Grimes, K.G., 1974: Mesozoic and Cainozoic geology of the Lawn Hill, Westmoreland, Mornington and Cape Van Diemen 1:250 000 sheet areas, Queensland.

Bureau of Mineral Resources, Geology & Geophysics, Australia, Record **1974/106** (unpublished).

Extract from pages 8-10. ... with some added comments and corrections.

(3) Doomadgee Plain

The name Doomadgee Plain is applied to the large, sandy [lateritic] plain which extends over most of the lowland area of WESTMORELAND and MORNINGTON, and a few isolated areas on LAWN HILL; it corresponds with much of the unit Czs on the geological maps (see Fig. 1). It rises from an elevation of about 10 m near the coast to 120 m above sea level at its inland junction with the Cloncurry Plain. The coastal plain of ROBERTSON RIVER (Yates, 1953) and other sheet areas in The Northern Territory is in part an extension of the Doomadgee Plain.

The Doomadgee Plain is gently and broadly undulating and has a few flood plains along the larger water courses. The surface is of loose sand overlying a laterite profile and it is covered with low Eucalypt and Paperbark scrub. It is crossed in places by low, winding ridges of sand, mapped as Qas. These probably represent abandoned stream channels and levees. The drainage has densities of 0.1 to 0.3 per km, is widely spaced, and, in the central area of the plain, is directed radially away from the point where Cliffdale Creek emerges from the highlands. This radial form of the stream patterns and the Qas depositional areas may represent an old alluvial 'fan' similar to the Gilbert and Mitchell Fans of the eastern part of the Gulf (Doutch et al., 1972). It could also be a response to slight upwarping of the coast adjacent to the Wellesley Islands. The streams are braided or closely meandering. The Nicholson River and some of the streams of the eastern part of the plain have been incised, possibly as a result of the Holocene drop in sea level (see later). This erosion has exposed the ferricrete horizon of the laterite profile.

The ferricrete horizon appears to lie at only a shallow depth below the sandy surface of much of the plain, and it follows the local rise and fall of the ground. This suggests that the lateritization is a fairly recent (Pleistocene?) event, and antedates only the Holocene incision of the streams and the deposition of Qas. The laterite profile would, therefore, be younger than the main Tertiary lateritization, which affected the region (see later); however, the more recent lateritization may be superimposed on the Tertiary lateritization, for the surface may have been stable during the interval.

Shallow swampy or water-filled depressions occur in [many] parts of the plain which lack surface drainage channels (see the southwestern part of Fig. 7). They have flat floors which are only a few metres below the level of the surrounding plain. The shapes vary from oval to highly irregular. Some are as much as 2 km in diameter, but most are less than 500 m across. There is ~~commonly~~ [occasionally] a rim of ferricrete at the margins of the depression and the floor apparently lies below the level of the ferricrete zone.

Similar depressions have been observed in the lateritic areas of Cape York Peninsula, where they are more rounded in outline. Valentine (1959) described these Cape York depressions and suggested that they might be 'forms of a novel "tropical pseudokarst" due to the solution

of silica'. He did not elaborate on the process involved. Smart et al., (1974) reported on the drilling of two shallow auger holes (BMR Weipa 4 and 5) in and adjacent to one of these depressions north of Weipa. The drill holes indicated that the pisolitic zone dipped below the depression but thinned slightly. The pallid zone was not intersected by the auger.

Small pits up to 1.5m deep and several metres wide also occur in the Doomadgee Plain. Some have a small drainage hole at the bottom, and this extends under the ferricrete bed. They appear to be due to subsidence into a cavity beneath the ferricrete. K. Grant (pers. comm.) reports a large "sinkhole" on the old firebreak northwest of Corinda (see Fig. 1) at grid reference 110758 [yards] WESTMORELAND. He describes this as a "large sinkhole in massive laterite with numerous small satellites. The laterite is up to 10 feet (3 m) thick around the sinkhole. The depth of the hole is greater than 15 feet (5 m)".

These depressions are apparently formed by a process which could be referred to as 'laterite-karst', that is, by the subsurface removal of material in solution as a part of the lateritic process. Trendall (1962) discussed denudation by lateritic processes and considered that the surface was lowered mainly by removal of material in solution from the pallid zone of the laterite profile. If we accept this process, then the rate of solution in any part of a flat laterite plain would depend on the amount of rainwater passing through the relatively impermeable ferricrete zone into the pallid zone. If the permeability of the ferricrete zone were increased at any point (e.g., at intersecting joint planes or by fracturing due to the uprooting of a tree) then the rainwater would penetrate more readily at that point and greater solution would occur beneath it. As a result the overlying ferricrete and the ground surface would subside locally to form a closed depression. Once this stage were reached the process would become self-perpetuating as additional surface water would be channeled into the depression, and solution would be maintained at a greater rate than the surrounding areas. The depression would enlarge horizontally but not vertically, as solution is restricted to the zone of the fluctuating water-table. A broad, shallow depression of the type observed would eventually result. The small sinkholes would represent the early stage of the process.

Tricart (1972) discussed the origin of similar closed depressions in cuirassed (lateritized) plateau surfaces, and considered that a tunnelling (piping) process was the dominant agent for the subsurface removal of material. While piping could be effective on a well dissected plateau, the depressions on the Doomadgee Plain can be up to 10 km from the nearest stream channel, and this seems an excessive distance for piping to occur. Solution, therefore, appears to be the dominant process forming the Doomadgee Plain depressions.

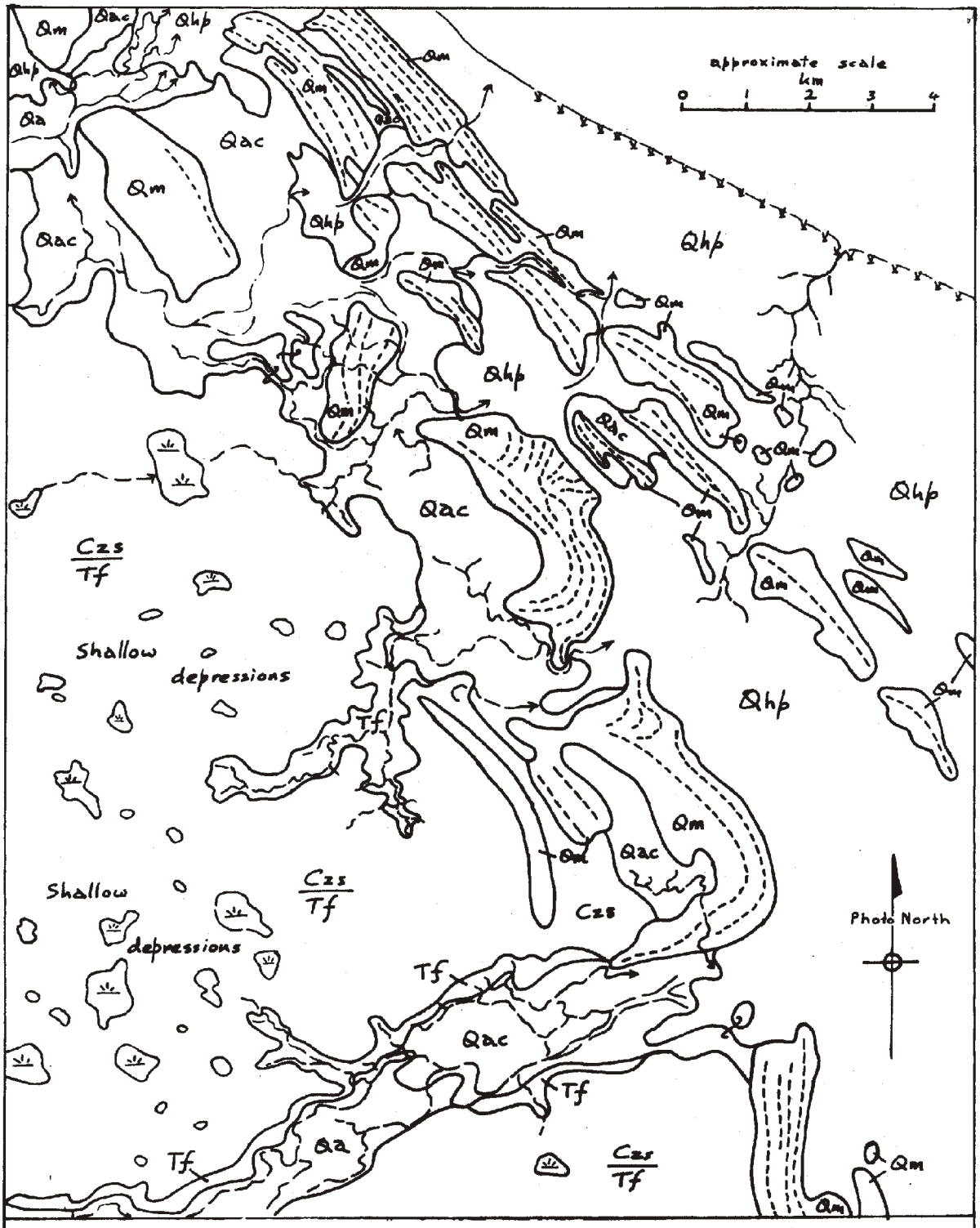

FIG 6 INTERPRETATION MAP FOR FIG 7

Karumba Plain

- Qhp — Tidal flats
- Qac — Vegetated coastal flats
- Qm — Sandy beach ridges
- ----- Ridge trends

Doomadgee Plain

- Czs — Thin sand sheet
- Tf — Ferricrete exposed in breakaways
- Shallow, swampy depression

from Westmoreland Run 3
Photo 4262 (CAB 4018)

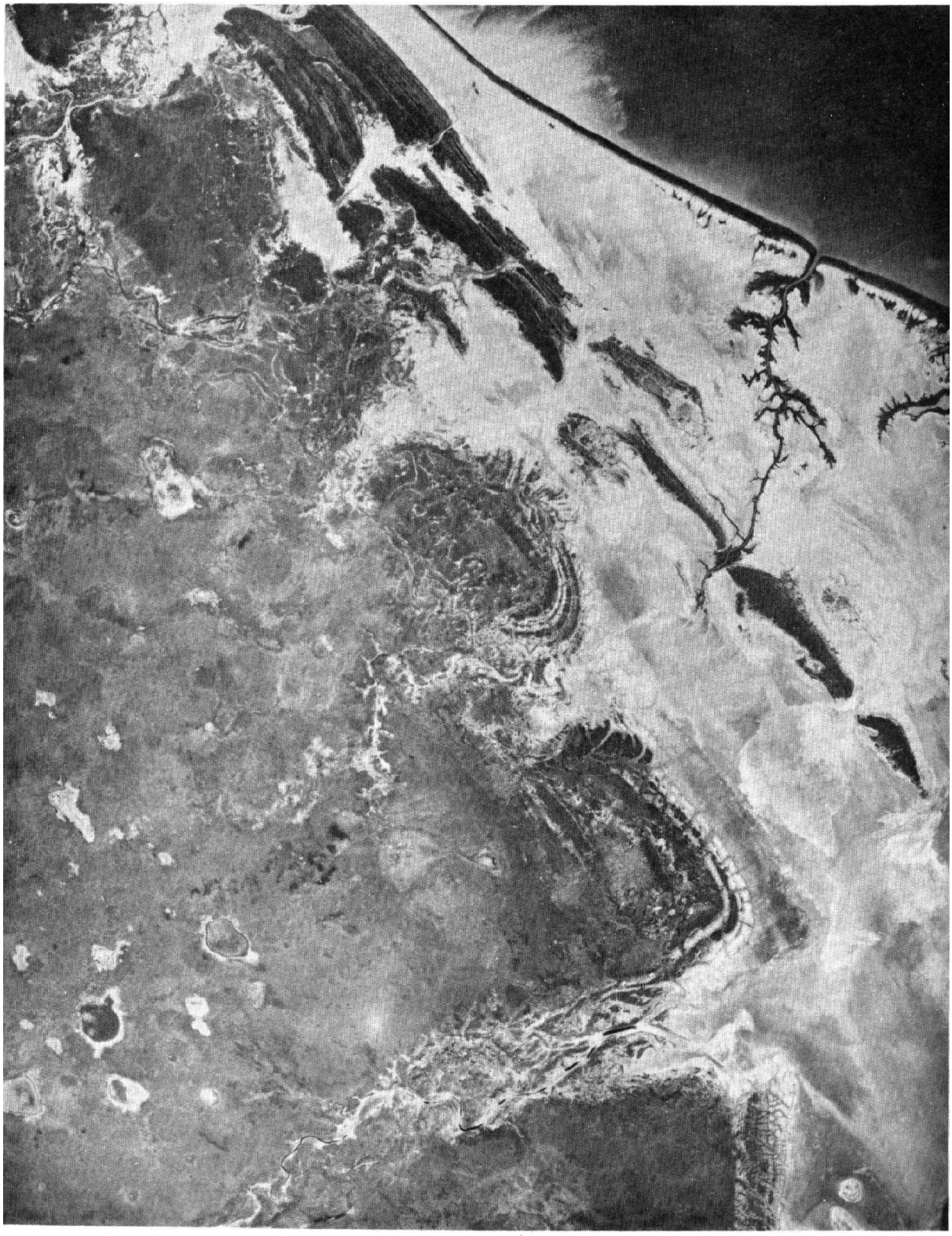

Fig. 7 Features of the Karumba Plain and a part of the Doomadgee Plain. See Fig. 6 for interpretation.
(WESTMORELAND, CAB 4018, Run 3, Photo 4262).

Extract from p 32-33. ....

DEEP-WEATHERING PROFILES (Tf)

These are of several types and ages, and are developed on a variety of rocks. They have been indicated on the geological maps in two ways. Where only a nodular ferricrete zone of a standard laterite profile (Hays, 1967) is exposed it is mapped as 'Tf. Where the underlying mottled zone is exposed on its own through stripping of the overlying ferruginous zone, it is indicated on the maps as a stippled pattern superimposed on the symbol for the formation on which it is developed. The complete laterite profile is only exposed in a few river and sea-cliff sections (e.g., Fig. 21).

The most extensive area of deep weathering is that which underlies the Doomadgee Plain and parts of the Cloncurry Plain. A standard laterite profile (Hays, 1967) is developed on the Floraville Formation. A similar profile is present on Mornington Island, where it is developed mostly on the Normanton Formation. The sea cliffs of Mornington Island show the best exposures of the standard laterite profile (Figs. 21 & 22). It consists of a hard nodular ferricrete, about a metre thick, overlying a softer thin ferruginous zone, which grades down into a mottled zone up to 10 m thick. A pallid zone is also present in some places, but generally appears to lie below the present sea level. On the Doomadgee Plain the laterite profile is covered by a widespread, though thin, sand sheet (Czs); outcrops of ferricrete are restricted to breakaways and stream beds. The best exposures are near Doomadgee and along the Nicholson River to the west of the mission where the full profile is exposed in places.

In the southwestern part of the region the Mullaman Beds generally form flat-topped mesas, and there are also flat-topped hills of Precambrian rocks (see Physiography). These have been silicified and ferruginized by a deep-weathering process. These areas of deep weathering are not symbolized on the geological maps accompanying this report.

Several authors (e.g., Hays, 1967; Wyatt & Webb, 1970) consider that the laterites of northern Australia are of several ages but that there was a main lateritic event before or during the early Miocene (e.g., the Tennant Creek Surface of Hays, 1967). The laterite profiles developed on the Tertiary Surface of the Isa Highlands may be equivalent to the early or mid-Tertiary Tennant Creek Surface of Hays (op. cit.) as they postdate the Cretaceous or early Tertiary Floraville Formation, and antedate the Pliocene upwarping, which initiated the dissection of the Tertiary Surface.

The laterite profiles of the Mornington Plateau and the Doomadgee Plain were probably also initiated during this main lateritic period of the early to mid-Tertiary. However, the Doomadgee Plain has escaped dissection and has received only minor deposition since that time. It may, therefore, have been subjected to lateritization for a longer period if the climate was suitable. The ferricrete zone of the Doomadgee Plain appears to follow the local rise and fall of the gently undulating surface of the plain and outcrops in only the banks of recently incised streams. This close correspondence to the form of the present land surface suggests that this is a younger (Pleistocene) ferricrete, possibly 'overprinted' on to the main laterite profile.