Spireslack Locality 7 (and 7b): Complex fault zone in McDonald Limestone

NGR: [274845 630590]–[274895 630623] [NS 74845 30590]–[NS 74895 30623]

Key categories of interest Rarity Quality

Key category of interest	Rarity	Quality
1. Structural geology	5	5
2. 3D visualization	3	4

Access: Good access to base of exposure, easily accessible from roadway.

Current safety: Potential for falling blocks/scree from limestone pavement, sharp drop behind access

Measures to enhance site: Viewing platform away from steep drop and large rocks; barrier between platform and steep drops.

Key categories in order of interest (1 = primary interest); Rarity, 5 = only example in Spireslack, 1 = many examples in Spireslack; Quality 5 = exceptional preservation in Spireslack, easy access/viewing potential 1 = average preservation in Spireslack, difficult access/viewing potential

Photograph overview with polygon boundary

(Overview of Locality 7 and 7b) (north and south wall respectively). Site boundary includes key rock exposures, immediate access to site and viewpoints to the site. Left photo taken from scarp looking to the north, and right hand photo taken looking to the equivalent fault on the south of the void.

Site description

Geology

Whilst there are many small faults intersecting the McDonald Limestone pavement, none are quite as spectacular as the structures associated with the > 5 m displacement fault at this locality. The west-most wall of the fault in the limestone is heavily fractured and faulted, containing a complex network of conjugate and linked small- displacement faults. Relay ramp structures are also well developed. As in Locality 3, structures like these are rare but are critical to study in order to further the understanding fault growth and evolution. Fault rocks (primarily limestone fault-breccias) are observed along the planes of some of the larger displacement faults. Thin dykes also

cut the limestone pavement. The main fault also displaces the mechanically weaker seatearth in the lower half of the void, where the west most wall of the fault has a markedly different faulted signature than that of the mechanically stronger limestone. This is important to highlight how faulting affects rocks with differing mechanical strengths.

The fault is visible in section view in the main scarp, where it also displaces one of the Palaeogene dykes. Together the localities on the north and south of the void contribute to a 3D understanding of fault networks cutting coal- bearing sequences.

Access and enhancement suggestions

This locality is accessible from existing roadways and there is sufficient space at the base of the pavement to stand safely to view the structures. The seatearth in the lower part of the void is also accessible, although the pond in the lower

void is liable to flood and may impede access at times. A flood barrier could be constructed to avoid this. Barriers at the top of the seatearth horizon would improve safety for viewing the structures in the limestone pavement.

Site photographs

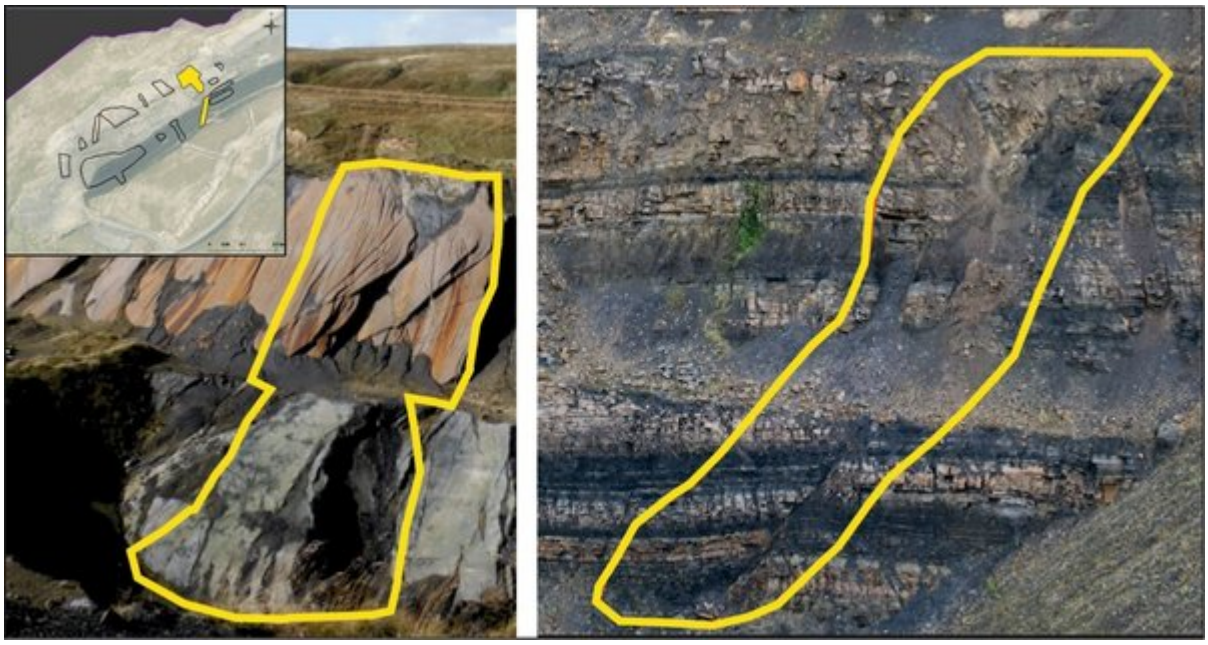
(Spireslack_7 P1): Spectacular fault structures, including relay ramps, limestone lenses and small faults have formed in response to faulting of the McDonald Limestone pavement . © BGS, NERC.

(Spireslack_7 P2): The fault is also seen in the scarp of the void — however, the damage associated with the west side wall of the fault is not as obvious in this section view as it is on the limestone pavement. The fault also displaces a Palaeogene dyke. © BGS, NERC.

(Spireslack_7 P3): Fault breccia, formed from fracturing and rotation of the stiff McDonald Limestone along the main fault plane. Fault rocks can give an indication of how intense the faulting was and how often the sequence has been faulted. © BGS, NERC.

(Spireslack_7 P5): Foreground shows the faulting style of the seatearth, sitting stratigraphically above the McDonald Limestone. The main fault displacing the units is to the right of the photos, but the intense deformation recorded in the west wall of the fault by the limestone is less obvious in the seatearth — a result of the differing mechanical strengths of the units faulted. © BGS, NERC.

References



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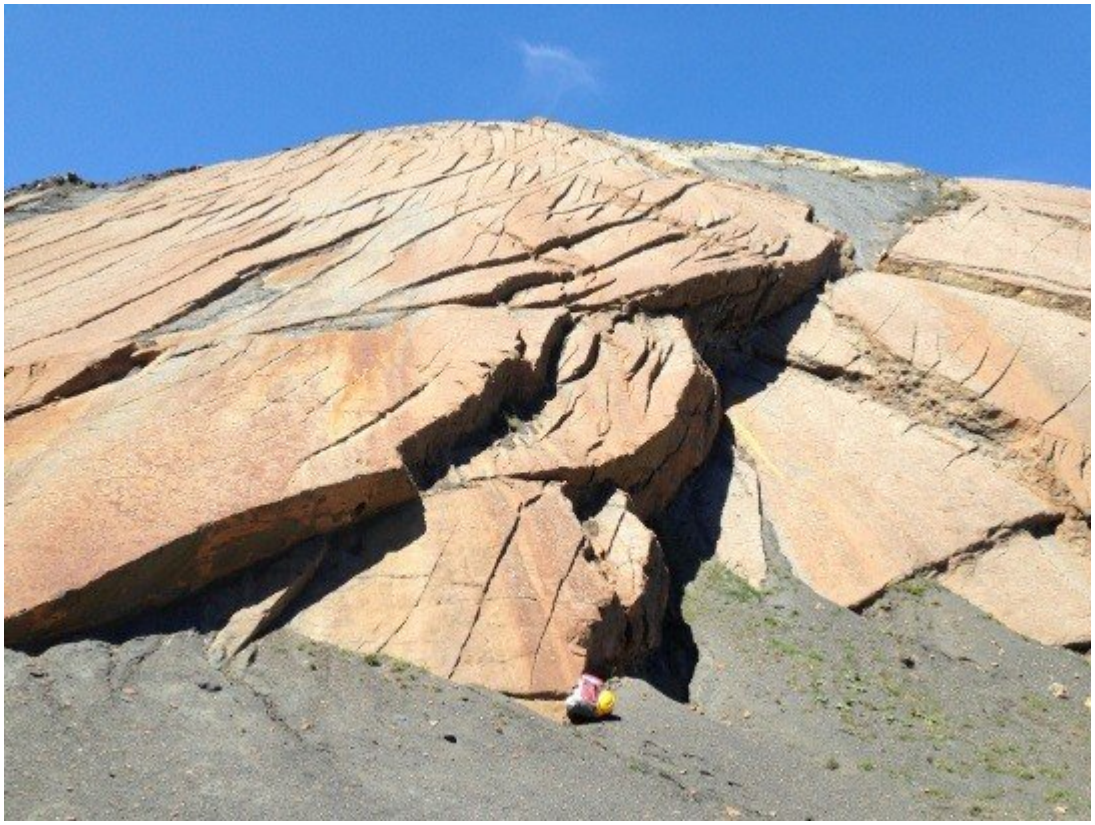
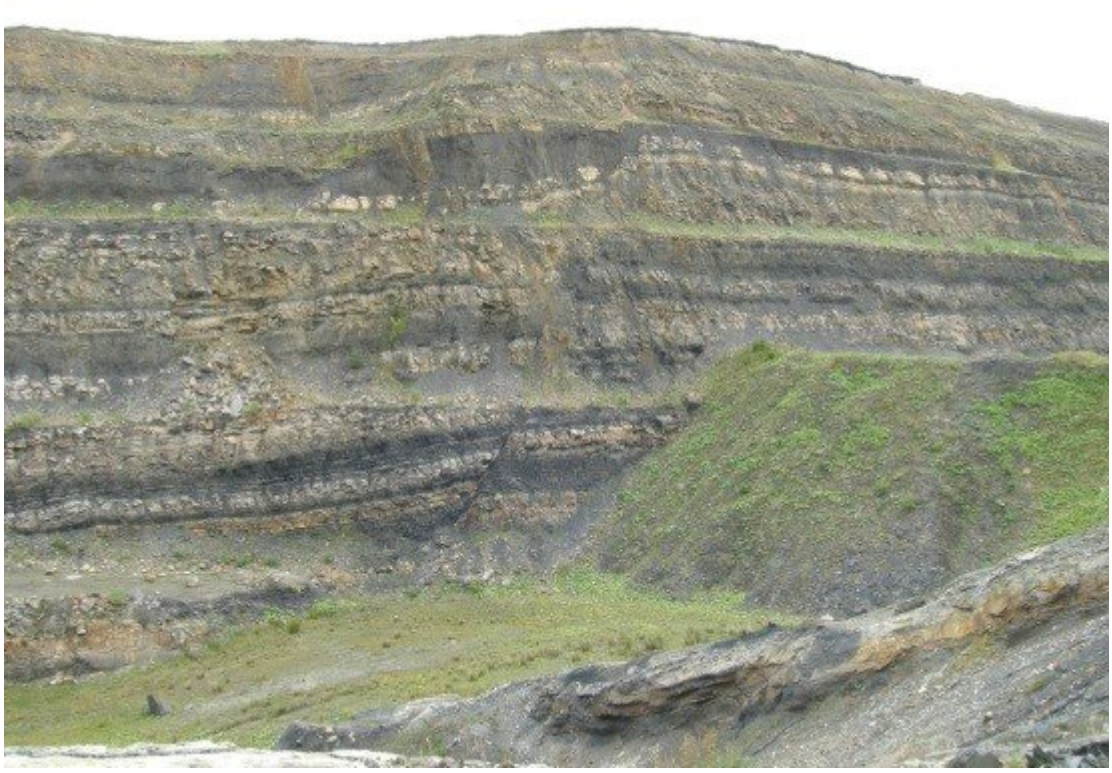


(Spireslack_7 P1) Spectacular fault structures, including relay ramps, limestone lenses and small faults have formed in response to faulting of the McDonald Limestone pavement . © BGS, NERC.



(Spireslack_7 P2) The fault is also seen in the scarp of the void — however, the damage associated with the west side wall of the fault is not as obvious in this section view as it is on the limestone pavement. The fault also displaces a Palaeogene dyke. © BGS, NERC.

(Spireslack_7 P3) Fault breccia, formed from fracturing and rotation of the stiff McDonald Limestone along the main fault plane. Fault rocks can give an indication of how intense the faulting was and how often the sequence has been faulted. © BGS, NERC.

(Spireslack_7 P5) Foreground shows the faulting style of the seatearth, sitting stratigraphically above the McDonald Limestone. The main fault displacing the units is to the right of the photos, but the intense deformation recorded in the west wall of the fault by the limestone is less obvious in the seatearth — a result of the differing mechanical strengths of the units faulted. © BGS, NERC.