
| AUTHOR:_C. CARTER | PAGE3OF |

| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS |
|--------|-------|------------|--|--|
| METERS | | FILE NO. | FILE NO. | 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 | i | | |
| 7.5 | 24.61 | 12 | | |
| 8.0 | 26.25 | 13 | | |
| 8.5 | 27.89 | 14 | | |
| 9.0 | 29.53 | (5 | | |
| 9.5 | 31.17 | 16 | | |
| 10.0 | 32.81 | 17 | | new puper |
| 10.5 | 34.45 | 18 | 200 - Canada Sanda S | |
| 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 | | 1. · |
| 17.5 | 57.41 | 32 | | and the second of the second o |
| 18.0 | 59.06 | 33 | | - 1 |
| 18.5 | 60.70 | 34 | | |
| 19.0 | 62.34 | 32 | | 15.3 |
| 19.5 | 63.98 | 36 | | |
| 20.0 | 65.62 | 37 | | Part of the second seco |

| SITE:_EXELON VICTORIA_ B-235) | DATE: "Ilslo7 |
|-------------------------------|---------------|
| CLIENT:_MACTEC | JOB:_7501 |
| AUTHOR:_C. CARTER | PAGE 4 OF 7 |

| AUTHOR: | _C. CARTI | <u> </u> | | PAGEOF |
|--------------|----------------|------------|-------------|--------------------------|
| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS |
| METERS | | FILE NO. | FILE NO. | CASING, WATER, ROCK, ETC |
| WEIERS | ILEEI | IFILE NO. | IFILE NO. | CASING, WATER, ROCK, ETC |
| | | | | |
| 20.5 | 67.26 | 38 | 1 | |
| 20.5 | 68.90 | 39 | | |
| 21.0 | 70.54 | 40 | | |
| 21.5 22.0 | | 41 | | |
| | 72.18 | 42 | | |
| 22.5 | 73.82 75.46 | - 43 | | |
| 23.5 | 77.10 | 44 | | |
| 24.0 | 78.74 | 45 | | |
| 24.5 | 80.38 | 46 | | / |
| 25.0 | 82.02 | 45 | | |
| 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 | 22 | | |
| 29.5 | 96.78 | 56 | | |
| 30.0 | 98.43 | 57 | | |
| 30.5 | 100.07 | 28 | | |
| 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 | 1 | |
| 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 | 25 | | |
| 39.5 | 129.59 | 76 | | |
| 40.0 | 131.23 | 77 | | |
| 70.0 | 101.20 | | | |

| SITE:_EXELON VICTORIA_ 8-2361 | DATE: 11/18/07 | |
|-------------------------------|----------------|--|
| CLIENT: MACTEC | JOB:_7501 | |
| AUTHOR:_C. CARTER | PAGE | |

| DEPTH DEP | TH UNFILTERED | (FILTERED | COMMENTS | |
|-------------|---------------|-----------|--------------------------|--|
| METERS FEET | Γ FILE NO. | FILE NO. | CASING, WATER, ROCK, ETC | |

| | | | |
|------|----------|----------------|-------------|
| 40.5 | 132.87 | 78 | |
| 41.0 | 134.51 | 79 | |
| 41.5 | 136.15 | 80 | |
| 42.0 | 137.80 | કો | , |
| 42.5 | 139.44 | 82 | |
| 43.0 | 141.08 | 83 | 2 |
| 43.5 | 142.72 | 84 | |
| 44.0 | 144.36 | & S | |
| 44.5 | 146.00 | 86 | |
| 45.0 | 147.64 | 87 | |
| 45.5 | 149.28 | 88 | |
| 46.0 | 150.92 | 89 | |
| 46.5 | 152.56 | 10 | |
| 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 | <u> የ</u> ን | |
| 50.5 | 165.68 | 98 | |
| 51.0 | 167.32 | 99 | |
| 51.5 | 168.96 | טטן | 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 | 165 | |
| 54.5 | 178.81 | 106 | |
| 55.0 | 180.45 | 167 | |
| 55.5 | 182.09 | 80) | : |
| 56.0 | 183.73 | 199 | |
| 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 | lls | |
| 59.5 | 195.21 | 116 | |
| 60.0 | 196.85 | 117 | |

| SITE:_EXELON VICTORIA_B-2307_ | DATE: 111847 | |
|-------------------------------|--------------|--|
| CLIENT:MACTEC | JOB:_7501 | |
| AUTHOR:_C. CARTER | PAGE6OF | |

| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS |
|--------|-------|------------|----------|--------------------------|
| METERS | FEET | FILE NO. | FILE NO. | CASING, WATER, ROCK, ETC |

| 80.5 198.49 118 61.0 200.13 119 61.5 201.77 17.0 17. | | | | | |
|--|------|--------|------|-----|-----------|
| 61.5 201.77 120 62.0 203.41 12-1 62.5 205.05 122 63.0 206.69 123 63.5 208.33 124 64.0 209.97 12.5 64.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13/1 67.5 221.46 132 68.0 223.10 1/3 68.0 223.10 1/3 68.1 224.74 134 69.0 226.38 135 69.5 228.02 136 70.0 229.66 137 70.5 231.30 138 71.0 232.94 13 71.5 234.58 140 72.5 237.86 147 74.0 242.78 145 75.0 248.06 147 76.0 249.34 156 76.0 249.34 156 76.0 249.34 156 76.0 249.34 156 77.0 252.62 157 77.5 254.27 153 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 78.0 255.91 154 | 60.5 | 198.49 | 118 | | |
| 62.0 203.41 12-1 62.5 205.05 12-2 63.0 206.69 12-3 63.5 208.33 12-4 64.0 209.97 12-5 64.5 211.61 12-6 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13-1 67.5 221.46 13-2 68.0 223.10 13-3 68.5 224.74 13-4 68.0 223.10 13-3 68.5 224.74 13-4 68.0 226.38 13-7 70.5 231.30 13-8 71.0 229.96 13-7 71.5 234.58 14-0 72.0 236.22 14-1 72.0 236.22 14-1 74.0 242.78 14-5 75.5 247.70 14-9 76.0 249.34 15-6 76.5 250.98 15-6 77.0 252.86 15-7 77.5 254.27 15-3 77.5 254.27 15-3 77.5 254.27 15-5 78.0 255.91 15-4 78.0 255.91 15-5 78.0 255. | 61.0 | 200.13 | 119 | | 42 |
| 62.0 203.41 12-1 62.5 205.05 122 63.0 206.69 12.3 63.5 208.33 124 64.0 209.97 12.5 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13/4 68.0 223.10 13/3 68.5 224.74 13/4 69.0 226.38 13/7 70.0 226.66 137 71.5 234.58 140 71.5 234.58 140 71.6 232.94 13/7 71.5 234.58 140 71.0 242.78 14/5 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 14/7 71.0 242.06 15/6 71.0 245.06 15/7 71.0 252.02 15/5 71.0 255.91 15/4 71.0 255.91 15/5 | 61.5 | 201.77 | 120 | | |
| 62.5 205.05 122 63.0 206.69 123 63.5 208.33 124 64.0 209.97 125 64.5 211.81 12-6 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13/ 67.0 219.82 13/ 68.0 223.10 13/ 68.5 224.44 13-9 69.0 226.38 13/ 69.0 226.38 13/ 70.0 229.66 137 70.5 231.30 13/ 71.0 232.94 13/ 71.0 238.90 14/3 73.0 238.90 14/3 73.0 244.42 14/6 75.0 248.94 15/9 75.5 247.70 14/9 75.5 247.70 14/9 76.0 248.94 15/9 77.0 252.62 15/2 77.5 254.27 15/3 78.0 255.91 15/4 78.0 255.91 15/4 78.0 255.91 15/4 78.0 255.91 15/4 78.0 255.91 15/4 78.0 255.91 15/4 78.0 255.91 15/4 | | 203.41 | 121 | | |
| 63.0 206.69 123 63.5 208.33 124 64.0 209.97 125 64.6 211.61 12-6 65.0 213.25 12-7 65.5 214.90 12-8 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 68.0 223.10 133 68.5 224.74 137 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 71.5 234.55 140 72.0 236.22 147 72.5 237.86 147 72.0 236.22 147 73.0 239.50 143 73.5 241.14 144 74.0 242.78 143 75.5 24.70 143 76.0 249.34 150 76.0 249.34 150 76.0 249.34 150 77.0 252.62 152 77.0 252.62 152 77.0 252.62 152 77.0 252.62 155 78.0 259.99 155 | | | 122 | . 4 | |
| 63.5 208.33 124 64.0 209.97 12.5 64.5 211.61 12-6 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13/ 67.5 221.46 132 68.0 223.10 13-3 68.5 224.74 13-4 68.0 226.38 13-5 69.5 228.02 13-6 70.0 229.66 13-7 70.5 231.30 13-8 71.0 232.94 13-7 71.5 234.58 14-0 72.0 236.22 14-1 72.5 237.86 14-7 73.0 239.50 14-3 73.5 241.14 14-4 74.0 242.78 14-5 75.0 246.06 14-7 75.5 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.0 255.62 15-7 77.0 252. | | | 123 | • | |
| 64.0 209.97 12.5 64.5 211.61 12-6 65.0 213.25 12-7 66.5 214.90 11-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13.1 67.5 221.46 13-2 68.0 223.10 13.3 68.6 224.74 13-7 68.0 226.38 13-7 69.0 226.38 13-7 70.5 231.30 13-8 71.0 232.94 13-7 71.5 234.58 14-0 72.0 236.22 14/1 72.5 237.86 14-7 73.0 239.50 14-7 74.0 424.78 14-7 74.0 424.78 14-7 75.5 244.42 14-6 75.0 246.06 14-7 75.5 244.42 14-6 75.0 246.06 14-7 75.5 25.5 24.70 14-9 76.5 25.59 155 79.0 259.19 155 | | | 124 | | |
| 64.5 211.61 12-6 65.0 213.25 12-7 65.5 214.90 12-8 66.0 216.54 1/2-9 66.5 218.18 13-0 67.0 219.82 13.1 67.5 221.46 13-2 68.0 223.10 13-3 68.5 224.74 13-7 68.0 226.38 13-5 69.5 228.02 13-6 70.0 229.66 13-7 70.5 231.30 13-8 71.0 232.94 13-9 71.5 234.58 14-0 72.0 236.22 14-1 72.5 237.86 14-2 73.0 239.50 14-3 73.0 239.50 14-3 74.0 242.78 14-5 75.0 246.06 14-7 75.5 247.70 14-9 76.0 249.34 15-0 76.5 250.98 15-1 77.0 252.62 15-2 77.0 252.62 15-2 77.5 254.27 15-3 78.0 255.91 15-4 78.0 255.91 15-4 78.0 255.91 15-4 78.0 255.91 15-4 78.0 255.91 15-4 78.0 255.91 15-5 79.0 259.19 15-5 | | | 125 | | |
| 65.0 213.25 12-7 66.5 214.90 12-8 66.0 216.54 12-9 66.0 216.54 12-9 66.0 218.18 13-0 67.0 219.82 13/ 67.5 221.46 13-2 68.0 223.10 13-3 68.5 224.74 13-7 69.0 226.38 13-7 70.0 229.66 13-7 70.5 231.30 13-8 71.0 232.94 13-9 71.5 234.58 14-0 72.0 236.22 14-/ 72.5 237.86 14-7 73.0 239.50 14-3 73.0 240.56 14-7 74.0 242.78 14-5 75.0 246.06 14-7 75.5 247.70 14-9 76.0 249.34 15-0 76.5 250.98 15-7 77.0 252.62 15-2 77.0 252.62 15-2 77.0 252.62 15-2 77.0 252.62 15-2 77.5 254.27 15-3 78.0 255.91 15-7 78.0 255.91 15-7 78.0 255.91 15-7 78.0 259.19 15-7 78.0 259.19 15-7 78.0 259.19 15-7 78.0 259.19 15-7 78.0 259.19 15-7 78.0 259.19 15-7 78.0 259.19 15-7 78.0 259.19 15-7 | | | 126 | | |
| 65.5 214.90 12-8 66.0 216.54 12-9 66.5 218.18 13-0 67.0 219.82 13/ 67.5 221.46 13-2 68.0 223.10 13-3 68.5 224.74 13-4 69.0 226.38 13-5 69.0 226.38 13-5 69.5 228.02 13-6 70.0 229.86 13-7 70.5 231.30 13-8 71.0 232.94 13-9 71.5 234.58 14-0 72.0 236.22 14-1 72.5 237.86 14-7 73.0 239.50 14-3 73.5 241.14 14-4 74.0 242.78 14-5 75.0 246.06 14-7 75.5 244.06 14-7 75.5 244.06 14-7 76.0 249.34 15-0 76.0 249.34 15-0 76.0 249.34 15-0 76.5 250.98 15-5 77.0 255.91 15-4 78.0 255.91 15-5 79.0 259.19 15-6 | | | 127 | | |
| 66.0 216.54 1/29 66.5 218.18 1/30 67.0 219.82 1/3/ 67.5 221.46 1/32 68.0 223.10 1/3/ 68.5 224.74 1/37 69.0 226.38 1/35 69.5 228.02 1/36 70.0 229.66 1/37 70.5 231.30 1/38 71.0 232.94 1/39 71.5 234.58 1/40 72.0 236.22 14/ 72.5 237.86 1/47 73.0 239.50 1/4/3 74.0 242.78 1/4/5 74.5 244.42 1/4/6 75.0 246.06 1/47 76.0 249.34 1/50 76.5 250.98 1/5(77.0 252.62 1/52 77.0 252.62 1/52 77.0 255.55 1/55 79.0 259.19 1/5/5 | | | 128 | | |
| 66.5 218.18 130 67.0 219.82 131 67.5 221.46 132 68.0 223.10 133 68.0 226.38 135 69.0 226.38 135 69.5 228.02 136 70.0 229.66 137 70.5 231.30 138 71.0 232.94 137 71.5 234.58 140 72.0 236.22 141 73.0 239.50 143 73.5 241.14 1444 74.0 242.78 145 74.0 242.78 145 75.0 246.06 147 75.5 247.70 149 76.0 249.34 150 76.5 250.98 156 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 77.0 255.62 157 78.0 255.51 154 | | | 129 | | |
| 67.0 219.82 13/ 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 74.0 242.78 143 74.0 242.78 143 75.5 241.14 144 76.0 249.34 150 76.0 249.34 150 76.5 250.98 15{ 77.0 252.62 152 77.0 252.62 152 77.0 252.62 157 77.0 255.63 154 77.0 255.63 154 77.0 255.63 154 77.0 255.63 154 77.0 255.63 154 77.0 255.63 155 78.0 255.51 154 78.5 257.55 155 | | | 130 | | |
| 67.5 221.46 | | | | | |
| 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 72.5 237.86 147 73.0 239.50 143 73.5 241.14 1444 74.0 242.78 145 75.0 246.06 147 75.5 247.70 149 76.0 249.34 156 76.0 249.34 156 77.0 252.62 152 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 | | | | | |
| 68.5 224.74 /34 69.0 226.38 /35 69.5 228.02 /36 70.0 229.66 137 70.5 231.30 138 71.0 232.94 /37 71.5 234.58 /40 72.0 236.22 /4/ 72.5 237.86 /42 73.0 239.50 /43 73.5 241.14 /44 74.0 242.78 /45 74.5 244.42 /46 75.0 246.06 /47 75.5 247.70 /47 76.0 249.34 150 76.5 250.98 157 77.0 252.62 152 77.0 252.62 152 77.0 252.62 152 77.0 255.91 154 78.0 255.91 154 78.5 257.55 155 79.0 259.19 156 | | | 133 | | |
| 69.0 226.38 /35 69.5 228.02 /36 70.0 229.66 137 70.5 231.30 138 71.0 232.94 /39 71.5 234.58 /40 72.0 236.22 /4/ 72.5 237.86 /42 73.0 239.50 /43 73.5 241.14 /44/ 74.0 242.78 /45 74.5 244.42 /46 75.0 246.06 /47 75.5 247.70 /49 76.0 249.34 / 150 76.5 250.98 /5{ 77.0 252.62 /52 77.5 254.27 /53 78.0 255.91 /54 78.5 257.55 /55 79.0 259.19 /56 | | | 134 | | |
| 69.5 228.02 /36 70.0 229.66 137 70.5 231.30 138 71.0 232.94 139 71.5 234.58 /40 72.0 236.22 /4/ 72.5 237.86 /42 73.0 239.50 /43 73.5 241.14 /44 74.0 242.78 /45 75.0 246.06 147 75.5 247.70 /49 76.0 249.34 150 76.0 249.34 150 76.5 250.98 15{ 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 | | | 135 | | |
| 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 72.5 237.86 147 73.0 239.50 143 73.5 241.14 144 74.0 242.78 145 75.0 246.06 147 75.5 247.70 149 76.0 249.34 150 76.5 250.98 151 77.0 252.62 157 77.5 254.27 153 78.0 255.91 154 78.5 257.55 155 79.0 259.19 156 | | | 136 | | |
| 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 75.0 246.06 147 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 | | | 137 | | |
| 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 75.0 246.06 147 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 | | | | | |
| 71.5 | | | | | |
| 72.0 236.22 14/ 72.5 237.86 142 73.0 239.50 143 73.5 241.14 144 74.0 242.78 145 75.0 246.06 147 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 | | | 140 | | |
| 72.5 237.86 | | | 141. | | |
| 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 75.5 247.70 149 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 | | | 142 | | |
| 73.5 241.14 /44 74.0 242.78 /45 74.5 244.42 /46 75.0 246.06 147 75.5 247.70 149 76.0 249.34 15b 76.5 250.98 15{ 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 | | | 143 | | |
| 74.0 242.78 | | | 144 | | |
| 74.5 244.42 146 75.0 246.06 147 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 | | | 145 | | |
| 75.0 246.06 147 hlu 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 | | 244.42 | 146 | | |
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| 80.0 262.47 157 | | | 157 | | |

| SITE: EXELON VICTORIA B-230 | DATE: "(18/07 | |
|-----------------------------|---------------|--|
| CLIENT: MACTEC | JOB:_7501 | |
| AUTHOR:_C. CARTER | PAGEOF | |

| DEPTH DEPTH | UNFILTERED | FILTERED | COMMENTS | · 64 |
|-------------|------------|----------|--------------------------|------|
| | FILE NO. | FILE NO. | 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 | | |
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| 97.0 | 318.24 | | | |
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| 100.0 | 328.08 | | | |

| GE Vision |
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| <u> K-2301</u> C/ | ALIPEK | FIELD LOG |
|---|----------------|--|
| SITE:_EXELON VICTORIA COUNTY COLCLIENT:_MACTEC | - . | DATE: 11/18/67 JOB: 7501 |
| AUTHOR: C. CARTER | | PAGE 1 OF 2 |
| | | • 0 0 0 00 000 000 000 000 000 000 000 |
| 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: | | 1110112 |
| | | PHONE: |
| | | PHONE: |
| COMPANY: | | PHONE: |
| BOREHOLE DESIGNATION: R-2367 L | .OCATION: | Parimeter |
| COUNTY:_VICTORIA_RANGE:TOWNS | HIP: | SECTION: |
| | | |
| DIAMETERS AND DEPTH RANGES: 5" 0 TO | 310 ft | |
| BOREHOLE TOTAL DEPTH AS DRILLED: 310 | £4 | |
| CONDUCTOR CASING?: YES_K_ DEPTH TO BO | TTOM OF | Casing_2; No |
| DEPTH TO BEDROCK: | DEPTH TO | WATER TABLE: VA |
| DEPTH TO BEDROCK:; FRESH WATER; FRESH WATER; FRESH WATER; | | |
| DEPTH TO BOREHOLE FLUID: | TIME SINC | E LAST CIRCULATION: 11:45 am |
| LOGGING CREW:_C. CARTERVEHICLE(S) USED AND MILEAGE: _RENTAL | | |
| MOBILIZED FROM:_VICTORIA, TX | DEPARTU | RE TIME: 10:00 am |
| ARRIVED ON SITE: 10:30 am STANDBY TIME: | | 91 |
| STANDBY TIME: | CAUSE: | |
| LOGGING STARTED: 1:44 pm | LOGGING | COMPLETED: 2:13 pm |

1151 Pomona Road, Unit P, Corona, CA 92882

Ph (951) 549-1234 Fx (951) 549-1236

| SITE:_EXEL CLIENT:_M/ AUTHOR:_C | ACTEC | | Y COL <u>B-23</u> 07 | | DATE: <u>u lvgl</u> JOB: _7501 PAGE 2 OF 2 | | |
|---|--|--------------------|--|----------------------------------|--|--|------------|
| WINCH: MICROLOG CALIPER PI | GER | 5310 <u>×</u> | SILVER_X 5772 OTHER | OYO OTHER | RG | OTHER | |
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| CALIBRATIO | | S/N 201 | 1.968 IN (50 MM) | AS BUILT 3.937 IN (100 MM) | 8.000 IN (203.2 MM) | PVC FITTING 4.500 IN | lulo |
| AS MEAS. AS MEAS. AS MEAS. AS MEAS. | B2307CAL | | 2.025 | 3.948 3.952 | 8.036 | 4.567 | |
| AS MEAS. AS MEAS. | NCE PEREC | DRMED ON | SITE: | | | | |
| EQUIPMEN | T PROBLE | MS OR FAIL | URES: | | | | ^ . ^ . |
| SUGGESTI | ONS, ADDIT | TIONS, CHA | NGES: | | | | - - |

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| 3-2307 | _DEVIATION FIELD LOG |
|--|--|
| SITE:_EXELON VICTORIA COUNTY COL_ CLIENT:_MACTEC AUTHOR:_C. CARTER | DATE: <i>ulisto1</i> JOB:_7501 PAGE 1 OF 2 |
| CONTACT:_STEVE CRISENZOCONTACT:CONTACT: | PHONE: PHONE: |
| Х • | PHONE: PHONE: PHONE: PHONE: PHONE: |
| GENERAL SITE CONDITIONS/LOCATION: | |
| BOREHOLE CONSTRUCTION: CASED | TOWNSHIP: SECTION: UNCASED X 0 TO 310 ft; TO 310 ft H TO BOTTOM OF CASING 2 ; NO DEPTH TO WATER TABLE: NA WATER MUD X ; SALT WATER MUD ; |
| DEPTH TO BOREHOLE FLUID: | TIME SINCE LAST CIRCULATION: 11:45 am |

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GEOVision Report 7534-01 Exelon COL Victoria Boring Geophysical Logging rev 0

April 29, 2008 Page 515 of 543

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DCN# EXE805



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| SITE:_EXELON VICTOR | RIA COUN | TY COL 8 - 230 | 7_ | DATE: 1/18 JOB: 7501 | 67 | | |
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| AUTHOR:_C. CARTER_ | | | | PAGE 2 OF 2 | | | |
| LOGGING CREW:_C. C | | DENITAL | | | | | |
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| MAINTENANCE PERFO | RMED ON | N SITE: | | | | | |
| EQUIPMENT PROBLEM | IS OR FA | ILURES: | | | | | |
| SUGGESTIONS, ADDIT | TIONS, CH | ANGES: | | | | | |
| GEOVision Geophysical Service | s 11. | 51 Pomona Road, U | nit P, Corona, (| CA 92882 Ph (9 | 951) 549-1234 Fx (951) 549-123 | | |

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 SH 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



Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06

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 GEOVision's Seismograph Calibration Procedure or accuracy of the recorder. equivalent should be used. Calibration must be performed on an annual basis.



Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06 Page 2

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

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



Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06 Page 3

- 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



Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06 Page 4 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 $S_{\rm H}$ -wave pulse trains to verify the data obtained from the first arrival of the $S_{\rm H}$ -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 Contany Mart Date 9/11/06

QA Review______Date_____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

GE Vision Procedure for OYO P-S Sus

Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06 Page 5

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OYO SUSPENSION P-S VELOCITY LOGGING SETUP

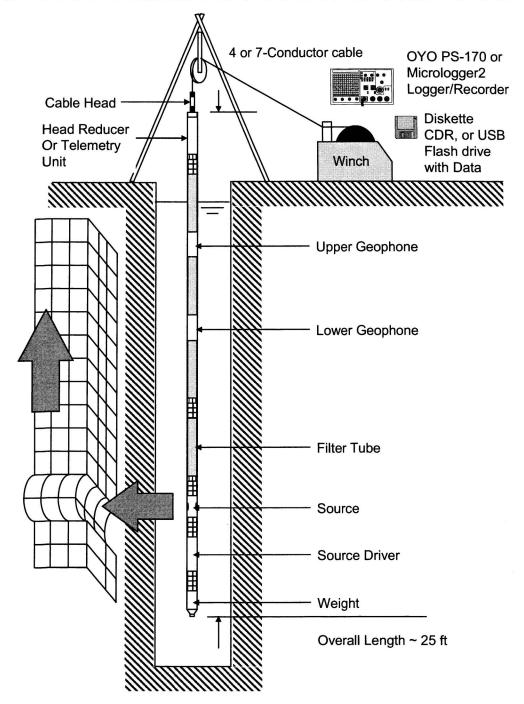


Figure 1. Suspension PS logging method setup

GE Vision

Procedure for OYO P-S Suspension Seismic Velocity Logging

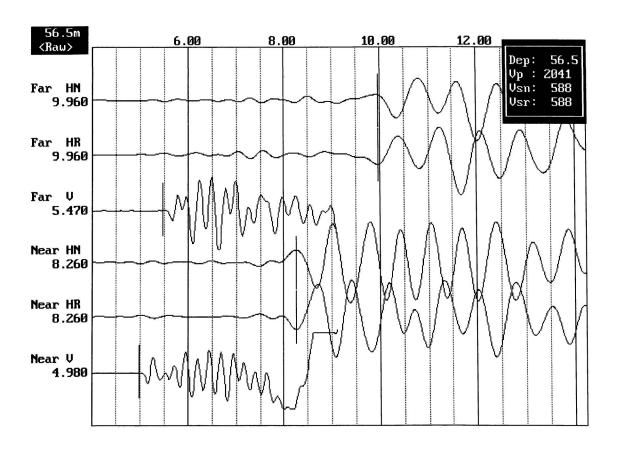


Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner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

Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06 Page 7

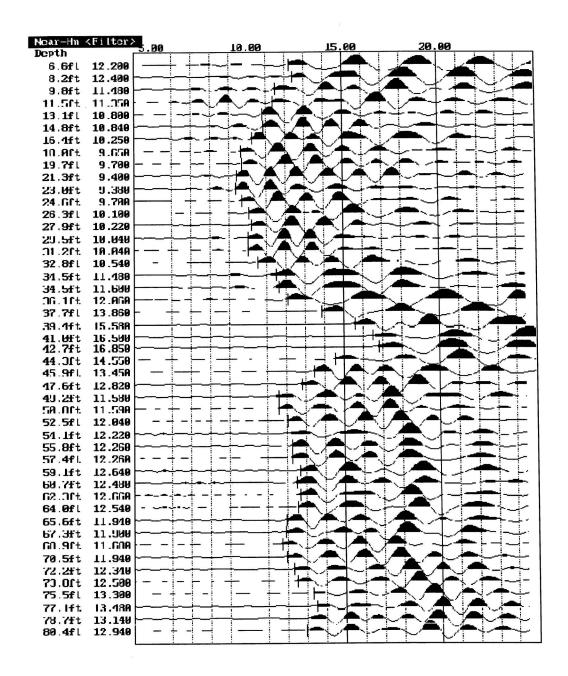


Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole

Procedure for OYO P-S Suspension Seismic Velocity Logging Rev 1.31 9/11/06 Page 8



P-S SUSPENSION VELOCITY FIELD LOG

| SITE: | DATE: |
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| | JOB: |
| | PAGE 1 OF |
| CONTACT: | OFFICE PHONE: |
| | PHONE: |
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| BOREHOLE CONSTRUCTION: CASE | ED UNCASED |
| | 0 TO;,TO |
| BOREHOLE TOTAL DEPTH AS DRILL | |
| | DEPTH TO BOTTOM OF CASING; NO |
| | DEPTH TO WATER TABLE: |
| BOREHOLE FLUID: WATER; FF | RESH WATER MUD; SALT WATER MUD; |
| DEPTH TO BOREHOLE FLUID: | TIME SINCE LAST CIRCULATION: |

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| SITE: | DATE: |
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| CLIENT: | JOB: PAGE 2 OF |
| AUTHOR: | PAGE 2 OF |
| | |
| LOGGING CREW: | |
| VEHICLE(S) USED AND MILEAGE: | |
| MOBILIZED FROM: | DEPARTURE TIME: |
| ARRIVED ON SITE: | _ |
| STANDBY TIME: | _CAUSE: |
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| AUTHOR: | | . 7 180 | | PAGE | OF |
| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS | |
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| 0.5 | 1.64 | | | | |
| 1.0 | 3.28 | | | | |
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| DEPTH | DEPTH | UNFILTERED | FILTERED | COMMENTS | | | |
| METERS | FEET | FILE NO. | FILE NO. | CASING, WA | TER, 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 | | | | 30. 30. 30. 30. 30. 30. 30. 30. 30. 30. | | |
| 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 | | 5. | | | | |
| 29.5 | 96.78 | | | | 2 | | |
| 30.0 | 98.43 | | | | | | |
| 30.5 | 100.07 | | | 0.0 | | | |
| 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 | | | | | | |

116.47

118.11

35.5

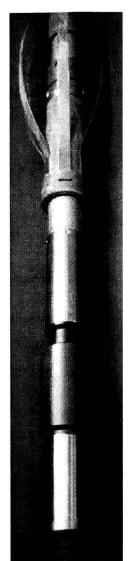
36.0

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.



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