Perran Beach to Holywell Bay, Cornwall

[SW 764 575]–[SW 758 591]

Introduction

Within the section of coast north of Perran Beach and east to Holywell Bay (see (Figure 7.41) and (Figure 7.42)), two prominent near-vertical N–S-trending lead-vein lodes can be studied in a series of exposures in the cliff sections. The mineral assemblage can be examined in a series of small dumps along the line of the vein. The exposures clearly demonstrate the structure and mineralogy of these late, low-temperature cross-course veins.

Dines (1956) described four small lead mines in the area, namely Wheal Golden [SW 761 590], Penhale Mine [SW 762 580], East Wheal Golden [SW 767 581], and Phoenix Mine [SW 764 580] (see (Figure 7.41)). There is little other detailed geological literature except for much earlier references by Pryce (1778), and Collins (1912).

The line of the veins can be studied traversing from Penhale Point in a southerly direction. The outcrop of the Penhale Lode is clearly seen in a series of cliff sections across the various coastal indentations ('zawns') of the Holywell promontory. The Penhale Lode is best observed from above the major collapsed shaft (above the beach) near to the renovated mine buildings, the line of the lode being marked by bifurcating quartz veins.

Description

The country rock ('killas) to the mineralized veins is Lower Devonian slates and grits, although the eastern part of the traverse from Perran Beach to Holywell Bay is covered by blown sand. The mineral lodes are characteristically marked by the development of banded comby quartz with fluorite, galena and some siderite.

In 1849 Penhale Mine produced 100 tons of 8% copper ore, and between 1849 and 1870 raised 1270 tons of lead ore, realising 7150 oz of silver, and 7060 tons of brown hematite (the latter may have come from the Perran Iron Lode). The Penhale Lode is best exposed in the head of the inlet, along the zawn north of Penhale. The lode has a N10°W strike and 10°E underlie. The vein can be seen in both faces of the zawn along with many quartz-filled stringers along belts of minor shears. Penhale Mine was worked down to 100 fathoms. Full details of the various shafts along the vein are detailed in Dines (1956). Farther north, where the vein cuts through several smaller zawns, a small section above a partially wooded shaft can be examined easily and safely. The vein is filled with bands of comb-growth quartz, fluorite, galena and a little siderite. Farther north the vein direction is marked by sea caves formed along the worked vein section, and at surface above the vein by a line of dumps. Wheal Golden developed the northern part of a lead lode coursing N10°W and underlying 10°E. This follows the coast from Penhale Point to the northern part of Ligger Point.

At the west side of Holywell Bay, Wheal Golden is exposed in a beach cave section, probably formerly worked as an adit. This beach section can only be viewed at exceptionally low tidal conditions. The lode here is 0.8 m wide and filled with comby quartz, fluorite and siderite. Young's Shaft (of Wheal Golden) was sunk partway down the cliff, 230 m east of Penhale Point. The mine is believed to have been active in the 18th and 19th centuries and was to intersect the richest parts of the lode 70 fathoms deep at the time of abandonment. Output records for the period 1849 to 1855 are listed as 2560 tons of lead ore and 24 200 oz of silver. In the cliffs on the south-western side of Holywell Bay a further three small sections of a lode structure are exposed, within a shear belt zone. Again erosion and tidal colouring has caused the features to be poorly exposed, but the section appears to be ferruginous and of a vuggy nature.

The East Wheal Golden shaft was sunk on a section of lode paralleling the Wheal Golden Lode (365 m to the east). The shaft is 18 m from the cliff edge at the south end of Holywell Bay. A yield of 15 tons of lead ore and 180 oz of silver is recorded for 1861.

Dines (1956) described the Phoenix Mine as being on the East Wheal Golden Lode, 365 m east of Penhale Mine. Between 1873 and 1876 the mine raised 77 tons of lead ore and 282 oz of silver. It is believed that the lode continues southwards, and is probably the quartz-rich vein described as intersecting the Perran Iron Lode at depth.

The exposure of the Penhale Lode in the cliff at the north end of Perran Beach is some 60 cm wide and dips about 70°E. It is filled with interlayered comby quartz, some fluorite and galena. The cliff here, on the southern part of Ligger Point, is cut by many quartz-filled tension gashes and quartz stringers. This section can only be reached at low tidal conditions, similar to the situation at the northerly cliff section of the Wheal Golden lodes in western Holywell Bay.

The Perran Iron Lode of the Gravel Hill Mine GCR site is reported to be intersected south-east of the mine by at least two north–south veins, yielding a little lead and silver in the iron workings. To the north-west of Gravel Hill Mine continuation of the Perran Iron Lode has probably determined the line of the cliffs. Erosion along this line has removed much evidence, but in places evidence of iron mineralization can still be seen. The probable intersection point of the Penhale Lode with the continuation of the Perran Iron Lode has also been eroded out.

Interpretation

Several authors have detailed fluid-inclusion studies based on cross-course mineralization in South-west England (see Alderton, 1993). Much of this work has been based on studies relating to the role and origin of high-salinity basinal fluids in ore deposition. Wilkinson (1990) studied the role of mineralizing fluids in the development of parts of the Cornubian Orefield, considering especially evidence from mineral veins in south Cornwall. This work confirmed the fluids to be of high salinity, similar to basinal brines, with the ore minerals being deposited at about 140°C. However, it was also recognized that low-salinity fluids (at *c.* 200°C) were contemporaneously mobilized in E–W-trending normal faults, and these sporadically infiltrated the cross-courses at structural intersections. The formation of a mineral assemblage such as galena, sphalerite, chalcopyrite, quartz and siderite can be accounted for by the mixing of the two fluid types. Differences in paragenesis within the orefield may be dominantly a result of different mixtures of two or more fluid types. If comparisons with this model can be made it may be that there has been a major contribution of this fluid type at Penhale-Wheal Golden. The galena-fluorite-quartz mineralization in the north–south lodes of the Perran Beach to Holywell Bay area may result from mixing of low-salinity metamorphic fluids with a highly saline brine derived from a Mesozoic (offshore) basin. Elsewhere in Cornwall cross-course mineralization contains either of these fluids but not usually both.

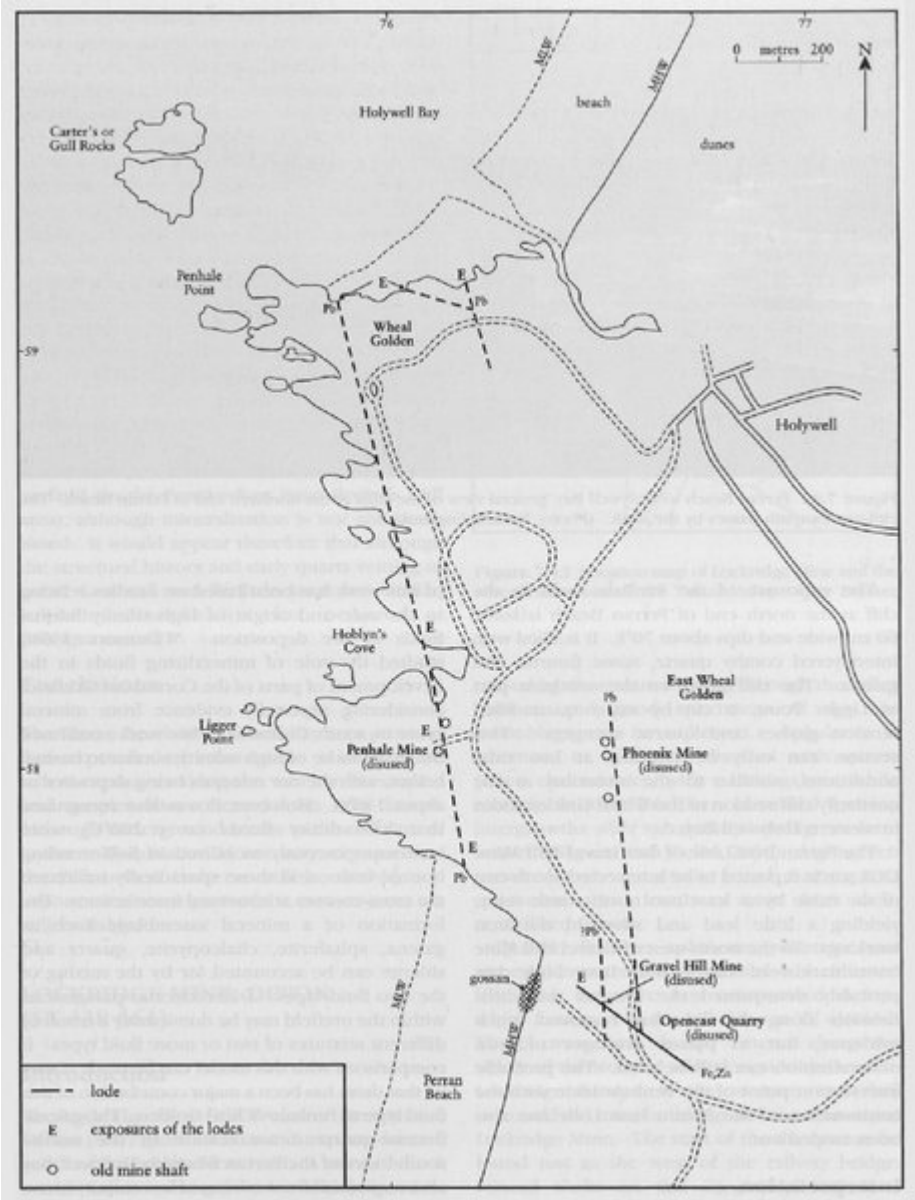
Although small-scale north–south lead-silver veins intersect the Perran Iron Lode, which contains siderite and sphalerite as reported by Henley (1971), it is believed to have been filled at about the same time, the north–south veins being slightly later. South of the Perran Iron Lode, virtually all the lodes course NNE–SSW and carry tin, copper and lead. Some may be re-opened fissures originally carrying older tin and copper ores and further filled by lead ores.

The north–south lodes of the Penhale–Wheal Golden area occur within a belt of shearing of a similar trend, in which quartz stringers are prominent. Research on lead-antimony mineralization in north Cornwall (Clayton *et al.,* 1990) has shown that en-echelon vein systems are related to shear zones, quartz deposition often being contemporaneous with shearing. The Penhale–Wheal Golden structural situation would seem to be similar to the north Cornwall orefield (in the Pentire–Port Issac–Bounds Cliff area), although mineralization is not antimony-based. It would appear therefore that although the structural history and early quartz veining in north Cornwall and Penhale areas are similar, sulphide mineralization has occurred at different times.

Conclusions

The Perran Beach to Holywell Bay area provides fine exposures of cross-course mineralization where exposures along the vein can be studied and samples also collected from vein dumps. Although underground access to the cliff sites of in-situ mineralization is not easy, exposures of the Perran Iron Lode can still be viewed, and exposures of some parts of the cross-courses are still available.

References



(Figure 7.41) Perran Beach to Holywell Bay. (E) represents exposures of the lodes within the area (Penhale Lode, Perran Iron Lode, Wheal Golden Lode and East Wheal Golden Lode).

(Figure 7.42) Perran Beach to Holywell Bay, general view of the cliffs at the northern end of Perran Beach. The cliff-top footpath passes by the shaft. (Photo: Natural England.)