Soil Management

GENERAL CONSTRUCTION PRACTICE

Best practice soil management involves giving appropriate consideration to the following issues.

Earthworks

- Earthworks and grading activities should be minimised, if not totally avoided, during those periods of rainfall when stormwater runoff is either occurring or expected to occur.
- Excavated material should not be placed adjacent to protected vegetation, stream banks, or within locations where it may become an unacceptable source of sediment runoff.
- Soil stockpiles should be located away from areas subjected to concentrated overland flow.
- Where necessary, a *Flow Diversion Bank* or *Catch Drain* should be placed up-slope of a stockpile to direct overland flow around the stockpile. The diversion of up-slope stormwater around stockpiles is generally recommended during those periods when rainfall is possible, the average monthly rainfall exceeds 45mm, and the up-slope catchment area exceeds 1500m^2.
- Stormwater runoff originating from stockpiles needs to be directed to, and/or controlled by, a suitable sediment trap (e.g. *Sediment Fence* or *Compost Berm*).

Photo 1 – Catch drain

Photo 2 – Sediment fence placed down-slope of soil stockpile

- All earth slopes need to be formed at a stable slope consistent with the soil properties. Unless otherwise supported by geotechnical advice, earth batters should be restricted to a maximum gradient of:
  - 2:1(H:V) for soils with a low erosion hazard
  - 3:1(H:V) for soils with a high erosion hazard
  - 4:1(H:V) for soils with an extreme erosion hazard
- All fill material placed on work site should comprise only natural earth and rock that complies with local specifications.
- All soil stockpiles should remain in a free-draining condition to avoid long-term soil saturation.
- Soil should be removed from stockpiles in a manner that avoids vehicles travelling over the stockpile.
- All exposed subsoils should be covered as soon as practicable, especially if dispersive.
- All soil stockpile areas should be rehabilitated as soon as reasonable and practicable after the material has been removed.

Topsoil management

- Wherever reasonable and practicable, topsoil should only be stripped and stockpiled immediately before bulk earthworks are about to occur within any stage of works.
- Unless the topsoil is contaminated with pollutants or excessive weed seed, the soil should be preserved for reuse on the site wherever possible. The practice of selling/disposing of stripped topsoil early in the construction program, only to import topsoil at a later date, must be avoided unless justified by sound soil science and/or vegetation management practices.
- Topsoil should be stripped only while in a moist condition. If the soil is too dry it will pulverise the soil, if too wet it may lead to clodding or hardsetting—particularly if the soil has a high silt or clay content. The soil should be wet enough to form a clump when squeezed, but not wet enough to drip water while being squeezed.
- Wherever practicable, topsoils should not be mixed with subsoils during stripping and stockpiling procedures, especially if the subsoils are dispersive.
- Table 1 outlines the recommended management of topsoil stockpiles.

Table 1 – Management of topsoil stockpiles

Condition of topsoil	Recommended stockpiling requirements
Topsoils containing valuable plant seed content that needs to be preserved for re-establishment.	• Upper 50mm of soil stockpiled separately in mounds 1 to 1.5m high. • Topsoil more than 50mm below the surface stockpiled in mounds no higher than 1.5 to 3m. • The duration of stockpiling should be the minimum practicable, but ideally less than 12 months.
Imported topsoil, or in-situ topsoil containing minimal desirable or undesirable seed content.	• Maximum desirable stockpile height of 2m. • The duration of stockpiling should be the minimum practicable, but ideally less than 12 months.
Topsoils containing significant **undesirable** seed content.	• Ideally replace soil with alternative local topsoil free of weed seed content (seek expert advice). • Depending on expert advice, stripped topsoil may be appropriately treated to prevent germination of weed seed content, covered with clear plastic sheeting to help burn-off the weed seed content, or buried under a minimum 100mm of soil.
Topsoils containing weed seed of a declared noxious or otherwise highly undesirable plant species.	• Suitably bury the topsoil on-site, or remove the soil from the site for further treatment (in accordance with local and State laws). • Stripped soil must **not** be transported off-site without appropriate warnings and identification.
Previously disturbed sites where the surface soils consist of a mixture of topsoil and dispersive subsoil.	• Mix the soil with gypsum, lime or other appropriate ameliorants prior to stockpiling in either high or low mounds according to required protection of seed content. • Choice of chemical treatment of the dispersive soil depends on desired pH adjustments (seek expert advice).

- All topsoils (local and imported) should be tested and where necessary ameliorated before placement. As a guide, topsoil should be:
  - a friable, sandy loam with good texture and structure;
  - free from large clods, lumps of subsoil, weed seed, or any other deleterious material;
  - free of stones larger than 25mm with no more than 5% of the material retained by a 1.2mm B.S. sieve, and contain not less than 2% organic matter;
  - within a suitable pH range in accordance with revegetation requirements.

- Before respreading topsoil, the subsoil should be scarified to break up any compacted or surface sealing, and to enable the appropriate keying of the two soils (Photo 3).
  - On slopes less than about 3:1(H:V) scarify lightly compacted subsoil with a tined implement to a depth of 50 to 100mm, and heavily compacted subsoils to a minimum depth of 300mm, ensuring all ripping and cultivation operations occur along the contour.
  - On banks steeper than about 3:1(H:V), chain or harrow to break any surface seal and fill any minor rills; alternatively, the surface can be track walked to promote the formation of cleat marks parallel to the contour.
- When it is desirable to re-establish the entrapped seed content of the soil, the topsoil should be re-spread in the reverse sequence to its removal so that the original upper 50mm soil layer is returned to the surface.
- Topsoil should be spread to a lightly compacted (i.e. firm) depth of about 40 to 60mm on lands where the slope exceeds 4:1(H:V), and 75 to 100mm on lesser slopes. Special techniques, including stair-stepping of subsoil surfaces (Photo 4), will generally be required when spreading topsoil on slopes steeper than 2:1.
- When working adjacent to a watercourse, topsoil should not be spread at a significantly different elevation (relative to the watercourse) to where it originated.
- After spreading topsoil, the surface should be left in an appropriate scarified (roughened) condition to assist moisture infiltration and inhibit soil erosion.
- Prior to planting, any compacted or crusted topsoil surfaces should be cultivate to a depth of 100mm, but not greater than the depth of topsoil.

Photo 3 – Scarifying the soil surface

Photo 4 – Stair stepping of step batter

Soil adjustment

Soils should be adjusted with a combination of fertilisers and ameliorants to improve both the short- and long-term success of their revegetation. Fertilisers must be applied in accordance with manufacturer's guidelines, or site-specific specialist advice.

The soil testing report should, as a minimum, provide advice on the pH, nitrogen, organic matter, phosphorus, potassium and lime requirements for both the topsoil and subsoil. It is essential for the pH of the soil to be appropriately adjusted so that the essential nutrients that exist within the soil can be made available to the plant. Most plant nutrients are readily available in the pH range of 6.5 to 7.5, but locally adapted vegetation can grow successfully over a much wider pH range.

In some instances, it may be more effective to select species to suit the local conditions rather than to alter the soil to suit some selected vegetation. Selecting the most suitable plant species, establishment techniques, planting densities, fertiliser type, application rates, watering schedule and maintenance requirements, all require the guidance of experts. When planning the revegetation of a site the best recommendation is to seek experienced advice through specialist landscape consultants, revegetation practitioners, local bushland care groups and government bodies.