

G08/221-B VDS:KW  
18<sup>th</sup> November 2008

Rustrum No 2  
c/- Sterling Pty Ltd  
PO Box 142  
CHATSWOOD NSW 2057

**Attention: Terry Roche**

Dear Sir

**Re: Proposed Senior Living Development 222 Main Road, Toukley: Acid Sulphate Assessment, Preliminary Report.**

This preliminary report presents the results of acid sulphate assessment carried out along with a geotechnical investigation.

Fieldwork was carried out on the 30<sup>th</sup> September and 1<sup>st</sup> October, 2008 and comprised of seven boreholes (BH1 to BH7). BH1 to BH4 was drilled using a truck mounted Ezi-probe drill rig in the upper portion. On the lower portion of the site, BH5 and BH6 were drilled to a termination depth of 3m using a skid steer mini drilling rig fitted with a 100mm diameter solid flight 'V-bit' auger drill. BH7 was carried out using portable push tube equipment to a termination depth of 1.8m.

The fieldwork was carried out by our geotechnical staff who selected the test locations, carried out in-situ testing and disturbed sampling, and prepared logs of boreholes on the soils encountered. The borehole logs are presented in appendix A and approximate test locations are shown on the attached Drawing No. G08/221-1.

Laboratory testing carries out on soil samples obtained during the investigation included the following:

- pH tests in H<sub>2</sub>O (distilled water) to assess current acidity;
- pH tests in H<sub>2</sub>O<sub>2</sub> (hydrogen peroxide) to assess the potential for acid sulphate generation;
- Reduced Inorganic Sulphur (Scr) and Total Actual Acidity (TAA) to assess neutralising lime dosing requirement.

No. 222 Main Rd has a frontage of about 50m on the northern side of the road extending north about 70 to 80m to the rear of the site to the Southern shore of Tuggerah lake. The above proposed site has an area of about 1ha, with current site surface reduced levels ranging from about RL8-9m AHD along Main Rd to about RL1-2m AHD fronting the Lake shore (where localised acid sulphate assessment may be justified) with majority of site being RL9m-5m. A concrete driveway provides good

access to the lower portion of the site from the upper portion of the site which has been retained by a series of decrepit retaining walls.

The lower northern portion of the site is heavily grassed and the southern higher portion of site has grass and shrubbery. Surface soils encountered were Sandy Silt topsoil and Sandy silty Gravel fill in Parts.

Subsurface profiles encountered in the lower portion of the site (BH5 to BH7) comprised shallow (<0.2m) fill overlying clay and clayey sand Alluvium.

Fifteen soil samples were obtained from BH5, BH6 and BH7 for pH tests in water ( $H_2O$ ) and hydrogen peroxide ( $H_2O_2$ ) to assess for existing acidity and the potential for acid sulphate generation. Sampling depths ranged up to 3.0m below existing surface levels.

Current guidelines from the Acid Sulphate Soil Management Advisory Committee (ASSMAC 1998) list indicators of pH in water of less than 4 for actual acidity and pH in hydrogen peroxide of less than 3 for potential acidity.

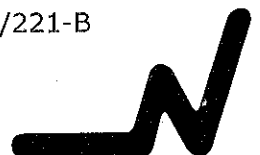
None of the fifteen soil samples recorded pH <4. Four soil samples tested recorded pH <3 in  $H_2O_2$  indicating a potential for producing acidity upon oxidation.

In view of the above, Sand and a Clay samples from BH5 at depths of 0.8m to 1m and 2.8m to 3m respectively, were forwarded to Environmental Analysis Laboratory of Southern Cross University Lismore to carry out Total Actual Acidity and Chromium Reducible sulphur tests. Test results are included in the attached table.

The reduced inorganic sulphur tests indicate that the medium textured alluvium has a Scr of less than 0.06% (0.003% to 0.007%) or 37moles $H^+$ /t and the fine textured CLAY has a Scr of less than 0.03% (0.003%) or 62moles $H^+$ /t.

It is therefore considered that no associated acid sulphate interventions are required during earthworks for the above proposed site improvement works if the volume of excavation in the area containing BH5, BH6 and BH7 is less than 1000t. If it is likely that more than 1000t of soil in the low lying area (area below RL 5.0m contour) is to be excavated the following management practices should be incorporated.

- Prior to excavation, facilities for stockpiling and treatment of acid sulphate soils should be established. Acid sulphate soil should be prevented from leaching prior to treatment.
- Excavated soil should be mixed with hydrated lime (neutralising capacity more than 95%) at a rate of 5kg/m<sup>3</sup>. Treated soil may be used as fill on site or disposed off site. If off site disposal is required, waste classification may be required.
- Lime treated soil should be tested for pH in water to assess that neutralisation is achieved. The treated soil should record pH>6.5 in water. Most of the measured acidity of site soil is existing actual acidity. Therefore, pH test in water would be sufficient to assess the effectiveness of treatment.

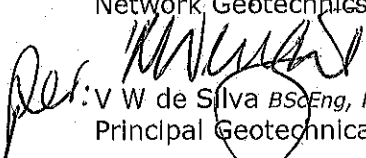


- An environmental consultant should be appointed to oversee the excavation treatment and testing. A validation report may be required by the Council after treatment.

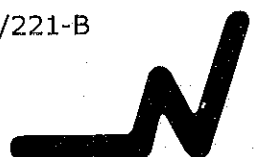
The above recommendations should be the basis of an Acid Sulphate Soil Management Plan (ASSMP) if such a plan is required by the Council. If the volume of soil to be excavated is limited to those from the proposed footing excavations and not more than 150m<sup>3</sup> the above recommendations contained herein meet the requirements of ASSMP. The recommended works should be carried out under the direction of an environmental consultant and a validation report submitted at the completion of site works stating that acid sulphate soils have been treated and have undergone remediation treatment.

This report should be read in conjunction with the attached General Notes. Please contact the undersigned if you require further assistance.

For and on behalf of  
Network Geotechnics Pty Ltd

  
Per: V W de Silva BScEng, MEng, SMIE Aust, CPEng, NPER  
Principal Geotechnical Engineer

encl    General Notes  
         Results of Acid Sulfate Soil Analysis  
         Drawing No G08/221-1 Site Plan



## ***GENERAL NOTES***

---

### **GENERAL**

Geotechnical reports present the results of investigations carried out for a specific project and usually for a specific phase of the project (e.g. preliminary design). The report may not be relevant for other phases of the project (e.g. construction), or where project details change.

### **SOIL AND ROCK DESCRIPTIONS**

Soil and rock descriptions are based on AS 1726 – 1993, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer to the terms and symbols sheet for definitions.

### **GROUNDWATER**

The water levels indicated on the logs are taken at the time of measurement and depending on material permeability may not reflect the actual groundwater level at those specific locations. Also, groundwater levels can vary with time due to seasonal or tidal fluctuations and construction activities.

### **INTERPRETATION OF RESULTS**

The discussion and recommendations in the accompanying report are based on extrapolation / interpolation from data obtained at discrete locations. The actual interface between the materials may be far more gradual or abrupt than indicated. Also, actual conditions in areas not sampled may differ from those predicted.

### **CHANGE IN CONDITIONS**

Subsurface conditions can change with time and can vary between test locations. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions.

### **REPRODUCTION OF REPORTS**

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this firm. Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimise the likelihood of misinterpretation from logs.

### **FURTHER ADVICE**

Network Geotechnics would be pleased to further discuss how any of the above issues could affect your specific project. We would also be pleased to provide further advice or assistance including;

- assessment of suitability of designs and construction techniques;
- contract documentation and specification;
- construction control testing (earthworks, pavement materials, concrete);
- construction advice (foundation assessments, excavation support).

## RESULTS OF ACID SULFATE SOIL ANALYSIS (Page 1 of 1)

2 samples supplied by Network Geotechnics Pty Ltd on 10th October, 2008 - Lab. Job No. A0561  
Analysis requested by Steve Thorley. - Your Project: G08/221

| Sample Site | Depth (m) | EAL lab code | Texture (note 6) | Moisture Content (% moisture) | Lab. Bulk Density tonne DW/m <sup>3</sup> | TAA pH <sub>10</sub> | Titratable Actual Acidity (TAA) mole H <sup>+</sup> /tonne (to pH 6.5) | Reduced Inorganic Sulfur (% chromium reducible S) (%Scr) (note 2) | Reduced Inorganic Sulfur (Scr) mole H <sup>+</sup> /tonne (a-22B) | NET ACIDITY Chromium Sulfate mole H <sup>+</sup> /tonne (based on %ScrS) (note 5) | LIME CALCULATION Chromium Sulfate kg CaCO <sub>3</sub> /m <sup>3</sup> (includes 1.5 safety factor) (note 5) |
|-------------|-----------|--------------|------------------|-------------------------------|-------------------------------------------|----------------------|------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Method No.  |           |              |                  |                               |                                           | 23A                  | 23F                                                                    | 22B                                                               | a-22B                                                             | note 5                                                                            | note 5                                                                                                       |
| BH 5        | 0.8-1.0   | A0561/1      | Medium           | 20.3                          | 1.6                                       | 5.02                 | 17                                                                     | 0.008                                                             | 5                                                                 | 22                                                                                | 3                                                                                                            |
| BH 5        | 2.8-3.0   | A0561/2      | Fine             | 21.3                          | 1.6                                       | 4.58                 | 21                                                                     | 0.052                                                             | 32                                                                | 53                                                                                | 7                                                                                                            |

### NOTE:

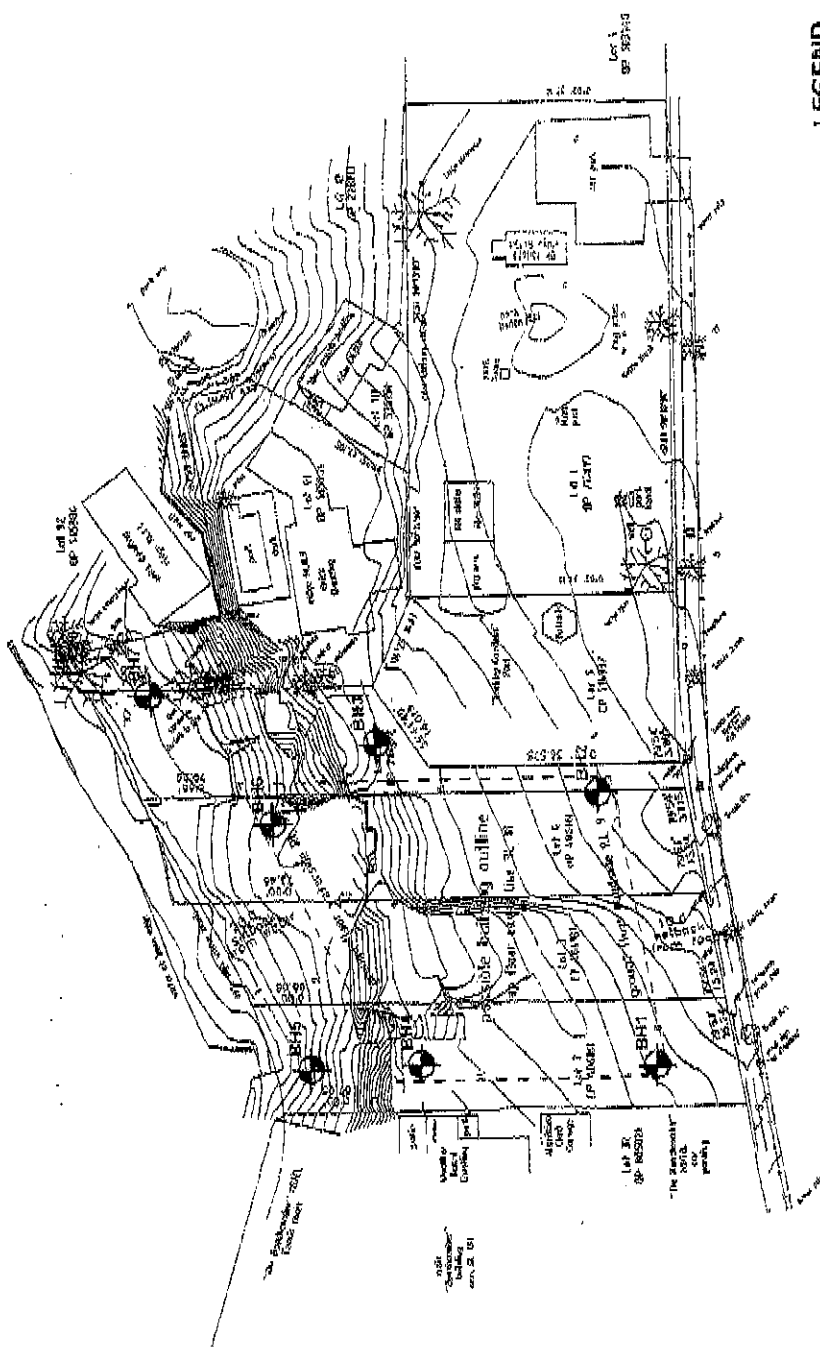
- 1 - All analysis is Dry Weight (DW) - samples dried and ground immediately upon arrival (unless supplied dried and ground)
- 2 - Samples analysed by SPOCAS method 23 (ie Suspension Peroxide Oxidation Combined Acidity & sulfate) and 'Chromium Reducible Sulfur' technique (Scr - Method 22B)
- 3 - Methods from Ahern, CR, McElnea AE, Sullivan LA (2004). *Acid Sulfate Soils Laboratory Methods Guidelines*. QLD DNRME.
- 4 - Bulk density was determined immediately on arrival to laboratory (insitu bulk density is preferred)
- 5 - ABA Equation: Net Acidity = Potential Sulfidic Acidity (ie. ScrS or Sox) + Actual Acidity + Retained Acidity - measured ANC/FF (with FF currently defaulted to 1.5)
- 6 - The neutralising requirement, lime calculation, includes a 1.5 safety margin for acid neutralisation (an increased safety factor may be required in some cases)
- 7 - For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays
- 8 - .. denotes not requested or required
- 9 - SCREENING, CRS, TAA and ANC are NATA certified but other SPOCAS segments are currently not NATA certification
- 10 - Results at or below detection limits are replaced with '0' for calculation purposes.
- 11 - Projects that disturb >1000 tonnes of soil, the ≥0.03% S classification guideline would apply (refer to acid sulfate management guidelines).

(Classification of potential acid sulfate material if: coarse Scr≥0.03%S or 19mole H<sup>+</sup>/t; medium Scr≥0.06%S or 37mole H<sup>+</sup>/t; fine Scr≥0.1%S or 62mole H<sup>+</sup>/t)



Lab Accred No. 1 4940  
This Document is issued in accordance with NATA's Accredited Requirements with ISO/IEC 17025

*[Signature]*



# LEGEND

Approximate location of boreholes



STERLING'S PTY LTD  
PROPOSED SENIOR LIVING  
220 MAIN ROAD  
CHURLEY



Scale 1:1000  
Drawing No. 10000-271

Network  
Geotechnics Pty Ltd  
100-110 Main Road, Churley, NSW 2156  
Tel: 02 9688 1765 Fax: 02 9688 1766  
Email: info@network-geotechnics.com.au

Drawing No. 10000-271