

**© UKRIGS Education Project: Earth Science On-Site**

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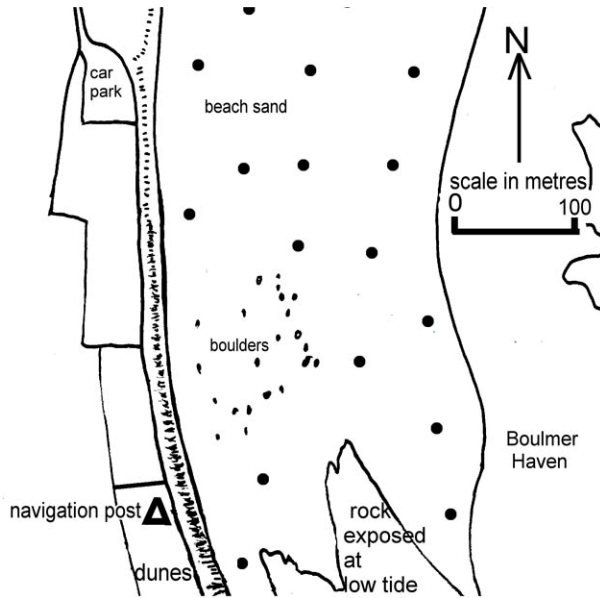
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**PUPIL WORKSHEET 1**

Pupil Name .....

**Site 1: Investigating Boulmer Beach Sediments.**



**1.** On the map mark and label the first 4 sites you investigate as **1a, 1b, 1c and 2.**

**2.** Circle the words below which best describe the boulders you see at **site 1a.**

**black, fine interlocking crystals, no joints, no fossils, no bedding. Igneous.**

**grey, fine grained, with fossils, sedimentary**

**yellow, made of cemented sand grains. Sedimentary.**

**Metamorphic rock.**

**3.** Take a small sample of sand (use sticky tape on dry sand) and look closely at it with a 10x hand lens. Describe the particles.

**4.** Describe how the sand moves along the beach channel of running water.

**5.** Summarise in the table below the evidence for processes affecting the sediments that you have seen.

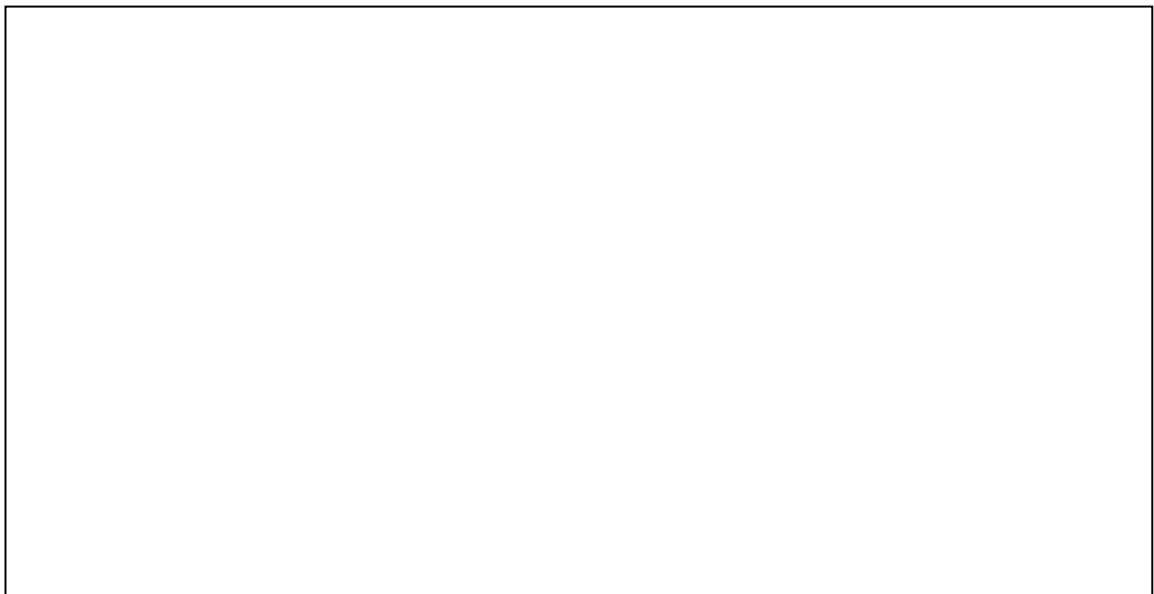
| PROCESS            | EVIDENCE FOR THIS GROUP OF PROCESSES AFFECTING THE BEACH |
|--------------------|----------------------------------------------------------|
| <b>Chemical:</b>   |                                                          |
| <b>Biological:</b> |                                                          |
| <b>Physical:</b>   |                                                          |

PUPIL WORKSHEET 2

Pupil Name .....

**Site 2: The Southern Wave Cut Platform.**

This exposure shows a wave-cut platform and cross bedding planes. In the box below sketch a part of the outcrop showing both the wave-cut platform and cross bedding.



1. With a compass measure the direction of dip of cross bedding (that is the same as the direction of the current) and write it on your sketch.
2. Label what the size of the cross beds tells you about the strength of the current.
3. In the table below write the following statements in the order that they describe what must have happened to these rocks. **Oldest statement is number 1.**

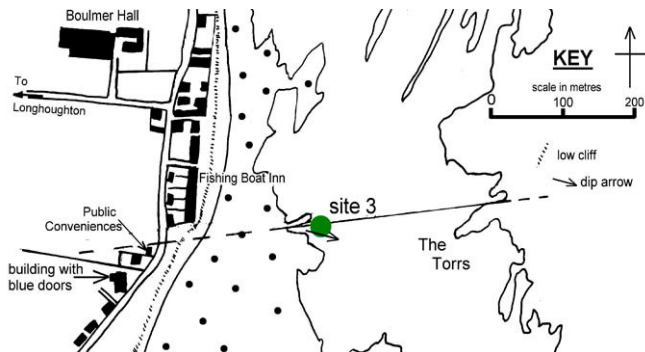
**Weathering of this sandstone to form new sand grains on the beach**  
**Uplift of the sandstone by plate tectonic forces**  
**Transport of the sand in a flowing current from the north**  
**Deposition of the sandstone by a fast flowing current**  
**Weathering of an ancient rock to form sand grains**

|                                 |
|---------------------------------|
| <b>YOUNGEST EVENT (last):</b> 5 |
| <b>4</b>                        |
| <b>3</b>                        |
| <b>2</b>                        |
| <b>OLDEST EVENT (first):</b> 1  |

**PUPIL WORKSHEET 3**

Pupil Name .....

**Site 3: The Rocks on "The Torrs".**



Site 3 has been marked on the map

6. Label the area of sedimentary rocks.
7. Measure the dip amount of the beds and write it next to the dip arrow at site 3.
8. Measure the width of the grey rock in metres:

**Width** \_\_\_\_\_ **metres**

1. **On the map** draw in the northern edge of the grey rock. (Use the buildings in the village to help guide you) and label it. Use dotted lines to show where the rock might go under the sand and out to sea.

2. Explain how a fault may have caused the northern side to be downthrown compared to the southern side of the grey rock, without affecting the dolerite.

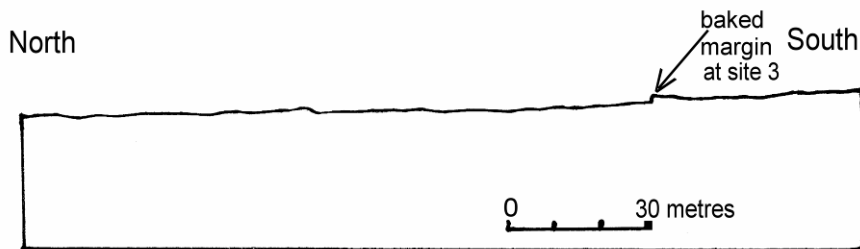
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3. The section below runs through the baked contact at site 3. Draw in the two underground edges of the grey rock. (Use the scale to help you). Extend them upwards as dotted lines to show where they have been eroded away.

4. Label **a) dipping sedimentary rocks;** **b) dyke;** **c) eroded dyke;** and **d) downthrown side of fault.**



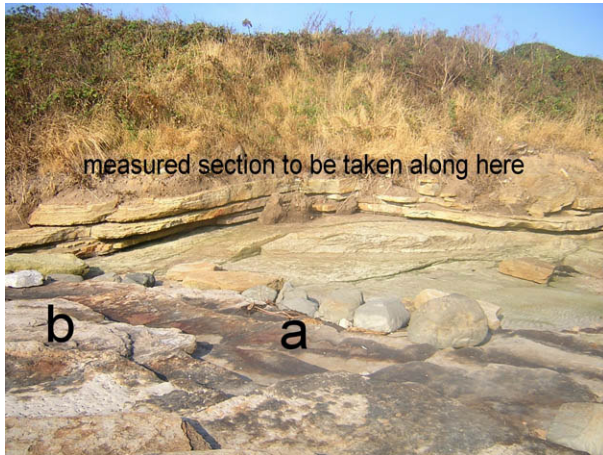
5. Number these statements in the correct order, summarising what you have seen so far. Number the oldest as "1" and youngest as "6"

- . **weathering and erosion of sandstone by wave action**
- . **deposition of beach sand by last tide**
- . **intrusion of dyke and stretching of crust**
- . **faulting (brittle fracture of crust)**
- . **deposition of sandstones**
- . **tilting of sandstones to the southeast**

PUPIL WORKSHEET 4

Pupil Name .....

**Site 4: Boulmer - North Foreshore.**



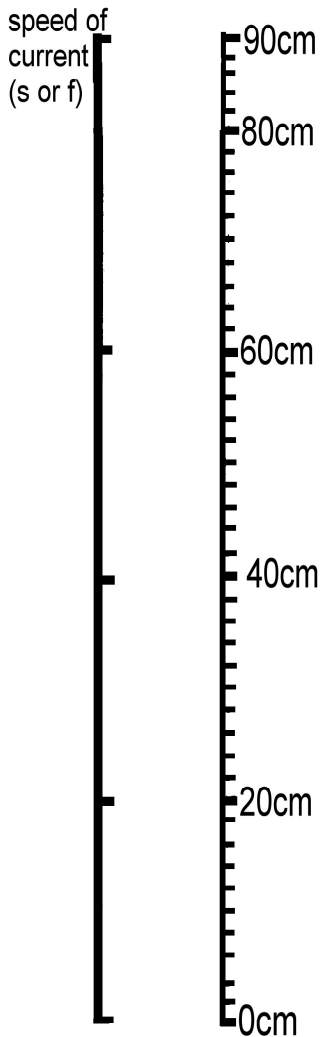
1. What features can you see on the bedding planes at "a" and "b"?

a) \_\_\_\_\_

b) \_\_\_\_\_

2. Take a dip measurement direction and amount, and record it below.

**Direction:** \_\_\_\_\_ **Amount:** \_\_\_\_\_



3. Measure a column of sediment in the low cliff, starting with the lowest shale bed. Plot the beds on the column on the left.

4. **On the right**, write **c** for small cross beds; **b** for burrows next to the beds in which you see them. **On the left**, next to each bed, write **s** for slower) or **f** (for faster) to show changes in current.

5. Look at the beds and the loose material on the beach and see if you can find evidence for each of the following. Write your evidence in the right hand column of the table.

|                                            |  |
|--------------------------------------------|--|
| Marine deposition                          |  |
| Currents from the north                    |  |
| Waves in shallow water                     |  |
| Soft bodied animals living in the sediment |  |
| Land with plant growth not too far away.   |  |

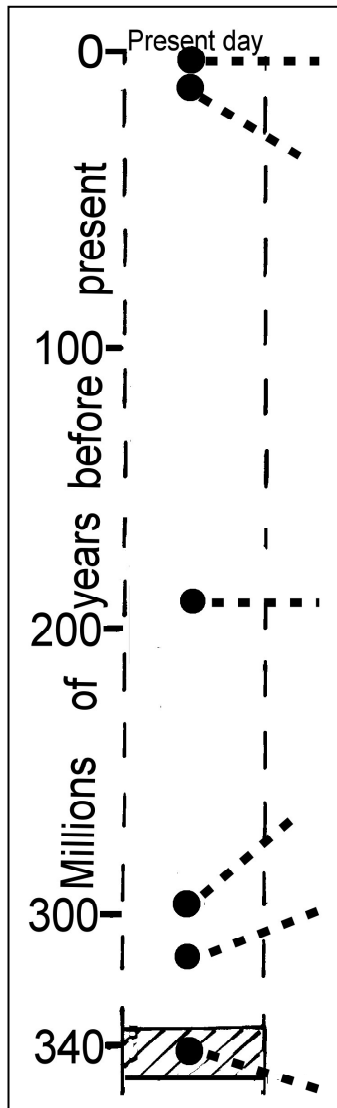
6. Summarise your findings by completing the following sentence.

**The Carboniferous limestone rocks were formed in a \_\_\_\_\_ area which was silted up from the north by \_\_\_\_\_ deposits that in places had plants growing on top forming \_\_\_\_\_. In the muddy deposits lived \_\_\_\_\_ bodied organisms.**

**PUPIL WORKSHEET 5**

Pupil Name .....

**Summary Of Events.**



Write each of the following statements (or its letter) in the correct box on the geological event column above.

- A. Period of faulting.**
- B. Period of dolerite dyke intrusion (crustal stretching).**
- C. Deposition of dune and beach sands begins.**
- D. End of glaciation and beginning of weathering and marine erosion continuing to present day.**
- E. Deposition of delta deposits with plant growth and burrowing marine animals.**
- F. 340 million years of erosion leaving no rock evidence behind.**

PUPIL WORKSHEET 6

Pupil Name .....

SUMMARISING THE ROCK CYCLES:

**PUPIL HOMEWORK SHEET:** The Two Rock Cycles at **Boulmer**.

**FIRST CYCLE: deposition.** What can you say about the deposition of the older beds on the foreshore HINTS: Evidence for marine deposition; fossils, grain size etc.

**FIRST CYCLE: uplift and tilting.** What can you say about the changes to the beds cause by plate tectonics? HINTS: tilting, faulting, intrusions etc.

**SECOND CYCLE: weathering and erosion.** What evidence of present day weathering and erosion have you seen on the foreshore?

**SECOND CYCLE: sediment transport.** How many different ways have you seen sediments being transported on the foreshore?

**SECOND CYCLE: deposition.** What kinds of modern deposits have you seen and what rock types might they form in future? HINT: Don't forget plant and animal evidence – and which parts might survive as fossils.