Erosion and Sediment Control Fundamentals

Erosion and Sediment Control

• Manage the following
  - Communication
  - Work
  - Water
  - Erosion
  - Sediment

.....in that order!

“Five Pillars” - Barry Fagan, PE, Alabama DOT

Communication

• “The Best Management Practice”
  - External Communication
  - Internal Communication
  - Contractor Communication
Work

• “Inspect what you expect.”
  - Contractor still works for client.
  - Does contract adherence = compliance?
  - All responsibilities should be on the table.

Water

• “Clean water in, clean water out”
  - Manage
    • Raindrop
    • Runoff
    • Run on
    • Flow - through
    • Dewatering

Erosion

• Raindrop impact and shear forces from runoff must be minimized - cover it up and slow it down.
Erosion & Sediment Control Workshop

Sediment

- Fast water carries more sediment than slow water. If you can’t keep it, slow it down.

Exercise

- What are the five pillars of erosion and sediment control management and provide in the correct order of importance?

Operational BMPs

- Follow the SW/E&SC Plan
- Re-emphasize protection of critical areas
- Minimize amount and duration of exposure
- Inventory materials
- Implement concurrent with clearing and grubbing
- Implement in phases (clearing/grubbing and mass grading)
- Good housekeeping
- Maintain BMP measures
Erosion and Sedimentation Defined

- **Erosion** is the wearing away of soil caused by the action of water, wind, ice, gravity or other geological agents.

- **Sedimentation** is the deposition of that eroded soil

*Source: NCDENR Erosion and Sediment Control Planning and Design Manual*

Soil Erosion: Two Phases

- **Detachment:** individual particles are loosened from the soil mass.
  - Rainsplash > running water > wind

- **Transport:** water or wind carries the detached particles downslope or downwind.
After Soil is Saturated …

- Transport
- Detachment

Soil Particle Size

- Sand: Large, heavy particle; Hard to detach; Quick to settle
- Silt: Size between sand and clay; Most easily eroded particle; Settleable, with time
- Clay: Hard to detach due to cohesion; Hard to settle due to small size

Sedimentation: Size Matters

- Coarse Clay: High settling time
- Silt: Moderate settling time
- Fine sand: Low settling time
Turbidity

• Turbidity is the measure of relative water clarity
• Measured in NTU’s – Nephelometric Turbidity Units

*NTU = Nephelometric Turbidity Unit

• 50 NTU* for regular streams
• 25 NTU for lakes and reservoirs
• 10 NTU for trout waters

*NTU = Nephelometric Turbidity Unit
Erosion: Bare vs. Grass

Before Stabilization...

...and After
**Review Questions**

- In general, erosion (increases/decreases) with increasing rainfall and (increases/decreases) with increasing vegetative cover.

- List general soil types (clays, silts, sands, gravel) in order from most erodible to least erodible.

**Construction Site Focus Areas**

- Gravel Construction Entrance
- Silt Fence on perimeter
- Managing site runoff
- Protect I/O of pipes/culverts
- Constructing stable slopes
- Quick Groundcover
- Highest protection near streams
- Keep mud on your property

**Gravel Construction Pads**
Review Questions

- What is the primary purpose of a gravel construction entrance?

- Your construction entrance has to be sweetened daily due to unstable base material. A cost effective solution is...

Summary

- **Install at beginning of job**
- **Maintain for effectiveness**
Perimeter Protection

Review Questions

• Good erosion control results in good sediment control. T/F and why?

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• Silt fences are very effective sediment control practice when used in concentrated flows such as ditch lines or culvert inlet? T/F and why?
Summary

- Perimeter protection
- Avoid concentrated flow
- Maintain after rainfall

Managing Runoff
Review Questions

- Bale barriers are an effective method for sediment control? Why?

- Implementing erosion control methods while road construction activities are occurring is not cost effective. T/F and why?

Summary

- Plan for sediment control at discharges
- Use velocity control
- Stabilize quickly w/ correct erosion control materials
Protecting Pipe Culverts and Swales
Review Questions

• What are some other stabilization materials that can substitute just as effectively and could be more economical in drainage swales/ditches instead of rip rap?

• My ditch is just a little too steep to be stabilized with seeding and mulching alone; what is my next best selection?

Summary

• Stabilize pipe inlets and outlets
• Perform as soon as pipe is installed
• Hard armor for swales w/ steep gradients

Constructing Stable Slopes
Review Questions

• What two topographic factors have the greatest impact on the magnitude of erosion?

• What are some of the factors that contribute to roadway fill sloughing?
Summary

• Compaction in lifts
• Construct at angle that can be stabilized w/matting and vegetation
• Stabilize in stages

Timely Groundcover
Review Questions

• What BMP can reduce erosion up to 90-95% on disturbed sites?

• I have a one-half mile haul road through rolling topography; what is a simple construction method to minimize sediment loss?
  - Groundcover
  - Construct and stabilize in phases
Summary

- As soon as grading completed or after any phase of idle activity
- Good site prep and seed bed prep
- Attention to detail on seeding/hydroseeding

Stream Buffers
Summary

- Observe buffers and setbacks
- Provide highest level of protection
- Monitor these high risk areas for needed maintenance
Review Questions

• Most construction site erosion will result from r__________ and r__________?

• Erosion is the displacement of soil particles by the actions of w__________ and w__________?
Review Questions

- What BMP can reduce erosion up to 90-95% on construction projects?
- I have a one-half mile haul road through rolling topography; what is a simple construction method to minimize sediment loss?

Summary

- Get to know the property
- Planning critical
- Follow design guidelines
- Construct and stabilize

Finished Product
Review Questions

• This addition to sediment impoundment measures greatly improves trapping efficiency?

• My project is being built near and drains to several high quality streams. What BMP or treatment can I use to minimize water quality impacts from my stormwater runoff?
Erosion and Sediment Control BMP Summary Questions

- BMPs for controlling surface water runoff
  - berms, diversions, slope drains, level spreaders
- BMPs for outlet/discharge points
  - Pits, basins, wattles, rock dams
- BMPs for controlling velocity in ditch lines
  - Wattles, rock check dams, ditch blocks
- BMPs for use at stream crossings
  - Silt fence, rip rap aprons
- BMPs for tie ins at public roads
  - Construction entrance pads

Summary

- Follow the plans and permits
- Ask questions if needed
- Be proactive!
Questions?

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