

Location & Access:

West Bay is accessed from the A35 road which runs from Honiton to Dorchester.

At the Bridport roundabout, the B3157 connects to the village.

There are numerous car parks at West Bay, the largest being found at map references SY 465 906 and SY 463 903.



East Beach, West Bay — photo: Paul Berry

Key Geography: Stunning cliffs, shelly beach, development of a port, growth of tourism industry, coastal management features.

Description:

Roughly halfway along the 95-mile Jurassic Coast World Heritage Site is the village of West Bay, originally known as Bridport Harbour. The settlement gained TV fame as the setting for the crime thriller 'Broadchurch', starring David Tennant, Olivia Colman and Jody Whittaker, and was also used as the location for the drama 'Harbour Lights' featuring Nick Berry, and was the opening scene of the popular comedy 'The Rise and Fall of Reginald Perrin'. The area also has great interest for the geographer, being a good place to examine some of the geology of the Jurassic Coast, along with some interesting coastal landscape features to study. It also offers a useful case study examining the growth of the tourism industry, and has some great coastal defences to investigate.

THE HARBOUR

West Bay harbour at the mouth of the river Brit has a long history, and was constructed in 1722. It has since been beset by nature's problems, enduring being silted up, blocked by shingle, and damaged by storms. A series of repairs and enlargements have followed. The harbour has been moved twice from its original position one mile inland, firstly to the coast by East Cliff where the river once met the sea, and then 270 metres to the west to its present location. West Bay once exported nearby Bridport's ropes and nets, while importing gravel, timber and coal. Visitors to Bridport might have come across the curious old phrase 'To be stabbed with a Bridport dagger', which actually referred to the ropes made in **(continued overleaf)**



West Bay harbour — photo: Paul Berry

Curiosity Questions:

- # West Bay is within the Jurassic Coast World Heritage Site. When was the Jurassic Coast inscribed on the WHS list?
- # What three periods of rock formations are represented on the Jurassic Coast?
- # What geology gives nearby Golden Cap its brightly coloured cliff top?
- # Nearby Lyme Regis is synonymous with which famous female fossil collector?

Further information:

- # <https://wordpress.com/post/devongeography.wordpress.com/9136>
- # www.westbay.co.uk/
- # <https://wessexcoastgeology.soton.ac.uk/Bridport-Sands-East-Cliff.htm>

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the town, and actually meant to be hanged. Shipbuilding at West Bay dates from the days of Alfred the Great in the ninth century, and there were large yards to the west of the harbour, turning out cutters, schooners, barques and fishing smacks. At one time, three hundred workers were employed here. By 1830, over 500 vessels used West Bay harbour each year. However, when the railway arrived at Bridport in 1884, trade at the port reduced. The settlement was renamed as West Bay and began to grow as a holiday resort, with the economy altering to focus on tourism and fishing. The railway line from West Bay to Bridport eventually closed to passengers in 1930, and although it continued for a while transporting goods, it finally closed in 1962. The old station was restored in the 1980s, and two old coaches remain on a short length of track, now serving as a restaurant.

The excellent 'Discovery Centre' near the beach was opened in 2018, and is a great source of information on the history of West Bay, as well as covering fossils, geology and wildlife of the local area. It has won a series of awards, and is sited in a restored Methodist church, known locally as the 'chapel on the beach'. There is always a warm welcome from volunteers and trustees, and the well-constructed displays and 3D models along with a regular programme of walks and talks provide a great service for visitors. It is also free to enter!

EAST CLIFF



East Cliff, West Bay — photo: Paul Berry

The highlight of West Bay has got to be the spectacular 'Broadchurch' scenery at East Cliff. These golden cliffs are of Bridport Sands, rocks formed around 175 million years ago. The sandstone beds are exposed here to a height of around 43 metres, and have an overall depth of 49 metres. Each metre of the Bridport Sands took 20,000 years to accumulate, meaning it would have taken 860,000 years for all the exposed cliff height to be created. The Bridport Sands Formation is one of the major sandstones in the Jurassic sequence in Dorset, being laid down in the Early Jurassic, in the Toarcian Age, between 182 and 174 million years ago. During the early Jurassic, the supercontinent of Pangea began to split apart and the world



Ridged cliff face, East Cliff — photo: Paul Berry



*Narrower beds near top of East Cliff
— photo: Paul Berry*

experienced a significant increase in plate tectonic movement, volcanic activity and mountain building. This was therefore a period of significant global change, as continental configurations, oceanographic patterns, and biological ecosystems were altered. As far as Dorset was concerned, during the early Jurassic there was a deep sea covering this area, with thick clay deposits (typical in Lyme Bay) being laid down. As the seas became shallower, rivers brought material from further north, and deposited sands at the front of a huge delta that began to grow southwards.

As we view them, the rocks at East Cliff vary in colour from bright orange to earthy brown. This hides the fact that they are naturally a blue/grey colour - the oranges in the cliff being due to oxidation at the surface of fine pyrite grains (fools gold) which changes it from a mineral with a metallic lustre to a dull iron ore called limonite. If you look at freshly broken piece of cliff you can usually see the original colour. The sedimentary beds of East Cliff are clearly horizontal, much as they were when they were first

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Joint collapse, East Cliff —
photo: Paul Berry

deposited. They do however, display a ridged face, where layers of hard, carbonate cemented sands alternate with less well cemented sands. The layers weather and erode at different rates producing the corrugated surface. As calcium carbonate in sea water precipitates out, it acts as a cement for the sandstone, and the cliffs here offer a clear demonstration of the cyclical nature of environmental change. Calcium carbonate concentrations in the sea have varied over time, with storm conditions bringing more organic detritus (which uses calcium carbonate for hard parts) which increases the amount of 'cement' and creates the 'harder' rock layers. If you study the cliffs closely, you can see that the harder layers of sandstone are more closely spaced at top rather than at the bottom. Does this mean that stormy times became more frequent to create these layers, or that at that time, the supply of sand was decreased?

East Cliff is full of vertical joints that have opened up in the sandstone, many creating buttresses and recesses, and some that have been deepened into caves. At the top of the cliffs, some joints have been opened up and then infilled with the debris of rocks above. These splits in the rock surface create perfect nesting sites for seabirds.

A honeycomb effect, known as tafoni (the Italian word for cavern) can be seen in places in the sandstone cliffs. This is eventually destroyed by landfalls, and then very slowly created again. This feature of distinctive rows of small pockets within the rock is thought to be created by salt weathering, although there are many alternative theories.

The East Cliff sandstones were created in a shallow marine environment, and close examination can reveal considerable reworking from the impact of storms, flooding and bioturbation. The latter refers to the continuous effect of burrowing marine animals living in the sediments, their activity changing the chemical properties and transport of water throughout the formation as the created tunnels were subsequently filled up by calcium rich sediments.



Landslip, East Cliff — photo: Paul Berry



Marine erosion at the base of East Cliff —
photo: Paul Berry

The Cliffs at West Bay experience rapid undercutting when the beach level is low, and wave cut notches do appear in places. Higher beach levels protect the cliffs to a degree, along with unsupported buttresses that have collapsed as rock falls, but it must be remembered that the prevailing south westerly winds here blow across a fetch of ocean that stretches for 3100 miles, so there is quite an onslaught to be delivered from marine erosion. Landslips have always been a significant factor in these cliffs, assisted by non-marine processes that help to create slipping and mass slumping. With the addition of water, the clays in the cliff can slide over the lower layers, a situation made worse by the numerous faults in the rocks. A major rockfall occurred at East Cliff on 28th June,

2017, after a long dry spell was followed by heavy rainfall. The coastal footpath was cut off, and there was some loss of land from the clifftop golf course. It is impossible to offer any reliable predictions for events such as this, and the cliffs here could be stationary for 100 years before a sudden fall occurred. It is disturbing to see so many visitors occupying positions on the beach directly below the obviously unstable cliffs, while others take their chances right on the very edge of the cliff tops.



'Hanging valley', East Cliff — photo: Paul Berry

A few hundred metres from West Bay, a clear dip in the sandstone cliffs can be identified. This is **(continued overleaf)**

a small dry valley, inclined seawards, that resembles a dry chalk coombe. Here, in the cold phases of the Pleistocene ice age (including the last phase called the Devensian), the frozen sandstone floor became impermeable and held up running melt water from warmer spells to cut a valley. Under these periglacial conditions (there was no actual ice cover this far south), 'head' or hill wash debris was transported from the valley slopes to the valley floor due to solifluction as the ground cycled through periods of freezing and melting. This is visible in places at the top of the cliffs as a reddish layer on top of the yellow Bridport Sands. The valley was eventually truncated by coastal erosion and landslips, altering the lay-out of hole six, the signature hole on the Bridport and West Dorset golf course.



Freshwater — photo: Paul Berry

BURTON FRESHWATER

Travelling eastwards from West Bay, you come to Burton Freshwater. Here, the river Brid runs through the shingle beach built high to protect the holiday camp from flooding in severe storms. Further east from here are the Burton Cliffs, beds of Bridport Sands here being topped by a layer of Middle Jurassic Inferior Oolite. This is a younger and harder marine limestone laid down between the Aelenian and Bathonian Ages, approximately 174-168 million years ago. There are several different types of oolites in the

UK, including the great or main oolite which is also known as Bath Stone, and the superior oolite known as Portland Stone. An oolite is a spherical crystalline deposit of billions if not trillions of small concentric or radial structures called 'ooliths', these being composed mainly of calcium carbonate surrounding a nucleus of a sand grain or tiny shell fragment. In part of the cliffline, above the Inferior Oolite is a thin layer of Frome Clay, often known as Fullers Earth.



West Cliff — photo: Paul Berry

WEST CLIFF

To the west of the harbour, the orange cliffs of the Bridport Sands soon give way to the slumped grey layers of clay that make up West Cliff (or Watton Cliff). The geology now is primarily Frome Clay (Fullers Earth) topped by the Middle Jurassic Forest Marble, part of the great oolitic limestone series. The coast path that follows the line of West Cliff runs past a now disused quarry, where the brown coloured limestone called Forest Marble was once quarried. In between these two main layers is a distinctive lighter coloured bed about 30 cm thick, made up of crushed shells (known as the Boueti Beds). The Frome Clay is often also known as 'Fuller's Earth' and name coming from its absorbent properties that led to its use in fulling or degreasing of wool. As it happens, the local Fullers Earth is not suitable for this process. Forest Marble is not a true marble, but rather a shelly limestone that takes a good polish. It is widely used as a building stone and for paving, and can be commonly seen in the town of Bridport.

The change in rock types west of the harbour is due to faulting, with a number of fault lines between West Bay and Seatown creating a complicated geology. The area around Eype's Mouth is known as 'fault corner', where the Eype's Mouth Fault crosses the far end of Watton (West) Cliff at an angle. Rocks here were part of the supercontinent Pangea when the Atlantic ocean formed around 170 million years ago. The rock layers on the eastern side of the fault have dropped down around 200 metres, bringing younger grey clay right next to much older yellow sandstone.



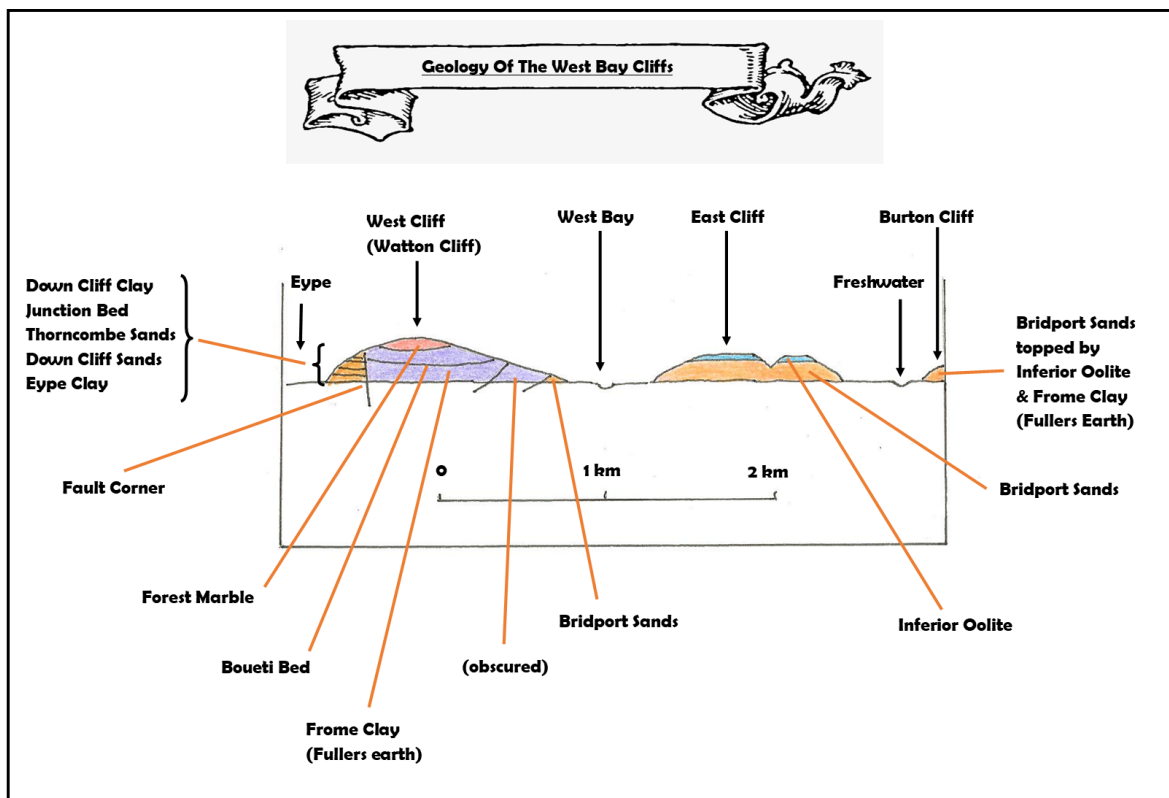
Rock armour, West Bay — photo: Paul Berry

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COASTAL DEFENCES

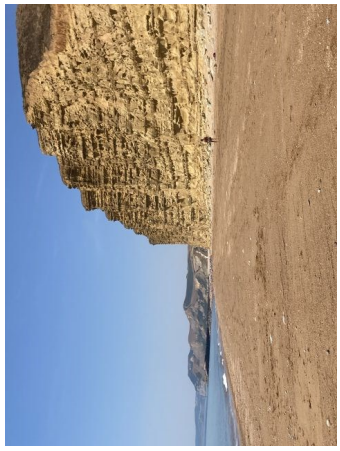
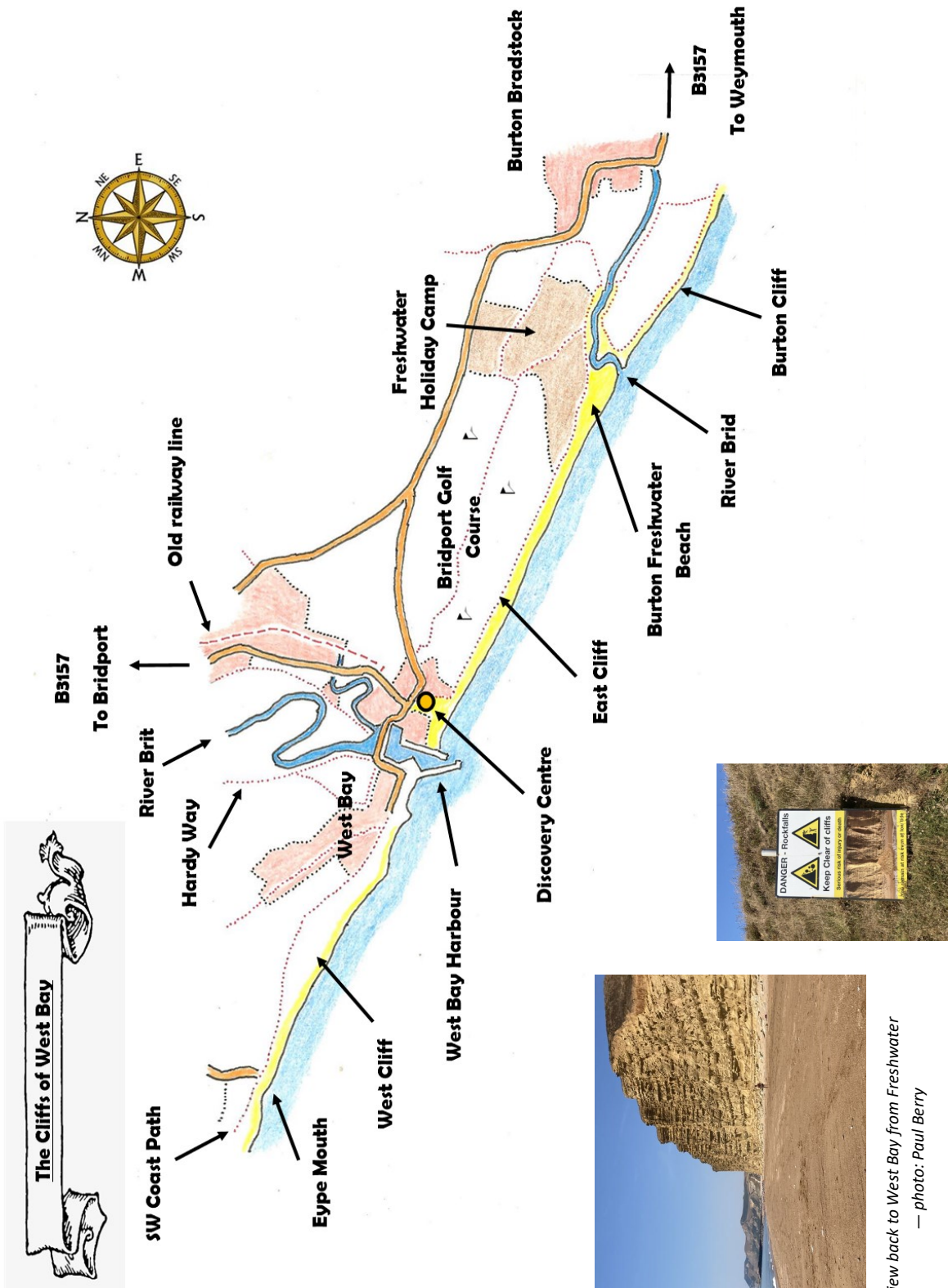
This location also provides a good opportunity to study coastal defence schemes. When the port of West Bay was moved to its present position, two piers were constructed to house the harbour, with the river Brit being diverted to run between them. In 2005, a new coastal defence scheme came into being, with the West Pier replaced (and renamed the Jurassic Pier), the East Pier rebuilt, a new slipway constructed, and the outer harbour area created. It meant West Bay harbour could now be used on the 50% of days when southerly swell conditions occurred, which was previously not possible. The harbour piers were protected with a thick barrier of rock armour formed of Scandinavian Larvkite rock. At West Cliff, large protective boulders were also added to the foreshore, and backed by a sea wall, promenade and regraded artificial grass-covered slope to protect the area from landfalls. Beach nourishment has been carried out at West Bay since the mid-1980s, raising the beach shingle to a height of 7.5m. Regular replenishment is required to resist the work of the sea.

If you want to explore the area a little further afield, the South West Coast Path provides spectacular access to both the north and south. Care needs to be taken however, as some stretches run extremely close to the (unstable) cliffs. The path has already been re-routed inland in a number of places.



Answers to Curiosity Questions:

- # West Bay is within the Jurassic Coast World Heritage Site. When was the Jurassic Coast inscribed on the WHS list? (2001)
- # What three periods of rock formations are represented on the Jurassic Coast? (Triassic, Jurassic, and Cretaceous)
- # What geology gives nearby Golden Cap its brightly coloured cliff top? (Cretaceous sandstone called Upper Greensand)
- # Nearby Lyme Regis is synonymous with which famous female fossil collector? (Mary Anning)



View back to West Bay from Freshwater
— photo: Paul Berry



Photo: Paul Berry