Session 4

Erosion and Sediment Control Best Management Practices (BMPs)

1

Overarching Principles

Erosion control is the key!!!

Manage Water

- Look up, around and down
- Assess where water comes from, how it will move through the site, and where it ends up

Manage Soils

- Understand soil erodibility – some soils more erodible than others
- Protect soils accordingly

2

Planning

Planning considerations:

- Limit construction activities to the shortest practical duration
- Restrict active works areas to a manageable size
- Plan for diversion of run-on stormwater

3

Scheduling

On sensitive or high erosion hazard sites, if possible plan construction for times when the rainfall activity is typically lower (e.g. April – October)

High erosion hazard site >500 t/ha/yr calculated soil loss using RUSLE

Be prepared though, heavy rain can occur at any time of year!

4

Reduce Disturbance Areas

- Stage development where practical, reducing the area exposed to erosion at any one time
- Limit disturbance to 5m (preferably 2m) from essential work areas
- Use barrier fence (upslope) and sediment fence (downslope) to define work areas and “no-go” zones

5

Managing Water
Catch Drains/Diversion Banks

8

Purpose

- Divert clean stormwater around works areas and help keep work areas dry
- Capture and convey dirty water to sediment traps
- General stormwater conveyance
- Shorten slope lengths
- Temporary or permanent features
- Very important tool in erosion control

9

Perimeter Bank

10

Catch Drains

11

Clean Water Diversion

12

Bitumen Emulsion Spray

13 Centre for Environmental Training cet

Shotcrete

14 Centre for Environmental Training cet

Check Dams

15 Centre for Environmental Training cet

Purpose

- Reduce velocity of flow in channels, reducing erosive energy
- Can provide moderate filtering/trapping capacity for coarse sediment
- Longer detention times can allow settling of some fine sediment, but this would almost certainly be re-eroded unless removed after each storm

16 Centre for Environmental Training cet

Example – 'Geo-ridge'

17 Centre for Environmental Training cet

Example – biodegradable logs

18 Centre for Environmental Training cet

Maintenance

- Check for erosion problems during and after rain, especially at inlets and outlets
- Repair scoured areas and line with erosion resistant materials
- Remove accumulated sediment
- Provide new drains as construction proceeds to new areas
- Look for signs of localised flooding and redesign drains if necessary

19 Centre for Environmental Training cet

Inlet / Outlet Protection


20 Centre for Environmental Training cet

Failed Inlet Protection

21 Centre for Environmental Training cet

Stabilised Access

- Establish a single stabilised site access
- Helps limit disturbance and reduce erosion at a high traffic point(s)
- Reduces sediment tracking to road
- Reduces down-time after rain

22 Centre for Environmental Training cet

Maintenance

- Even out wheel ruts
- Remove sediment from sediment basin and replace or resurface gravel periodically
- Repair surface drains
- Sweep the road

23 Centre for Environmental Training cet

What would you do here?

24 Centre for Environmental Training cet

Stockpiles

- Store topsoil and subsoil separately
- Understand dispersive soil types (typically subsoils) – do not mix
- Preserve seed viability and soil structure (minimise re-working)
- Control erosion and prevent sediment pollution
- Longer term stockpiling – mulch cover or revegetation is a good option

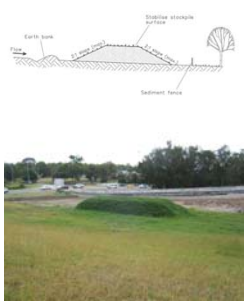
25 Centre for Environmental Training

Construction / Maintenance

- Place at least 2 m from property boundaries and hazard areas (e.g. waterways, roads, existing vegetation)
- Place stormwater diversion drains upslope and sediment fence downslope
- Keep height < 2 m if possible, and batters with 2:1 maximum slope
- Stabilise stockpiles that are in place for more than 10 days using vegetation or cover (~60% effective cover)

27 Centre for Environmental Training

Stockpiles



29 Centre for Environmental Training

Examples - Poor Practice

30 Centre for Environmental Training

Sediment Controls

- Erosion controls must be a major priority at any development site, but inevitably are not 100% effective
- Sediment controls act along with good erosion control to minimise off-site pollution, as part of an overall "treatment train"

31 Centre for Environmental Training cet

Pollutants – Not Just Soil

- Suspended solids, especially sediment that can carry other pollutants "piggy-back" (e.g. nutrients, heavy metals)
- Nutrients
- Organic matter and other oxygen-depleting materials
- Pesticides
- Litter, construction wastes, hydrocarbons

32 Centre for Environmental Training cet

Example – good practice

33 Centre for Environmental Training cet

Soil Type and Sediment Trapping Effectiveness

- The coarser the sediment, the easier to trap (generally)
- Effective capture of finer silts and clays requires long detention times and/or flocculation
- Dispersible sediments in particular may never settle out except with flocculation!

34 Centre for Environmental Training cet

Catchment and Runoff Characteristics

- For smaller catchments (<4,000 m^2) small sediment traps (e.g. sediment fence) can be used to good effect if designed and installed properly
- Larger catchments require much larger traps (i.e. sediment basins)
- Possible to estimate sediment yield to help size sediment traps
- Keep traps offline (avoid concentrated flow) and divert clean water to improve effectiveness

35 Centre for Environmental Training cet

Function of Sediment Traps

- Sediment traps generally work by reducing flow velocities, allowing sediment and other pollutants time to settle
- It is a common misconception that traps work by "filtering" water (although this is a partial mechanism in some traps)

36 Centre for Environmental Training cet

Maintenance of Sediment Traps

- Inspect devices after each storm and:
  - Remove sediment when sediment reaches 1/3 to 1/2 capacity
  - Repair damage
  - Assess effectiveness and install additional erosion and sediment controls as required
  - Flocculate sediment basins capturing fine or dispersible sediment

37 Centre for Environmental Training cet

Turf Filter Strips

38 Centre for Environmental Training cet

Example – what is missing?

39 Centre for Environmental Training cet

Sediment Fence

40 Centre for Environmental Training cet

Purpose

- Use downslope of all disturbed areas
- Best used to dam water where it is inclined to pond (e.g. flat areas at base of batters)
- Designed for sheet flow, not concentrated flow
- Not appropriate in waterways
- Woven geotextile supported by star pickets, hardwood posts etc.
- Reinforce with steel wire or mesh for higher flows
- Construct along the contour to prevent water concentrating at one point
- Trap mainly sand and gravel – most silt and clay will pass through

41 Centre for Environmental Training cet

Effectiveness

- Sediment fence typically has pore openings typically ~ 0.035 mm
- Clay and silt are <0.02 mm and much will pass straight through
- Sand >0.02 mm and gravel caught with greater efficiency
- Trapped material will improve efficiency to a point……maintenance required to ensure continued performance

42 Centre for Environmental Training cet

Examples - Poor Practice?

43

Centre for Environmental Training

Poor Location?

44

Centre for Environmental Training

Examples - Good Practice

45

Centre for Environmental Training

Inappropriate Use

46

Centre for Environmental Training

Repairs Required

47

Centre for Environmental Training

Gravel Sausages and Kerb Inlet Filters

48

Centre for Environmental Training

Purpose

- Used to protect kerb-side stormwater inlets, grated drains etc.
- Can be moderately effective at trapping coarse sediment when selected, installed and maintained correctly
- Remove sediment regularly otherwise it will be re-mobilised
- Take care to avoid causing downstream flooding

49 Centre for Environmental Training cet

Examples – Good Practice


50 Centre for Environmental Training cet

Example – Good Practice

51 Centre for Environmental Training cet

Example
What's Good? What's Bad?

52 Centre for Environmental Training cet

Filter Bags/Dewatering


53 Centre for Environmental Training cet

Purpose

- Place at end of pipes to filter sediment
- Use when dewatering pits, trenches and sediment traps
- Locate in a well grassed area away from waterways during use
- Max. pore size ~0.2mm (traps sands and some silts)

54 Centre for Environmental Training cet

Dewatering – example

55

Centre for Environmental Training

Coarse Sediment Traps

56

Centre for Environmental Training

Example – 'U' Traps

57

Centre for Environmental Training