Material Characterisation and Management for Minesites

Landloch has a team of experienced soil scientists, engineers, and geoscientists who provide a range of services for the characterisation and management of materials excavated on minesites. These services include:

- **interpretation of material properties based on chemical/physical analysis data;**
- **determination of material stability and erodibility;**
- **characterisation of waste rock properties relevant to rehabilitation activities;**
- **advice on fertiliser requirements to optimise growth of a range of plant species;**
- **recommendations on properties of constructed growth medium profiles to optimise plant available water; and**
- **advice on plant species that may be adapted to particular conditions or that may help to remediate a site.**

Waste materials excavated and placed in waste dumps show large variations in chemical and physical properties. Frequently, the materials are quite hostile to plant growth, and sometimes highly unstable.

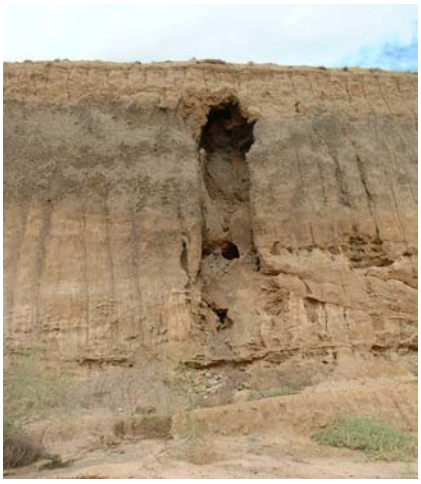
For those reasons, characterisation of materials, including topsoils, subsoils, and waste rock, **prior** to construction of a waste dump – and certainly prior to topsoiling and seeding – is strongly recommended. Material characterisation can avoid serious problems and reduce or avoid long-term maintenance costs for rehabilitated areas. Equally, knowledge of material properties will provide essential management information, including data for the development of slope profiles to minimise erosion and requirements for the site to stockpile specific materials to be used for rehabilitation. It also assists in managing materials to avoid placing particular materials near the waste dump surface (i.e. materials that are acid generating, highly saline, sodic or highly erodible), and may even provide a basis for adopting in-pit disposal of some materials.

Landloch has developed testing protocols to measure the stability of materials. These protocols include in-field and laboratory based methods to measure material erodibility and the identification of material properties that indicate a material's risk of tunnel erosion. Although tunnel erosion is commonly linked to clay dispersion, the dispersive behaviour is sometimes masked by salinity, and not all materials that tunnel badly are dispersive or sodic. Consequently, there is potential for unstable materials to avoid identification until waste dumps become highly unstable.

Characterisation of waste rock materials prior to construction of waste rock dumps can assist sites to manage these materials effectively. Using suitable waste rock materials for armouring of erodible soils greatly increases the stability of constructed slopes and the likelihood that rehabilitation will be successful.

Landloch can develop inventories of soils and waste rock materials highlighting their physical and chemical properties, quantities of each resource, and recommend handling methods and potential uses during rehabilitation activities.

Characterisation can also be crucial for revegetation success. Apart from salinity (a common problem in some areas), extremes of pH are common. Some sites prepared for rehabilitation have pH values as low as 3.5 and 4.0, and responses to amendments can be dramatic. Similarly, material characterisation should consider the full range of plant macro- and micro-nutrients if plant growth is to be optimised. Importantly, fertiliser and amendment recommendations should be tailored to specific soil/waste combinations and to the specific vegetation to be seeded.



The depth of soil profiles constructed will impact on the water holding capacity of the soils and the amount of water available to plants used in rehabilitation. Alternatively, vegetation recommendations may be developed to cope with problem materials or situations – including waterlogging, pH extremes, and salinity, and studies of erodibility can be carried out to give early guidance to waste dump design.

For more information on material characterisation and management, contact:

Dr Rob Loch (B.Agr.Sc, B.A., Ph.D)
Principal Consultant
lochr@landloch.com.au

Evan Howard (B.Eng)
Environmental Consultant
howardev@landloch.com.au

Landloch Pty Ltd
PO Box 57
HARLAXTON QLD 4350
Ph: (07) 4613 1825
Fax: (07) 4613 1826
Email: admin@landloch.com.au
Web: www.landloch.com.au