General Certificate of Education
January 2004
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

GEOGRAPHY (SPECIFICATION A) GGA7P
Unit 7

No additional materials are required.

To be issued to candidates on or after 1 December prior to the examination.

Pre-release material

Instructions

- This material must be kept **unmarked** for use in the forthcoming examination.
- The centre 4-page section of this booklet contains coloured photographs, which can be detached.

Advice

- You should use the information contained in this booklet to become familiar with the aims, methods and data provided. Methods of data presentation should be considered and subsequent analysis and conclusions drawn. Enquiry related issues should be explored. You should use your own experience of fieldwork.

TITLE OF ENQUIRY

How and why do river channels change downstream?

AIM

The aim of this enquiry is to determine how channel landforms and other channel characteristics change downstream and the reasons for these changes.

In order to complete this enquiry, a number of objectives can be identified.

Objective 1. To determine how channel landforms change downstream.

Objective 2. To determine how the channel characteristics of width, depth, velocity and bedload change downstream.

Objective 3. To attempt to explain the changes using data collected as evidence of changing processes downstream.

BACKGROUND INFORMATION

Many AS and A2 geography textbooks predict the ways in which channel landforms and other channel characteristics and processes change downstream. **Figure P1** summarises these expected changes.

The study area is within the drainage basin of the River Noe in the Vale of Edale, situated in the Peak District. Three sites were measured within the drainage basin – one at grid reference 121869 on Golden Clough; one at grid reference 119868 on Grinds Brook, into which Golden Clough flows, and a final location at grid reference 129852 on the River Noe downstream from its confluence with Golden Clough. These rivers flow across millstone grits within an area with a mean annual precipitation of 1200 mm. **Figure P2a** shows the location of the study area on the 1:50000 Landranger Ordnance Survey map, whilst **Figure P2b** shows the study sites in more detail.

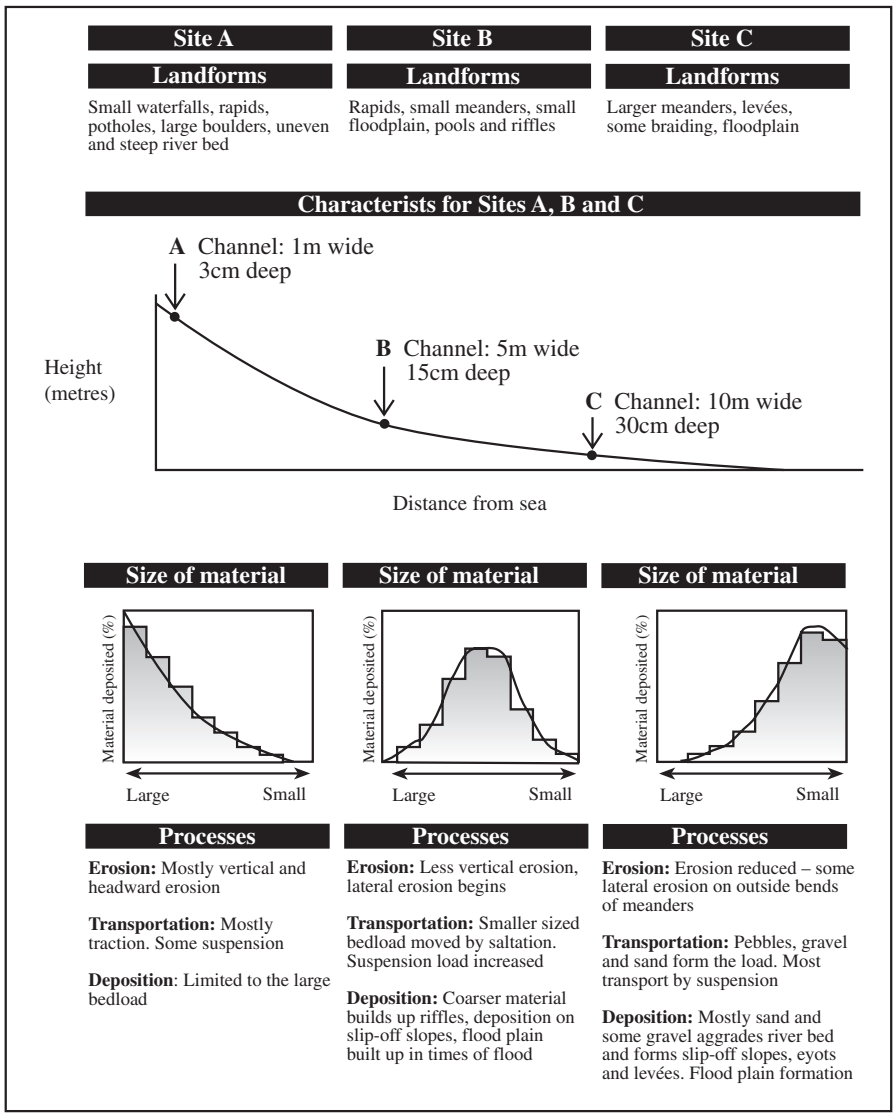

Site A
Site B
Site C
Landforms
Landforms
Landforms
Small waterfalls, rapids, potholes, large boulders, uneven and steep river bed
Rapids, small meanders, small floodplain, pools and riffles
Larger meanders, levées, some braiding, floodplain
Characterists for Sites A, B and C
A Channel: 1m wide 3cm deep
B Channel: 5m wide 15cm deep
C Channel: 10m wide 30cm deep
Height (metres)
Distance from sea
Size of material
Size of material
Size of material
Material deposited (%)
Large
Small
Processes
Processes
Processes
Erosion: Mostly vertical and headward erosion
Transportation: Mostly traction. Some suspension
Deposition: Limited to the large bedload
Erosion: Less vertical erosion, lateral erosion begins
Transportation: Smaller sized bedload moved by saltation. Suspension load increased
Deposition: Coarser material builds up riffles, deposition on slip-off slopes, flood plain built up in times of flood
Erosion: Erosion reduced – some lateral erosion on outside bends of meanders
Transportation: Pebbles, gravel and sand form the load. Most transport by suspension
Deposition: Mostly sand and some gravel aggrades river bed and forms slip-off slopes, eyots and levées. Flood plain formation

Figure P1

Ordnance Survey Map is not reproduced here due to third-party copyright constraints. The full copy of this pre-release material can be obtained by ordering GGA7/PM from AQA Publications Tel: 0161 953 1170.

Figure P2a

Ordnance Survey Map is not reproduced here due to third-party copyright constraints. The full copy of this pre-release material can be obtained by ordering GGA7/PM from AQA Publications Tel: 0161 953 1170.

Figure P2b

DATA COLLECTION

Figure P3 (in the centre of this booklet) shows photographs of the three study sites and two other locations (photographs **7** and **8**) slightly further downstream. At each of the study sites, two × 10 metre lengths were measured along the banks following the channel upstream and downstream of the chosen site location. At the mid point along these segments, a cross-section of the stream was measured and the following information was recorded:

Width of the channel;
Depth of the channel at the left and right bank (looking upstream) and at nine equidistant points in between;
Wetted perimeter;
Bankfull width;
Vertical distance between water height and bankfull height;
Velocity at five equidistant points across the channel.

Along the length of the segment the gradient of the 10 metre long profile was measured and fifteen samples of bedload were selected by observation to represent the variety of bedload present. The long axis was measured and the shape recorded by reference to examples of bedload indicative of different categories used as illustrations.

Figure P4a gives detailed depth and velocity measurements for the study sites and **Figure P4b** gives detailed information on bedload. A summary of the results of the surveys and information on cross sectional area, hydraulic radius and discharge are shown in **Figure P4c**.

The following equipment was used in the data collection of each segment: a tape measure, two metre rules, one half metre rule, impeller, clinometer.

Site 1

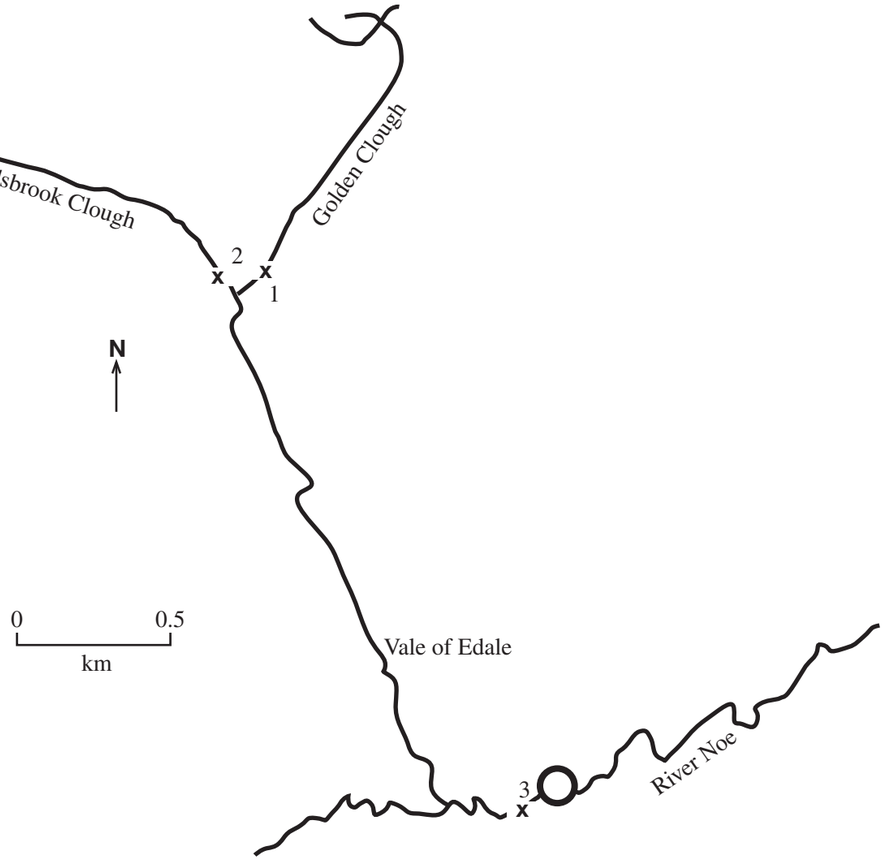
1

Site 1

2

Site 2

3



O Location where photographs 7 and 8 were taken.

x 1, 2, 3 are study sites

Figure P3

Site 2

4

Site 3

5

Site 3

6

7

8

Turn over ▶

Site 1	Distance from left bank (m)	0	0.14	0.28	0.42	0.56	0.70	0.84	0.98	1.12	1.26	1.40
Segment 1	Depth (cm)	47	48	54	50	43	38	29	20	7	5	2
	Velocity (m/sec)		0.046		0.046		0.046		0.046		0.046	
Site 1	Distance from left bank (m)	0	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
Segment 2	Depth (cm)	9	13	17	16	21	15	22	22	17	17	3
	Velocity (m/sec)		0.112		0.228		0.046		0.046		0.046	
Site 2	Distance from left bank (m)	0	0.29	0.58	0.87	1.16	1.45	1.74	2.03	2.32	2.61	2.90
Segment 1	Depth (cm)	20	6	4	20	16	23	22	24	18	19	17
	Velocity (m/sec)		Too shallow		0.046		0.086		0.108		0.092	
Site 2	Distance from left bank (m)	0	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00
Segment 2	Depth (cm)	0	5	3	0	0	0	0	3	14	12	27
	Velocity (m/sec)		Too shallow		Too shallow		Too shallow		Too Shallow	0.228	0.117	
Site 3	Distance from left bank (m)	0	0.64	1.28	1.92	2.56	3.20	3.84	4.48	5.12	5.76	6.40
Segment 1	Depth (cm)	3	9	23	30	17	17	21	16	9	3	2
	Velocity (m/sec)		0.046		0.349		0.429		0.669		Too shallow	
Site 3	Distance from left bank (m)	0	0.59	1.18	1.77	2.36	2.95	3.54	4.13	4.72	5.31	5.90
Segment 2	Depth (cm)	0	5	12	8	13	15	10	14	22	5	1
	Velocity (m/sec)		0.068		0.428		0.486		0.428		0.073	

Figure P4a

Turn over ▶

Sample number	Site 1				Site 2				Site 3			
	Segment 1		Segment 2		Segment 1		Segment 2		Segment 1		Segment 2	
	Long Axis (cm)	Shape	Long Axis (cm)	Shape	Long Axis (cm)	Shape	Long Axis (cm)	Shape	Long Axis (cm)	Shape	Long Axis (cm)	Shape
1	84	A	97	SA	64	SA	13	SA	90	SR	22	R
2	47	SA	12	SR	20	A	35	A	14	R	11	R
3	11	SA	13	A	22	SA	30	SA	12	SR	5	R
4	8	SR	16	SR	10	R	45	SR	56	A	11	SR
5	28	A	6	SR	3	R	6	A	33	SA	15	R
6	8	SR	26	SA	3	A	28	SA	17	R	14	A
7	21	SR	43	SR	12	A	24	SA	18	R	8	SR
8	36	A	23	A	14	SR	11	R	23	A	6	SA
9	60	SA	24	A	52	A	38	A	17	A	25	A
10	26	A	20	A	5	R	69	SR	60	SA	9	R
11	8	SR	95	R	42	A	23	SA	38	A	6	SR
12	81	SR	54	A	20	SR	15	SA	38	A	25	SA
13	24	A	128	SA	10	SR	76	A	14	R	10	R
14	42	A	35	A	5	R	43	SR	24	SR	7	SA
15	8	A	11	SA	11	SR	15	R	21	SA	17	SA
Mean	32.8		40.2		19.5		31.4		31.7		12.7	

Key: A – angular, SA – sub angular, SR – sub rounded, R – rounded.

Figure P4b

Characteristics	Site 1		Site 2		Site 3	
	Segment 1	Segment 2	Segment 1	Segment 2	Segment 1	Segment 2
Width (metres)	1.40	2.50	2.90	6.00	6.40	5.90
Average depth (cm)	31.18	15.64	17.18	5.82	13.64	9.55
Bankfull width (m)	2.1	3.11	3.3	6.3	10.80	9.80
Vertical distance between water height and bankfull (cm)	8.8	9.2	9.5	27.0	250.0	141.0
Cross sectional area (m^2)	0.437	0.391	0.498	0.349	0.873	0.563
Wetted perimeter (m)	2.40	2.90	3.40	6.15	6.50	6.22
Hydraulic radius	0.182	0.135	0.146	0.057	0.134	0.091
Velocity (m/sec)	0.046	0.055	0.067	0.151	0.091	0.120
Discharge (cumecs)	0.020	0.022	0.033	0.053	0.079	0.068
Mean bedload size (cm)	32.8	40.2	19.5	31.4	31.7	12.7
Gradient (°)	16	11.5	2	5	1	2

Figure P4c

NB All results refer to channel width and not bankfull unless otherwise stated.