

### **Quality Control Definitions**

**Blank:** This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

**Duplicate:** This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

**Matrix Spike :** A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

**LCS (Laboratory Control Sample) :** This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

**Surrogate Spike:** Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

### **Laboratory Acceptance Criteria**

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.



**Borehole No.**  
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# BOREHOLE LOG

**Client:** HELM PTY LTD  
**Project:** PROPOSED RESIDENTIAL DEVELOPMENT  
**Location:** 177 RUSSELL AVENUE, DOLLS POINT, NSW

**Job No.:** 29353S **Method:** SPIRAL AUGER & CASING ADVANCER **R.L. Surface:** ~1.6 m  
**Date:** 4/5/16 **Datum:** AHD  
**Plant Type:** JK308 **Logged/Checked By:** A.B./P.S.

| Groundwater Record                                   | SAMPLES |     |    | Field Tests | RL (m AHD) | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION                                                                 | Moisture Condition/ Weathering | Strength/ Rel Density | Hand Penetrometer Readings (kPa) | Remarks                    |
|------------------------------------------------------|---------|-----|----|-------------|------------|-----------|-------------|------------------------|-----------------------------------------------------------------------------|--------------------------------|-----------------------|----------------------------------|----------------------------|
|                                                      | ES      | U50 | DB | DS          |            |           |             |                        |                                                                             |                                |                       |                                  |                            |
| <p>ON COMPLETION OF AUGERING</p> <p>AFTER 15 HRS</p> |         |     |    |             |            |           |             |                        | FILL: Silty sand, fine grained, brown, trace of roots and root fibres.      | M                              |                       |                                  | GRASS COVER                |
|                                                      |         |     |    |             |            | 1         |             | SP                     | SAND: fine to medium grained, light brown, trace of shell fragments.        | M                              | VL                    |                                  |                            |
|                                                      |         |     |    |             |            | 1         |             |                        |                                                                             |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | 0         |             |                        | as above, but grey.                                                         | W                              |                       |                                  |                            |
|                                                      |         |     |    |             |            | 2         |             |                        |                                                                             |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | -1        |             |                        |                                                                             |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | 3         |             |                        | SAND: fine to medium grained, dark grey, trace of silt and shell fragments. |                                |                       |                                  | SPT SUNK UNDER SELF WEIGHT |
|                                                      |         |     |    |             |            | -2        |             |                        |                                                                             |                                |                       |                                  | SLIGHT ORGANIC ODOUR       |
|                                                      |         |     |    |             |            | 4         |             |                        | SAND: fine to medium grained, grey.                                         |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | -3        |             |                        |                                                                             |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | 5         |             |                        |                                                                             |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | -4        |             |                        |                                                                             |                                | L                     |                                  |                            |
|                                                      |         |     |    |             |            | 6         |             |                        |                                                                             |                                |                       |                                  |                            |
|                                                      |         |     |    |             |            | -5        |             |                        |                                                                             |                                |                       |                                  |                            |



**Borehole No.**

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# BOREHOLE LOG

**Client:** HELM PTY LTD  
**Project:** PROPOSED RESIDENTIAL DEVELOPMENT  
**Location:** 177 RUSSELL AVENUE, DOLLS POINT, NSW

**Job No.:** 29353S

**Method:** SPIRAL AUGER & CASING ADVANCER

**R.L. Surface:** ~1.6 m

**Date:** 4/5/16

**Datum:** AHD

**Plant Type:** JK308

**Logged/Checked By:** A.B./P.S.

| Groundwater Record | SAMPLES |     |    |    | Field Tests       | RL (m AHD) | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION                         | Moisture Condition/Weathering | Strength/Rel Density | Hand Penetrometer Readings (kPa) | Remarks         |
|--------------------|---------|-----|----|----|-------------------|------------|-----------|-------------|------------------------|-------------------------------------|-------------------------------|----------------------|----------------------------------|-----------------|
|                    | ES      | U50 | DB | DS |                   |            |           |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    | N = 22<br>6,9,13  |            | -6        |             | SP                     | SAND: fine to medium grained, grey. | W                             | MD                   |                                  | CASING ADVANCER |
|                    |         |     |    |    |                   |            | -8        |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    |                   |            | -7        |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    | N = 15<br>3,6,9   |            | -9        |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    |                   |            | -8        |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    |                   |            | -10       |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    | N = 30<br>6,13,17 |            | -12       |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    |                   |            | -11       |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    |                   |            | -13       |             |                        |                                     |                               |                      |                                  |                 |
|                    |         |     |    |    |                   |            | -12       |             |                        |                                     |                               |                      |                                  |                 |



Borehole No.

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# BOREHOLE LOG

**Client:** HELM PTY LTD  
**Project:** PROPOSED RESIDENTIAL DEVELOPMENT  
**Location:** 177 RUSSELL AVENUE, DOLLS POINT, NSW

**Job No.:** 29353S **Method:** SPIRAL AUGER & CASING ADVANCER **R.L. Surface:** ~1.6 m  
**Date:** 4/5/16 **Datum:** AHD  
**Plant Type:** JK308 **Logged/Checked By:** A.B./P.S.

| Groundwater<br>Record | SAMPLES |     |    |    | Field Tests        | RL (m AHD) | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION                                                         | Moisture Condition/<br>Weathering | Strength/<br>Rel Density | Hand Penetrometer<br>Readings (kPa) | Remarks |
|-----------------------|---------|-----|----|----|--------------------|------------|-----------|-------------|------------------------|---------------------------------------------------------------------|-----------------------------------|--------------------------|-------------------------------------|---------|
|                       | ES      | U50 | DB | DS |                    |            |           |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | -13       |             | SP                     | SAND: fine to medium grained, grey.                                 | W                                 | (L - MD)                 |                                     |         |
|                       |         |     |    |    | N = 6<br>7,3,3     |            | 15        |             | CH                     | SILTY CLAY: high plasticity, grey.                                  | MC>PL                             | St                       | 140<br>140                          |         |
|                       |         |     |    |    |                    |            | -14       |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | 16        |             | SC / CL                | CLAYEY SAND/SANDY CLAY: fine grained, light grey.                   | W                                 | MD                       |                                     |         |
|                       |         |     |    |    |                    |            | -15       |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | 17        |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | -16       |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    | N = 19<br>4,8,11   |            | 18        |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | -17       |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | 19        |             | SP                     | SAND: fine to medium grained, light grey, trace of shell fragments. |                                   | (MD)<br>D                |                                     |         |
|                       |         |     |    |    |                    |            | -18       |             |                        | as above,<br>but trace of clay.                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | 20        |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    |                    |            | -19       |             |                        |                                                                     |                                   |                          |                                     |         |
|                       |         |     |    |    | N = 34<br>10,18,16 |            |           |             |                        |                                                                     |                                   |                          |                                     |         |

WATER FLUSH RETURN  
LIGHTER COLOUR



Borehole No.

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# BOREHOLE LOG

**Client:** HELM PTY LTD  
**Project:** PROPOSED RESIDENTIAL DEVELOPMENT  
**Location:** 177 RUSSELL AVENUE, DOLLS POINT, NSW

**Job No.:** 29353S **Method:** SPIRAL AUGER & CASING ADVANCER **R.L. Surface:** ~1.6 m  
**Date:** 4/5/16 **Datum:** AHD  
**Plant Type:** JK308 **Logged/Checked By:** A.B./P.S.

| Groundwater Record | SAMPLES |     |    |    | Field Tests | RL (m AHD) | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION                                                                  | Moisture Condition/ Weathering | Strength/ Rel Density | Hand Penetrometer Readings (kPa) | Remarks         |
|--------------------|---------|-----|----|----|-------------|------------|-----------|-------------|------------------------|------------------------------------------------------------------------------|--------------------------------|-----------------------|----------------------------------|-----------------|
|                    | ES      | U50 | DB | DS |             |            |           |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | -20       |             | SP                     | SAND: fine to medium grained, light grey, trace of shell fragments and clay. | W                              | D                     |                                  |                 |
|                    |         |     |    |    |             |            | 22        |             | -                      | SANDSTONE: fine to medium grained, light grey.                               | SW                             | L                     |                                  | HIGH RESISTANCE |
|                    |         |     |    |    |             |            | -21       |             |                        | REFER TO CORED BOREHOLE LOG                                                  |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | 23        |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | -22       |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | 24        |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | -23       |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | 25        |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | -24       |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | 26        |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | -25       |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | 27        |             |                        |                                                                              |                                |                       |                                  |                 |
|                    |         |     |    |    |             |            | -26       |             |                        |                                                                              |                                |                       |                                  |                 |



Borehole No.

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# CORED BOREHOLE LOG

**Client:** HELM PTY LTD  
**Project:** PROPOSED RESIDENTIAL DEVELOPMENT  
**Location:** 177 RUSSELL AVENUE, DOLLS POINT, NSW

**Job No.:** 29353S **Core Size:** NMLC **R.L. Surface:** ~1.6 m  
**Date:** 4/5/16 **Inclination:** VERTICAL **Datum:** AHD  
**Plant Type:** JK308 **Bearing:** N/A **Logged/Checked By:** A.B./P.S.

| Water Level<br>Barrel Lift | RL (m AHD) | Depth (m) | Graphic Log | CORE DESCRIPTION<br>Rock Type, grain characteristics, colour, structure, minor components.      | Weathering | Strength | POINT LOAD STRENGTH INDEX $I_p(50)$                     | DEFECT DETAILS                      |                                                                                                                                                              |
|----------------------------|------------|-----------|-------------|-------------------------------------------------------------------------------------------------|------------|----------|---------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            |            |           |             |                                                                                                 |            |          |                                                         | DEFECT SPACING (mm)                 | DESCRIPTION<br>Type, inclination, thickness, planarity, roughness, coating.                                                                                  |
|                            |            |           |             |                                                                                                 |            |          | EL-0.03<br>VL-0.1<br>L-0.3<br>M-1<br>H-3<br>VH-10<br>EH | 500<br>300<br>100<br>50<br>30<br>10 | Specific General                                                                                                                                             |
|                            | -20        | 22        |             | START CORING AT 22.23m                                                                          |            |          |                                                         |                                     |                                                                                                                                                              |
|                            | -21        | 23        |             | SANDSTONE: fine to medium grained, light grey, bedded at 5°.                                    | SW         | L        |                                                         |                                     | (22.80m) Be, 0°, P, S                                                                                                                                        |
|                            |            |           |             | as above, but bedded at 0°.                                                                     |            |          |                                                         |                                     | (23.00m) J, 40°, P, R, XW INFILL                                                                                                                             |
|                            |            |           |             | CORE LOSS 0.07m                                                                                 | SW         | M        |                                                         |                                     | (23.27m) CS, 0°, 2 mm.t                                                                                                                                      |
|                            | -22        | 24        |             | SANDSTONE: fine to medium grained, light grey, bedded at 0-5°.                                  |            | H        |                                                         |                                     | (23.53m) CS, 0°, 20 mm.t                                                                                                                                     |
|                            | -23        | 25        |             | SANDSTONE: fine to medium grained, light grey, orange brown and red brown, cross bedded at 20°. |            |          |                                                         |                                     | (23.84m) CS, 0°, 20 mm.t                                                                                                                                     |
|                            | -24        | 26        |             | END OF BOREHOLE AT 25.26 m                                                                      |            |          |                                                         |                                     | MONITORING WELL INSTALLED TO 8.49m, SLOTTED TO 5.5m TO 8.49m, SAND FILTER TO 4.8m, BENTONITE PLUG TO 0.7m, BACKFILLED TO SURFACE, COMPLETED WITH GATIC COVER |
|                            | -25        | 27        |             |                                                                                                 |            |          |                                                         |                                     |                                                                                                                                                              |
|                            | -26        |           |             |                                                                                                 |            |          |                                                         |                                     |                                                                                                                                                              |

JK\_LIB\_CURRENT - V8.00.GLB Log J & K CORED BOREHOLE - MASTER 29353S DOLLS POINT.GPJ <<DrawingFile>> 25/05/2016 14:32 Produced by gINT Professional. Developed by Dalgal



JK Geotechnics

Job No. 29353S

BHI

START CORING AT 22.23m

22

23

CORE  
LOSS: 0.4m

24

25

EOBH AT 25.26m

**Borehole No.**

**2**

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# BOREHOLE LOG

**Client:** HELM PTY LTD  
**Project:** PROPOSED RESIDENTIAL DEVELOPMENT  
**Location:** 177 RUSSELL AVENUE, DOLLS POINT, NSW

**Job No.:** 29353S

**Method:** SPIRAL AUGER & CASING ADVANCER

**R.L. Surface:** ~1.3 m

**Date:** 3/5/16

**Datum:** AHD

**Plant Type:** JK308

**Logged/Checked By:** A.B./P.S.

| Groundwater Record | SAMPLES |     |    |    | Field Tests     | RL (m AHD) | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION                                                                | Moisture Condition/<br>Weathering | Strength/<br>Rel Density | Hand Penetrometer Readings (kPa) | Remarks                         |
|--------------------|---------|-----|----|----|-----------------|------------|-----------|-------------|------------------------|----------------------------------------------------------------------------|-----------------------------------|--------------------------|----------------------------------|---------------------------------|
|                    | ES      | U50 | DB | DS |                 |            |           |             |                        |                                                                            |                                   |                          |                                  |                                 |
| AFTER 14 HOURS     |         |     |    |    |                 | 1          |           |             | -                      | FILL: Silty sand, fine grained, grey brown, trace of root and root fibres. | M                                 |                          |                                  | GRASS COVER                     |
|                    |         |     |    |    | N = 3<br>2,1,2  |            | 1         |             | SP                     | SAND: fine to medium grained, grey, trace of fine grained shell fragments. | M                                 | VL                       |                                  | MARINE                          |
|                    |         |     |    |    |                 |            | 0         |             |                        |                                                                            | W                                 |                          |                                  |                                 |
|                    |         |     |    |    | N = 2<br>2,1,1  |            | 2         |             |                        |                                                                            |                                   |                          |                                  |                                 |
|                    |         |     |    |    |                 |            | -1        |             |                        |                                                                            |                                   |                          |                                  |                                 |
|                    |         |     |    |    | N = 2<br>0,1,1  |            | 3         |             |                        |                                                                            |                                   |                          |                                  |                                 |
|                    |         |     |    |    |                 |            | -2        |             |                        |                                                                            |                                   |                          |                                  |                                 |
|                    |         |     |    |    |                 |            | -3        |             |                        |                                                                            |                                   | L                        |                                  |                                 |
|                    |         |     |    |    | N = 4<br>2,1,3  |            | 5         |             |                        |                                                                            |                                   |                          |                                  |                                 |
|                    |         |     |    |    |                 |            | -4        |             |                        |                                                                            |                                   |                          |                                  |                                 |
|                    |         |     |    |    | N = 10<br>2,4,6 |            | 6         |             |                        | SAND: fine grained, light brown.                                           |                                   |                          |                                  | ORGANIC ODOUR                   |
|                    |         |     |    |    |                 |            | -5        |             |                        | SAND: fine to medium grained, dark grey, trace of silt.                    |                                   |                          |                                  | WASHBORING WITH CASING ADVANCER |