GCSE Case Study:

COASTAL LANDFORMS OF EROSION AND DEPOSITION

making space for sand



Department for Environment Food & Rural Affairs

Environment Agency

Flood and Coastal Resilience Innovation Programme

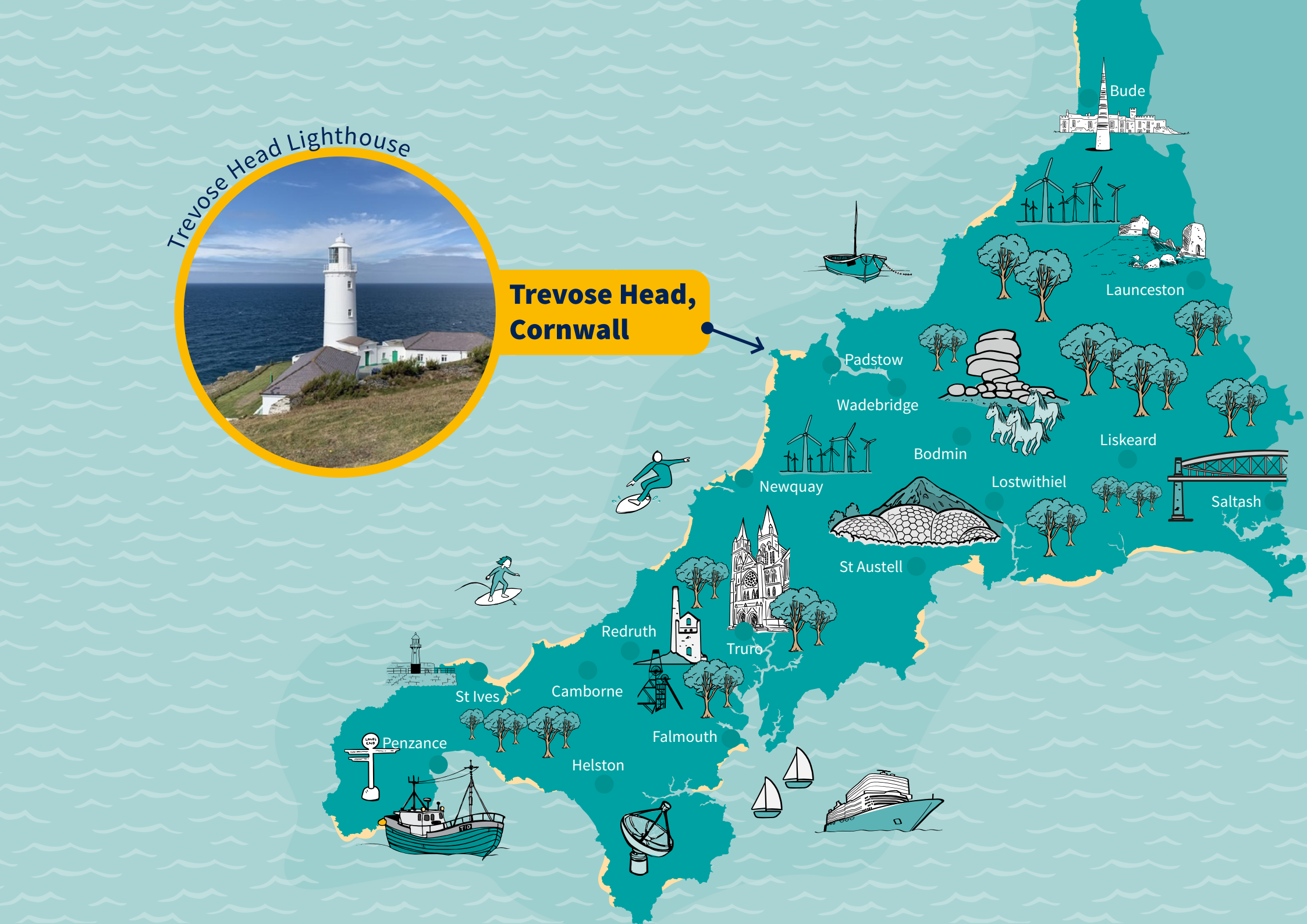
Part of the Resilience Innovation Fund

CORNWALL COUNCIL
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geography southwest

SOUTH WEST COASTAL MONITORING

Photo: John Allan


Trevose Head Lighthouse
Trevose Head, Cornwall
Bude
Launceston
Padstow
Wadebridge
Bodmin
Liskeard
Newquay
Lostwithiel
Saltash
St Austell
Redruth
Truro
Camborne
St Ives
Falmouth
Penzance
Helston

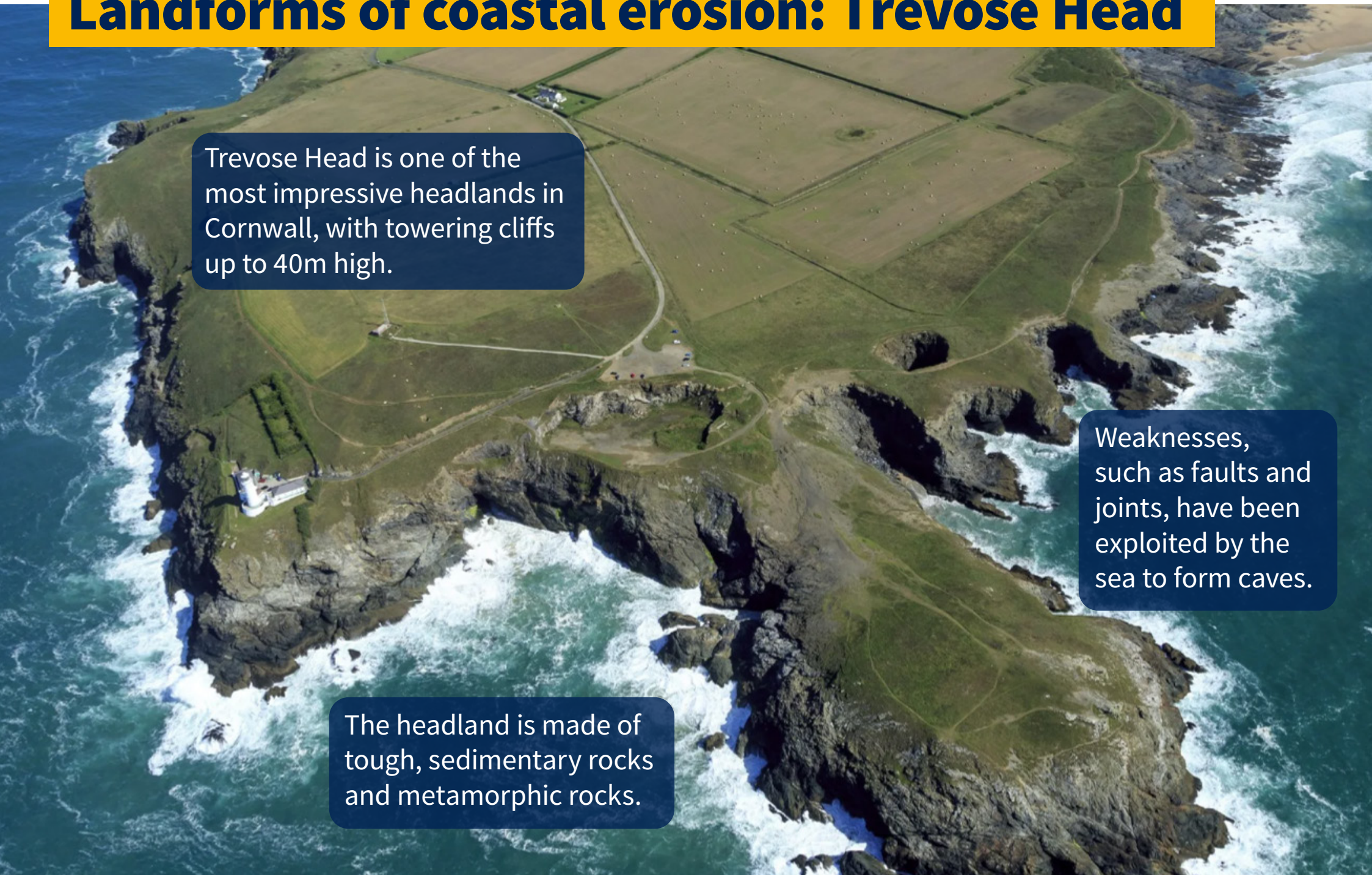
Trevose Head 1:50,000 OS map



Landforms of coastal erosion and deposition



Landforms of coastal erosion: Trevose Head

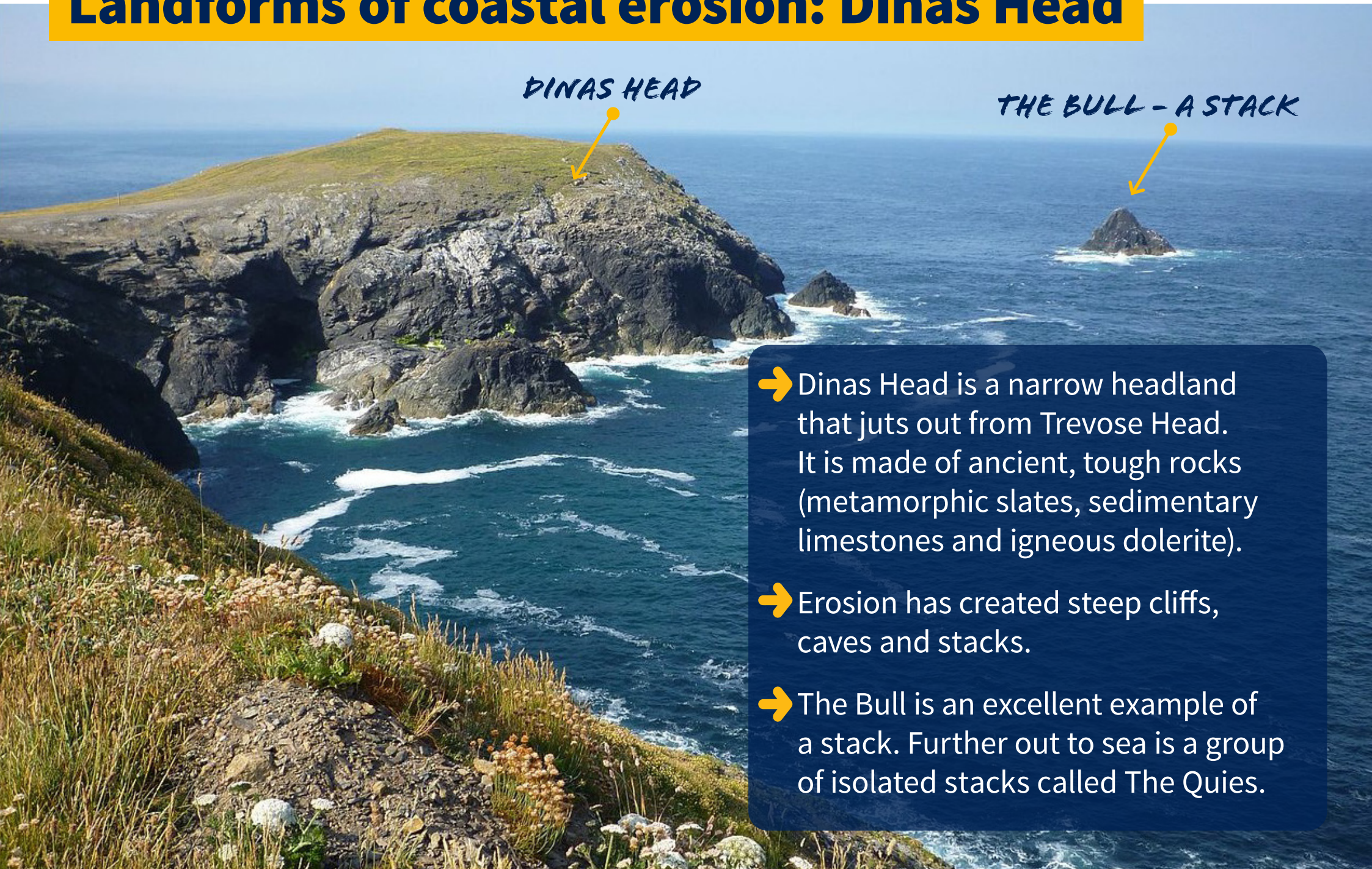


Trevose Head is one of the most impressive headlands in Cornwall, with towering cliffs up to 40m high.

Weaknesses, such as faults and joints, have been exploited by the sea to form caves.

The headland is made of tough, sedimentary rocks and metamorphic rocks.

Landforms of coastal erosion: Dinas Head



- Dinas Head is a narrow headland that juts out from Trevose Head. It is made of ancient, tough rocks (metamorphic slates, sedimentary limestones and igneous dolerite).
- Erosion has created steep cliffs, caves and stacks.
- The Bull is an excellent example of a stack. Further out to sea is a group of isolated stacks called The Quies.

Landforms of coastal erosion: Round Hole

Round Hole at Trevose Head is an example of a blowhole. Over thousands of years, erosion created a sea cave beneath the cliffs.

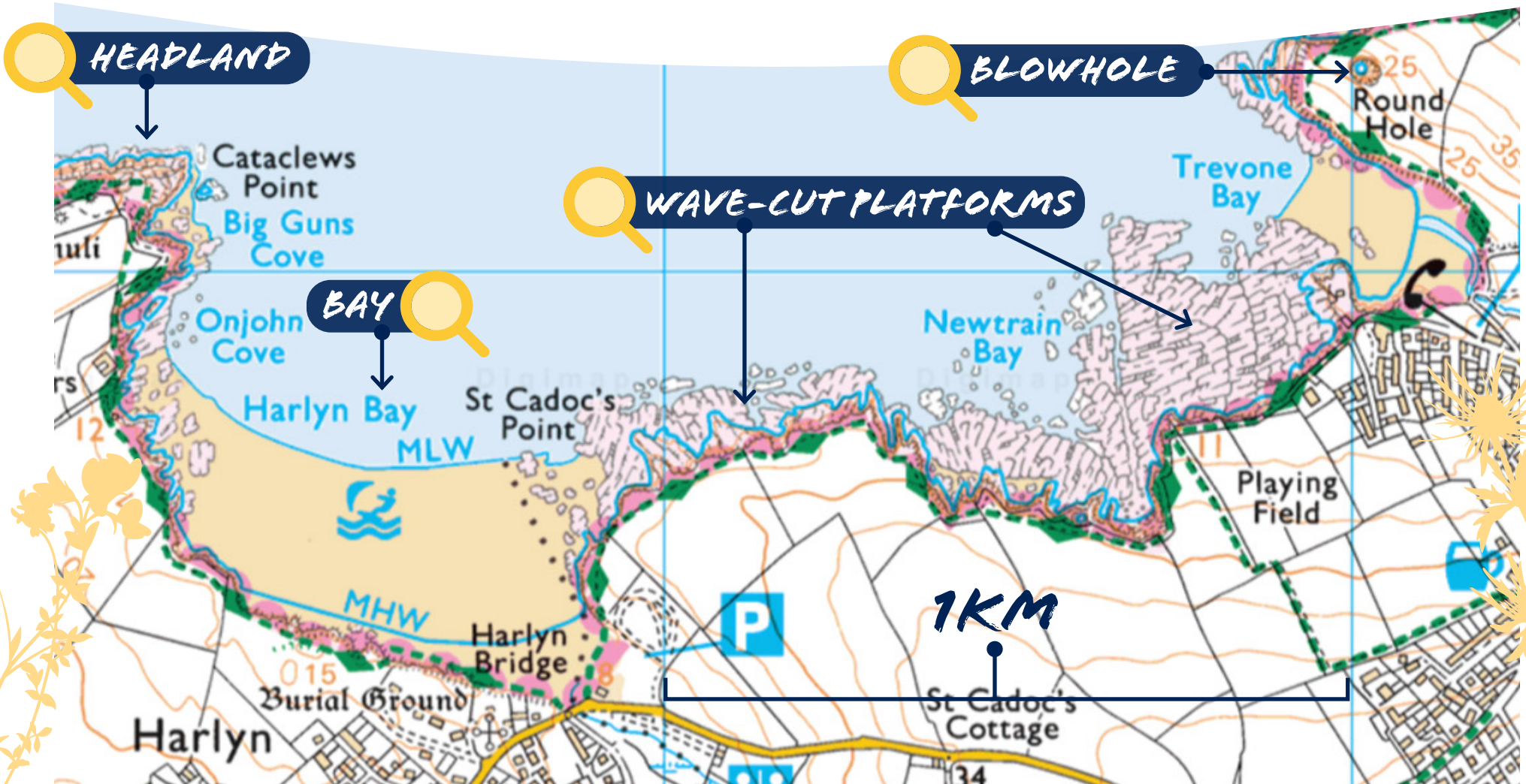


Weakened by erosion, the roof eventually collapsed to form a 25m depression.

Images courtesy of Cornwall Live

Landforms of coastal erosion: Trevone

- Headlands and bays have been formed in response to variations in rock type.
- There are extensive wave-cut platforms along this stretch of coastline.
- Wave-cut platforms are broad, gently sloping areas of bare rock exposed at low tide.
- Sculpted by abrasion, they are the remnants of cliffs that have retreated over many thousands of years.



Landforms of coastal erosion: Harlyn Bay

Harlyn Bay is located on the north Cornwall coast just east of Trevose Head. It is one of several bays formed between the rocky headlands of Cataclews Point to the west and St Cadoc's Point to the east.

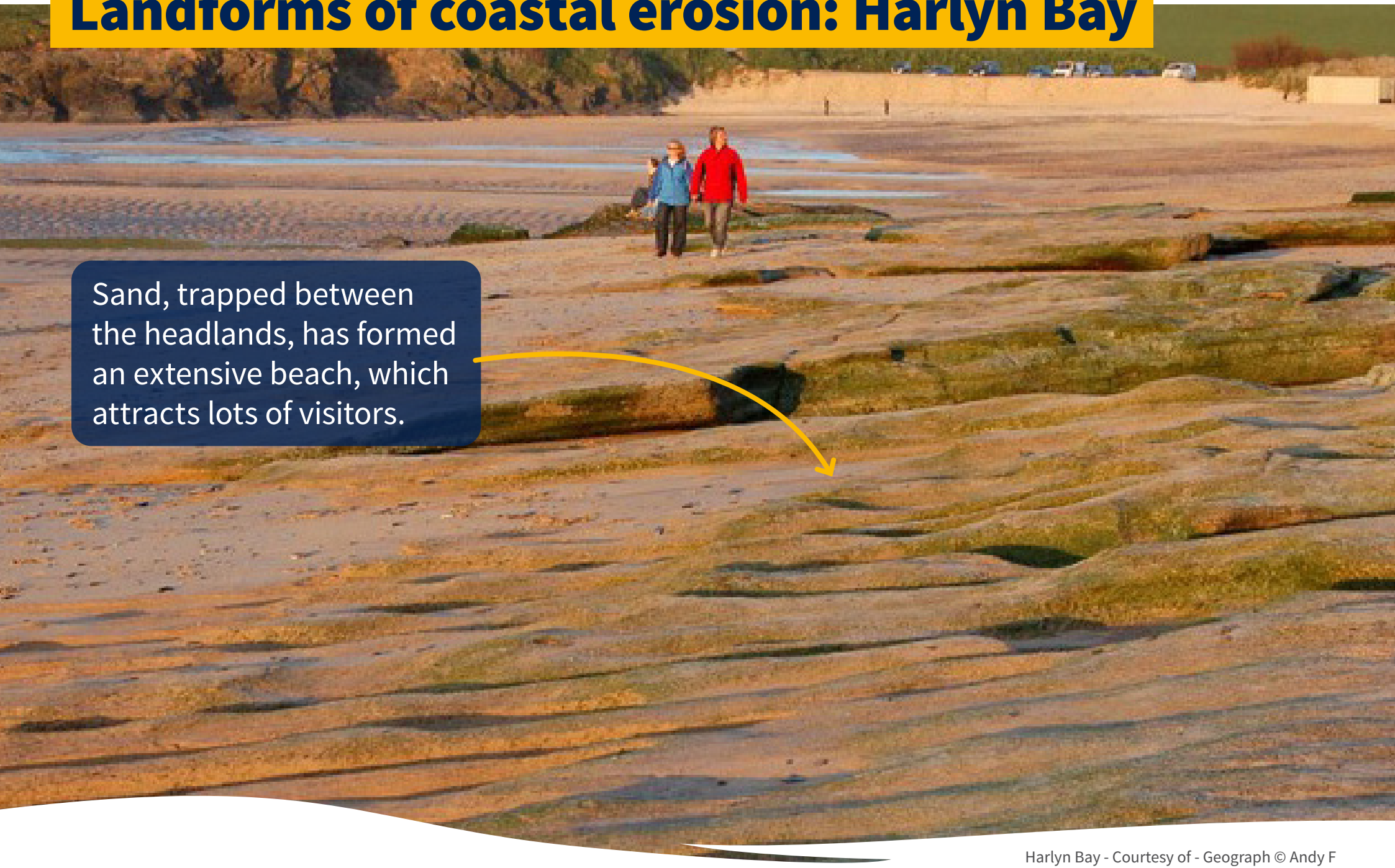




Landforms of coastal erosion: Harlyn Bay

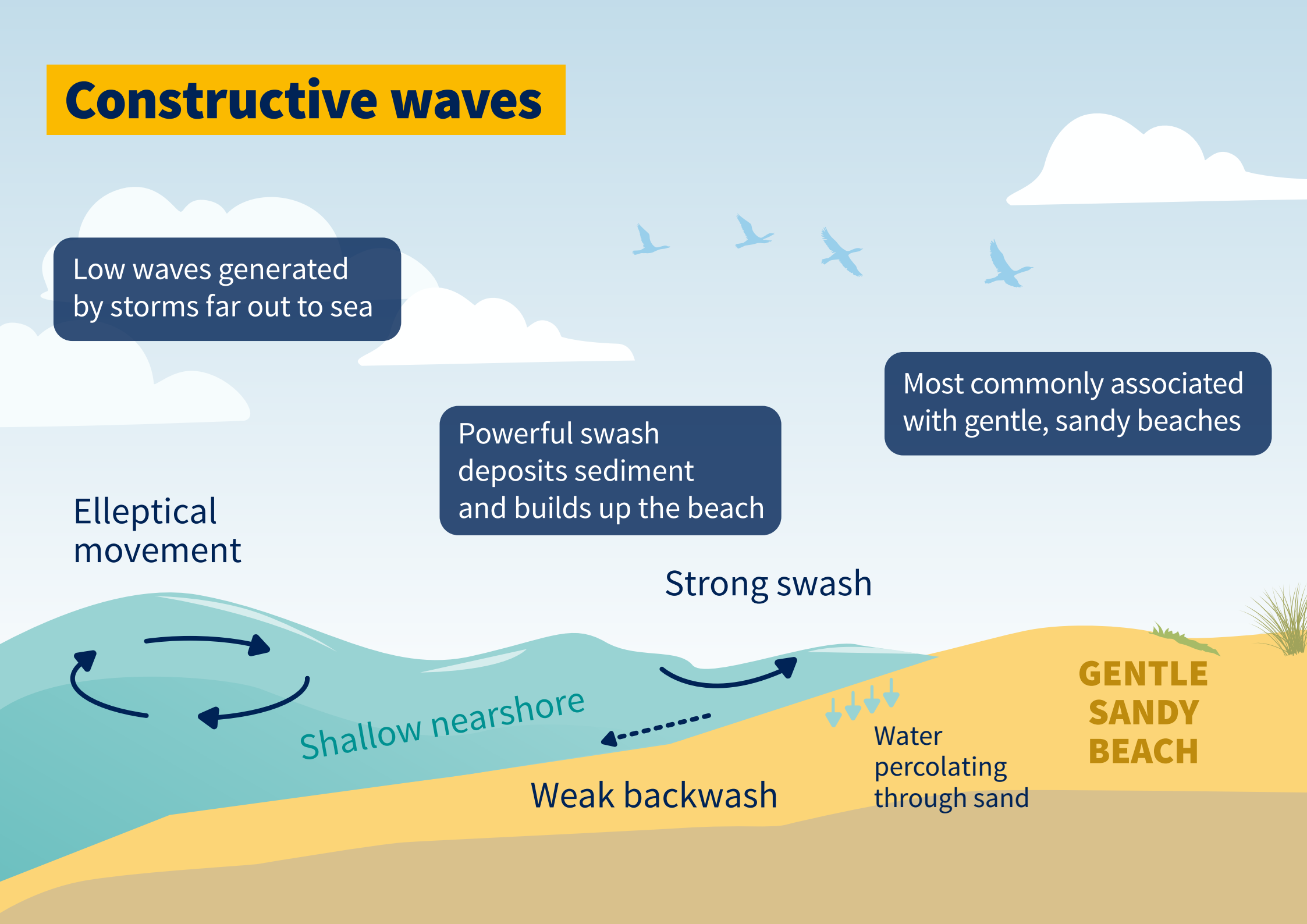


Landforms of coastal erosion: Harlyn Bay

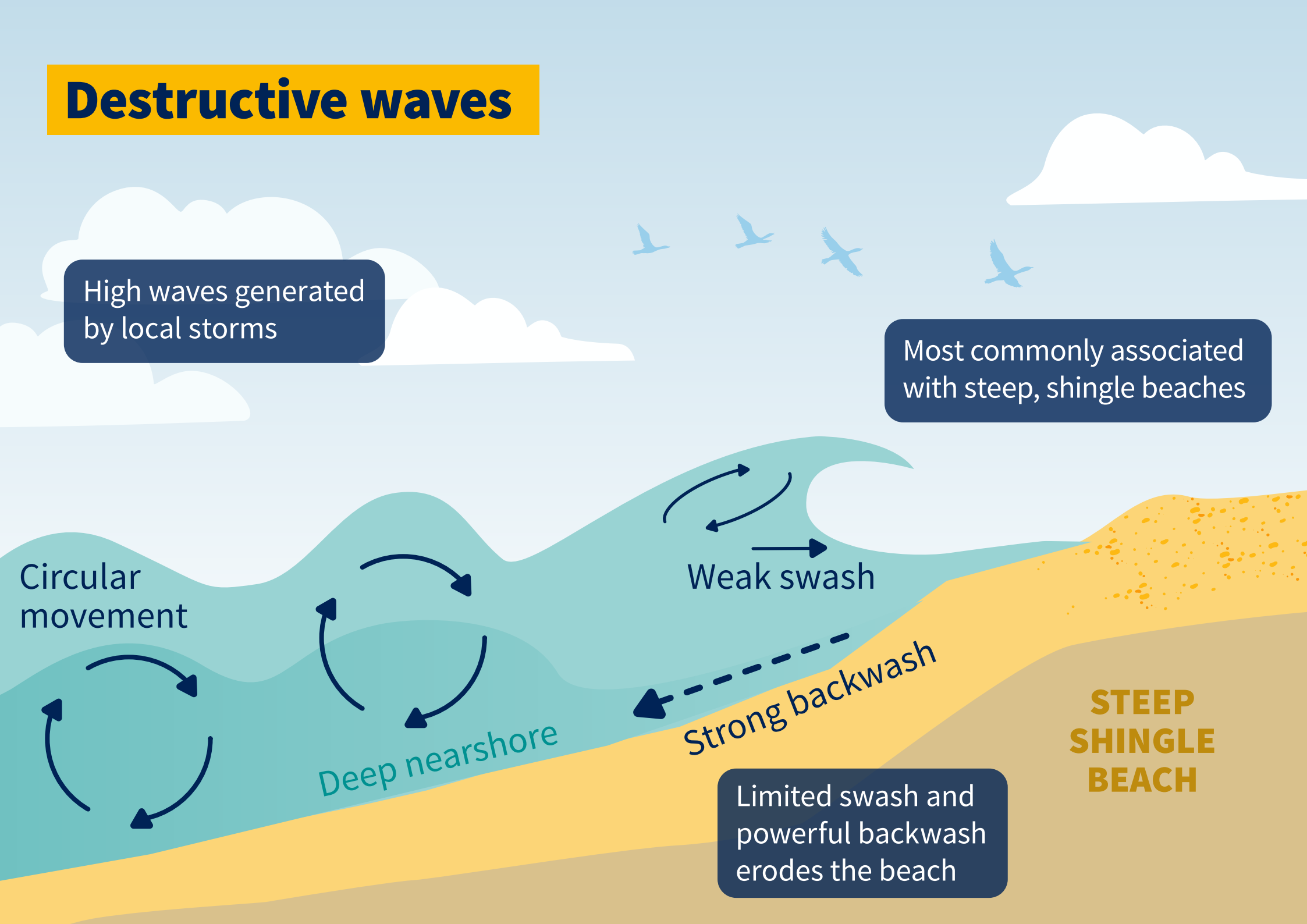


Harlyn Bay - Courtesy of - Geograph © Andy F

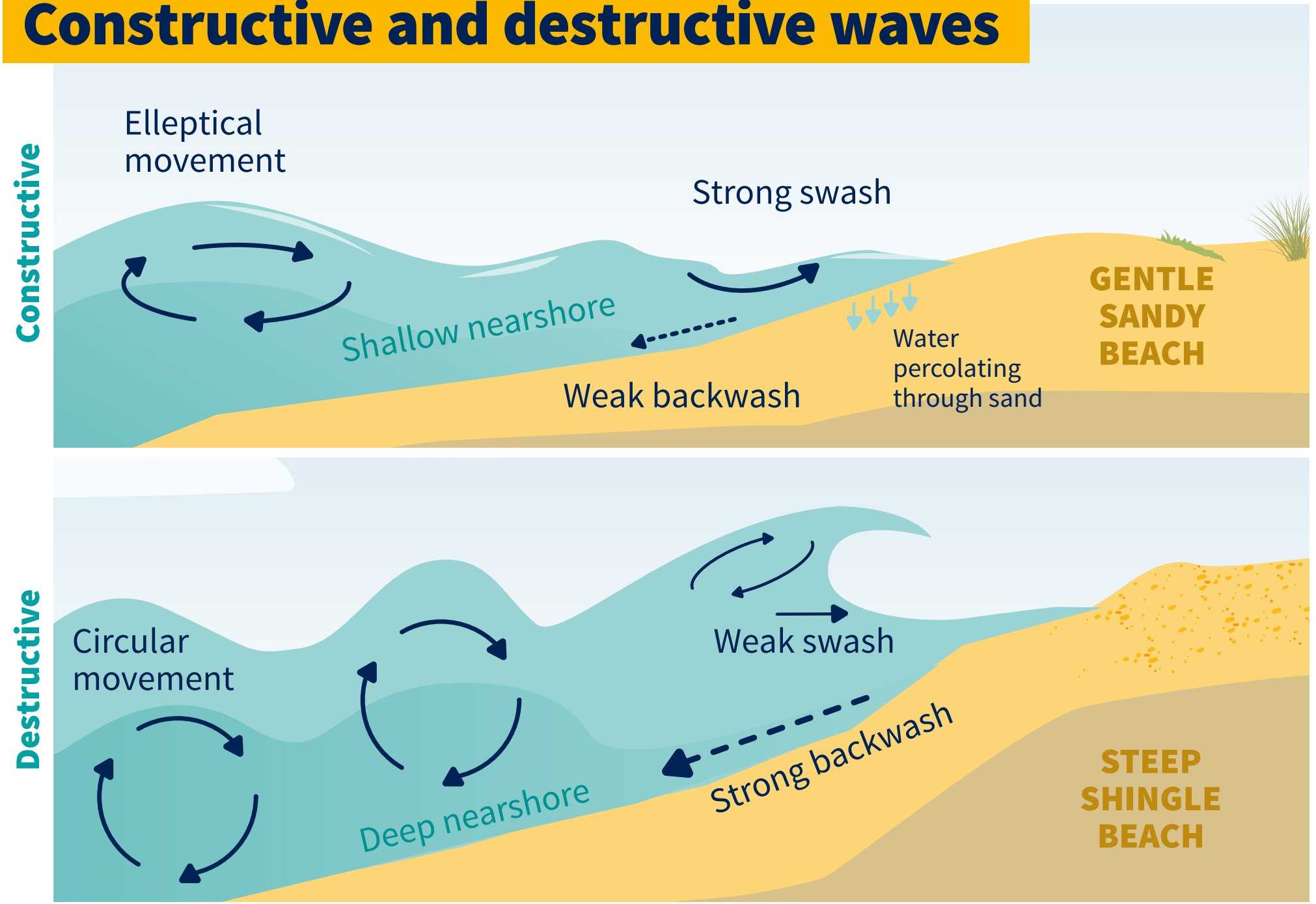
Constructive waves



Destructive waves

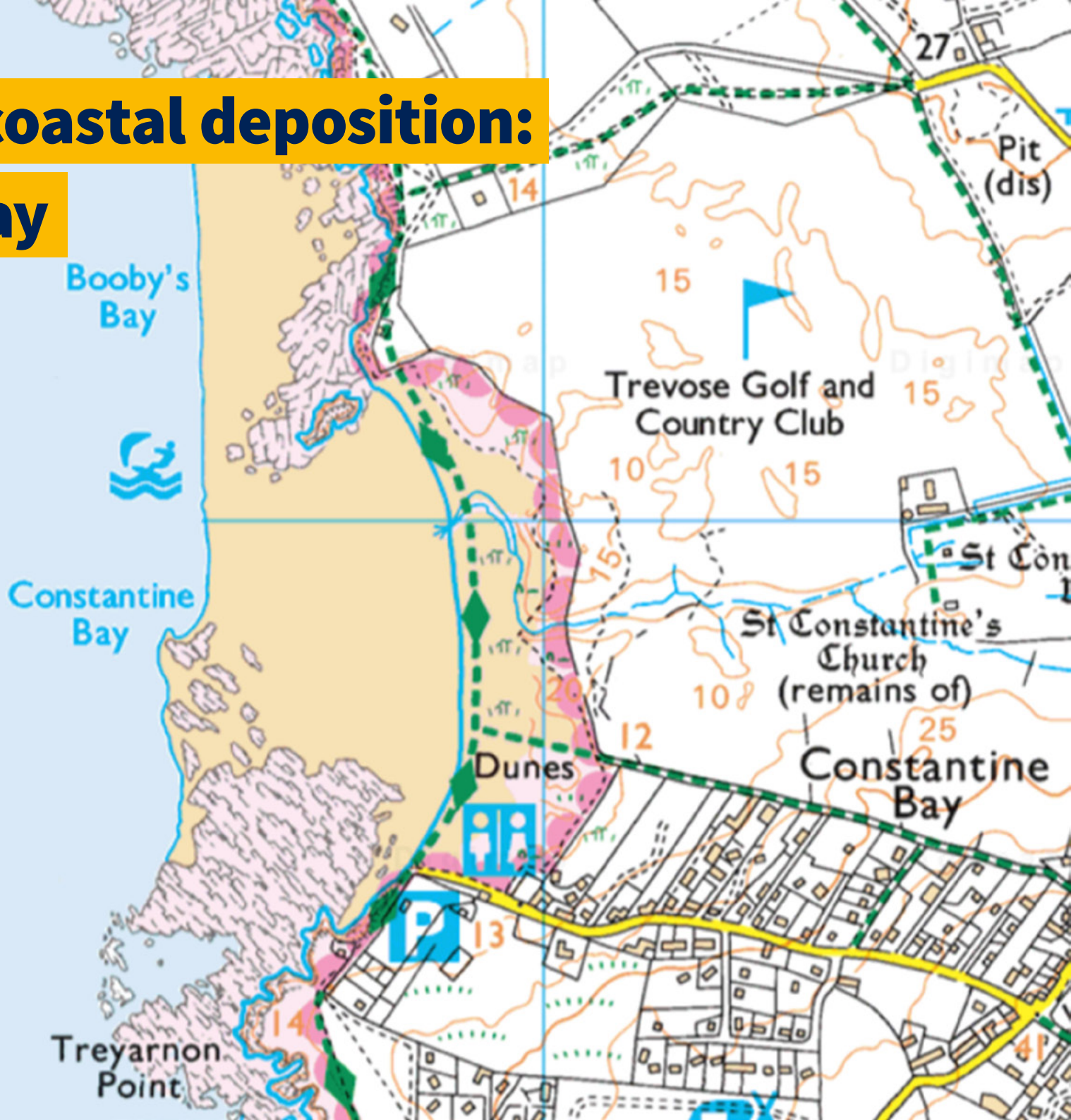


Constructive and destructive waves

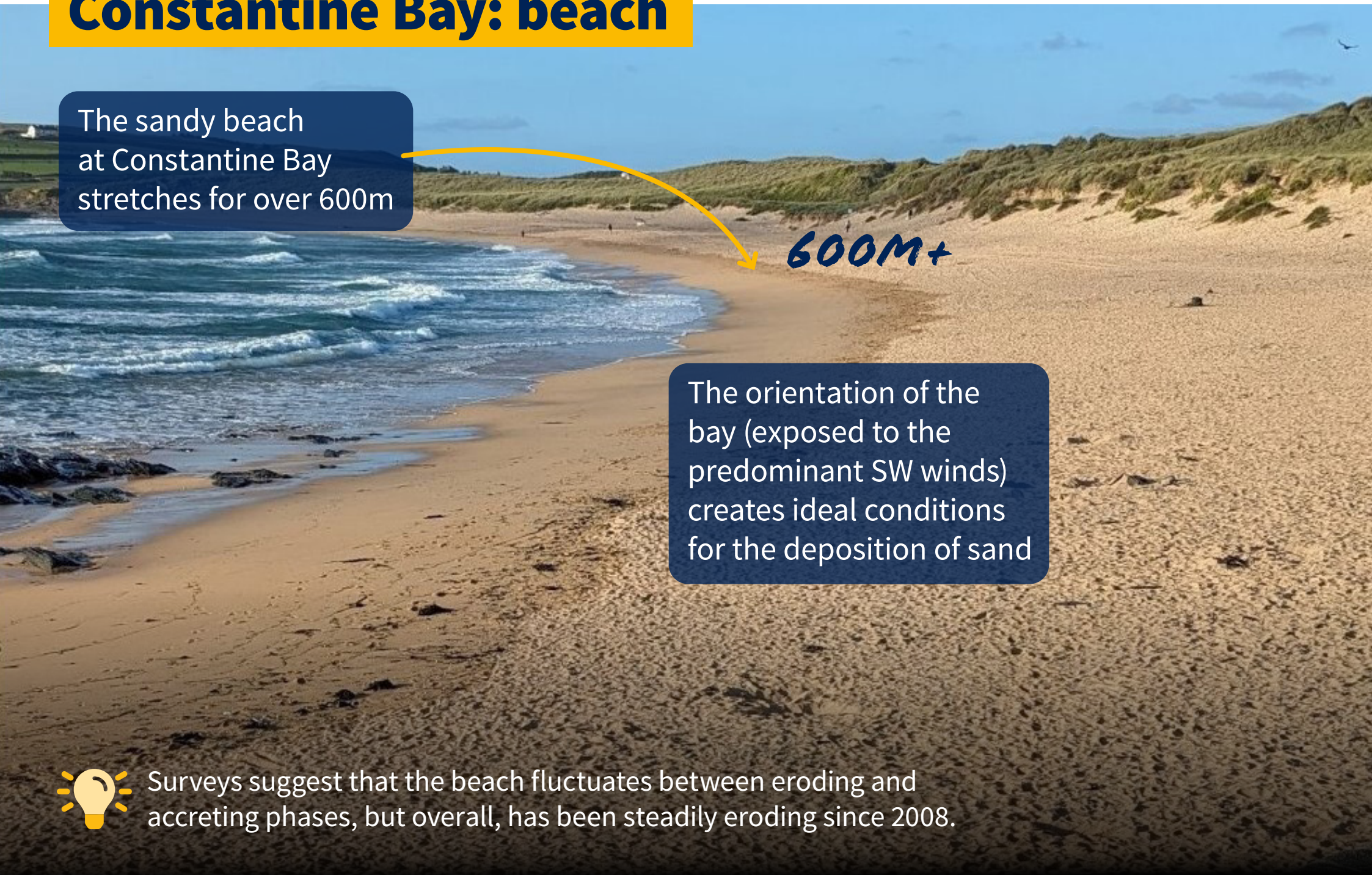


Landforms of coastal deposition: Constantine Bay

- Constantine Bay is a wide, open beach, of golden sand fringed by moderately low, steep cliffs. To the south are the rocky reefs of Treyarnon Point.
- At the back of the beach is an extensive area of sand dunes, part of which has been developed into a golf course.
- The beach buries an ancient forest!



Constantine Bay: beach



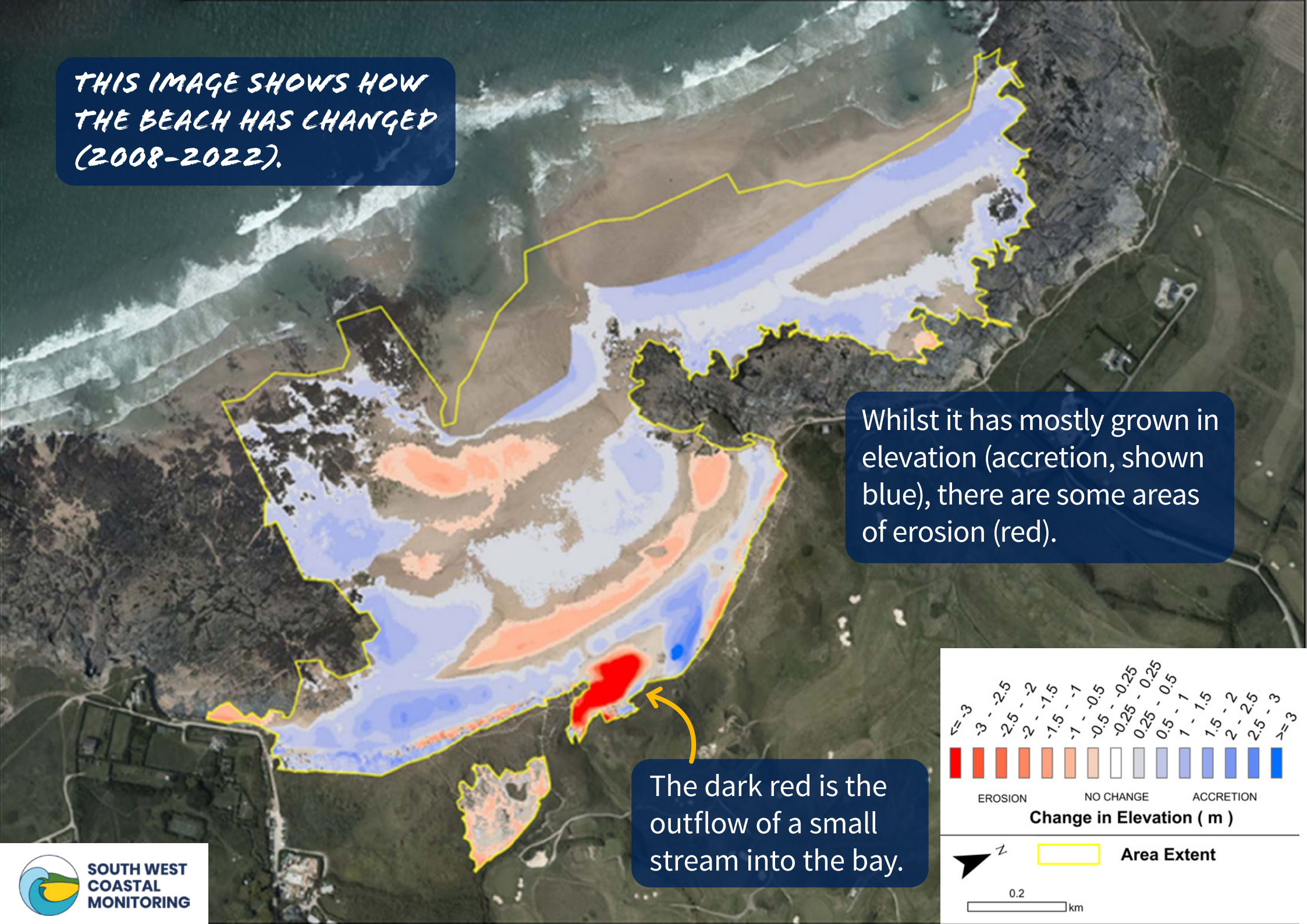
Surveys suggest that the beach fluctuates between eroding and accreting phases, but overall, has been steadily eroding since 2008.

Constantine Bay: beach



Sand is brought onshore by constructive waves and may be transported along the beach by longshore drift.

Occasional storms generate destructive waves which can cause significant erosion of the beach, e.g. in 2013/14 and 2020.


THIS IMAGE SHOWS HOW THE BEACH HAS CHANGED (2008-2022).
Whilst it has mostly grown in elevation (accretion, shown blue), there are some areas of erosion (red).
The dark red is the outflow of a small stream into the bay.
<= -3
-3 - -2.5
-2.5 - -2
-2 - -1.5
-1.5 - -1
-1 - -0.5
-0.5 - -0.25
-0.25 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
>= 3
EROSION
NO CHANGE
ACCRETION
Change in Elevation (m)
N
Area Extent
0.2
km
SOUTH WEST COASTAL MONITORING

Constantine Bay: sand dunes



How do sand dunes form?

CONDITIONS NEED TO BE JUST RIGHT FOR SAND DUNES TO FORM:

Large supply of sand deposited on the beach, with some obstacles (driftwood, seaweed) to trap sand.

1. Obstacles such as driftwood get dropped on the beach.

2. The wind blows sand up the beach, which gets trapped by the obstacle.

3. Colonising pioneer plants like marram grass grow on the the dune and stablise it with their roots and trap more sand.

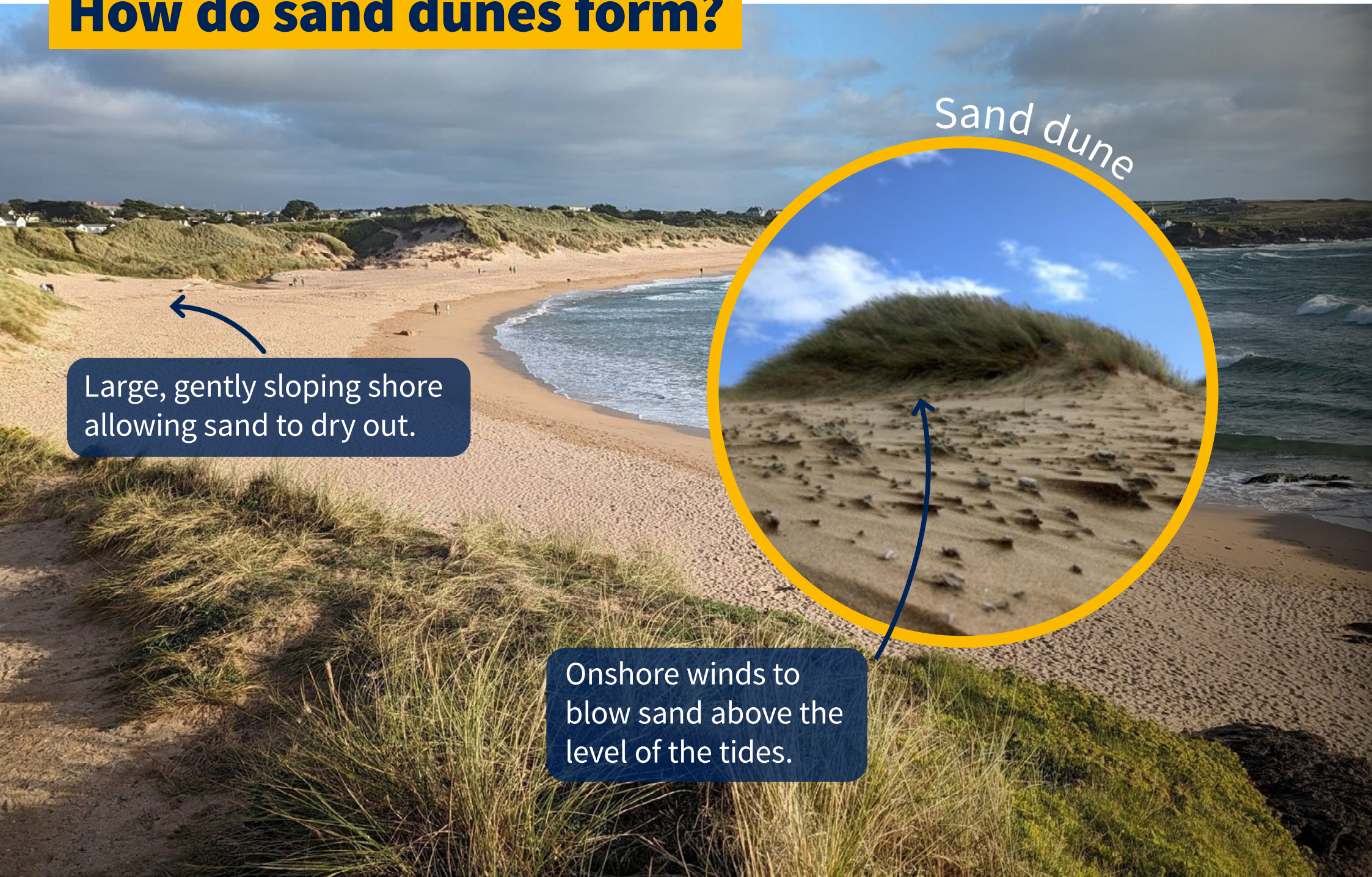


4. This creates an embryo dune.

5. As the plants die they add organic matter to the soil, improving it for other plants.

SEA

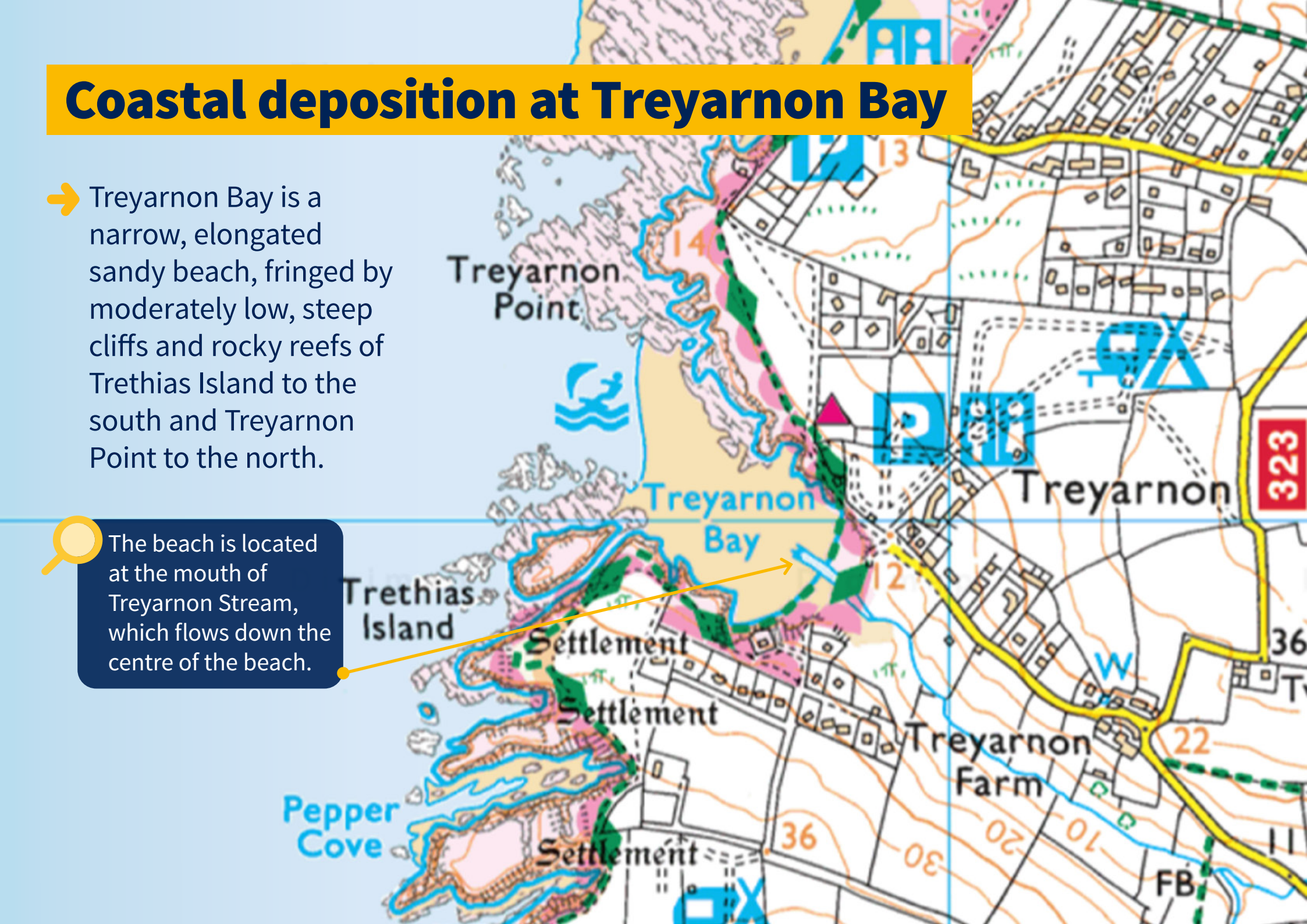
How do sand dunes form?



Coastal deposition at Treyarnon Bay

- Treyarnon Bay is a narrow, elongated sandy beach, fringed by moderately low, steep cliffs and rocky reefs of Trethias Island to the south and Treyarnon Point to the north.

The beach is located at the mouth of Treyarnon Stream, which flows down the centre of the beach.



Beach and sand dunes

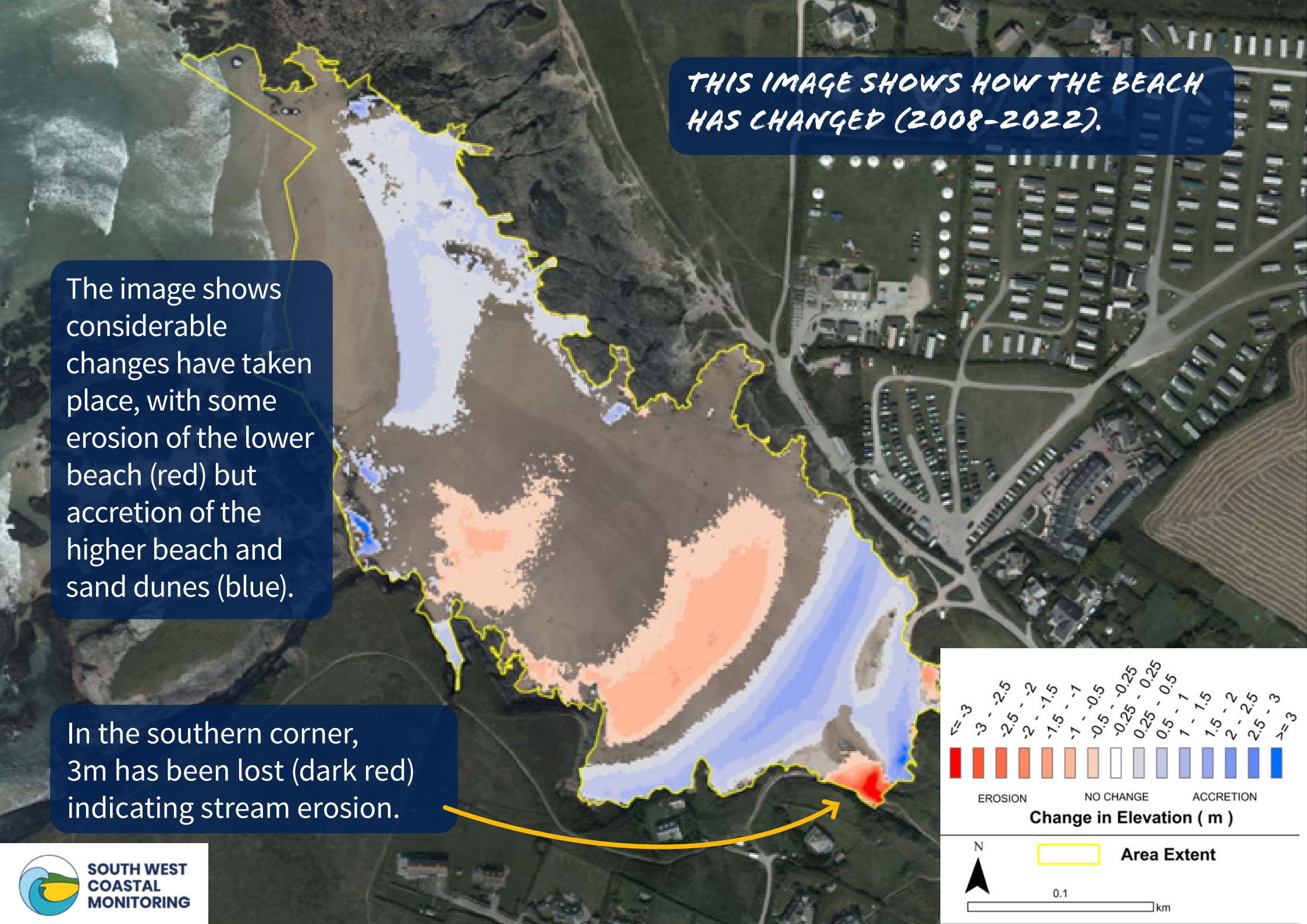
A sandy beach has formed here due to the orientation of the narrow bay. Sand dunes have formed at the back of the beach.

A caravan park (Holiday Site on the map) has been built on the dunes.

Notice the many small coves, formed by weathering and erosion of weaker rocks.

As sea levels rise, the area of sand dunes will be squeezed between the sea and the caravan park.




THIS IMAGE SHOWS HOW THE BEACH HAS CHANGED (2008-2022).
The image shows considerable changes have taken place, with some erosion of the lower beach (red) but accretion of the higher beach and sand dunes (blue).
In the southern corner, 3m has been lost (dark red) indicating stream erosion.
<= -3
-3 - -2.5
-2.5 - -2
-2 - -1.5
-1.5 - -1
-1 - -0.5
-0.5 - -0.25
-0.25 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
>= 3
EROSION
NO CHANGE
ACCRETION
Change in Elevation (m)
N
Area Extent
0.1
km
SOUTH WEST COASTAL MONITORING

REVISION SUMMARY

1. What is the name of the headland featured in this case study?

2. The Bull is an example of what coastal landform of erosion?

3. Round Hole is an example of a blowhole. How did it form?

4. What is a wave cut platform?

5. What landform of deposition has formed in Harlyn Bay?

6. Constructive waves are responsible for eroding a beach.
   True or false?

7. Destructive waves are formed by local storms.
   True or false?

8. How has the beach at Constantine Bay changed since 2008?

9. Do sand dunes form above or below the high tide line?

10. What name is given to a newly formed sand dune?

REVISION SUMMARY: ANSWERS

1. Trevose Head
2. Stack
3. Erosion of a cave and of a joint extending to the surface inland, forming a large hole or depression
4. A gently sloping, smooth rocky platform at the base of cliffs
5. Beach
6. False
7. True
8. The beach has grown in elevation (height)
9. Above
10. Embryo dune