Use of Cover and Site Rehabilitation

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Introduction

- Effective rehabilitation protects the soil surface against erosion in the long term
- Can readily reduce soil loss to much less than 1% of the unprotected condition
- Rehabilitation should occur promptly and progressively as works are completed in individual areas
- Effective measures for mines and quarries listed in Appendix F of Blue Book Volume 2E

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Stabilisation Targets

- General Site Areas
  - Low rainfall period (Mar-Nov)
    - C = 0.15 (50% effective groundcover) after 20 days inactivity
  - High rainfall period (Dec-Feb)
    - C = 0.1 (60% effective cover) after 20 days inactivity
    - C = 0.05 (70% effective cover) after a further 60 days
- Stockpiles
  - If stockpile is to be left for more than 10 days, stabilise to C = 0.1 (60% effective cover)

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Stabilisation Targets

- Diversion drains
  - Stabilise within10 days, C = 0.05 (70% effective cover), and ensure stable discharge area
- Waterways
  - When rain not forecast in next 3 days C >0.1 (i.e. less than 60% effective cover), and emergency measures on hand in case of rain to reduce C <0.1
  - Within10 days C=0.05 (70% effective cover)

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Options

Cover the soil surface:

- Re-Vegetation
- Physical cover: mulch, woodchip
- Spray products: soil binders, bitumen emulsion, hydromulch
- Roller products: RECPs, geosynthetics
- Hard armouring: paving, rock lining, shotcrete, concrete etc.

Soil Slopes

Flat <1 in 10

Mulch and veg., reveg planting or seeds, soil binding, bonded fibre matrix, compost blankets, jute mesh and mats, mulch and veg, turf

Mild 1 in 10 to 1 in 3

Mulch and veg., reveg planting or seeds, soil binding (hydroseed), bonded fibre matrix, compost blankets, jute mesh and mats, anchored mulch and veg, turf

Steep >1 in 3

Bonded fibre matrix, compost blankets, anchored jute mesh and mats, reinforced turf, cellular confinement system, rock armouring

C-factors

Class	Type	Suitable for Vegetation Type [1]	Design Life (months)	Use in Concentrated Flow [2]	Availability (days) [3]	Relative Cost Bracket [4]	Residual Impact [5]	C-factor = <33%, <6m	C-factor <33%, 6-15m	C-factor <33%, >15m	C-factor 33-50%, <6m	C-factor 33-50%, 6-15m	C-factor 33-50%, >15m
BIODEGRADABLE MULCHES [7]													
Straw (anchored)	4.5 tonnes per hectare	Grass	1 to 6	No	< 5days	Low	Moderate	0.17	0.17	0.20	0.20	0.20	0.20
Wood Chip	16 tonnes per hectare	Grass/Shrubs	1 to 6	No	< 5days	Low	Moderate	0.08	0.08	0.08	No data		
Wood Chip	27 tonnes per hectare	Shrubs	1 to 6	No	< 5days	Low	Moderate	0.05	0.05	0.05	No data		
Wood Chip	56 tonnes per hectare	Shrubs	1 to 6	No	< 5days	Low	Moderate	0.03	0.03	0.03	0.03	0.03	0.03
Hydromulching	1.5 tonnes mulch + 300 litres binder per hectare	Grass	1 to 3	No	< 5days	Low	Low	0.06	0.03	0.07	0.03	0.06	0.10
Bonded Fibre	5 tonnes fibre per hectare	Grass	1 to 6	No	< 5days	Low	Moderate	0.06	0.03	0.07	0.03	0.06	0.10
ROLLED EROSION CONTROL PRODUCTS (RECPs) [7]													
Biodegradable	Jute mesh	Grass	6 to 12	Yes	< 5days	Low	Moderate	0.10	0.20	0.40	0.20	0.40	0.60
	Coconut fibre mesh (~400 gsm)	Grass	24	Yes	< 5days	Low	Moderate	0.10	0.20	0.40	0.20	0.40	0.60
	Coconut fibre mesh (~700 gsm or more)	Grass	48	Yes	< 5days	Medium	Moderate	0.10	0.10	0.20	0.10	0.15	0.20
	Curled wood fibre	Grass	6 to 12	Yes	< 5days	Medium	Moderate	0.01	0.05	0.10	0.10	0.15	0.20
	Jute matting (~350 gsm)	Grass	6 to 18	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
	Jute matting (~500 gsm)	Shrubs	12 to 24	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
	Coconut fibre matting (~450 gsm)	Grass	12 to 18	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
	Coconut fibre matting (~900 gsm)	Shrubs	8 to 24	Yes	< 5days	Medium	Moderate	0.00	0.03	0.07	0.03	0.06	0.10
Photodegradable	Mesh (< 5 mm openings)	Grass	1 to 6	Yes	< 5days	Low	Moderate	0.01	0.05	0.10	0.10	0.15	0.20

Appendix A

Site Preparation and Topsoil

- Successful rehabilitation starts with good soil management and site preparation
- Deep rip, scarify, track walk or otherwise stabilise embankments along the contour
- Replace stored topsoil evenly over rehab surface (~75mm flat/gentle, 40-60mm steeper)
- Stabilise constructed surface using a range of appropriate measures

Surface Roughening

- Topsoil far more likely to ‘adhere’ to roughened surface
- Track walking, contour ripping, scarification, terracing etc
- Up to 50% reduction in soil loss from properly prepared slopes
- Creates micro-contours to trap sediment and water
- Maximising vegetation ‘strike’

Example

Re-vegetation

- Ideal, inexpensive method in most situations, but use with caution in concentrated flow and on steep slopes
- Annuals for temporary cover and fast establishment, often combined with perennials for longer term protection
- Require topsoil, water, fertiliser, soil ameliorants
- Seek specialist advice – Vegetation Management Plan

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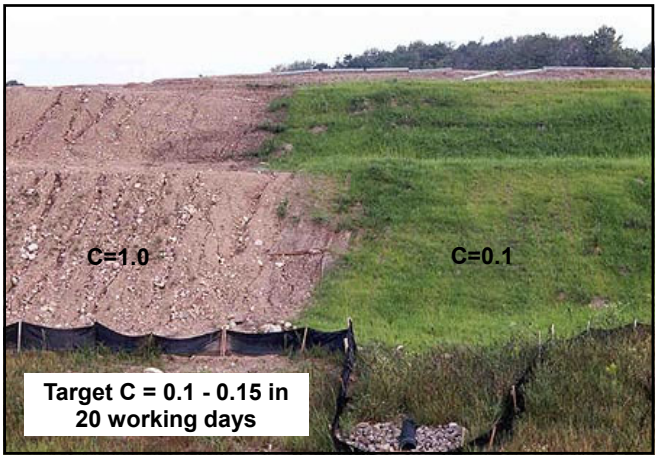
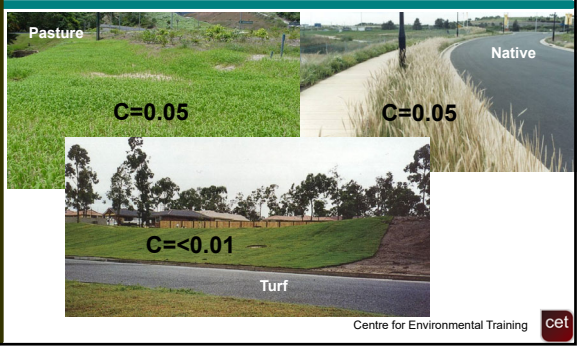


Grasses



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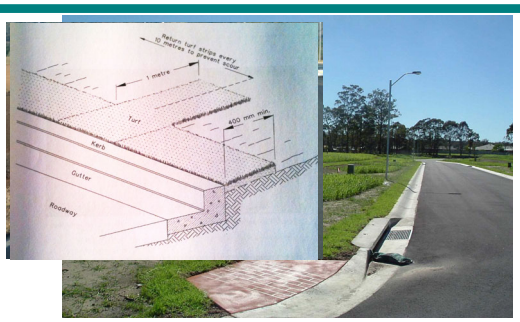
Cover Crop and Turf Strips



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Jute and Native Grasses

Hydroseeding

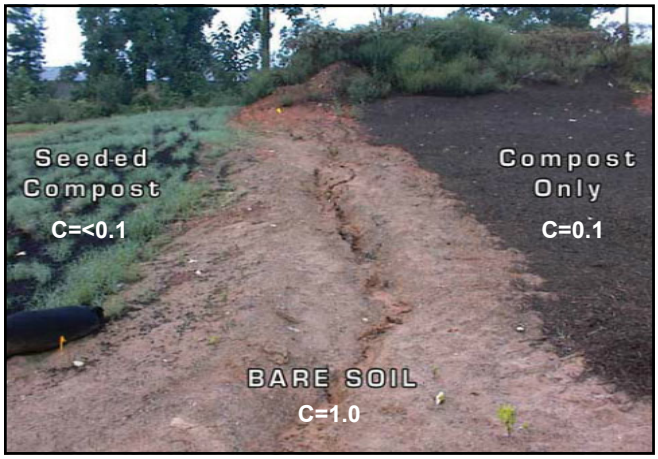
Hydroseeding Issues

- Different to hydromulching
- Typically just seed, fertiliser and seed carrier (typically paper confetti), maybe wetting agent?
- Can be dislodged by raindrop impact or surface flows
- Can result in slumping of product down slope
- May include other soil ameliorants (lime, gypsum etc.)

Native Mulch

Mulch and Vegetation

Compost Blanket



Straw or Cane Mulch

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Problems

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Hydromulch

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Bonded Fibre Matrix (BFM)

Bitumen Emulsion

- Water based emulsion, e.g. “Dustdown”
- $1-$2 per litre
- Diluted at rates 10:1 to 40:1
- Application at 1 diluted litre per m^2

Bitumen Emulsion

Rolled Erosion Control Products

- Products that help stabilise the soil while vegetation establishes
- Particularly useful on steeper batters and in waterways where water velocity can be high
- Must be securely anchored to the ground
- Always follow manufacturer’s advice on product selection and installation

RECP Types

- Erosion Blankets
  - Jute mesh
  - Jute matting
  - Coconut fibre matting
- Plastic fibre meshes
  - Non-biodegradable nylons
  - Biodegradable polymers
- Reinforced turf

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Range of Products/Manufacturers

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Jute Mat

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Jute Mesh and Grass

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Jute Mesh

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Bonded Fibre Blanket

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Reinforced Turf

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Woven Plastic Mesh

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Cellular Confinement Systems

- Can be used to stabilise drains, chutes, banks or channels with low to medium velocity flows or steeper slopes
- Permanently fixed to stable soil base
- Topsoil used to fill “cells” prior to re-vegetation
- May also be filled with small gravel or other engineered drainage materials
- Can be used to construct temporary stream crossings

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Concrete Mats

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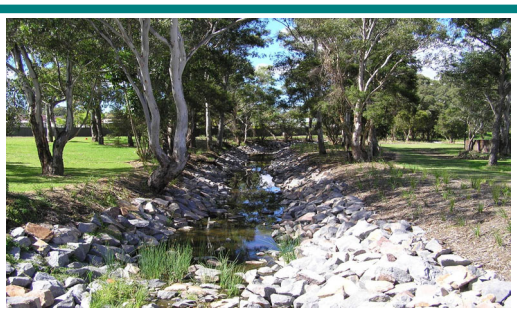
Permanent Armouring

- In high erosion hazard situations vegetation is often not suitable (e.g. waterways, steep embankments)
- Consider use of rock rip-rap, concrete, gabions, retaining walls etc.

Rock Rip-Rap



Gabion Baskets

Poor Stabilisation?

- Poor stabilisation leads to ongoing erosion and pollution problems
- Often brought about by lack of proper design and failure to properly assess the site constraints and product capabilities

Concentrated Flow Inappropriate Product