

MANAGING COASTAL ACID SULFATE SOILS

A TECHNICAL MANUAL FOR BARKER INLET SOUTH AUSTRALIA

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AIM: Develop a technical manual to assist land developers and local governments in the Barker Inlet area identify and appropriately manage Coastal Acid Sulfate Soils by incorporating:

- Management tools
- Properties and processes
- Distribution
- Remediation options



BACKGROUND

- Coastal soils with sulfidic materials (potential acid sulfate soil materials - PASS) surrounding Barker Inlet (20 km²) have been progressively drained by bunding over the last 100 years (figure 1a)
- Oxidation of pyrite has produced sulfuric acid causing sulfidic horizons to form (actual acid sulfate soil material - AASS)
- The bunded area now contains approximately 12 km² of PASS and 1.6 km² of AASS (figure 1b)
- Acidification of soils has led to various degrees of soil and water degradation (figure 1d)
- Future land disturbance at Gillman will cause further environmental damage

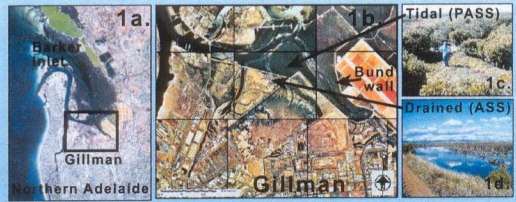
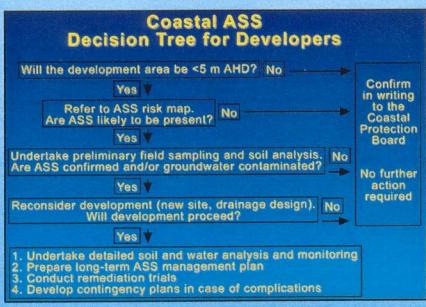


Figure 1. The Gillman study area is located 15 km north of Adelaide and covers an area of about 4 km². (1a). Aerial photo of the study area show a series of linear bund walls separating the paired study sites (1b). The tidal mangrove and samphire study site to the north (1c) is separated from the drained study site to the south (1d), which contains actual ASS and the remediation experiments, by a bund wall that was constructed in the 1960s.

MANAGEMENT TOOLS

Coastal development approvals require ASS risk assessment (using the coastal ASS decision tree).



PROPERTIES AND PROCESSES

Conceptual model (figure 2) illustrates chemical and physical changes that occur when tidal influences are excluded from sulfidic materials in mangrove sediments. Vegetation changes are also evident in the photograph of the same area below.

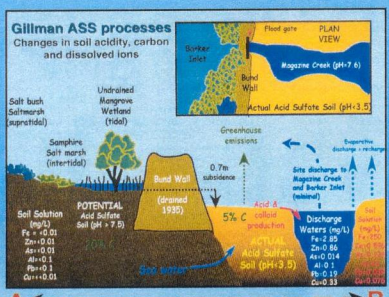
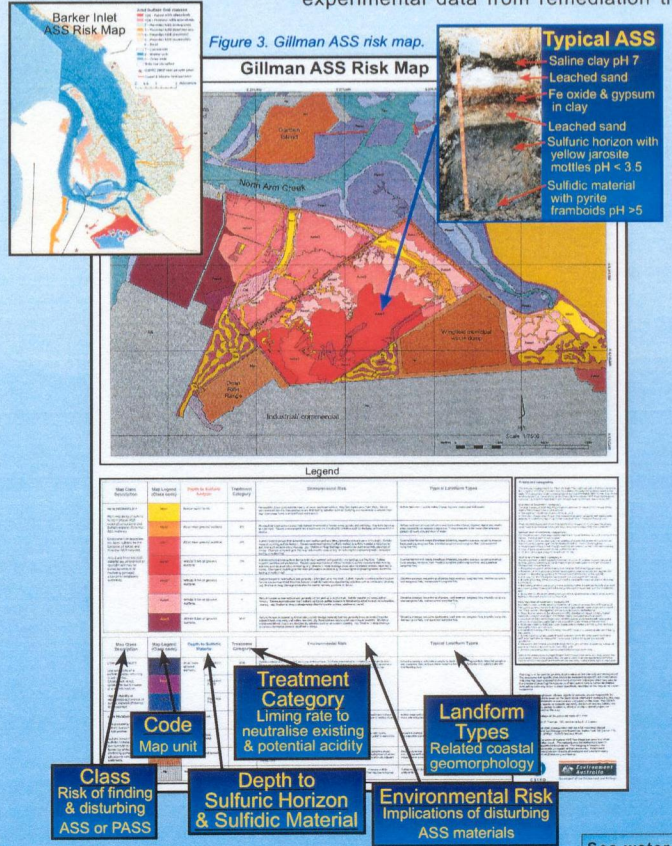


Figure 2. Gillman ASS conceptual model

DISTRIBUTION

The ASS risk map (figure 3 below) shows the range and distribution of soil types found in the Gillman area. Red colours are various **actual ASS with sulfidic horizons** with underlying sulfidic material. Purple colours are various soils containing **sulfidic materials with no sulfidic horizons (PASS)**. The map legend explains the environmental risks associated with disturbing the mapped soil (and land form) types. The 14 mapping units are allocated an ASS risk class (likelihood/ease of ASS disturbance) and corresponding treatment category (tonnes of lime, required to treat disturbed soil). Finally, management and remediation options have been assigned to each mapping unit, based on experimental data from remediation trials.



REMEDIALTION OPTIONS

Principles	Stop pyrite oxidation	Neutralise	Leach
Trials conducted at Gillman	Sea water re-flooding	Bio-remediation	Leaching/aging
	Freshwater wetlands	Lime slotting	
	Water table management	Sea water re-flooding	

OUTCOMES

Adoption of manual by local government and incorporation into state planning policy. Methodology applied to the South Australian coastal ASS mapping project.



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