# OUTENIQUA LAB

# EXTENTION TO WALVIS ROAD MOSSEL BAY SOIL INVESTIGATION



MAY 2018

Authors:

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## Introduction

Outeniqua Lab (Pty) Ltd was requested by Aurecon of George to conduct a soil investigation on an green field area proposed for the extension of Walvis road. The investigation was done by.

- Machine (TLB) excavating five trial pits until machine refusal,
- Profiling of the five trial pits using the "MCCSSO" format,
- Taking disturbed samples of the various materials encountered for materials testing,
- Handheld Dynamic Cone Penetrometers (DCP) to a maximum depth of 2m or refusal.

### **General Appreciation**

The site lays to the west of the existing Walvis road section and is bordered between Louis Fourie Weg on the Northern side and a School fence line on the Southern side.

The site has two distinct storm water valleys which would flood/flow during rainy periods and the grade of the rest of the site falls towards the North.

Isolated rock outcrops are scattered across the site.

### Available Information

The following maps, plans and analysing software was used for the desk study of the road section:

- The 1:250 000 Geological map of the area (Sheet 3322 Oudtshoorn) obtained from the Council for Geoscience.
- Arial images obtained from Google Earth.
- A layout plan obtained from Aurecon.

### Geology

The geological mapping indicates that the site is underlain by Shales of the Bokkeveld Series and Feldspathic Sandstones of the Table Mountain Series.

### **Site Investigation**

In order to investigate the road section, the following was undertaken:

- Six trial pits were machine excavated to a maximum depth of 2.7m of refusal, profiled according to MCCSSO and disturbed samples taken for moisture content as well as California Bearing Ratio (CBR) testing.
- Seven number of hand held Dynamic Cone Penetrometer (DCP) tests were performed from the natural ground level.

# **Outcome of the Site Investigation**

## **Field Testing**

The detailed information and test results of the materials, trial pits and DCP's performed on the road section are attached.

Find a summary of the trial pits below:

| Position | Depth         | Thickness | Description  |
|----------|---------------|-----------|--|
|          | (mm)          | (mm)      |  |
| TP 1     | 0-180         | 180       | Dry, dark grey, dense, intact, SILTY SANDY GRAVEL, transported.  |
|          | 180-700       | 520       | Dry, light reddish orange, dense, intact, SANDSTONE ROCK, residual.                                      |
| TP 2     | 0-500         | 500       | Slightly moist, dark grey, dense, intact, SILTY SANDY GRAVEL WITH ROOTS, transported.                    |
|          | 500-1200      | 700       | Slightly moist, light brown, dense, intact, SANDSTONE ROCK, residual.                                    |
| TP 3     | 0-600         | 600       | Slightly moist to moist, dark reddish orange, dense, intact, SILTY SANDY GRAVEL WITH ROOTS, transported. |
|          | 600-620       | 20        | Dry, light reddish orange, dense, intact, SANDSTONE ROCK, residual.                                      |
| TP 4     | 0             |           | Dry, light reddish orange, dense, intact, SANDSTONE ROCK, residual.                                      |
| TP 5     | 0-250         | 250       | Dry, light brown, dense, intact, SILTY SANDY GRAVEL WITH ROOTS, transported.                             |
|          | 250-1010      | 760       | Dry, light reddish orange, very dense, intact, SILTY SANDY GRAVEL WITH BOULDERS, transported.            |
|          | 1010-<br>1700 | 690       | Dry, light reddish orange, dense, intact, SANDSTONE ROCK, residual.                                      |
| TP 6     | 0-170         | 170       | Slightly moist to moist, dark brown, medium dense, intact, SILTY SANDY CLAY WITH GRASS, transported.     |
|          | 170-2700      | 2530      | Moist, dark brown, dense, intact, SILTY SANDY CLAY WITH COBBLES, transported.                            |
| TP 7     | 0-1300        | 1300      | Slightly moist to moist, dark reddish orange, dense, intact, SILTY SAND WITH BRICKS AND RUBBLE, fill.    |
|          | 1300-<br>2200 | 900       | Moist, dark reddish orange, dense, intact, SILTY SAND, transported.                                      |
|          | 200-1400      | 1200      | Dry, light reddish orange, dense, intact, SANDSTONE ROCK, residual.                                      |

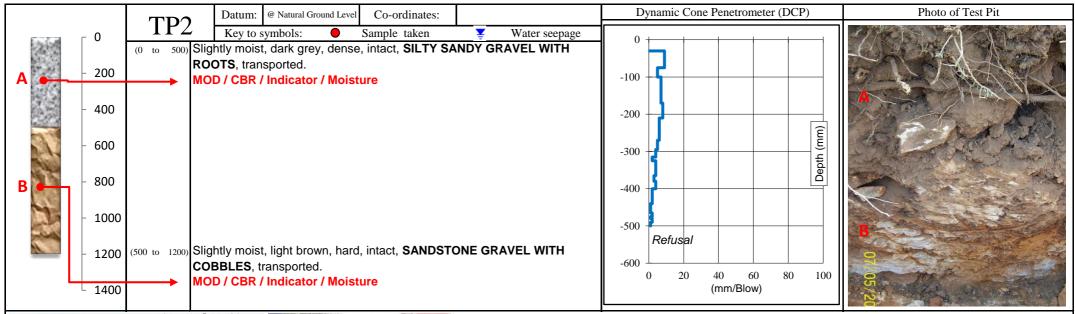
Llewelyn Heathcote - B-Tech. (Civil Eng.) & BSc Hons (Transportation)

For Outeniqua Lab (Pty) Ltd.

|                                    |            |                   |                        |   |                     |                         | -                         |  |
|------------------------------------|------------|-------------------|------------------------|---|---------------------|-------------------------|---------------------------|--|
|                                    | Oute       | eniqua            | Lab (Pty)              | Ltd.  | R-PRC               |                         | Aurecon<br>65 York Street |  |
|                                    |            | ls Testing La     |                        |   | Dec                 | -14 Customer :          |                           |  |
|                                    |            | lis Testing La    | aboratory              |   |                     |                         | George<br>6530            |  |
|                                    | U          |                   | ge : PO Box 3186,      | George Industria, 6536                                    |                     | Project :               |                           | Soil Investigation - Mossel Bay  |
|                                    |            |                   |                        | il: llewelyn@outeniqualab.co.z                            | za                  | Date Reported :         |                           |  |
|                                    |            |                   |                        |   |                     | Dementia                | one Penetrometer (DCP)    |  |
|                                    |            | TP1               |                        | Ground Level Co-ordinates:                                |                     |                         | one Penetrometer (DCP)    | Photo of Test Pit  |
| it with                            | _ O        |                   | Key to symbols:        | Sample taken  | Water seepa         |                         |                           |  |
|                                    | 100        |                   | ansported.             | , intact, SILTY SANDY GI                                  |                     |                         |                           | 700  |
| A                                  | - 100      |                   | ansponed.              |   |                     | -100                    |                           |  |
| 1000                               | - 200      |                   |                        |   |                     | 200                     |                           |  |
| <b>新教</b>                          | 200        |                   |                        |   |                     | -200                    |                           |  |
| 1.2.2                              | - 300      |                   |                        |   |                     | -300                    | Ξ                         | A Charles he   |
|                                    |            |                   |                        |   |                     | 5                       |                           |  |
| B                                  | - 400      |                   |                        |   |                     | -400                    | Depth (mm)                | A A A A A A A A A A A A A A A A A A A  |
| 1039月                              | - 500      |                   |                        |   |                     |                         |                           | the state of the s |
| 100                                | 500        |                   |                        |   |                     | -500                    |                           | ENT AS AN AND SON 1  |
| 588 H                              | - 600      |                   |                        |   |                     | -600                    |                           |  |
|                                    |            |                   | un light roddioh oron  | as hard intest CANDET                                     |                     | Refusa                  | I                         | B  |
| 101454                             | - 700      | (180 to 700) D    | ry, light reduish oran | ge, hard, intact, <b>SANDST</b>                           | UNE RUCK, residual. | -700                    |                           |  |
|                                    |            |                   |                        |   |                     | 0 20                    |                           |  |
|                                    | └ 800      |                   |                        |   |                     |                         | (mm/Blow)                 |  |
| CLIENT<br>ROJECT<br>TEST R<br>DATE | 1AU<br>107 | IRECON<br>11-0520 | Rojeu<br>Test<br>Dati  | IT IAURECON<br>T II<br>RT: TP I<br>= 107-052018<br>To<br> |                     |                         |                           |  |
|                                    |            |                   | Directors              | D McDonald (Reg. Eng. )                                   |                     | Jeathcote (B-Tech Civil | ) · Miss A Govender       |  |

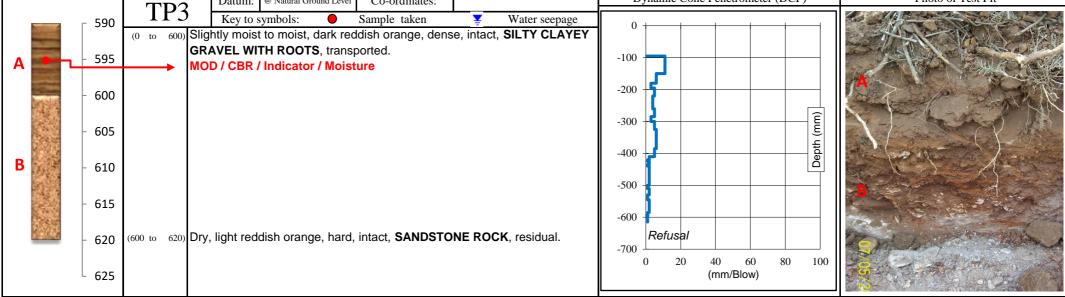
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| OUTENIQUA<br>LAB6 Mirrorball Street, George : PO Box 3186, George Industria, 6536Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn@outeniqualab.co.za |                      | Project :<br>Date Reported : | Extension to Walvis Road - Soil Investigation - Mossel Bay<br>10/05/18 |





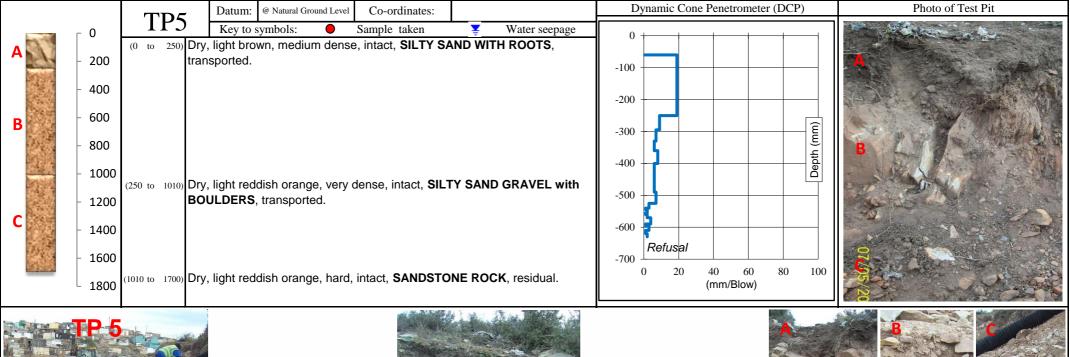
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|---|---------------------|----------------------|-----------------|------------------------------|--------------------------------|
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| LAB Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn      | @outeniqualab.co.za |                      | Date Reported : | 10/05/18                     |                                |
|   |                     |                      |                 |                              |                                |
| Datum: @ Natural Ground Level                                   | Co-ordinates:       |                      | Dynamic Co      | ne Penetrometer (DCP)        | Photo of Test Pit              |





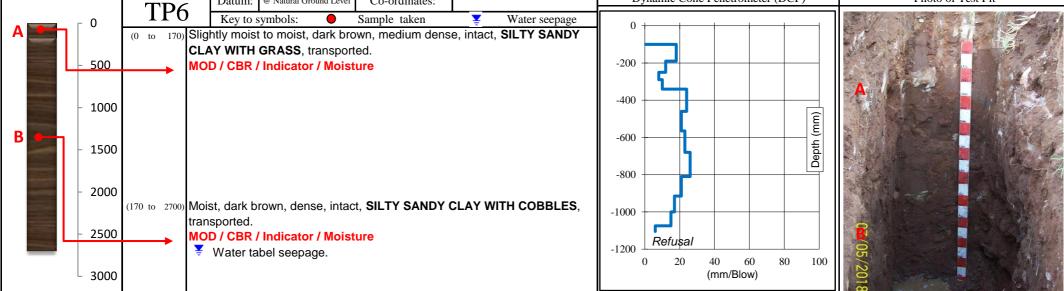
| OUTENIQUA<br>6 Mirrorba   | 5 Testing Lab<br>95/07742/07<br>Il Street, George | Lab (Pty) Ltd.       R-PROF-1-5         oratory       Dec-14         e : PO Box 3186, George Industria, 6536         044 8745779 : e-mail: llewelyn@outeniqualab.co.za | Customer :<br>Project :                                | Aurecon<br>65 York Street<br>George<br>6530<br>Extension to Walvis Road - S<br>10/05/18 | oil Investigation - Mossel Bay |
|---|---|--|--|---|--------------------------------|
|   |   | Datum: @ Natural Ground Level Co-ordinates:  | Dynamic Co   | one Penetrometer (DCP)  | Photo of Test Pit              |
| 0<br>- 0.1<br>- 0.2<br>- 0.3<br>- 0.4<br>- 0.5<br>- 0.6<br>- 0.7<br>- 0.8<br>- 0.9<br>1 | TP4   | Key to symbols:       Sample taken       Water seepage         Aurecon       TF 4       TF 4         07 - 05 - 18       07 / 05 / 018         Befusal no test pit      | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | 40 60 80 100<br>(mm/Blow)   | Refusal no test pit            |
|   |   | Director:       Director:       Director 2000 (Reg. Eng. Tech. Civil)       L Heat   |  |   | Refusal no test pit            |

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|---|----------------------|-----------------|--|
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| LAB Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn@outeniqualab.co.za |                      | Date Reported : | 10/05/18   |



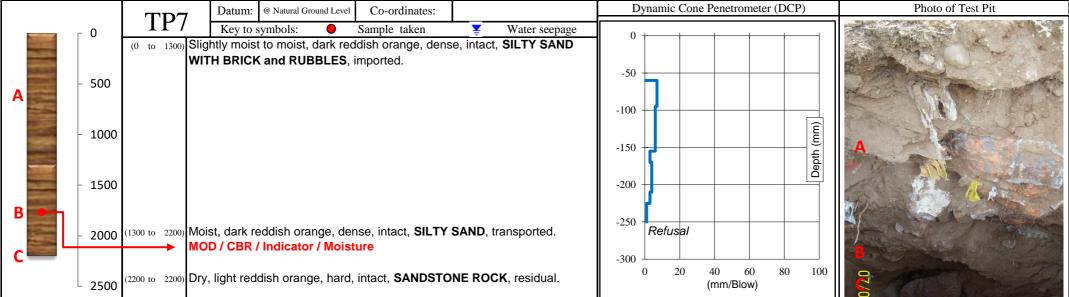


| Materials Testing Laboratory   |                            |  | Customer :      | Aurecon<br>65 York Street<br>George |                                 |
|--|----------------------------|--|-----------------|-------------------------------------|---------------------------------|
| Registration No. 95/07742/07   |                            |  |                 | 6530                                |                                 |
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| <b>LAB</b> Tel: 044 8743274 : Fax: 044 8745779 : e-mail:   | lewelyn@outeniqualab.co.za |  | Date Reported : | 10/05/18                            |                                 |
|  |                            |  |                 |                                     |                                 |
| TP6 Datum: @ Natural Grou  | d Level Co-ordinates:      |  | Dynamic Co      | ne Penetrometer (DCP)               | Photo of Test Pit               |
|  |                            |  |                 |                                     |                                 |





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| LAB Tel: 044 8743274 : Fax: 044 8745779 : e-mail: llewelyn@outeniqualab.co.za   |                      | Date Reported : | 10/05/18   |  |
|   |                      |                 |  |  |





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|           |  | QUA L            | AB (               | Pt           | y) Ltd.             |          |             | <u>R-CBR-1-7</u> Nov-16   |
|-----------|--|------------------|--------------------|--------------|---------------------|----------|-------------|---|
|           | Registration No. 95/07   | 742/07           |                    | •            | - /                 |          |             |   |
| NIO       | Materials Testing<br>0A 6 Mirrorball Street, 0                 |                  | lox 3186           | Geo          | orge Industria, 65  | 36       |             |   |
| AB        | Tel: 044 8743274 :   |                  |                    |              |                     |          | b.co        | ).za  |
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|           | 65 York Street   |                  |                    |              | Date Received :     |          |             |   |
| tome      | George   |                  |                    |              | Date Reported :     |          |             |   |
|           | 6530   |                  |                    |              | Req. Number :       |          |             |   |
| ntior     | n : Ryno Schraader   |                  |                    |              | No. of Pages :      | 1/4      |             |   |
|           | CALIFORNIA BEAR  | NG RATIO - (     |                    |              | EPORT<br>Method GR1 | .GR5.GF  | <b>२</b> 10 | , <u>GR20,GR30,GR40)</u>  |
|           |  |                  | Material Ir        |              |                     | , ,      |             | 70695   |
| Sam       | ple Position (SV)  | TP 2 - Layer 1   | COLTO              |              | TP 2 - Layer 2      | COLTO    | ):          | Sieve Analysis  |
|           | h (mm)   | 0-500            | G9                 |              | 500-1200            | Not      |             |   |
| Sam       | ple No   | 70695            | Subgra             | de           | 70696               | Classifi | ed          | ₽° 80   |
| S         | Source   | In-Si            |                    |              | In-Sit              |          |             | <b>B</b><br><b>B</b><br><b>B</b><br><b>B</b><br><b>B</b><br><b>B</b><br><b>B</b><br><b>B</b><br><b>B</b><br><b>B</b>  |
| Materials | 5 Source<br>Colour<br>Soil Type<br>Classification              | Dark G           | irey               |              | Light Br            | own      |             |   |
| ate.      | Soil Type  | Silty Sandy Grav | el with Ro         | ots          | Sandstone with Gr   |          | bels        |   |
| Σď        | Classification   | Existi           |                    |              | Existi              |          |             |   |
| √ax.      | Stone size in hole (mm)  |                  |                    | uc           |                     | -        | u           | 0.0 0.1 1.0 10.0 100.0  |
| 7         | 75.0mm   | 100              |                    | Opinion      | 100                 |          | Opinion     | Sieve Size  |
| _ (       | 63.0mm   | 100              |                    | g            | 100                 |          | ð           | CBR Chart   |
|           | 50.0mm   | 100              |                    |              | 100                 |          |             |   |
| SSS       | 37.5mm   | 100              |                    |              | 100                 |          |             |   |
|           | 28.0mm   | 100              |                    |              | 95                  |          |             |   |
| ge        | 20.0mm   | 100              |                    |              | 86                  |          |             | 8 10  |
| <u> </u>  | 14.0mm   | 98               |                    |              | 82                  |          |             |   |
| eg t      | 5.00mm   | 93               |                    |              | 67                  |          |             |   |
| Pe        | 2.00mm   | 90               |                    |              | 59                  |          |             | 90 92 94 96 98 100 102<br>Compaction (%)  |
|           | 0.425mm  | 81               |                    |              | 40                  |          |             |   |
| (         | 0.075mm  | 44.2             |                    |              | 18.8                |          |             | 70696   |
|           |  |                  | il Mortar          | & Co         |                     | 1        |             | Sieve Analysis  |
|           | ling Modulus   | 0.85<br>10       | 0.75 <b>-</b> 2.70 | V            | 1.83                |          |             |   |
|           | se Sand (%)<br>Sand (%)  | 41               |                    |              | 32<br>36            |          |             | 80<br>  |
|           | Clay (%)   | 41               |                    |              | 30                  |          |             |   |
|           | d Limit (%)  | 17               |                    |              | 25                  |          |             | еве 40<br>20 20   |
|           | ticity Index (%)   | 5                | ≤ 12               | $\checkmark$ | 6                   |          |             |   |
|           | ar Shrinkage (%)   | 2.5              |                    |              | 3.0                 |          |             | 0.0 0.1 1.0 10.0 100.0  |
|           |  | -                | R / Densit         | v Re         | lationship          |          |             | Sieve Size  |
| I         | Max Dry Density (kg/m <sup>3</sup> )                           | 2120             |                    |              | 1938                |          |             | CBR Chart   |
| o l       | Opt Moisture Content (%)                                       | 7.1              |                    |              | 10.2                |          |             |   |
|           | Mould Moisture Con. (%)  | 7.1              |                    |              | 10.1                |          |             |   |
| (         | @100% Mod AASHTO   | 100.0            |                    |              | 100.0               |          |             |   |
|           | Swell (%)  | 0.43             | ≤ 1.5              | $\checkmark$ | 0.98                |          |             | Han a start with the |
|           | 100% NRB   | 95.5             |                    |              | 95.9                |          |             |   |
| z K       | Swell (%)  | 0.56             |                    |              | 1.39                |          |             |   |
|           | 100% Proctor   | 90.8             |                    |              | 91.1                |          |             | 90 92 94 96 98 100 102<br>Compaction (%)  |
|           | Swell (%)  | 0.79             |                    |              | 1.57                |          |             | • 70695 • 70696   |
|           | @ 100% Mod AASHTO  | 33               |                    |              | 24                  |          |             | • 70695 • 70696   |
| ж H       | <ul> <li>@ 98% Mod AASHTO</li> <li>@ 95% Mod AASHTO</li> </ul> | 23               |                    |              | 16                  |          |             | 550 Wearing Course Graph (TRH 20)   |
|           | @ 95% Mod AASHTO<br>@ 93% Mod AASHTO                           | 13<br>9          | ≥ 7                | *            | 9                   |          |             | ີ ຊີ 500 -<br>450 Slippery  |
|           | @ 93% Mod AASHTO<br>@ 90% Mod AASHTO                           | 5                | 21                 | 不            | 6 3                 |          |             | t 400   |
|           | itu Moisture Content (%)                                       | 5<br>3.1         |                    |              | <u> </u>            |          |             | Good<br>Good<br>Carlor Cood<br>Good<br>(May be Dusty)<br>Ravels   |
| 1115      |  |                  | tion Achie         |              | By The Material     |          |             | 200 - Mater   |
|           | COLTO:   | G9 Subgrade      |                    |              | Not Classified      |          |             | 50 - Ravels and Corrugates  |
|           | AASTHO System  | A-4              |                    |              | A-1-b / A-2-4       |          |             | 0 4 8 12 16 20 24 28 32 36 40 44 48   |
|           | Unified System   | SM-SC            |                    |              | GM-GC               |          |             | Grading Coefficient (Gc)  |
|           | Simoa System   | 5.00             | 1                  |              | 550                 |          |             | <u> </u>  |

Specimens sampled by Mawanda Rwatshube

• The weather conditions were such that there was no detrimental effect on the sample/s taken.

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2. The uncertain (Ú) indicates that the test result is either equal to or is above / below the specified limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliant (P) or non compliant (Í) based on a 95%

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 Measuring Equipment, traceable to National Standards is used where applicable. Results reported in this Test Report relate only to the items tested and are an indication only of the sample provided and/or taken.

5. While experiment account of a state to ensure the correctness of all tests and reports, neither Outenique Lab (Pty) Ltd nor its employees shall be liable in any way whatever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequence thereof.



|           | Registration No. 95/07                                   |                        |  |                                 |           |   |
|-----------|--|------------------------|--|---------------------------------|-----------|---|
|           | Materials Testing  |                        |  |                                 | ~~~       |   |
|           | 1UA 6 Mirrorball Street, C<br>Tel: 044 8743274           |                        |  |                                 |           |   |
| .AU       |  | Fax: 044 8745          | //9 : e-m  |                                 | -         |   |
|           | Aurecon  |                        |  | Project :                       |           | alvis Road Soil Investigation - Moss                            |
| tom       | er : 65 York Street                                      |                        |  | Date Received :                 |           |   |
|           | George   |                        |  | Date Reported :                 |           |   |
| -         | 6530   |                        |  | Req. Number :<br>No. of Pages : | 2/4       |   |
| entio     | on: Ryno Schraader                                       |                        | TEGT   | REPORT                          | 2/4       |   |
|           |  |                        |  |                                 |           | ,GR20,GR30,GR40)  |
|           | CALIFORNIA BEAR  |                        |  |                                 | ,6K5,6K10 |   |
|           |  |                        | Material India   | ators                           | 1         | 70697   |
|           | nple Position (SV)                                       | TP 3 - Layer 1         | COLTO:   |                                 | -         | Sieve Analysis  |
|           | th (mm)  | 0-600                  | Not  |                                 |           |   |
|           | nple No  | 70697                  | Classified   |                                 |           |   |
| als       | Source   | In-Si<br>Darik Daddial |  |                                 |           |   |
| jeri;     |  | Dark Reddisl           | •  |                                 |           | 8 40  |
| Materials | Source       Colour       Soil Type       Classification | Silty Clayey Grav      |  |                                 |           | 80 40   |
|           |  | Existi                 | , The second sec | +                               | 1         |   |
| via>      | . Stone size in hole (mm)<br>75.0mm                      | 100                    | Opinion  |                                 |           | 0.0 0.1 1.0 10.0 100.0<br>Sieve Size                            |
|           | 75.0mm<br>63.0mm   | 100                    | hid hid  |                                 | <b> </b>  |   |
| ð         | 50.0mm   | 100                    | 0  |                                 |           | CBR Chart   |
| ŝŝir      | 37.5mm   | 100                    |  |                                 |           |   |
| Passing   | 28.0mm   | 100                    |  |                                 |           |   |
| ge        | 20.0mm   | 99                     |  |                                 |           | 01K (%)   |
| ţą        | 14.0mm   | 99                     |  |                                 |           | °   |
| Sen       | 5.00mm   | 98                     |  |                                 |           |   |
| Percenta  | 2.00mm   | 96                     |  |                                 |           | 90 92 94 96 98 100 102  |
| Δ.        | 0.425mm  | 86                     |  |                                 |           | Compaction (%)  |
|           | 0.075mm  | 37.0                   |  |                                 |           |   |
|           |  | So                     | il Mortar & C  | onstants                        | 8         | Sieve Analysis  |
|           | ding Modulus   | 0.81                   |  |                                 |           |   |
|           | rse Sand (%)   | 11                     |  |                                 |           | 80<br>  |
|           | e Sand (%)   | 51                     |  |                                 |           | e 60  |
|           | & Clay (%)   | 39                     |  |                                 |           | 80 40 40 40 40 40 40 40 40 40 40 40 40 40                       |
|           | iid Limit (%)  | 22                     |  |                                 |           | 20 20   |
|           | sticity Index (%)  | 8                      |  |                                 |           | o   |
| line      | ear Shrinkage (%)  | 4.0                    |  |                                 |           | 0.0 0.1 1.0 10.0 100.0<br>Sieve Size                            |
|           | May Dry Danaity (log/m <sup>3</sup> )                    |                        | R / Density R  | elationship                     |           |   |
|           | Max Dry Density (kg/m <sup>3</sup> )                     | 2020                   |  |                                 |           | CBR Chart   |
| MOD       | Opt Moisture Content (%)<br>Mould Moisture Con. (%)      | 7.7                    |  |                                 |           | 10  |
| Σ         | @100% Mod AASHTO   | 7.9<br>100.0           |  | 1                               |           | •   |
|           | Swell (%)  | 0.79                   |  | +                               |           | CBR (%)   |
| В         | 100% NRB   | 95.8                   |  |                                 |           | 0   |
| NRI       | Swell (%)  | 0.91                   |  |                                 |           |   |
|           | 100% Proctor   | 91.3                   |  | -                               |           | 0 2   |
| Proc      | Swell (%)  | 0.95                   |  | 1                               |           | Compaction (%)  |
|           | @ 100% Mod AASHTO  | 22                     |  |                                 |           | • 70697   |
| ~         | @ 98% Mod AASHTO   | 15                     |  |                                 |           | Wearing Course Greek (TPH 22)                                   |
| CBR       | @ 95% Mod AASHTO   | 8                      |  | T                               |           | Wearing Course Graph (TRH 20)                                   |
| S         | @ 93% Mod AASHTO   | 5                      |  | 1                               |           | 6 500 -<br>8 450 -<br>5 400 -                                   |
|           | @ 90% Mod AASHTO   | 3                      |  |                                 |           | 350     Good     (May be Dustd)                                 |
| In        | situ Moisture Content (%)                                | 5.9                    |  |                                 |           |   |
|           |  |                        | tion Achieve   | d By The Material               |           | S 150 - Good  |
|           | COLTO:   | Not Classified         |  |                                 |           |   |
|           | AASTHO System  | A-4                    |  |                                 |           | 0 4 8 12 16 20 24 28 32 36 40 44 48<br>Grading Coofficient (Gc) |
|           | Unified System   | SC                     |  |                                 |           | Grading Coefficient (Gc)  |

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 While every care is taken to ensure the correctness of all tests or any erroneous conclusions drawn therefrom or for any consequence thered.

|           |   | QUA L                        | AB (Pt                    | y) Ltd.             |                     | <u>R-CBR-1-7</u> <u>Nov-16</u>   |
|-----------|---|------------------------------|---------------------------|---------------------|---------------------|--|
|           | Registration No. 95/077                                     |                              |                           |                     |                     |  |
|           | Materials Testing   |                              | au 2400 . Oa              |                     | 200                 |  |
| NIU<br>Ab | UA 6 Mirrorball Street, 0<br>Tel: 044 8743274 :             | Eorge : POB<br>Fax: 044 8745 | 0X 3180, Geo<br>779 · e-m | ail∙ llewelvn@out   | oo<br>teniqualah co | 72   |
|           | Aurecon   | 147. 0110110                 |                           | Project :           | •                   | alvis Road Soil Investigation - Moss   |
|           | 65 York Street  |                              |                           | Date Received :     |                     |  |
| tome      | er :<br>George  |                              |                           | Date Reported :     | 29/05/18            |  |
|           | 6530  |                              |                           |                     | 1348/18             |  |
| ntior     | n: Ryno Schraader   |                              |                           | No. of Pages :      | 3/4                 |  |
|           | CALIFORNIA BEAR   |                              |                           | EPORT<br>Method GR1 | GR5 GR10            | ),GR20,GR30,GR40)  |
|           |   |                              | Alterial Indica           |                     | ,0110,0111          | 70698  |
| Sam       | ple Position (SV)   | TP 6 - Layer 1               | COLTO:                    | TP 6 - Layer 2      | COLTO:              |  |
|           | h (mm)  | 0-170                        | Not                       | 170-2700            | Not                 | Sieve Analysis   |
| Sam       | ple No  | 70698                        | Classified                | 70699               | Classified          | 2° 80  |
| Materials | Source  | In-Si                        | tu                        | In-Sit              | u                   | <b>b</b> 190   |
| erial     | E Colour  | Dark Br                      | own                       | Dark Br             | own                 | 8 40   |
| ate       | ର୍ତ୍ତି Soil Type  | Silty Sandy Cla              | y with Grass              | Silty Sandy Clay    | with Cobbels        | 80 40  |
| ≥ (       | Classification  | Existi                       | ng                        | Existi              | ng                  | ₽ <sup>20</sup>  |
|           | Stone size in hole (mm)                                     |                              | uo                        |                     | uo                  | 0.0 0.1 1.0 10.0 100.0<br>Sieve Size   |
|           | 75.0mm  | 100                          | Opinion                   | 100                 | Opinion             | Sieve Size   |
| 0         | 63.0mm  | 100                          | ō                         | 100                 | ō                   | CBR Chart  |
|           | 50.0mm  | 100                          |                           | 100                 |                     | 10   |
| as        | 37.5mm  | 100                          |                           | 100                 |                     |  |
|           | 28.0mm  | 100<br>100                   |                           | 100<br>98           |                     | CBR (%)  |
| tag .     | 20.0mm<br>14.0mm  | 97                           |                           | 98                  |                     | - <sup>1</sup>   |
|           | 5.00mm  | 97                           |                           | 90                  |                     | 4  |
| erc       | 2.00mm  | 91                           |                           | 89                  |                     |  |
| a f       | 0.425mm   | 81                           |                           | 80                  |                     | Compaction (%)   |
|           | 0.075mm   | 55.9                         |                           | 43.6                |                     | 70699  |
|           |   |                              | il Mortar & Co            |                     |                     | Sieve Analysis   |
|           | ling Modulus  | 0.72                         |                           | 0.88                |                     |  |
|           | se Sand (%)   | 12                           |                           | 10                  |                     | 5 80   |
|           | Sand (%)  | 27                           |                           | 41                  |                     | <b>bi</b> 80<br><b>bi</b> 80<br><b>b</b> |
|           | & Clay (%)  | 61                           |                           | 49                  |                     |  |
|           | d Limit (%)   | 21                           |                           | 20                  |                     |  |
|           | ticity Index (%)  | 2                            |                           | 9<br>4.5            |                     |  |
| lines     | ar Shrinkage (%)  | 1.0<br>CBE                   | R / Density Re            |                     |                     | 0.0 0.1 1.0 10.0 100.0<br>Sieve Size   |
| 1         | Max Dry Density (kg/m <sup>3</sup> )                        | 001                          |                           | 2118                |                     |  |
| E E       | Opt Moisture Content (%)                                    |                              |                           | 7.4                 |                     | 100 CBR Chart  |
|           | Mould Moisture Con. (%)                                     |                              |                           | 7.1                 |                     |  |
| _         | @100% Mod AASHTO  |                              |                           | 100.0               |                     | (%)  |
|           | Swell (%)   |                              |                           | 0.91                |                     | B <sup>10</sup>  |
|           | 100% NRB  |                              |                           | 96.0                |                     |  |
|           | Swell (%)   |                              |                           | 1.28                |                     |  |
|           | 100% Proctor  |                              |                           | 92.3                |                     | 90 92 94 96 98 100 102<br>Compaction (%)   |
|           | Swell (%)   |                              |                           | 1.49                |                     |  |
|           | @ 100% Mod AASHTO   |                              |                           | 12                  |                     | • 70698 • 70699  |
| ж H       | <ul><li>@ 98% Mod AASHTO</li><li>@ 95% Mod AASHTO</li></ul> |                              |                           | 7                   |                     | 550 Wearing Course Graph (TRH 20)  |
| /         | @ 95% Mod AASHTO<br>@ 93% Mod AASHTO                        |                              |                           | 4 2                 |                     |  |
|           | @ 93% Mod AASHTO<br>@ 90% Mod AASHTO                        |                              |                           | 1                   |                     | 5 400  |
|           | itu Moisture Content (%)                                    | 8.0                          |                           | 10.2                |                     | Good<br>Good<br>250 - Erodible (May be Dusty)<br>Ravels  |
| 1112      |   |                              | tion Achiever             | By The Material     | <u> </u>            | Solution Sol   |
|           | COLTO:  | Not Classified               |                           | Not Classified      |                     | Ravels and Corrugates  |
|           | AASTHO System   | A-4                          |                           | A-4                 |                     | 0 4 8 12 16 20 24 28 32 36 40 44 48  |
|           | Unified System  |                              | . 1                       | SC                  | • 1                 | Grading Coefficient (Gc)   |

Specimens sampled by Mawanda Rwatshube

• The weather conditions were such that there was no detrimental effect on the sample/s taken.

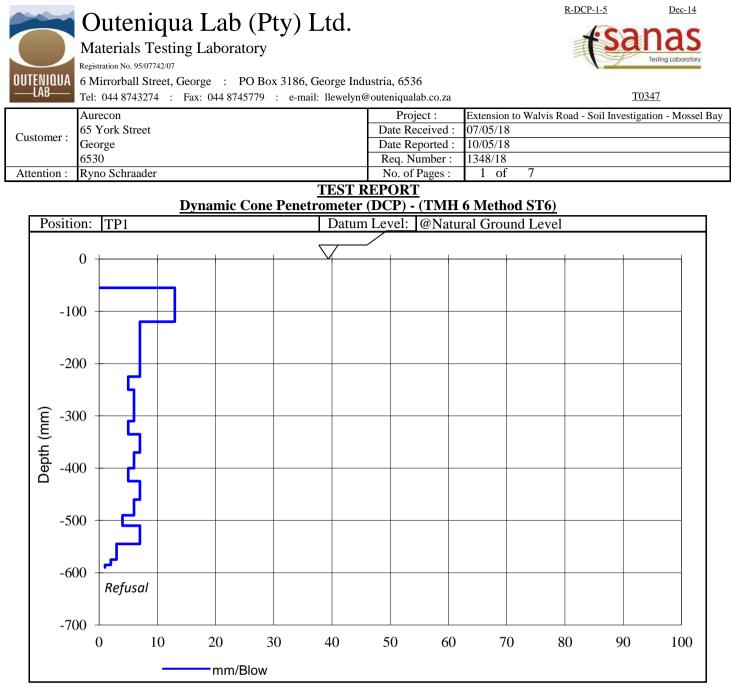
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|  | Registration No. 95/077<br>Materials Testing     |  |                 |              |                                 |   |  |
|--|--|--|-----------------|--------------|---------------------------------|---|--|
| FNL  |  |  | lox 3186.       | Geo          | orge Industria. 65              | 36                                      |  |
| LAB  | 1UA 6 Mirrorball Street, G<br>Tel: 044 8743274 : |  |                 |              |                                 |   | 0.za   |
|  | Aurecon  | · uni 0++ 01+0                         |                 |              | Project :                       |   | /alvis Road Soil Investigation - Moss  |
|  |  | 65 York Street Date Received : 07/05/* |                 |              |                                 |   | aivis Road Soli Investigation - Mossi  |
| tom  | or ·   | George                                 |                 |              |                                 | 22/05/18                                |  |
|  | 6530   |  |                 |              |                                 |   |  |
| entio  |  |  |                 |              | Req. Number :<br>No. of Pages : | 4/4                                     |  |
|  |  |  | TES             | TP           | REPORT                          | -/                                      |  |
|  |  |  |                 | 200-         | 1 Mothod GP1                    | CD5 CD1                                 | <u>0,GR20,GR30,GR40)</u>   |
|  |  |  |                 |              |                                 | ,61,5,611                               |  |
|  |  |  | Material Ir     |              | ators                           | 1                                       | 70700  |
|  | nple Position (SV)                               | TP 7 -Layer 2                          | COLT            | <b>D</b> :   |                                 |   | Sieve Analysis   |
|  | th (mm)  | 1300-2200                              | G8 SS           | G            |                                 |   | 100  |
|  | nple No  | 70700                                  |                 |              |                                 |   |  |
|  | Source   | In-Si                                  |                 |              |                                 |   |  |
| erić   | Colour   | Dark Reddis                            | and<br>ng       |              |                                 |   | 8 40   |
| Materials  | Source<br>Colour<br>Soil Type<br>Classification  | Silty S                                |                 |              |                                 |   | <b>b</b> 40<br>20  |
|  |  | Existi                                 |                 |              |                                 |   |  |
| Max  | . Stone size in hole (mm)                        |  |                 | on           |                                 |   | 0.0 0.1 1.0 10.0 100.0<br>Sieve Size   |
|  | 75.0mm   | 100                                    |                 | Opinion      |                                 |   |  |
| D  | 63.0mm   | 100                                    |                 | Ő            |                                 |   | CBR Chart  |
| assing   | 50.0mm   | 100                                    | ļ               |              |                                 |   |  |
| ass  | 37.5mm   | 100                                    |                 |              |                                 |   |  |
| <u>α</u>   | 28.0mm   | 100                                    |                 |              |                                 |   | 01   |
| age  | 20.0mm   | 100                                    |                 |              |                                 |   | 8  |
| Percentage   | 14.0mm   | 99                                     |                 |              |                                 |   |  |
| ő  | 5.00mm   | 96                                     |                 |              |                                 |   |  |
| Ре   | 2.00mm   | 94                                     |                 |              |                                 |   | 90 92 94 96 98 100 102<br>   |
|  | 0.425mm  | 84                                     |                 |              |                                 |   |  |
|  | 0.075mm  | 33.6                                   | <br>  M = =1    | • •          | l                               |   | 4  |
| <u></u>  | ding Modulus                                     |  | il Mortar       |              | Distants                        | 1                                       | Sieve Analysis   |
| Grading Modulus         0.89         0.75 - 2.70         v           Coarse Sand (%)         10 |  |  |                 | v            |                                 |   |  |
|  | sand (%)   | 10<br>54                               |                 |              |                                 |   |  |
|  | & Clay (%)                                       | <u>54</u>                              |                 |              |                                 |   |  |
|  | a Clay (%)<br>iid Limit (%)                      | <u>30</u>                              |                 |              |                                 |   | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  |
|  | sticity Index (%)                                | 4                                      | ≤ 12            | $\checkmark$ |                                 |   | <sup>1</sup> 20  |
|  | ar Shrinkage (%)                                 | 2.0                                    | <u> </u>        | •            |                                 |   | 0,  0.0 0.1 1.0 10.0 100.0   |
|  |  |  | I<br>R / Densit | v Re         | lationship                      | I                                       | Sieve Size   |
|  | Max Dry Density (kg/m <sup>3</sup> )             | 2150                                   |                 | , ite        |                                 |   |  |
| MOD  | Opt Moisture Content (%)                         | 7.4                                    |                 |              |                                 |   | CBR Chart  |
|  | Mould Moisture Con. (%)                          | 7.7                                    |                 |              |                                 |   |  |
| 2  | @100% Mod AASHTO                                 | 100.0                                  |                 |              |                                 |   | - «  |
|  | Swell (%)  | 0.06                                   | ≤ 1.5           | $\checkmark$ |                                 |   | CBR (%)  |
| В  | 100% NRB   | 95.2                                   |                 |              |                                 |   | ┤°   |
| NR   | Swell (%)  | 0.12                                   | <u> </u>        |              |                                 |   | 1 1  |
|  | 100% Proctor                                     | 91.7                                   |                 |              |                                 |   |  |
| R Proc   | Swell (%)  | 0.16                                   | 1               |              |                                 |   | Compaction (%)   |
|  | @ 100% Mod AASHTO                                | 43                                     | t               |              |                                 |   | • 70700  |
|  | @ 98% Mod AASHTO                                 | 31                                     |                 | 1            |                                 |   | Wearing Course Grant (TBU 20)  |
| CBR  | @ 95% Mod AASHTO                                 | 19                                     |                 |              |                                 |   | Wearing Course Graph (TRH 20)  |
|  | @ 93% Mod AASHTO                                 | 14                                     | ≥ 10            | $\checkmark$ |                                 |   | 450 - Silppery   |
|  | @ 90% Mod AASHTO                                 | 9                                      |                 |              |                                 |   | <b>B</b> 350 - Good  |
| In   | situ Moisture Content (%)                        | 7.0                                    |                 |              |                                 |   |  |
|  | · /  | Soil Classifica                        | tion Achi       | evec         | By The Material                 | - · · · · · · · · · · · · · · · · · · · | So     200     Materials     Ravels       So     150     Good     So       So     50     Ravels and Corrugates |
|  | COLTO:   | G8 SSG                                 |                 |              |                                 |   | 50 - Ravels and Corrugates   |
|  | AASTHO System                                    | A-2-4                                  |                 |              |                                 |   | 0 4 8 12 16 20 24 28 32 36 40 44 48  |
|  | Unified System                                   | SM-SC                                  |                 |              |                                 |   | Grading Coefficient (Gc)   |

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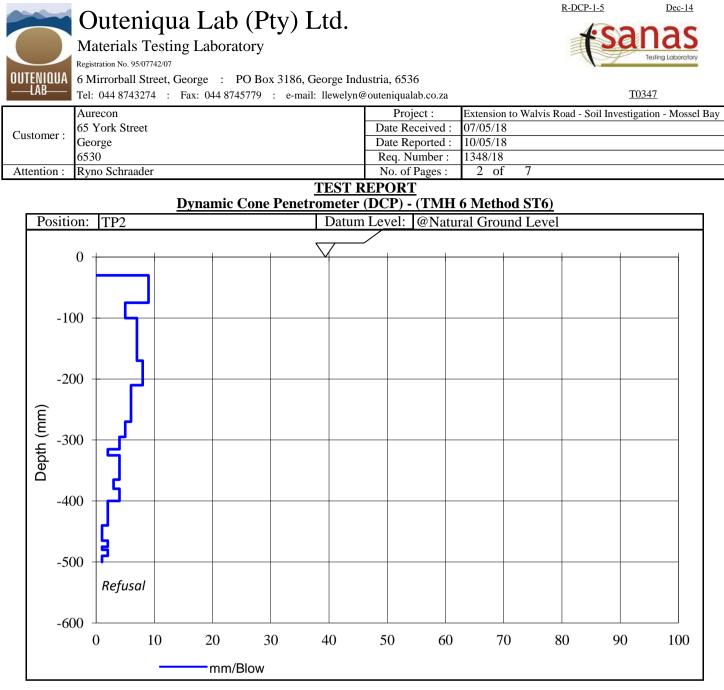




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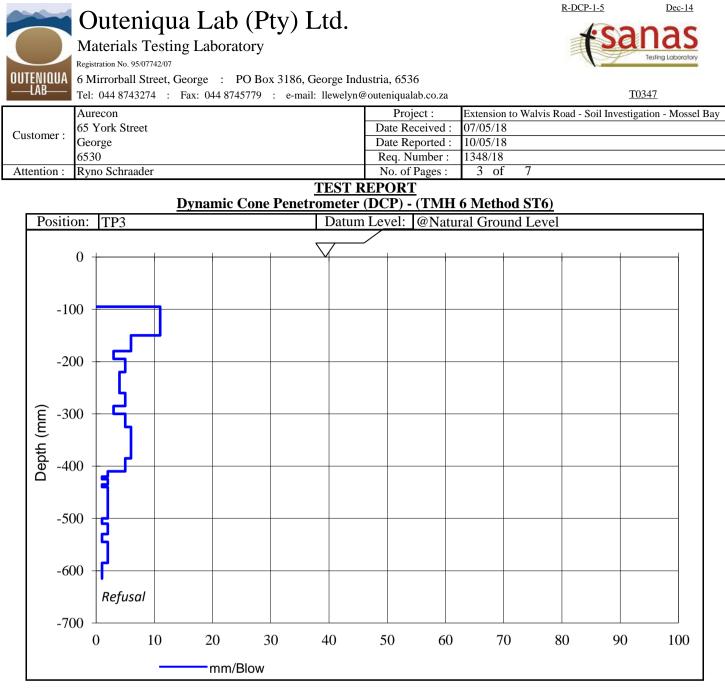
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therefrom or for any o nce thereof.

L Heathcote (B-Tech. & BSc Hons. Civil)

Miss A Govender



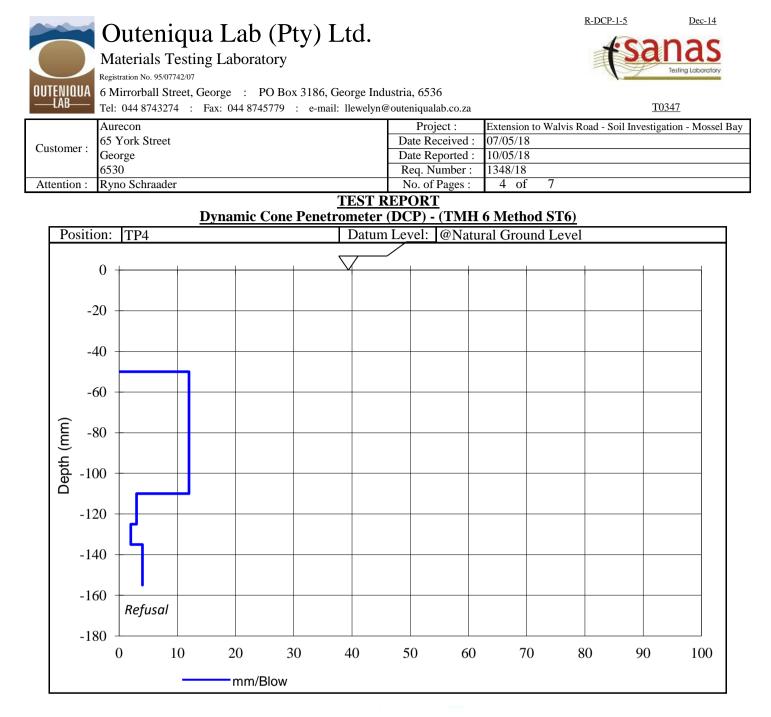


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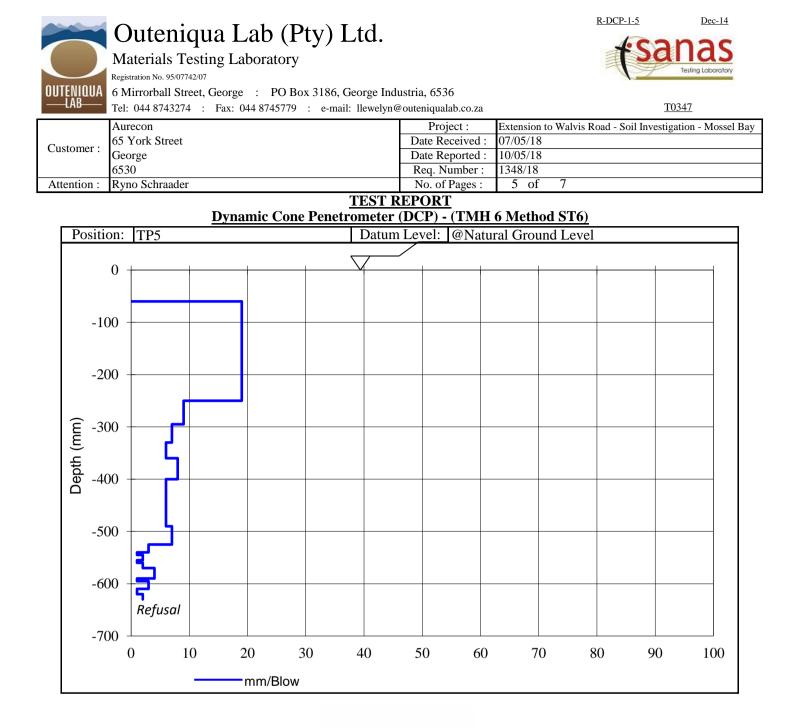
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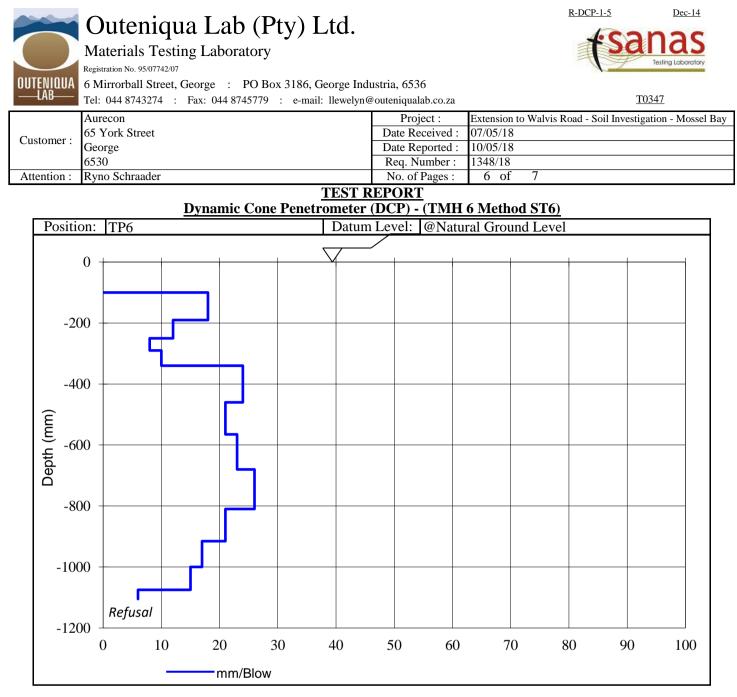
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Miss A Govender

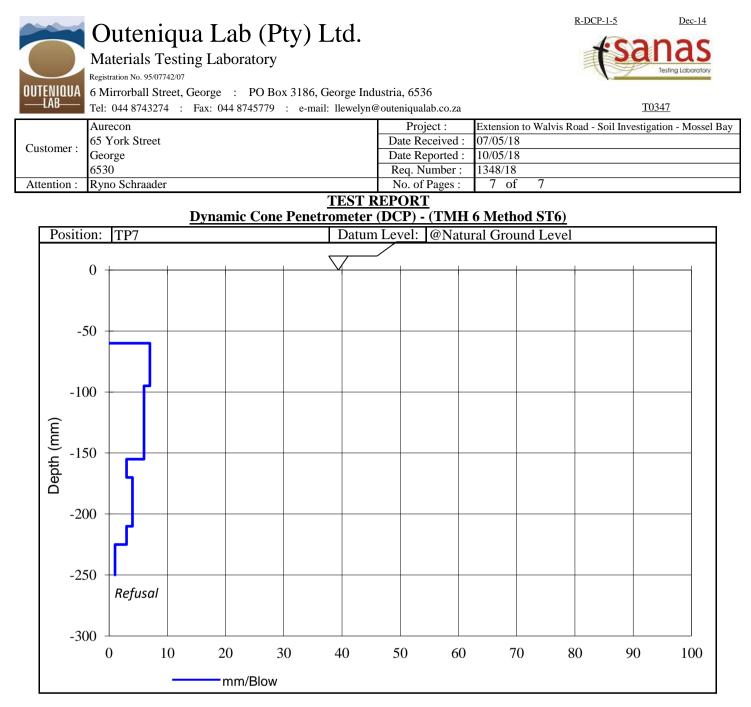




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