2.5. Devonian/Carboniferous (Variscan), North Devon

The Variscan Orogeny or mountain building period which caused the severe folding and deformation of the Devonian and Carboniferous rocks in South West England resulted from gradual encroachment and collision of a continent drifting from the south. The effects of this were progressive south to north during the two geological periods. The earlier Devonian rocks of South Devon had already been severely deformed and compressed whilst the later Carboniferous rocks in a marine sedimentary basin to the north were still being formed.

The late-Devonian and Carboniferous marine limestones, sandstones and shales of North Devon are well seen in five active quarries, Meldon, Westleigh, Bray Valley, Venn and Beam.

2.5.1 Meldon Quarry

General view of current working area.

Photo ME 07 *From SX 5692 9262* *Facing NW*

Meldon Quarry is near Okehampton on the northern edge of Dartmoor. Several different rock types are worked. In the current working area the suite of rock types left to right includes chiastolite slate (blue-grey colour) in contact with metamorphosed rock, in contact with dolerite dyke 1 (mainly beneath the blast rubble). Elsewhere in the complex structure in the quarry are volcanic tuffs with dolerite dykes of the Meldon Volcanic Formation, mudstones, siliceous slates, impure limestones and cherts of the Lower Carboniferous Meldon Chert Formation and sandstones and shales of the Upper Carboniferous Crackington Formation. In addition, the intensely deformed Slate with Lenticles Formation, the oldest rock present, is believed to be Devonian in age.

The whole suite of different rocks has been metamorphosed and mineralised in the contact aureole (i.e. the zone affected by heat) of the Dartmoor Granite. All the different rocks have been intensively heated and the product mixture is sold as hornfels, a rock name applied to all rocks baked hard by heat of a nearby igneous intrusion. Historically, the product has been valued for its strength properties for use as rail ballast.

Much of the geological interest at Meldon is in the wide Geodiversity range of rock and mineral types and the quarry is designated as a Site of Special Scientific Interest.

Some examples of the diversity of rock and mineral types at Meldon:

Clockwise from top left:

1. *Fine grained hornfels metamorphosed from original mudstone.*
2. *Porphyritic dolerite*
3. *Slate with chiastolite crystals formed by metamorphism of some types of mudstones*
4. *Sulphide mineralization weathering to rusty coloured mineral oxides*
5. *Sulphate residue (white) precipitated recently from acid water on hornfels surface*
6. *Wollastonite, a fibrous calcium silicate mineral resulting from metamorphism of siliceous limestone.*

2.5.2 Westleigh Quarry

General view of the quarry and outcrop of Westleigh Limestone Formation

Photo WE 0 *Aerial Photo* *Facing East*

Westleigh Quarry, Burlescombe, situated to the west of the M5 about 10 km ENE of Tiverton, is a large limestone quarry working the Lower Carboniferous Westleigh Limestone Group. The limestone forms an elongate ridge aligned WSW-ENE in the form of an inlier completely surrounded by the Aylesbeare Mudstone Group of Triassic age.

The quarried ridge exposes the limestone for a total length of about 2km. In the foreground is the original Westleigh Quarry, now merged with Fenacre Quarry at the farthest end of the complex. Rocknell Quarry, currently not working, is just off the bottom right corner of the photo and Lower Whipcott Quarry, a geological SSSI for the Westleigh Limestone, is at the top left immediately beyond the yellow field.

The Westleigh Limestone deposit is unique in southwest England in that it is a localised accumulation of more than 100 metres thickness of turbidite limestones formed in deep water by high density tubidity currents flowing from shelf sea areas to the north, the same process which formed the sandstones and shales of the Crackington and Bude Formations quarried at Venn and Beam Quarries to the west.

Westleigh Quarry *West end of main quarry showing anticline*

Photo WE 03b *From ST 0581 1716* *Facing West*

A major anticline axis extends along the full length of the quarry. The photo shows the anticline as seen in the west end of the quarry viewed from the south side. In the left half of the photo the beds dip steeply to the left and towards the viewpoint; in the right half of the photo, the beds dip steeply to the right and away from the viewpoint.

Particularly in and close to the axial zone, the folding is often complex. The fold plunges at either end of the quarry forming a long periclinal or 'whaleback' structure. The fold is displaced at several places along its length by numerous cross faults. At the other end of the quarry at Fenacre, a cross fault displaces the axis by about 120 metres.

The overall red colour of the rock surfaces at Westleigh is considered to be caused by staining from the overlying and surrounding Triassic red beds which rest unconformably on the limestone infilling a palaeokarst surface. The limestone is generally a medium grey colour.

The Westleigh Limestone Group is subdivided into two - the Upper Westleigh Limestone, mainly thickly bedded limestones with thin shale partings and chert beds and nodules, and the Lower Westleigh Limestone, which comprises thinly bedded and argillaceous limestones with interbedded mudstones and shales. The junction is gradational, one into the other.

Westleigh Quarry *Upper Westleigh Limestone at top of quarry, south side*

Photo WE 07a *From ST 0598 1722* *Facing SW*

General view of thickly bedded limestone of the Upper Westleigh Limestone. Some turbidite sedimentary structures can be observed on the base of the bedding planes.

Westleigh Quarry *Lower Westleigh Limestone in quarry floor*

Photo WE 30 *From ST 0573 1733* *Facing NE*

Section of the Lower Westleigh Limestone beds in the northern limb. The core of the anticline is represented by the intensely deformed, pale coloured rock behind the shovel loader (right). A minor fold flexure is seen on the northern limb behind the excavator (left).