ELC_17: Esk Valley

Site information

Location and summary description:

The site comprises a 1 kilometre stretch of gorge along the River Esk near the village of Smeaton. The section extends from Smeaton Bridge in the north to the confluence of the River North Esk and River South Esk, at the ‘Meeting of the Waters’ to the south. The site displays strata from the Middle Coal Measures Formation of the Upper Carboniferous.

National Grid reference:

Mid-point: [NT 34206 69403]

South-west end: [NT 33946 69134]

North-east end: [NT 34481 69663]

Site type: Natural section; Natural exposure

Site ownership: Smeaton Estate

Current use: Private estate

Field surveyors: Sarah Arkley and Eileen Callaghan

Current geological designations: None

Date visited: 7th May 2014

Other designations: River Esk Local Biodiversity Site, Smeaton Bridge is a Grade B Listed Structure

Site Maps

(Figure 22) River Esk Location Map. The site comprises the incised gorge of the River Esk (landform) in which bedrock is exposed along the steep banks. The geologically significant area in the southern part of the site provides a good location for studying the cliff section.

Site description

Background

Within East Lothian the River Esk flows from the council boundary just past the A68 and reaches the Firth of Forth at Musselburgh. This locality is the best exposure of the Middle Coal Measures Formation within East Lothian. The surrounding area has been mined for coal and Smeaton Colliery was located a few hundred metres to the south-west of this site in 1854. Also locally there was the Smeaton Brick and Tile Works which exploited the local clay, sand and coal deposits.

Sedimentary rocks

The Middle Coal Measures Formation is a cyclic sequence of white, grey and brown sandstone and siltstone with dark grey mudstone and coals and seatearths. The sandstone and softer siltstone and mudstone are exposed in cliff sections along the west bank of the River Esk (ELC_17_P1). The sandstone is locally channelized (erosional base; (ELC_17_P2),

and the contact between the sandstone and underlying mudstone/siltstone is a sharp and erosive indicating high energy deposition in streams. In channel sandstones exposed on the east bank of the River Esk a layer of large carbonised wood and plant fragments can be seen at the base of the unit indicating that during flood flows, the channels carried woody debris and deposited it within the channel sediments (ELC_17_P5). Below the sandstone is a coal layer approximately 20cm thick (ELC_17_P6).

Access and additional information

Access to the River Esk at this locality can be made by parking within the village of Smeaton and crossing the A6094 at Smeaton Lodge. The road can then be followed down to Smeaton Bridge. Even though this is a private estate the area appears used by local dog walkers. A bridle path runs from Smeaton Bridge on the east side of the river to Pickle Dirt on the south side of the A68. The path is a pleasant walk giving access to exposures on the east bank of the River Esk and views to the exposures on the west bank of the River Esk. Two footbridges are marked on the 1:10 000 OS map but neither of these still cross the river, (ELC_17_P9), therefore not giving access to the west bank of the river or offering a circular route.

Stratigraphy and rock types

Age: Upper Carboniferous

Formation: Middle Coal Measures Formation

Rock type: Sandstone, siltstone, mudstone with seatearths and coals

Assessment of site: access and safety

Road access and parking Parking can be found in Smeaton but as this is a very small village further parking can be found in Whitecraig. There is a pavement which follows the estate wall along the A6094 southwards towards Smeaton Lodge. The road easily leads down to Smeaton Bridge.

Safety of access Care has to be taken when walking along the A6094, even though there is a good pavement. The bridle path along the River Esk may become slippy in wet weather so care should be taken, stout footwear is recommended. Care should also be taken when near the river particularly when it is in full spate.

Safety of exposure The cliffs are continually eroding, so care should be taken at the base of the cliffs. When viewing the cliffs from the riverbank care should be taken to assess the flow of the River Esk.

Access Access via tracks in open country.

Current condition The rocks are well exposed, especially on the east bank of the river, some faces are covered in vegetation, especially the exposures on the west bank of the river.

Current conflicting activities The site is on a private estate which may allow fishing although no signs or fishermen were seen.

Restricting conditions The land is on a private estate which may restrict visiting although no signs suggesting this were noted.

Nature of exposure River section exposing cliff sections along both banks.

Assessment of site: culture, heritage & economic value

Historic, archaeological & literary associations Smeaton Bridge is a single span sandstone bridge probably built of local stone.bridge and a Grade B listed building.

Aesthetic landscape Pleasant tree lined walk along the River Esk. History of Earth Sciences Note applicable.

Economic geology The Middle Coal Measures in East Lothian have been exploited for their deposits for the past two hundred years, located near to this location were Smeaton Colliery and Smeaton Brick and Tile Works.

Assessment of site: geoscientific merit

	Rarity	Quality	Literature/collections	Primary interest
Lithostratigraphy	Regional	Excellent		X
Sedimentology	Local	Good		
Igneous/mineral/metamorphic geology				
Structural geology				
Palaeontology				
Geomorphology				

Site geoscientific value

This site displays the Middle Coal Measures Formation of the Upper Carboniferous. This is the best locality within East Lothian for seeing rocks of this age.

The River Esk provides an excellent example of the Middle Coal Measures Formation with regional lithostratigraphical significance.

Assessment of site: current site usage

Community The site is easily accessible and is used at present by dog walkers and horse riders.

Education The site displays a variety of features suitable for amateur geologists to study depositional sedimentary environments.

Assessment of site: fragility and potential use of the site

Fragility Weathering/erosion

Potential use The bridle path along the River Esk could be developed as a short trail with on-site interpretation opposite a cliff section on the west bank and also the cliff section on the east bank exposing the coal. Footbridges across the river would enhance access and could connect the site to Dalkeith Country Park. The cliff sections are well exposed and would provide educational opportunities for the study of coal formation.

Geodiversity summary

This site contains good exposures of largely fluvial sedimentary strata of the Middle Coal Measures Formation and is the best site to view these strata in East Lothian. The structures and different lithologies seen at this site help to understand the terrestrial depositional environments of the upper Carboniferous in the Midland Valley.

The walk along the River Esk is attractive, peaceful and easily accessed. There are possibilities for adding geological interpretation to this site.

Site photos

(ELC_17_P1) Cliff section on the west bank of the River Esk. The buff coloured sandstone can be seen resting on the softer mudstone/siltstone which is undercuts the sandstone. © BGS, NERC.

(ELC_17_P2) The thinly bedded sandstone slightly obscured by vegetation appears to be a channel which has cut into the thicker bedded sandstone below. The sharp, erosive contact between the sandstone and the undercutting mudstone/siltstone can be clearly seen © BGS, NERC.

(ELC_17_P3) Interbedded sandston showing differing lithologies, the finer grained silty sandstone beds are being eroded more quickly giving rise to prominent beds of sandstone. © BGS, NERC.

(ELC_17_P4) Cliff section on the east bank of the River Esk. Exposure is showing massive bedded yellow/orange sandstone with a thin layer of coal exposed at its base. Erosive debris at the base of the section is obscuring the true thickness of the coal. © BGS, NERC.

(ELC_17_P5) Coal rafts seen in consolidated material at the base of the sandstone. The coal deposits may have been transported by the sand during deposition in a fluvial environment or are plants remains which have been carbonised into coal. © BGS, NERC.

(ELC_17_P6) 20cm layer of coal at the base of the sandstone. The coal is dull black, fractured and sulphurous, yellow staining can be seen. © BGS, NERC.

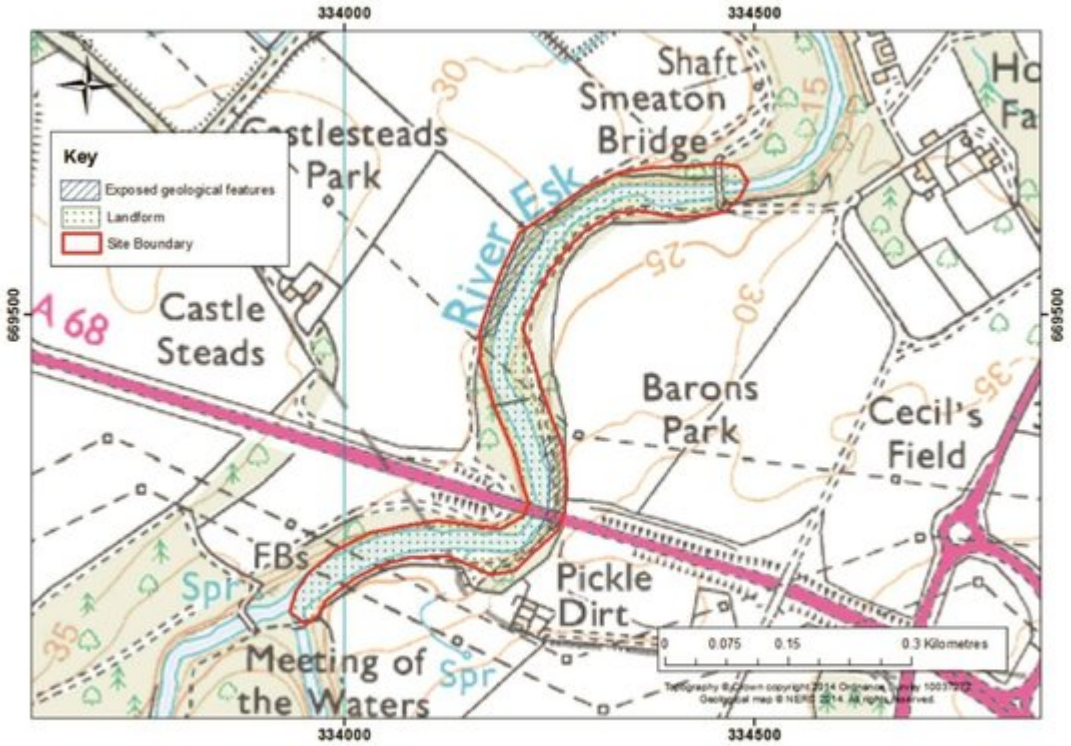
(ELC_17_P7) Cliff section continues along the east bank of the River Esk and has been used as a foundation for the A68 which crosses the river at this point. © BGS, NERC.

(ELC_17_P8) Cliff section exposing thick beds of sandstone interbedded with thinner beds of silty sandstone. Due to their lithology they are eroding more quickly than the thicker micaceous sandstone beds. The base of the thinner beds indicates a channel like structure. The coal exposed just north of this section is not seen at this location. © BGS, NERC.

(ELC_17_P9) The footbridge at the ‘Meeting of the Waters’ is no longer in use. © BGS, NERC.

References

Site Maps



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