# PARK HALL COUNTRY PARK: KS2 TRIASSIC TEACHING TRAIL

**The Park Hall Country Park Triassic Teaching Trail at KS2** [Reference is also made to KS3 and KS4 activites]

**Items to bring on the Visit**

Appropriate clothing & footwear. Wellies are easy to clean.

Enough copies of the three KS2 pupil worksheets, and the Pebble Sheet (document **PH10**):

Teacher Reference sheet on Key Observations and a copy of the Play Canyon Map in **PHKS2 – 5.1b**

The activity sites on the Trail are:
- Site A - Setting the Scene
- Site B - Looking at Triassic Sandstones
- Site B - Field sketch
- Site C - Park Hall Pebble Hunt
- Site C - Park Hall Pebble identity sheet

Notebook, sketchbook, camera, tape recorder, magnifiers, water dropper bottles, tape measure, compass.

Equipment for collecting soil samples.

Simple clinometer useful for older children.

**Start at the Visitor Centre**

☛Assembly point/parking/toilets & small classroom. The larger "Conference" room can be booked for use by parties.

Briefly remind pupils of Health & Safety issues, including avoiding contact with all dogs and their poo [hence use of wellies - easier to clean].

Teacher might wish to point out displays in the Visitor Centre - as summaries of what they are about to see in the Park. Most displays are about the vegetation & wildlife, but stress that the site is especially important for the story that the rocks tell us. Triassic Period of time - just before the dinosaurs - relate to time line.

Give out equipment.

**Site A. Viewpoint overlooking Quarry- at English Nature display board (**See Map in **PHKS2 – 5.1b)**

**Pupils will need First Activity sheet- Setting the Scene at Triassic Park Hall**

| Instruction/question/task | Possible answers |
|---|---|
| Orientate the outline map with the quarry | |
| Use a compass to locate North. | |
| Mark compass points on outline map. | |
| Look across the site[eastwards]<br>Is the landscape natural or man-made? | Man-made!<br>Stress that it was a quarry [some use the term pit], now partly reclaimed/overgrown by vegetation. |
| What was quarried? | Gravel/pebbles[more important] & sand/sandstone [uses can be discussed later or for homework].<br>Plenty of sand lying around, much being waste. |

| | |
|---|---|
| Note reddish colours & layering, | Pebbles at bottom, sandstones on top, relate to experiment on sedimentation/settling. Conglomerate is the correct geological term for pebble bed. Most conglomerates are well-cemented, but these are fairly loose gravels. Pebble bed is a clearly understood term. |
| Note sandy soil, vegetation & wildlife | As part of integrated fieldwork. Look out for potential sites to view soil profiles and for collecting soil samples. |
| Why is vegetation being cleared?<br>Gorse is rampant! | The Management Plan requires this: to show the rock faces, as the site is important for the rocks & what they tell us. |

☛ Follow the path round the southern end of the quarry, [rather than charge down the sand or the steps in front of the display board!].

**Stop 1 Overlooking the quarry at extreme SW corner**

Newly fenced, much overgrown,

| Observations/teaching points | |
|---|---|
| Bed of sandstone above a bed of pebbles | |
| Beds slope in which direction? | Eastwards |
| Estimate thickness of sandstone | 1.5 metres |
| Need to look where it extends. | |

**Stop 2 On path at southern end of quarry**

| Observations/teaching points | |
|---|---|
| Path is on the top of the same bed of sandstone, sloping east. | This is just the top of the bed & we know how thick it is [1.5m] from seeing it round the corner. |
| Sandstone is made of sand grains stuck together [not very well]. | |
| Also shows thin layering | |
| We can't see exactly where it goes because it is covered with soil & grass | Suggest that it extends underground southwards & eastwards – but it has been quarried away to north & west. |

**Site B On path below face in SE corner**

☛ **You will need Teacher Reference she**
**et on Key Observations**
**Pupils will need Second Activity Sheet- Looking at Triassic Sandstones & Field sketch for labelling**

| | |
|---|---|
| Initial observations | Relate to first Qs on worksheet |
| Key point of layering in these rocks | Questions on worksheet |
| Relate features in face to sketch | for later labelling |
| Estimate height of face | About 4 metres |
| Estimate/measure thickness of selected bed [eg lowest sandstone bed] | Depends on bed chosen |
| Ask about the slope between the face and the quarry floor – what it is made of & how was it formed? | This is a scree slope made of sand & gravel fallen from the sides of the quarry after the face was abandoned. This is an example of the part gravity plays in erosion. |
| Ask if there is any danger of falling rock | Yes, hence we keep away from the faces!! |
| Ask children to look out for signs of blasting in the sandstone faces | Vertical drilled shot holes can be seen. The sandstone was blasted into the quarry. |

Children complete first part of worksheet, including labelling of field sketch.

☛ Take a closer look at the rocks. This is best treated as a Question & Answer field teaching situation:

| | |
|---|---|
| Rocks can tell their story if we ask the right questions from what we already know about our Earth today. | |
| Ask children where sand & pebbles are naturally found today, [other than in quarries!]. | Depending on the extent of preparation and prompting, the children will suggest beaches, rivers & deserts as places where these sediments can be found & actively be transported in modern environments. |
| | For completeness, teacher might like to add the work of ice, if nobody else suggests it. |
| At this point walk a few metres further north along the path to the large blocks of sandstone resting on the scree slope. Where have they fallen from? | The blocks have fallen from the face above |

Second part of activity sheet -**Looking at Triassic Sandstones**
Follow the questions on the worksheet.

**Stop 3 - Path adjacent to pond below exposure showing cross-bedding. (See Map 5.1b),**
[No need to clamber up to the face]
A KS3 activity has been devised for this locality and the features may be worth pointing out to younger children as an extension. It could be linked to Rivers in later KS2 Geography.

☛ Set the scenec by telling pupils "If we look at the sandstones and pebble beds here we can see what they can tell us about how they got here & what was it like at that time of deposition. There are clues to tell us where this river came from":

View the layering in the quarry face. (See **Figure 1**)

| | |
|---|---|
| Apart from the gentle tilt to the east [into the quarry face], can you see if each of the layers are roughly continuous & near-horizontal? | No!! Some are sloping, including both the sandstone and pebble beds. These sloping beds are called "cross bedded". |
| Which direction are they sloping? | Northwards. By ?? degrees - possibly measure with clinometer |
| The KS3 sketch is handed out for labelling | |
| Discuss settling in water & refer to sedimentation experiment - horizontal layers | Horizontal layers indicate deposition in quiet water |
| Refer to Rivers demonstration with slide - moving sand & gravel in water, cascades down front of sloping mass to produce cross-bedding. | Cross-bedding of this type indicates deposition in flowing water. In this case from South to North. |
| With the KS3 material there is a CD animation to demonstrate cross bedding which might usefully form part of the preparation for this visit. | |

**Figure 1. Stop 3: Cross Bedding.**

☛ The Park Hall Pebbles identity sheets give details of eight types of pebble commonly found at Park Hall and other Triassic sites in many parts of Britain. Photographs and sketches have been made of cut samples of pebbles, together with a short description and suggested age and source for each.

| | |
|---|---|
| 23% Vein quartz | Mineral |
| 66% Quartzite | Sedimentary rocks |
| 2% Sandstone | |
| 2% Conglomerate/Breccia | |
| 2% Limestone[decalcified] | |
| 1% Granite | Igneous rocks |
| 1% Porphyry | |
| 1% Rhyolite | |
| Others, less than 1% include | |
| Basalt [hard, black, fine grained] | Igneous rock |
| Schist [thin bands of quartz and mica crystals] | Metamorphic rock |

These pebbles were eroded from rocks in localities further south, including South Wales, and SW England/ NW France (before the English Channel existed), then transported during Triassic times by rivers to Park Hall, and beyond.
For follow-up work, use could be made of the UK Geology Wall Map to identify present day outcrops of the source of some of these pebbles. (See document **PHKS2 – 6**)

**Key Points [see Teacher Reference sheet]**
1. The pebbles are well-rounded - relate to sugar cubes exp.
2. Hard pebbles survive long distance transport. Less hard ones are rapidly destroyed.
3. Many pebbles show contact points where other pebbles have been pressed against them, & often split through them. This is due to the immense pressure of the weight of sediment & later rock lying on top over millions of years since they were deposited.

**Children work through the Third Activity Sheets- Park Hall Pebble Hunt, using Park Hall Pebbles identity sheet**

☛ **Use the loose pebbles from the scree. No collecting from the quarry faces as this is a protected site.**
After the childen have hunted and collected a range of different pebbles, the teacher should be able to help in the identification, with the aid of the Park Hall Pebbles identity sheet. There will always be some “don’t knows.”

The worksheet asks the children to sketch a pebble. Alternatively, the teacher might wish to take a selection of pebbles back to school to do this as part of follow-up work and for display. Make sure you choose from the many pebbles lying around loose in the quarry, not the faces. As a further conservation measure, pebbles should be returned to the site after use.

**Stop 4 Point out the pond, which is intermittent. (See Map 5.1b),**

Relate to porous rocks.

| | |
|---|---|
| Why is there a pond here, even if only for some of the time? | Likely some beds under the pond may be clay layers or have a lot of clay between the sand grains, preventing the water soaking through. Several other parts of the sand & gravel areas have ponds or marshes [eg north of Visitor Centre car park]. |
| How can this be proved? | Drill a borehole, check the fragments / pull up the core! |
| If drilled right through the clayey layer what might happen to the water? | Soak into the sandstone underneath! |
| | Note Sheepwash borehole, 1Km east of Park Hall was drilled by Staffs Potteries Water Board & still supplies water to N Staffs. |

**Stop 5 Approaching the northern end of quarry**, past the circle of placed blocks of sandstone, notice the foot path crosses a bed of sansdstone. **(See Map 5.1b),**

| | |
|---|---|
| Use a compass to see which direction it is sloping | East. Older children could use a clinometer to measure slope angle. |
| Perhaps discuss where it might extend | beneath the lowest pebble beds on east!<br>[But how far west it goes is a KS4 task!] |

**Stop 6 [optional] - NW corner of Quarry – Fault (See Map 5.1b & Figure 2 below),**

☛ This is a KS4 topic, but may be worth looking at as it is clearly visible and completes the story of Park Hall. A CD animation and an activity involving the completion of a sketch are available with other KS4 materials.

Long after the beds had been laid down & hardened something happened to them.

| | |
|---|---|
| The sandstones in the quarry show plenty of fractures, how could they be broken [other than by blasting] while still underground? | Possible answers relate to earth movements including uplift and tilting, with earthquakes.<br>All rocks at Park Hall are tilted gently eastwards[as we have already seen]. |
| What could a really big earthquake do to the rocks? | Not just break/crack them, but move them!! This would produce a fault. |
| Ask children what they might expect to see if great blocks of rocks had been moved against eachother | - signs of crushing, broken rock, disturbed blocks of rock.<br>- breaking of layering of sandstone & pebbles |

Now look in the NW corner of the quarry- main points to note: (See **Figure 2**. below)

| | |
|---|---|
| Higher sandstone has moved downwards on west side of fault relative to the pebble beds on east [?by 5-10 metres] | |
| Main fault line[plane] has red clayey paste of ground-up rock flour, so fine and sticky that water cannot soak through, & is almost always wet! | |
| Narrow fault zone includes broken blocks of sandstone, tilted over | |
| Pebbles have been dragged down adjacent to the fault on east side | |
| Fault runs N-S along western side of quarry & drops the pebble beds too deep to get | |
| Caused by tension in the Earth's crust | |
| When did the faulting/Earth movements occur? | After the Triassic when the rocks were deposited [Likely after Cretaceous] |

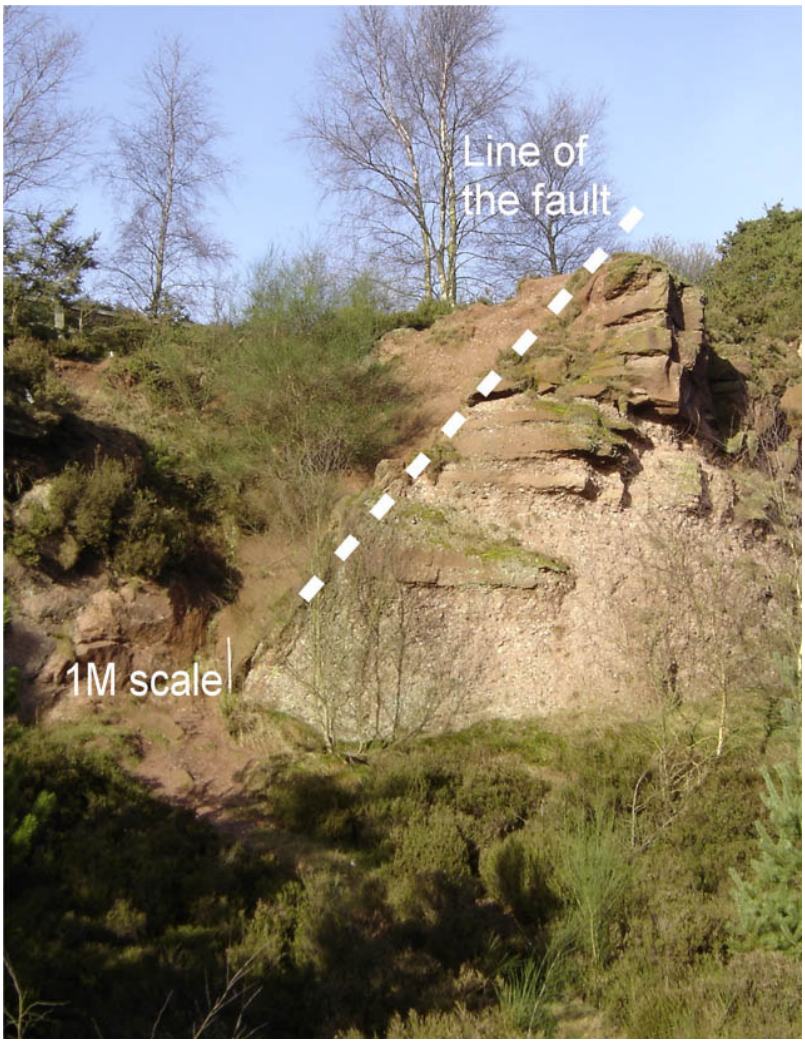


**Figure 2. The Fault at Stop 6**

**Stop 7 Gully by old steps.**

☛ Notice the gully on the west side of the quarry.

Unfortunately a path has been cut right through the "delta" formed at the mouth of the gulley. In time it should re-establish itself!

| | |
|---|---|
| What has caused this gully to form? | Clearly cut by running water- recent flash flood |
| Where has the water gone to? | Soaked into porous rocks |
| Why do you think that the sand has been washed further than pebbles at the bottom of the gulley | Sand grains, being smaller than pebbles can be transported as the energy decreases & pebbles get deposited first. Modern version of Triassic events at Park Hall |

**Return Southwards – think about Quarrying & use of sand and gravel**

☛ On the return southwards, following the path on west side, it might be useful to ask the children what happened to everything dug out of the quarry. They should have seen the signs of blasting & might be asked about the origin of the name Hopper Fort [where there were crushers and graders].

The hard pebbles were used as aggregates for roadmaking and for concrete.

The sands had to be washed to remove the clay before they could be used in concrete.

Follow-up work could include research on uses of sand and gravel. (See document **PHKS2 – 6**)

Pass a second display board, then the first, & on to the Visitor Centre.

Displays could be viewed if they had not seen at the start of the visit.