COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1966/63

REPORT ON PHOTO-INTERPRETATION NEWCASTLE WATERS, DALY WATERS, AND LARRIMAH 1:250,000 SCALE SHEETS, NORTHERN TERRITORY.

by

J.C. Rivereau
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C O N T E N T S

SUMMARY

Most of the studied area is covered by laterite, lateritic soil and sand (LARRIMAH, DALY WATERS); the sand entirely covers the southern part (NEWCASTLE WATERS), forming a flat, featureless sand plain with no creeks. On NEWCASTLE WATERS, a few outcrops of Middle Cambrian have been found in the southern corner and two folded, well-bedded ridges of "Ashburton Sandstone"*, trending north, occur within the shallow depression of Lake Woods and Sturt Plain. On DALY WATERS the Mullaman Beds and Montejinni Limestone are exposed in the western part as inliers within the laterite; in the southwestern part a fault striking north-east may have brought volcanic rocks to the surface. On LARRIMAH Proterozoic outcrops and the Antrim Plateau Volcanics occur in the northeastern corner, and Cambrian limestone and the Cretaceous are observed along the river channels.

The study of the anomalies of the former and actual drainage pattern as well as of the morphology of the lateritic mesas, and particularly of the inliers on DALY WATERS, has suggested lineaments of northeast trend, and the presence of two anticlinal ridges, trending northwest; one in the middle of DALY WATERS, the other between Birdum and Elsey Creek on LARRIMAH.

I. INTRODUCTION

LARRIMAH, DALY WATERS and NEWCASTLE WATERS 1:250,000 scale Sheets are between the DALY RIVER basin to the north, and the Wiso basin to the south (between 132° and 133°30' E longitude and 15° and 18°S latitude).

The photo-interpretation of this area has been carried out with the purpose of assisting in the planning and execution of the field work programmed for the 1966 season.

The air photographs used were flown in 1963 at a nominal scale of 1:85,000. Detail from the individual photo scale overlays has been reported on overlays of the National Mapping photo scale compilation sheets and then reduced to a scale of 1:250,000.

A. NEWCASTLE WATERS

I. Physiography

The sheet area appears as a flat, featureless sand plain with the trace of some old dunes trending west-north-west visible in places.

This monotony is broken:

(1) On the southwestern corner of the sheet by few, very low, rounded outcrops of Cambrian;

(2) On the eastern part, from south to north, by the shallow depression of Lake Woods, the outcrops of the "Ashburton Sandstone" and the outcrops of laterite surrounding the Sturt Plain, which is a geomorphological continuation of Lake Woods.

Except in the easternmost part, no creek has been recorded throughout the whole sheet area.

II. Stratigraphy (See Table)

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* Proposed new name: Tomkinson Creek Beds.

NEWCASTLE WATERS

TABLE OF PHOTOGEOLOGICAL UNITS

Photogeological character		Possible geological equivalent		
	Qa – alluvium, old alluvium, residual clay	Quaternary		CAINOZOIC
	Qc – Colluvium			
	Qs – Sand			
	CP – Clay or salt pan			
Light grey toned with white spots, irregular pattern.	Ql – Lacustrine formation, caliche, travertine.			
Mesa-form with scarp dark toned at the top, lighter at the foot.	Cz – Laterite and residual soil	Undifferentiated		
Dark toned, low, rounded outcrop.	Cme – Sandstone, siltstone	Merrina Beds	MIDDLE CAMBRIAN	PALAEOZOIC
Grey toned, well bedded, strongly folded outcrop.	Pl – Sandstone	"Ashburton Sandstone"	LOWER PROTEROZOIC	PRECAMBRIAN

Lower proterozoic B1, "Ashburton Sandstone"

This formation crops out in the easternmost part of the sheet within the Lake Woods-Sturt Plain depression. It is composed of folded, well-bedded sandstone trending north. Laterite may cover the northernmost outcrops.

Middle Cambrian, Cmc, Merrina Beds

A few outcrops of this formation, which is widespread on SOUTH LAKE WOODS (Milligan, Smith, Nichols and Doutch, 1966), are found in the southwestern part of NEWCASTLE WATERS, forming low, weathered, rounded mounds. North of these outcrops, two small scarps have been referred to this unit but they may be only laterite.

Laterite, Cz

It occurs in the eastern corner of the sheet area, around the Sturt Plain and to the west is covered by sand.

In the Sturt Plain area the laterite may conceal Cretaceous rocks (Mullaman Beds).

Q.

Around Lake Woods and Sturt Plain a light grey to white, flat lying formation is found which may be a recent lacustrine deposit or a crust formed of caliche or travertine.

III. Structure

Except for the limited area of the "Ashburton Sandstone" and for few lineaments within the laterite, no structural feature can be found throughout the sheet area, because of the cover of sand. For the same reason a geomorphological analysis attempt is not possible, in the absence of any morphological feature such as drainage pattern or duricrust scarp.

B. DALY WATERS

I. Physiography

The central and eastern part of the sheet area is flat, mainly covered by laterite, lateritic soil and sand. On this lateritic mesa, laterite is more or less weathered, showing an old drainage pattern, and large depressions almost filled up with alluvium and sand, with, in some places, superficial duricrust.

In the western part, the lateritic cover has been completely eroded from a wedge-sharped area; the limit of the laterite is well shown by a continuous scarp facing the west. The underlying rocks, partly covered by sand, crop out in this large notch.

In the central part (Hidden Valley area) four inliers of Cretaceous rocks surrounded by scarps, occur within the laterite, and towards the east scattered lateritic scarps are found.

There is no important creek on the laterite, but the old drainage pattern is still well outlined. Creeks of little extent are found in the general area round "Hidden Valley". In the northeast corner of the sheet Waters Creek flows to the north. In the southeast corner the Sturt Plain occurs, which is a morphological continuation of Lake Woods. In the western part of the sheet, where the laterite has been removed by erosion, the hydrographic pattern is more closely spaced, with creeks flowing to the west on less permeable formations.

DALY WATERS

TABLE OF PHOTOGEOLOGICAL UNITS

Photogeological character			Possible geological equivalent		
	Qa – alluvium, old alluvium, residual clay.				
	Qs – Sand		Quaternary		
	CP – Clay or salt pan			CAINOZOIC	
Light grey toned with white spots. Irregular pattern.	Ql – Lacustrine formation, caliche, travertine				
Mesa form with scarp dark toned at the top, lighter at the foot. Hummocky surface.	Cz – Laterite, residual soil		Undifferentiated		
Soft, light toned formation with white patches	Klm – Sandstone, siltstone, mudstone		Mullaman Beds	CRETACEOUS	MESOZOIC
Soft, medium grey toned formation	Cmm – Limestone, marl		Montejinni limestone or Daly River group	MIDDLE CAMBRIAN	PALAEOZOIC
	U – Undetermined				

As far as both the former and present drainage patterns are concerned, they are parted by a north-west diagonal crossing the sheet. Northeast of this line, the creeks drain roughly to the north; southwest of this line the drainage is towards the south. The partition line is well marked by the central inlier area and by the northern limit of laterite which bounds the western notch.

II. Stratigraphy (See Table)

In assigning possible geological equivalents to the photogeological units, reference has been made to the literature and legend of maps of adjoining areas, except for the Cainozoic. (Traves, 1955: Paine, 1963).

Middle Cambrian €mm. Montejinni Limestone

It occurs only in the western part of the sheet area and is, in some places, difficult to differentiate from the overlying Cretaceous because it is partly covered by Cretaceous colluvium. It is a rather soft, flat-lying, marly formation.

Cretaceous Klm. Mullaman Beds

This formation, which crops out principally in the western part, forming a scarp in some places, is directly overlain towards the east by laterite. It is also present in the central part but generally covered by sand.

In some places it has a hard, white to grey toned appearance (probably sandstone), and elsewhere it appears as light grey toned patches with smooth surface surrounded by sand (probably soft siltstone and mudstone).

On Run 6 photo 5140 a fault, striking north-east, crosses the formation. This fault is surrounded by rocks showing a special "facies" that has been labelled "U" on the map, and that may be due to volcanic rocks brought to the surface by the fault.

Laterite Cz.

It covers most of the sheet area. It is partly mantled by sand or recent detrital sediments. From air photographs it shows a rough, hummocky surface with very low, rounded mounds; it is grey toned, with dark patches probably due to vegetation, becoming lighter where sand occurs.

The laterite has been either completely eroded as in the western part of the sheet area and in the central part where the Cretaceous inliers occur, or only partly eroded showing the outlines of the old drainage pattern now filled up with sand. This partly eroded laterite surface has a typically hummocky appearance and probably consists of remnants of laterite and of a mixture of eluvial disaggregated laterite and alluvial formation.

Ql

This symbol has been chosen to characterize several recent superficial formations such as caliche, travertine or lacustrine deposits. They occur within shallow depressions or old river channels, and form irregular white patches or spots.

III. Structure

The Middle Cambrian and Cretaceous rocks appear to be nearly flat-lying.

The fault on Run 6 photo 5140 may have brought the Antrim Plateau Volcanics to the surface.

On this sheet there is no direct observation of any structure but a short geomorphological study has shown:

(1) Many lineaments trending northeast, deduced from the drainage pattern and relief anomalies.

(2) An alignment with a northwest trend, formed by the inliers in the laterite, divides the sheet area into two parts as far as the drainage is concerned. The northeastern area drains to the north while the southwestern part drains to the south. Geomorphologically, this partition of the drainage plus the succession of inliers suggests the presence, underneath, of an anticlinal ridge.

C. LARRIMAH

I. Physiography

The sheet area is flat, mainly covered by laterite, lateritic soil and sand. In the southern half of the sheet large depressions occur, filled up with sand and clay or capped by superficial duricrust.

To the north (and partly on KATHERINE RIVER) the laterite forms a scarp facing north. Some scarps of laterite are also found west of the Stuart Highway. Elsewhere the lateritic surface has been eroded by a former drainage now filled up with old and recent alluvium.

Three principal creeks flow to the north: Dry River, Elsey Creek and Bridum Creek. These creeks in many places have no defined channel and show only a wide former valley; in places they are completely filled up with alluvium and are recognized only by means of photographic tone.

Many sink holes and caves occur in low areas throughout the sheet.

Except for the Proterozoic (northeastern corner) the units are flat-lying and crop out along the river beds.

II. Stratigraphy (See table)

In assigning possible geological equivalents to the photogeological units, reference has been made to the literature and legends of maps of adjoining areas, except for the Cainozoic (Traves, 1955; Randal, 1963).

Proterozoic

B_1

There is only one outcrop of this unit in the northeast corner of the sheet. It is a light grey well-jointed sandstone. No bedding is visible in the aerial photographs.

B_2

It forms two narrow north-west trending ridges of folded rocks (presumably sandstone) in the north-east corner of the sheet. It is unconformably overlain by Cambrian units and Cretaceous cover.

Lower Cambrian Cla Antrim Plateau Volcanics

Topographically it occupies a low, flat area in the northeastern corner of the sheet, unconformably overlying the Proterozoic, and is concealed within a short distance beneath a cover the Cretaceous rocks and laterite.

LARRIMAH

TABLE OF PHOTOGEOLOGICAL UNITS

Photogeological character		Possible geological equivalent		
	Qa - Alluvium, old alluvium, residual clay	QUATERNARY		CAINOZOIC
	Qs - Sand			
	CP - Clay or salt pan			
Light grey toned with white spots, irregular pattern	Ql - Lacustrine formation caliche, travertine.			
Mesa-form with scarp dark toned at the top, lighter at the foot; hummocky surface	Cz - Laterite, residual soil	UNDIFFERENTIATED		
Soft light formation with white patches	Klm - Sandstone, siltstone mudstone	Mullaman Beds	CRETACEOUS	MESOZOIC
Soft medium grey formation	Cmm - Limestone, marl	Montejinni Limestone or Daly River Group	CAMBRIAN	PALAEOZOIC
Grey toned, hard, rounded outcrop	Cla - Basalt	Antrim Plateau Volcanics	CAMBRIAN	PALAEOZOIC
Light grey to grey toned, well bedded, folded outcrop.	B_1, B_2 - Sandstone	Undifferentiated	PROTEROZOIC	PRECAMBRIAN

Middle Cambrian 6mm

It is correlated with the Tindall Limestone (Daly River Group) and occurs only in flat areas along the old valleys of Dry River and Elsey Creek and is difficult to differentiate from the alluvial deposits to the south. On Run 4 Photo 5010 the small scarp along the creek has been referred to this unit.

The presence in the northern half of the sheet of many sink holes and caves suggests that:

- either the Cretaceous formation (Mullaman Beds) is more calcareous in this area,

- or the Cretaceous is thin and weathered and allows the morphology of the underlying Tyndall Limestone to appear.

Mullaman Beds K1m Cretaceous

This formation probably covers most of the sheet area but is concealed by laterite. It consists of flat lying, soft sandstone, siltstone or mudstone, and usually crops out within the gentle slope at the foot of the lateritic scarp.

Laterite and residual soils - Cz

Laterite extends throughout the sheet area capping any underlying unit. It is partly mantled by sand or recent detrital sediments and forms a rough, hummocky surface with very low, rounded mounds; it is grey toned with dark patches probably due to vegetation, and has a lighter tone where it is mantled by sand.

It forms scarps along the Dry River and further north, between Western and Birdum Creeks and west of Elsey Creek.

The full scarp has been shown, on the map, as laterite but, the Cretaceous formations, underneath, may begin within this scarp.

In the central part of the sheet area the lateritic cover is very eroded and a former drainage pattern with large depressions occurs, now filled up. Within the sink holes areas the laterite has been almost completely weathered giving rise to a typical hummocky surface which probably consists of laterite and a mixture of eluvial disaggregated laterite and alluvial formation.

Q1

This symbol has been chosen to characterize several recent superficial formations such as caliche, travertine or lacustrine formation. They occur within shallow depressions or old river channels in the south-eastern corner of the sheet.

III. Structure

Except for the Proterozoic, the formations which crop out through the sheet are flat lying and partly covered by laterite. No dip has been recorded. Nevertheless a short geomorphological study based on the anomalies of the drainage pattern and of the tableland of laterite, has drawn the attention to:

(1) Many lineaments trending northeast;

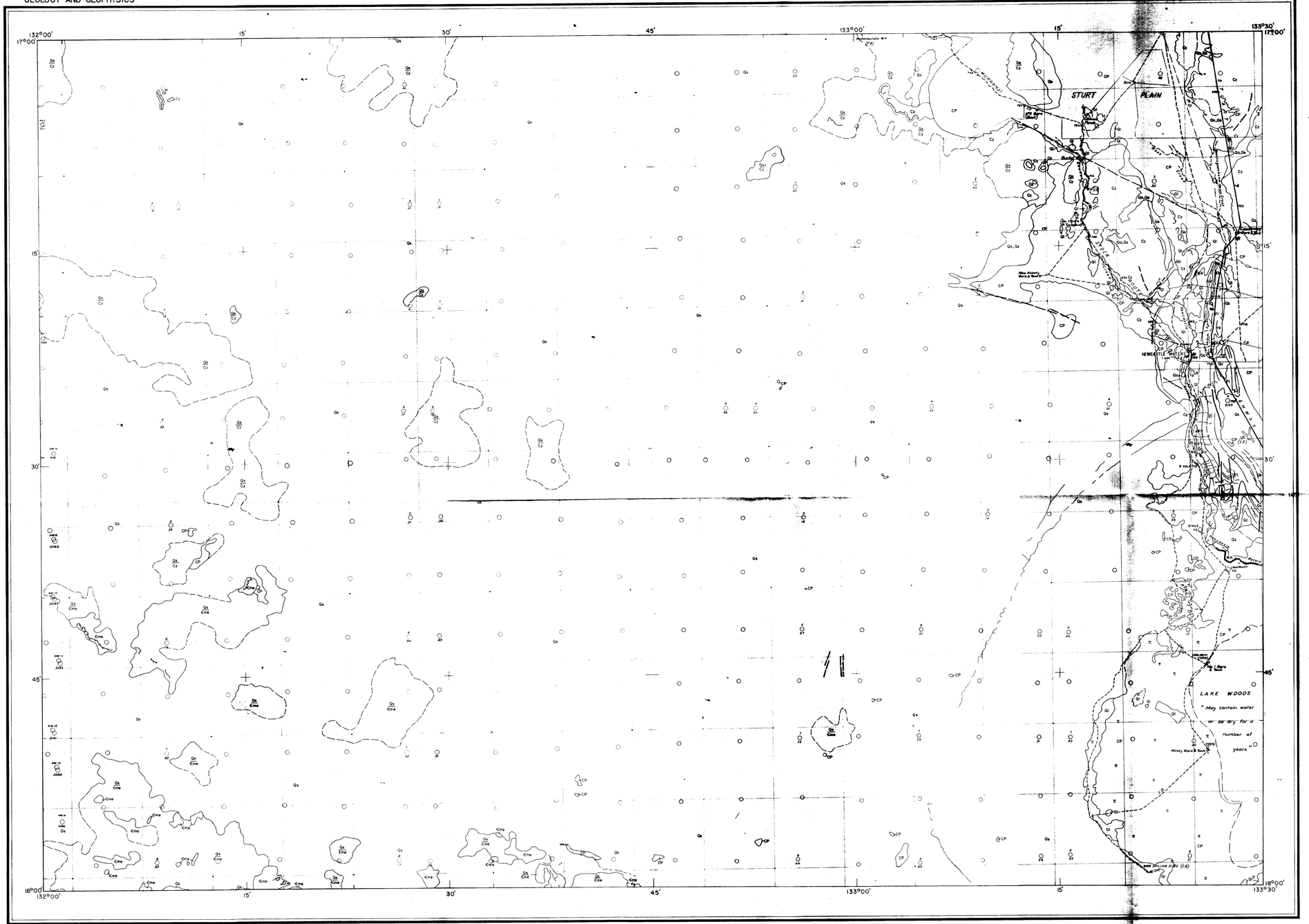
(2) Between Birdum Creek and Elsey Creek, the laterite forms a scarp and is at a higher level than elsewhere; moreover the drainage pattern is a typical concentric drainage in the western part of this area. To the southeast, this area continues as a sandy area with no drainage at all, bounded westward by a depression, and eastward by the Birdum River. These morphological anomalies suggest that an anticlinal ridge with a northwest trend, may occur underneath.

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

NEWCASTLE WATERS

NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SE53-5



REFERENCE

Photogeological Character		Possible Geological Equivalent			
	Qa Alluvium, old alluvium, residual clay			QUATERNARY	CAINOZOIC
	Qc Colluvium				
	Qs Sand				
	CP Clay or salt pan				
Light grey-toned, with white spots, irregular pattern	Ql Lacustrine formation, caliche, travertine				
Mesa form, with scarp, dark-toned at the top, lighter at the foot	Cz Laterite and residual soil			UNDIFFERENTIATED	
Dark-toned, low, rounded outcrop	Cms Sandstone, siltstone	Merrina Beds	MIDDLE CAMBRIAN		PALAEOZOIC
Grey-toned, well bedded, strongly folded outcrop	Pt Sandstone	"Ashburton Sandstone"	LOWER PROTEROZOIC		PRECAMBRIAN

- Lithological boundary
- Probable lithological boundary
- Anticlinal axis
- Synclinal axis
- Fault
- Probable fault or lineament
- Edge of bed
- Probable edge of bed
- Edge of bed expressed as scarp

Estimated dips

- Horizontal
- Very low
- Low
- Medium
- Steep
- Vertical

- Trend line
- Joint pattern
- Topographic scarp
- Laterite (L), Terrace (T), Scree (S)
- Dyke

- Principal road
- Minor roads and tracks
- Railway line
- Telephone line
- Fence
- State boundary
- Mine
- Homestead
- Yard
- Windpump
- Airport or Airfield, Landing ground
- Bore
- Tank
- Well
- Spring
- Waterhole
- Dam
- Photo-centre points
- Photo-centre points - adjoining sheet

Compiled by the Bureau of Mineral Resources, Geology and Geophysics.
Detail adjusted to photoscale compilation prepared by the Division of National Mapping, Department of National Development.
Aerial photography by Adastra Airways Pty. Ltd.; complete vertical coverage at 1:85,000 scale. Transverse Mercator Projection.

SCALE 1:250,000

5 0 5 10 15 MILES

5 0 5 10 15 20 25 KILOMETRES

INDEX TO ADJOINING SHEETS

VICTORIA RIVER DOWNS	DALY WATERS	TANUMBIRINI
WAVE HILL	NEWCASTLE WATERS	BEETALOO
WINNECKE CREEK	SOUTH LAKE WOODS	HELEN SPRINGS

Photo-interpretation by the Photogeological Group, Bureau of Mineral Resources, Geology and Geophysics 1965
Interpreted by: J.C. Rivereau, Institut Français du Pétrole.

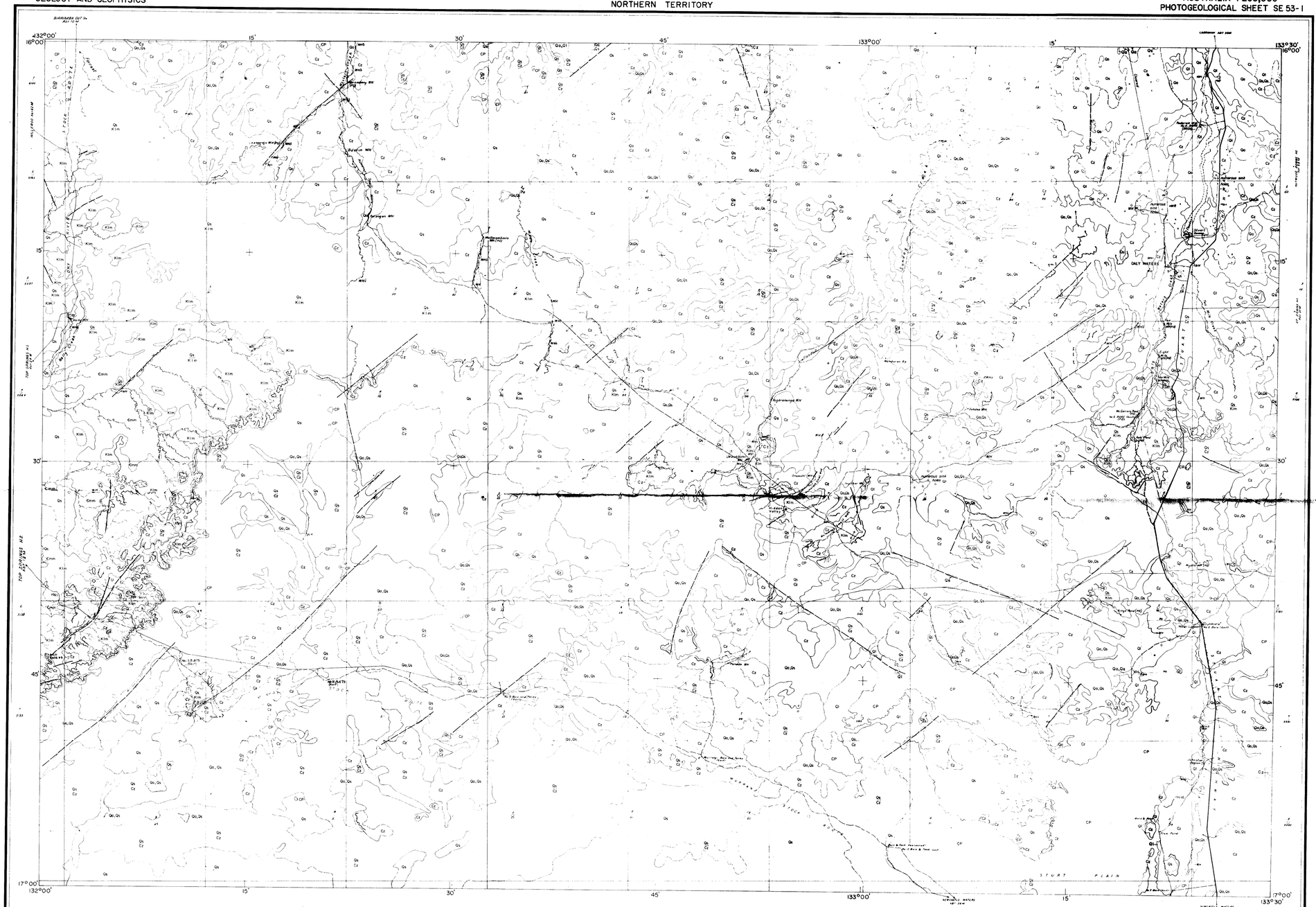
E53/A5/2

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

DALY WATERS

NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SE 53-1



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Photogeological Character		Possible Geological Equivalent			
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	Qs	Sand			
	CP	Clay or salt pan			
Light grey-toned, with white spots, irregular pattern	Qi	Lacustrine formation, caliche, travertine			
Mesa-form, with scarp, dark-toned at the top, lighter at the foot, hummocky surface	Cz	Laterite and residual soil			
Soft, light-toned formation, with white patches	Kim	Sandstone, siltstone, mudstone	Mullaman Beds	CRETACEOUS	MESOZOIC
Soft, medium grey-toned formation	Cmm	Limestone, marl	Montejinni Limestone or Daly River Group	MIDDLE CAMBRIAN	PALAEOZOIC
	U	Undetermined			

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- Vertical

- Trend line
- Joint pattern
- Topographic scarp
- Laterite (L), Terrace (T), Scree (S)
- Sink holes

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- Well
- Spring
- Waterhole
- Dam
- Photo-centre points
- Photo-centre points-adjoining sheet

Compiled by the Bureau of Mineral Resources, Geology and Geophysics.
Detail adjusted to photoscale compilation prepared by the Division of National Mapping, Department of National Development
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DELAMERE	LARRIMAH	HODGSON DOWNS
VICTORIA RIVER DOWNS	DALY WATERS	TANUMBIRINI
WAVE HILL	NEWCASTLE WATERS	BEETALOO

Photo-interpretation by the Photogeological Group, Bureau of Mineral Resources, Geology and Geophysics 1966.
Interpreted by: J.C. Rivereau, Institut Français du Petrole.

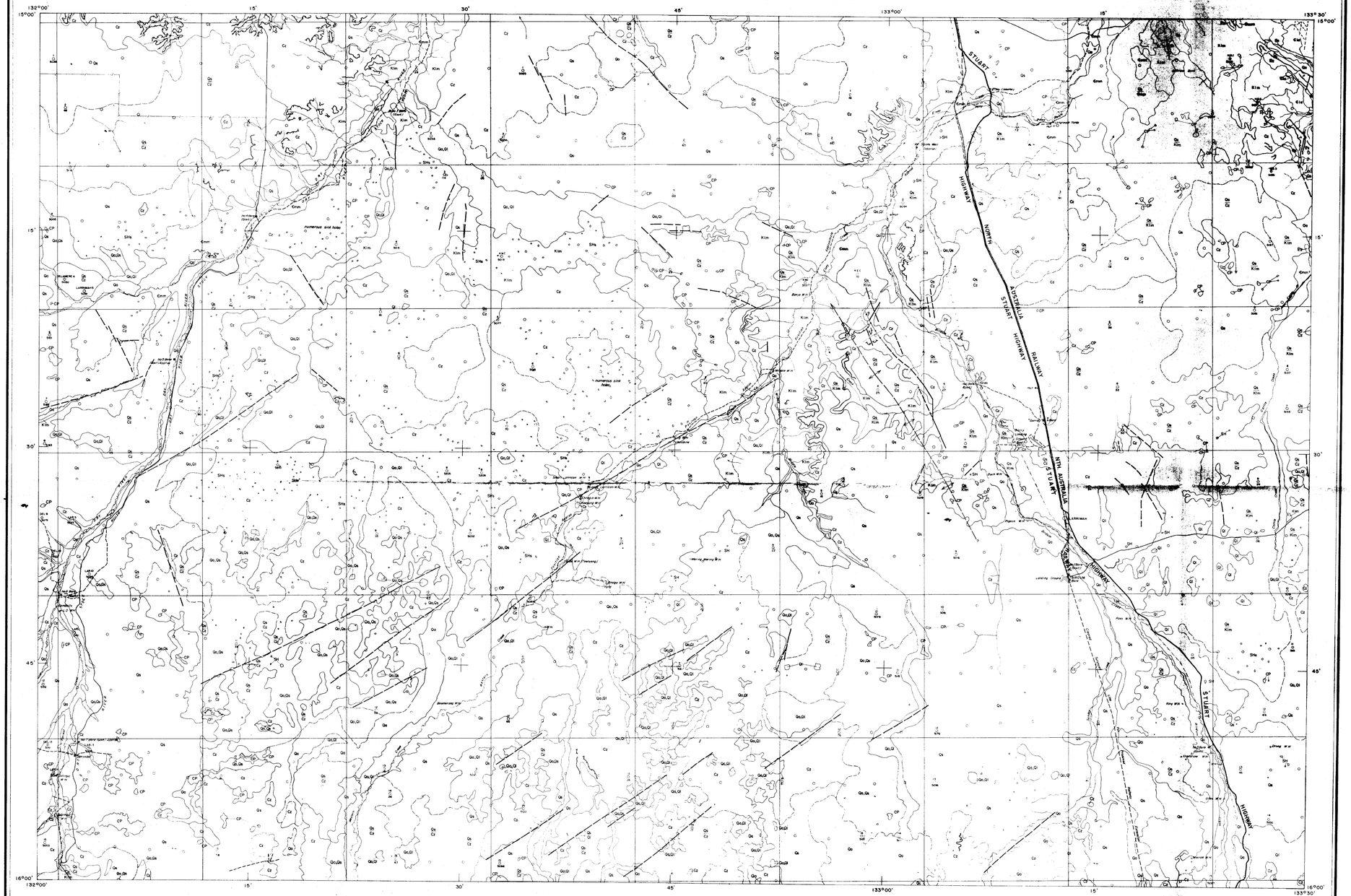
E53/A1/1

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

LARRIMAH

NORTHERN TERRITORY

AUSTRALIA 1:250,000
PHOTOGEOLOGICAL SHEET SD53-13



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	Qs Sand				
	CP Clay or salt pan				
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Meso-form, with scorp, dark-toned at the top, lighter at the foot, hummocky surface	Cz Laterite, residual soil		UNDIFFERENTIATED		
Soft, light-toned formation, with white patches	Kim Sandstone, siltstone, mudstone	Mullaman Beds	CRETACEOUS		MESOZOIC
Soft, medium grey-toned formation	Kmn Limestone, marl	Montejinni Limestone or Daly River Group	CAMBRIAN		PALAEOZOIC
Grey toned, hard, rounded outcrop	Klo Basalt	Antrim Plateau Volcanics			
Light grey to grey toned outcrop	Pl Sandstone	Undifferentiated	PROTEROZOIC		PRECAMBRIAN
Light grey to grey toned, well bedded, folded formation	Pz Sandstone				

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- Photo-centre points-adjoining sheet

Compiled by the Bureau of Mineral Resources, Geology and Geophysics. Detail from 1:85,000 scale photography adjusted to 1:50,000 scale compilation prepared by the Division of National Mapping, Department of National Development. No 1:85,000 scale compilation available. Aerial photography by Adastra Airways Pty. Ltd., 1963: complete vertical coverage at 1:85,000 scale. Transverse Mercator Projection.

SCALE 1:250,000

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5 0 5 10 15 20 25 KILOMETRES

INDEX TO ADJOINING SHEETS

FERGUSSON RIVER	KATHERINE	URAPUNGA
DELAMERE	LARRIMAH	HODGSON DOWNS
VICTORIA RIVER DOWNS	DALY WATERS	TANUMBIRINI

Photo-interpretation by the Photogeological Group, Bureau of Mineral Resources, Geology and Geophysics 1966.
Interpreted by: J.C. Rivereau, Institut Français du Pétrole.

D52/A13/2