CHAPTER 3
PRINCIPLES OF EROSION AND SEDIMENTATION

3.1 GENERAL

The most effective means of reducing the soil lost from property is to prevent the erosion of the soil. Structural barriers can provide 70% to 90% sediment removal efficiencies from runoff, but natural groundcover and mulching can provide 90% to 98% reduction in erosion and soil loss.

3.2 EROSION PROCESS

Erosion is a natural process by which soil and rock is loosened and removed by the action of water or wind. The primary focus of this manual is the control of erosion and sedimentation caused by surface water runoff. Construction-site erosion has been shown to be in most cases, the most excessive form of erosion known causing serious and costly problems, both on-site and off-site.

Runoff, water moving over the soil surface, is caused by rain water falling at a faster rate than it can be absorbed by the soil. The runoff water detaches and transports soil particles from one location to another. The erosiveness of flowing water depends upon its velocity, turbulence, plus the amount and type of abrasive material it transports. The higher the velocity of runoff, the higher the number of soil particles that can be transported.

The potential for an area to erode is related to four factors: soil type, surface cover, topography and climate.

The soil type has a direct impact on the erodibility of the soil. Key factors that affect the erodibility of a type of soil are the soil texture, the organic matter content, the type of soil structure, and the permeability of the soil.

Surface cover primarily in the form of vegetation, shields the soil surface from the impact of falling rain, reduces runoff velocity and spreads out the flow of water.

Topographic features such as the size of drainage basins and the steepness of slopes directly affect runoff rates and volumes.

Climate, particularly the frequency, intensity, and duration of rainfall are primary factors that determine the amount of runoff produced.

3.3 EROSION CONTROL

Effective erosion control addresses the prevention of soil erosion by protecting the soil surface from the erosive forces of rain and runoff. Prevention of erosion is always better than remedial measures and should receive priority in any erosion and sedimentation control plan. Soil erosion cannot be completely prevented, as some natural erosion occurs on the landscape even under ideal conditions.

The idea is to prevent accelerated erosion to the extent practicable. The following practices can be used to prevent erosion:

- Plan the development to fit the site topography (Avoid highly erosive areas).
- Minimize the duration and size of area exposed without ground cover.
- Protect exposed ground areas from off-site runoff.
- Stabilize exposed ground areas as soon as possible.
- Reduce runoff velocities whenever possible.
- Protect steep slopes from excessive runoff.

Project phasing, particularly on large projects, can be critical to successful erosion control. The minimizing of disturbed land area, re-establishment of ground cover and the installation of BMPs should be carefully coordinated with the phases of a project.

3.4 SEDIMENTATION PROCESS

Sedimentation is the deposition of soil particles that have been transported by runoff. The amount and size of the material that can be transported increases with the velocity of the runoff. Sedimentation occurs when the runoff slows down enough and for a long enough period of time to allow the suspended soil particles to settle from the runoff. Gravel and sand particles are usually not transported very far by running water and are deposited when the water first slows down. Conversely, some very small clay particles, may not settle out even when the water stops moving. This is because the particles are held in suspension.

3.5 SEDIMENTATION CONTROL

Sedimentation control is a remedial measure that involves trapping sediment as runoff leaves the land during storm events. Most sedimentation control is achieved through the use of structural controls, sometimes referred to as Best Management Practices (BMPs).

Effective sedimentation control requires that the majority of the eroded soil be captured on-site. Chapter 5 of this manual provides the user with an inventory of BMPs, that when properly used, installed and maintained will effectively control sedimentation from a construction site. BMPs are generally applicable to a specific site situation and the erosion control plan for a site shows the correct BMP to control off-site sedimentation.