



**REPORT ON THE ASSESSMENT
OF
COUNTY GEOLOGICAL SITES
IN THE NORTH DEVON AREAS OF OUTSTANDING NATURAL BEAUTY**

**Phase 2 Area from Saunton - Morte Point – Ifracombe and Ifracombe – Combe
Martin**



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Martin**

E.C. FRESHNEY and J.A. BENNETT

Prepared by: **Devon RIGS Group**

February, 2006

For: **Northern Devon Coast and Countryside Service**

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Introduction

The RIGS Initiative in Devon: County Geological Sites

The Regionally Important Geological/Geomorphological Sites (RIGS) Initiative was set up by the Nature Conservancy Council, now English Nature, as part of its Earth Science conservation Strategy. The purpose being to register sites showing valuable geological or geomorphological features on a county-wide basis, in a similar fashion to sites showing other natural and environmental features. An essential concept of the initiative is to promote the educational and research use, as well as the conservation of such sites.

The RIGS Group for Devon was set up in 1991 from among people interested in geological conservation and education, including members from Exeter University, The University of Plymouth, Exeter and Plymouth city museums, and from school staff and interested amateurs. It proceeded to contact other similarly interested people in the county, asking them to submit proposals for sites in their local area which they considered suitable to be nominated as RIGS. This procedure produced an initial list of 120 sites for the county, which were compiled into a computer based list.

For the purpose of registration and promotion of sites identified through the RIGS Initiative in Devon, the term County Geological Site (CGS) has been adopted, as their status parallels that of County Wildlife Sites, which are also being registered for conservation purposes.

County Geological Site Numbers

Site registration numbers used in this report, and on the accompanying registration sheets and maps, are made up from the number of the Ordnance Survey 1: 10,000 quarter-sheet e.g. SX55SW, together with an additional number allocated to each site located within the quarter sheet e.g. SX55SW 1. This system provides a unique number for each site and allows the provision of site numbers for further sites in each quarter-sheet area. The system also gives an immediate approximate site location within five a five kilometre square. If, as occasionally happens, a site lies across the boundary between two quarter sheets, the site is referred to the sheet which contains the larger part of the site.

Access to County Geological Sites

Some of the sites proposed as County Geological sites in the AONB are accessible from cliff paths or are on the foreshore and do not present problems of access. Where sites are on privately owned land there is no implied right of access and it is the responsibility of persons wishing to visit the site to contact the land owner and obtain permission to visit. One is in a tourist attraction where payment is required for access.

Site Sensitivity.

Some indication of the sensitivity of certain sites to damage has been given. There is a need in all cases for adherence to the Countryside Code and A Code for Geological Field Work (issued by the Geologists' Association) when visiting sites. An arrangement whereby copies of these codes are given to those applying for details of the sites, would assist with the conservation of the sites.

Conservation

Sites of Special Scientific Interest (SSSIs).

The SSSIs in the AONB have been either selected because of their nationally important geological features or for their nature/environmental features but which also have an important geological component. Many of the SSSIs have within them sites described in Geological Conservation Reviews which cover certain aspects of geology such as 'Marine Devonian', 'Quaternary' and other specialities. The presence of the individual review sites provides part of the argument for the citing the inclusive area as an SSSI. As SSSIs have statutory protection and regulation, they are therefore not discussed in this report but listed in Table 1. Details of these SSSIs can be seen in English Nature's web site at www.english-nature.org.uk/. There can be some overlap between SSSIs cited for a biological reason and County Geological Sites (CGSs). In some of the biological SSSIs geology is mentioned but not in sufficient detail to preclude the designation of a geological CGS. Also in some geological SSSIs a particular aspect of geology may be emphasised while in the CGS a different one may be covered.

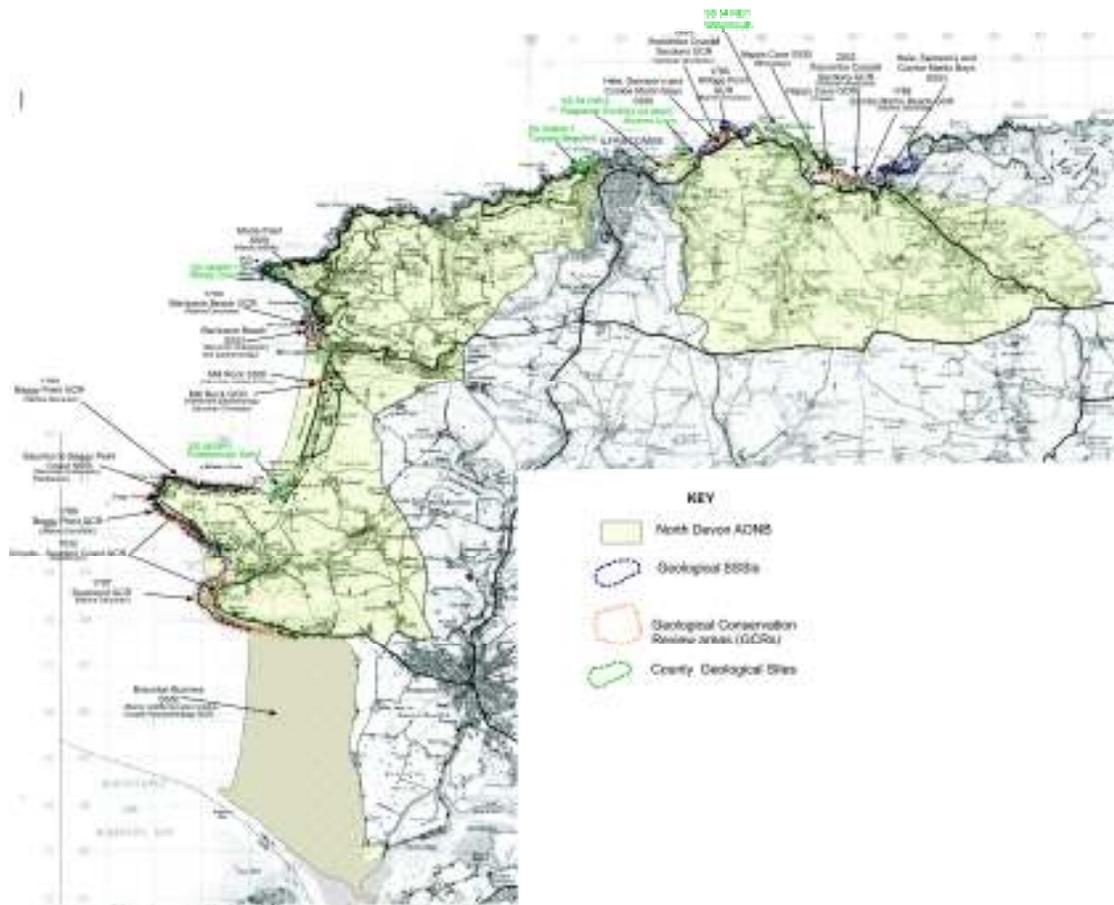


Figure 1. Map showing area of northern part of North Devon AONB with positions of SSSIs, GCRs and proposed County Geological Sites

SSSIs

Locality	Grid Reference	Type of site	GCRs within site
Braunton Burrows	430 350	(M) Mainly biological but some geomorphology	One GCR
Saunton to Baggay Point Coast	447 408 to 434 393 to 446 376	(G) Devonian stratigraphy, Pleistocene sediments and erratics.	Three marine Devonian GCRs and one Quaternary
Mill Rock	455 431	(G) Devonian palaeontology	Coincident with Mill Rock GCR
Barricane Beach	453 443	(G) Devonian stratigraphy and palaeontology	Coincident with Barricane Beach GCR
Morte Point	450 455	(B) Mainly botanical but mentions Devonian rocks	None

Napps Cave	563 475	(M) Caves showing development of aragonite crystals	Includes Napps Cave GCR
Hele, Samson's and Combe Martin Bays	536 479 to 547 485 and 567 476 to 582 480	(G) Devonian stratigraphy and palaeontology and Variscan structures	Contains three GCR sites (Rillage Point, Ilfracombe Coastal Sections and Combe Martin Beach

G Geological **B** Biological **M** Mixed geological and biological

GCRs

Locality	Grid Reference	Geological speciality	Comments
Braunton Burrows	430 350	Coastal Geomorphology	Falls within Braunton Burrows SSSI
Downend	434 389 to 445373	Marine Devonian	Falls within Saunton to Baggy Point SSSI
Croyde to Saunton Coast	427 400, 435 390 and 438 379	Quaternary	Falls within Saunton to Baggy Point SSSI
Baggy Point	447 408 to 434 395	Marine Devonian	Falls within Saunton to Baggy Point SSSI
Mill Rock	455 432	Vertebrate Palaeontology (Silurian to Devonian Chordata)	Coincident with Mill Rock SSSI
Barricane Beach	454 443	Marine Devonian	Coincident with Barricane Beach SSSI
Ilfracombe Coastal Sections	536 480 to 543 486 and 569 474	Variscan Structures of South- West England	Overlaps with Rillage Point GCR
Rillage Point	539 483 to 545 487	Marine Devonian	
Napps Cave	565 475	Caves	Good example of aragonite crystals
Combe Martin Beach	568 475 to 575 476	Marine Devonian	

Table 1. Geological and geomorphological SSSIs and GCR sites

The present Survey

Northern Devon Coast and Countryside Service asked for a survey to be made of geological and geomorphological sites in the North Devon Areas of Outstanding Natural Beauty additional to those already protected by SSSI status. New and modifications of existing County Geological Sites have already been proposed for the southern part of the North Devon AONB within the Phase 1 report (Freshney et al., 2004). Descriptions of proposed sites in the northern part of the AONB, along with maps and photographs are to be found in Appendix 1

CGS Site No.	Locality	Grid Reference	Geological speciality
SS 44 SW/1	Putsborough Sand	451 413 to 445 407	Pickwell Down Sandstone- lithology- sedimentology
SS 44 NW/1	Windy Cove, Morte Point	445 454	Morte Slate lithology and bedding cleavage relationship
SS 54 NW/1	Tunnels Beaches, Ilfracombe	514 478 to 511 477	Kentisbury Slates lithology and bedding to cleavage relationship
SS 54 NW/2	Rapparee Cove	SS 528 477	Kentisbury Slates, Faulting
SS 54 NW/3	Blythes Cove	SS 536 479	Combe Martin Slates, Cleavage/ bedding relationship, mineralisation
SS 54 NE/1	Watermouth	SS 553 485 to 558 481	Lester Slates-and-Sandstones. <i>Chondrites</i> burrowing. Recumbent folding

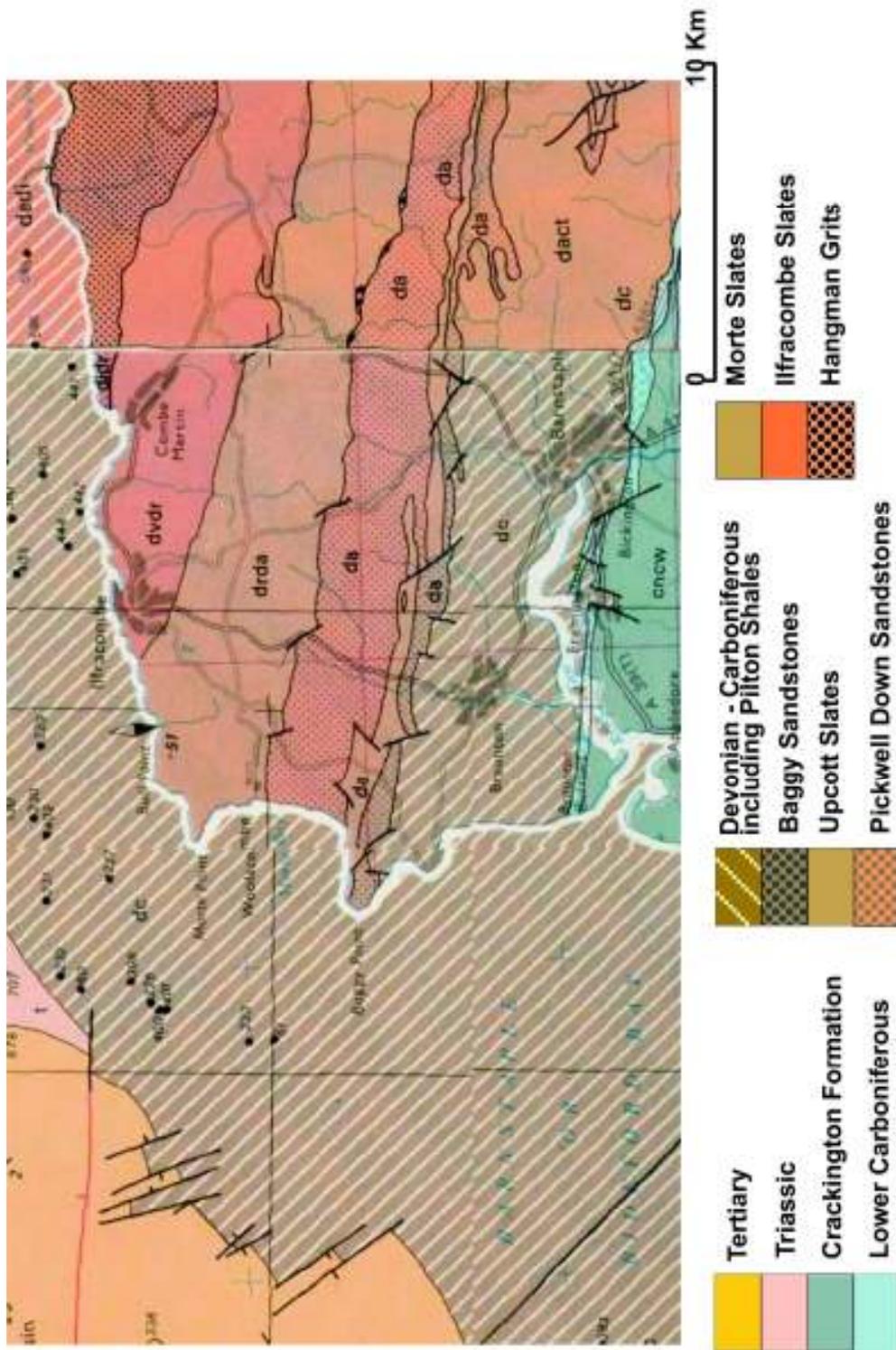
Table 2. Proposed County Geological Sites

Summary of the geology of the Phase 2 part of the North Devon AONB and its immediate surroundings

Most of the area of this northern part of the AONB is underlain by sedimentary rocks belonging to the Middle and Upper Devonian, but some Carboniferous crops out in the Croyde to Barnstaple area. Pleistocene to Recent deposits occur in the Croyde to Saunton area and flanking the northern side of the River Taw.

The Devonian rocks were laid down in conditions ranging from fluvial to shelf marine, in a fault-controlled basin which derived its supply of sediments from the north. The topmost Devonian sediments indicate a deepening of the sea and this trend continues into the Carboniferous. During the late Carboniferous the Devonian and Carboniferous rocks were folded and faulted during the Variscan Orogeny.

During the Ice Age the ice came as far south as the Taw Estuary leaving transported erratic boulders such as granite and granulite gneiss. Raised beaches belonging to interglacial phases during the Ice Age are well developed. River deposits which were deposited since the Ice Age and are still being deposited today lie along the Taw Estuary



Based upon BGS Geological 1:250 000 Map sheets 51N 06W Lundy and 51N 04W Bristol Channel, by permission of the British Geological Survey IPR/51-39C British Geological Survey. c NERC. All rights reserved

Figure 2. Geological map of the northern part of the North Devon AONB

Devonian.

The Devonian sediments of North Devon were deposited in an environment ranging from fluvial to shelf marine and were derived from a landmass to the north in the area of what is now Wales. The approximately east – west shoreline oscillated from north to south in its position. Southward movement brought the more continental and fluvial conditions more characteristic of the Welsh Devonian into North Devon, while a retreat northwards allowed the more marine conditions normally found in south Devon to migrate to North Devon. The types of sediments and their contained fossils which characterize these marine and continental pulses are described below in the formation and member descriptions (Fig.3).

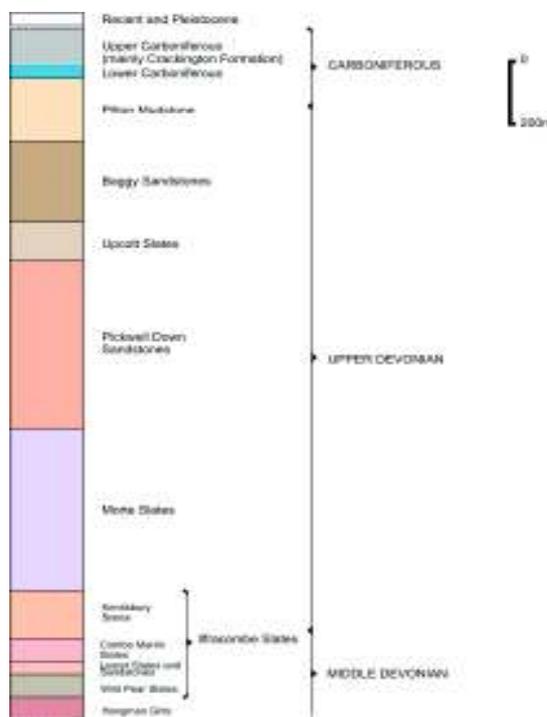


Figure 3. Stratigraphy of the northern part of the North Devon AONB

Middle Devonian

Hangman Grits

Although this formation does not crop out within the AONB for completeness it is described. The formation is divided into five members in which sandstones predominate along with some conglomerate. These beds are of fluvial origin and some sandstones show convolute bedding and some yield remains from primitive plants. Intercalated into this mainly sandy

sequence are three formations which contain marine fossils and indicate marine transgressions into the area.

Ilfracombe Slates

This formation is divided into four members all marine in origin, the Wild Pear Slates, the Lester Slates- and- Sandstones, the Combe Martin Slates and the Kentisbury Slates

Wild Pear Slates

This member consists of slates with subordinate sandstones and siltstones with a few limestones. There is a poorly developed marine fauna and indications are that the member was deposited on the front part of a delta.

Lester Slates and Sandstones

This member comprises slates sandstones, some cross-bedded and some coarse and thin crinoidal limestones. In part of the member corals and brachiopods have been found indicating shallow offshore conditions.

Combe Martin Slates

The Combe Martin Slates consist mainly of slate with three distinctive limestone beds and some sandstone and siltstone. The faunas in the limestones are dominated by corals along with crinoids brachiopods and gastropods. The environment was fully marine. Variation in nature of the coral faunas from the same member in the Quantock Hills, well to the east of the present area westward to the Combe Martin area, suggest that the sea was deepening westwards.

Kentisbury Slates

This highest member in the Ilfracombe Slate is still dominantly slate but with common siltstones and sandstones some coarse-grained and up to 2m thick. It is possible that the junction of the Middle and Upper Devonian occurs within the Kentisbury Slates but lack of good diagnostic fossil material. The presence of much sand and lack of a well developed marine within the member suggests a progradation of the shoreline from the north. The member may have been deposited on a delta platform.

Upper Devonian

Morte Slates

This formation is made up dominantly of greenish grey to purple slates with a few thin sandstone bands and calcareous nodules. A poorly developed fauna consisting of brachiopods such as *Cyrtospirifer verneuili* and bivalves suggests that fresh and brackish water from a nearby delta was reducing the salinity in the pro delta area.

Pickwell Down Sandstones

Cross-bedded and ripple marked red purple and green sandstones. At the base there is keratophytic tuff band known as the Bittadon 'Felsite' which has yielded fish remains. These sandstones represent a return to continental sedimentation probably in rivers and lakes not dissimilar to the conditions appertaining to the sedimentation of the Old Red Sandstone of South Wales.

Upcott Slates

Greenish grey slates and siltstones with occasional fine-grained cross-bedded sandstones dominate the member. Some comminuted shell debris is present. It has been suggested that these beds were deposited in alluvial back-swamps or shallow freshwater lakes.

Baggy Sandstones

The formation is characterised by massive cross-bedded sandstones, thin-bedded sandstones, conglomerates and slumped beds as well as thin limestones. The fauna is poor but contains bivalves, possibly of brackish to freshwater affinities, and plant remains. Trace fossils are common. The Baggy Sandstones were probably deposited in a delta being built out southwards from a river coming from the north.

Pilton Mudstones

The Pilton Mudstones which span from the Devonian up into the Carboniferous are made up of fossiliferous slates and sandstones, although the amount of sandstone diminishes upward into the Carboniferous part of the formation. The delta of the Baggy Sandstones retreated northward and the Pilton Mudstones were deposited in a well oxygenated shelf sea which showed signs of deepening upward into the Carboniferous.

Carboniferous

The Carboniferous is not well represented at outcrop in the area of the AONB owing to a cover of alluvium and Blown Sand, but outcrop to the east suggests that both Lower and Upper Carboniferous may be present.

Lower Carboniferous

Pilton Mudstones

This probably consists of mudstones containing fossils such as trilobite, and brachiopods deposited in a deepening shelf environment.

Codden Hill Chert

To the east of the area this formation consists of cherts and dark grey to black mudstones deposited in deep water with a lack of oxygen in the bottom waters. Thus the fossils found came from free swimming organisms such as goniatites and bivalves which lived in the better oxygenated upper waters.

Upper Carboniferous

Evidence from farther east suggests that dark grey shales and sandstones of the Crackington and Limekiln formations may underlie part of the area. These sediments were deposited in water less deep than during the deposition of the Lower Carboniferous, by the action of turbidity currents flowing down a southward dipping slope, probably from deltas to the north.

Variscan Orogeny

Deposition of the Devonian and Carboniferous sediments ceased late in the Carboniferous and earth forces connected with the Variscan Orogeny compressed the rocks in a south to north direction producing folds overturned to the north and with crests aligned east – west. At the same time as the development of folding, the compression caused recrystallisation and reorientation of the platy minerals found particularly in the more muddy rocks and this produced a fissility along planes at an angle to the original bedding. This fissility or ability to be easily split is known as slaty cleavage and in this area is particularly marked in such formations as the Morte Slates. This cleavage has an axial planar relationship to the folding (Fig. 4).

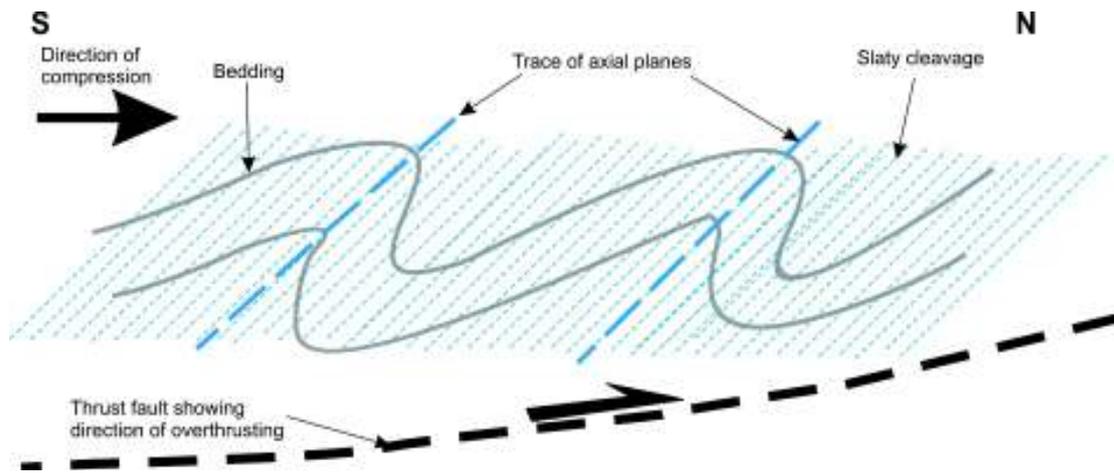


Figure 4. Generalised relationship of cleavage to bedding in the North Devon area showing possible thrust fault at depth.

The deformation of the area during the Variscan Orogeny also led to much faulting which is of three main types. One type, which is least easy to detect, is normal faulting sub parallel to the dip and the folding. One example of this is the Brushford Fault which passes along the southern edge of Exmoor and may reach the west coast under Braunton Burrows. Another type is wrench faulting, which in this area trends NW-SE or NNW-SSE. This faulting typically shows dextral movement, and is part of a swarm of such faults which cut South-West England. The best known within the AONB is the Combe Martin Fault with which may be associated the silver /lead mineralisation of Combe Martin. The Sticklepath Fault to the west of the present area is probably the most studied of these faults in S.W. England. These wrench faults are best seen crossing the cliffs and foreshore around Morte Point and to the east of this towards Combe Martin. The third type of faulting is thrusting which is not seen cropping out at the surface at all but may be deduced from geophysical data and other tectonic considerations. One such major thrust may underlie the Exmoor area carrying it northwards over Carboniferous rocks of Mendip aspect.

Mineralisation

The most important mineralisation within the AONB is that of silver bearing lead at Combe Martin. The argentiferous galena there is reputed to have been worked as early as the 13th Century but the last major working was in the time of Queen Elizabeth I. The ore is mainly associated with the Lester Slates and Sandstones and may have been formed before the main Variscan deformation. During that episode the ore

bodies appear to have been folded and some of the ore redistributed within the cleavage and in fault structures such as the Combe Martin Fault.

Quaternary

Since there is no direct evidence of the occurrence of sediments of Permian to Tertiary age over Exmoor, the next proven deposition took place during the Pliocene with marine beach sediments from interglacial times and erratics from the glacial periods. The Saunton to Baggy Point Coast SSSI contains examples of both the beach deposits and the erratics.

It is thought that ice of the Wolstonian Stage reached the north Devon and Cornish coast and pushed up the Taw Estuary. The last glaciation of the Ice Age, the Devensian ice did not reach farther south than south Wales. The Wolstonian ice transported erratic blocks including gneiss, porphyry, dolerite and epidiorite into the area and these are now found on old shore platforms within the Saunton area. These erratics probably came in the ice from western Scotland.

Later in the geological history of the area is the establishment in the late Pleistocene and Flandrian of a river and estuary system with attendant river terrace gravels and loams as well as estuarine muds. This system bore some resemblance to the present Taw and Torridge river system.

Appendix 1

Site Descriptions

Putsborough Sands	Appendix 1- 2
Windy Cove, Morte Point	Appendix 1- 9
Tunnels Beaches	Appendix 1- 12
Rapparee Cove	Appendix 1- 16
Blythes Cove	Appendix 1- 20
Watermouth	Appendix 1- 24

Key to site maps



Devon County Geological Sites (otherwise known as Regionally Important Geological Sites)

Site reference no. SS 44 SW/1 **Name:** Putsborough Sands

District: North Devon **Parish:** Georgeham

National grid ref: SS 4455 4073 to 4507 4133 **OS sheets:** 1:50k 180 1:25k 139 1:10k SS 44 SW GS 1:50k 292

Locality description (address): Putsborough Sands at South end of Woolacombe Sands

Nature of site: Rocky foreshore and low cliffs

Geological / geomorphological features:

Pickwell Down Sandstone. Red purple and greenish grey sandstones, siltstones and slates (Plate 1). Some sandstones are relatively structureless in the bottom part and grade up into finer more muddy laminated tops (Plate 2). The sandstones are commonly cross-bedded and some show and ripple drift bedding (Plates 3 & 4). Mud clast conglomerates are seen (Plate 5). Sometimes the more muddy siltstones and slates below the more massive sandstones are disrupted and brecciated by the sudden deposition of sand on a fluid unconsolidated mud (Plates 6 & 7). The features seen are characteristic of deposition in a fluvial to possibly lacustrine environment. The beds dip at angles of between 50° and 65° in a southerly direction and are affected by a cleavage which shows up strongly in the slates and more muddy sandstones. At the southern end of the site the transitional junction with the more mudstone rich Upcott Slates can be seen.

Reasons for registration as a Regionally Important Geological / Geomorphological Site:

The only good examples within the AONB of the more continental sediments of the Pickwell Down Sandstones. Both the lithologies and sedimentary structures are well displayed as well as structural features such as cleavage.

Site sensitivity: None

Safety: The cliffs are sufficiently low not to cause any problems unless one ventures to the cliff of Upcott Slate to the south. Care must be exercised in climbing over any slippery rocks.

Interest groups: **Schools.** Years 17-18. **University.** Undergraduate - Research
Professional geologists - Amateur geologists - General
public.

Access and Parking: Paying car park at [SS 4475 4075] See map. Payment is required for whole day

Date of assessment (V = visited) : V November 2005 E C Freshney

Site owner :

Foreshore is presumably Crown property but the access and car park probably belongs to
Putsborough Sands Caravan Park
Putsborough
Georgeham
Nr Braunton EX33 1LB

Other comments:

Overlaps in southern part with SSSI (Saunton to Baggy Coast)

References:

Edmonds, E.A., Williams, B.J. and Taylor, R.T. 1979. Geology of Bideford and Lundy Island. *Mem Geol. Surv. G.B.*, sheets 292, with 275, 276, 291 and part of 308.

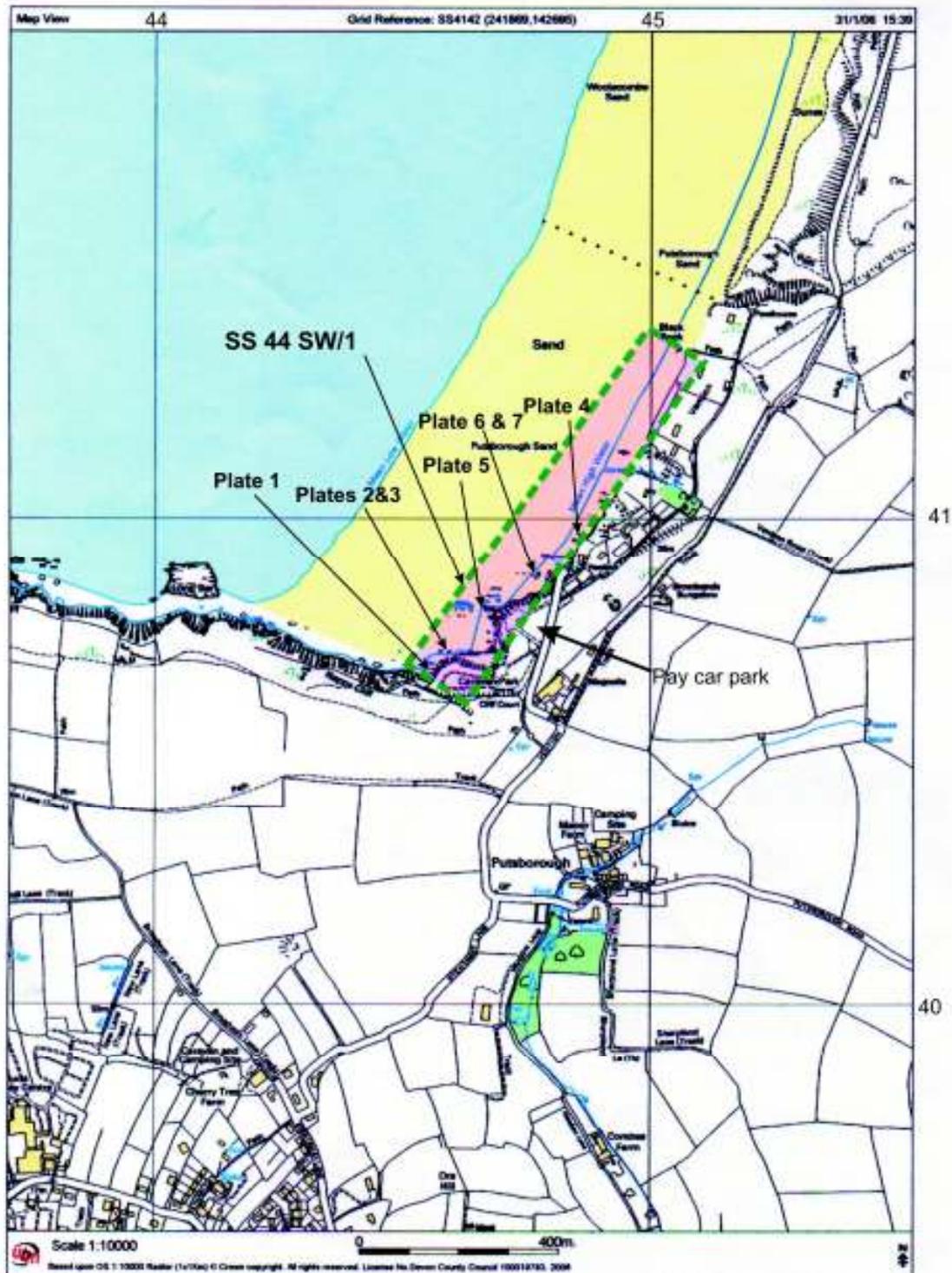




Plate 1 Purple sandstones and greenish grey slates and siltstones of Pickwell Down Sandstones



Plate 2 Purple sandstone in Pickwell Down Sandstones showing more massive lower part to right overlain by more muddy laminated upper part where the cleavage is more marked

Plate 3. Top part of sandstone seen in Figure 2 showing cross-bedding and cleavage

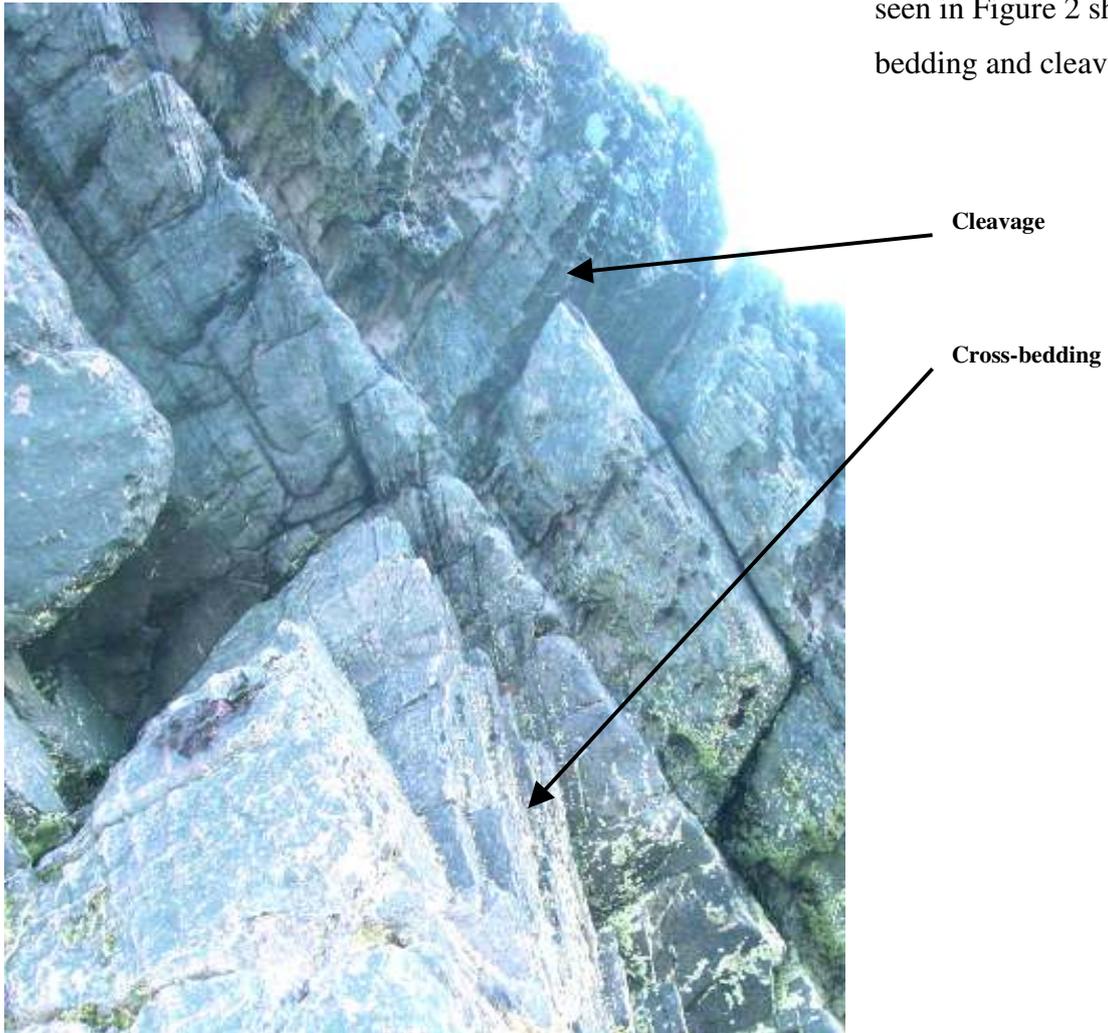


Plate 4. Sandstone showing small scale cross-lamination (ripple drift bedding)

Mud clast conglomerate



Plate 5. Purple sandstones with greenish grey siltstones and a mud clast conglomerate



Plate 6. Purple and grey mudstone and siltstone brecciated by sudden deposition of overlying sandstone.



Plate 7. Purple and green brecciated siltstone and mudstone underlying massive sandstone. Detail from Plate 6.

Devon County Geological Sites (otherwise known as Regionally Important Geological Sites)

Site reference no. SS 44 NW/1 **Name:** Windy Cove, Morte Point

District: North Devon **Parish:** Morthoe

National grid ref: SS 4452 4540 **OS sheets:** 1:50k 180 1:25k 139 1:10k
SS44NW **GS** 1:50k 292

Locality description (address): Windy Cove, Morte Point

Nature of site: Cliffs

Geological / geomorphological features:

Greenish grey Slates of the Morte Slates showing indistinct colour banding. Well-developed slaty cleavage. The bedding strikes 260° and dips at 22° N. The colour banding associated with the bedding can be seen on the extensive cleavage surfaces on the southward facing cliff on the northern side of the cove. Bedding surfaces can be seen dipping northward into the sea at the western end of the cove. The cleavage is subvertical and strikes at 290°

Reasons for registration as a Regionally Important Geological / Geomorphological Site:

Good examples of bedding cleavage relationships where bedding is not clearly picked out by strong lithological contrasts such as sandstone and slate.

Site sensitivity: None

Safety: Care must be exercised near the cliff edge

Interest groups: **Schools.:** Years 17-18. **University.** Undergraduate - Research Professional geologists - Amateur geologists - General public.

Access and Parking: Parking in Morthoe with a walk on public paths towards Morte Point

Date of assessment (V = visited) : V 2005 E C Freshney

Site owner : National Trust

Other comments: Lies within the Morte Point biological SSSI

References:

Edmonds, E.A., Williams, B.J. and Taylor, R.T. 1979. Geology of Bideford and Lundy Island. *Mem Geol. Surv. G.B.*, sheets 292, with 275, 276, 291 and part of 308.



WINDY COVE, MORTE POINT

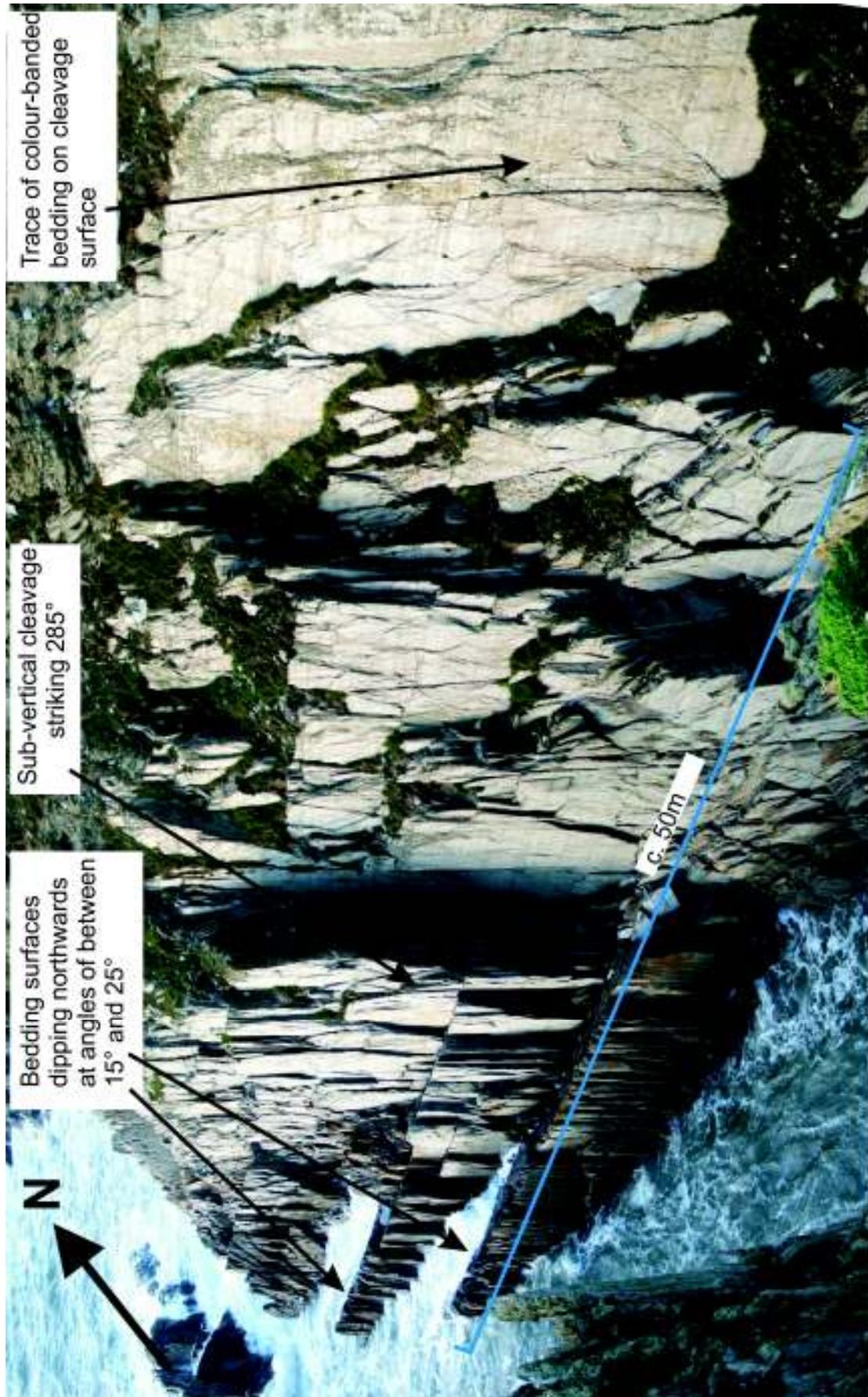


Plate 8. Morte Slates showing relationship between bedding and cleavage

Devon County Geological Sites (otherwise known as Regionally Important Geological Sites)

Site reference no. SS 54NW/1 **Name:** Tunnels Beaches, Ilfracombe

District: North Devon **Parish:** Ilfracombe

National grid ref: SS 5144 4778 to 5105 4766 **OS sheets:**1:50k 1801:25k 139 1:10k
SS54NW **GS 1:50k** 277

Locality description (address): Cliffs at Tunnel Beach, Ilfracombe

Nature of site: Base of cliffs above High Water Mark

Geological / geomorphological features:

Grey silty slates and sandstones of the Upper Devonian Kentisbury Slates showing intense deformation of the bedding by a strong penetrative slaty cleavage. The bedding dips around 25° in a southerly direction while the cleavage also dips south but at 60°. In places the sandstones are almost completely disrupted by the cleavage. (Plates 9 to 11)

Reasons for registration as a Regionally Important Geological / Geomorphological Site:

Good exposures of the lithology of part of the Kentisbury Slates and the effect of intense deformation on a mudstone/ sandstone sequence.

Site sensitivity: None known

Safety: Care must be taken with the state of the tides to avoid being cut off if one went too far west on a rising tide. There is also some possibility of falling debris from the cliff

Interest groups: **Schools.** Years 12-16: Years 17-18. **University.** Undergraduate - Research Professional geologists - Amateur geologists - General public.

Access and Parking: The access to the site through a tunnel is private and a charge is made. A left branch of the tunnel accesses 'Gent's Beach' while the right branch goes to 'Lady's Beach', a relict of the days of bathing segregation. The photographs in this description were taken at Gent's Beach. There are three small car parks around the entrance to the site but these are likely to be very busy in the holiday season.

Date of assessment (V = visited) : V E C Freshney August, 2004

Site owner : Tunnels Beaches, Bath Place, Ilfracombe, North Devon

Other comments:

References: Edmonds, E.A., Whittaker, A. and Williams, B.J. 1985. Geology of the Country around Ilfracombe and Barnstaple. *Memoir of the British Geological Survey*, Sheets 277 and 243 (England and Wales).



TUNNELS BEACHES

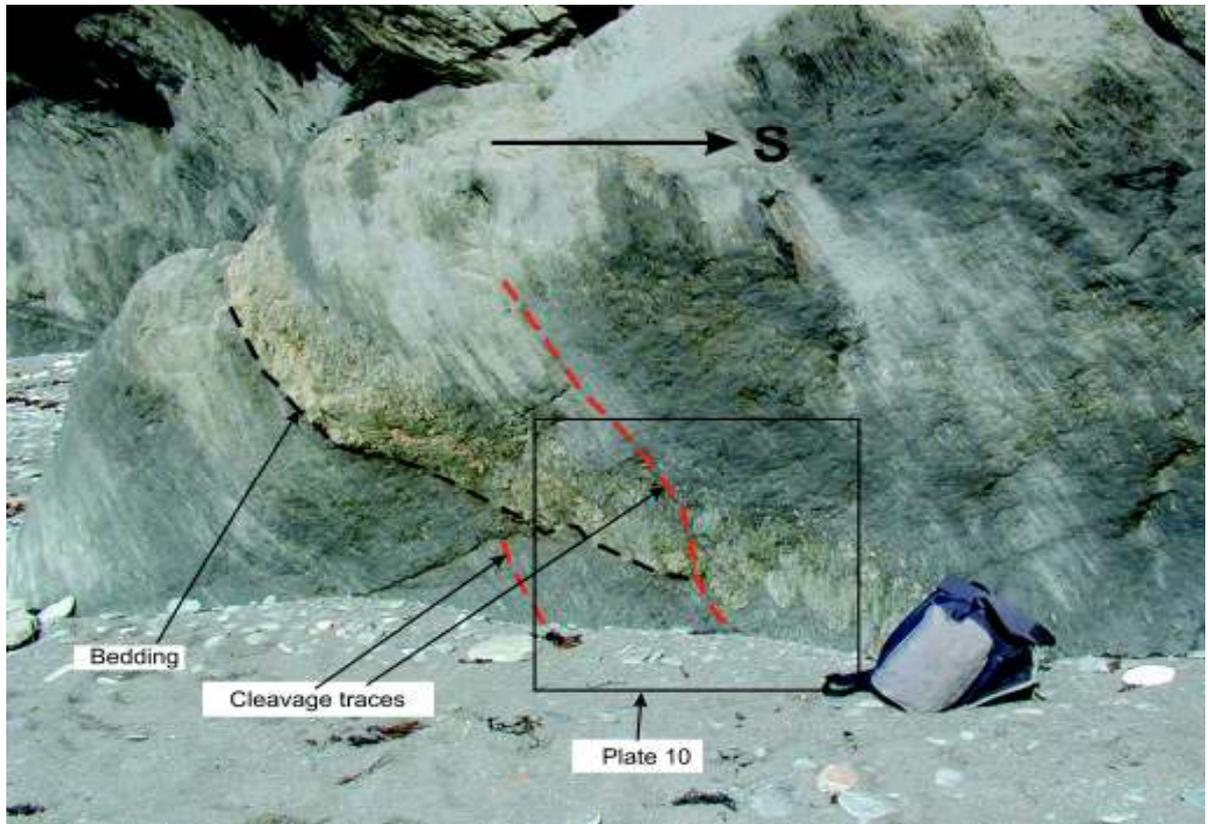


Plate 9. Grey silty slates and sandstone of the Kentisbury Slates showing sandstone partly disrupted by penetrative slaty cleavage. Outline box shows position of Plate xx



Plate 10. Detail from Plate 9 above showing cleavage shearing out the sandstone.



Plate 11. Strike section in Kentisbury Slates showing strong slaty cleavage (sub horizontal in this view) with many tectonic lenses of siltstone and sandstone produce by the dismemberment of the bedding by the cleavage

Devon County Geological Sites (otherwise known as Regionally Important Geological Sites)

Site reference no. SS 54 NW/2 **Name:** Rapparee Cove

District: North Devon **Parish:** Ilfracombe

National grid ref: SS 528477 **OS sheets:** 1:50k 180 1:25k 139 1:10k
SS54NW **GS 1:50k** 277

Locality description (address): Rapparee Cove, on coast east of Ilfracombe

Nature of site: Small cove with beach, steps down onto beach

Geological / geomorphological features:

Slates and sandstones of the Kentisbury Slates

Large normal fault, showing terminal drag on hanging wall at back of cove

Fault plane is visible on the western side of the cove, showing some slickensides

Cleavage/bedding relationships and small scale folding visible in the cliff along the lower part of the access path

Reasons for registration as a Regionally Important Geological / Geomorphological Site:

Excellent site for observing a large faulted contact. Obviously displaced beds

Site sensitivity: None known

Safety: Advisable to check tide tables. Inaccessible at high tide

Interest groups: Schools, Years 5-11: Years 12-16: Years 17-18. University, Undergraduate -
- Amateur geologists - General public.

Access and Parking:

Rapparee Cove is to the east of Ilfracombe Harbour

About fifty steps down to the beach from the path

Easily reached from south west coast path on foot

Parking possible at Ilfracombe Swimming Pool site on A399

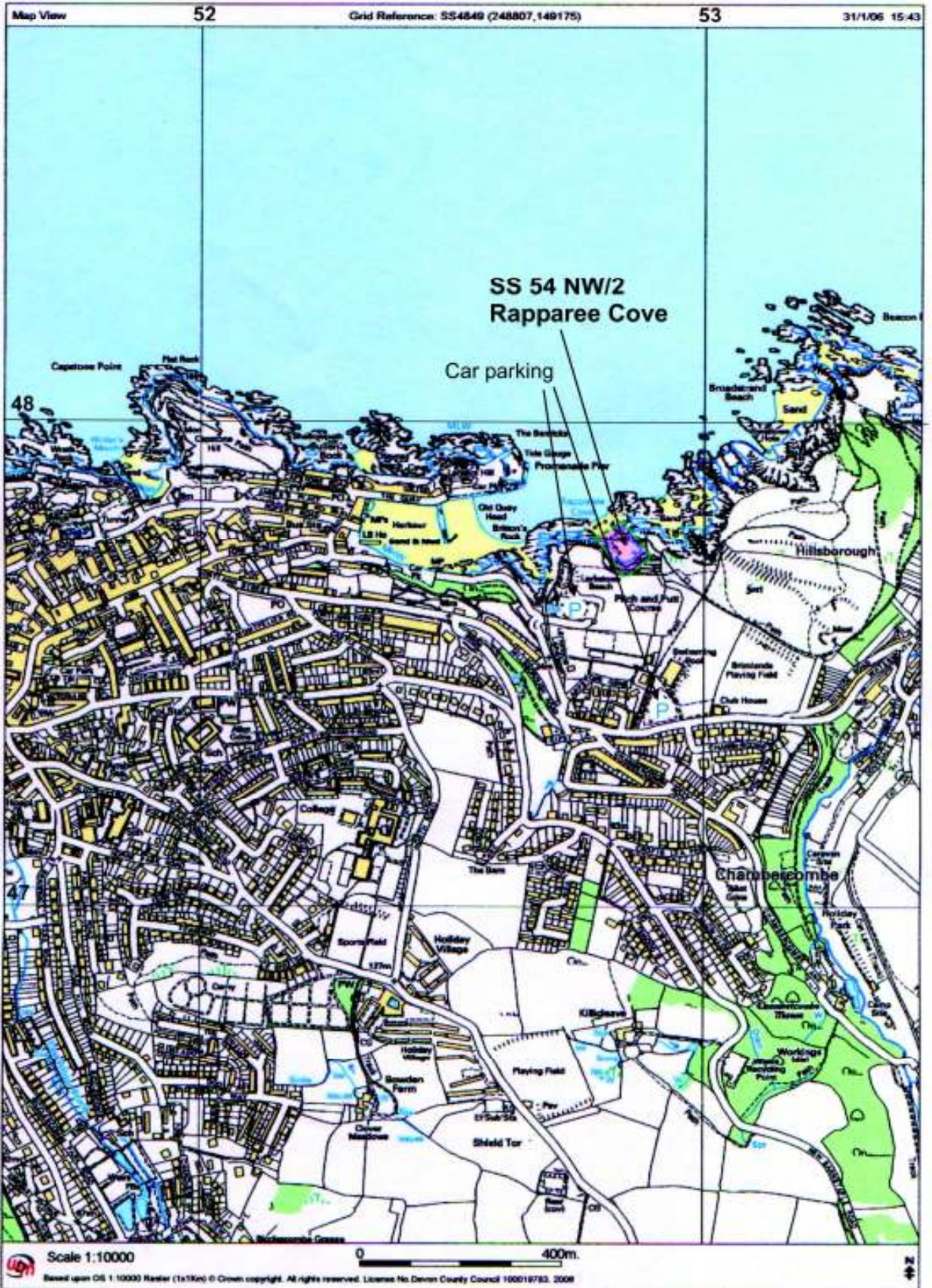
Date of assessment (V = visited): V 13 January 2006 J. Mather and
Jenny Bennett

Site owner : Foreshore ? Crown

Other comments:

References:

Edmonds, E.A., Whittaker, A. and Williams, B.J. 1985. Geology of the Country around Ilfracombe and Barnstaple. *Memoir of the British Geological Survey*, Sheets 277 and 243 (England and Wales).



RAPPAREE COVE



Plate 12. Normal fault at the back of Rapparee Cove showing terminal drag on hanging wall. Contrast in lithologies across faults indicates scale of displacement



Plate 13 Fault related drag folding to west of fault in Plate 12.

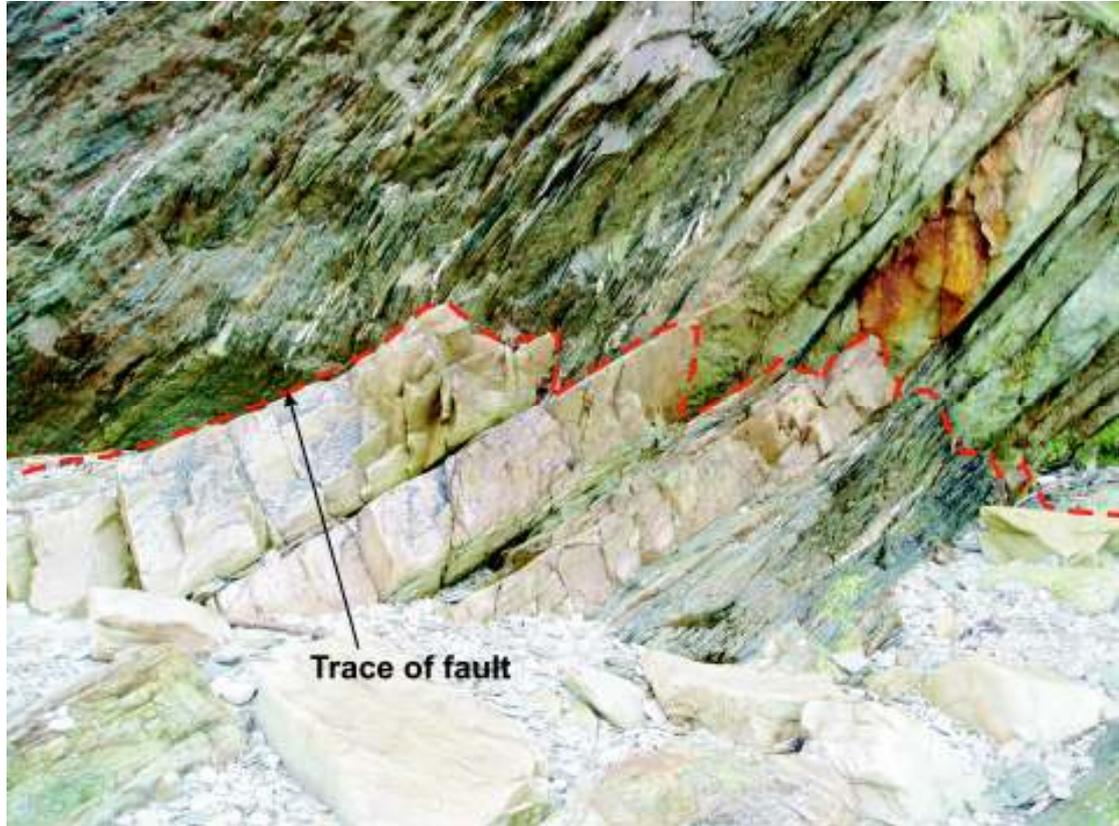


Plate 14. Sandstones and slates of the Kentisbury Slates cut by faulting at Rapparee Cove. The beds on the far side of the fault show a steeper dip than those on the viewer's side of the fault.

Devon County Geological Sites (otherwise known as Regionally Important Geological Sites)

Site reference no. SS 54 NW/3 **Name:** Blythes Cove
District: North Devon **Parish:** Ilfracombe
National grid ref: SS 536 479 **OS sheets:** 1:50k 180 1:25k 139 1:10k SS54
NW **GS 1:50k** 277

Locality description (address): Western side of Hele Bay, to west of SSSI

Nature of site: exposure of deformed slates and sandstones on beach

Geological / geomorphological features:

Limestones and slates of the Combe Martin Slates
Good bedding/cleavage relationships, mineral veining, alternation of limestones, sandstones and shales, accessible on beach just below slipway. Small leat needs to be crossed

Reasons for registration as a Regionally Important Geological / Geomorphological Site:

Very clear cleavage /bedding relationships easily visible

Site sensitivity: None known

Safety:

Not accessible at high tide
Leat needs crossing with care

Interest groups: **Schools.** Years 17-18. **University.** Undergraduate -
Amateur geologists - General public.

Access and Parking: Pay car park near beach on Beach Road, not suitable for coaches

Date of assessment (V = visited) : January 13th 2006 V Jenny Bennett and John Mather

Site owner :

Public beach

Other comments:

On western side of bay from Hele, Samson's & Combe Martin bays SSSI
Could be combined with visit to this SSSI, and to the Hillsborough local nature reserve

References:

Edmonds, E.A., Whittaker, A. and Williams, B.J. 1985. Geology of the Country around Ilfracombe and Barnstaple. *Memoir of the British Geological Survey*, Sheets 277 and 243 (England and Wales).



BLYTHES COVE

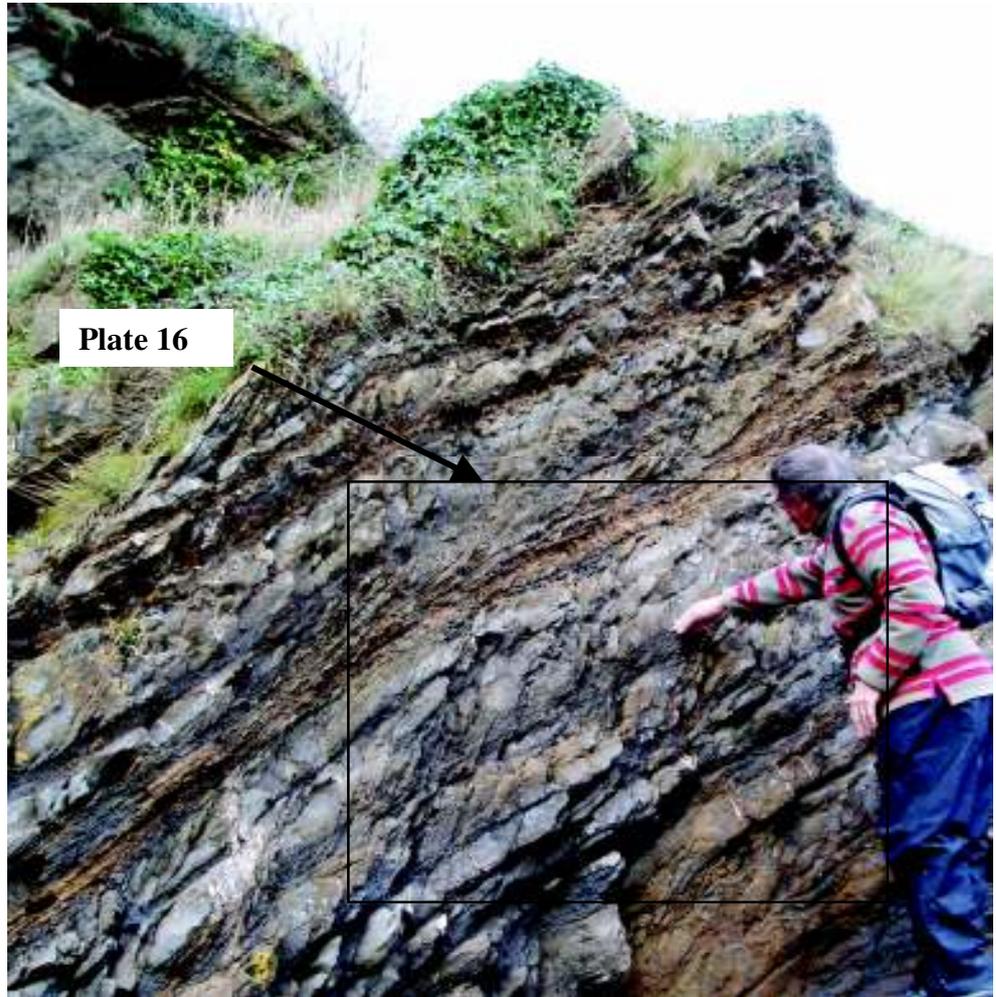


Plate 15. Cleavage/ bedding relationship in slates and limestones of the Combe Martin Slates. Cleavage at around 40° to bedding

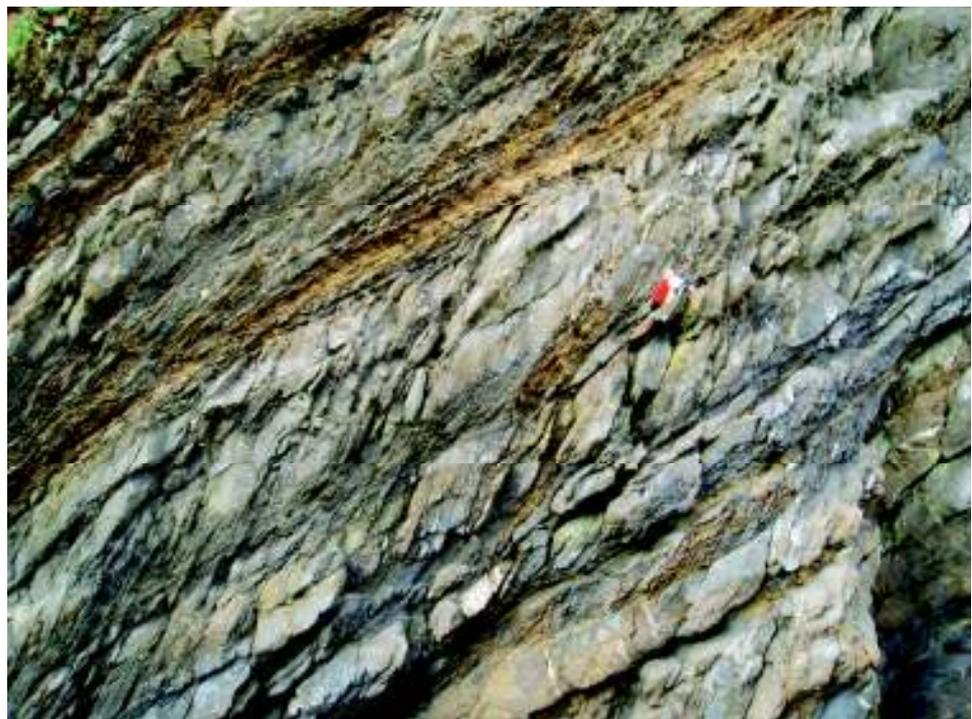


Plate 16. Close up of part of section in Plate 15 above.



Plate 17. Rotation of cleavage across shear zone mineralised with quartz and ferruginous calcite.

Devon County Geological Sites (otherwise known as Regionally Important Geological Sites)

Site reference no. SS 54 NE/1 **Name:** Watermouth

District: North Devon **Parish:** Berrynarbor

National grid ref: SS 555 482 **OS sheets:** 1:50k 180 1:25k 139 1:10k SS 54
NE GS 1:50k 277

Locality description (address): Watermouth, inlet close to Watermouth Castle
(Watermouth Harbour) off A39

Nature of site: Inlet, with features exposed on foreshore

Geological / geomorphological features:

Lester Slates-and-Sandstones. Cross-bedded sandstones, silty slates and ferruginous limestones. The inlet is a drowned valley. Tight folding can be seen in rocks on the northern foreshore, slates rich in burrows (*chondrites*) are visible interbedded with sandier layers. Iron stained siltstones present. Large recumbent fold on southern side is visible from the southern end of the northern shore

Reasons for registration as a Regionally Important Geological / Geomorphological Site:

Good exposures of Lester Slates-and-Sandstones containing trace fossils. A well exposed semi recumbent fold. Geomorphology, (drowned valley).

Site sensitivity: None known

Safety:

Tide dependent, inlet fills very quickly

Interest groups: Schools. Years 12-16: Years 17-18. University.

Undergraduate - Research Professional geologists - Amateur geologists - General public.

Access and Parking: Access is past the Watermouth Cove holiday park. There is a small pay car park at the Harbour

Date of assessment (V = visited) : V January 13th 2006 Jenny Bennett and John Mather

Site owner :

Harbour is next to Watermouth Cove, part of a 27 acre private park, The northern headland is owned by the Watermouth Cove Holiday Park

Other comments:

References:

Edmonds, E.A., Whittaker, A. and Williams, B.J. 1985. Geology of the Country around Ilfracombe and Barnstaple. *Memoir of the British Geological Survey*, Sheets 277 and 243 (England and Wales).



WATERMOUTH



Plate 18. *Chondrites* trace fossils in siltstones interbedded with ferruginous weathering limestone



Plate 19. Syncline overturned to North with axial plane and slaty cleavage dipping at 40° - 50° S



Plate 20. Recumbent chevron folds in slate

Appendix 2 Glossary and abbreviations

Bivalve	Marine or freshwater molluscs having a soft body with platelike gills enclosed within two shells hinged together
Brachiopod	Sessile, two-shelled, marine animals that somewhat resemble bivalves(i.e. "clams") externally but are quite different internally.
Breccia	A rock formed from angular fragments instead of rounded. See conglomerate
CGS	County Geological Site. A RIG site of countywide importance
Chert	A fine-grained sedimentary rock composed of crypto-crystalline silica
Conglomerate	A rock formed from rounded fragments or pebbles
Conodont	Distinctive multi-bladed teeth made made of calcium phosphate which belonged to a worm like creature possibly ancestral to vertebrates
Crinoids	Sea-lily, or stalked echinoderm; related to the starfish and the sea-urchin
Cross-bedding	Sets of layers or beds inclined to the true structural dip caused by current transportation mainly seen in sandstones
Devensian	The last glacial period (or Ice Age) of the Pleistocene in Britain
Dextral movement	Right lateral movement on a wrench fault
Dolerite	Medium grained igneous rock with composition similar to basalt
Distributary	Minor rivers that branch off from a major river before it reaches the sea, particularly in a delta
Distal turbidite	A sedimentary deposit formed by a bottom hugging current bearing a poorly sorted load of sand, mud and silt. The 'distal' refers to it being deposited far out in the basin or on the lower slopes
Epidiorite	A metamorphosed form of gabbro or dolerite
GCR	Geological Conservation Review. The GCR was designed to identify those sites, usually already SSSIs, of national and international importance needed to show all the key scientific elements of the Earth heritage of Britain.

Goniatite	One of an extinct genus of fossil cephalopods, allied to the later ammonites
Granulite gniess	A high-grade metamorphic rock with a coarse fissility characteristic of a gniess
Keratophyric tuff	Consolidated volcanic ash derived from a sodium rich lava
Lithology	The physical character of a rock, such as color, mineralogy, and grain size
Porphyry	An igneous rock with crystals embedded in a finer groundmass of minerals
Progradation	The outward building of a sedimentary deposit, such as the seaward advance of a delta or shoreline
Raised beaches	The remnants of former coastlines represented by platforms usually with deposits of gravels and sands on them
Slickensides	A smooth striated polished surface produced on rock by movement along a fault
Slumped bed	A sediment formed of the transported and disrupted debris of pre existing sediments. This disruption takes place on a marine slope and may be triggered by an earth tremor
Stratigraphy	The sequence or order of rock or soil layers in a geologic formation.
Terminal drag	Distortion of the bedding adjacent to a fault and showing its last direction of movement
Trilobite	Marine arthropods, a phylum of hard-shelled creatures with multiple body segments and jointed legs
Turbidity current	A bottom hugging current bearing a poorly sorted load of sand, mud and silt
Variscan Orogeny	A period of mountain building and tectonic deformation that spanned in time from early to late Carboniferous.
Unconformably	A situation where a geological surface separates older from younger rocks and represents a gap in the geologic record
Wolstonian	The penultimate Pleistocene glaciation in Britain

Wrench fault A fault which moves in a lateral direction rather than up and down as is the case of a normal or reverse fault