SGMenvironmental

Creating enduring value

SGME VALUES

Honest

Trust

Innovation

Safety

Soil science

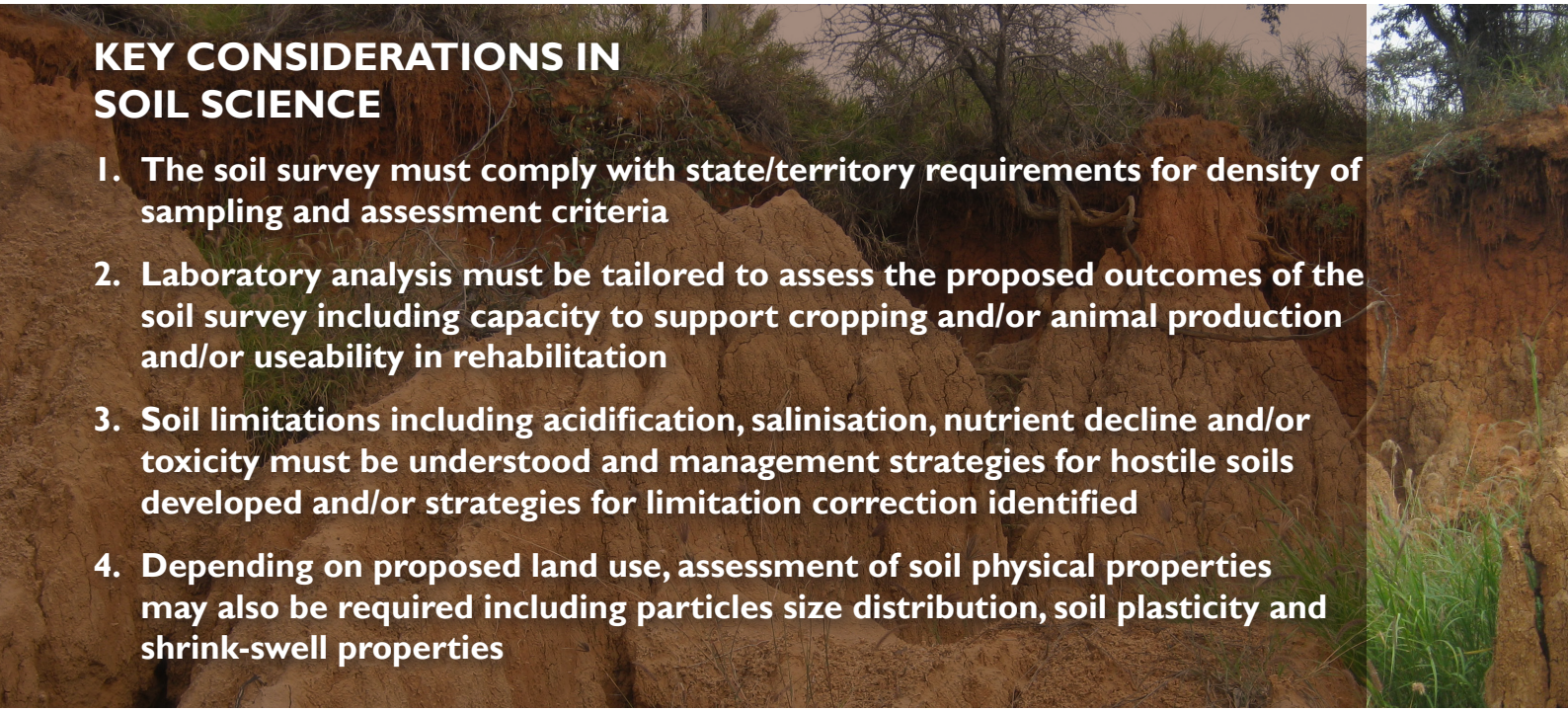
Soil is one of the world's most valuable assets, and it is its physical characteristics and fertility which determine its productivity. While soils are valuable they are also vulnerable, being subject to a wide range of natural and man-made processes which may cause them to erode or lose their productivity. For example, pre-stripping of soil and stockpiling prior to mining.

Soils typically consist of several layers, which together form the soil profile. More generally the profile consists of topsoil close to the ground surface and subsoil below the depth of topsoil.

Before mining commences each state and territory government of Australia requires the mine operator to describe the types of soil that occur within the proposed mining lease and their value for agricultural production including their capacity to support cropping and/or animal production. Further there is also a requirement to determine the volume and how the soil will be best used in mine rehabilitation. It is generally accepted that topsoil is the most valuable portion of the soil profile for mine rehabilitation since by comparison to subsoil it will generally promote high vegetation growth rates, will have high infiltration rates and porosity, low levels of bulk density and provision of a balanced pool of nutrients in equilibrium with a relatively high level of stored organic matter. However, in certain circumstances it may be possible to use subsoil as part of the rehabilitated soil profile. Advantages of this strategy include that it will increase the volume of soil available for rehabilitation and result in a potentially thicker or larger area of reinstated soil after rehabilitation. It is important that mine managers understand the mines inventory of available soil and how this interacts with the proposed landforms and final land use for the mine after rehabilitation.

At SGME we will work with you during the initial phases of mine planning to describe the soils within your proposed mining lease using established soil survey techniques including describing the soils using the Australian Soil Classification and applying state/territory assessment criteria to determine their capacity to support cropping and/or animal production. Based on the soil survey and assessment criteria we will determine which layers of the soil profile can be used in mine rehabilitation resulting in a volume calculation. This will be important for your mine closure planning including defining your post mining landforms and land uses.

If you have already completed rehabilitation then we can utilise our experience and knowledge of soil science to assess the health of your rehabilitated soils and determine if they can support a sustainable vegetation cover and land use.



KEY CONSIDERATIONS IN SOIL SCIENCE

1. **The soil survey must comply with state/territory requirements for density of sampling and assessment criteria**
2. **Laboratory analysis must be tailored to assess the proposed outcomes of the soil survey including capacity to support cropping and/or animal production and/or useability in rehabilitation**
3. **Soil limitations including acidification, salinisation, nutrient decline and/or toxicity must be understood and management strategies for hostile soils developed and/or strategies for limitation correction identified**
4. **Depending on proposed land use, assessment of soil physical properties may also be required including particles size distribution, soil plasticity and shrink-swell properties**

OUR APPROACH

At SGME we will work with you to determine the outcomes that are required of the soil survey and then develop a soil survey strategy that is cost effective and satisfies state/territory planning requirements. We will coordinate laboratory testing and analyse the returned results using state/territory assessment criteria. Finally, we will prepare a report that is practical and tailored to your requirements.

If we are assessing your rehabilitation then we will help you to understand the unique soil risks that apply to your rehabilitation and provide you with innovative solutions that reduce your risk to acceptable levels while not compromising on government and community expectations.

Past projects

1. New Acland Coal Mine, progressive rehabilitation certification of 349 hectares, Qld (New Hope Group)
2. Wilkie Creek Coal Mine, assessment of soil from rehabilitated land and recommendations for improving soil capability, Qld (Peabody)
3. Wilkie Creek Coal Mine, assessment of the potential impact of beneficial water on rehabilitated land, Qld (Peabody)
4. Glen Davis Legacy Mine, PFAS and hydrocarbon contamination assessment of soil, NSW (Legacy Mines Program)
5. Hazelwood Coal Mine, rapid assessment of rehabilitation, Vic (Engie)
6. Great Australian Operation, review of soil inventory and assessment of soil chemistry constraints on vegetation growth, Qld (Round Oak Minerals)
7. Stanmore Coal Mine, soil survey, land suitability assessment and rehabilitation planning, Qld (Stanmore IP Coal Pty Ltd)
8. New Century Mine, contamination assessment of soil beneath an evaporation dam, Qld (Century Mining Ltd)
9. Cow Flats Legacy Mine, contamination assessment of soil, NSW (Legacy Mines Program)
10. Burton Coal Mine, assessment of growth media and spoil and recommending an amendment program, Qld (Peabody)
11. Musswellbrook Coal Mine, management of soil survey and land capability assessment to support a mine modification over previously rehabilitated land, NSW (Musswellbrook Coal Company)
12. Arrow Energy Beneficial Use Project, assessment of the potential impact of beneficial water on farmland near Roma, Qld (Arrow Energy)
13. Mangoola Coal Mine, soil survey and biophysical strategic agricultural land assessment of the brown field site, NSW (Glencore)
14. Kestrel Coal Mine, review of strategic cropping land and white paper on how mine land can be returned to pre-mining condition, Qld (Rio Tinto Coal)
15. Balranald Mineral Sand Project, preparation of a soil survey report and biophysical strategic agricultural land assessment, NSW (Iluka)

Working with SGME

We are highly experienced and leaders in the fields of soil science, geochemistry and mine closure. At SGME we support you to achieve your objectives in ways that contribute to a sustainable outcome:

- Our director and technical leaders are 'on the tools'. We will not waiver from this commitment as it is critical to your successes
- We have a practical, solution focussed work ethic
- We are cost-effective, without the overheads of larger competitors
- A high level of responsiveness, enabling us to mobilise at short notice

Dr Timothy Rohde

Timothy is certified professional soil scientist (CPSS), a practicing engineer in Queensland (RPEQ) and a mine closure specialist (MAusIMM(CP)). He has a been a consultant for 18 years and has worked extensively throughout Australia in coal and metalliferous mining and has published over 25 papers on soil science, geochemistry and mine closure. He has gained a reputation by not backing away from difficult projects (positivity), delivering on his promises (trust), looking for new ways to help (innovation) and sharing mutual responsibility for preventing harm and promoting well-being (safety).

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