



# Acid Sulfate Soil Management and Treatment

Earth Systems provides specialist expertise in the management of acid sulfate soil (ASS) and related water quality issues. From identification and characterisation of high-risk soil types and environments, through to prevention, control and treatment, Earth Systems has been providing solutions for ASS-related issues on varying scales to a diverse range of clients for more than 20 years.

Acid sulfate soil (ASS) forms naturally in both coastal and inland settings under highly reducing conditions in saturated organic-rich sediments where there is a source of sulfate and iron.

In these sediments, microbially mitigated sulfate reduction results in the formation of iron sulfides, including pyrite (FeS<sub>2</sub>). When exposed to air, either by natural means (lowering water table, drought, seasonal evaporation, erosion) or anthropogenic activity (development/excavation, agriculture, drainage development), the iron sulfides oxidise, resulting in low pH (acid) drainage and the formation of secondary iron-rich oxides, hydroxides and sulfate salts.

Without appropriate management, ASS has the potential for significant environmental, health and economic impacts, including:

- soil acidification;
- acid (low pH) and metalliferous drainage;
- toxic H<sub>2</sub>S, SO<sub>2</sub> and volatile organic sulfur compound emissions;
- infrastructure corrosion (steel and concrete structures); and
- reduced agriculture and aquaculture productivity.

## SERVICES PROVIDED

Earth Systems provides specialist expertise in all aspects of the identification, characterisation, prevention, management and treatment of ASS and the associated acid and metalliferous drainage, including:

- ASS audits, including ASS risk assessment and management system audits throughout all phases of project development.
- Baseline studies and impact assessments associated with the disturbance/dewatering of ASS and potential acid generation.
- Development of rehabilitation strategies.
- Development of comprehensive site-specific ASS management, prevention and monitoring strategies that can be integrated with existing development or rehabilitation planning.
- Identification, geochemical characterisation and classification of soils, including static and kinetic geochemical testwork, sulfur chemistry/speciation and acidity generation rate determination (OxCon testwork).

- Water quality assessment and monitoring, including sampling protocols, total acidity and acidity load assessment, analytical data assessment and treatment reagent requirements.
- Computer-based modelling and assessment of ASS potential including site water balances, acidity/contaminant load balances and geochemical equilibrium modelling.
- Design/implementation of site-specific ASS prevention, control and treatment strategies, including contract treatment options.
- Leading-practice environmental training workshops for regulators, managers, supervisors and operators on ASS management.

## PROJECT EXPERIENCE

- Key authors for the Australian Federal government's *Managing AMD* handbook.
- Technical input into the Victorian government's ASS Policy.
- Identification, characterisation, prediction and management of ASS at sites throughout Australia and southeast Asia.
- Provision of ASS services to a major port infrastructure project.
- Provision of ASS services to the agricultural sector, including ASS management strategies for a 50,000 ha sugar cane plantation in Eastern Sumatra.
- Provision of ASS services to governments and authorities to assist with the management of acid drainage, including the environmentally sensitive Mekong Delta, Vietnam and Lower Lakes & Lower Murray Regional Irrigation Authority, South Australia.
- Development of software tools to facilitate ASS management (eg. AMD Audit, ABATES, AMDact).
- Development of the OxCon kinetic geochemical test for quantifying sulfide oxidation and acidity generation rates.
- Design, construction and installation of passive and active treatment systems for ASS sites in the mining, agriculture, industry and infrastructure/urban development sectors.



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