# APPENDIX B

# ENGINEERING PARAMETERS

# APPENDIX B

# ENGINEERING PARAMETERS

## B1. AVAILABLE INFORMATION

Stability analyses undertaken for this study were based on parameters summarised in Table B1.

The values adopted were based on the following:

1. Coffey and Partners Report S8463/3-AG "Old Mans Valley Geotechnical Investigations" dated 18 July 1990. This information included laboratory triaxial and direct shear tests which are summarised in more detail in Appendix G.

2. UCS and point load testing on samples collected by PSM for this study (refer to Section B2 below).

3. Extensive experience and laboratory strength testing of breccia rocks from a gold mine in Central Kalimantan considered similar to those found at the Hornsby Quarry.

4. Experience and testing of sandstone in the Sydney region.

# TABLE B1
# MATERIAL STRENGTH PARAMETERS

| | FILLING | | | BRECCIA | | | | | | SANDSTONE | | | | | MUDDY BRECCIA ZONES | DEFECTS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ROCK MASS** | **EASTERN/ SOUTH WESTERN/ NORTHERN** | **CRUSHER** | **SOUTH WESTERN** | **RESIDUAL** | **EW** | **RES/EW** | **HW** | **HW/MW** | **SW/FR** | **RESIDUAL** | **EW** | **RES/EW** | **HW/MW** | **SW/FR** | | **SEAMS IN SW/FR BRECCIA** | **SHEARS IN MUDDY BRECCIA** |
| Unit Weight $\gamma$ ($kN/m^3$) | 20 | 20 | 20 | 19.5 | 19.5 | 19.5 | 20 | 23.5 | 23.5 | 19.5 | 19.5 | 19.5 | 24 | 24 | 22 | - | - |
| Substance UCS (MPa) | NA | NA | NA | 0.5 to 1 | 1 to 2 | 1 | 1 to 3 | 2 to 5 | 3 to 80 | 0.5 to 1 | 1 to 2 | 1 | 2 to 25 | 12 to 40 | 1 to 5 | 1 to 3 | 1 to 2 |
| Design Shear Strength c' (kPa) | 10 | 0[A.] | 10 | 5 | 20 | 20 | 28 | 75 | 300 | 20 | 75 | 50 | 400 | 1000 | 35 | 0 | 0 |
| Design Friction Angle $\phi$'(deg) | 30 | 35[A.] | 30 | 28.5 | 25 | 25 | 39 | 40 | 45 | 30 | 25 | 30 | 45 | 45 | 40 | 35 | 28 |
| Modulus E (MPa) | 30 | 25 | 30 | 40 | 40 | 40 | 300 | 350 | 1500 | 50 | 50 | 50 | 800 | 2000 | 300 | - | - |
| Poissons Ratio - $\nu$ | 0.3 | 0.35 | 0.3 | 0.3 | 0.3 | 0.3 | 0.25 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.25 | - | - |

NOTES:
[A.] Find values based on back analysis of fill at Cross Section 11 for an assumed FOS of 1.1 (refer to Appendix H).

## B2. UCS AND POINT LOAD TEST DATA FOR MUDDY BRECCIA

Lump samples of slightly weathered to fresh and moderately weathered muddy breccia were taken from the quarry to perform UCS (unconfined compressive strength) testing and point load testing. This rock type was tested to supplement the comprehensive testing data available in the Coffey and Partners Report.

**TABLE B2**
**UCS AND POINT LOAD TEST FOR MUDDY BRECCIA**

| ID | WEATHERING GRADE | SATURATION | WET DENSITY | UCS (MPa) | POINT LOAD AVERAGE (MPa) | RATIO | COMMENT |
|---|---|---|---|---|---|---|---|
| 1 | SW/FR | DRY | 2.4 | 13.0 | 0.43 | 30.6 | UCS failure by axial splitting |
| 2 | SW/FR | DRY | 2.4 | 9.8 | 0.49 | 20.1 | UCS failure by axial splitting |
| 3 | SW/FR | DRY | 2.3 | 2.2 | 0.36 | 6.3 | UCS failure by axial splitting |
| 4 | SW/FR | DRY | 2.4 | 5.1 | 0.53 | 9.8 | UCS failure by axial splitting |
| 5 | SW/FR | SATURATED | 2.4 | 5.8 | 0.43 | 13.6 | UCS failure by axial splitting |
| 6 | MW | SATURATED | - | - | 0.31 | - | UCS sample disintegrated after soaking. |
| AVERAGE | | | 2.4 | 7.2 | 0.44 | 16.1 | |

Testing certificates are included as Attachment B1.

## B3. TEST PIT SOIL TEST RESULTS

The following soil testing was undertaken on bulk samples collected from testpits.

1. Particle size distribution (PSD),
   - undertaken on samples from testpits
     TP1 (crusher plant area)
     TP3 (crusher plant area)
     TP4 (south western fill area)
     TP6 (south western fill area)
     TP8 (above drainage diversion works)
     TP10 (eastern fill area)
     TP12 (eastern fill area)
     TP14 (eastern fill area)
   - Results are included in Attachment B2.

2. Atterberg Limits
   - Undertaken on samples for testpits
     TP3 (crusher plant area)
     TP4 (south western fill area)
     TP6 (south western fill area)
     TP8 (above drainage diversion works)
     TP12 (eastern fill area)
     TP14 (eastern fill area)
   - Results are included in Attachment B2.

**ATTACHMENT B1**
**ROCK MATERIAL LABORATORY TEST CERTIFICATES**

Australian Geomechanical Laboratories Pty Ltd
ABN 25 065 630 506
1/29 Finchley Street, Milton, Qld. 4064
P.O. Box 434, Paddington, Qld. 4064
Telephone: (07) 3217 5535
Facsimile: (07) 3217 5311
Email: aglabs@bigpond.net.au

# POINT LOAD TEST REPORT

Test Method: AS 413 3.4.1

| | | | |
|---|---|---|---|
| Client: | Pells Sullivan Meynink Pty Ltd | Report No. | 610246-PTL |
| Project: | PSM1059 | Test Date: | 12/10/06 |
| | | Report Date: | 13/10/06 |

| Sample No. | Client ID | Depth (m) | $I_S$ (MPa) | $I_{S(50)}$ (MPa) | Load Direction | *Descriptive Term |
|---|---|---|---|---|---|---|
| 610246 | 1 | - | 0.58 | 0.55 | Irregular Lump | M |
| 610246 | 1 | - | 0.34 | 0.30 | Irregular Lump | M |
| 610247 | 2 | - | 0.25 | 0.30 | Irregular Lump | M |
| 610247 | 2 | - | 0.69 | 0.67 | Irregular Lump | M |
| 610248 | 3 | - | 0.35 | 0.33 | Irregular Lump | M |
| 610248 | 3 | - | 0.41 | 0.38 | Irregular Lump | M |
| 610249 | 4 | - | 0.46 | 0.46 | Irregular Lump | M |
| 610249 | 4 | - | 0.62 | 0.59 | Irregular Lump | M |

Remarks: The specimens tested as received.

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High

Sample/s supplied by the client



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N ATA Accredited Laboratory Number 9926

Form Number: GT024-5

Authorised Signatory

J. Russell

Manager

Australian Geomechanical Laboratories Pty Ltd
ABN 25 065 630 506
1/29 Finchley Street, Milton, Qld. 4064
P.O. Box 434, Paddington, Qld. 4064
Telephone: (07) 3217 5535
Facsimile: (07) 3217 5311
Email: aglabs@bigpond.net.au

# UNCONFINED COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 1289 6.4.1

| | | | |
|---|---|---|---|
| Client: | Pells Sullivan Meynink Pty Ltd | Report No. | 610246-UCS |
| Project: | PSM1059 | Test Date: | 12/10/06 |
| | | Report Date: | 13/10/06 |

| Sample No.: | 610246 | 610247 | 610248 | 610249 |
|---|---|---|---|---|
| Client ID: | 1 | 2 | 3 | 4 |
| Depth (m): | - | - | - | - |
| Description: | - | - | - | - |
| Wet Density ($t/m^3$): | 2.37 | 2.40 | 2.31 | 2.40 |
| Moisture Content (%): | 2.6 | 3.4 | 3.8 | 3.8 |
| Specimen Length (mm) | 119.3 | 80.6 | 102.3 | 63.3 |
| Specimen Dimensions (mm) | 60.4 x 72.0 | 77.6 x 64.5 | 94.3 x 70.3 | 41.7 x 55.0 |
| Mode of Failure: | Axial Splitting | Axial Splitting | Axial Splitting | Axial Splitting |
| Test Duration (Min:Sec): | 1:23 | 2:31 | 1:30 | 0:53 |
| | | | | |
| **UCS (MPa):** | **13.0*** | **9.75*** | **2.23*** | **5.14*** |

Remarks: Stored and tested as received. Block samples were supplied by the client and the specimens were cut into rectangular prism.

| | | |
|---|---|---|
| Sample/s supplied by the client | Test Apparatus: ELE 1000kN Concrete Compression Machine | Page 1 of 1 |

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Authorised Signatory

J. Russell

Manager

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Form Number: GT017-5

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Telephone: (07) 3217 5535
Facsimile: (07) 3217 5311
Email: aglabs@bigpond.net.au

# POINT LOAD TEST REPORT

Test Method: AS 413 3.4.1

| | | | |
|---|---|---|---|
| Client: | Pells Sullivan Meynink Pty Ltd | Report No. | 611168-PTL |
| Project: | PSM1059 | Test Date: | 7/11/06 to 8/11/06 |
| | | Report Date: | 10/11/06 |

| Sample No. | Client ID | Depth (m) | $I_S$ (MPa) | $I_{S(50)}$ (MPa) | Load Direction | *Descriptive Term |
|---|---|---|---|---|---|---|
| 611168 | 5 | - | 0.41 | 0.48 | Irregular Lump | M |
| 611168 | 5 | - | 0.31 | 0.37 | Irregular Lump | M |
| 611169 | 6 | - | 0.32 | 0.31 | Irregular Lump | M |
| 611169 | 6 | - | 0.32 | 0.30 | Irregular Lump | L |

Remarks: The specimens tested after 24 hours soaking in water.

*EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High

Sample/s supplied by the client



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Manager

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Facsimile: (07) 3217 5311
Email: aglabs@bigpond.net.au

# UNCONFINED COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 1289 6.4.1

| | | | |
|---|---|---|---|
| Client: | Pells Sullivan Meynink Pty Ltd | Report No. | 611168-UCS |
| Project: | PSM1059 | Test Date: | 7/11/06 to 9/11/06 |
| | | Report Date: | 10/11/06 |

| | |
|---|---|
| Sample No.: | 611168 |
| Client ID: | 5 |
| Depth (m): | - |
| Wet Density (t/m$^3$): | 2.30 |
| Moisture Content (%): | 1.0 |
| Specimen Length (mm) | 66.7* |
| Specimen Diameter (mm) | 52.9 x 59.6 |
| Mode of Failure: | Axial Splitting |
| Test Duration (Min:Sec): | 2:05 |
| | |
| **UCS (MPa):** | **5.77*** |

Remarks: Stored and tested after 24 hours of soaking in water.

| | | |
|---|---|---|
| Sample/s supplied by the client | Test Apparatus: ELE 1000kN Concrete Compression Machine | Page 1 of 1 |

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J. Russell

Manager

N ATA Accredited Laboratory Number 9926

Form Number: GT017-5

**ATTACHMENT B2**
**SOIL MATERIAL LABORATORY TEST CERTIFICATES**

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 1*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 1/S 1 (mixed fill)*<br>*Sydney Lab No. 610021* | *150.0* | *100.0* |
| | *75.0* | *100.0* |
| | *63.0* | *100* |
| | *53.0* | *100* |
| | *37.5* | *97.5* |
| | *26.5* | *92.4* |
| | *19.0* | *88.7* |
| | *13.2* | *85.7* |
| | *9.5* | *81.8* |
| | *6.7* | *78.6* |
| | *4.75* | *75.3* |
| | *2.36* | *68.3* |
| | *1.18* | *58.6* |
| | *0.600* | *52.3* |
| | *0.425* | *47.5* |
| | *0.300* | *37.1* |
| | *0.150* | *24.8* |
| | *0.075* | *19.8* |



remarks : *Sample received from the Client on the 16/10/06*



NATA WORLD RECOGNISED ACCREDITATION



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Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *24/10/06*

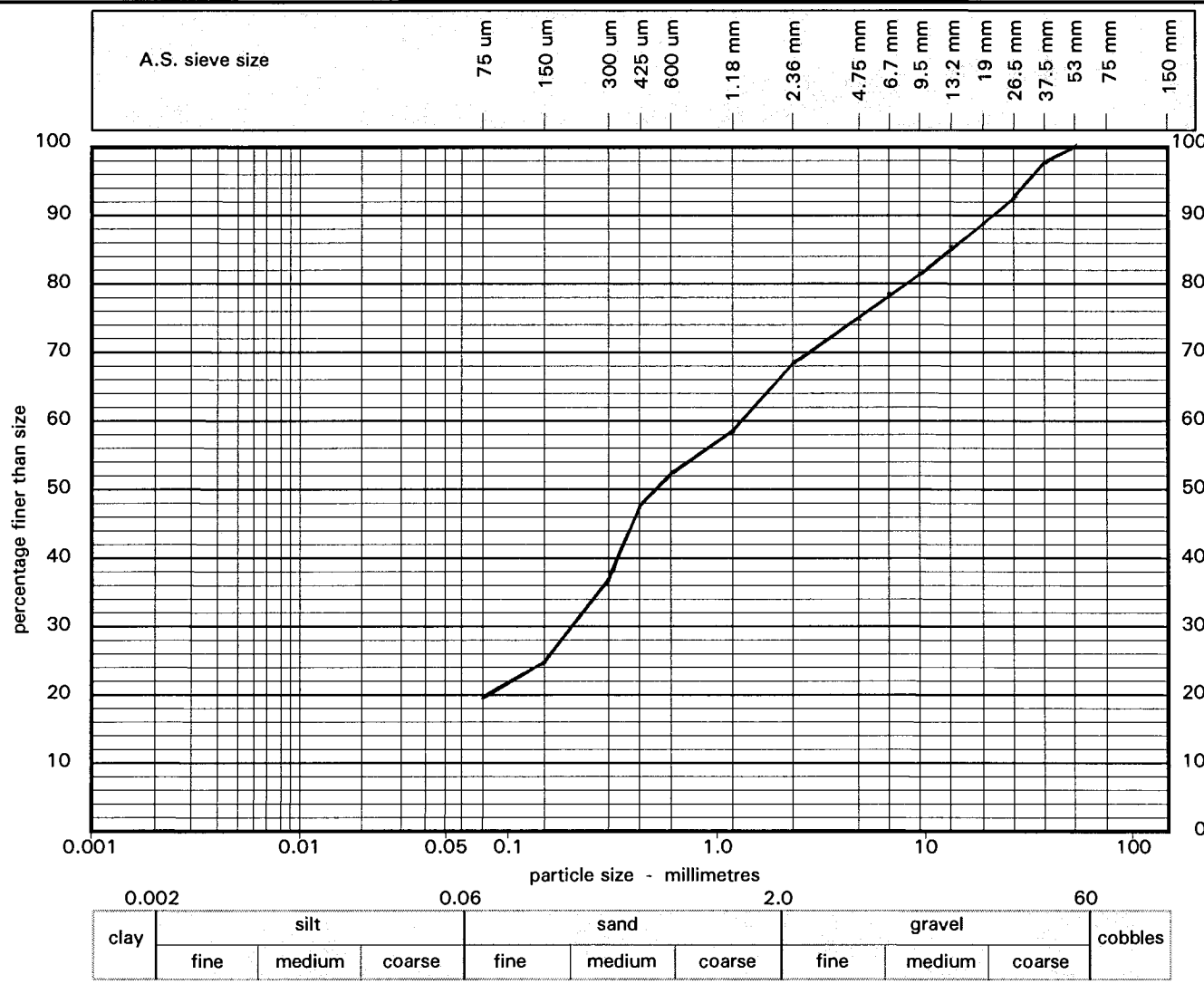
coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 1*

test procedure : *AS1289.3.6.1*
depth : -
sample no : *610021*
sample identification: *TP1/S1 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | - |
| plastic limit | % | - |
| plasticity index | % | - |
| linear shrinkage | % | - |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☐
other ☐

**Preparation Method**

dry sieving ☐
wet sieving ☐

**Linear Shrinkage**

Mould size mm
crumbing ☐
curling ☐

classification :



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Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *23/10/06*

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 3*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 3/S 3 (mixed fill)*<br>*Sydney Lab No. 610023* | *150.0* | *100.0* |
| | *75.0* | *100.0* |
| | *63.0* | *100* |
| | *53.0* | *96.2* |
| | *37.5* | *95.4* |
| | *26.5* | *94.3* |
| | *19.0* | *91.7* |
| | *13.2* | *81.9* |
| | *9.5* | *72.6* |
| | *6.7* | *66.1* |
| | *4.75* | *60.2* |
| | *2.36* | *48.4* |
| | *1.18* | *38.6* |
| | *0.600* | *31.0* |
| | *0.425* | *27.9* |
| | *0.300* | *24.7* |
| | *0.150* | *19.5* |
| | *0.075* | *16.1* |



remarks : *Sample received from the Client on the 16/10/06*





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*Garry K Collins*
*Specialised Testing Manager*
Date : *24/10/06*

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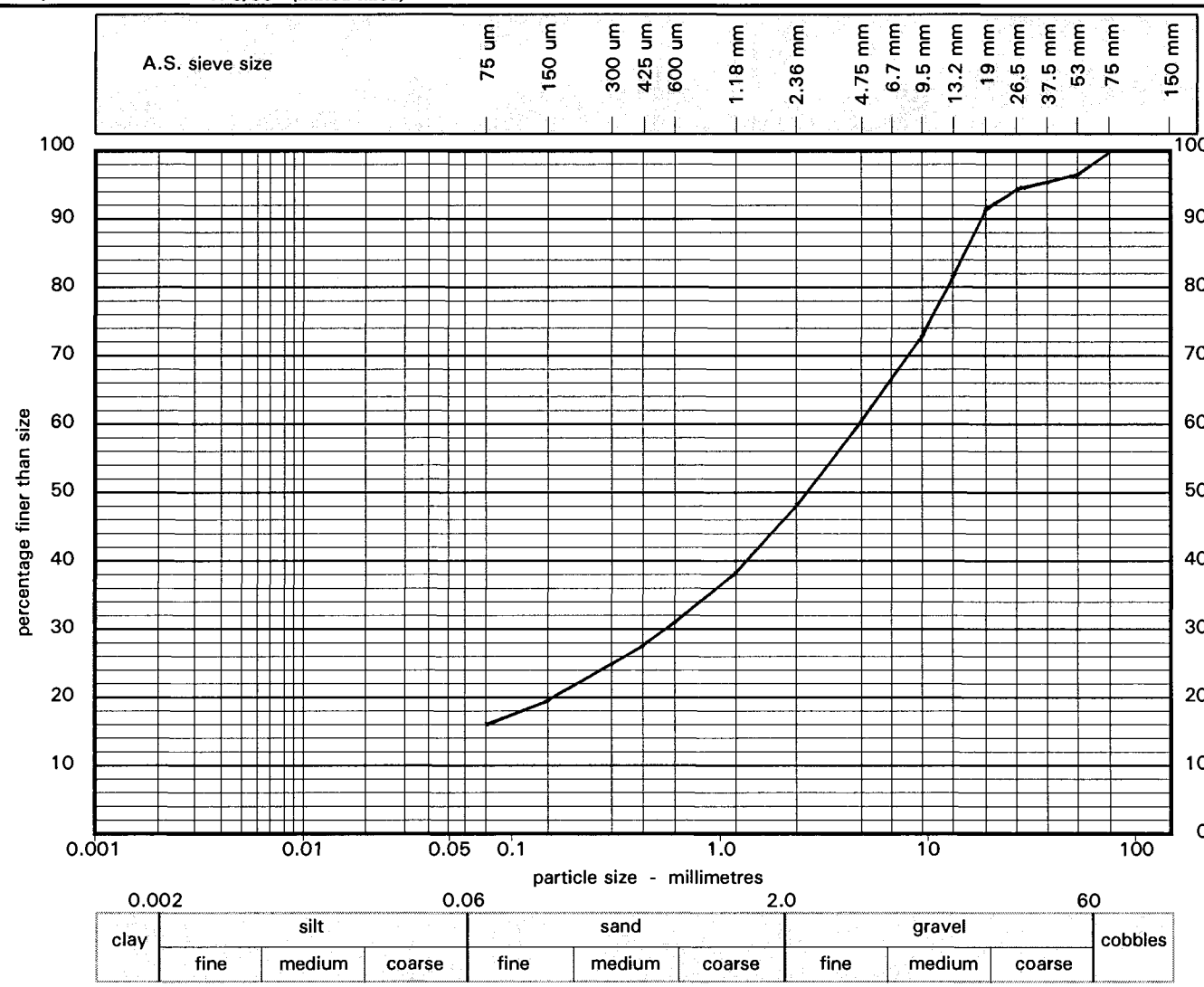
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution & atterberg limits

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 3*

test procedure : *AS1289.3.1.2,3.2.1,3.3.1,3.4.1,3.6.1*
depth : -
sample no : *610023*
sample identification: *TP3/S3 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | *38* |
| plastic limit | % | *23* |
| plasticity index | % | *15* |
| linear shrinkage | % | *9.5* |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☒
other ☐

**Preparation Method**

dry sieving ☒
wet sieving ☐

**Linear Shrinkage**

Mould size *250* mm
crumbing ☐
curling ☐

classification :



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*Garry K Collins*
*Specialised Testing Manager*
Date : *23/10/06*

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coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 4*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 4/S 5 (mixed fill)*<br>*Sydney Lab No. 610024* | *150.0* | *100.0* |
| | *75.0* | *80.6* |
| | *63.0* | *80.6* |
| | *53.0* | *78.2* |
| | *37.5* | *71.5* |
| | *26.5* | *67.8* |
| | *19.0* | *64.6* |
| | *13.2* | *60.9* |
| | *9.5* | *58.9* |
| | *6.7* | *56.8* |
| | *4.75* | *55.1* |
| | *2.36* | *48.9* |
| | *1.18* | *42.4* |
| | *0.600* | *36.4* |
| | *0.425* | *33.4* |
| | *0.300* | *29.7* |
| | *0.150* | *23.3* |
| | *0.075* | *19.2* |



remarks : *1.Sample received from the Client on the 16/10/06*
*2.Sample did not meet Minimum Mass of Sub-sample requirement as per AS1289.1.1 Section 5.7 Table 1*



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Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*
Date : *24/10/06*

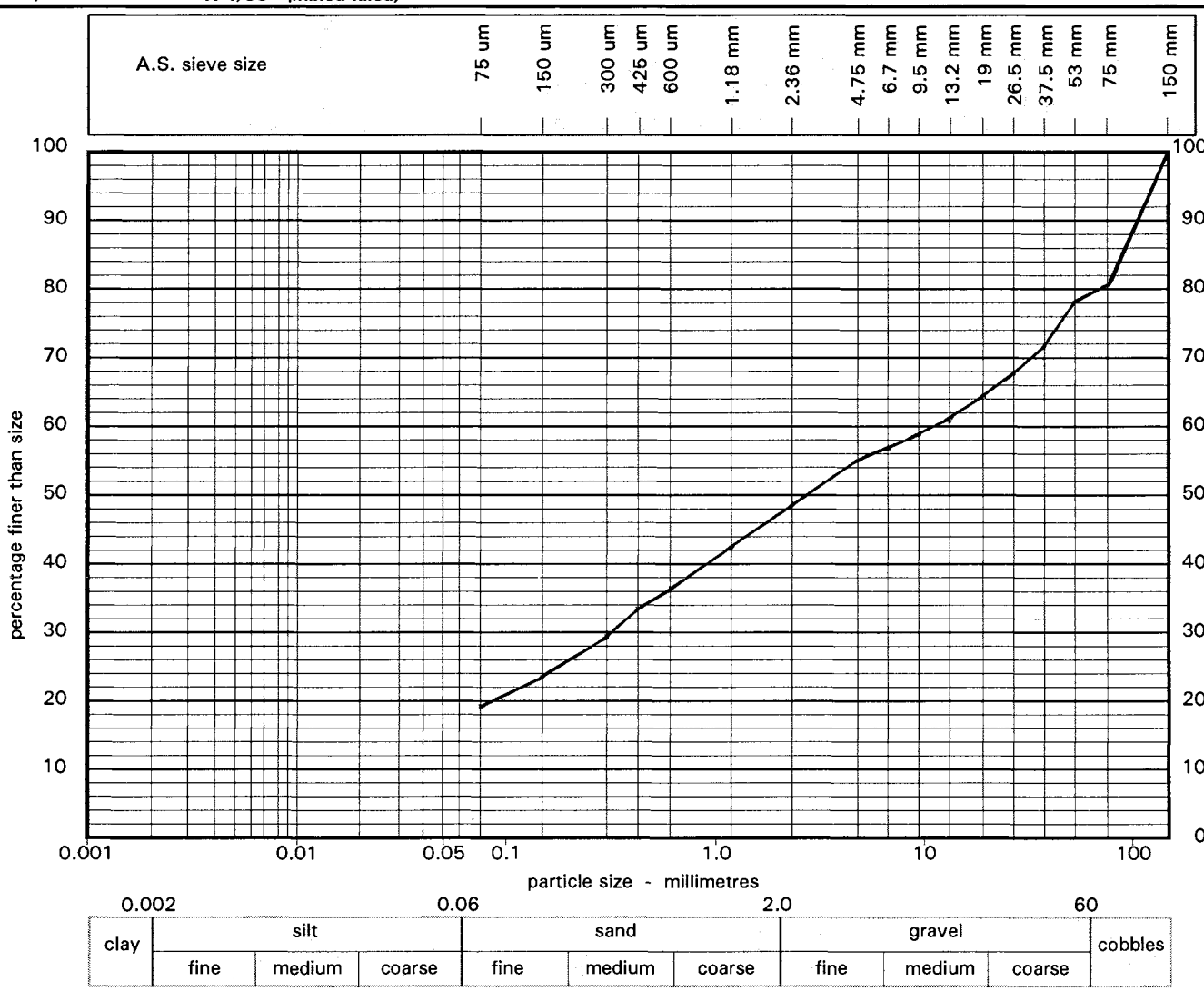
coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution & atterberg limits

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 4*

test procedure : *AS1289.3.1.2,3.2.1,3.3.1,3.4.1,3.6.1*
depth : -
sample no : *610024*
sample identification: *TP4/S5 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | *40* |
| plastic limit | % | *25* |
| plasticity index | % | *15* |
| linear shrinkage | % | *7.0* |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☐
other ☐

**Preparation Method**

dry sieving ☐
wet sieving ☐

**Linear Shrinkage**

Mould size mm
crumbing ☐
curling ☐

classification :

***Note: Sample did not meet Minimum Mass of Sub-Sample as per AS1289.1.1 Section 5.7 Table 1***

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Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *23/10/06*

Form Number L1.8R2 Version 6.0

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 6*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 6/S 7 (mixed fill)*<br>*Sydney Lab No. 610026* | *150.0* | *100.0* |
| | *75.0* | *76.6* |
| | *63.0* | *70.3* |
| | *53.0* | *64.9* |
| | *37.5* | *59.3* |
| | *26.5* | *54.0* |
| | *19.0* | *52.3* |
| | *13.2* | *51.1* |
| | *9.5* | *50.0* |
| | *6.7* | *49.3* |
| | *4.75* | *48.4* |
| | *2.36* | *43.7* |
| | *1.18* | *35.7* |
| | *0.600* | *29.0* |
| | *0.425* | *25.5* |
| | *0.300* | *21.9* |
| | *0.150* | *16.1* |
| | *0.075* | *12.3* |



remarks : *1.Sample received from the Client on the 16/10/06*
*2.Sample did not meet Minimum Mass of Sub-sample requirement as per AS1289.1.1 Section 5.7 Table 1*



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Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*
Date : *24/10/06*

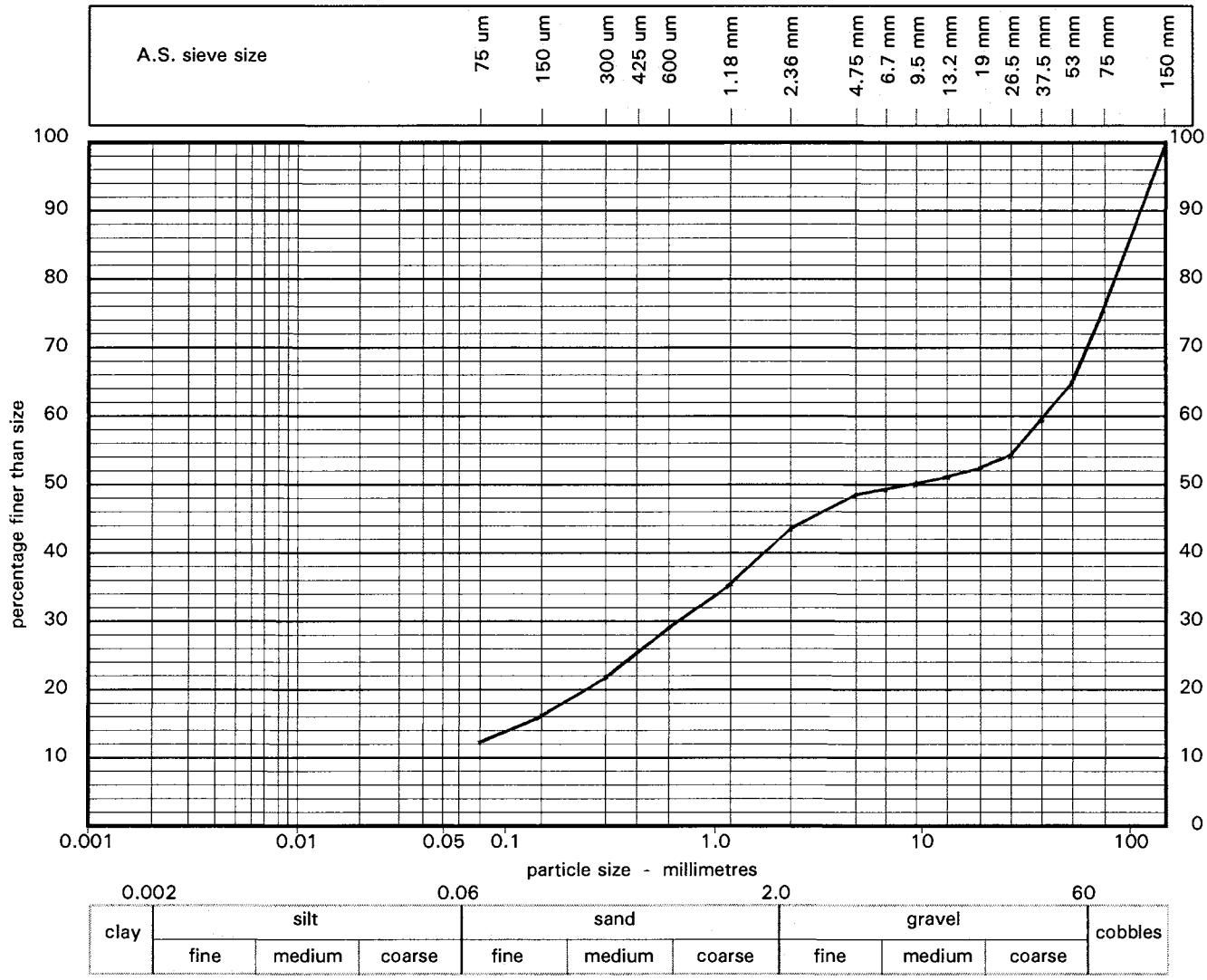
coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution & atterberg limits

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 6*

test procedure : *AS1289.3.1.2,3.2.1,3.3.1,3.4.1,3.6.1*
depth : -
sample no : *610026*
sample identification: *TP6/S7 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | *Not Obtainable* |
| plastic limit | % | *Non Plastic* |
| plasticity index | % | *Not Obtainable* |
| linear shrinkage | % | *Not Obtainable* |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☒
other ☐

**Preparation Method**

dry sieving ☒
wet sieving ☐

**Linear Shrinkage**

Mould size mm
crumbing ☐
curling ☐

classification :

*Note: Sample did not meet Minimum Mass of Sub-Sample as per AS1289.1.1 Section 5.7 Table 1*

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Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *23/10/06*

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 8*
test procedure. : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 8/S 9 (mixed fill)*<br>*Sydney Lab No. 610028* | *150.0* | *100.0* |
| | *75.0* | *87.6* |
| | *63.0* | *87.6* |
| | *53.0* | *87.6* |
| | *37.5* | *80.8* |
| | *26.5* | *76.2* |
| | *19.0* | *73.0* |
| | *13.2* | *70.7* |
| | *9.5* | *68.4* |
| | *6.7* | *66.1* |
| | *4.75* | *63.6* |
| | *2.36* | *53.2* |
| | *1.18* | *38.9* |
| | *0.600* | *28.7* |
| | *0.425* | *24.7* |
| | *0.300* | *20.6* |
| | *0.150* | *15.0* |
| | *0.075* | *11.8* |



remarks : *1.Sample received from the Client on the 16/10/06*
*2.Sample did not meet Minimum Mass of Sub-sample requirement as per AS1289.1.1 Section 5.7 Table 1*



NATA Accredited Laboratory No. 431
Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *24/10/06*

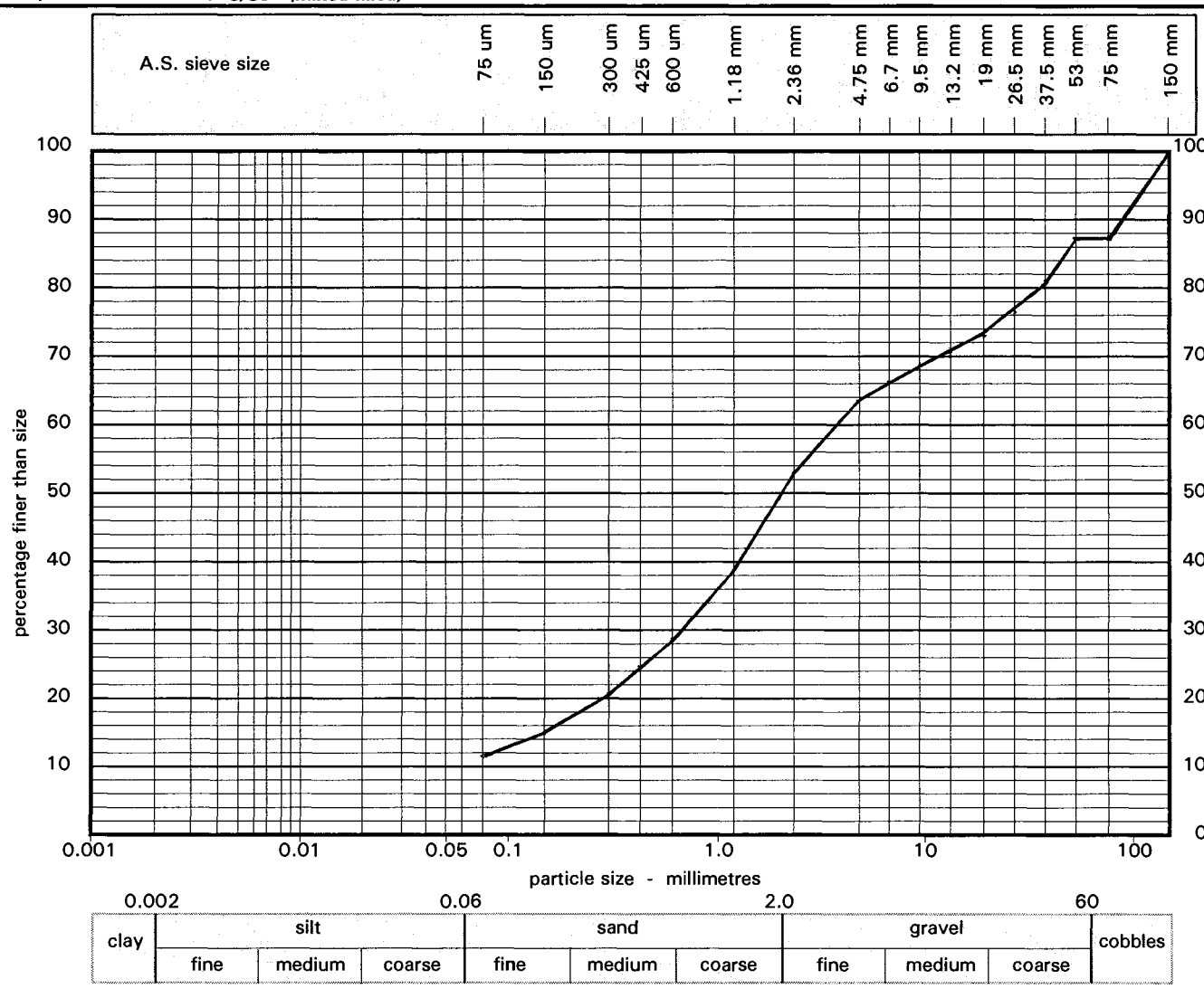
coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution & atterberg limits

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 8*

test procedure : *AS1289.3.1.2,3.2.1,3.3.1,3.4.1,3.6.1*
depth : -
sample no : *610028*
sample identification: *TP8/S9 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | *Not Obtainable* |
| plastic limit | % | *Non Plastic* |
| plasticity index | % | *Not Obtainable* |
| linear shrinkage | % | *Not Obtainable* |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☒
other ☐

**Preparation Method**

dry sieving ☒
wet sieving ☐

**Linear Shrinkage**

Mould size mm
crumbing ☐
curling ☐

classification :

*Note: Sample did not meet Minimum Mass of Sub-Sample as per AS1289.1.1 Section 5.7 Table 1*



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*Specialised Testing Manager*
Date : *23/10/06*

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SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 10*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 10/S 11 (mixed fill)*<br>*Sydney Lab No. 610030* | *150.0* | *100.0* |
| | *75.0* | *100.0* |
| | *63.0* | *100.0* |
| | *53.0* | *100.0* |
| | *37.5* | *98.4* |
| | *26.5* | *92.3* |
| | *19.0* | *83.1* |
| | *13.2* | *74.9* |
| | *9.5* | *70.4* |
| | *6.7* | *66.3* |
| | *4.75* | *63.2* |
| | *2.36* | *56.6* |
| | *1.18* | *49.7* |
| | *0.600* | *43.2* |
| | *0.425* | *37.9* |
| | *0.300* | *30.0* |
| | *0.150* | *20.0* |
| | *0.075* | *16.2* |



remarks : *1.Sample received from the Client on the 16/10/06*
*2.Sample did not meet Minimum Mass of Sub-sample requirement as per AS1289.1.1 Section 5.7 Table 1*



NATA Accredited Laboratory No. 431
Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *24/10/06*

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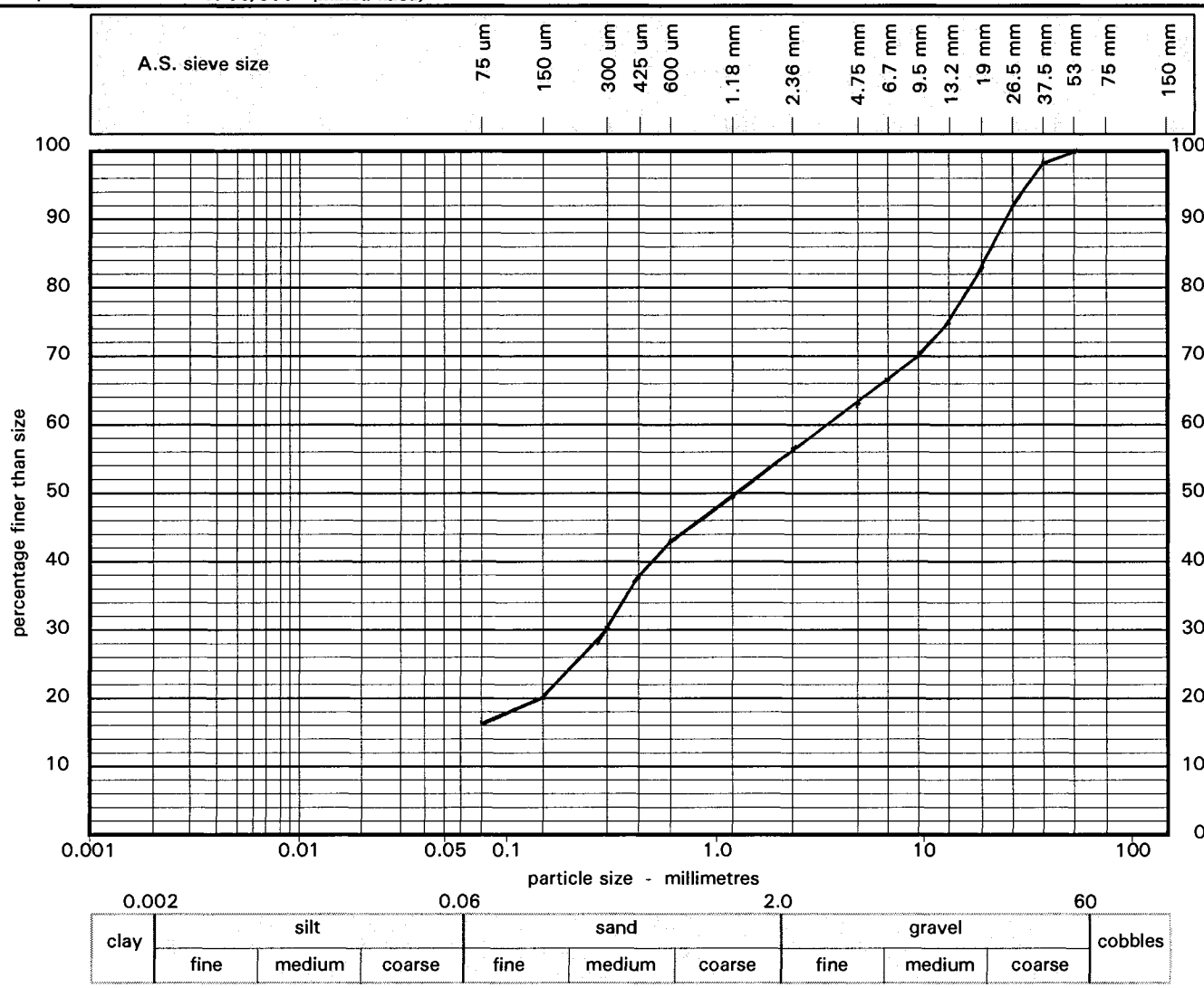
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 10*

test procedure : *AS1289.3.6.1*
depth : -
sample no : *610030*
sample identification: *TP10/S11 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | - |
| plastic limit | % | - |
| plasticity index | % | - |
| linear shrinkage | % | - |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☐
other ☐

**Preparation Method**

dry sieving ☐
wet sieving ☐

**Linear Shrinkage**

Mould size mm
crumbing ☐
curling ☐

classification :

*Note: Sample did not meet Minimum Mass of Sub-Sample as per AS1289.1.1 Section 5.7 Table 1*



NATA Accredited Laboratory No. 431
Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*
Date : *23/10/06*

Form Number L1.8R2 Version 6.0

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 11*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 12/S 12 (mixed fill)*<br>*Sydney Lab No. 610031* | *150.0* | *100.0* |
| | *75.0* | *86.6* |
| | *63.0* | *80.0* |
| | *53.0* | *76.4* |
| | *37.5* | *63.2* |
| | *26.5* | *51.9* |
| | *19.0* | *47.8* |
| | *13.2* | *45.0* |
| | *9.5* | *43.1* |
| | *6.7* | *40.8* |
| | *4.75* | *38.3* |
| | *2.36* | *30.3* |
| | *1.18* | *23.0* |
| | *0.600* | *17.3* |
| | *0.425* | *14.9* |
| | *0.300* | *12.5* |
| | *0.150* | *9.1* |
| | *0.075* | *6.9* |



remarks : *1.Sample received from the Client on the 16/10/06*
*2.Sample did not meet Minimum Mass of Sub-sample requirement as per AS1289.1.1 Section 5.7 Table 1*



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Approved Signatory:
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*Specialised Testing Manager*
Date : *24/10/06*

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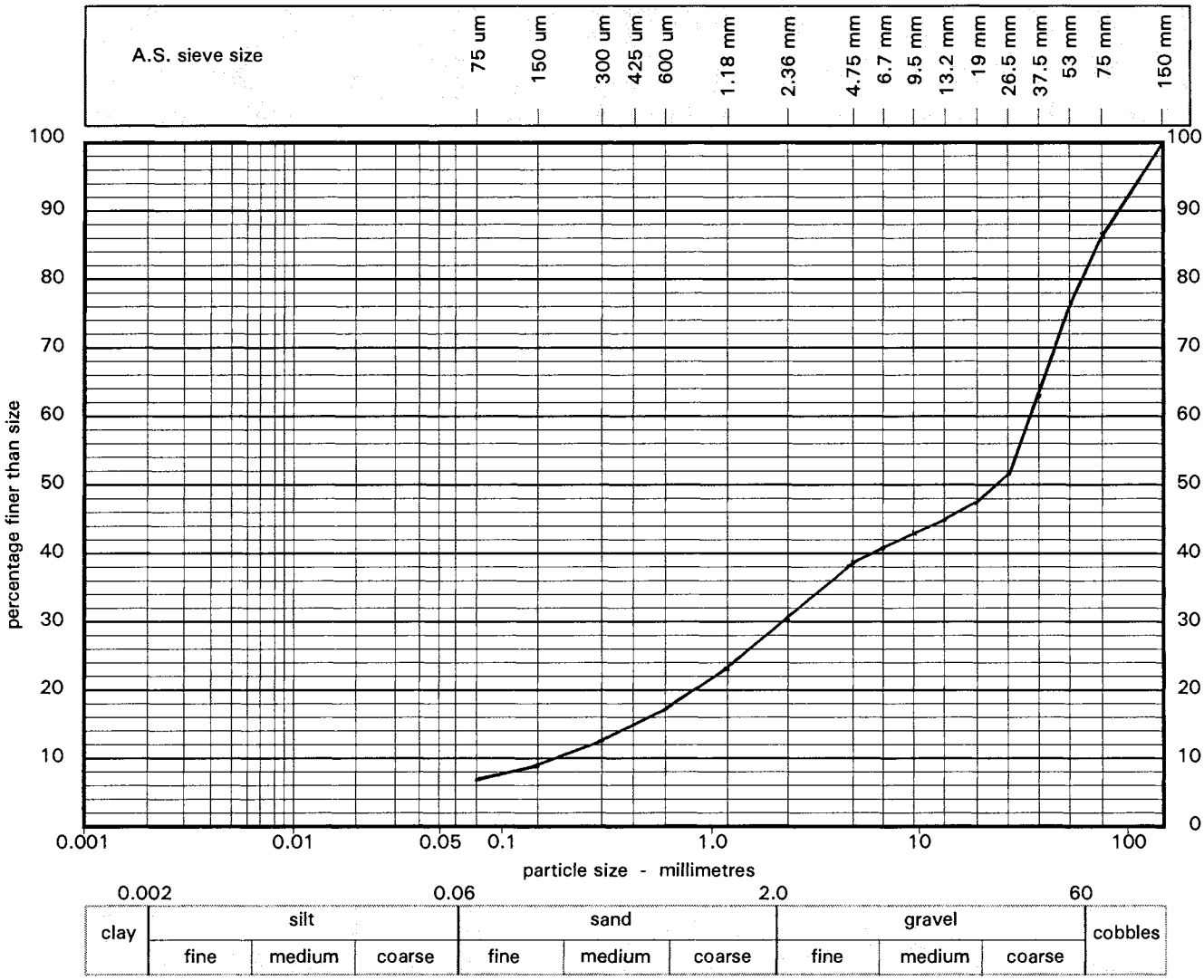
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution & atterberg limits

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 11*

test procedure : *AS1289.3.1.2,3.2.1,3.3.1,3.4.1,3.6.1*
depth : -
sample no : *610031*
sample identification: *TP12/S12 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | *Not Obtainable* |
| plastic limit | % | *Non Plastic* |
| plasticity index | % | *Not Obtainable* |
| linear shrinkage | % | *Not Obtainable* |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☒
other ☐

**Preparation Method**

dry sieving ☒
wet sieving ☐

**Linear Shrinkage**

Mould size *250* mm
crumbing ☐
curling ☐

classification :

***Note: Sample did not meet Minimum Mass of Sub-Sample as per AS1289.1.1 Section 5.7 Table 1***

Form Number L1.8R2 Version 6.0





NATA Accredited Laboratory No. 431
Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*

Date : *23/10/06*

coffey geotechnics
SPECIALISTS MANAGING THE EARTH

Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# test results

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 12*
test procedure : *AS1289.3.6.1*
test date : *23/10/06*

| SAMPLE IDENTIFICATION | A.S SIEVE SIZE (DIAMETER) (mm) | PERCENT PASSING (%) |
|---|---|---|
| *TP 14/S 14 (mixed fill)*<br>*Sydney Lab No. 610032* | *150.0* | *100.0* |
| | *75.0* | *94.8* |
| | *63.0* | *94.8* |
| | *53.0* | *94.8* |
| | *37.5* | *90.0* |
| | *26.5* | *86.0* |
| | *19.0* | *84.2* |
| | *13.2* | *82.5* |
| | *9.5* | *81.2* |
| | *6.7* | *79.3* |
| | *4.75* | *77.4* |
| | *2.36* | *71.6* |
| | *1.18* | *65.1* |
| | *0.600* | *57.3* |
| | *0.425* | *50.1* |
| | *0.300* | *40.0* |
| | *0.150* | *26.6* |
| | *0.075* | *21.2* |



remarks : *1.Sample received from the Client on the 16/10/06*
*2.Sample did not meet Minimum Mass of Sub-sample requirement as per AS1289.1.1 Section 5.7 Table 1*



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*Specialised Testing Manager*

Date : *24/10/06*

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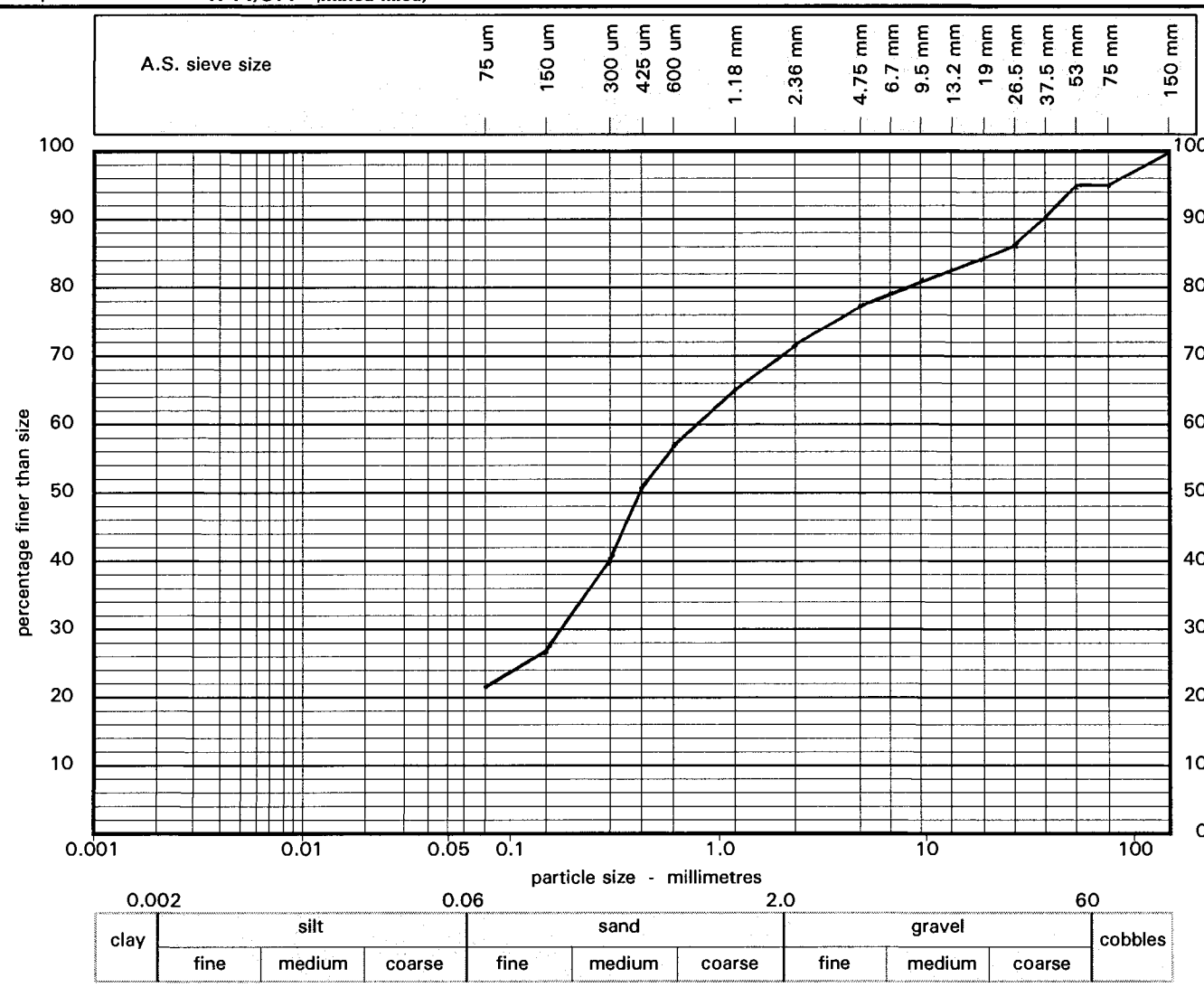
Unit 8, 12 Mars Road, Lane Cove West, NSW, 2066
Ph: (02) 9911 1000 Fax (02) 9911 1003

# particle size distribution & atterberg limits

client : *PELLS SULLIVAN MEYNINK PTY LTD.*
job no : *LCOVLAB4329BH*
principal :
laboratory : *SYDNEY*
project : *LABORATORY TESTING - PSM 1059.TF2*
report date : *October 24, 2006*
location : *HORNSBY QUARRY*
test report no. : *BH 12*

test procedure : *AS1289.3.1.2,3.2.1,3.3.1,3.4.1,3.6.1*
depth : -
sample no : *610032*
sample identification: *TP14/S14 (mixed filled)*




**Atterberg Limit :**

| | | |
|---|---|---|
| liquid limit | % | *34* |
| plastic limit | % | *20* |
| plasticity index | % | *14* |
| linear shrinkage | % | *7.0* |
| natural moisture | % | - |

**Sample History**

natural state ☐
air dried ☐
oven dried ☒
other ☐

**Preparation Method**

dry sieving ☒
wet sieving ☐

**Linear Shrinkage**

Mould size *250* mm
crumbing ☐
curling ☐

classification :

***Note: Sample did not meet Minimum Mass of Sub-Sample as per AS1289.1.1 Section 5.7 Table 1***



NATA Accredited Laboratory No. 431
Approved Signatory:
*Garry K Collins*
*Specialised Testing Manager*
Date : *23/10/06*

Form Number L1.8R2 Version 6.0

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| Client | : COFFEY ENVIRONMENTS PTY LTD | Laboratory | : ALS Environmental Sydney | Page | : 1 of 5 |
| Contact | : MR GARRY COLLINS | Contact | : Greg Vogel | Work Order | : ES0613359 |
| Address | : 8/12 MARS ROAD LANE COVE WEST NSW AUSTRALIA 2066 | Address | : 277-289 Woodpark Road Smithfield NSW Australia 2164 | | |
| E-mail | : garry_collins@coffey.com.au | E-mail | : Greg.Vogel@alsenviro.com | | |
| Telephone | : 02 9911 1000 | Telephone | : +61 (02) 8784 8555 | | |
| Facsimile | : 02 9911 1001 | Facsimile | : +61 (02) 8784 8500 | | |
| Project | : LCOVLAB4329BH | Quote number | : EN/007/06 | Date received | : 25 Oct 2006 |
| Order number | : 5350 | | | Date issued | : 27 Oct 2006 |
| C-O-C number | : 29854 | | | No. of samples | - Received : 8 |
| Site | : - Not provided - | | | | Analysed : 8 |

*ALSE - Excellence in Analytical Testing*

NATA Accredited Laboratory 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

| Signatory | Position | Department |
|---|---|---|
| Peter Dickenson | Senior Spectroscopist | Inorganics - NATA 825 (10911 - Sydney) |

## Comments

This report for the ALSE reference ES0613359 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical Results for Samples Submitted**
- **Surrogate Recovery Data**

The analytical procedures used by ALS Environmental have been developed from established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

ALS Environmental

## Analytical Results

| | | | | Client Sample ID : | TP1/S1 | TP3/S3 | TP4/S5 | TP6/S7 | TP8/S9 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample Matrix Type / Description : | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | | Sample Date / Time : | ( 25 Oct 2006 ) ( 15:00 ) | ( 25 Oct 2006 ) ( 15:00 ) | ( 25 Oct 2006 ) ( 15:00 ) | ( 25 Oct 2006 ) ( 15:00 ) | ( 25 Oct 2006 ) ( 15:00 ) |
| | | | | Laboratory Sample ID : | | | | | |
| *Analyte* | *CAS number* | *LOR* | *Units* | | ES0613359-001 | ES0613359-002 | ES0613359-003 | ES0613359-004 | ES0613359-005 |
| **EA055: Moisture Content** | | | | | | | | | |
| Moisture Content (dried @ 103°C) | | 1.0 | % | | <1.0 | 1.4 | 1.7 | 3.5 | 2.3 |
| **ED040T : Total Sulphate by ICPAES** | | | | | | | | | |
| Sulphate as SO4 2- | 14808-79-8 | 100 | mg/kg | | 280 | 430 | 160 | <100 | 200 |

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## Analytical Results

| | | | | Client Sample ID : | TP10/S11 | TP12/S12 | TP14/S14 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample Matrix Type / Description : | SOIL | SOIL | SOIL | | |
| | | | | Sample Date / Time : | ( 25 Oct 2006 ) ( 15:00 ) | ( 25 Oct 2006 ) ( 15:00 ) | ( 25 Oct 2006 ) ( 15:00 ) | | |
| | | | | Laboratory Sample ID : | | | | | |
| *Analyte* | *CAS number* | *LOR* | *Units* | | ES0613359-006 | ES0613359-007 | ES0613359-008 | | |
| **EA055: Moisture Content** | | | | | | | | | |
| Moisture Content (dried @ 103°C) | | 1.0 | % | | <1.0 | 3.5 | 1.1 | | |
| **ED040T : Total Sulphate by ICPAES** | | | | | | | | | |
| Sulphate as SO4 2- | 14808-79-8 | 100 | mg/kg | | 410 | <100 | <100 | | |

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## Surrogate Control Limits

- **No surrogates present on this report.**