Session 5

Sediment Basins and Dewatering

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Sediment Basin Test

- Blue Book Reference Section 6.3.2
- Some small and flat sites may not warrant construction of a sediment basin i.e. those <2,500m^2 disturbed area for which a ECSP (rather than a SWMP) is required
- Run RUSLE to check the annual soil loss from the total disturbed area
- If annual soil loss <150m^3 (150m^3 = 200 tonnes) a sediment basin may not be required
- If so, employ alternative measures

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Sediment Basin Maintenance

- Sediment basin test
- If required, consider location(s)
- Basin design criteria
- Basin maintenance requirements
- Basin design depends on sediment type
- Different basin designs and maintenance regimes for Types C, F and D basins

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Sediment Basins

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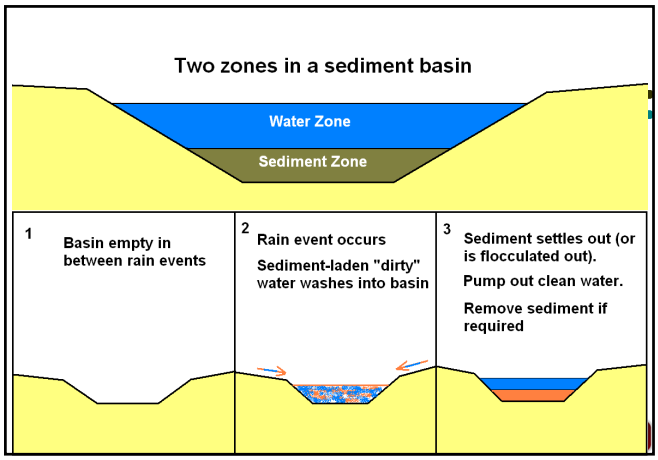

Purpose

- Collect sediment-laden stormwater runoff and retain pollutants
- Probably the most effective of all sediment control devices due to their large water and sediment storage capacity
- Generally used on larger (>2,500 m^2 construction sites)
- Types C and F (non-dispersive) and D (dispersive)

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Permanent Basins

- Designed by experienced professionals, having regard to the volumes of runoff, quantity and types of sediment expected
- Size includes a sediment settling and a sediment storage zone, mark with pegs
- Prioritise public safety
- Provide length/width ratio > 3:1 – use baffles if necessary
- Ensure inlet/outlet structures are stabilised against erosion

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Wet Basins

- Watertight structures that store water for sufficient time to allow settling of fine and dispersed suspended solids
- Complete storm capture devices
- Storage zone for 2 months soil loss (RUSLE) or 50% of water zone on low erosion hazard sites
- Often flocculated to enhance performance if sediments are dispersive (colloidal)
- Pump water out once settling has occurred

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Settling zone capacity – Types D and F basins

- Blue Book Reference Table 6.3 (pages 6.25 and 6.25) and Appendix L (spreadsheets)
- 5 day, 75th percentile is default
- 80th percentile for highly sensitive receiving waters or rehabilitation to take longer than 6 months
- 85th percentile (or higher) if receiving waters are highly sensitive AND rehabilitation to take longer than 6 months
- Consider better erosion controls rather than just making basins bigger

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Settling zone capacity – Types D and F basins

- Note the significant increase in basin size with change of design criteria (e.g. from 75th to 90th percentile)
- In what circumstances might 2-day or 20-day rainfall figures be used?
- What implications to these have for maintenance?
- What does design using 5-day, 75th percentile rainfall depth have for basin maintenance? How quickly must flocculation, settlement and emptying occur?

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Example – Wet Basin

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Maintenance

- Pump out wet basins after sufficient settling time / flocculation has occurred, to restore design capacity in time for the next storm
- Inspect / test the quality of outlet waters to assess performance
- Remove sediment once the sediment storage zone is full
- Regularly check the integrity of the basin, particularly inlet/outlet structures, and repair any damage

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Dry Basins

- Only effective for coarse sediments where shorter settling times are required
- Can be built of earth, rock or gabions
- Drain naturally through a geotextile-lined permeable wall or slotted riser

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Example – Dry Basin

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Temporary Basins

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Temporary Basins

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Basin Sizing

Blue Book Design Spreadsheet:

- Site details
- Catchment and disturbed catchment areas
- Soil analysis
- Rainfall data
- RUSLE Factors
- Sediment basin design criteria
- Calculations and Sediment basin volumes

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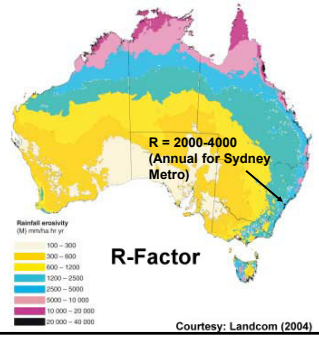
Soil analysis

- Percentages of sand, silt and clay
- Dispersion percentage
- Percentage of whole soil dispersible (Ref BB Section 6.3.3(e))
- Derives Soil Texture Group

Rainfall data

- Design rainfall depth (no. of days and percentile)
- (Ref BB Table 6.3)
- 5-day 75th percentile is default
- x-day, y-percentile rainfall event – read off graphs in BB Appendix L
- Rainfall R-factor – from BB Appendix B maps, IECA 2008 Tables E1 and E2, or calculate

Rainfall Erosivity (R-factor)



- A measure of the ability of rainfall to cause erosion
- Related to the energy and intensity of rainfall
- Varies throughout Australia and throughout the year
- Range in NSW 250-10,000

RUSLE Factors

- Rainfall erosivity (R-factor)
- Soil erodibility (K-factor)
- Slope length (m) – enter site data
- Slope gradient (%) – enter site data
- Length/gradient (LS-factor) – calculated
- Erosion control practice (P-factor) – default
- Ground cover (C-factor) - default

Sediment Basin Design Criteria

- Storage (soil) zone design (no. of months) – minimum generally 2 months
- Cv (Volumetric runoff coefficient) (proportion of rainfall that runs off as stormwater) – typically 0.5 for Australian sites

Calculations

- Soil loss (t/ha/yr)
- Soil Loss Class
- Soil loss (m^3/ha/yr)
- Sediment basin storage (soil) volume (m^3)
- Sediment basin settling (water) volume (m^3)
- Sediment basin total volume (m^3)

Alternatives to Basins
Dewatering Bag

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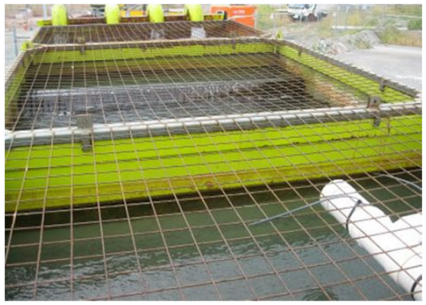
Alternatives to Basins
Settling Tanks



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Alternatives to Basins
Floc Socks, Floc Blocks

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Rainfall Activated
Flocculant Dosing

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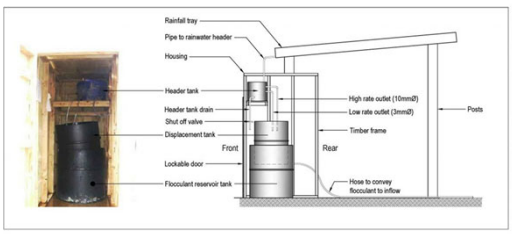
Rainfall Activated
Flocculant Dosing



- Chemical coagulants and flocculants: https://www.austieca.com.au/documents/item/818#

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Alternatives to Basins
Silt Buster

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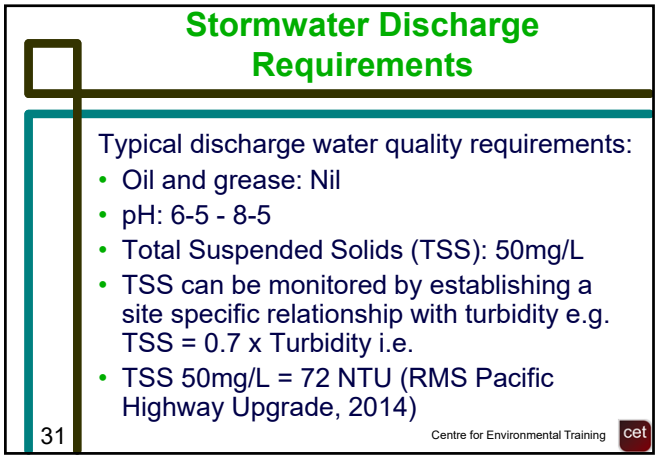
Stormwater Discharge Requirements
Typical discharge water quality requirements:
• Oil and grease: Nil
• pH: 6-5 - 8-5
• Total Suspended Solids (TSS): 50mg/L
• TSS can be monitored by establishing a site specific relationship with turbidity e.g. TSS = 0.7 x Turbidity i.e.
• TSS 50mg/L = 72 NTU (RMS Pacific Highway Upgrade, 2014)
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