Method selection for Assessment of Actual and Potential Acid Sulfate Soils

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This brief method discussion is to clarify the differences between the SPOCAS and SCR Suite analysis techniques for acid sulfate soils analysis. At EAL we believe that the SCR Suite has the following advantage for the assessment of actual and potential acid sulfate soils and also for the accurate calculation of liming rates:

- Very high accuracy and reproducibility down to very low levels (ie. 0.005%S)
- No interference by organic matter or metal ions
- Simple unambiguous results to compare to published guidelines
- Low cost method
- Quick turn around time with ability to analyse as wet weight
- Combined with ANC to give post liming validation

The TPA can be used with the SCR Suite to additionally verify post liming or give an acid trail (or SPOCAS equivalent results).

In Section A1.1 of Ahern, 2004 the following statement is made-

'At present, S_{CR} provides the most reliable and direct measure of reduced inorganic sulfur over the wide range of values encountered in ASS. The S_{CR} method is particularly recommended for measuring sulfide contents close to the action limits, and on soils with appreciable organic.'

In Section A2.1 of Ahern, 2004 the following statement is made-

'If differences occur between results from various sulfur methods used to predict sulfidic acidity (eg. S_{CR} , S_{POS}) then the S_{CR} result should take precedence for use in the acid base account).'

The acid sulfate manual states that 'At least one of two main suites of analyses will normally be required for most acid sulfate soil situations:

the *chromium suite* (Figure A2.2), or the *SPOCAS suite* (Figure A2.3).

The following diagrams are from the acid sulfate manual and describe the ASS collection procedure and the SCR Suite. A summary glossary of terms is attached to assist with acid sulfate soils understanding.

ASS ANALYSIS

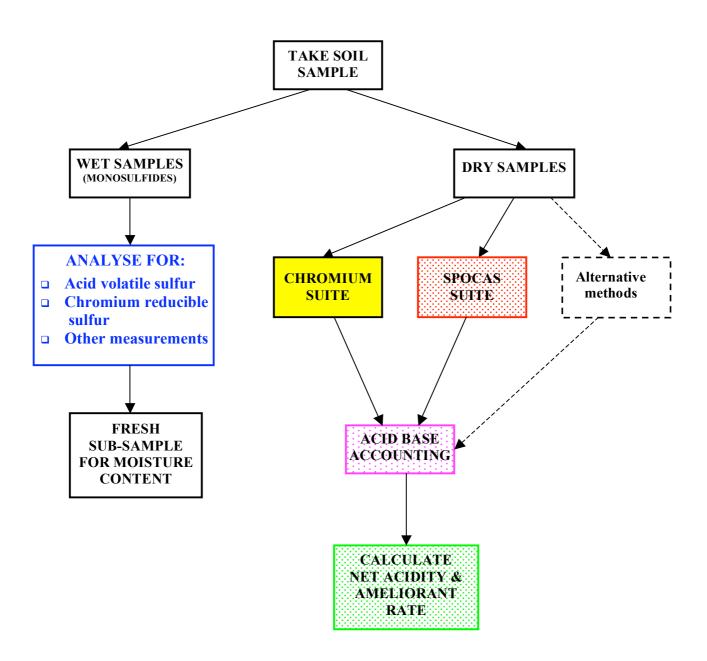
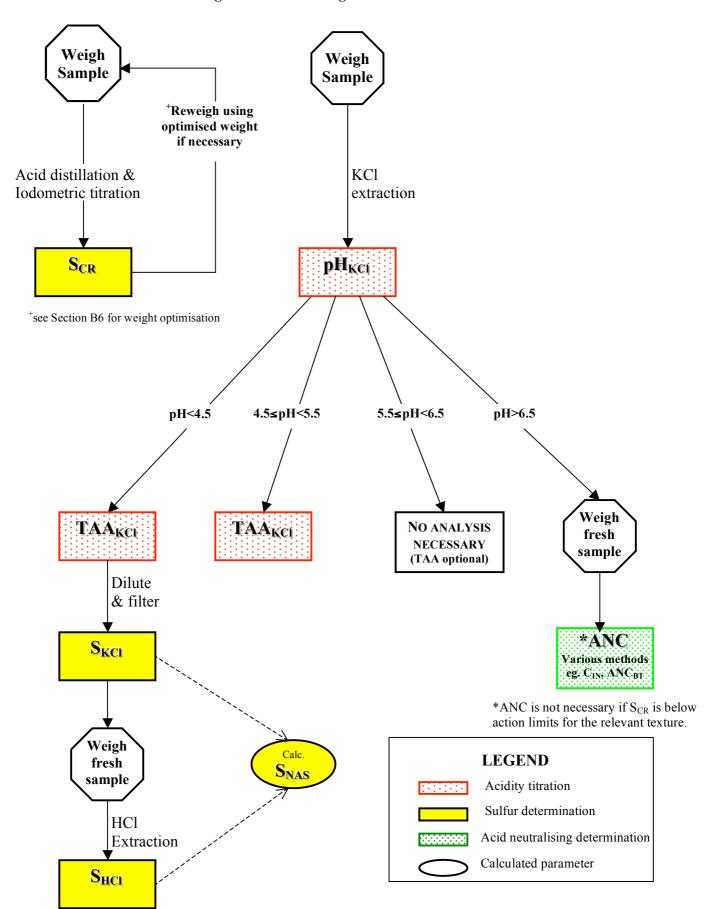


Figure A2.1: Flow diagram for analysis of ASS

CHROMIUM SUITE- Figure A2.2: Flow diagram for Chromium Suite



Glossary of Abbreviations

ABA

Acid-Base Accounting. An ABA approach is widely used for predicting net acidity from sulfide oxidation of ASS. While several ABA models have been used for ASS, they all share a common underlying principle/approach, encapsulated in the following equation:

Net Acidity = Potential Sulfidic acidity + *Existing Acidity - ANC

ANC

The acid neutralising capacity (or ANC) is a measure of a soil's inherent ability to buffer acidity and resist the lowering of the soil pH. Acid buffering in the soil may be provided by dissolution of calcium and/or magnesium carbonates (eg. shell), cation exchange reactions, and by reaction with the organic and clay fractions.

ASS

Acid Sulfate Soils - Include actual acid sulfate soils or potential acid sulfate soils. Actual and potential acid sulfate soils are often found in the same soil profile, with actual acid sulfate soils generally overlying potential acid sulfate soil horizons.

AASS

Actual Acid Sulfate Soils - are soils containing highly acidic soil horizons or layers resulting from the aeration of soil materials that are rich in iron sulfides, primarily sulfide. This oxidation produces hydrogen ions in excess of the sediment's capacity to neutralise the acidity resulting in soils of pH of 4 or less when measured in dry season conditions. These soils can usually be identified by the presence of pale yellow mottles and coatings of jarosite.

PASS

Potential Acid Sulfate Soils - are soils which contain iron sulfides or sulfidic material which have not been exposed to air and oxidised. The field pH of these soils in their undisturbed state is pH 4 or more and may be neutral or slightly alkaline. However, they pose a considerable environmental risk when disturbed, as they will become severely acid when exposed to air and oxidised.

ASSMP

Acid Sulfate Soil Management Plan

CRS

Chromium Reducible Sulfur - A commonly used, low cost method of determining reducible inorganic sulfur compounds. It does not suffer from interferences from organic sulfur compounds or sulfates. Often used where results are close to trigger values, and where significant organics are present although does not quantify the actual acidity resulting from AASS.

CRS Suite

The Chromium suite is a collection of independent analytical methods each of which determines a component of the acid base account.

SPOCAS Suspension Peroxide Oxidation Combined Acidity & Sulfur (SPOCAS) method (McElnea et al. 2002a; Latham et al. 2002)

SPOCAS Suite

A second approach is to perform the complete SPOCAS method (see Figure A2.3). The SPOCAS method is in essence a self-contained ABA.

TAA The Total Actual Acidity result of SPOCAS represents a measure of the actual acidity.

TPA The Total Potential Acidity result of SPOCAS represents a measure of the net acidity, effectively equivalent to the sum of the soil's **potential sulfidic acidity** and **actual acidity**.

References

Ahern, CR, McElnea AE, Sullivan LA (2004). Acid Sulfate Soils Laboratory Methods Guidelines. QLD DNRME.

ASSMAC- Stone, Y. Ahern CR, and Blunden B (1998). Acid Sulfate Soil Manual, Wollongbar, NSW.