ELC_1: Gala Law, Lammermuir Hills

Site information

Location and summary description:

The site is a small quarry situated on the eastern slope of Gala Law, located at the northern edge of the Lammermuir Hills, 11 km south of Haddington, and 2 km north-east of Lammer Law. The quarry exposes a sequence of greywackes, siltstones, mudstones and shales belonging to the Gala Group of Silurian Age.

National Grid reference:

Mid-point: [NT 53607 63348]

West-end: [NT 53566 63360]

East-end: [NT 53627 63355]

Site type: Artificial Quarry Works

Site ownership: Not known

Field surveyors: Hugh Barron and Rachael Ellen

Date visited: 25/09/2014

Current use: Quarry is an active borrow pit

Current geological designations: None

Other designations: Within the Lammermuir AGLV, Lammermuirs Local Biodiversity Site.

Site map

(Figure 6) Gala Law Location Map. The site boundary includes key rock exposures, immediate access to the quarry, and viewpoints looking down into the quarry.

Site description

Background

Gala Law is a small hill approximately 4.5 km south from the village of Gifford accessed by a track leading south-west to Lammer Law. The Silurian rocks underlying Gala Law are exposed in a quarry, in use since at least 1854 for roadstone,

Sedimentary rocks

The quarry exposes Silurian sedimentary rocks of the Gala Group, deposited in a marine environment as part of a turbidite sequence. The eastern wall of the quarry has been recently worked and provides a 30 m long section, in subvertical, gently folded, thinly-bedded (mm- and cm-scale) alternating brown- weathered siltstone, pale grey and black micaceous mudstone (ELC_1_P1)). This sequence represents a distal turbidite deposit, typical of low energy background sedimentation depositing fine layers of sediment following rapid deposition of wackes (high-matrix sandstone) during high-energy turbidity currents (ELC_1_P2). Rare graptolites can be found within the black shale layers (ELC_1_P3), in abundant blocks on the quarry floor. On the western side of the quarry, a 1 m thick rib of massive, red-brown weathered,

coarse-grained quartzo-feldspathic greywacke is exposed, representative of a high-energy, channelled turbidite flow (ELC_1_P4). This wacke has been extensively quarried and large blocks of it are piled up on the quarry floor.

Structural geology

The steeply inclined rocks at this site are typical of the Southern Upland accretionary complex. They have been also been gently folded, with the best examples found in the siltstones and shales in the eastern wall of the quarry. A minor fault is also present here, forming a 10 cm wide brecciated zone cross-cutting siltstone units (ELC_1_P5). Mineralised, slickenlined fracture surfaces are exposed on the rib of greywacke in the west of the quarry, along with reddened iron-stained fractures.

Access and additional information

The site can be accessed along the track from the car park for Lammer Law, just at the entrance to Blinkbonny Wood. At the time of the field assessment, fresh rock piles within the quarry indicate that the quarry is still active at a small scale, and therefore care should be taken whilst visiting. The sides of the quarry are not high, but care should be taken when examining faces as any loosened rock is liable to fall, quarried blocks can be examined from piles on the quarry floor away from the quarry walls (ELC_1_P6).

Stratigraphy and rock types

Age: Silurian

Group: Gala Group

Rock type: Greywacke, siltstone, mudstone,

Assessment of site: access and safety

Road access and parking: Road access along minor roads heading toward the farmstead of Longyester, and heading south toward Blinkbonny Wood. Parking is available at the entrance to the Blinkbonny Wood.

Safety of access The site is accessed along a minor road and along a well-marked gravel track within upland terrain.

Safety of exposure Care should be taken when examining faces within the quarry as the rocks may be loose, and an assessment made of each face before approaching. The bases of rock piles should be avoided. The floor of the quarry is uneven in places and may become locally flooded following rain.

Access Small-scale quarry operations may impose temporary restrictions on access.

Current condition The eastern wall in particular is well exposed, with the western wall increasingly covered by vegetation or dumped materials.

Current conflicting activities Small-scale active quarry operations.

Restricting conditions Quarry operations may impose temporary restrictions on access.

Nature of exposure Quarry section

Assessment of site: culture, heritage & economic value

Historic, archaeological & literary associations The Gala Law quarry has been worked historically from at least 1854, and likely even longer in a now disused and overgrown quarry on the western side of Gala Law.

Aesthetic landscape Gala Law lies at the northern margin of the scenic Lammermuir Hills, gently rolling uplands frequented by walkers. The popular Lammer Law (a SSSI for biodiversity) is accessed via the track adjacent to this site.

History of earth sciences No known association

Economic geology The quarry was historically worked for roadstone, and is still in small-scale operation today.

Assessment of site: geoscientific merit

	Rarity	Quality	Literature/collections	Primary interest
Lithostratigraphy	Local	Moderately good		x
Sedimentology	Local	Moderately good		x
Igneous/Mineral/ Metamorphic Geology				
Structural geology	Local	Poor		
Palaeontology	Local	Moderately good		x
Geomorphology				

Site geoscientific value

The quarry on Gala Law provides a moderately good section through the Silurian Gala Group. The site has moderately good exposures of a distal turbidite sequence, including graptolite fossils, which are indicative of Silurian deep marine environments. There are also exposures of associated folding and faulting within the sedimentary rocks.

Gala Law quarry provides a moderately good example of Silurian deep marine sedimentology with local stratigraphic significance. It also provides a local example of graptolite fossils, preserved to moderately good quality.

Assessment of site: current site value

Community The site is passed daily by walkers climbing Lammer Law.

Education The site provides a moderately good section through a Silurian turbidite sequence that would provide a good introduction to marine depositional processes and environments, and the relationship between sedimentary strata and graptolite fossils.

Assessment of site: fragility and potential use of the site

Fragility Weathering/erosion, sample/fossil collecting, dumping, likelihood of development

Potential use The site has teaching potential for Higher/Further education and school education. Use of the site for teaching purposes may be enhanced by an on-site interpretation (such as sign boards at the car park or along the path) or a Geo-trail, along with online information.

Geodiversity summary

The site comprises a representative section through fossiliferous turbidite sequences typical of the Silurian era. The sedimentary rocks seen here allow interpretation of marine depositional environments, as well as an understanding of organisms that were alive during the Silurian. The Gala Law is easily accessed by a well maintained track, and forms part of a walking trail to the popular Lammer Law. There is potential for developing the geodiversity value of the through on-site or online interpretation, and engagement with local schools.

Site photos

(ELC_1_P1) Steeply dipping, thinly bedded siltstones, mudstones and shales exposed in the east wall of the quarry at Gala Law. The thicker units are grey-brown siltstone, with thinner black shale and pale grey micaceous mudstone between. These sequences represent low-density submarine turbidity current deposits, resulting from low-concentration flows transporting mainly silt- and clay-sized material. These fine-grained sediments would have been deposited by suspension fallout and traction, following a period of high flow velocity and rapid deposition of the initial coarse-grained sandy turbidite. Photo looking toward the south-east. © BGS, NERC.

(ELC_1_P2) Detail of very fine (mm-scale) laminations within the siltstone, mudstone and shale sequence exposed in the east wall of the quarry. These sediments were laid down in submarine fan systems adjacent to the Laurentian continental margin. Siltstone layers are yellow-brown, mudstone layers are pale-grey and shale layers are black. © BGS, NERC.

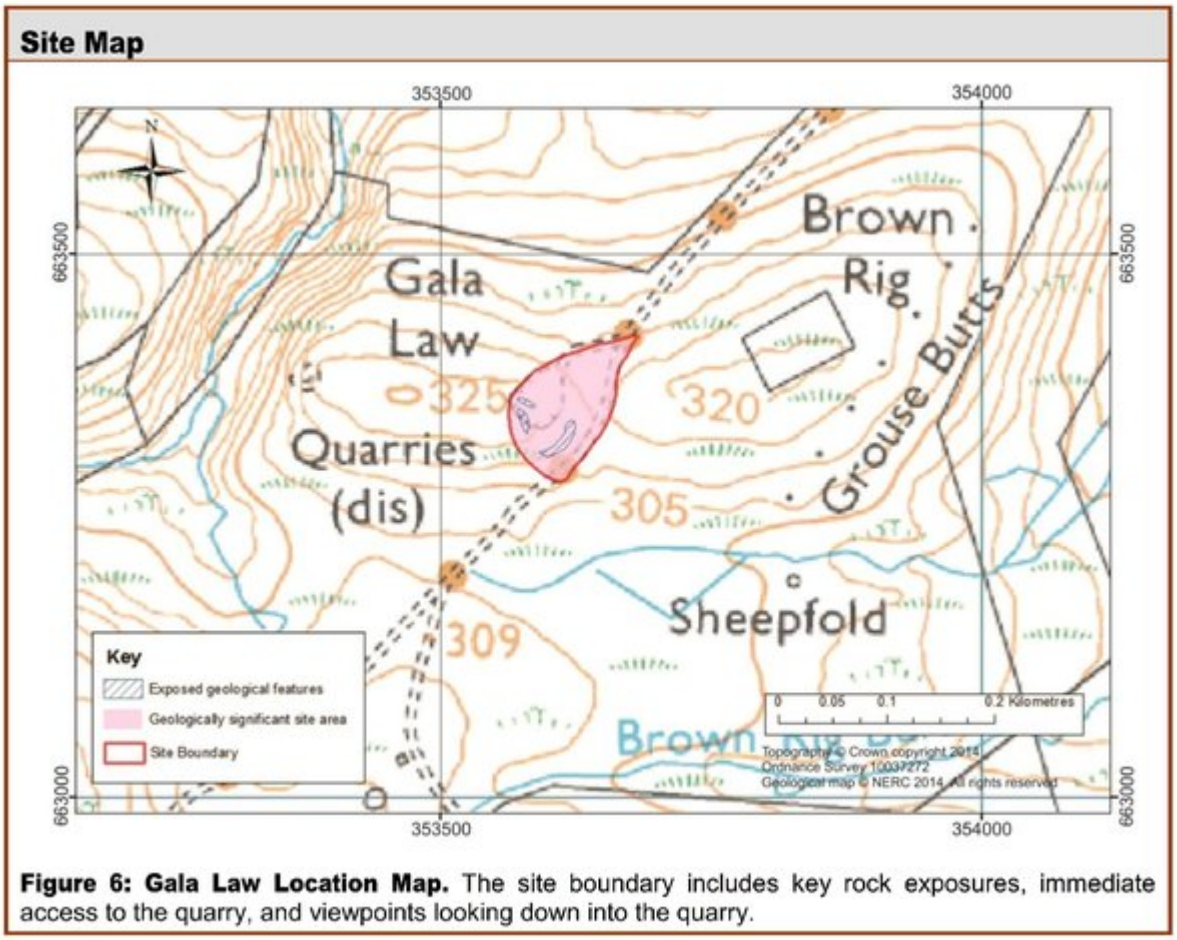
(ELC_1_P3) Hand specimen from the site reveals a black shale layer containing abundant graptolite fossils. Graptolites are one of the characteristic fossils used to help define the stratigraphy of the Ordovician and Silurian successions, and have been used to define ‘biozones’ throughout the strata, aiding geologists in dating the sequence. Graptolites, marine colonial organisms, lived from the Upper Cambrian to the Lower Carboniferous. © BGS, NERC.

(ELC_1_P5) A 10cm wide fault zone is exposed at the north end of the east wall, composed chiefly of brecciated clasts of the surrounding siltstone. Photo taken looking west. © BGS, NERC.

(ELC_1_P4) A 1m thick rib of brown-red greywacke (coarse-grained, poorly-sorted sandstone characterised by quartz, feldspar and lithic clasts forming more than 15% of the rock) is exposed on the western wall of the quarry. The greywacke was deposited as part of a turbidity current during Silurian times, the principal depositional agent in the submarine fan systems dominating the region at the time. Such coarse-grained sediments within turbidite sequences are representative of high flow velocities and rapid rates of deposition during the onset of a turbidity current, which can be strong enough to scour submarine canyons into unconsolidated deep sea sediments. Photo looking toward the west. © BGS, NERC.

(ELC_1_P6) Typical view of the eastern quarry wall, exposing sequences of siltstones, mudstones and shale. Quarry activity has left clean fresh faces to examine, as well as large rock piles on the floor of the quarry, such as the one in the right of the photo. These rock piles have extensive hand specimens to examine without sampling from the quarry wall itself. Photo looking south. © BGS, NERC.

References



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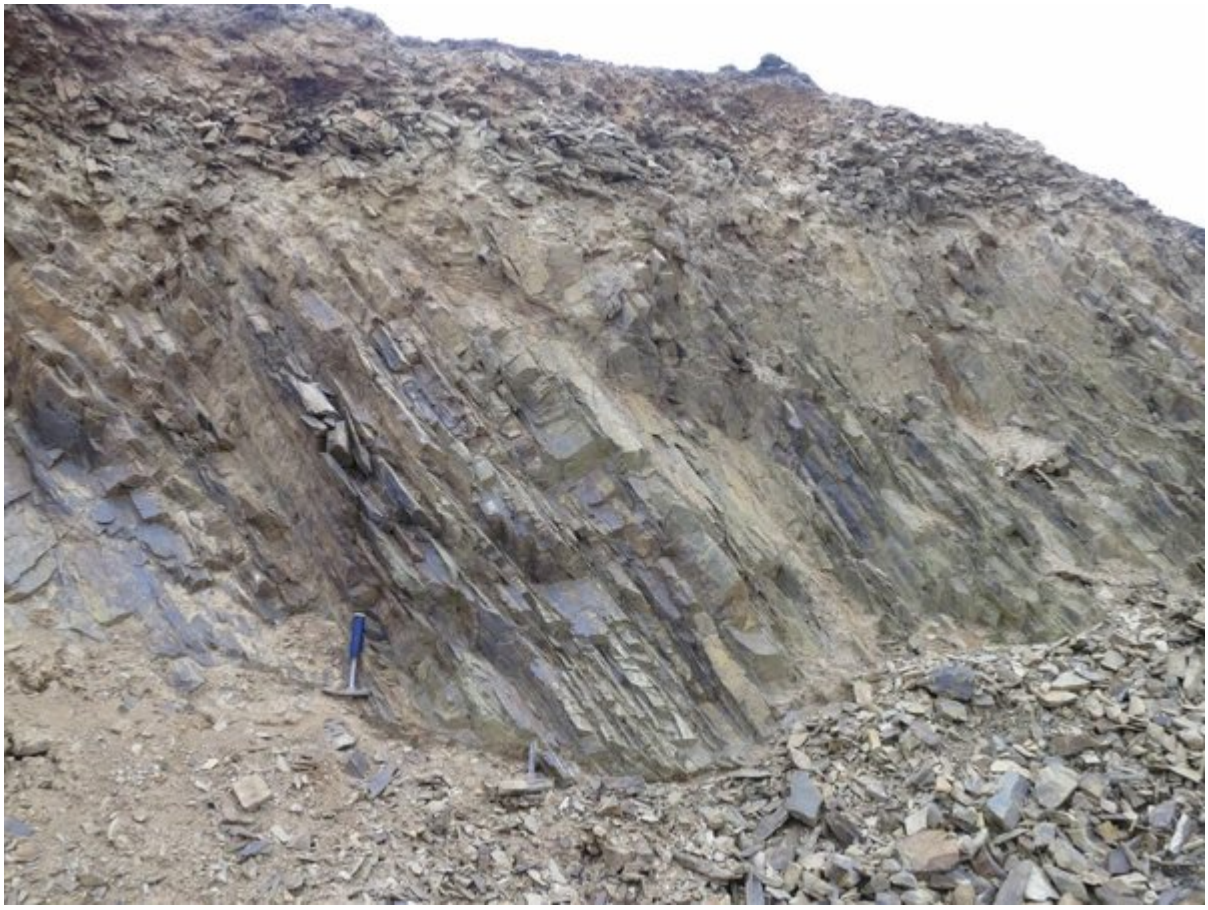

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