RB 52/52

DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

REGIONAL MAPPING SECTION

PLIO-PLEISTOCENE DUNES NORTH-WEST OF LAKE TORRENS, S.A. AND THEIR INFLUENCE ON EROSIONAL PATTERN

by

B. P. Webb
Senior Geologist

and

Dr. H. Wopfner
Geologist.

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G.S. 1949
D.M. 1100/59

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PLIO-PLEISTOCENE DUNES NORTH-WEST OF LAKE TORRENS, S.A. AND THEIR INFLUENCE ON EROSIONAL PATTERN

A recent photo-interpretation study of the south-western margin of the Great Australian Artesian Basin has revealed a conspicuous pattern of parallel lineations developed west and north-west of Lake Torrens. At first sight these lineations suggest a reflection of basement or Cretaceous structures, but present study indicates that they form part of an ancient dune assemblage.

The lineations occur in the area circumscribed by the parallels 29°40' and 30°35' southern latitude and by the meridians 136°20' and 136°50' eastern longitude.

Within the southern portion of their occurrence (i.e. on Wigan and Teaweara - one mile sheets) the lineations trend roughly north-south and they extend laterally from about the western margin of these sheets for 15 to 20 miles to the east. Here they were first noted by R.K. Johns (Department of Mines, S.A.) in connection with preliminary mapping of the Andamooka 4 mile sheet (unpublished). To the north (on Stuart, Billa Kalina and Turret - one mile sheets) the lineations swing into a north-west trend, which is maintained to their northern limit at the Cretaceous breakaway country at the headwaters of Emu, Margaret and Stuart Creeks. At their southernmost occurrence, a turn into a SSW-trend is indicated.

Photo-interpretation was carried out on both vertical and oblique air photographs of a focal length to altitude-ratio of approximately 1:40000 (about 1 inch equal to 50 chains on vertical photographs).

In the southern part of the area in question, the lineations appear as light coloured, parallel lines or bands,

about 100 feet to 800 feet apart. Under the stereoscope, many of the lines do not show much relief, but occasional ones can be identified as low ridges.

Within this region a well developed pattern of longitudinal "desert" dunes of Recent age crosses over these lineations at near right angles and it is apparent from a study of the photos that the Recent sand accumulations overlie the lineations.

Towards the northern portion of the area the lineations are exposed without the recent sand cover and rest on "gibber" flats. Here they can be seen to consist of low ridges with an estimated maximum elevation of between 5 and 20 feet with flat, even crests, whose flanks frequently exhibit small white scars suggestive of the presence of gypsum or kunkar. Near the margins of the Cretaceous breakaway country, the north-west trend of the lineations is taken over and carried on by a remarkable erosional pattern of steep sided, parallel valleys separated by elongated, tongue-shaped hills. These erosional trends are cut into flat lying and duricrusted strata of Lower Cretaceous age (presumably Aptian). In several instances, the low ridges which defined the lineations further south, can be followed to where they are perched on top of some of the duricrust ridges, or flanking the uppermost juvenile channels of some of the parallel valleys.

Still further north, where only Cretaceous sediments stratigraphically below the duricrust-level are exposed, no trace of these lineations can be detected.

From the foregoing observations two valid conclusions can be drawn.

(1) The pattern of lineations is overlain by Recent sand-dunes and therefore predates the modern sand accumulations.

(2) Once erosion has proceeded to the stage where the uppermost Cretaceous strata, and particularly the capping duricrust, have been removed, the lineations are no longer present, and therefore their formation must postdate the duricrust.

The above conclusions allow a dating of these lineations as post-duricrust - pre-Recent. Hence explanations which speculate on reflected "basement" structures as being the cause of the lineations are out of the question. Doming of the Cretaceous strata by movements postdating the duricrust (a feature which is known from numerous examples within the Great Australian Artesian Basin) would be expected to produce a rudimentary consequent drainage and furthermore it would still be expressed after the uppermost members have been stripped by erosion.

According to K. Jones (personal communication), the lineations as developed in the area of Teaweara and Wigan - one mile sheets are very low ridges, composed of white to light grey, calcareous, sandy silt. This composition, together with the very regular and parallel distribution in a wide, sweeping arc suggest a system of old, kunkarised dunes. Similar occurrences of Plio-Pleistocene calcareous dunes are particularly well known from the south-east of South Australia, where they are connected with old shore-lines (Sprigg, 1952 and 1959).

The dune system whose relicts are thought to form the lineations in question was presumably governed by the shore line of an ancestor of Lake Torrens, (but of greater dimensions than the present lake). A further support for this interpretation is the parallelism of this old dune system with the present western shore line of Lake Torrens and its inferred extension to the north-west.

Minor uplifts, probably in early Pleistocene time, gradually narrowed and shortened this inland lake (or embayment?) and brought the shoreline-dune system to its present level.

A consequent drainage system developed, controlled by the distribution of the dune system. Drainage channels followed the dune corridors and as erosion progressed, this parallel pattern was superimposed onto the flat lying, duricrusted Cretaceous strata. (Drainage control by linear sand dunes is a common feature of modern sand-accumulations as for instance

within the northern and eastern Simpson Desert or Sturts Stony desert).

Study of the drainage system as a whole clearly indicates, that the initial, parallel development is governed by features situated above the Cretaceous and not by structural or textural peculiarities within the Cretaceous itself. The drainage remains parallel (and in conformity with the trend of the lineations) only in its initial stages. Once the drainage matures, the initial parallel pattern is discarded and a dendritic drainage pattern develops typical for flat lying Cretaceous strata throughout the Great Australian Artesian Basin.

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BPW:HW:CERF
1/3/61

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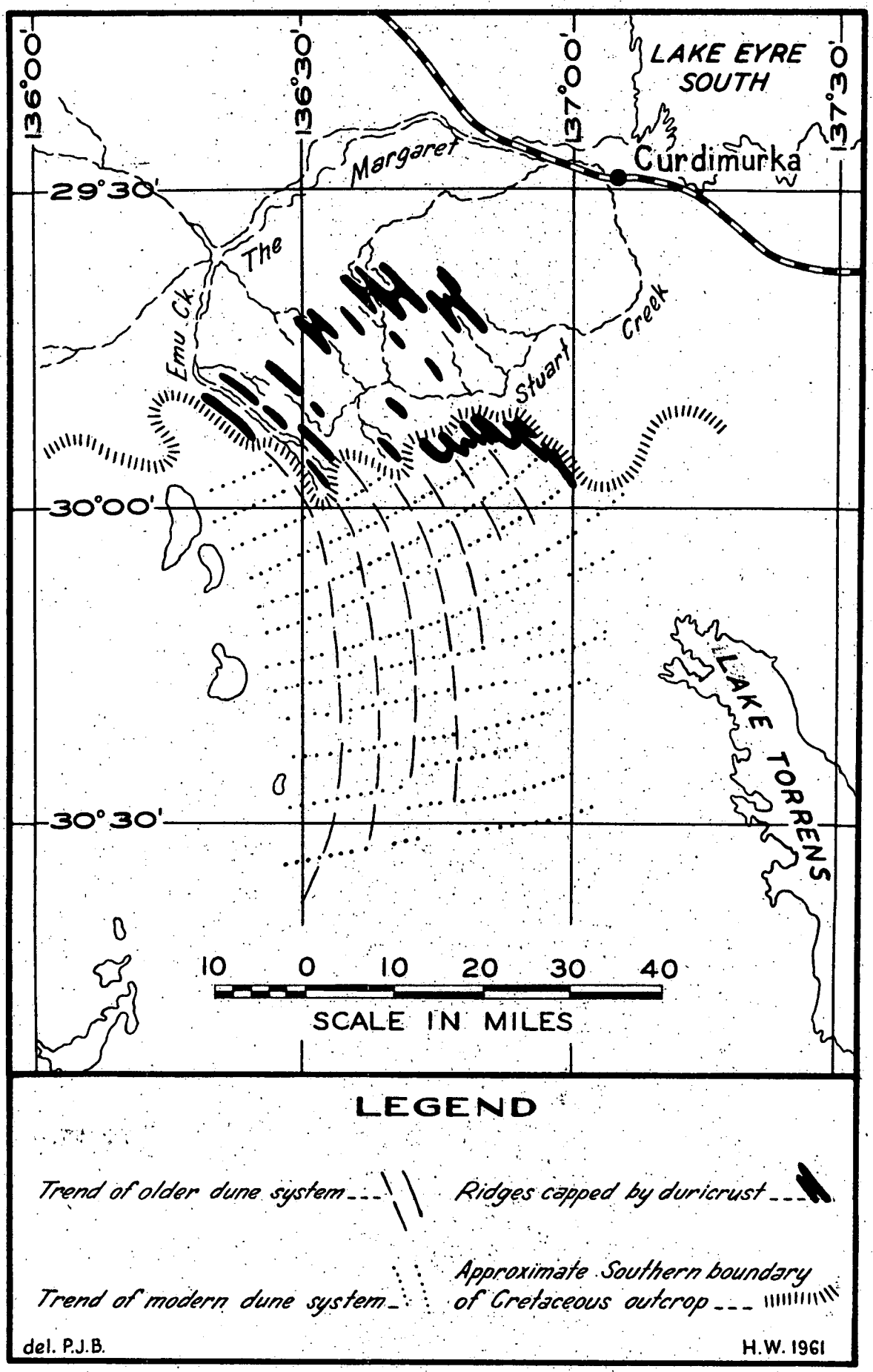
136°00'
136°30'
137°00'
137°30'
LAKE EYRE SOUTH
Margaret
Curdimurka
29°30'
The
Emu Ck.
Creek
Stuart
30°00'
LAKE TORRENS
30°30'
10 0 10 20 30 40
SCALE IN MILES
LEGEND
Trend of older dune system
Ridges capped by duricrust
Trend of modern dune system
Approximate Southern boundary of Cretaceous outcrop
del. P.J.B.
H.W. 1961