SYNOPSIS
This report describes the methodology and results of the acid sulfate soil assessment undertaken at the proposed Kings Forest Stage 1 site, Kings Forest, NSW in support of the Kings Forest Stage 1 Project Application.
SUMMARY

Project 28 Pty Ltd commissioned Gilbert & Sutherland (G&S) to conduct an acid sulfate soil assessment (ASSA) to identify whether acid sulfate soils (ASS) are present in the material to be excavated or dredged during the construction of the proposed Kings Forest Stage 1 Project Application at Kings Forest, New South Wales.

The assessment identified that some potential acid sulfate soil materials and acidic non-acid sulfate materials will be encountered during Stage 1 works. These materials will require management (i.e. lime application) during any proposed excavation works to reduce potential impacts to the surrounding environment.

This report finds that the constraints associated with the presence of ASS do not constitute an impediment to development in accordance with the Stage 1 Project Application and can be effectively managed through the implementation of an approved ASSMP, which includes provisions for on-site ASS testing, lime neutralisation, validation testing and monitoring.
CONTENTS

1 Introduction ...........................................................................7
   1.1 Background ...................................................................7
   1.2 The project application .................................................7
   1.3 Acid sulfate assessment ................................................7
   1.4 Objectives ...................................................................7
   1.5 Department of Planning input ........................................8

2 The proposal ........................................................................9
   2.1 Location, area and elevation ..........................................9
   2.2 Existing development ....................................................9
   2.3 Vegetation ...................................................................9
   2.4 Topography and drainage .............................................9
   2.5 Geology / landform element .........................................9
   2.6 Soil classification ........................................................9

3 Development proposal ........................................................10
   3.1 Construction sequence ................................................10

4 Method .................................................................................11
   4.1 Sampling and testing procedures .................................11
       4.1.1 Screening procedures ..........................................11
       4.1.2 Analytical procedures ..........................................11
       4.1.3 Relevance of ASSMAC guidelines ......................11

5 Results ................................................................................13
   5.1 Screening results .........................................................13
   5.2 Laboratory results and discussion ..............................13
   5.3 2010 CARDNO geotechnical investigation ..................14
   5.4 Monosulfides ..............................................................14
   5.5 ASS management ........................................................15

6 Conclusions ........................................................................16

7 Appendix 1 – Soil borelogs ..................................................17
8 Appendix 2 – Soil field screening results ............................19
9 Appendix 3 – Laboratory analysis certificates ....................21
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>DRAWING NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10468.2.1</td>
<td>Site location</td>
</tr>
<tr>
<td>10468.2.2</td>
<td>Gilbert &amp; Sutherland borehole locations</td>
</tr>
<tr>
<td>10468.2.3</td>
<td>Acid sulfate soil distribution</td>
</tr>
</tbody>
</table>
## Glossary

<table>
<thead>
<tr>
<th>TERM</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASS</td>
<td>Acid Sulfate Soils. This is the collective term for both Actual Acid Sulfate Soils and Potential Acid Sulfate Soils.</td>
</tr>
<tr>
<td>ASSMAC</td>
<td>Acid Sulfate Soil Management Advisory Committee</td>
</tr>
<tr>
<td>ASSMP</td>
<td>Acid Sulfate Soils Management Plan.</td>
</tr>
<tr>
<td>PASS</td>
<td>Potential Acid Sulfate Soils. These soils contain pyrite and are usually undisturbed. When these soils are exposed the pyrite oxidises to produce sulfuric acid.</td>
</tr>
<tr>
<td>AASS</td>
<td>Actual Acid Sulfate Soils. These soils are formed when the pyrite in Potential Acid Sulfate Soils oxidises to produce sulfuric acid.</td>
</tr>
<tr>
<td>CRS</td>
<td>Chromium Reducible Sulfur (CRS) is an analytical method, which quantifies sulfur in an inorganic (i.e. pyritic) form. This method is a suitable test to determine whether the oxidisable sulfur is from organic material or if it is from pyrite, and therefore formed under estuarine conditions.</td>
</tr>
<tr>
<td>TAA</td>
<td>Titratable Actual Acidity. TAA is a measure of a soil's acidity prior to the complete oxidation of sulfidic material, including both pyritic and organic acidity.</td>
</tr>
<tr>
<td>TPA</td>
<td>Titratable Potential Acidity. TPA is the titratable oxidisable acidity, calculated from the complete oxidation of the soil.</td>
</tr>
<tr>
<td>TSA</td>
<td>Titratable Sulfidic Acidity. TSA is a measure of the soil acidity resulting from sulfidic material. This is a general indicator of the acidity produced from pyritic material.</td>
</tr>
</tbody>
</table>
1 Introduction

1.1 Background
Project 28 Pty Ltd commissioned Gilbert & Sutherland Pty Ltd to conduct an acid sulfate soil assessment (ASSA) for the purpose of determining the presence of acid sulfate soils within the Stage 1 Project Application area of the Kings Forest development site.

The Stage 1 Project Application affects much of the site which is situated immediately north-west of Cudgen Lake and approximately three kilometres south of the coastal township of Kingscliff. The site location is shown in Drawing No.10468.2.1.

1.2 The project application
The Project Application incorporates the following elements:
- Subdivision to create new lots for future development.
- Construction of the entrance road to the site and associated intersection works on Tweed Coast Road.
- Subdivision and associated infrastructure works for the first stage of urban development (Precinct 5).
- Bulk earthworks across the site.
- A commercial site to the north of the Tweed Coast Road.

The proposed extent of works is shown on the attached MPS Architects drawing Number MPS 2142 DA-02.

1.3 Acid sulfate assessment
This Acid Sulfate Soil Assessment (ASSA) was informed by a soil survey and ASSA of the entire Kings Forest site conducted in June 1998 and supplementary drilling and soil sampling undertaken between 30 May and 3 August 2007.

The ASSMAC Guidelines advocate avoidance as the preferred management method for acid sulfate soils. This is because avoidance carries the least environmental risk. However, earthworks would be a necessary component of the works proposed for the site.

An investigation was therefore necessary to determine whether ASS were present and the best means of managing soil disturbance at the site.

Site excavation will involve volumes of greater than 1,000 tonnes of material to a maximum depth of between 2.0m and 10.0m below natural surface level (NSL).

The site activities which may result in the disturbance of acid sulfate soil (ASS) or potential acid sulfate soil (PASS) involve:
- wet and dry excavation for construction of lakes
- cutting and filling of non-lake areas
- construction of services trenches.

Site survey indicates the majority of the subject site is below 5m Australian Height Datum (AHD).

According to New South Wales Department of Land and Water Conservation (1997) ASS risk mapping for Cudgen, there is a low probability of encountering ASS materials in the soil profile across the majority of the development site. In the south-east of the proposed development site (adjacent to Cudgen Lake and Cudgen Creek) the probability of intersecting ASS materials increases to high.

This report is divided into sections describing:
- the physical characteristics of the site
- the sampling and analytical procedures employed, and
- the detailed results of the assessment.

1.4 Objectives
The objectives of the assessments were to:
- determine the extent and spatial variability of acid sulfate soils at the site
- estimate the overall acid generating potential of the material to be excavated and the neutralisation capacity required.
1.5 Department of Planning input

The Director General of the Department of Planning (DoP) issued amended Environmental Assessment Requirements (DGRs) for the Kings Forest Concept Plan on December 23, 2010.

The applicable DGR 6.2 requires that the proponent ‘Identify the location and scale of any ASS impacts and provide a summary of the management likely to be required’.

Additionally, the NSW Minister for Planning has requested certain acid sulfate assessments in Section C10 of the Concept Approval (as modified on 22 December, 2010).

Condition C10 requires that ‘a detailed acid sulfate soils (ASS) assessment and ASS Management Plan (ASSMP) addressing groundwater and acid sulfate soils prepared by a suitably qualified person must be submitted with each development application for subdivision.

The assessment must be carried out in accordance with the ASSMAC Guidelines (1988)...’ In accordance with the condition (C10) the ASSMP would be prepared by a suitably qualified person and submitted prior to issue of construction certificates for future precinct earthworks.

This report and the associated Acid Sulfate Soil Management Plan address the specific DGR’s and concept plan approval conditions as they relate to acid sulfate soil issues.
KINGS FOREST
STAGE 1 PROJECT APPLICATION
SCOPE OF WORKS

- Precinct 1
- Rural Retail Development Works
- Precinct 5 Subdivision Works
- Tweed Coast Road Intersection Works
- Kings Forest Parkway through to Western Precincts
- Roads through to Southern Precincts
- Bulk Earthworks

SCALE 1:20000@A3

MPS 2142 DA-02a

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