ELC_7: Old Markle Quarry, East Linton

Site information

Location and summary description:

Disused basalt quarry, located ~0.5 km west of the village of East Linton. The site displays the type locality of the ‘Markle Basalt Lava’, which is of widespread occurrence in the lower Carboniferous lavas of the Midland Valley. The basalt forms part of the Garleton Hills Volcanic Formation, part of the Strathclyde Group of the lower Carboniferous. Historically, the quarry was worked at least until 1854, and closed sometime before 1895.

National Grid reference:

Mid-point: [NT 58385 77010]

Site type: Artificial quarry works

Site ownership: Not known

Current use: Disused, agricultural land

Field surveyors: Sarah Arkley & Rachael Ellen

Current geological designations: None

Date visited: 16th April, 2014

Other designations: Markle Quarry Pond Local Biodiversity Site

Site map

(Figure 12) Old Markle Quarry Location Map. The site boundary has been drawn to include rock outcrops to the north of the quarry, as they are of the same rock type and will provide alternative exposures to examine should high water levels in the pond of the quarry restrict access. Access and general viewpoints are also included within the geologically significant site area.

Site description

Background

The quarry was active in the early 1800s, for extraction of basalt presumably for aggregate. The plagioclase-macrophyric basalt flow exposed in the quarry is known traditionally as the ‘Markle Basalt Lava’ type, and is of widespread occurrence in the lower Carboniferous lavas of the Midland Valley. This quarry represents the type locality of the Markle Basalt type. The quarry floor is now flooded, but quarry faces remain accessible for examination (ELC_7_P1). Should water levels rise and access be restricted, there are natural exposures to the north of the quarry which could be examined.

Volcanic rocks

The quarry face displays a 7–8 m thick basalt lava, generally massive with sub-vertical joints, and weakly developed columnar jointing in unworked faces (ELC_7_P2). The basalt flow is composed of abundant large (<1 cm) plagioclase feldspar phenocrysts and pseudomorphs after olivine phenocrysts (<0.3 cm), set in a fine grained grey-red groundmass ((ELC_7_P3). The pseudomorphs after olivine contain hematite, chlorite and a small component of quartz (Smith,

1959).The basalt is reddened throughout the outcrop due to hematisation, with locally concentrated alteration surrounding fractures. The feldspar phenocrysts are tabular to blocky in nature, and white in colour with a visible cleavage plane. The olivine pseudomorphs are more lobate in nature than the feldspars. The basalt is non-vesicular at the base, becoming increasingly vesicular (exhibiting elongation in places, suggesting flow-aligned morphology – see (ELC_7_P4) and fissile toward the top 1 – 2 m of the outcrop, interpreted as the near surface facies of an ‘aa’ flow type (lava flow which cools as large blocks with a rough, jagged surface). Mineralised fracture planes occur along the sub-vertical joints, possibly calcite.

Structural geology

There are abundant examples of slickenlined joints (evidence of rock on either side of the joint moving with respect to the other), with the slickenlines trending in an ENE-WSW orientation (ELC_7_P5).

Access and additional information

Within the old quarry itself there is debris and boulders along with boggy ground, making an uneven walking surface. The quarry is also partially filled with water, but the quarry face is accessible in places. Broken loose boulders can be collected. Rock face seems fairly stable, although weathering and fracturing in places may potentially lead to rock fall, and therefore care should be taken whilst examining this outcrop. This quarry is featured as an excursion in the Lothian Geology Excursion Guide.

Stratigraphy and rock types

Age: Lower Carboniferous

Formation: Garleton Hills Volcanic Formation

Rock type: Basalt, plagioclase-macrophyric

Assessment of site: access and safety

Road access and parking Good access from pavement along the A199, and parking by the roadside either along Haddington Road (B1407), or along the road in the Orchard Field housing estate. Enter through a farmer’s gate from pavement to enter quarry site.

Safety of access Pavement is adjacent to a busy and fast road, and is necessary for site access. The path to the quarry is along a rough track. Rough uneven ground on sides and floor of quarry, overgrown and boggy in places. Deep water in front of quarry walls should be avoided.

Safety of exposure Care should be taken as in all quarries, and an assessment made of each face before approaching. The quarry faces are high, and potentially loose material may fall, therefore care should be exercised. There is loose material underfoot, overgrown by grass and weeds.

Access Accessed via tracks in agricultural land

Current condition The condition is good with rock faces generally well exposed, however moss and lichen cover the basalt in places on the quarry faces. A few trees and vegetation may obscure views in summer, and there are minor amounts of farmer debris, boulders, and wood in places.

Current conflicting activities None

Restricting conditions After heavy rainfall the water in front of the quarry face may rise so that access to the lower parts of the quarry faces is not achievable.

Nature of exposure Vertical quarry faces

Assessment of site: culture, heritage & economic value

Historic, archaeological & literary associations No known association

Aesthetic landscape Old quarry on the edge of East Linton, revealing underlying geology

History of earth sciences Type locality of Markle basalt

Economic geology Quarried in 1800, activity ceased between 1854 and 1895. Use unknown, probably for road metal.

Assessment of site: geoscientific merit

	Rarity	Quality	Literature/collections	Primary interest
Lithostratigraphy				
Sedimentology				
Igneous/mineral/metamorphic geology	Regional	Good	Smith, 1959	X
Structural geology	Local	Poor		
Palaeontology				
Geomorphology				

Site geoscientific value

This site is the type section for ‘Markle Basalt’ (now a disused term for the plagioclase-macrophyric basalt exposures throughout the Midland Valley of Scotland), and is therefore the most important section through this part of the Carboniferous volcanic sequence in the region.

The Old Markle Quarry provides a good example of typical Carboniferous basalt lava flow, with regional significance.

Assessment of site: current site usage

Community The quarry is on the outskirts of the town of East Linton, and rarely visited by the local community. It is likely to be frequented by the occasional geologist due to its significance as the type locality of Markle Basalt.

Education The site is the type locality for the Markle Basalt lava, and is exposed particularly well, with plenty of fresh faces for examination of the large plagioclase phenocrysts. The quarry would act as an excellent reference point to those interested in igneous rocks of the lower Carboniferous of the Midland Valley of Scotland. On-site interpretation boards would be appropriate for this site.

Assessment of site: fragility and potential use of the site

Fragility Natural overgrowth, geohazard

Potential use Research, Higher/Further Education, School Education, On-site interpretation

Geodiversity summary

The main value of this site is its geological association of being a type locality for a regionally widespread and common rock type. It contains excellent exposures of the Markle Basalt, a basalt type common and widespread throughout the central belt of Scotland. The site exposes an excellent cross section through a basalt lava flow containing abundant

feldspar phenocrysts, vesiculated flow tops and other features typical of a basalt lava flow (e.g. sub-vertical cooling joints).

Site photos

(ELC_7_P1) Overview of Old Markle Quarry. The floor of the quarry is filled with water, and the edges of the pond are littered with old bits of wood, rock debris, and other loose material. The accessible rock face is shown in this photo. Photo looking south. © BGS, NERC.

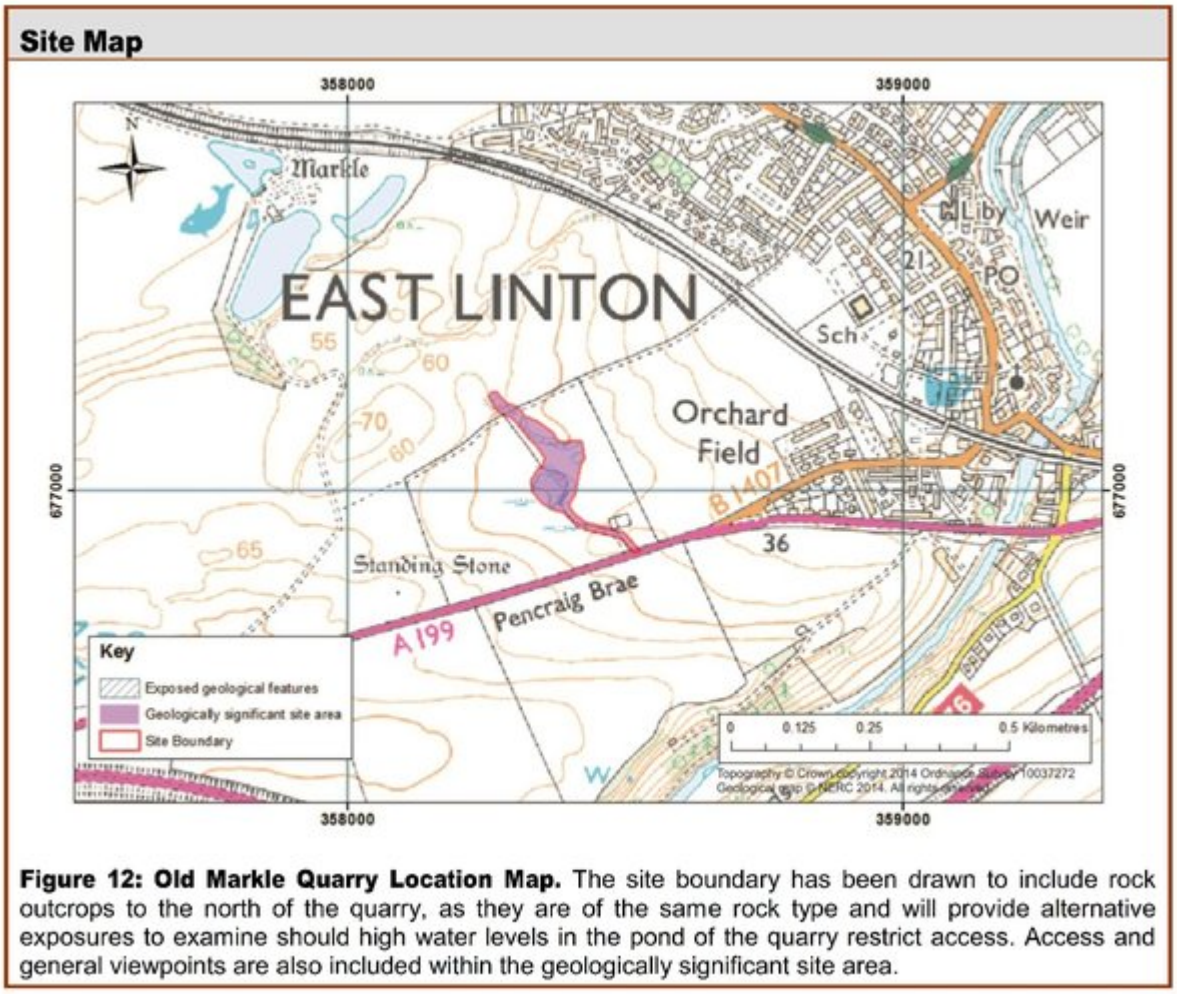
(ELC_7_P2) Weakly developed columnar jointing within the plagioclase-macrophyric basalt. Columnar joints form when a basalt flow is cooling, with the cooling surface (e.g. ground or air) typically perpendicular to the orientation of the joints. In this case, the columnar joints are near vertical, suggesting the cooling surface was sub-horizontal (e.g. ground or air). Photo looking west. © BGS, NERC.

(ELC_7_P3) Detail of the plagioclase-macrophyric basalt at this locality. The groundmass is grey-red, with abundant phenocrysts of white, blocky to equant feldspar phenocrysts. The reddish crystals which are lighter than the ground mass are pseudomorphs after olivine. © BGS, NERC.

(ELC_7_P4) Detail of elongated vesicles (relict gas bubbles) within the basalt lava flow. The vesicles are elongated, suggesting they have been aligned during motion within the lava flow. This so called ‘vesicle flow alignment’ suggests a movement of the lava flow from left to right in this photo. © BGS, NERC.

(ELC_7_P5) Slickenlines on joint within basalt. Slickenlines are ‘scrapes’ left on joint surfaces when the rock on either side of the joint has moved against the other. The movement often polishes the joint surface, as is the case in a lot of the slickenlines surfaces at this locality.

References



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