## Case Study C Pevensey Bay

Two aspects that differ between the beaches of Pevensey Bay and those at Eastbourne are the state of the wooden groynes and the prevailing wave direction in relation to beach alignment. East of Sovereign Harbour most of the the groynes have been allowed to fall into disrepair, however, their impact in serviceable condition would not be of any significance with respect to longshore drift. The prevailing waves hit the beach head-on as opposed to obliquely , as is the case along the Eastbourne section, therefore, longshore drift is very minimal in comparison, draw-down being the main issue. The terms drift aligned and swash aligned are used to describe these beaches from a geomorphological perspective. The beaches west of Langley Point are the classed as the former and those to the east, the latter type.

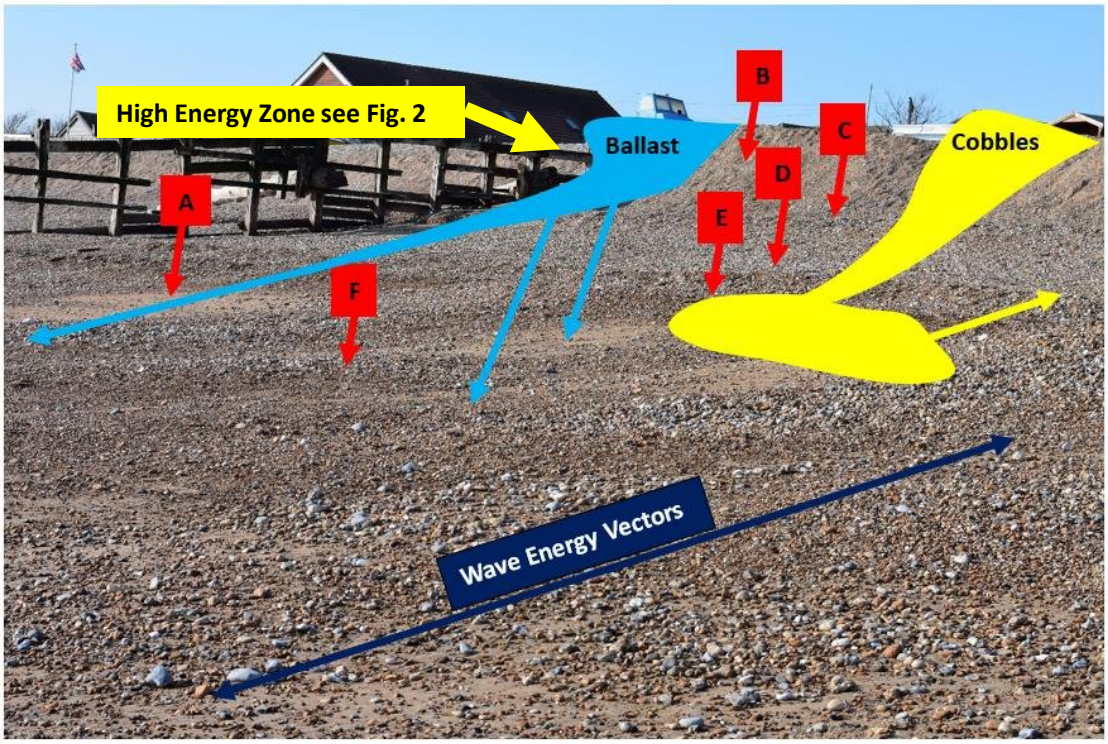


Figure 1. Swash aligned beach just east of Pevensey Bay car park. The contrasting-coloured clasts and fines form a patchwork of graded sediments that reflects the previous wave energy environment.

A: Thin sand Veneer B: Cliffing C: HW spring D: Subsequent HW mark indicating the tidal cycle is tending towards neaps. E: Cuspate Bedform F: Accumulation of cobbles.

This beach does not conform to standard beach processes due to the nature of the sediment mix. These can effectively be termed anthropogenic as they are formed of mechanically recycled sediments recovered from the toe of the beach.

The processes this beach has gone through since the latest recycling program will have commenced with erosion and draw-down of the chaotically mixed sediments by several agents including breaking waves, fore-wash and rain water. Figure 2. Some fines will be carried away in suspension and the coarser sand grains redistributed along the beach slope (A in Figure 1) .


**Figure 2:** Large gravel and small cobbles are drawn down and becomes sorted into distinct patches, depending on grain size, that reflect the wave energy environment during the previous HW.

The rate of the erosion will depend on wave vectors and tidal heights. And as a swash aligned beach the movement will be up and down the beach. The fines will form the matrix of an unconsolidated conglomerate that incorporates variable quantities of the cobbles and large pebbles. Once the slope is allowed to settle it presents a relatively solid surface on which larger clast can be moved around the beach and settle in low energy zones within the wave environment. (F). The backwash starts to funnel down between the deposits becoming turbulent and displacing more sediments. The larger clasts only

move a short distance whilst the smaller grains are redistribute further often in a graded manner that can be seen in patterns at low water. Figure 3

**Figure 3:** Beach at Eastbourne Bandstand, the fines have been drawn down and deposited in response to the wave energy distribution during the previous tide.

Where grey cobbles protect the high energy zone the beach is maintained in a stable state. Two factors are responsible for this;

The inherent inertia of the cobbles is large enough to absorb incident wave vector energy. Those resting on the berm slope can be dislodged and move downslope under the effect of gravity and back wash. They then come to rest as the beach slope gradient tends towards the horizontal. With sufficient cobbles a deposit forms down slope of the berm which increases overall stability. If the cobbles remain on the beach slope they will eventually be washed back up again.

When the ballast is eroded by wave action a short-term turbidity current is set up. This consists of back-wash loaded with sand and pebbles, which easily transports any cobbles within the mix downslope and often incorporates the larger clasts. This forms a relatively flat sloping beach that extends seaward of the vertically faced HW berm. These conditions promote high energy plunging waves that break onto the friable unconsolidated conglomerate at HW springs.

**Figure 4:** A stable beach at Holywell, the undulating beach profile consisting of grey cobble deposits is stable due to the inertia contained within the cobbles.

The beach above has been stabilised by a strip of grey cobbles, around 5m wide only a few clasts thick that stretches across the entire beach. The locally derived drifted cobbles can be seen overtopping the opposite wooden groyne. Once sufficient cobbles have drifted the veneer of cobbles acts as an energy absorbing cover. In time the load will be forced to the NE side of the beach and overtop the groyne structure. The supply is erratic and when the input ceases they become assimilated within the low tide sands.

Another important aspect that differs between the two stretches of coastline, divided at the Redoubt, is their geomorphology. Between Beachy Head and the Redoubt, the beaches are backed by solid geology that has been armoured, whereas eastwards from the Redoubt the beaches front a deposit of shingle that rests on a compacted Holocene sedimentary sequence and sub cropping solid geology. The loss of beach sediments west of the Redoubt will expose the Victorian sea walls. which then become the first line of defence against the sea. There is no second line of defence for beaches that front the mobile sedimentary features along the coast from the Redoubt to Cooden.

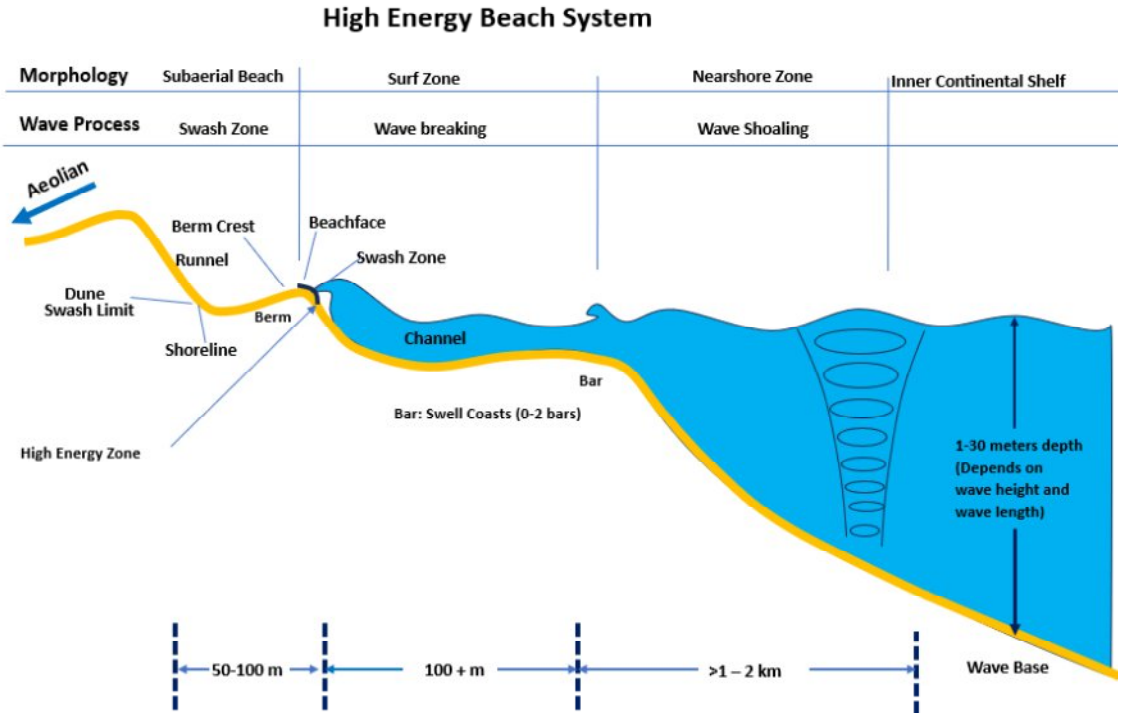


**Figure 5:** A beach can also be described in terms of the environmental forces that impact upon it. The Sussex coastline is situated within a geographic zone that has the second highest tidal range and impacted by storm waves at a relatively high frequency. These types of beaches are described as high energy beach systems with a macro-tidal range.

The beaches that front the barrier beach have evolved in response to the recharging and recycling programs. The sand and rounded pebbles are quickly drawn down under storm conditions and therefore, current profiles further increase sediment loss.

Natural systems tend towards equilibrium or states of reduced energy. A high energy beach system loaded with a mixture of low inertia sediment grains will go through a random series of redistribution events that will displace and draw-down a significant proportion of the recycled material. Depositing it in a region of less energy, that exists lower down the beach.