Experiment No. 3

"To understand the initiation and characteristics of bedload motion"

Apparatus Name: Advanced Hydrological Apparatus

HYDROGEOLOGY LAB

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING

UET, LAHORE

Procedure:

Connect the flexible piping from the river inlet tank to the quick release connector on the flow meter.

Set the slope of the sand tank to between 0.6% and 0.8%. Smooth the sand level, parallel to the top of the tank, and lightly tamp it down. Use the scoop to cut a straight * trapezoidal channel into the sediment bed, from the river inlet tank to the deep cut-out at the foot of the tank. The channel should be approximately 5 cm deep and 10 cm wide. Record the channel dimensions.

Set the river inlet flow rate to 1.5 l/min and allow time for the sediment bed to become saturated. Surface flow should then occur along the channel. If bedload motion is observed, reduce the channel slope, reform the initial channel and restart the experiment. Record the depth and width of flow in at least ten randomly selected places along the channel. As the inlet and outlet will both affect the local hydraulics and channel behavior, ignore the uppermost and lowermost 30 cm of the main channel when taking recordings.

Increase the slope slightly until you observe that grains of bed sediment start to move. This is the threshold of motion. Make careful observations to establish whether there is in fact a specific threshold of motion, or whether the onset of motion is more gradual.

Slowly increase the valley slope in 0.6%-0.8% stages up to the maximum slope of the simulator, making observations and taking sediment yield measurements at each stage. Each run should last for 20-25 minutes, with sediment yield measured every five minutes (or more frequently for high sediment flow rates). The channel should be left for 5-10 minutes at each setting before taking recordings, to allow the transport rate to adjust to the new flow rate. It should be possible to observe sediment transport by rolling, sliding and saltation processes described in the theory earlier. Depending on the caliber of sediment used to form the bed of the channel, suspension may occur at the higher flow rates.

The experiment may be repeated for different initial flow rates if desired.

* If a meandering channel is used then motion will be initiated at the bends well before the straight sections. Sediment eroded from each of the bends will be deposited at the next inflection point downstream. Is this the intention? It seems to complicate the threshold of motion rather than clarify it to me. I suggest using a straight channel at least in the first instance. A meandering channel could be used in a subsequent experiment to investigate the influence of non-uniformity of the channel on the threshold condition.

Inlet Flow Rate _____ l/min
Valley Slope _____ %

Observations and Calculations:

Elapsed Time min	Sediment Transport Rate g/min	Channel Width (m)	Channel Depth (m)	Observations of sediment transport Processes

Assignment:

a) Basing your conclusion on your observations, is there a specific threshold of motion for river bedload?

b) If so, is there a defining relationship between bed slope, river flow rate, Shields parameter and initiation of bedload motion?

c) Are there any other factors that also appear to have an effect on the initiation and characteristics of sediment movement.