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SML 73

MOUNT SERLE – OUTOUIE HILL AREA

**PROGRESS AND FINAL REPORTS
TO LICENCE SURRENDER FOR THE PERIOD
1/10/1964 TO 28/6/1965**

Submitted by
The Broken Hill Pty Co. Ltd
1965

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Government of South Australia
Primary Industries and Resources SA

THE BROKEN HILL PROPRIETARY COMPANY LIMITED

GEOLOGICAL DEPARTMENT

Quarterly Interim Report to December, 31st 1964

on Special Mining Lease No. 73

WHYALLA, S.A.

D.E. Catley
January, 1965

Quarterly Interim Report to December 31st 1964.
on Special Mining Lease No. 73.

THE BROKEN HILL PROPRIETARY COMPANY LIMITED: WHYALLA: S.A.

QUARTERLY INTERIM REPORT TO DEC. 31ST 1964.

ON PROSPECTING ACTIVITIES

ON SPECIAL MINING LEASE NO. 73

INTRODUCTION:

Special Mining lease No.73 in the northern Flinders Range was acquired on September 1st 1964 for a period of six months. The object of acquiring the lease is to protect the Company's interest whilst a search for economic phosphate deposits is in progress.

A staff of two geologists equipped with a 1 ton Land Rover and caravan are employed on this work.

METHODS:

The lease covers the Angepena and Arrowie Cambrian synclines - see attached plan.

A systematic sampling programme is in progress and is designed to cover the entire Cambrian sequence along a number of traverse lines in both synclines. A total of 42.8 miles of traverse have been completed to Dec. 20th, 1964. The field method is to test every bed in the sequence with nitric acid and ammonium molybdate and where a positive reaction occurs, samples are taken and submitted to the Whyalla Chemical Laboratories for phosphorus determination.

RESULTS:

The laboratory results on 79 samples are shown in Table 1. The location of the traverses and the samples taken on the traverses are shown in Drawing No. 34305.

ACKNOWLEDGEMENT:

The Company wishes to acknowledge the assistance given by the South Australian Department of Mines in providing access to unpublished maps and records.

TABLE I.

Phosphate Samples taken to December 31, 1964.

<u>Number</u>	<u>%P</u>	<u>Type</u>	<u>Location</u>
P1	0.10	Scolithus sandstone	) Reedy Spring. Lat 30°38'41". Long 139°06'0"
P2	0.25	Scolithus sandstone	
P3	0.28	Calcareous sandstone	
P4	1.05	Ferruginous horizons above scolithus sandstone	
WY31	0.075	Shaley carbonate rock	) (2.2E. 1.3S
WY32	0.065	" " "	) (2.15E. 1.15S
WY33	0.06	Dark grey slaty carbonate rock.	) (1.9E. 0.85S
WY34	0.06	Grey calc-argillite	) (1.85E. 0.60S
WY35	0.07	Yellow-green shale	) (1.8E. 0.40S
WY36	0.035	Black limestone	) Balcanoona Run 1. (1.8E. 0.35S
WY37	0.030	Grey fine grained sands	) Photo 7584 (2.0E. 1.40N
WY38	0.035	Brown-grey sandstone	) (2.0E. 1.35N
WY39	0.06	Yellow argillaceous sandstone	) (2.0E. 1.35N
WY40	0.11	Mudstone, weathered yellow	) (1.75E. 1.35N
WY41	0.04	" " "	) (500' above WY40
WY42	0.04	Purple shale & sandstone with shale inclusions	) (1,100' above WY40
WY43	0.045	Brown calc. rock with shale partings	) (1.05S. 2.55W
WY44	0.065	" " " " " "	) (1.10S. 2.65W
WY45	0.02	Friable white sandstone	) Balcanoona Run 2. (1.35S. 2.70W
WY46	0.10	Green-brown slate	) Photo 7554 (100'ft above WY45
WY47	0.03	Friable white sandstone with shaley bands	) (800'ft above WY45
WY48	0.015	Friable brown sandstone	) (1200'ft above WY45

WY49	0.05	Friable, fine grain-ed sandstone, argillaceous matrix	Balcanoona Run 2. 0.10N. 1.75E. Photo 7551
WY51	0.06	)	) Lat.30°45'37". Long. 139°1'12"
WY52	0.065	)	)
WY53	0.075	)	)
WY54	0.075	) Limestone	) Samples WY52 to WY57 taken between WY51 and WY58
WY55	0.07	)	)
WY56	0.10	)	)
WY57	0.065	)	)
WY58	0.07	)	) Lat.30°45'30". Long.139°0'57"
WY59	0.08	Greywacke, fine grained, silty	Lat.38°48'8". Long.139°03'20"
WY60	0.075	Greywacke medium - fine grained	Above WY59
WY61	0.075	Greywacke fine grained	Above WY60
WY62	0.075	" " "	Lat.30°48'. Long.139°3'7"
WY63	0.07	" " "	Lat.30°47'52". Long.139°3'7"
WY64	0.07	Greywacke, calcareous	Below WY63
WY65	0.12	Greywacke, coarse grained, soft	Lat.30°47'40". Long.139°3'
WY66	0.07	Greywacke, sity, hard	As WY65
WY67	0.08	Greywacke, fine grained	Below WY66
WY68	0.11	Shale to base of greywacke	Lat.30°47'30". Long.139°02'47"
WY69	0.08	Greywacke, coarse grained	Interbed in WY70
WY70	0.08	Greywacke, medium - fine grained	Below WY71
WY71	0.065	Greywacke, fine grained	Below WY72
WY72	0.065	Greywacke, fine grained, calcareous	Lat.30°49'10". Long.139°00'42"
WY73	0.085	Greywacke, coarse grained, granular	Above WY72
WY74	0.075	Greywacke, very fine grained	Lat.30°49'24". Long.139°00'47"

WY75	1.70	Siltstone, limonitic, earthy material in cavities
WY76	0.90	Shale, light green
WY77	0.19	Limestone, grey crystalline
WY78	0.10	Limestone with shaley bands
WY79	0.08	" " " "
WY80	0.07	Greywacke, fine grained, calcareous
WY81	0.67	Greywacke, coarse granular
WY82	0.16	Greywacke, fine grained, calcareous
WY83	0.18	Limestone, brown and silty
WY84	0.18	Mottled limestone
WY86	1.10	Siltstone with yellow limonitic earth
WY87	0.16	" " " "
WY88	2.10	Indurated limonitic shale
WY89	0.88	Limonitic, hard and silty
WY90	0.62	" " " "
WY91	0.47	" " " "
WY92	1.70	" " " "
WY93	0.15	" " " "
WY94	0.06	Grey-yellow, brecciated weathered sandstone
WY95	0.14	" " " "
WY244	1.5	Limonitic siltstone
WY245	0.11	Calcareous sandstone
WY246	0.12	Siltstone
WY247	0.13	Siltstone
WY248	0.035	Duricrust
WY249	2.50	Limonitic manganimiferous earthy wad.

Lat.30°44'31". Long.139°00'9"
 Lat.30°44'15". Long.139°
 Lat.30°46'35". Long.139°11'35"
 Lat.30°47'45". Long.139°8'
 " " " " " "
 Lat.30°48'21". Long.139°1'52"
 Lat.30°48'22". Long.139°1'51"
 " " " "
 Lat.30°46'38". Long.139°5'15"
 Lat.30°41'36". Long.139°12'40"
 250 yds W of WY88
 400 yds W of WY88
 Lat.30°45'5". Long.138°59'20"
 "
 "
 "
 "
 As WY87
 Lat.30°41'13". Long.139°13'30"
 Lat.30°38'47". Long.139°12'45"
 Lat.30°47'. Long.139°05'30"
 Overlying WY244
 Lat.30°47'. Long.139°05'40"
 Lat.30°47'05". Long.139°05'40"
 Lat.30°47'20". Long.139°06'20"
 Lat.30°46'50". Long.139°07'

WY250	0.12	Greywacke
WY96	0.36	Manganiferous siltstone
WY97	1.57	Limonitic siltstone
WY98	0.65	Limonitic siltstone
WY99	0.085	Greywacke

From Lat. $30^{\circ}47'30''$. Long. $139^{\circ}02'50''$
to Lat. $30^{\circ}48'$. Long. $139^{\circ}03'20''$

Lat. $30^{\circ}46'55''$. Long. $139^{\circ}7'4''$

Lat. $30^{\circ}46'55''$. Long. $139^{\circ}6'45''$

Lat. $30^{\circ}47'$. Long. $139^{\circ}6'$

Lat. $30^{\circ}35'30''$. Long. $139^{\circ}52'30''$

Note: Co-ordinates on individual air photos are measured in inches and tenths from
the centrepont.

THE BROKEN HILL PROPRIETARY COMPANY LIMITED

GEOLOGICAL DEPARTMENT

FINAL REPORT ON
SPECIAL MINING LEASE NO.73.

WHYALLA, S.A.

D.E. Catley,
May, 1965.

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PLAN.

Geology of S.M.L. No.73. Drawing No.34305.

SUMMARY.

1. Two areas in the Arrowie syncline gave average assays of 1.65% P and 1.86% P.
2. Both are small and unsuited for quarrying.
3. It is recommended that the Company abandon S.M.L. No.73.

A. Introduction.

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The Company acquired Special Mining Lease No.73 in the northern Flinders Range in September 1964 in order to carry out a phosphate exploration programme.

The lease covers the Arrowie and Angepena Cambrian synclines and both have been systematically traversed and sampled for phosphate. A total of 51 miles of traverses were completed and 86 samples were assayed.

B. Method.

The traverses were designed to cover the complete stratigraphic sequence from the basal Cambrian upwards in a number of areas in each syncline.

The nitric acid - ammonium molybdate test was used and sample widths which gave a strong yellow precipitate were collected for assay.

It was recognized at an early stage that the strength of the reaction depended on how the phosphorus was bound up in the rock and on the gangue. The application of a given quantity of nitric acid to a lime phosphate rock releases more phosphorus than from a siliceous phosphate rock. It was also noted that dense rocks respond less strongly than more porous rocks and that weathered surfaces are liable to give misleadingly strong reactions.

C. Geology.

The Cambrian sediments in the North Flinders Range are confined to five major basins.

They may be classified as follows:-

1. Isolated depositional areas centred within the main Adelaide Geosyncline:-
 - a) Angepena Basin
 - b) Arrowie Basin
 - c) Hawker Basin
2. Isolated depositional areas marginal to the Adelaide Geosyncline:-
 - a) Wirrealpa Basin
 - b) Beltana Basin.

The Angepena and Arrowie basins were selected because a thickness of 12 - 14,000ft of sediments is attained in the Arrowie basin, and the Angepena basin is located close to the centre of mining operations at Balcanooona.

The succession is given by Dalgarno (1913) as follows:

LAKE FROME GROUP

Grindstone Range Sandstone

Unnamed sandstone

Balcoracana Formation

Moodlatana Formation.

Wirrealpa Limestone. Arcoona Ck. Lst.)

) Middle Cambrian Series.

BILLY CREEK FORMATION

HAWKER GROUP

Narina Greywacke

Oraparinna Shale

Bunkers Sandstone

Parara Limestone

Ajax Limestone

Wilkawillina Limestone

Parachilna Formation.

) Lower Cambrian Series.

Pound Quartzite

) Murinoan Series.

The highest member encountered is the Narina Greywacke in the Arrowie syncline and the lowest is the Parachilna Formation in both synclines.

There are some considerable differences in the general characteristics of the two synclines from a sampling point of view. The Arrowie syncline generally is the worst exposed, and is a fairly featureless basin surrounded by very considerable ranges formed by the Pound Quartzite.

The most prominent outcrops are in the Marina Greywacke near the Southern margin of the syncline and the Parara Limestone on the northern limb of the syncline (See Drawing No. 34305).

The Angepena syncline contains better outcrops and is well elevated and dissected East of Nopabunna.

However, the Tertiary pediment which obscures much of the Parachilna Formation in the Angepena syncline is less well developed in the Arrowie syncline.

D. Results.

The results are summarized in Table 1.

FINAL REPORT ON
SPECIAL MINING LEASE NO.73.

D.E. Catloy,
May, 1965.

-6-
TABLE 1.

15.

<u>Number</u>	<u>SP</u>	<u>Type</u>	<u>Location</u>
P1	0.10	Scolithus sandstone	)
P2	0.25	Scolithus sandstone	)
P3	0.28	Calcareous sandstone	) Reedy Spring. Lat 30°38'41". Long. 139°06'0"
P4	1.05	Ferruginous horizons above scolithus sandstone	)
WY31	0.075	Shaley carbonate rock	) (2.2E. 1.38
WY32	0.065	" " "	) (2.15E. 1.15S
WY33	0.06	Dark grey slaty carbonate rock.	) (1.9E. 0.85S
WY34	0.06	Grey calc-argillite	) (1.85E. 0.60S
WY35	0.07	Yellow-green shale	) (1.8E. 0.40S
WY36	0.035	Black limestone	) Balcanoona Run 1. (1.8E. 0.35S
WY37	0.030	Grey fine grained sands	) Photo 7584 (2.0E. 1.40N
WY38	0.035	Brown-grey sandstone	) (2.0E. 1.35N
WY39	0.06	Yellow argillaceous sandstone	) (2.0E. 1.35N
WY40	0.11	Mudstone, weathered yellow	) (1.75E. 1.35N
WY41	0.04	" " "	) (500' above WY40
WY42	0.04	Purple shale & sandstone with shale inclusions	) (1,100' above WY40
WY43	0.045	Brown calc. rock with shale partings	) (1.05S. 2.55W
WY44	0.065	" " " " " "	) (1.10S. 2.65W

<u>Number</u>	<u>ZP</u>	<u>Type</u>	<u>Location</u>
WY45	0.02	Friable white sandstone	) Balcanoona Run 2. (1.35S. 2.70W
WY46	0.10	Green-brown slate	) Photo 7554 (100' above WY45
WY47	0.03	Friable white sandstone with shaley bands	) (800' above WY45
WY48	0.015	Friable brown sandstone	) (1200' above WY45
WY49	0.05	Friable, fine grained sandstone, argillaceous matrix	) Balcanoona Run 2. 0.10N. 1.75E. Photo 7551
WY51	0.06	)	) Lat. 30°45'37". Long. 139°01'12"
WY52	0.065	)	)
WY53	0.075	)	)
WY54	0.075	) Limestone	) Samples WY52 to WY57 taken between WY51 and WY58
WY55	0.07	)	)
WY56	0.10	)	)
WY57	0.065	)	)
WY58	0.07	)	) Lat. 30°45'30". Long. 139°00'57"
WY59	0.08	Greywacke, fine grained, silty	Lat. 38°48'8". Long. 139°03'20"
WY60	0.075	Greywacke medium - fine grained	Above WY59
WY61	0.075	Greywacke fine grained	Above WY60
WY62	0.075	" " "	Lat. 30°48'. Long. 139°03'7"
WY63	0.07	" " "	Lat. 30°47'52". Long. 139°03'7"
WY64	0.07	Greywacke, calcareous	Below WY63

WY65	0.12	Greywacke, coarse grained, soft
WY66	0.07	Greywacke, silty, hard
WY67	0.08	Greywacke, fine grained
WY68	0.11	Shale to base of greywacke
WY69	0.08	Greywacke, coarse grained
WY70	0.08	Greywacke, medium - fine grained
WY71	0.065	Greywacke, fine grained
WY72	0.065	Greywacke, fine grained, calcareous
WY73	0.085	Greywacke, coarse grained, granular
WY74	0.075	Greywacke, very fine grained
WY75	1.70	Siltstone, limonitic, earthy material in cavities
WY76	0.90	Shale, light green
WY77	0.19	Limestone, grey crystalline
WY78	0.10	Limestone with shaley bands
WY79	0.08	" " " "
WY80	0.07	Greywacke, fine grained, calcareous
WY81	0.67	Greywacke, coarse granular
WY82	0.16	Greywacke, fine grained, calcareous
WY83	0.18	Limestone, brown and silty
WY84	0.18	Mottled limestone

Lat. 30°47'40". Long. 139°03'

As WY65

Below WY66

Lat. 30°47'30". Long. 139°02'47"

Interbed in WY70

Below WY71

Below WY72

Lat. 30°49'10". Long. 139°00'42"

Above WY72

Lat. 30°49'24". Long. 139°00'47"

Lat. 30°44'31". Long. 139°00'9"

Lat. 30°44'15". Long. 139°

Lat. 30°46'35". Long. 139°11'35"

Lat. 30°47'45". Long. 139°08'

" " " " " "

Lat. 30°48'21". Long. 139°1'52"

Lat. 30°48'22". Long. 139°1'51"

" " " "

Lat. 30°46'38". Long. 139°05'15"

Lat. 30°41'36". Long. 139°12'40"

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WY86	1.10	Siltstone with yellow limonitic earth
WY87	0.16	" " " " " "
WY88	2.10	Indurated limonitic shale
WY89	0.88	Limonitic, hard and silty
WY90	0.62	" " " "
WY91	0.47	" " " "
WY92	1.70	" " " "
WY93	0.15	" " " "
WY94	0.06	Grey-yellow, brecciated weathered sandstone
WY95	0.14	" " " " " "
WY44	1.5	Limonitic siltstone
WY45	0.11	Calcareous sandstone
WY46	0.12	Siltstone
WY47	0.13	Siltstone
WY48	0.035	Duricrust
WY49	2.50	Limonitic manganiferous earthy wad.
WY250	0.12	Greywacke
WY96	0.36	Manganiferous siltstone

250 yds W of WY88

400 yds W of WY88

Lat. 30°45'5". Long. 138°59'20"

"

"

"

"

"

Lat. 30°41'13". Long. 139°13'30"

Lat. 30°38'47". Long. 139°12'45"

Lat. 30°47'. Long. 139°05'30"

Overlying WY244

Lat. 30°47'. Long. 139°05'40"

Lat. 30°47'05". Long. 139°05'40"

Lat. 30°47'20". Long. 139°06'20"

Lat. 30°45'50". Long. 139°07'

From Lat. 30°47'30". Long. 139°02'50"

to Lat. 30°48'. Long. 139°03'20"

Lat. 30°46'55". Long. 139°07'4"

WY97	1.57	Limonitic siltstone
WY98	0.65	Limonitic siltstone
WY99	0.085	Greywacke
WY438	0.81	Limestone & ferruginous limestone
WY439	0.5	" " "
WY440	0.78	" " "
WY441	0.58	" " "
WY442	0.15	" " "
WY449	0.29	" " "
WY450	0.92	" " "

Lat. 30°46'55". Long. 139°6'45".

Lat. 30°47' . Long. 139°6'

Lat. 30°35'30". Long. 139°52'30"

Balcanaona Run 1. Photo 589. 0.28/2.0W

" " " 0.18/1.8W

" " " 0.08/1.8W

" " " 0.28/2.0W

" " " 0.2N/2.1W

" " " 1.0S/2.4W

" " Photo 587. 0.1N/0.7W

Note: Co-ordinates on individual air photos are measured in inches and tenths from the centrepoint.

60

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Only eight of the assays exceed 1.0% P or 

Tricalcium phosphate these are:-

TABLE 11.

Sample No.	%P	Stratigraphic Position	Location
P4	1.05	Parachilna Fm.	Reedy Spring
WY.75	1.70	" "	3 mi. W. Nantawarrina bore
WY.86	1.10	" "	" " " "
WY.88	2.10	" "	" " " "
WY.92	1.70	" "	" " " "
WY.244	1.50	Bunkers sandstone equivalent	Orange Tree Dam
WY.249	2.50	" " "	" " "
WY.97	1.57	" " "	" " "

These fall into two areas, Nantawarrina Bore and Orange Tree Dam in the Arrowie syncline.

Four samples from Nantawarrina average 1.65% P.

Three samples from Orange Tree Dam average 1.86% P.

All samples are from limonitic, and occasionally slightly manganiferous siltstones and sandstones of the Parachilna Formation in the case of the Nantawarrina area, and of the Bunkers Sandstone equivalents in the Orange Tree Dam area.

The Nantawarrina area phosphatic rocks are intermittently exposed over a distance of 500 yds, the most easterly outcrop measuring 188ft. x 4 ft. (average).

Six samples collected along the strike of this outcrop (WY.75 and 88-92) average 1.3% P.

The outcrops have only low relief and would not be amenable to quarrying.

The Orange Tree Dam outcrops are near continuous over 2.5 miles. Individual phosphatic bands are very thin (2 - 4 inches) and there is a preponderance of non-phosphatic interbeds.

The outcrops are in low lying, flat ground and are not suitable for quarrying.

In both areas the beds have low dips ranging from 15° - 40°.

E. Conclusions.

The only guide available on the value and potential of these results is contained in a report by Mr Canavan on the result of his overseas trip. In this he states that in North Africa the lowest grade acceptable for quarrying is 5% T.C.P. equivalent 1.0% P, and 55% T.C.P. equivalent to 11.0% P for mining.

The results obtained on S.M.L.73, 1.65% P and 1.86% P are not attractive, they are not in quarryable areas, nor is any useful tonnage indicated in the areas.

It is unlikely that the rocks will be richer in phosphate at depth. The limonite associated with the phosphate is almost certainly oxogenous, and it is probable that both iron and phosphorus are enriched at the surface.

Recommendations.

It is recommended that the Company relinquish Special Mining Lease No.73.

REFERENCE.

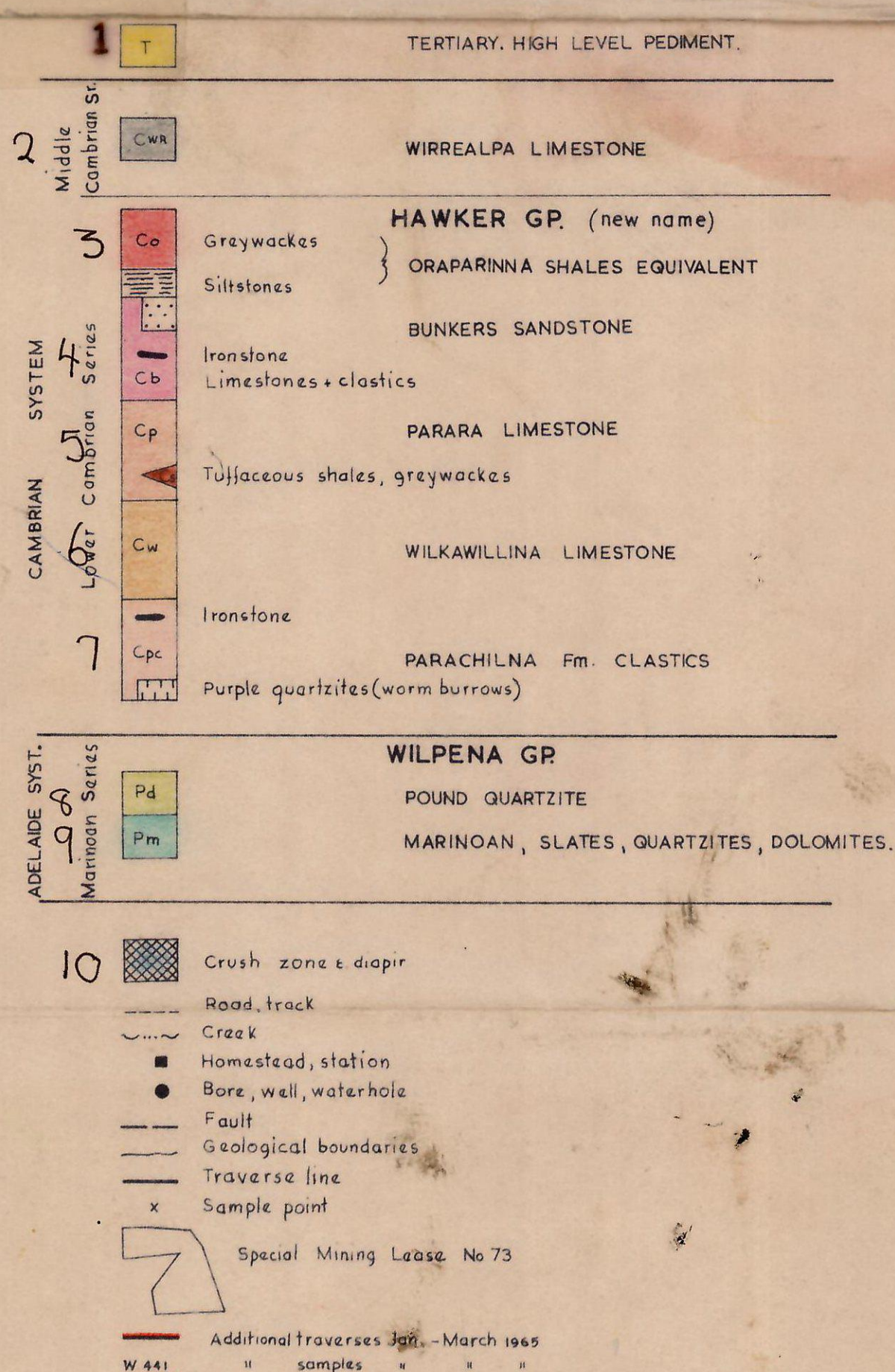
22

Dalgarno. C.R.

Lower Cambrian Stratigraphy of the
Flinders Ranges.

South Australian Dept. of Mines Rept.
Ex 58/158 also. Proc. Roy. Soc. S.A.
(in press).

GEOLOGY OF BHP SPECIAL MINING LEASE No 73
NORTH FLINDERS RANGE



ENV 506

Scale 1" = 1 mile approx.
DRG. No. 34305

