

pinkish-red clay at various horizons, mostly associated with Fe-Mn. Weak stratification, parallel to the ground surface.

6- Dense greenish-yellow and buff sands in layers 1-4cm thick with blocky structure, seen in ABC only. At B the sands at depth are heavily impregnated with Fe-Mn and contain several pebblesized clasts of red clay.

Unit 1, the soil, is a freely-drained stony brown earth. Its parent material is Unit 2, a diamicton regarded as a 'head' deposit produced by gelifluction. This consists partly of reworked clays, silts and sands of Units 3, 4 and 5 but also includes a substantial number of chert fragments. The clay of Unit 3 appears to be reworked Mercia Mudstone. It spreads thinly both upslope and eastward of the section and is interpreted as a mud-flow. Its sharp plane base points to flow over a compact undeformable surface of the underlying sands of Unit 5. It most probably derives from an outlier of Mercia Mudstone capping the spur beneath the patch of Valley Gravel. Wetting from an exceptional thaw of ground-ice and snow could have exceeded the liquid limit of the Mudstone, allowing gravity-controlled flow of the clay over still-frozen sands. The laminated silts of Unit 4 appear to thicken east into a former shallow gully beyond which is the mud-flow. The silts, affected by sheet-wash, could have an aeolian component. The sands of Units 5 and 6 are also slope deposits, derived largely from the Otter Sandstone. The thin silty-clay seams (Section ABC) and the layers and clasts of red clay (Section DEF) may represent deposition of fines by sheet-wash or wind action, and of slabs of Mudstone by sliding, on successive slope surfaces. If so, the sands aggraded as discrete layers when wetted sufficiently to render them mobile. Near Section DEF the deposits were angered to 5-8m and foundation piles for the house entered bedrock at a maximum of 8.5m. This depth, given the geometry of the slope, indicates that the sands, which form the bulk of the deposits, probably gathered at the foot of a bluff cut into the Otter Sandstone by the valley stream.

The deposits at both sites accumulated on a succession of vegetation-free surfaces under conditions which ensured that water remained at or close to the ground surface. A periglacial environment, which allowed deep frozen ground on a southfacing slope and geomorphological processes dominated by mass movement and wash seems most likely. The slope has been inactive since deposition of the head (Unit 2), affected only by Flandrian pedogenic processes and diagenetic introduction of Fe-Mn by groundwater. Present slope form and the deposits are so closely related that they were most probably produced about the end of the cold Devensian Stage of the Quaternary.

The chert fragments (Units 1, 2) cannot have been supplied directly from the Greensand, but from the outlier of Valley Gravel which is one of many inter-tributary, spur-crest remnants of a once extensive sheet (Geological Survey Sheet 326). Only after deepening of the Wiggaton tributary valley could the slope deposits accumulate and chert be incorporated in them. Therefore at least two periods of chert transport and deposition can be identified, separated by a phase of valley erosion.

The slope deposits gave rise to unanticipated difficulties in preparing foundations for the houses. Their textural variability, down-slope stratification and control on groundwater flows meant that the prospect of slope failure under non-uniform distribution of loads, and at least of differential settlement, was high. Accordingly the houses were eventually supported on piles driven to bedrock. Because similar heterogeneous deposits are likely to occur elsewhere in the Otter basin, their significance in engineering terms should not be ignored.

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Abstracts of other papers read at the Annual Conference, January 1988

High quality sandstone resources of SW England. R. C. Scrivener, *British Geological Survey, 30, Pennsylvania Road, Exeter EX4 6BX.*

A Department of Environment-funded project to examine resources of high-quality sandstones for aggregate usage has been carried out by the British Geological Survey in parts of SW England and S Wales. The study in SW England comprised a review of the properties and distribution of Devonian and Carboniferous sandstones from an area bounded in the south by National Grid line northing SX90 and extending east to include the Quantock Hills.

Approaches to local government departments, commercial operators and national laboratories yielded a limited amount of aggregate test data and these were supplemented by the collection and testing of samples specifically for the study. Tests included Polished Stone Value (PSV), Aggregate Impact Value (AIV), Aggregate Crushing Value (ACV), Aggregate Abrasion Value (AAV), water absorption and relative density. PSV and AAV are particularly relevant to the selection of sandstones intended to provide skid-resistant road surfaces. Test results for these factors are presented for three geological formations, namely, the Crackington Formation (Upper Carboniferous), Bude Formation (Upper Carboniferous) and Hangman Grit (Middle Devonian). Variations in AAV and PSV are related to sandstone petrology, degree of weathering, and siltstone/mudstone content. The need for further work on aggregate weathering properties is indicated.

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Recent investigations into the Bovey Formation at Beacon Cottage Farm, St. Agnes, Cornwall. N.L. Jowsey, D. L. Parkin, A.P.C. Smith, P. T. Walsh. *Geology Laboratory, Department of Civil Engineering, City University, London EC1 V 0HB.*

The mid-Oligocene sediments forming the Beacon Cottage Farm Outlier at St. Agnes, Cornwall, have a stratigraphical/geomorphological importance which is out of all proportion to their modest residual bulk (i.e. ca 3 x 105m3).

There has been no continuous exposure of this outlier since the 1940s and, apart from a very limited programme of hand-augering in 1974, no sampling of the sediments since 1932.

During 1986/7, some 60 holes have been sunk into the area surrounding the farm, many of these into the Palaeozoic floor below the outlier. Collectively, these show that all previous interpretations concerning the extent, stratigraphy and structure of the outlier are substantially incorrect.

It is demonstrated that the outlier preserves beneath it widespread zones of rotten rock in granite and kills of pre-mid-Oligocene age. The sub-Oligocene unconformity is nowhere flat and varies in altitude by at least 20m. The local Bovey Formation succession comprises a two-member sequence of basal sands, which are often pebbly, overlain by candle clay, the whole totalling 8.4m in maximum development. There is considerable indirect evidence that either the rotted Palaeozoic floor has palaeoslopes which locally exceed 45° or that several post-mid-Oligocene faults (and, possibly, a WNW-ESE fold axis) have affected the outlier.

Planning and environmental aspects of extraction operations.
J.F. Cowley

The extraction of minerals is generally one of the most controversial types of development. The operations are seen widely as damaging to the environment, destructive to other resources, as a producer of nuisance and an activity giving rise to derelict or despoiled land. The historical justification for these views is clear and indisputable. Because of these impacts, applications for mineral extraction dealt with within the framework of the Town & Country Planning Acts fall with slaughter houses and casinos etc. into a group of development operations described as "bad neighbour developments" (S26T & CP Act 1971), which require a special degree of publicity.

Behind many objections to mineral development are concerns relating to the impact on local amenities and the landscape, where the activities might lead to new problems or major changes in the existing scene. It needs to be recognised that it is probably the issue of change which might be brought about by these new operations, which concerns and appears to threaten the security of the public and which therefore gives rise to objections. The response to these concerns has been a growing resistance to mineral extraction expressed both as policy restrictions and public campaigns against individual proposals. The question arises as to whether this response is justified and as to whether the extractive industry could present its proposals in a more positive manner. This paper explores two issues. First the extent of nuisance and secondly the recreation of landscape.

Surface geophysical anomalies associated with stratabound mineralization at Sourton Tors, north-west Dartmoor. *J.M. Reynolds. Department of Geological Sciences, Plymouth Polytechnic, Drake Circus, Plymouth, PL4 8AA.*

Detailed and extensive land geophysical surveys have been undertaken around Sourton Tors, north-west Dartmoor, using V.L.F., ground conductivity, electrical resistivity, Spontaneous Polarization, scintillometric and geomagnetic methods. The local mineralization has been determined previously from core material obtained in 1966 by the then Institute of Geological Sciences. The sometimes spectacular geophysical anomalies recorded have been correlated with stratabound mineralization which occurs within the Crackington and Meldon Chert Formations. The new geophysical surveys have provided a more detailed delineation of the mineralized zones and have revealed previously unknown but significant conductivity anomalies which are associated with the Meldon Volcanic Formation and with the Meldon Shale and Quartzite Formation.

Pentevrian basement fragments within the Cadomian Perros granitoid complex at Port Béni, the Trégor, N. Brittany. *R.A. Roach. Department of Geology, University of Keele.*

In the Trégor the E-W aligned late Precambrian Perros granitoid complex, a major multicomponent Cadomian pluton, contains fragments of 2 b.y. old Pentevrian basement known as the Port Béni gneiss. These basement fragments are most numerous along the northern, seaward end of the estuary of the River Jaudy. Here, at Port Béni, the basement occurs as a number of NNE-SSW trending blocks separated by two components of the Perros complex, these occurring as steeply dipping sheets with a trend similar to that of the gneiss blocks. Comparison of structures between adjacent basement blocks indicates that there has been little rotational movement between them. Contacts between the basement and igneous components are sharp and lack reaction phenomena. These relationships suggest that the outcrops at Port Béni possibly represent a high level in the pluton, with their orientation indicating at least local crustal extension at a high angle to the length of the pluton. Later extension is indicated by the presence of basic dykes forming part of the ENE-WSW trending Trieux dyke swarm of probable Upper Palaeozoic age.

Tien Shan - Junggar Basin, NW China: a present day analogue of the New Red Sandstone Molasse of SW England. *Chris Cornford. Hallsannery Field Centre, Bideford, Devon EX39 SHE.*

The present day molasse being shed off the Tien Shan mountains into the Junggar Basin to the north is a "knock on" effect from the distant India-Asia collision and the resulting Himalayan orogeny. The Tien Shan structure was initiated by the union of the small Junggar block with the North China block during the "Variscan" Orogeny, but has been reactivated a number of times to shed coarse clastics into the adjacent intracontinental basins. The latest activation was the Himalayan Orogeny.

Slides of post Himalayan and recent sediments for this area of NW China will be compared with the New Red Sandstone sediments seen in SW England.

Pursuing the analogy with SW England suggests that the oceanic crust and continental collision could have been far to the south; that the river depositing the Budleigh Salterton pebble bed might just have disappeared by evaporation within 10's of km; that the sporadic injection of an aeolian dune into fluvial units can be a common occurrence; and that the land surface could have been covered with plants, but with poor conditions for fossilisation, resulting in the organically barren units.

Grassroots conservation in the South West. *Hugh Prudden, Yeovil College.*

A Geological Advisory Group has been operating for several years in Somerset within the Somerset Trust for Nature Conservation. Its purpose is to keep a watching brief on day-to-day local developments, report on planning applications which may involve places of geological importance, provide geological expertise to the Somerset Trust, and endeavour to stimulate an awareness of geology.

It is a valuable forum for local, mainly non-professional, geologists. It cooperates with the Nature Conservancy Council and at the same time complements the work of the national body. Members of the Ussher Society may care to consider the idea of developing similar groups in other parts of the South West.

Industrial minerals in the South West: thoughts for the future. *C.M. Bristow ECC International Ltd., John Keay House, St. Austell, Cornwall PL15 4DJ. (no abstract available).*

A new look at the Wheal Remfry Breccia. *A. V. Bromley, Camborne School of Mines, Pool, Cornwall TR15 3SE, and C.M. Bristow, FCC International Ltd., John Keay House, St. Austell, Cornwall, PL25 4DJ. (no abstract available).*