FIELDWORK AROUND THE POTTERIES : THE KINGSWOOD BANK - BEECH AREA

1. Meeting place : the Gravel Pit Lodge (SJ 852407).

2. Viewpoint of M6 motorway cutting from northern motorway bridge looking south.

Possible activities:

(a) Describe the rock type exposed in the cutting (Conglomerate or gravel: sandstones; Pebble Beds within the Cannock Chase Formation in the Sherwood Sandstone Group Scythian:Triassic (formerly Bunter Pebble Beds)).

(b) Use the principle of Original Horizontality. Can you see an original horizontal? Estimate dip and strike (15-20° in between 180° and 230°).

(c) Use the principle of superposition. Where are oldest beds, youngest beds? (Oldest at northern end)

(d) Estimate the thickness of beds visible along the length of the cutting. (c.85 m measured). Would you recommend any stratigraphic divisions within the Pebble Beds Formation?

(e) Estimate the thickness of the beds seen on east side of cutting (?30 m).

(f) Look northwards. Why does the landscape become low-lying to the north? Why is there an E-W north-facing slope? (The base of the hard Pebble Beds outcrops forming a north-facing scarp. It is helped by the erosion caused by the stream running WSW-ENE south of the Manor House and through Park Cottages. The underlying rocks the unconformity are the Etruria Marl Formation (older) to the east and the harder sandstone beds of the Newcastle Sandstone Formation to the west).

(g) Look at your 1:63360 or 1:250,000 or 1:625,000 maps. Into which basin are the Pebble Beds dipping? (The Stafford-Eccleshall Basin).

(h) Why do you think the line of the motorway was chosen thhere? (It runs partly through a worked-out gravel pit).

3. Walk across the bridge and turn right up the path to the outcrops immediately above the motorway fence Knowl Wall:

Possible activities:

(a) Measure dip and strike

(b) Measure succession

(c) Identify facies

(d) Identify cross bed types

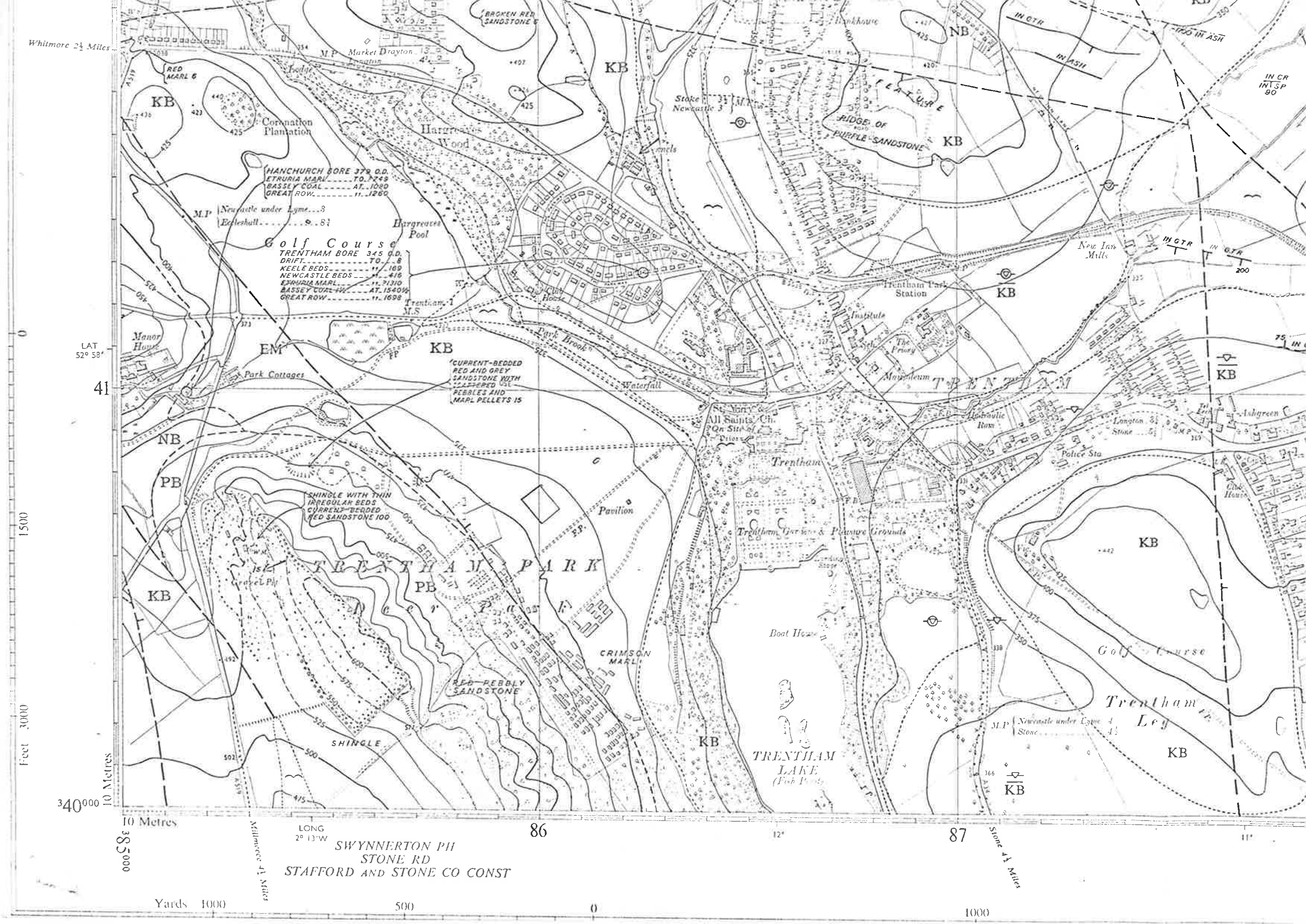
(e) Measure crossbed thicknesses and directions

(f) Describe the nature of occurrence of the pebble facies

(g) Is this outcrop above or below the main gravel bed?
(below the Trentham Conglomerate Member)

4. Walk to the main face of the former gravel pit.

See separate worksheets for this outcrop.



Whitmore 2½ Miles
RED MARL 6
Coronation Plantation
Hargreaves Wood
HANCHURCH BORE 379 O.D.
ETRURIA MARL TO 249
BASSEY COAL AT 1080
GREAT ROW 1260
M.P Newcastle under Lyme 3
Eccleshall 8¾
Hargreaves Pool
Golf Course
TRENTHAM BORE 345 O.D.
DRIFT TO 6
KEELE BEDS 169
NEWCASTLE BEDS 416
ETRURIA MARL 1310
BASSEY COAL AT 1540
GREAT ROW 1698
Trentham M.S
Manor House
LAT 52° 58′
EM
Park Cottages
KB
CURRENT-BEDDED RED AND GREY SANDSTONE WITH SCATTERED PEBBLES AND MARL PELLETS 15
Park Brook
Waterfall
NB
PB
SHINGLE WITH THIN IRREGULAR BEDS CURRENT-BEDDED RED SANDSTONE 100
Pavilion
TRENTHAM PARK
Deer Park
Gravel Pit
CRIMSON MARL
RED PEBBLY SANDSTONE
SHINGLE
Market Drayton 13
Longton 4½
Lodge
BROKEN RED SANDSTONE 5
Stoke 3½
Newcastle 3
RIDGE OF PURPLE SANDSTONE
FEATURE
Bankhouse
IN GTR
IN ASH
IN CR IN SP 90
New Inn Mills
Trentham Park Station
Institute
The Priory
Mausoleum
TRENTHAM
St Mary & All Saints' Ch. On Site of Priory
Trentham
Hydraulic Ram
Longton 3½
Stone 5½
Police Sta
Ashgreen
Club House
Trentham Gardens & Pleasure Grounds
Boat House
TRENTHAM LAKE (Fish Ponds)
Golf Course
Trentham Ley
M.P Newcastle under Lyme 4
Stone 4½
LONG 2° 13′W
SWYNNERTON PH
STONE RD
STAFFORD AND STONE CO CONST
Millmeece 4½ Miles
Stone 4½ Miles
86
87
41
340000
385000
10 Metres
Feet 3000 1500 0
Yards 1000 500 0 1000

WORKSHEET FOR ADVANCED LEVEL STUDENTS SUITABLE FOR THE MIDDLE OF THEIR COURSE (ASSUMING THAT THEY HAVE DONE 'O' LEVEL) OR THE END OF THEIR COURSE (ASSUMING THEY HAVE NOT DONE 'O' LEVEL).

INSTRUCTIONS: Follow the instructions in the questions. Work precisely and swiftly on your own. There is room at the end of the sheet for setting down any problems which you may come across.

PRELIMINARY TASK

1. Make a scaled plan of the outcrop using pacing and compass measurements. This task should not be prolonged more than 15 minutes. Refer all your data to this plan.

THE NATURE OF THE BEDS

2. Measure and record dip angle ___: dip azimuth ___: strike azimuth ___.

3. Estimate the thickness of the beds and graphically log the succession starting for convenience at the top and using the log sheet provided.

4. a) Describe the commonest rock type using your rock description chart.
   b) Comment on any problems in describing the sediment.

   c) Comment on the nature of the base of the beds.

5. Gibson et al (1925) suggested that the rocks at Kingswood Bank lay in a fossil river valley aligned north-south. Explain how you would test this hypothesis.

6. What vertical differences do you see in the sediments of these beds at this outcrop? How do these bear upon the problem of the origin of the beds?

7. What lateral differences do you notice in the sediment of one chosen bed?

   Draw the sediments of one bed roughly to scale referring to any outstanding differences which are displayed.

8. How do the features of Q6 and Q7 relate to the processes and environment of origin of these beds?

THE NATURE OF THE SEDIMENT

9. What is the maximum particle size of the intraformational fragments (___mm) and the extraformational fragments (___mm)?
   What factor of the depositional process does maximum particle size relate to?

10. What is the shape of the pebbles?

    sphericity (blades? rods? discs? spheres?). . . . . .

    roundness . . . . . .

    What is the significance of the shape of the pebbles?

11. Describe the surface structure of the fragments.

    What is the significance of the surface structure of the fragments?

12. The collection of material. Collect randomly from outcrop (in the approved manner) 50 fragments of the 16-64 mm clast size.(Use intermediate diameters). You will take these back to school eventually so you should be careful to label this material and reference it to your field notes in the approved manner. Collect 10 cobbles.

13. The composition of the material. Sort the fragments in the field according to composition using the worksheet provided. Add a column headed "unknown composition" at the bottom of the sheet. Do the cobbles differ in composition from the pebbles?

14. Make a list of derived fossils under the following headings:

	Rock	fossil	likely age	likely place of origin
(i)				
(ii)				
(iii)				
(iv)				
(v)				
(vi)				

15. You can ascertain the nature of the unknown specimens at school. You can calculate percentages of different types of pebbles at school. Here make a preliminary field assessment of the likely source of the materials.

Rock type	Type of source area	Possible age	Possible geographical source region

THE DISPERSAL PATTERN OF THE SEDIMENT

16. What palaeocurrent indicators are available for measurement?

1. _____ 2. _____ 3. _____

17. Make palaeocurrent measurements, one per bed, measuring the thickness of the bed.

	DIP	AZIMUTH	BED THICKNESS	COMMENTS
i.				
ii.				
iii.				
iv.				
v.				
vi.				

What depositional factor might thickness of bed relate to?

18. What estimate do you make in the field of the direction of origin of the depositing current?

(N.B. You will plot and analyse these data further back in the laboratory).

19. Compare your hypothesis of origin of the pebbles based on pebble composition with that derived from the study of palaeocurrent data.

Study of the micas contained in the finer beds yielded isotopic age dates of $2.8\text{-}2.9 \times 10^8$ yrs. How do these data bear upon the problem?

A PROBLEM TO DO WITH APPLIED GEOLOGY

20. Collect data which will enable you back at school to give separate estimates to the Department of the Environment of the amount of sand, pebbles, and cobbles removed from this pit as commercial gravel during its life. Quote the amounts in cubic metres, tonnes and the value in pounds sterling assuming each tonne will sell for £0.50.

21. Would you recommend that commercial workings of gravel be allowed to restart? Would you recommend that Messrs. Perle buy this hole and fill it with industrial (including chemical) waste? What advice would you give to the Trent Water Authority?

22. Outline carefully any problems you come across in trying to explain the nature and origin of these beds.

23. Teachers. Write down a list of behavioural objectives (à la Bloom for example) which the compiler of this worksheet had in mind when he wrote it.

ADVANCED LEVEL — A ROCK DESCRIPTION CHART

CHARACTERS	TESIS LENS SCRATCH SOUND WHEN STRUCK SMELL WHEN STRUCK COLD DILUTE HCl	GRAIN SIZE IN MM. MEAN: EXTREMES RANGE:	MINERAL COMPOSITION	FOSSIL CONTENT BODY FOSSILS TRACE FOSSILS ATTITUDE	COLOUR REASON FOR COLOUR	FABRIC & TEXTURES	STRUCTURES	DIAGENETIC PROCESSES	SPECIFIC GRAVITY OR DENSITY	WEATHERING TEXTURES & STRUCTURES	CONCLUSIONS (ROCK NAME & ENVIRONMENT OF ORIGIN)
IGNEOUS ROCKS			FELSIC % MAFIC %		LEUCOCRATIC MESOTYE MELANOCRATIC HYPERMELANIC	eg APHANITIC	JOINTS GRADING MARGINAL CHILLING XENOLITHS	OF TEXTURES STRUCTURES		eg SPHEROIDAL	
SEDIMENTARY		WENTWORTH-UDDEN NAME	MINERALS CEMENT		ROCK COLOUR CHART NUMBER	POROSITY SORTING ANGULARITY - ROUNDNESS SPHERICITY	PRIMARY/DEPOSITIONAL - BOUGHT AND eg CHANNEL CUTS SOLE STRUCTURES SYNDEPOSITIONAL - IN BED eg LAMINATION SMALL SCALE X-B LARGE SCALE X-B PRIMARY CURRENT LINEATION TOP OF BED eg RIPPLE MARKS POST DEPOSITIONAL eg LOAD STRUCTURES DEFORMATION	OF TEXTURES STRUCTURES FOSSILS		FISSILITY	
METAMORPHIC			FELSIC % MAFIC %			eg PORPHYRYBLASTIC FOLIATION SCHISTOSITY GNEISSOSITY	CLEAVAGE JOINTS	OF TEXTURES STRUCTURES		eg PORPHYROBLASTS FRAGMENTS SLATY SPLITTING	
ROCK NAME											

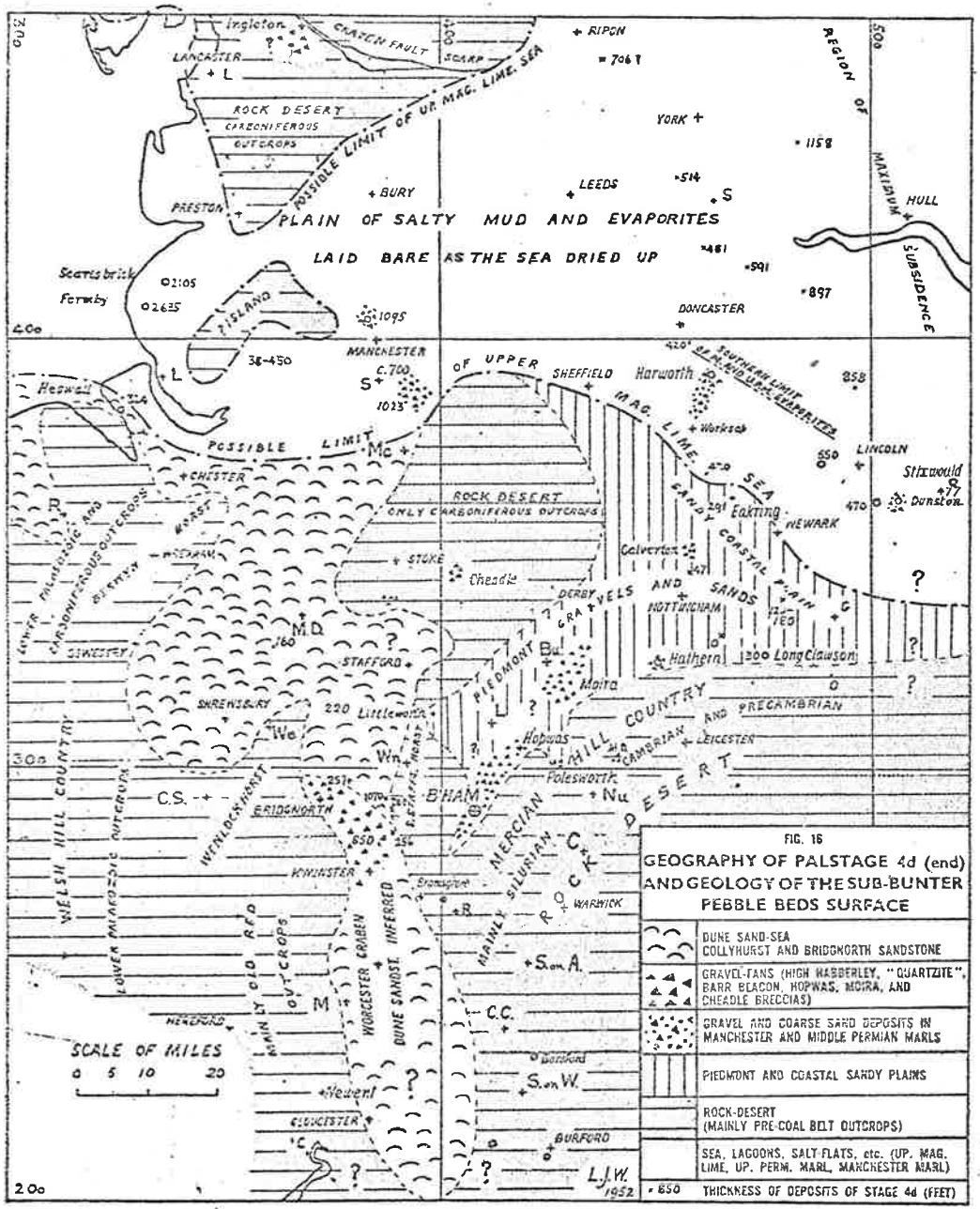


Fig. 16.—Geography and Surface Geology of Palstage 4d (end)

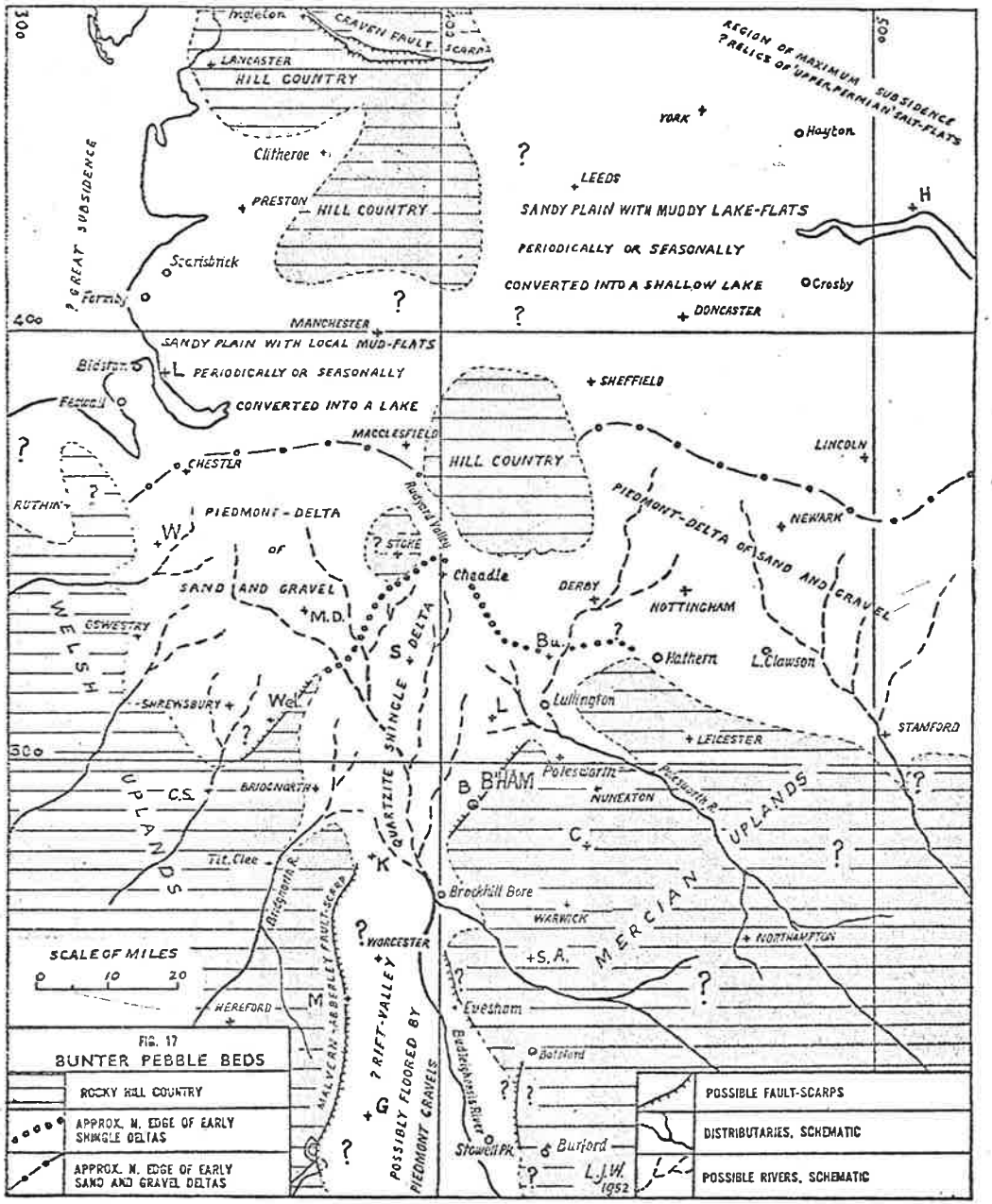


Fig. 17.—Geography of the early part of Palstage 5—the Bunter Pebble Beds