Funded by Defra's Aggregates Levy Sustainability Fund, administered by English Nature.

INTRODUCTION

☛ Field groups will need measuring tapes, compasses and clinometers if dip measurements are to be attempted, as well as clipboards, a measuring tape and copies of the relevant field sheets for individual pupils. (See **TED8 worksheets**)

Group Leaders will need a plastic bottle of dilute HCl, a small plastic bottle of water; a flexible sheet of foam rubber to demonstrate the shape of folds. A digital camera will also be useful.

☛ **If the transport is by coach,** have the party dropped at the eastern end of the vale at Hapsford Bridge (ST747484), and arrange to be picked up just west of the church in Great Elm. Allow about 4 hours for the visit. Proceed on foot along the road on the left through the lorry park (taking care of any moving traffic), and over the river bridge. Then take the path between two warehouses and the small path to left, alongside river, through the kissing gate and into Vallis Vale. At a wide gravel area, take the short narrow footpath opposite the footbridges to Egford Brook. It is 200 metres to the north-north-east, to the exposure through the trees.

Smaller vehicles and minibuses should be parked carefully at the roadside either at Hapsford, or at Fordbury Bottom, ST 749492, from where parties may then make the 25 minute walk eastwards (downstream) along the vale to the broad gravelled area. The exposure is 200 metres along the short path to the northeast, behind the trees, opposite the footbridges to Egford Brook.

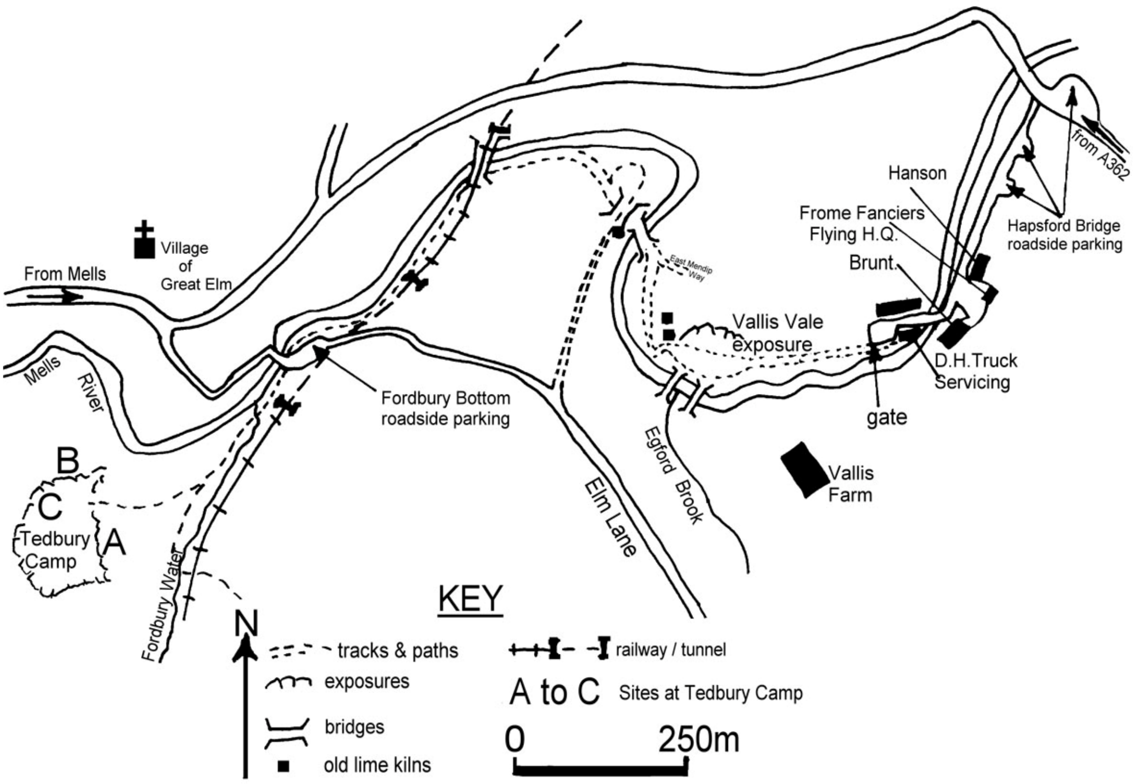


Figure 1. Site map of Vallis Vale and Tedbury Camp

NOTE: The given name for the exposure referred to here as Vallis Vale is “De la Beche.”

☛ The field exercises here are divided into eight areas of focus. At the planning stage field leaders should decide which combination of them will meet the needs of any particular group or syllabus.

Field Exercises at Vallis Vale. Do not allow climbing on the exposure, or attempts to collect from this protected site. Remind pupils of the purpose of the field excursion: to investigate the Rock Cycle. Then, focus the attention on what can be seen in the exposure.

Ask the pupils to conduct a preliminary investigation of the **lower** part of the exposure and collect observational evidence as to the kind of rock they think it is: igneous; sedimentary; metamorphic. Use worksheet 1 to guide observations and record any features they identify (e.g. crystals, grains, bedding, fossils, joints, weathering etc.)

After a suitable interval bring the group together to share their observations.

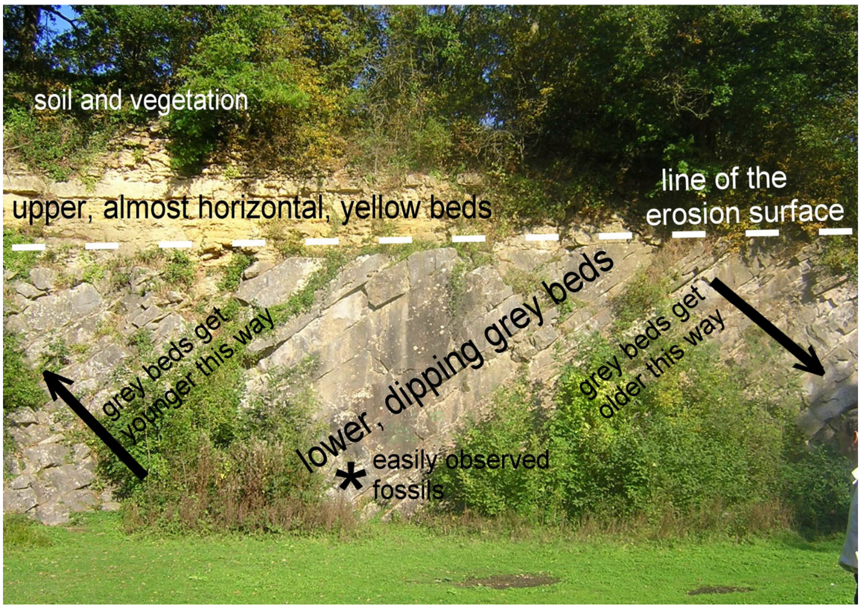


Figure 2. The Vallis Vale exposure.

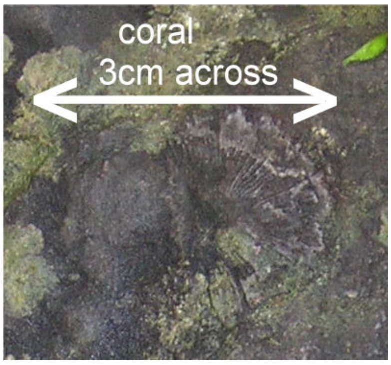


Figure 3. Coral at the Vallis Vale exposure.

These preliminary observations can best be done from about 15 metres away. (See **Figure 2)** Since the yellow beds are not safely accessible at this site the rock cycle considered here refers to the "grey rock cycle" in the lower part of the Vale, as though the upper beds were not present. The work on the "yellow rock cycle" and the link between them occurs later at Tedbury Camp.

Remind the group of the simple model of a rock cycle to help them organise their observations: **phase i**, deposition of beds; **phase ii**, deformation (tilting folding, metamorphism and / or igneous intrusions, **phase iii**, uplift, weathering and erosion.

FIRST FOCUS: Examining the deposition phase of the (grey) rock cycle

Suitable questions at this site	Acceptable answers
What observations have you made about these grey rocks?	In no particular order: they are in layers; grey in colour; are fine grained; contain fossils (coral and brachiopod) . (See **figures 2 & 3**).
Do they react with dilute HCl.? (Group leaders should demonstrate using HCL from a small plastic bottle. What do you conclude from this test?	Yes it does. (unless you chose one of the Chert beds, which is dark and glassy (SiO_2) and does not) It is a rock made of calcium carbonate.
To which rock group do these rocks belong: igneous, metamorphic or sedimentary?	Layered rocks with fossils are sedimentary.
What sedimentary rock is made of calcium carbonate? What non-sedimentary rock is also made of calcium carbonate?	Limestones. Marble.
How is marble formed?	By heat and pressure in the Earth's crust acting to metamorphose limestones. (But notice, this part of the rock cycle has not happened here. Nor has melting to form igneous rocks.)
What are the main differences between marble and limestone?	Marble is made of interlocking crystals of calcite, and all fossil remains have been destroyed.
What does the fossil evidence tell us about the conditions under which these grey limestones were formed?	The corals suggest a warm marine environment of normal salinity, well oxygenated and fairly shallow. Since the corals are found lying on their side, (i.e. not perpendicular to the bedding which indicates the horizontal of the time) they must have been washed around by currents after death.
Concentrate on the ***lower*** (grey) part of the exposure. Describe the layers in these rocks. Are they horizontal? (**NOTE**: If compasses and clinometers are available a dip measurement can be made. See document **TED9** for guidance on how to do this)	There are many layers. No. They are steeply dipping to the left, or northwest. (340^{o} at about $40^{o}$from the horizontal)
If they are sedimentary rocks would they have been laid down at this angle?	They would have been laid down roughly horizontally. (**Principle of Original Horizontality**)
TASK 1: Complete worksheet 1, describing the grey limestones.	See **TED8 KS3 worksheets**

SECOND FOCUS: Deformation phase in the (grey) rock cycle.

Suitable questions at this site	Acceptable answers
Remind the group they have deduced that the grey rocks were formed under the sea: If these grey limestones were formed below sea level, and are now at about 100 metres above sea level, what must have happened to them?	The rocks have been uplifted and tilted. (Large vertical changes in sea level can be discounted due to the vast amount of water involved in flooding land to this height).
What forces could have done this?	Plate tectonic forces, when plates collide, are the only known forces strong enough to tilt and uplift large volumes of crustal rocks.
If the rocks of the lithosphere were not being repeatedly uplifted by plate tectonic forces, what would happen to the landscape?	Weathering and erosion would reduce the continental areas to a sea – level plain.
TASK 2: Complete the rock cycle for the grey beds on worksheet 2	See **TED8 KS3 worksheets**

THIRD FOCUS: Weathering and erosion in the grey rock cycle.

Suitable questions at this site	**Acceptable answers**
How have these rocks become exposed at this particular site?	River erosion has excavated the valley, but then the rock has also been quarried by human activity. (The path you followed to the site was the line of a mineral railway in the past)
Are these grey beds porous? How can we test for porosity?	Use a few drops of water in a depression in the grey beds. The water does not sink in. These beds are relatively non porous.
Can you see joints at right angles to the bedding planes?	Yes, there are many in both the grey and yellow beds.
When rain falls onto these grey beds, where will it go?	Either run off to the stream, or flow down the joints underground.
How might these joints affect the rate of weathering of this rock?	It divides the rock into blocks to allow physical weathering (freeze-thaw) and also increases the surface area to acidic rain and chemical weathering of the limestone.
What evidence of weathering of these rocks can you see?	From here not much! They have only been exposed to weathering since about the 1950s. However, there are signs of soil formation near the top of the face, and evidence of biological weathering with tree roots growing into the joints and bedding. in the exposure.
If humans do not interfere, then what will eventually happen to the weathered fragments from this exposure?	They will form new sedimentary rocks in the future (i.e. the next Rock Cycle). Sediment in the River Mells might be transported to the River Avon, and then join new sedimentary rocks forming in the Severn Estuary.
What kind of fossils might be found in these new rocks by geologists millions of years in the future?	Accept most answers that recognise the need for resistant parts: e.g. boats, cars, cans, ipods, shellfish, dolphins, washed – in trees, drowned birds, (and maybe even human skeletons) etc. But not jelly fish etc.
TASK 3: Complete the field sketch on worksheet 2.	See **TED8 KS3 worksheets**

☛ **Setting the Scene.** Before leaving this site, it is important to set the scene for the work at the Tedbury Camp exposure. To do this explain that rocks extend through the landscape in three dimensions, including above their heads, where these rocks have now been eroded away. This is the **Principle of Lateral Continuity** which suggests these same beds can be found elsewhere. This section draws attention to the features that will help to recognise these beds when next encountered. Tell the group the next site is one where they can investigate the upper yellow rocks for themselves.

Suitable questions at this site	**Acceptable answers**
Draw the group's attention to the top of the face at Vallis Vale. What similarities and differences can you see between the rocks forming the bottom of the face, and those forming the top? Ask the group to hypothesise: are these upper rocks likely to be igneous, sedimentary, or metamorphic.	They are both bedded and jointed, (and presumably sedimentary. The upper beds are yellow, not grey. Without closer inspection (**not** to be done here) little else can be said. Point out that the line separating the two groups of beds is called an "erosion surface". Closer inspection will be made at the next exposure.
Which are the older rocks in this exposure, and which are the younger ones? **NOTE:** There is a younger upper (yellow) sequence) and an older lower (grey) sequence. In each sequence there is also an older and younger individual bed.	**Principle of Superposition** states the younger beds are found on top of older beds (unless they have been overturned). So the yellow beds on top are younger than the grey ones. Also the older grey beds are to the right (underneath) and the younger grey beds are to the left (on top).
Approximately what angle do the layers in the grey beds make with those in the yellow beds?	About 40^{o} to 50^{o}

☛ Either return to the minibus the way you came and drive via Great Elm to Fordbury Bottom, or if the party is to be picked up by coach in Great Elm later, continue on foot westwards (upstream) to Fordbury Bottom, and on to Tedbury Camp. (See **Figure 1**)
After crossing the road at Fordbury Bottom, the path is through the gate across the road. It passes alongside a railway and crosses the stream on a footbridge to the right and then follows the stream bank to the left. Where the path forks in the woodland take the right hand path. It is steeply uphill to the quarry platform. (See **Figure 1**) The route up to the camp is narrow and fairly steep in places: when wet it is slippery. Warn the group to be careful of their footing, and to stay out of the stream and off the railway.

Field Exercises at Tedbury Camp.

☛ Allow the group to stand on the broad flat area of the quarry (See **Figure 4**). A first impression of the flat surface is that it is a man-made, perhaps a tarmac artefact. It may look superficially dissimilar to the Vallis Vale exposure, however, it is the lateral continuation of the same geology. The Tedbury Camp site is in fact a natural surface which has been cleared of the overlying yellow beds for quarrying operations.
Large parties may be split between the three Tedbury sites, "A", "B", and "C", each of which can comfortably accommodate 15 to 20 pupils.

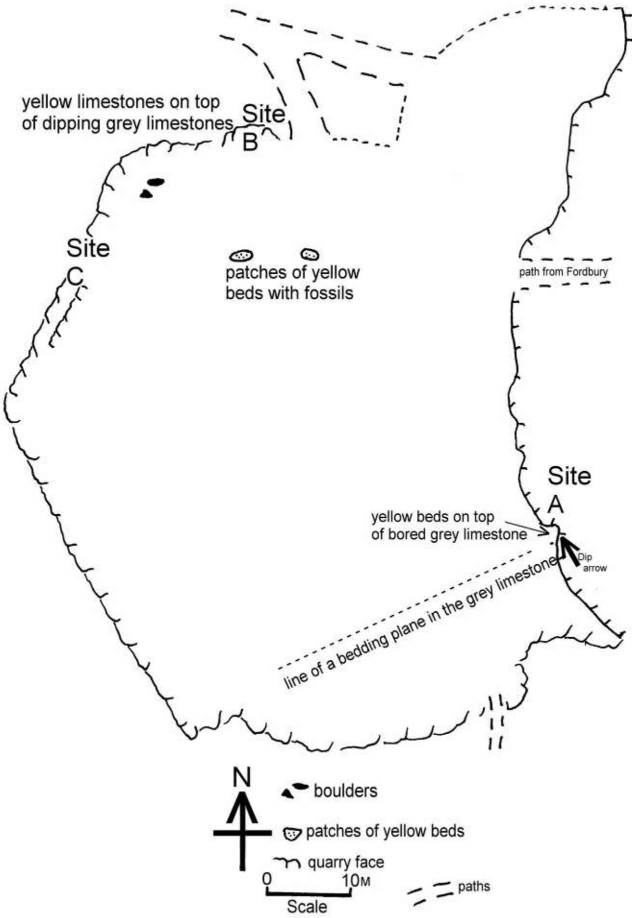


Figure 4. Map of Tedbury Camp.

Where the path from Fordbury reaches the quarry, Site "A" is to the left (south), along the eastern edge of the quarry. (See **Figure 4**)

Before the group walks across the flat surface ask them to observe what they are walking over, and to report anything "of interest". This should produce chance "finds" e.g. patches of yellow beds and associated fossils, issues dealt with in later sections. Whilst not easy to plan the outcomes, this opportunity can produce interest and engagement that can be addressed in detail at the later sites.

It is impossible to predict the sequence of finds, but they should include the following: small grey patches which are the remains of the cemented shell of an oyster, adapted to living on bare rock swept by marine currents; shells of other bivalves; bedding planes; small "dimples" which indicate the site of marine worm burrows below. (See **Figure 5**)

The surrounding bedding plane is "dimpled" where the individual bores of marine worms [not earth worms] have been filled with yellow sediment, and are now being eroded out from the more resistant grey limestone. (See **Figure 5**)

Figure 5. Cemented oyster shell on the erosion surface.

☛ At Site "A" there is a 1m step down to a grassy area from where the features of the surface can easily be viewed. Care should be taken getting the party down the step.

In this position draw the attention of the group to the nature of the rock in the edge of the quarry (as opposed to the flatter surface). It is clearly bedded and dipping to the right, however, measurement will show that the dip is in the same direction as at Vallis Vale, (where the beds dipped to the left), to the north west (about 50^o towards 342^o).

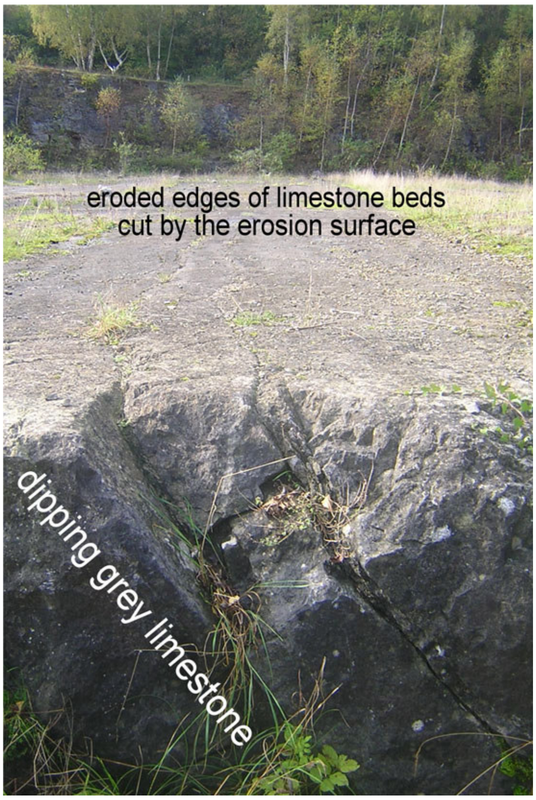


Figure 6. Site "A", the eastern edge of Tedbury Camp.

Once the bedding is identified then the large expanse of flat surface can be seen to be cutting across the bedding, with the near horizontal yellow beds at the rear of the quarry lying on top of it. (See **Figure 6**) This is the same geological relationship as at Vallis Vale, except, here, where it has been cleared, the erosion surface separating the two rock successions can be closely inspected in three dimensions.

This site is not a protected site, but damage to the exposure by collecting should be kept to a minimum. The first task is to link the geology at this spot with the Vallis Vale exposure visited earlier.

FOURTH FOCUS: Confirming lateral continuity of the beds.

Suitable questions at Site "A"	Acceptable answers
Using your answers on **Worksheet 1** what features can you see in these grey rocks which allow you to identify them as the same as those at Vallis Vale? **NOTE:** Don't allow the relative dip to confuse things. These beds appear to dip to the right, whilst in Vallis Vale they appear to dip to the left only because they are being seen from a different viewpoint.	Grey limestone beds, dipping (here to the right, but still 340^o or to the NW); well jointed; containing fossils; reacts with dilute HCl. and is non porous. (Use the water test)
Use a compass to measure the direction of dip and demonstrate that the "difference" in dip direction from Vallis Vale is not real, but due to a change in the direction of observation. Ask which part of the Vallis Vale exposure these grey beds represent?	These are the grey beds seen at the base of Vallis Vale. Careful observation of the quarry edge will reveal shelly bands (mainly brachiopods) confirming the direction of the bedding planes. Point out that the fossils they contain indicate they were deposited about 340 million years ago in the Carboniferous period.

☛ The task here is to unravel the evidence for events after the uplift of the grey beds. These events are part of an ancient period of weathering and erosion, not the present day weathering and erosion considered earlier at Vallis Vale.

Essentially the tilted grey limestones were subjected to a long period of erosion, until they formed an almost flat rocky surface. By 170 million years ago (in the Jurassic period), the rocky surface was being swept clear by marine waters, allowing no deposited sediment to remain. However, the rocky surface was colonised by marine organisms, adapted to live in such an environment. These included oyster type shells, cemented to the rock surface, and boring marine worms (not earth worms!) which cut into the rock. When the yellow beds began to be deposited the first sediments fell into the now empty bores and filled them up with colour-contrasting sediment from the grey limestone. (See document **TED4 briefing** for further details)

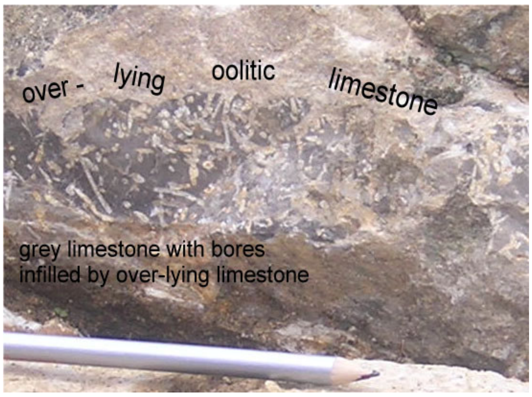
Figure 7. The bored limestone surface: Site "A".

Notice that the bedding is dipping to the right, whilst the thickness of bored limestone is almost horizontal, following the top of the erosion surface. i.e. both cut across the limestone bedding and are therefore younger.

This is an important observation since it establishes that the erosion surface and the animals that colonised it are also younger than the limestone: i.e. they are Jurassic, (Mesozoic) not Carboniferous (Palaeozoic) fossils.

FIFTH FOCUS: Investigating the colonisation of the erosion surface. (Site "A")

Suitable questions at Site "A"	Acceptable answers
Begin by asking the group to summarise the observations they have made whilst walking across the top of the erosion surface. [Many of these features can be pointed out at Site "A".] At this time also admire again any other fossils that have been found and reflect on pupils being able to walk across the bottom of a Jurassic sea without getting wet.	It is quite possible that cemented oyster shells have been found. It is also possible that the "dimples" have also been seen. These are the tops of bores, about 1mm across, filled with yellow sediment, that have been slightly eroded out to leave a small depression. (See **Figure 8**)
Draw the group's attention to the edge of the quarry (See **Figure 5**). Ask if the group can locate the bedding and the erosion surface.	The erosion surface is the almost horizontal surface, and the bedding dips at about 50^{o} to the right (NW).
Ask how to work out which is younger, the bedding or the erosion surface	The erosion surface cuts across the bedding, so it is younger. (**Principle of Cross Cutting Relationships**).
Point out the yellow "marks" in the top part of the grey limestones. Ask for speculation about what they might be.	Recognise suggestions which emphasise that they cut the limestone **and** the erosion surface, and so must be younger than both. They are in fact different kinds of burrow made by rock boring marine worms (e.g. *Trypanites*) and bivalves (e.g. *Pholadomya*). Both are filter feeders.
What does the presence of these fossils boring into and cemented onto the erosion surface tell you about the conditions of the time?	They are fossils of animals adapted to rough marine waters. (Burrows are recognised as fossils, which are defined as "evidence in the rocks of life in the past".) The lack of sediment indicates no deposition occurred whilst these animals colonised the rock surface.
What name can we give to this process of rock destruction by boring animals?	Biological weathering.
Ask for speculation about where the yellow filling of these bores might have come from. Draw the group's attention to the small contact with the yellow beds, cleared to the right (north) of Site "A". (See **Figure 6**). What does this tell us about the age of the bores?	The bores are filled with the first grains of the overlying yellow beds that were deposited on top. They are older than the yellow beds, whilst being younger than the grey beds and the erosion surface.
Ask if they can see an exposure of the yellow beds from the top of the Vallis Vale site? **TASK 4:** Mark an arrow on their map of the quarry (Worksheet 3) to show the direction of dip of the grey beds. Label Site "A" on the map. Also draw one or two grey bedding planes trending across the quarry floor (at right angles to the dip direction). Emphasise that these beds continue underground.	They are on top of the grey beds - at the rear and edges of the quarry where they have not been cleared away. (NOTE: **Principle of Lateral Continuity** states that sedimentary layers extend in three dimensions and might therefore be found elsewhere.) Having established that the surface is the lateral continuation of the one seen at Vallis Vale, move to Site B (and/or C if the group is large) to inspect the yellow beds in some detail. Point out again that the flat surface has been cleared of the yellow rocks during quarrying operations.



Where a thin skin of overlying yellow sediment remains on the erosion surface the yellow sediment can clearly be seen filling up the bores made into the grey limestone below.

Figure 8: The contact between the bored Grey Beds and the Yellow Beds (Site "A")

TASK: On worksheet 4 make a sketch of the edge of the erosion surface showing the burrows. Measure the depth of the deepest one you can see, and mark it on your sketch (See **TED8 worksheets)**

☛ Walk the group along the top surface towards the western edge of the quarry. Ask them to choose a grey bed and walk along it noticing changes in the surface as they go. Remind the group they are walking over a cleared surface that was until recently buried by the yellow beds. Then bring the group to Site "B" on the northern edge of the quarry. Give the group chance to examine the yellow beds which were inaccessible at Vallis Vale and search for fossils. Ask them to work in small groups using the second part of the table on Worksheet 1 to help them look at the exposure (and the fragments lying around).

NOTE: It should soon become apparent to the group that the "grey rock cycle" described at the end of the Vallis Vale investigation, is in fact only part of the story. After the uplift and erosion of the grey limestones, the next events for which we now have evidence at Site "B" is the colonisation of the erosion surface and the deposition of the yellow limestones, which have then been uplifted (but hardly tilted at all) and are now being weathered and eroded (along with the exposed grey limestones). This, for convenience, may be referred to as the "Yellow Rock Cycle".

FIFTH FOCUS: Identifying the Yellow Beds. (Site "B")

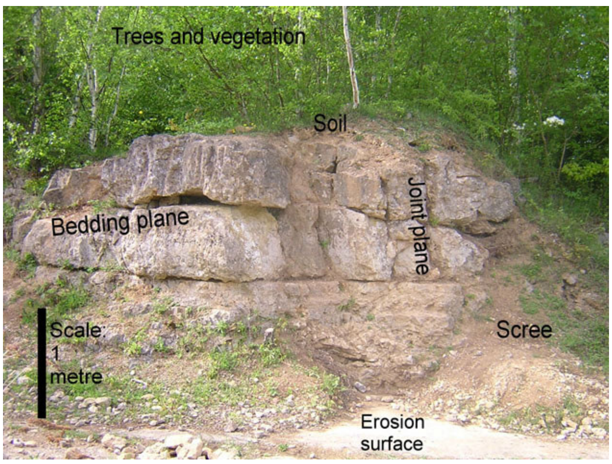


Figure 9. Site "B".

Suitable questions at Site "B"	**Acceptable answers**
Describe the rock and the different grains and fragments in it, and now they are held together. (Should attention be drawn to the lower 1metre of this exposure, the rock will be seen to be made up of poorly rounded pebbles: i.e. it is actually a conglomerate.)	It is made of ooliths (1mm diameter spherical bodies of calcium carbonate formed today by wave action in warm shallow water. There are also fossil fragments, cemented together by mineral (calcite)).
What other observations can you make about this rock? (Be prepared to conduct tests with dilute HCl and water.)	It is bedded; the beds are almost horizontal; they are jointed; it contains marine fossil fragments (e.g. bivalves, gastropods, echinoids). These beds sit directly on top of the dipping grey beds. Testing with dilute HCl indicates a sedimentary rock, a limestone. The water test indicates it is porous. **NOTE:** The fossils indicate the rocks were deposited in the Jurassic period, about 170 million years ago.
What kind of rock is it?	A (sedimentary rock) limestone.
How was it formed? NOTE: This is the first phase of the "Yellow Rock Cycle".	Deposition on a sea floor.
It is a very different limestone from the one you are standing on. How many differences can you find between the two?	The limestone is yellow in colour, more porous (pour water on it), coarser grained (the rounded 1mm grains are called ooliths, and were formed by precipitation of calcite under wave action in warm shallow water. (See **Figure 10**) Also these beds are nearly horizontal and contain different fossils, from the grey ones. Many of the fossils have been weathered out by acidic water leaving spaces in the rock.
Are the fossils whole, or broken?	Often broken
What does this tell you about the conditions in which the rock was deposited?	It suggests they were washed around by strong currents before being buried.
Some of the calcite fossil (brachiopod) shells have been removed, leaving a curving "hole" in the rock. What has happened to do this?	Chemical weathering. Ground water has chemically weathered away the shell more quickly than the rest of the limestone, due to small differences in reactivity. (See **Figure 10**)
TASK 5: On worksheet 1complete the second part of the table identifying the differences between the two limestones.	**NOTE:** Remind the group that rocks are mixtures of minerals and vary in composition depending on exactly how they were formed.
TASK 6: Using worksheet 4 draw a labelled sketch of site B.	See **TED8 KS3 worksheets**

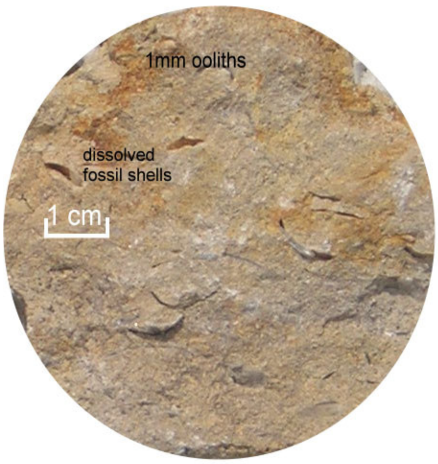


Figure 10. The Yellow Limestone

SIXTH FOCUS: Deformation and uplift in the Yellow Rock Cycle.

Suitable questions at Site "C"	Acceptable answers
Is there any evidence that these rocks at Site "C" (and "B") have been uplifted and tilted?	These rocks appear to be almost horizontal (in fact they dip gently eastwards). So they have been uplifted from below sea level (where the fossils lived when alive) to about 100 metres above sea level, but not tilted (much).
Remind the group that the grey limestones they are standing on date from about 340 million years ago, and have been both uplifted and tilted, as they saw at Vallis Vale. How can we explain the older beds being uplifted and tilted, but the younger ones only being uplifted, but **not** tilted?	There has to be **two** periods of disturbance. First the uplift and tilting of the grey limestones before the yellow ones were deposited and then a second uplift (of both) by 100 metres after the yellow beds were deposited. Since deposition marks the beginning of a rock cycle, this means we have **two** Rock Cycles here: one continuing at the present day, and an ancient one, predating the yellow beds.
The older grey beds are dated as 340 million years old, whilst the younger yellow beds are 170 million years old. What is the size of the time gap?	There is a 340 minus 170 = 170 million years gap between the two groups of beds. Remind pupils that each and every bedding plane is also a gap in the geological record, (which is often more "gap" than "record").
What feature in the quarry represents this 170 million year time gap?	The erosion surface they are standing on.
Ask the group what part of the rock cycle do they think was happening during that 170 million year time period, after the grey beds had been tilted and uplifted?	They will probably come up with "weathering and erosion", of the limestone. Press them till they also recognise that the physically weathered fragments, and chemically weathered solution products from the grey limestone would also have been transported and deposited to form rocks – somewhere else, (even though these "new" rocks are not found at Tedbury today). [NOTE: Yes, there is another (missing) rock cycle, but two are probably enough.]
From the evidence you can see, what happened next, after the formation of the erosion surface?	The yellow beds were deposited on top, with the first grains dropping into the bores in the grey limestone. (Then finally the area was uplift by about 100 metres).
Ask pupils to summarise the events forming the two rock cycles they have been investigating, using worksheet 5 to help them.	First deposition of grey limestones in the sea, (START OF CYCLE: 340 million years ago). Then tilting and uplift, weathering and erosion, including biological weathering by boring animals (for about 170 million years). END OF CYCLE 1 Then deposition of the yellow beds (about 170 million years ago) Then uplift (not much tilting) and weathering and erosion continuing to the present day (i.e. no evidence here of deposition after the yellow beds!). END OF CYCLE 2.

SEVENTH FOCUS: Weathering in the "Yellow Rock Cycle".

Suitable questions at Site "B" & "C"	Acceptable answers
What evidence can you see for the weathering of these yellow rocks at site "B"?	The joints in the limestone are open, there is soil formed on the top (signs of chemical weathering) and there is vegetation growing into the soil and rock (signs of biological weathering). There are also fragments of the rock lying around (a result of human physical weathering, called quarrying!). **NOTE:** Remind the group that erosion marks the end of one rock cycle and the start of another.
Ask the group how they could prove that at one time there were more beds lying on top of site "B". [Walk the group the few metres to site "C"]	By using the **Principle Of Lateral Continuity**: trace the top thick bed of limestone around the northwest corner of the quarry to Site "C" where some of these upper (younger) beds are still present.
Ask the group to describe these upper beds, and estimate the additional thickness of beds at Site "C" compared with Site "B". [**NOTE**: Clambering up the face should not be attempted. Conduct this exercise visually from the quarry floor]	About an extra metre of thinly bedded limestone beds that have been eroded away from Site "B", plus the top 60 cm of a thick limestone bed. (See **Figure 11**)

Figure 11. Site "C".

☛ Walk the group about halfway towards the south east corner of the quarry and stop somewhere in the middle. Allow the group to appreciate the size of the site.

EIGHTH FOCUS: Uses of the limestone:

Suitable questions for halfway across the quarry.	**Acceptable answers**
Ask the group to estimate the size of the cleared space. (Point out they can use the map and scale to help) Suggest the average thickness of rock removed is about 2metres, and ask approximately what volume of rock has been removed.	Its about 50m x 70m = 3500 square metres. (This is a low estimate, ignoring the corners) 3500 x 2 = 7,000 cubic metres
Why did the quarry company only want the grey limestone for road stone and not the yellow one?	It is more physically resistant than the yellow one, and more therefore suitable for roadstone aggregate. Being non porous it is also chemically more resistant having less surface area to be attacked, despite being composed of calcium carbonate.
What are the disadvantages for an area like this for large quarrying operations?	Help pupils to see answers in terms of landscape (unnatural, possibly ugly, slopes); natural history (disruption to wildlife); disruption to local communities (dust, heavy road traffic etc)
What can be done to offset the effects of these disadvantages?	Screen the site with earth banks and trees; minimise the effects on wildlife and reinstate the natural area afterwards; use rail to transport the limestone aggregate; wash down areas producing dust. Etc.
What are the possible uses for quarries such as Tedbury, after their productive life?	Unlike Whatley Quarry, this quarry has an open side, so suggestions involving water and water birds are unlikely. However, uses such as educational, Earth science research; left to naturalise; use as an adventure / leisure area, are more likely. There are also reasons for protecting the exposure for geo-diversity purposes. Also supporting wildlife – quarrying has always had a bad press from wildlife enthusiasts, so industry is keen to increase biodiversity in restoration schemes.
What are the advantages of large quarries such as this one (and Whatley Quarry, 1km away, over the hill)?	Jobs for people, more thriving rural economy (Workers spend money in towns and villages, construction material for roads, concrete products, coastal defences etc.
It is possible, by **prior** arrangement with the field centre, to conclude this visit with a guided tour around Whatley Quarry (one of Europe's largest). Contact: Whatley Quarry, Whatley, Nr Frome, Somerset. BA11 3LF. EMAIL: gill.odolphie@hanson.biz TELEPHONE: 01373 475931.	

Alternatively there is a public footpath around the perimeter of Whatley Quarry, which allows anyone to have a good view of the quarry at any time. Return to Fordbury Bottom (or your coach at Great Elm) and drive to the quarry entrance at GR 733479, either via Frome, or the village of Mells.
To access the footpath, park adjacent to the right hand side verge at the quarry entrance. Walk 10 yards north on the road side and then over the stile on your left. Walk along the path that follows the eastern side of the quarry. Then over a stile and follow the hedge as it bends to the left. Walk past the first copse and then walk to the top of the hill (which is an environmental screen-bank for the quarry) on the left. This gives an excellent view of Whatley Quarry.

NOTE: Transport costs reduce the quarry profits and increases the cost of the aggregate to the customer. Each lorry carries 20 tonnes and it costs about 20p per mile to move the rock. The cost of a lorry load of aggregate doubles every 30 miles it travels. Using bigger lorries is more economic, but increases the traffic problems: that is why rail is used when possible.
The policy is to extend quarries (in areas where people are familiar with them) rather than open new ones, keeping the impact to a smaller area. Hence the number of large quarries in the Mendips.