

# Hydrogeology of Wales: The Old Red Sandstone aquifer

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**This page is part of a category of pages that provides an updated review of the occurrence of groundwater throughout Wales.**

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## Geological setting



Outline distribution of the old Red Sandstone outcrops. P859270.

The outcrop of the Devonian-age Old Red Sandstone in Wales and the Welsh Borders surrounds the north and east margins of the South Wales Coalfield to form a large tract of land that encompasses what was once called Breconshire, Herefordshire and a large part of Monmouthshire. There is a sinuous westerly limb that ends at Nab Head on the Dyfed coast while the eastern limit comprises the graben faults which mark the Worcester Basin (including the East Malvern Fault) and the Severn valley south of Bridgnorth.

The base of the Old Red Sandstone is conformable. In most of south Wales and the Welsh Borderland, the Silurian–Devonian boundary is situated in Old Red Sandstone facies, with the transition from marine to fresh-water deposition occurring in the late Silurian. This contrasts with south-west Wales, where Devonian strata lie unconformably on Precambrian to Wenlock age strata, and in Anglesey where they lie unconformably over Precambrian to Llandovery strata. Tournaisian to Viséan strata (the Carboniferous Limestone facies) lie unconformably upon the Devonian-age strata except south of the Rhenish fault in south-west Wales where the Upper Devonian Skinkle Sandstones pass conformably into overlying Tournaisian to Viséan strata.

The Devonian sediments of south Wales and the Welsh borderlands are continental deposits known as the Old Red Sandstone facies. They derive from detritus from a mountain front to the north draining towards the sea just south of the present location of the Bristol Channel. The shallow marine and coastal environment that developed in the late Silurian and Early Devonian was succeeded by terrestrial alluvial facies throughout the remainder of the Lower Old Red Sandstone. There is a major unconformity between the Lower Old Red Sandstone and Upper Old Red Sandstone. The principal lithostratigraphical components of the Old Red Sandstone are shown in the **Lithostratigraphical components table** and the outline location of the Old Red Sandstone strata is shown in **Figure P859270**.

The main lithostratigraphical components of the Old Red Sandstone facies (after British Geological Survey, 2000).

	Central south Wales	Forest of Dean S Wales Coalfield E crop
Upper ORS	Grey Grits (21 m) Plateau Beds (41 m)	Quartz Conglomerate Group (45-200 m)
Lower ORS	Brownstones Formation (490 m) Senni Beds (300-380 m) Red Marls (1200-1375 m)	Brownstones Formation (1220 m) St Maughan's Group (380-610 m)

In the Lower Old Red Sandstone the St Maughan's Formation comprises a cyclic succession of fluvial channelised sandstones, floodplain mudstones and siltstones. Associated calcrete deposits occur in some channel bottoms. The Senni Beds comprises fluvially deposited fine- to coarse-grained sandstones with associated calcrete deposits. The overlying Brownstones Formation is mainly red fluvial channelised sandstones within red/brown mudstones deposited as overbank material and it is these that form the Black Mountains and the Brecon Beacons.



View of the Brecon Beacons capped by Old Red Sandstone Plateau Beds with the Neuadd and Pontsticill Reservoir in the Taff Fechan valley from the Twynau Gwynian north of Merthyr Tydfil. P542858.

The Upper Old Red Sandstone strata are more consistently arenaceous and conglomeratic as they young. The Plateau Beds cap the Brecon Beacons (**Plate P542858**), the Black Mountains and the western part of the north crop of the South Wales Coalfield. They are represented by an upward coarsening facies from mudstones through sandstones to conglomerate. The overstepping Grey Grits comprise a braided stream deposit which forms a quartzitic sandstone which may be grey, green or

yellow in colour. The overlying Quartz Conglomerate Group develop from the quartzitic sandstones into higher energy, conglomeratic material interbedded with sandstones and red mudstones.

Roberts (1966) described the joint patterns along the northern flanks of the South Wales Coalfield. Joint sets in the Brownstones Formation (shales and sandstones of the Lower Old Red Sandstone) are found at 350°, 330°, 270°, 240° and 220° (joint strikes being given as the larger of the two azimuths e.g. 350°-170° is recorded as 350° joint). The joints are best developed in the sandstone layers where characteristic joint sets with small dihedral angles predominate (350°-330°). They are reported to be smooth faced, planar, usually closed and persistent, with horizontal (strike) distances in excess of 15m being common. Succeeding members of the Upper Old Red Sandstone are jointed along the same trends but the coarser lithologies give rise to rougher, less rigidly parallel fractures. The topmost strata (Grey Grits) have a joint system with the master set striking at 340° and subordinate sets at 290°, 250° and 220°. These are smooth-faced, planar, with an average frequency of 15 cm and a horizontal and vertical persistence of 15-18m respectively. Roberts considers the majority of the joints to be shear fractures formed early in the deformational history of the area during the Variscan Orogeny.

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