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## B1 Porthleven

[SW 628 254]–[SW 634 250]

### Highlights

The time relationships between sedimentation, dolerite sill intrusions, and the earliest Variscan deformation, are well displayed at this type locality of the Mylor Slate Formation.

### Introduction

The section of low cliffs and beach outcrops to the south-east of Porthleven Harbour (from Little Trigg Rocks to about Eastern Tye) is often considered the type area for the laminated argillites and sandstones of the Upper Devonian Mylor 'Series' or Mylor Slate Formation (Leveridge and Holder, 1985; Holder and Leveridge, 1986). The intrusive bodies which here affect the Mylor beds are typical of the smaller greenstones in west Cornwall. Little detailed work has been done on them, although they are mentioned in early descriptions of the general area (Phillips, 1876; Flett, 1903, 1946).

### Description

Within the sediments at Porthleven are small, relatively thin (typically <1–2 m in thickness), high-level, intrusive sill-like bodies of basic composition. They are typical Cornish 'greenstones' or 'diabases' – regionally altered or metamorphosed doleritic intrusives featuring secondary albite, chlorite, actinolite, iron oxides and minor epidote, quartz, mica and carbonate. No chemical work is available, although they are probably tholeiitic in composition, in common with other bodies intruding Devonian strata in south and west Cornwall.

Intrusive relationships with the adjacent sediments are variable, although generally concordant contacts with the sedimentary lamination indicate that most of the bodies are sill-like in attitude. However, on the small scale, contacts may be slightly transgressive or highly irregular, with lobate junctions and cross-cutting intrusive tongues (Figure 4.5). Some contacts suggest that intrusion occurred at a high level into wet material with the development of attendant, soft-sediment deformation features, although thorough mixing between magma and sediment (peperite) was not achieved. Adjacent sediments may be locally baked and bleached at the contacts, although adinolization is rare; a c. 1 m pale-grey bleached zone is seen at the (upper?) contact of the largest body near the end of the beach section.

Relative to the deformation, there is evidence that some intrusives were pre-cleavage, and that they have been conformably folded with the sediments, probably during the early  $F_1$  fold phase of the late Devonian (Taylor and Wilson, 1975). Local shearing and minor faulting affect some masses, together with later extensive net veining by massive quartz.

In thin section, the intrusive greenstones are fine-grained, non-vesicular, subophitic metadolerites, typically replaced by various green, hydrous secondary minerals. The only primary phases remaining are (rare) clinopyroxene and apatite, the former showing partial replacement by a uraltic fringe of actinolite or pseudomorphed by chlorite. The more altered varieties are dominated by albite–chlorite (up to 60–70 vol.%), with variable carbonate, quartz, muscovite, epidote, iron oxides, sphene and rare biotite. Contact zones may show chilling in the thicker sills, but are often foliated and composed of green chlorite.

### Interpretation

Accompanying soft-sediment deformation implies that some of these small bodies were intruded at a very high level into a wet sediment pile. It is interesting to speculate that the small greenstones did not actually form pillows because they were intruded into a sequence of rapidly deposited distal turbidite-generated muds and sands, and the magma did not

actually reach the sediment–water interface. Penecontemporaneous intrusion and sedimentation is one of the more interesting aspects of the site, together with the sills being involved in the first phase of folding in south Cornwall. They are also typical of the smaller greenstone bodies of this region: illustrating the effects of low-grade regional metamorphism and the development of a variety of secondary assemblages characterized by albite–chlorite. The grade of regional metamorphism is generally assumed to be lower greenschist (chlorite zone), as pumpellyite has not been recorded and the chemical composition of the chlorite is undetermined.

## Conclusions

That the dolerite sills are only slightly younger than the rocks in which they are found, is shown by the evidence that these sediments were still soft when intrusion took place. Further, the earliest structural element in the sediments, a cleavage, can also be found in some of the sills, indicating that these at least were emplaced before the onset of the Variscan Orogeny.

## [References](#)



*(Figure 4.5) Apparently discordant relationship between a basic intrusive body (on the right) and adjacent foliated sediments of Lower Devonian age (on the left). Porthleven, Cornwall. (Photo: P.A. Floyd.)*