SLEMISH
COLLEGE
REVERENTIA INTELLECTIO VERITAS

Slemish College
Geography Department

Year 12 GCSE
Geography Coursework

Guide to Data Collection in the river

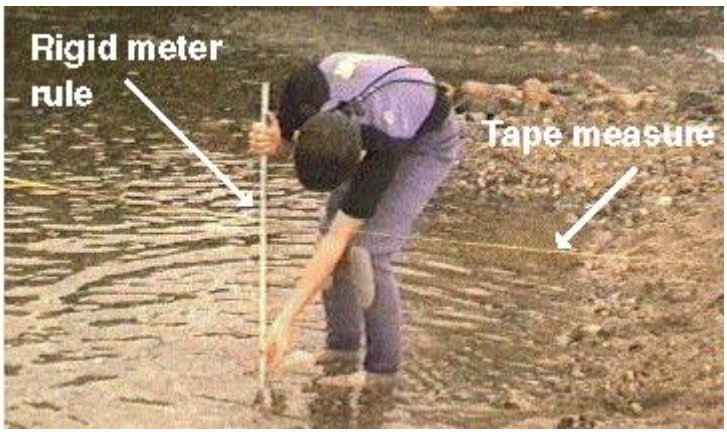
Collecting River Data

Please do not copy any parts of this booklet into your coursework as you will loose marks. You must put the explanations into your own words.

Section 1 – Width, Depth, Wetted Perimeter and Cross-sectional area

Equipment
Tape Measure
Metre ruler
Safety rope

1. Before starting any work on a river it is important to make sure that the section is safe to enter and is not too deep
2. A safety rope needs to be attached above the level of the water for people in the river to hold on to as they cross the river
3. The first task is to find out how wide the river is. Stretch the tape measure from one side of the stream to the other.
   The 0 marking should be level with the first piece of water
   Measure and record the total width of the river
4. To record the depth of the river, use the metre ruler. The measurement taken is the distance from the bottom of the river to its surface.
   The depth measurements should be taken at 30cm intervals across the river.
5. All of the measurements should be recorded on your recording sheet



GCSE Coursework River study

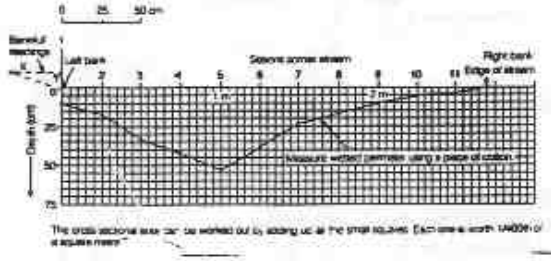
Writing up you results

Hypothesis 1 - The shape of the channel will change downstream. It will become wider and deeper downstream.

Drawing a cross-section

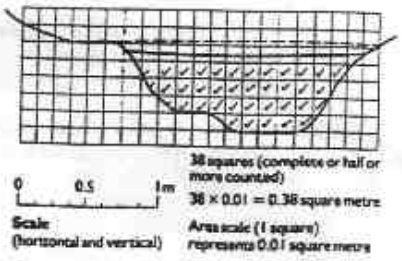
Use your measurements to draw a section on graph paper (remember that vertical and horizontal scales must be the same). For a small stream the scale '1 cm on the graph represents a distance of 25 cm' is about right. Draw the surface of the water to represent depth on the day of the fieldwork and draw the bankfull surface as a dashed line.

Fig. 11 Drawing a river cross-section



Calculating the cross-sectional area of the channel

A simple way of doing this is to count the number of complete squares, including those where half or more than half of the square is covered. **DO NOT** count the squares which are less than half covered. Multiply the number of squares by your scale and the result is the area in square metres. Calculate the percentage of the bankfull level that was filled with water on the day of the fieldwork.



Wetted perimeter

This can be measured from the cross-section using a piece of thread.

Channel efficiency

The efficiency of a channel is controlled by the degree of contact of the channel bed and banks with the stream water. In a wide, shallow channel there is a lot of contact between water and banks and loss of energy due to friction is very large and the channel is inefficient. An indicator of channel efficiency is the 'hydraulic radius'. This can be easily calculated using the following formula:

$$\text{Hydraulic radius} = \frac{\text{cross-sectional area}}{\text{wetted perimeter}}$$

The value obtained for the hydraulic radius is a unitless number. Higher values indicate greater efficiency. You would expect to record greater average speeds at those sites with a higher efficiency ratio.

What is Wetted Perimeter?

The Wetted Perimeter is the distance the water is in contact with. You can only work out the wetted perimeter distance after you have drawn a cross-sectional area graph based on the width and depth measurements on the field trip.

What is the Cross Sectional area?

Using your cross-sectional area graph, make sure that the scale on the graph is the same on both axes. You simply need to count the squares (whose size you already know) and a simple calculation of multiplying number with size will give you the cross-sectional area.

Another way to do this is to assume that the cross-sectional area = the average depth multiplied by the channel width.

Cross sectional form is best expressed in terms of a depth to width ratio. An important consequence is channel efficiency. The efficiency of a channel is controlled by the degree of contact between the bed and banks and the flowing water. Where there is a lot of contact between water and banks (a wide, shallow bedload stream) the loss of energy due to friction is high and the channel is inefficient. Narrower channels with high cohesive banks are more energy-efficient. A measure of channel efficiency is hydraulic radius, which is the ratio of cross-sectional area to wetted perimeter:

$$\text{Hydraulic Radius} = \frac{\text{Cross-sectional area}}{\text{Wetted Perimeter}}$$

Wetted perimeter represents the resistance to river flow (friction), and cross sectional area the energy of the flowing water. The higher the value the more efficient the channel

Section 2 – Velocity and Discharge

Equipment
Measuring Tape
Safety Rope
Stopwatch
A float
2 Ranging poles

1. Mark a 10m length of river downstream from the nearbank. Use ranging poles to identify a start and finish line
2. Use a float to time how long it takes to travel the 10m. To do this, simply put the orange into the river at a given point and use the stopwatch to time how long it takes to travel the 10 metres.
3. At each site, 3 times should be taken at the following points across the river
   - Near bank
   - Midstream
   - Far bank

   To do this it is best if one person drops the float and tells another person when to start and stop the watch. The person with the stopwatch should stand at the downstream finish point and stop the watch when the float passes the 10m point. A third person should be in position to catch the float.

4. All of the times should be recorded on record sheets

Velocity is the actual speed of the water . The velocity of a part of the river is calculated as

$$\text{Velocity (metres per second)} = \frac{\text{Distance (m)}}{\text{Time (seconds)}}$$

Discharge is defined as the volume of water passing a point on a river bank in a given time (usually one second). The volume is expressed either in cubic metres per second (cumecs) or in litres per second; there are 1000litres in $1m^3$.

Discharge is the stream velocity x cross-sectional area (in cumecs).

(Following the fieldwork you will receive a Discharge Data sheet to help you understand these calculations).

Section 3 Bedload

Equipment
Callipers
Ruler

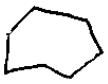
1. At each site you must pick up and measure the long axes and shape of 20 stones at random across the river

You should expect the rocks and pebbles on the stream bed to get smaller and more rounded as you move away from the river source – this may not be true if the stream passes over different rock types or if there has been a landslide.

The table below is the Powers shape index for stones (pebbles)

Shapes of Stone (Guide)

Very Angular 

Angular 

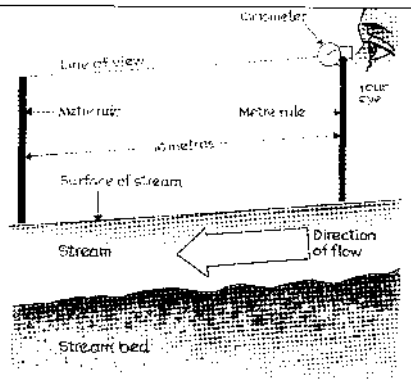
Sub Angular 

Rounded 

Well Rounded 

Long Axis = 

Section 4 Gradient

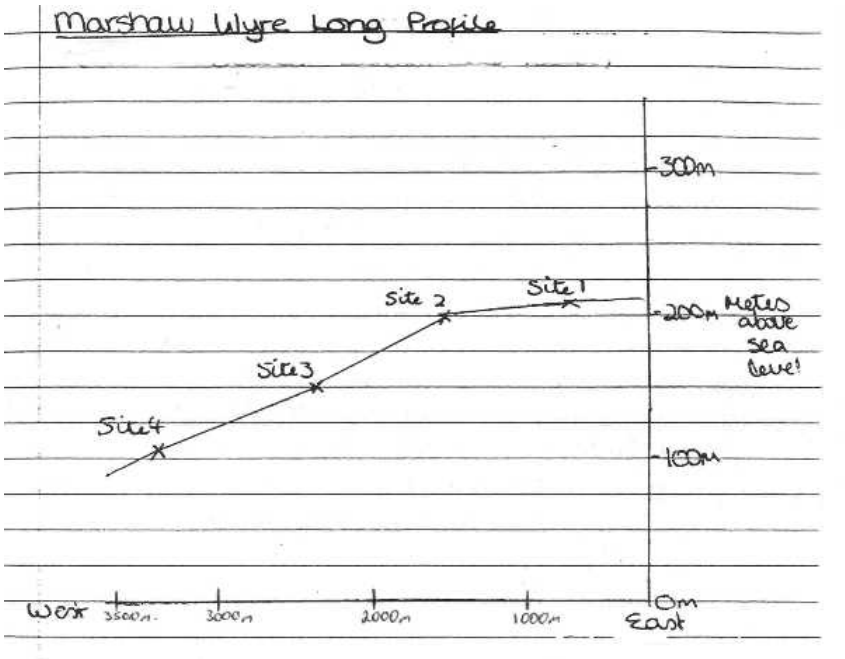


1. Measure a 10 m stretch of stream
2. Carefully hold two metre rules on the water surface 10 m apart
3. Use the clinometer to measure the angle between the tops of the two metre-rules
4. Do it two or three times to check your answers
5. Record your result

Equipment
2 ranging poles
clinometer

Gradient is the slope of the river. You can draw a long profile by using the contours and information from an OS map or you can measure the gradient where you do your channel measurements.

This will allow you to draw out something like this –



Ps – where do you think the information about the heights of the rivers came from?

Field Sketches

When you are on the field trip you will be asked to draw and annotate a Field sketch of the geography of the surrounding area of the river. It is important to put as much detail as possible into this. There is an example of the sort of information that you should include below.

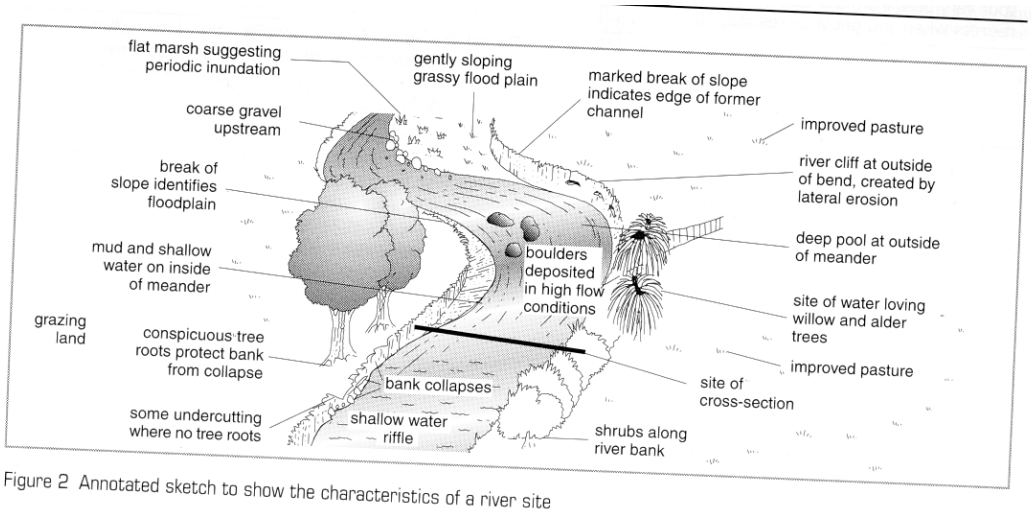


Figure 2 Annotated sketch to show the characteristics of a river site

Finally some guidance about safety

Rivers can be very dangerous

1. Keep away from deep water
2. Never work or cross the river on your own
3. Do not mess around in the river
4. Do not run or try to work quickly – this is when accidents happen
5. If you are ever in doubt – ask your teacher for help