



## South Wales RIGS Group Site Record RIGS Description

### SECTION A

| General  | South Wales  |
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| <b>Site Name:</b><br>Llwyn-cus stream and quarry section   | <b>File Number:</b><br>Site_RAW_JRD_4                                |
| <b>RIGS Number:</b> 585  | <b>Surveyed by:</b><br>RA Waters & JR Davies                         |
| <b>Grid Reference:</b><br>SN 9308 5061   | <b>Date of Visit:</b><br>January 2011                                |
| <b>RIGS Category:</b><br>Scientific  | <b>Date Registered:</b><br><b>Owner:</b> Llwyn-cus Farm              |
| <b>Earth Science Category:</b><br>Stratigraphical, Palaeontological  | <b>Planning Authority:</b> Powys County Council                      |
| <b>Site Nature:</b><br>Stream and quarry sections  | <b>Documentation prepared by:</b><br>Jerry Davies                    |
| <b>Unitary Authority:</b><br>Powys County Council  | <b>Documentation last revised:</b><br>15 <sup>th</sup> February 2012 |
| <b>OS 1:50,000 Sheet:</b> 147  | <b>Photographic Record:</b><br>Embedded in text                      |
| <b>OS 1:25,000 Explorer Sheet:</b> 188   |  |
| <b>BGS 1:50,000 Sheet:</b> E196  |  |
| <p><b>RIGS Statement of Interest:</b></p> <p>This forms part of a net work of key sites in the mid to late Ordovician succession of the Llanwrtyd area of mid Wales which allow the local rock succession to be examined. This succession records deposition along the eastern margin of the Lower Palaeozoic Welsh Basin.</p> <p>The sections along the stream to the east of Llwyn-cus farm lie within the Nantmel Mudstones Formation, but are unique in the region in yielding a rich shelly fauna which includes corals, bryozoa, numerous brachiopods, molluscs, trilobites and echinoderms. Rushton (1994) reports that this assemblage of benthic organisms is of mid Ashgill age (Cautleyan to early Rawtheyan stages). The fossils occur in randomly orientated calcareous nodules and in 'clots' of rottenstone set in a crudely cleaved, grey, silty mudstone matrix. Their fragmentary nature indicates reworking and transportation away from their original shallow water sites of growth, and the enveloping rock textures suggest entrainment within debris flows. Such an origin is consistent with accumulation along the tectonically active eastern margin of the Welsh Basin where, during the late Ordovician, basin margin faulting maintained steep west-facing gradients and promoted seismic instability.</p> <p>The Llwyn-cus sections provide a stratigraphically important data point in the otherwise poorly fossiliferous local Ashgill succession as well as offering insights into composition of contemporary benthic communities and the sedimentary processes that operated along the contemporary basin margin during the late Ordovician.</p> |  |

### Geological setting/context:

Stream and quarry sections to the east of Llwyn-cus farm provide unique exposures in the Nantmel Mudstones Formation in its Llanwrtyd area outcrop to the east of the Tywi Anticline (Figures 1 to 4). This early to mid Ashgill, mudstone-dominated division typically comprises pale to medium grey, thin-bedded turbidite and hemipelagite mudstones with distinctive darker burrow mottling and is a widely mapped component of the Lower Palaeozoic Welsh Basin succession (e.g. Davies et al., 1997; Schofield et al., 200X). Body fossils are rare within the Nantmel Mudstones and for this reason its age and internal stratigraphy is poorly constrained. The formation's outcrop in the Llanwrtyd area records accumulation across the eastern margin of the basin and the Llwyn-cus exposures provided important insights into the sedimentary process that operated in this setting, as well as abundant and datable shelly fossils.

The Llwyn-cus sections include exposures on the west-side of a small dingle 300 m to the east of the farm, and in a small disused quarry [SN 9309 5061] immediately to the east of the stream (Figures 1 & 2). The section was discovered by Dr John Davies and reported in his PhD thesis (Davies, 19XX). It is atypical of the Nantmel Mudstones in comprising poorly bedded silty mudstones with dispersed calcareous nodules (Figures 3 & 4) and clots of rottenstone which contain a rich and abundant shelly fauna; burrow mottling is poorly developed. Decalcified shell debris recognised as orange-weathering grains are present throughout the mudstone matrix and lenses of mudstone pebble and granule conglomerates are also present. The shelly fauna collected by Davies and now housed in the national Museum of Wales, Cardiff, has been examined by Rushton (1994). It includes solitary rugose and colonial tabulate corals, bryozoan fragments, abundant brachiopods, molluscs including bivalves, orthocones and gastropods, trilobites and echinoderms; a fragment of the ostracod *Lepidocoleus* is also present. The brachiopod assemblage is largely fragmentary but includes the species *Katastrophomena retroflexa*, *Leptaena* cf. *rugosa*, *Nicolella* cf. *actoniae*, *Platystrophia* cf. *threavensis* and *Sulevorthis* cf. *humilidorsatus*, as well the genera *Dalmanella*, *Eremotrema*, *Glyptorthis*, *Kozlowskites*, *Leangella*, *Leptestiina* and *Tripelesia*. The trilobite remains include *Atractopyge* cf. *verrucosa*, *Stenopareia* sp., *Stygina*? and parts derived from calymenid, illaenid, lichid genera. The echinoderms include fragments of cystoids and abundant crinoid columnals as well *Caryocrinites*? *rugatus*. According to Rushton (1994) the fauna is indicative of the Cautleyan to early Rawtheyan stages of the Ashgill Series.

Commenting on the environmental setting of the Llwyn-cus fauna, Rushton observes that it contains benthic forms that are typical of deep and muddy Ashgill settings, but also fragments of large orthids and strophomenids, and bryozoa, that are normally indicative of shallower water conditions. Together with the broken nature of many of the specimens, he takes this to indicate that the assemblage is transported and includes forms from different primary settings that have been mixed together during post-mortem transport. The texture of the Llwyn-cus lithologies supports this. The randomly distributed nodules set in poorly cleaved, but otherwise structureless silty mudstone matrix are consistent with deposition from debris flows. The deposit and its contained shelly fossils testify to the presence of steep gradients along the fault located eastern margin of the Welsh Basin during Ashgill times. Major slope failures possibly triggered by seismic events tapped into the benthic shelly communities and associated sediments located on the adjacent shelf. Entrained within slumps and

debris flows, this shelfal material was mixed together as it was transported down-slope.

The Llwyn-cus exposures offer a unique insight into the depositional processes that operated on the Ashgill margin of the Lower Palaeozoic Welsh Basin. The deposits and their entrained shelly fauna testify to accumulation from debris flows on steep basin margin slopes and show that both deep and shallower shelfal settings to the east were tapped as sediment sources. In contrast to much of the enveloping Nantmel Mudstones Formation, the shelly fauna within the Llwyn-cus debrites also allows them to be accurately dated.

#### **References:**

DAVIES J R, FLETCHER C J N, WATERS R A, WILSON D, WOODHALL D G and ZALASIEWICZ J A. 1997. Geology of the country around Llanilar and Rhayader. *Memoir of the British Geological Survey*, Sheets 178 and 179 (England and Wales).

RUSHTON, AWA. 1994. Report on the fossils from Llwyn-cus, Garth, in the Davies collection. British geological Survey Technical Report (Stratigraphy Series) WH 94/262 R.

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).

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| <b>PRACTICAL CONSIDERATIONS:</b><br>Please score Accessibility and Safety Red Amber or Green  |  |  |   |
| <b>Accessibility:</b>   |  |  | X |
| Comment: Easily accessible open dingle and small disused quarry sections  |  |  |   |
| <b>Safety:</b>  |  |  | X |
| Comment: No obvious difficulties; care should be taken when traversing the steep dingle sides; the quarry section is on the eastside of a wire fence. |  |  |   |
| <b>Conservation status:</b><br>There are no known conservation designations of this RIGS  |  |  |   |

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| <b>OWNERSHIP/PLANNING CONTROL:</b>  |  |  |  |
| <b>Owner/tenant:</b> Llwyn-cus Farm   |  |  |  |
| <b>Planning Authority:</b> Powys County Council   |  |  |  |
| <b>Planning status/constraints/opportunities:</b><br>There are no known planning constraints or opportunities |  |  |  |

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| <b>CONDITION, USE &amp; MANAGEMENT:</b>  |  |  |  |
| <b>Present use:</b> Stream bank and small disused quarry exposures   |  |  |  |
| <b>Site condition:</b> Reasonable; all parts are accessible and exposed, but the quarry face is becoming overgrown |  |  |  |
| <b>Potential threats:</b> Continued degradation of the exposures and infilling of the quarry section.              |  |  |  |
| <b>Site Management:</b> Periodic cleaning of the exposures and cutting back of vegetation                          |  |  |  |

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| <b>SITE DEVELOPMENT:</b>            |  |  |  |
| <b>Potential use (general):</b>     |  |  |  |
| <b>Potential use (educational):</b> |  |  |  |

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| <b>Other comments:</b> The landowner is adamant that she does not want the site to be advertised or any attention to be drawn to it that would invite unwelcome visitors. Therefore, whilst it is important to identify the scientific relevance of the exposures and their need for conservation, it is also important that its significance and location are held in confidence on closed county council files. An extensive collection of the fossils collected previously from the site are held at the National Museum of Wales in Cardiff and researchers should be discouraged from undertaking any additional, and potentially un-necessary collecting until they have examined this already curated material. |  |  |  |
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## Photographic Record



Photograph 1. Approach to the Llwyn-cus dingle from the west



Photograph 2. Disused quarry on the east side of the Llwyn-cus dingle



Photograph 3. Exposures on the west side of the Llwyn-cus dingle



Photograph 4. Close-up of nodule-bearing mudstones in Photograph 3