NINETEENTH NEWCASTLE SYMPOSIUM

Excursion Notes for 16th May, 1985

Venue: Thornton Brick Company Quarry and R.W. Miller's Old Test Pit at Ironbark.

Leaders: C.F.K. Diessel, University of Newcastle

K.J. Brown, Joint Coal Board

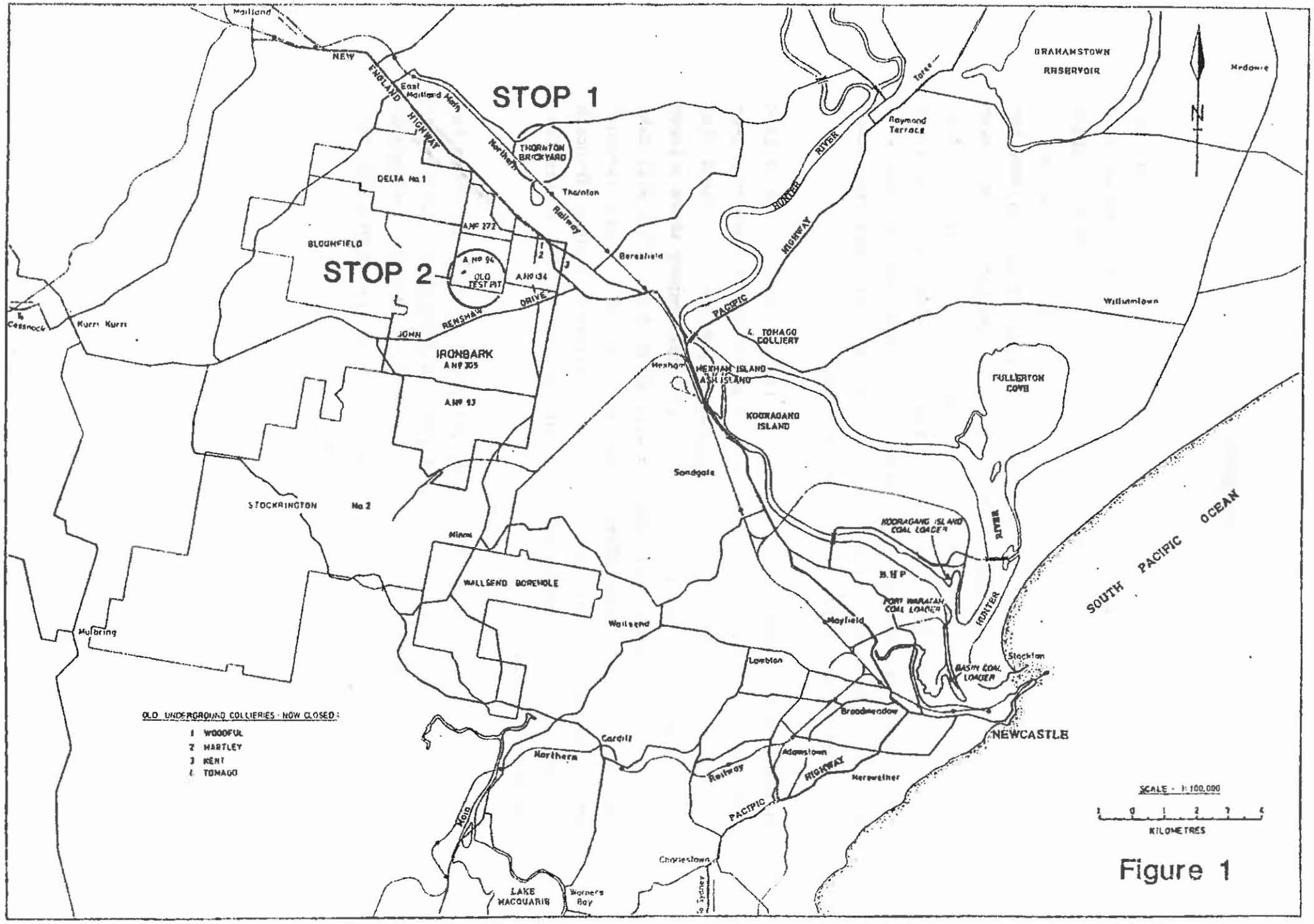
B. Preston, R.W. Miller & Co. Pty. Ltd.

Introduction

The Tomago Coal Measures extend from the eastern flank of the Lochinvar Anticline easterly to the coast in the Williamtown area North of Newcastle. In contrast to the Newcastle Coal Measures which can be studied in many excellent outcrops along the coastline and elsewhere in the Newcastle region, the underlying Tomago Coal Measures are mostly concealed underneath the Holocene deposits of the Lower Hunter River flood plain and its coastal fringe. Mainly for this reason, the Tomago Coal Measures received little attention in previous excursions of the Newcastle Symposium but this year two locations will be visited where some insight can be gained into the lower and middle portion of this interesting group of sediments.

As shown in the locality map of Figure 1 the two places to be visited during the excursion are located to the northwest of Newcastle near the northern closure of the Lake Macquarie Syncline. The first stop will be made in the quarry of the Thornton Brick Company where a lower portion of the Tomago Coal Measures will be studied. This will take approximately one hour after which the bus will drive (weather permitting) to the old test pit at R.W. Miller's planned Ironbark Colliery. At this second stop a middle portion of the Tomago Coal Measures is exposed.

The terminology used in these notes follows a proposal by Brown and Preston which will receive its first public hearing during this year's Newcastle Symposium. The new and considerably extended stratigraphy is shown in Figure 2 where it is compared with the traditional sub-divisions of David and, later, Robinson.


STOP 1
STOP 2
Maitland
NEW ENGLAND HIGHWAY
East Maitland Main
Northern Railway
THORNTON BRICKYARD
Thornton
DELTA No 1
A.NP 272
BLOOMFIELD
A.NP 94
OLD TEST PIT
A.NP 134
JOHN RENSHAW DRIVE
Beresfield
HUNTER RIVER
HIGHWAY
PACIFIC
Raymond Terrace
GRAHAMSTOWN RESERVOIR
Tarro
Hexham
Williamtown
Cessnock
Kurri Kurri
IRONBARK A.NP 305
A.NP 93
A. TOMAGO COLLIERY
HEXHAM ISLAND
ASH ISLAND
FULLERTON COVE
KOORAGANG ISLAND
Sandgate
STOCKRINGTON No 2
Minmi
KOORAGANG ISLAND COAL LOADER
WALLSEND BOREHOLE
Wallsend
Mayfield
PORT WARATAH COAL LOADER
Mulbring
Lambton
BASIN COAL LOADER
Stockton
Broadmeadow
NEWCASTLE
Cardiff
Northern
Adamstown
Merewether
Main
Charlestown
LAKE MACQUARIE
Warners Bay
to Sydney
SOUTH PACIFIC OCEAN
OLD UNDERGROUND COLLIERIES - NOW CLOSED :
1 WOODFUL
2 HARTLEY
3 KENT
4 TOMAGO
SCALE - 1:100,000
KILOMETRES
Figure 1

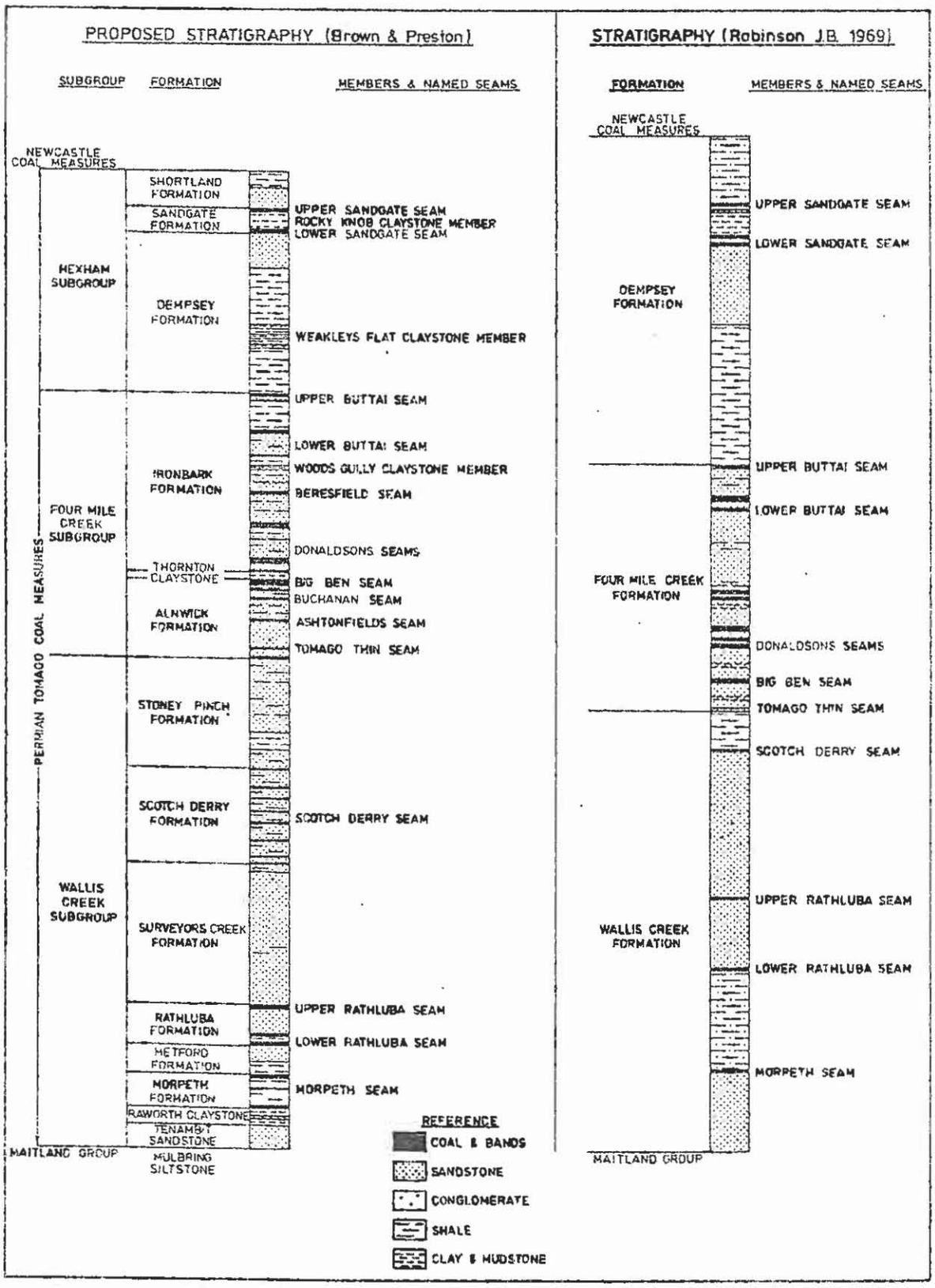


Figure 2. The correlation between the new and old stratigraphy of the Tomago Coal Measures.

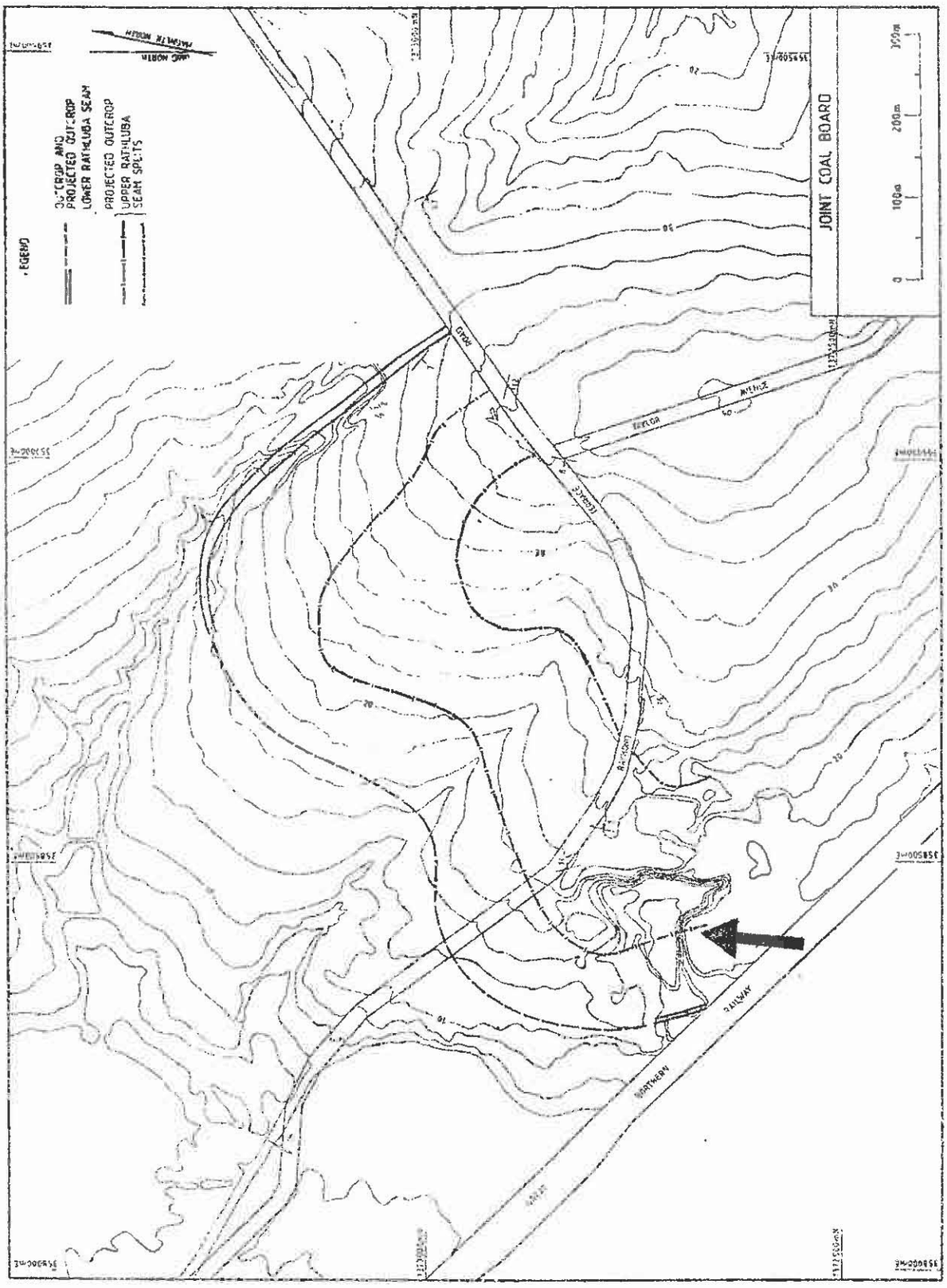


Figure 3. The structural setting of the Thornton Brick Quarry (arrow).

The Permian Geology of the Thornton Area

In the East Maitland/Thornton area the Tomago Coal Measures are folded into a series of gently plunging, sub-parallel folds that trend approximately north/south. The major stuctural element of the area is the Four Mile Creek Anticline flanked to the West by the East Maitland Syncline and to the east by the Thornton Syncline (Figure 3).

The Thornton Brick Company quarry is located in the axial plane region of the Thornton Syncline, the fold axis is running north/south near the eastern boundary of the quarry. Immediately to the west of the quarry low-lying, swampy country conceals the area of the eroded and peneplained Four Mile Creek Anticline. Further west, in the Metford and Morpeth areas of the East Mailand Syncline, brick clay mining has occurred on similar stratigraphic horizons to the Thornton brick pit. The area is renowned for its high quality brick clays that occur in association with coal seams.

Stratigraphically the Thornton brick quarry is located on sediments occurring between splits of the Rathluba Seam towards the base of the Wallis Creek Subgroup which is the basal unit of the coal measure sequence and lies conformably above the marine Maitland Group. The Morpeth Seam, the lowest coal horizon of the Tomago Coal Measures, underlies the Rathluba Seam by approximately 35 m to 40 m in the Thornton area and is separated from the marine basement by approximately 10 m to 15 m of the laminated sandstone.

In the western part of the brick quarry the Lower Rathluba Seam forms the floor of the quarry. An upper split of the seam is exposed in the eastern and southern highwalls. A stratigraphically higher split of the Rathluba Seam can be observed on the eastern side of the quarry property, the bulk of the brick-making materials being recovered from clayey sandstones and shales occurring between splits of the Rathluba Seam.

The location of the quarry on the nose of the syncline has extended the strike length of the brick clay deposit and allowed material to be

recovered from both flanks of the synclinal fold. Zoning protection of the brick clay deposit has been gazetted fairly recently and should ensure continued production from the area.

Description of the Section at the Quarry of the

THORNTON BRICK COMPANY

The section comprises the lower portion of the Wallis Creek Subgroup in the vicinity of and including parts of the Rathluba Seam. This sequence marks the transition form the marine conditions represented by the underlying Maitland Group to the delta environment which shaped much of the Tomago Coal Measures. The brick pit is situated close to the former basin margin which explains the relatively coarse particle size of the distributary sands contained in the section.

The frequency of worm burrows in the fine grained interseam sediments and the relatively high sulphur content of both coal and some country rocks suggests that they have been formed in a lower delta plain setting. The description is based on the subdivisions (Roman numerals) given in Figure 4 which also lists foreset azimuths in stratigraphic sequence. They have been measured in the localities indicated in Figure 5.

I. At the base of the section occurs a quartz- and feldspar-bearing sandstone which is of medium grain size and contains both tabular and trough cross bedding. The westerly dip of most foreset beds suggests a sediment transport in that direction by distributing channels.

II. In an upward direction the delta distributary phase gives way to overbank deposits presumably, in an interdistributary setting. Mudstone and coal horizons alternate, thus indicating a peatland environment which produced the rather dirty and heavily banded Rathluba Seam. Rootlets and other plant remains, including occasional tree stumps are common in the mudstones and silt- stones.

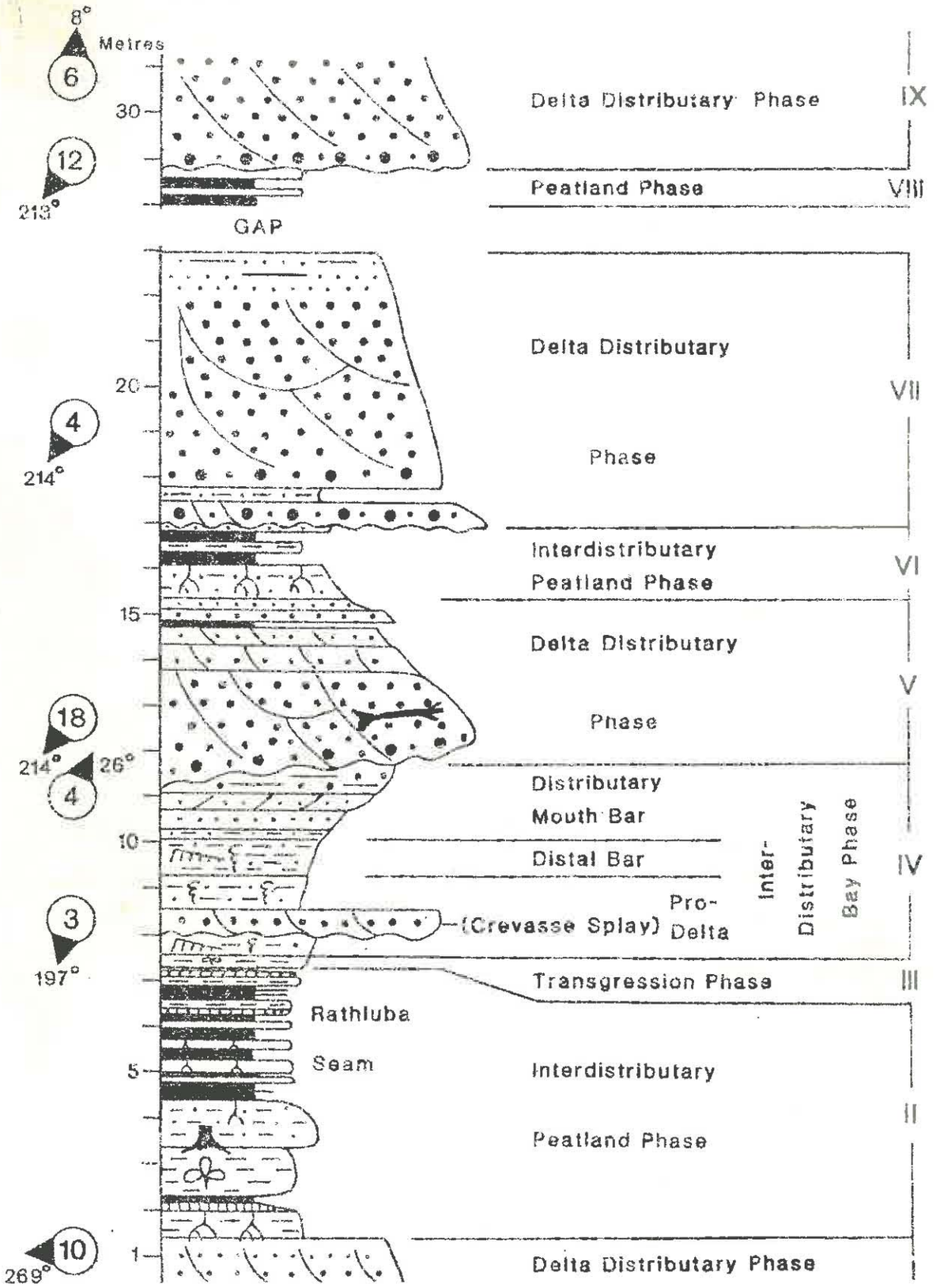


Figure 4. The measured section at the Thornton Brick Quarry (Stop 1).

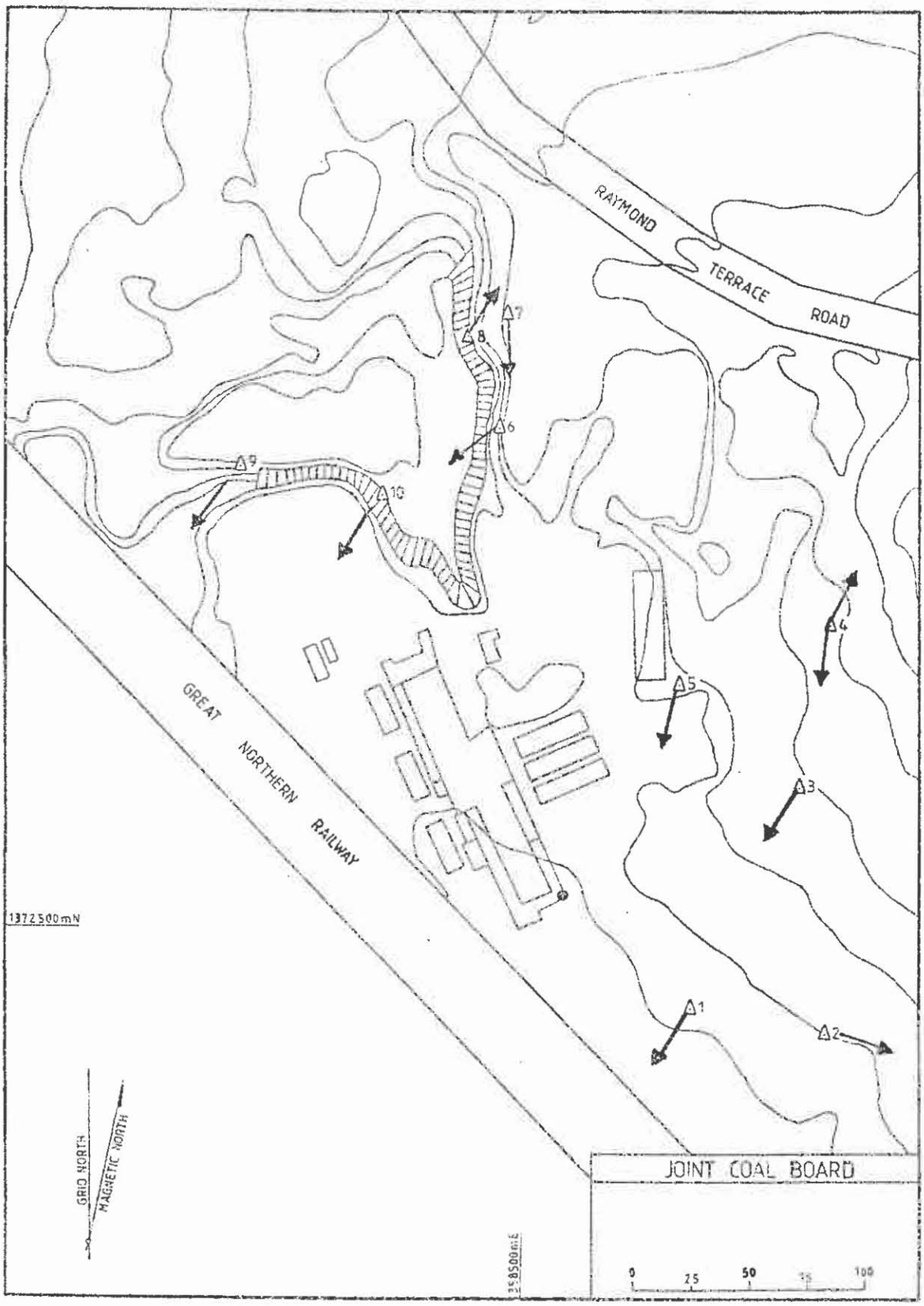


Figure 5. Palaeocurrent directions measured at the Thornton Brick Quarry (Stop 1).

III. A transgressive phase is indicated by a plant-bearing shale which overlies the lower portion of the Rathluba Seam.

IV. After the drowning of the Rathluba peat subaqueous deposition continued, probably in a sheltered interdistributary bay environment. The lower two metres of sediments consist of laminated shales and siltstones rich in worm burrows and microcrosslamination. This fine grained sequence is interrupted by a 0.4 - 0.8 m thick medium to coarse sandstone with an irregular basal erosion contact. It is very persistant beyond the boundaries of the quarry, contains crossbedding and, presumably, represents the proximal portion of a crevasse splay deposit.

In an upward direction the particle size increases suggesting the gradual closure of the interdistributary bay by an approaching (sub-?) delta. Prodelta shales give way to distal bar siltstones and distributary mouth bar sandstone.

V. The sandstone interpreted as representing the distributary mouth bar is deeply eroded in some places by a coarse to very coarse sandstone of several metres in thickness. The basal erosion contact, limited lateral extent, upward fining and abundant trough crossbedding suggest that this sandstone has been deposited in a distributary channel in which lateral under- cutting and slumping was common.

VI. Overbank siltstone is followed by another split of Rathluba Seam from which numerous plant roots extend into the silt floor.

VII. Another distributary sandstone overlies the coal split. The sandstone is coarse at its base but grades into fine laminated sandstone in its upper portion. Crossbedding is common.

VIII. Following a stratigraphic gap of approximately five metres a third split of the Rathluba Seam can be studied in a separate section.

IX. The seam split is overlain by a sequence of telescoped channel sandstones some of which contain pebble bands near their basal erosion contacts. This sequence marks the stratigraphically highest point in the quarry.

The Ironbark Colliery Project

R.W. Miller and Company Pty Limited has completed a detailed technical and economic feasibility study for the development and operation of a combined undergound and open cut mining operation at Ironbark located 23 km north-west of Newcastle (Figures 1 and 6).

Planning of the mine is based on a total raw coal production of 3.5 Mtpa.

The area amenable to open cut mining is situated along the subcrop zone and to the north of John Renshaw Drive. The underground mining area generally is located to the south of John Renshaw Drive.

The Permian Geology of the Ironbark Area

The Tomago Coal Measures in the Ironbark area attain a total thickness of about 600 metres. Only coal seams within the Four Mile Creek subgroup are of economic interest.

Some fifteen coal seam horizons (seams or seam sections) of the Beresfield, Upper Donaldson, Lower Donaldson, Big Ben, Buchanan and Ashtonfields Seams are of open cut potential. Only the Donaldson and Big Ben Seams are sufficiently thick for underground mining. Overlying the Big Ben Seam is a distinctive white claystone. This is known as the Thornton Claystone and forms a reliable marker horizon for correlative and stuctural purposes. The seams outcrop along the flank of the Four Mile Creek Anticline and generally dip to the south east into the Thornton Syncline.

Seam splitting with a subsequent rapid increase in interseam sediment thickness develops from west to east into the Thornton Syncline. Similarly sulphur values are lowest adjacent to the Four Mile Creek Anticline and increase into the Thornton Syncline. This may be due in part to the marine brackish influence of the overlying Dempsey Formation.

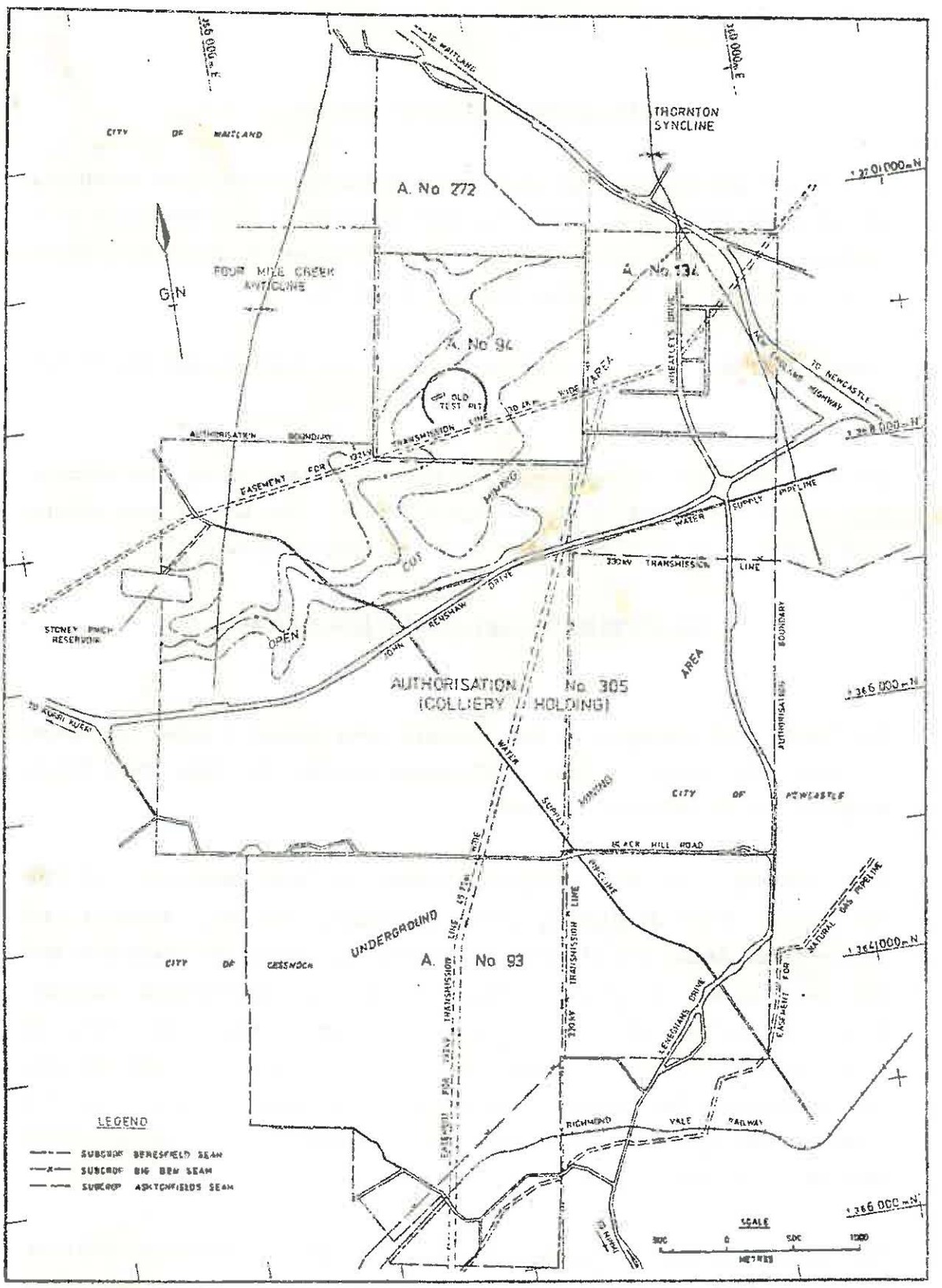


Figure 6. The location of the OLD TEST PIT (Stop 2).

The exploration pit was excavated on the site of small scale abandoned underground workings in 1971.

Seams exposed in descending order are:

Donaldson FG (highly weathered)
Donaldson H
Donaldson IJ
Donaldson K
Thornton Calystone
Big Ben L
Big Ben M

The Donaldson seam which generally is in two major splits has a total coal thickness of 5.5 m. However, in this area the seam begins to split rapidly into the Thornton Syncline.

Description of the Section at the Old Test Pit

The section which is illustrated in Figure 7 comprises a portion of the lower part of the economically important Four Mile Subgroup. Unlike the previous section in which the evidence of marine influence (worm burrows and sulphur content) suggested a lower delta plain environment, the Four Mile Creek Subgroup has been formed higher on the delta plain. The coal seams are thicker and cleaner, marine influence is absent and the mass ratio of coal versus interseam sediments is higher than in the Wallis Creek Subgroup.

I. Near the base of the excavation the 2 m thick Big Ben Seam is exposed. The coal is relatively clean except for a few thin dirt bands. The dull character of the coal is related to its high inertinite content.

II. Seam formation was interrupted by a volcanic event which resulted in the deposition of 1 m of volcanic ash (Thornton Claystone) on top of the Big Ben peat. At the base of the

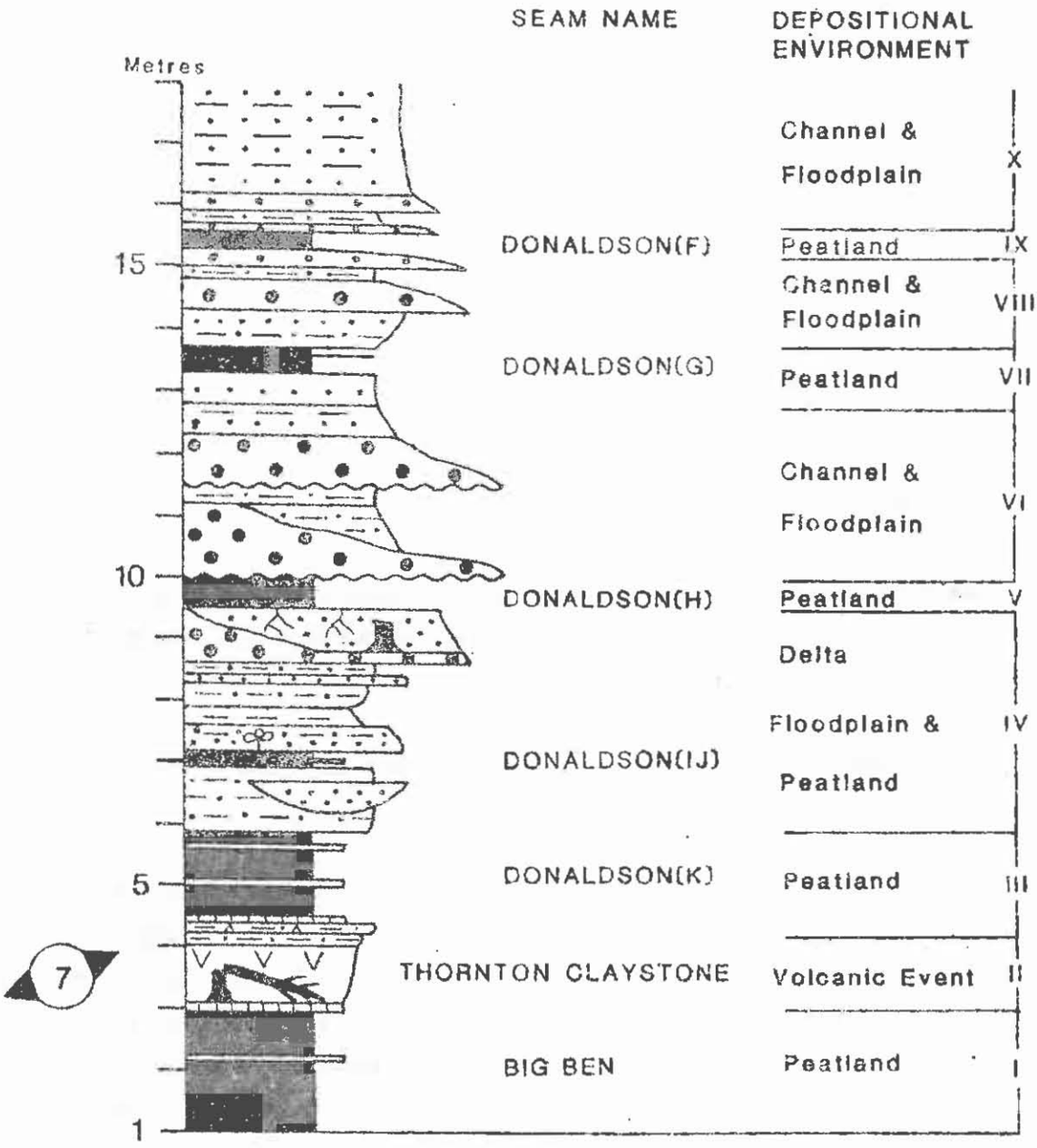


Figure 7. The measured section at the OLD TEST PIT (Stop 2).

tuff, coalified tree trunks show a NE-SW orientation. In addition to the downed trees, upright stumps in growth position protrude for about 30 cm from the coal into the tuff.

III. After the volcanic event peat accretion recommenced to form the lowest split of the Donaldson Seam (Split K). Frequent flooding of the peat is indicated by dirt bands in the coal.

IV. A mixed facies inleuding coarse but narrow channel sandstones, overbank shales, siltstones, and fine sandstones, some containing plantroots, leaves, tree stumps in growth position and some coal (Donaldson IJ) suggests a flood plain environment probably in an indistributary setting.

V. The Donaldson Seam, Split H, indicates another brief episode of peat accretion, only to be succeded by re-established floodplain conditions.

VI. Channel sandstones are more prominent than in the floodplain listed under IV. However, their lateral restriction and small size suggest that they have been formed from secondary drainage channels only, and that they do not represent trunk streams.

VII. Peatland environments are once more indicated by the Donaldson Seam (Split G).

VIII. A thin sequence of laminated siltstone and sandstone plus some lenticular medium sandstone separate Split G and F of the Donaldson Seam.

IX. The stratigraphically highest split (F) of the Donaldson Seam occurs near the top of the section.

X. The section is capped by sandstone and interbedded siltstone formed in a floodplain setting.