



## South Wales RIGS Group Site Record RIGS Description

**SECTION A**

General	South Wales
<b>Site Name:</b> Felindre Quarry and Road Cutting	<b>File Number:</b> Site_RAW_JRD_8
<b>RIGS Number:</b> 645	<b>Surveyed by:</b> RA Waters and JR Davies
<b>Grid Reference:</b> SN 7788 3437 to 7795 3437	<b>Date of Visit:</b> September 2010
<b>RIGS Category:</b> Scientific	<b>Date Registered:</b>
<b>Earth Science Category:</b> Stratigraphical, Sedimentological	<b>Owner:</b> Dan-yr-allt Farm (part only) <b>Planning Authority:</b> Carmarthenshire County Council
<b>Site Nature:</b> Quarry and road cutting	<b>Documentation prepared by:</b> J R Davies
<b>Unitary Authority:</b> Carmarthenshire County Council	<b>Documentation last revised:</b> 27 <sup>th</sup> January 2011
<b>OS 1:50,000 Sheet:</b> 146	<b>Photographic Record:</b> Attached
<b>OS 1:25,000 Explorer Sheet:</b> OL 12	
<b>BGS 1:50,000 Sheet:</b> E212	
<p><b>RIGS Statement of Interest:</b> This site forms part of a network of early Silurian (Llandovery) sites (RIGS and GCR) in the international type area for the Llandovery Series. Collectively, these sites represent the key sections in the local geology that underpin its international importance and demonstrate significant recent scientific discoveries.</p> <p>The Velindre cutting and quarry sections expose a late Ordovician succession that includes the contact between the sandstone-rich the Cwmcrynglyn Formation and the succeeding mudstone-rich Garth House Formation. Both units record sedimentation during the Hirnantian Stage, but the Cwmcrynglyn Formation formed at a time when global sea levels had fallen in response polar glaciation, whereas the Garth House Formation formed as sea level rose as this ice melted (Davies et al., 2009). In other sections (RAW_JRD_6) an unconformity marks the lowstand event, but the Velindre section exposes a complete succession of regressive and transgressive deposits in conformable contact. It provides excellent exposure in the wave influenced, shallow water facies deposited during the period of maximum shallowing, and in the fining-upwards transgressive succession which also displays slump affected levels.</p> <p>The section contributed to the fuller understanding of the Hirnantian succession in the Type Llandovery area advanced by Davies et al. (2009) which saw previously used nomenclature abandoned and recognition that the onset of post-glacial deepening occurred at a lower level in the local succession than earlier thought (Cocks et al., 1984; Woodcock &amp; Smallwood, 1987).</p>	

### **Geological setting/context:**

Earlier attempts to understand the stratigraphy of the Llandovery Series combined Late Ordovician (Ashgill) into a single division (Cock et al. 1984; Woodcock & Smallwood, 1987) termed the 'Scrach Formation'. The facies and fauna of this unit were reported as consistent with shallow water deposition during the widely acknowledged acme of the Late Ordovician polar glaciation (see Davies et al., 2009 and references therein) during the Hirnantian Stage. Sections examined by Davies et al. (2009), including RIGS RAW\_JRD\_6 and 7, underpinned a radical re-interpretation of this succession and its correlation with the Welsh Basin stratigraphy to the north-west. Davies et al. (2009) were able to show that in section to the east of the Crychan Fault Belt strata included by Cocks et al. (1984) in their 'Scrach Formation' were transgressive in character and overlay a major unconformity; and that it was erosion associated with the latter that marked the period of glacial lowstand. They were also able to show that shallow water facies formed during the glacially induced sea level fall are also preserved to the west of the fault belt, in agreement with observations by BGS in the Garth area (Schofield et al., 2004; Davies et al., 2010). It became clear to Davies et al. that the term 'Scrach Formation', which in one area included both regressive and transgressive Hirnantian facies, but elsewhere comprised just the transgressive succession, was inappropriate. Following BGS work (Davies et al. 2009; Schofield et al., 2004; Barclay et al., 2005), the regressive facies west of the fault belt are now included in the laterally gradational Ciliau and Cwmcringlyn formations. In both areas the deposits that accumulated once the ice began to melt and sea level rose are included in the Garth House Formation. To the west of the Crychan Fault Belt this unit succeeds the regressive facies conformably.

The Velindre exposures, comprising a farm quarry and contiguous A40 road cutting, provide an accessible section through the western succession of facies, specifically the Cwmcringlyn Formation and its contact with the Garth House Formation. The exposed succession dips steeply to the north-west, but is structurally inverted and youngs to the south-east. Westernmost exposures, in the farm quarry (Photo. 1), expose a coarsening upwards sequence through the Cwmcringlyn Formation. Silty mudstones with burrowed thin beds and laminae of sandstone, gradational with the underlying Ciliau Formation, pass stratigraphically upwards into a succession of cross-laminated, lenticular-bedded sandstones with mudstone partings (Photo. 2). Exposed bedding surfaces reveal symmetrical ripple marks. Similar lenticular sandstones are common in the lower part of the Garth House Formation, but the presence as interbeds of distinctive smooth grey mudstones allows a sharp contact between the two units to be identified in the south-east corner of the quarry (Photo. 3). Trace fossil casts on bedding surfaces are present in both units.

In the road cutting to the east, the thickness and frequency of sandstone beds decreases upwards within the Garth House Formation and smooth mudstones come to dominate (Figure 1). In this part of the section, thin units, in which the bedding is disturbed and disrupted, record the effects of syndepositional slumping. At the eastern end of the section, 10 m of dark grey mudstone containing balls and rafts of sandstone provide further evidence of downslope instability during Garth House Formation deposition (Figure 1).

The succession preserved in the Velindre section records events consistent with those outlined by Davies et al. (2009). The coarsening-upwards Cwmcringlyn

Formation records the influence of waves on sand deposited in increasingly shallow water as sea level fell during the early Hirnantian. The abrupt contact with Garth House Formation, the entry of smoother mudstones and the upwards decline in sandstone content are in keeping with deposition during the period of deepening water that followed as the Late Ordovician polar ice cap began to melt during the late Hirnantian. Movements on the Crychan Fault Belt were clearly important in allowing regressive Hirnantian units to be preserved to the west, but eroded to the east; it acted as a structural location for the early Hirnantian shoreline. Although this was overtopped during the subsequence transgression, speculative continuing seismic activity along this fracture belt may account for the disturbed units observed in the Garth House Formation at Velindre and elsewhere.

The Velindre quarry and road cutting provides a well exposed and accessible section through the Hirnantian strata that underlie the Type Llandovery succession. The impact of contemporary glacial and linked sea level events can be demonstrated in a continuous exposure that allows both regressive and transgressive facies, and their sedimentary structures and associated trace fossils to be examined.

#### **References:**

BARCLAY, W J, DAVIES, J R, HUMPAGE, A J, WATERS, R A, WILBY, P R, WILLIAMS, M and WILSON, D. 2005. Geology of the Brecon district. *Sheet explanation of the British Geological Survey*. Sheet 213 (England and Wales).

COCKS, L R M, WOODCOCK N H, RICKARDS R B, TEMPLE, J T and LANE P D. 1984. The Llandovery Series of the Type Area. *Bulletin of the British Museum (Natural History), Geology Series* Vol. 38, 131-182.

DAVIES, J R, WATERS, R A, WILLIAMS, M, WILSON, D, SCHOFIELD, D I and ZALASIEWICZ, J A. 2009. Sedimentary and faunal events revealed by a revised correlation of post-glacial Hirnantian (late Ordovician) strata in the Welsh Basin, UK. *Geological Journal*, Vol. 44, 322-340.

DAVIES, J R, WATERS, R A, ZALASIEWICZ, J A, MOLYNEUX, SG, VANDENBROUCKE, T R A and WILLIAMS, M. 2010. A revised sedimentary and biostratigraphical architecture for the type Llandovery and Garth areas, Central Wales: a field guide. *British Geological Survey Open Report*, OR/10/037.

SCHOFIELD, D I, DAVIES, J R, WATERS, R A, WILBY, P R, WILLIAMS, M and WILSON, D. 2004. Geology of the Builth Wells District – a brief explanation of the geological map. *Sheet Explanation of the British Geological Survey*. 1:50 000 Sheet 196 Builth Wells (England and Wales).

WOODCOCK, NH and SMALLWOOD, SD. 1987. Late Ordovician shallow marine environments due to glacio-eustatic regression: Scrach Formation, Mid Wales. *Journal of the Geological Society, London*, Vol.144, 393-400.

## SECTION B

### PRACTICAL CONSIDERATIONS:

Please score Accessibility and Safety Red Amber or Green

#### Accessibility:



Comment: Easily accessed from the A40 Trunk Road and Dan-yr-allt Farm track

#### Safety:



Comment: Cutting and quarry faces are low and battered with little likelihood of falling rock. Some noise impact from passing traffic.

#### Conservation status:

There are no known conservation designations of this RIGS

### OWNERSHIP/PLANNING CONTROL:

**Owner/tenant:** Part of the site (track-side quarry) is owned by Dan-yr-allt Farm

**Planning Authority:** Carmarthenshire County Council

#### Planning status/constraints/opportunities:

There are no known planning constraints or opportunities

### CONDITION, USE & MANAGEMENT:

**Present use:** Main road cutting relates to A40 road widening; contiguous quarry used by Dan-yr-allt Farm for track aggregate

**Site condition:** Good; all key contacts and rock types are currently well exposed

**Potential threats:** Could become overgrown and degraded over time

**Site Management:** Farmer should be discouraged from backfilling the quarry part of the section which exposes the Cwmcrcinglyn/Garth House contact

### SITE DEVELOPMENT:

**Potential use (general):** This site is of great importance to academics wishing to understand the geological evolution of the region.

**Potential use (educational):**

#### Other comments:



## Photographic Record

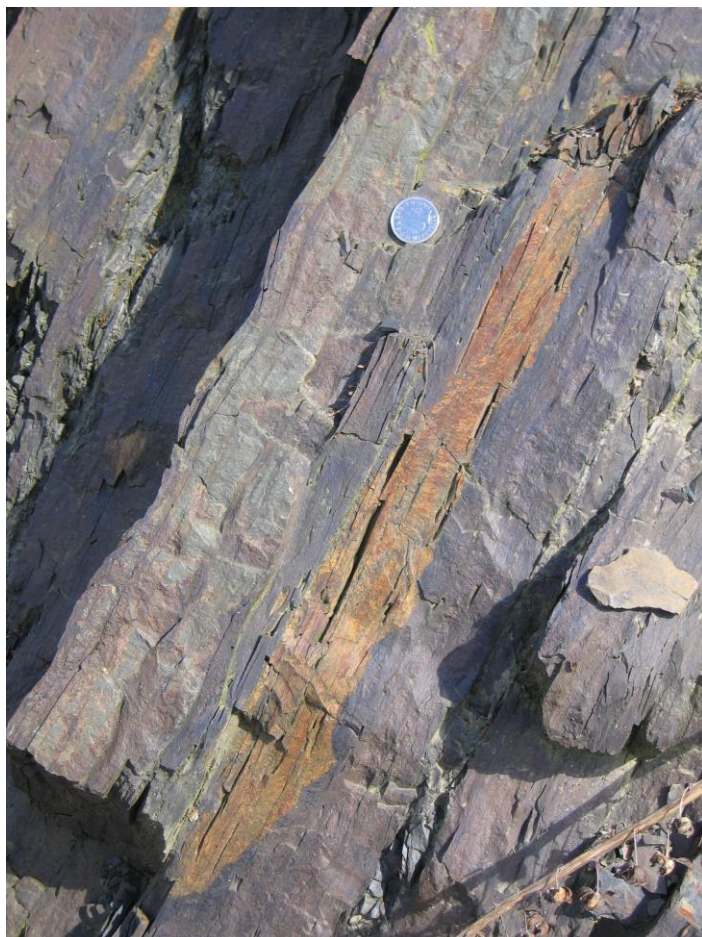


Photograph 1. Velindre Quarry; bedding is structurally inverted and the younging direction is to the right (east); Garth House Formation succeeds the Cwmcrlinglyn Formation in the right-hand corner of the quarry.



Photograph 2. Lenticular sandstones in Cwmcrlinglyn Formation, Velindre Quarry; younging direction is to the right





Photograph 3. Cwmcrynglyn Formation/  
Garth House Formation contact (right of  
coin), Velindre Quarry (note beds are  
overturned and young from left to right)

### Annotated Sketch

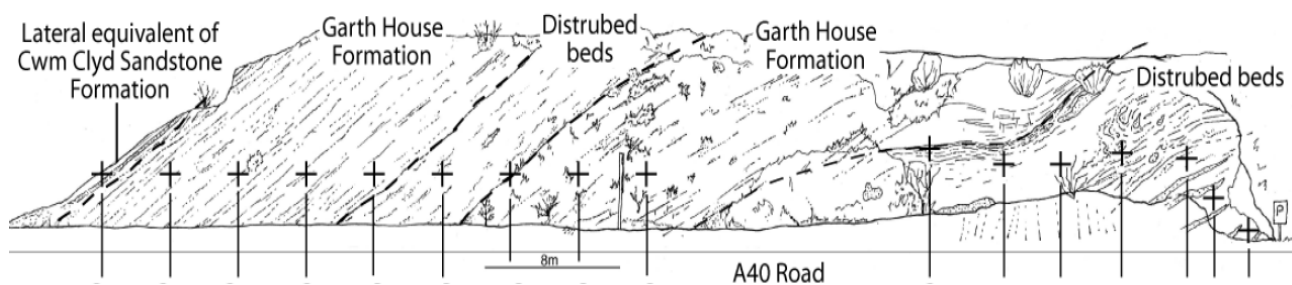


Figure 1. Annotated sketch of the Velindre A40 road cutting looking north (after Challands, 2008; crosses show his chitinozoan sampling points)