
Excursion 3 Falkirk

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Purpose: To examine typical Scottish Lower Coal Measures strata, including beds rich in bivalves (musselbands) and coal and ironstone seams; to see environmental consequences of historic underground mining including subsidence features and former building stone (sandstone) quarries.

Logistics: This day excursion is best by car but a small coach may also be suitable. Wellington boots are useful for this excursion as some of the features are in streams. **On no account should any old mine workings be entered.**

Maps: OS 1: 50,000 Sheet 65 Falkirk & West Lothian; OS 1:25,000 Sheet 349 Falkirk, Cumbernauld & Livingston; BGS 1: 50,000 Sheet 31E Grangemouth; locality map (Figure 3.1)

The Lower and Middle Coal Measures contain an abundance of coal and other resources that have been mined and quarried for hundreds of years, although the local coal mines are long since closed. Nodular and bedded clayband sideritic ironstones were mined along with blackband: a thinly layered clayband ironstone with many coal laminae, especially cannel (drifted mud-sized grains of plant carbon). Sandstone was quarried for building stone as in Bantaskine Park. These activities have bequeathed a legacy of environmental problems, some of which will be seen on this excursion. Some insight will be gained into the 'cycles' of sedimentation in coal-bearing strata; coal (tropical swamp forest) overlain usually by lake deposits of mudstone and siltstone, fluviodeltaic sandstones and, at the top, rooted fossil soils (seatearth and seatclay) underlying the next coal seam. In this kind of cycle, the general grain size of the sediment coarsens upwards. Where river deposits more or less directly overlie the coal seam, the rocks fine up in grain size from sandstone to siltstone and mudstone, the latter representing overbank deposits and some abandoned channel fills.

Understanding Coal Measures stratigraphy for seam-by-seam correlation between collieries and coalfields depends even today on recognising marker bands, commonly highly fossiliferous horizons made up of non-marine bivalves – the musselband. Marine fossils and *Lingulae* are also found in the three marine bands in the local Coal Measures sequence. (Figure 3.2) illustrates the stratigraphy of the Lower Coal Measures in the Falkirk area (Cameron *et al.*, 1998).

From the western [NS 8930 7980] of two roundabouts on the A803 at the east end of central Falkirk, first take the B803 SW for over 1 km then turn left onto the B8028 for about 2.5 km through Glen Village to the northern end of Shieldhill. Take the first turn left into Easton Drive [NS 8952 7700] and park where practical.

Locality 3.1 [NS 9001 7727] Westquarter Burn: Upper Drumgray Coal

Ignoring the first turn on the left in the housing estate, walk eastwards to use either of two closely spaced drove-road paths [NS 8998 7717] that head north to a new footbridge over the Westquarter Burn [NS 8989 7724]. Walk downstream (eastwards) to where a day level (drainage adit) is discharging minewater [NS 9003 7729]. A series of shallow crownholes (sits) on the south bank of the burn indicate outcrop workings in the Upper Drumgray Coal [NS 8993 7725]. The bivalves collected around this locality consist of: *Carbonicola* cf. *pseudorobusta*, *C. aff. Robusta*, *C. robusta/pseudorobusta*, *Curvirimula* sp. The seatearth under the coal represents a waterlogged fossil soil. The strata immediately above the coal are overbank deposits of a river. The sandstone overlying the mudstone and musselband may represent part of a minor delta, which infilled a lagoon or lake. The thin succession exposed dipping 8° SW is exposed at [NS 9006 7728]:

	Thickness (m)
Dark mudstone	0.80
Sandstone, silty, dark-grey	0.60
Mudstone, silty, dark-grey, bedded, with ironstone bands and nodules and non-marine mussels	1.30
Musselband	0.50

Mudstone	0.85
Medium to fine sandstone	0.35
Grey siltstone and fine silty sandstone	0.20
Cross-bedded sandstone with muddy base	0.50
COAL (undercut by a small waterfall); cleats trending 186° and 106°	0.10
Seatearth with blackband ironstone	0.80

Return to vehicles and drive north along the B8028 for almost 2.5 km, turn left (west) at [NS 8850 7908] along the B803 for about 800 m. Bear right at the Y-junction [NS 8770 7890] along an unnumbered road, which leads to the entrance of South Bantaskine Park that is on the right after about 500 m [NS 8705 7888]. Leave vehicles in the car park.

Locality 3.2 [NS 8743 7916] South Bantaskine Park: Upper Drumgray workings

Follow the main path north as far as possible and turn right, crossing a small bridge, which passes over a track leading into a large overgrown quarry. (Ignore the first track on the right.) About 200 m further east, enter the next quarry on the south side of the track. In summer the quarry may be overgrown, but much of the section can be examined in the south wall, especially near the west but also the east end of the quarry. The section exposed is:

	Thickness (m)
Sandstone, medium- to fine-grained, cross-bedded, impersistent silty bands, erosive base	>3.00
Siltstone, grey, bedded, passing down into silty mudstone	1.70
Mudstone, dark-grey, cannelloid (bituminous), very shelly (mussels)	0.12
Siltstone, grey, bedded, planty	0.18
Siltstone, grey, bedded, rare iron sandstone beds, transitional base	0.80
Mudstone, dark-grey, ironstone bands, musselband	0.65
Mudstone, silty, black, carbonaceous and micaceous, with many fish scales and teeth	0.30
Old mine working: stowed waste (or roof fall)	1.40
Seatearth, silt grade, grey	0.30
Sandstone, medium- to fine-grained, cross-bedded, small soft-sediment deformation structures, sharp erosive base	2.20
Siltstone, grey, bedded, planty	0.60
COAL	0.03
Seatearth (seen)	0.10

At least 3 m of sandstone may have been quarried from below this part of the section. The bivalves collected here are: *Carbonicola* sp. (aff. *communis*?), *C. cf. cristagalli*, *C. aff. cristagalli*, *C. aff. oslancis*, *C. cf. pseudorobusta*, *C. aff. robusta*, *C. cf. subconstricta*, *C. aff. subconstricta*, *Curvirimula cf. candela*, *Naiadites cf. flexuosus*, *N. aff. flexuosus*. This rich fauna identifies the old mine working (stowed waste) as the position of the Upper Drumgray Coal. Below the coal (fossilised swamp forest) there is the fossil soil (seatearth). The Upper Drumgray Coal was worked longwall in the first part of the nineteenth century. The quarrying of the sandstone for building stone occurred later.

Both of the thick sandstones exposed in the quarry are fluvial in origin, having been deposited in a meandering or branching system of river channels. Both have erosive bases on the underlying sediments. The underlying fine-grained parts of the succession contain two mussel-bearing units. This part of the succession was deposited on the floor of a shallow lagoon or lake. The siltstones between the two fossil bands and above the upper one are probably deltaic in origin (coarsening up succession), the source of the siltstone may have been the failure of a river bank levée. When these failures take place the river or delta channel diverts into the surrounding low-lying lake or lagoon depositing coarse material near the breach and the fine silts farther away. The scale of the low-lying waterlogged alluvial plains on which

these coal swamps, rivers and lakes existed may have rivalled that of the Amazon basin.

From Locality 3.2 return to the Y-junction and turn right (SW) onto the B803. After about 2.3 km, the masts of the Westerglen Transmitting Station are reached; park by these in the lane [NS 8640 7730] on the east side of the road. The section is on Auchengean Farm on the west side of the road and access is along the farm track.

Locality 3.3 [NS 8589 7727] Auchengean Farm: sub-Glenfuir Marine Band.

Walk along the track towards the steading. Before the steading is reached, turn north along the banks of the partly wooded burn for about 150 m, where there is a small waterfall. In the west bank of the waterfall there are three adits in strata that dip at 10° towards the NE. Orange-stained mine water can be seen from the bridge over the road, entering the stream at [NS 8595 7714]; this may be emerging from the Glenfuir Coal (Armada Main) workings.

	Thickness
Mudstone, dark-grey, bedded	
Blackband ironstone, with <i>Lingula</i> sp., foraminifera, and ostracods (<i>Geisina arcuata</i>)	10cm
Seatearth	

The *Lingulae* may take some time to find as they are small. This marine band is one of two at or near the base of the Lower Coal Measures; the other is the Lowstone. In the burn at [NS 8591 7724], about 45 m south of the adits, mussels may be found in a 60cm-thick mudstone, which rests on an 8cm coal. This is probably the Auldshiels Musselband. The shells collected from this exposure were: *Anthraconaia* sp., *Carbonicola* cf. *extenuata*, *C.* cf. *proxima*, *C.* aff. *proxima*, *Naiadites* aff. *hibernicus*, *Geisina arcuata*.

From Locality 3.3, follow the B803 back to the roundabout in the east end of Falkirk and then take the B902 northwards passing by Falkirk Grahamston Station and Carron to the A88 roundabout at Anton's Hill [NS 8780 8415]. Turn right on to the Bellsdyke Road to reach the roundabout at the junction between the A905 and A88 [NS 9070 8470] at South Bellsdyke, where cars may pause off road on the NE side.

Locality 3.4 [NS 908 832] South Bellsdyke, Heuck Farm, Skinflats: surface effects of underground mining

The buildings near the roundabout at South Bellsdyke are held together by metal straps. The reason for this structural support is ground instability, caused many years ago during mining of the Upper Drumgray Coal just below rockhead (Plate 3.3).

Follow the A905 southwards for 1 km to just south of Howkerse Farm and north of Skinflats, and turn left [NS 9080 8370] and head eastwards along Brackenlees Road. Hereon the roads are narrow and it is possibly better on foot since parking is difficult. This part of the route is on a discontinuous E–W low ridge underlying Howkerse and Orchardhead farms. The ridge exists because of the easterly trending North Broomage Fault in the underlying Lower Coal Measures. The fault-zone is unmined and separates working panels to the north and south, where subsidence has taken place because of longwall undermining. High ground strain is likely in the strata under this area; the spacing between the extracted coal panels varies, but is of about 60 m distance horizontally. The subsided ground accumulates surface water in wet weather, making the hollows easier to see.

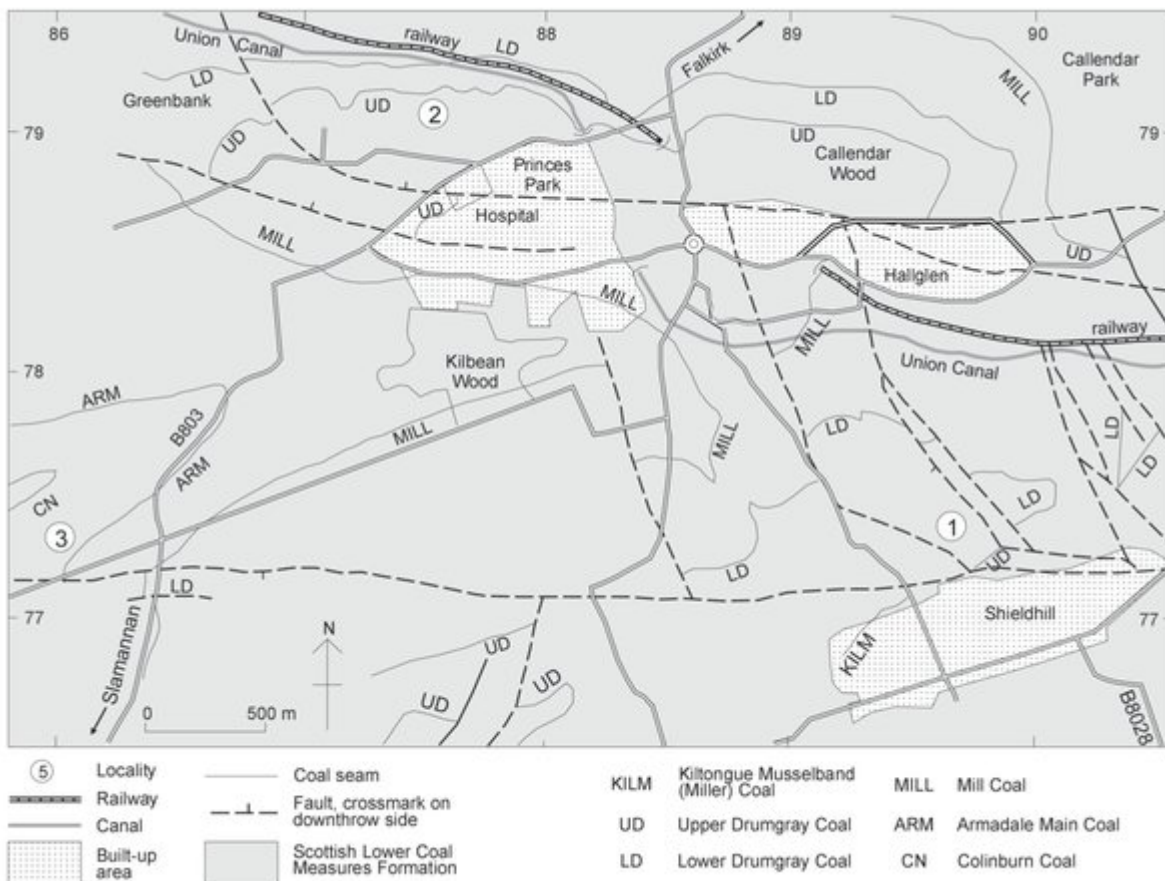
After approximately 1300 m, where the surfaced road turns left towards Orchardhead Steading, go right [NS 9205 8398] onto a rough track (a signed footpath) heading south towards the site of the former Heuck (Island) Farm steading. After about 500 m, the site of the former Grangemouth Colliery Zetland Pit No. 1 [NS 9212 8332] is just to the NW of the wood on the right of where the track first bends. In the nineteenth century there was a firebrick works here and at least one coke oven. Looking west, there is another low-profile E–W ridge, which extends westwards for over 1 km towards Skinflats. Underground, in the bedrock, a late-Carboniferous subvertical c.25 m-wide quartz-dolerite dyke intrudes the coal seams. These have been burnt and have not been mined for approximately 60 m on either side of the dyke. As a

result there is little or no ground subsidence along a narrow zone above and beside the dyke. However, there is considerable subsidence to the north and south of this zone, because of the removal of the coal in longwall mining panels. The strata forming the ridge are an area of high strain because the stresses caused by the subsidence pivot over it and effectively cause stretching of the unmined dyke corridor.

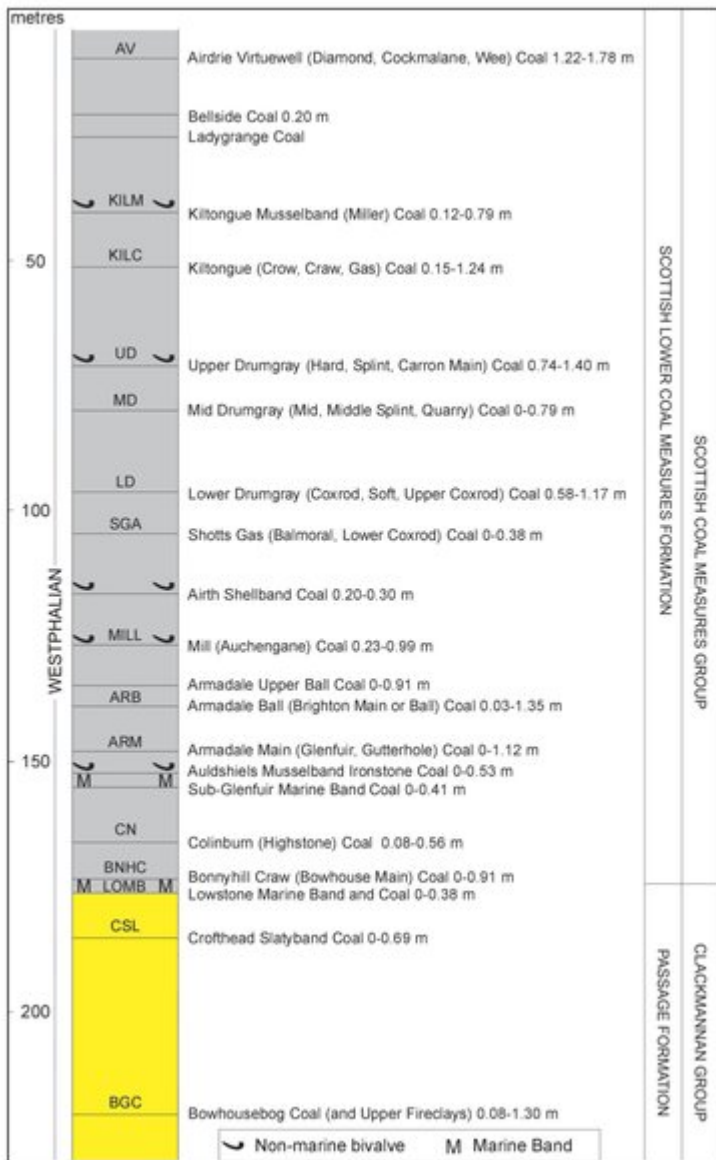
To the east and south of the Zetland Pit site are drowned areas of reclaimed land, now below sea level and forming very rare saline lagoon habitat. These lagoons are in areas of subsidence (c. 3 m) over panels of workings in the Upper Drumgray, Lower Drumgray and Shotts Gas coals. All of these subsidence hollows are on ground reclaimed from the estuary in 1767–70 when the River Carron was canalised. In this area there is a low cliff line at the former high-water mark of the meandering channel of the River Carron. The former estuarine carse clay level, into which the cliff is cut, is much lower than that of the main Holocene level and rises gently inland from about 4 to 7 m OD. Because of mining subsidence, the originally smooth terrace surface is visibly irregular.

About 500 m south of the Zetland Pit site is the elongate bing of Grangemouth Colliery Barony Pit No. 3 [NS 9225 8290] with spoil clearly exposed. Heuck steading was about halfway between the pits. Remains of colliery buildings and possible shaft location can still be made out and the course of the tramway south to the river (and former ferry) is now a path. From here return to the Zetland Pit site and walk westwards along a path towards Skinflats and the Newton Road. On the road, looking west towards the village (and also southwards), the dolerite dyke ridge is visible (just above 5 m OD) in the fields, with lower ground likely to be flooded in wet weather. Complete the loop to Skinflats, rejoin the A905 and vehicles parked farther north. Refreshments are available at the north end of Skinflats.

References



(Figure 3.1) Geological map of Falkirk area, showing Localities 1–3 for Excursion 3.



(Figure 3.2) Vertical section of Scottish Lower Coal Measures Formation in the Falkirk area.



(Plate 3.3) Locality 3.4. Evidence of ground instability due to shallow coal workings; house with restraining horizontal and vertical metal straps, near Bellsdyke roundabout.