Styrrup Quarry, Nottinghamshire

[SK 605 902]

Introduction

The quarry exposes a good section of the Nottingham Castle Formation, showing accreted sand bodies transverse to the palaeocurrent direction; both major and minor channel forms are distinguishable. Together with the nearby Scrooby Top Quarry, where exposure is parallel to the channel forms, this site provides an excellent opportunity to study the geometry of the deposits of large-scale rivers flowing off the Pennine Chain to the west, and the characters of the Nottingham Castle Formation.

Accounts of the Nottingham Castle Formation at Styrrup Quarrry have been give by Lamplugh *et al.* (1908), Swinnerton (1910, 1914, 1918), Elliott (1961), Taylor (1968, 1974), and Burley (1984).

Description

Styrrup Quarry displays excellent sections in the Nottingham Castle Formation, showing both large and small channels (Figure 3.47). The commonest sedimentary structure is large-scale planar cross-bedding. The sets have asymptotic bases and a gently curving form over horizontal distances of tens of metres. The sets are usually less than 2 m, but occasionally up to 4 m, in thickness. The sandstones contain horizons of pebbles and mudstone intraclasts aligned along foresets and concentrated on scour surfaces at the base of sets. Palaeocurrent indicators from cross-bed foresets are mainly to the east and north-east. The bounding surfaces between the larger cross-bedded sets have a lenticular form and a hierarchy of such surfaces is recognized.

Trough cross-bedding is rarer, on a smaller scale, and shows a greater spread of palaeocurrent orientations than the planar cross-bed sets. Horizontally laminated sediments, often showing parting lineation, form a minor part of the succession. The larger-scale cross-bed sets and associated smaller-scale structures are separated by sub-horizontal erosion surfaces of greater lateral extent than the foreset packages.

Palaeosols and ventifact horizons are reported from the top of the sequence at Styrrup Quarry (Swinnerton, 1914; Taylor, 1968), but are almost entirely absent lower in the sequence. Well■rounded 'frosted' grains are also present in the sandstones.

Interpretation

The most prominent and laterally persistent bounding surfaces are interpreted as the result of migration of channels. Lower-order surfaces are interpreted as defining laterally and vertically accreted packages of sediment and the form of the second-order channel fills. Palaeocurrent indicators suggest derivation of the sediment from the west and south-west, presumably ultimately from the Pennine upland area to the west, or the London Platform to the south.

Re-activation surfaces and falling-stage modifications of some foresets, together with the lateral extent of foreset packages, indicate an origin by intermittent migration of gently sinuous-crested transverse bars. The relationship between the trough- and planar-cross-bed sets suggests that the former were deposited by the migration of sinuous-crested megaripples in flows deflected by larger transverse bars.

The sandstones of the Nottingham Castle Formation may be interpreted by comparison with modern river systems, such as the Platte River in Nebraska (Blodgett and Stanley, 1980). The large-scale foresets are considered to indicate the presence of large bars (tens of metres wide, tens to hundreds of metres long, and over 2 m in height), which were overtopped and migrated downstream by slip-face progradation at high discharges. At lower discharges, these bars were modified by deposition of horizontal-laminated sands on their top surfaces and by megaripple migration on their margins

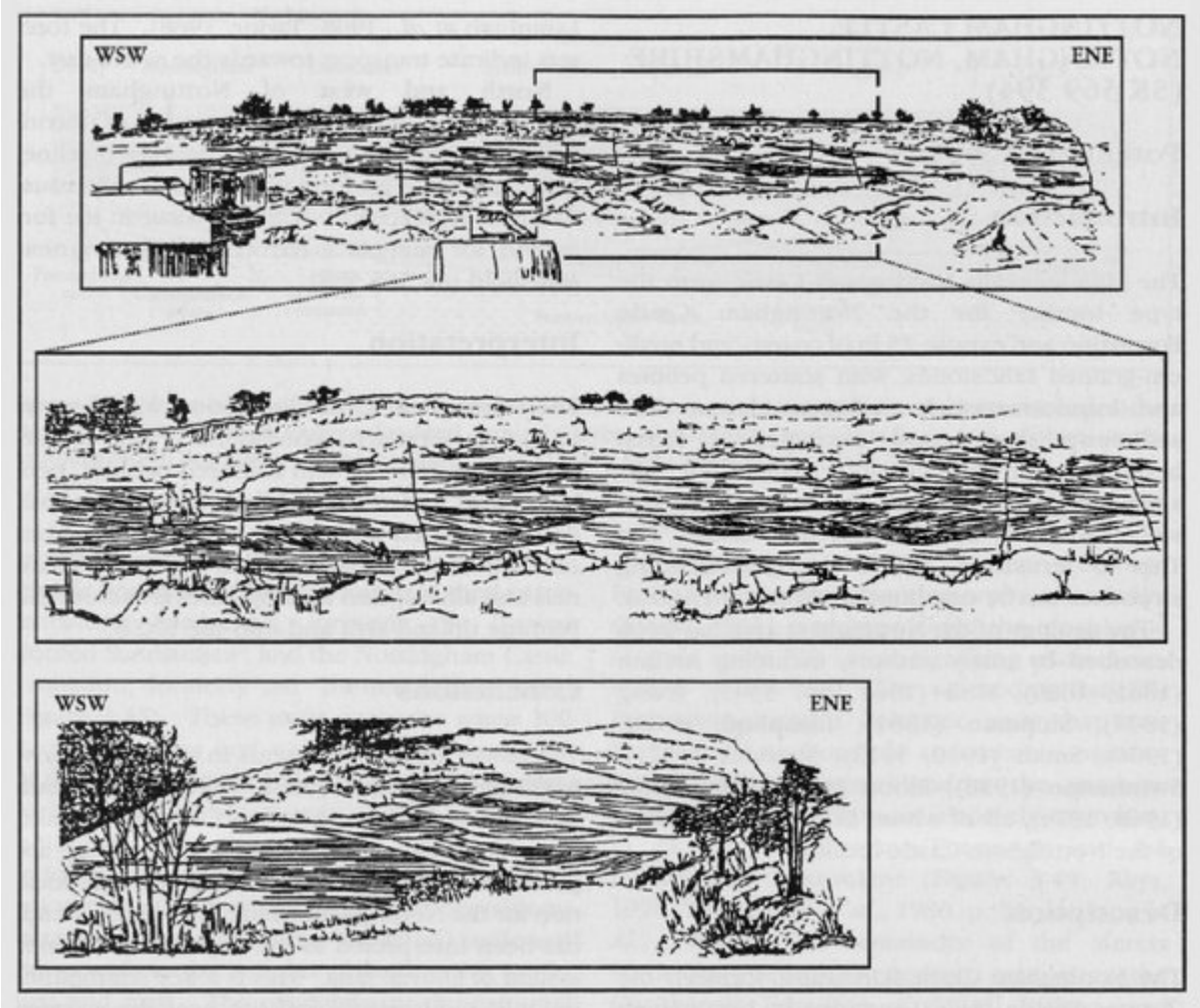
and in shallow second-order channels.

The well-rounded 'frosted' sand grains found at certain horizons suggest that aeolian deposits were present in the area. Similarly, the widespread occurrence of mudstone intraclasts suggests deposition of muds in overbank, bar top, or high-level channels as depositional energy fell. Together with the widespread occurrence of sub-horizontal erosion surfaces, this evidence suggests that only the lowest part of each depositional cycle has been preserved and may, in turn, help to explain the absence of aeolian deposits from the sequence, since these would have been reworked by each successive phase of channel reoccupation. Thus, the truncated nature of the sequences is probably a reflection of low rates of subsidence relative to the frequency of channel migration.

Conclusions

Styrrup Quarry offers good sections through the river-deposited sandstones of the Nottingham Castle Formation. Major and minor channel bedforms are seen, most of them cut transverse to the dominant north-easterly flow direction. These illustrate classic coarse-grained fluviatile sedimentary features of a major channel system running out into alluvial fans off the eastern margin of the Pennine Upland. This is a key sedimentological and stratigraphical site near the western margin of the Southern North Sea Basin.

References



(Figure 3.47) Field sketches of the Triassic channel systems in the Nottingham Castle Formation at Styrrup Quarry, viewed roughly transverse to flow. Based on unpublished work by S. D. Burley.