DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 82/26

THE INVESTIGATION OF TERTIARY COAL IN THE WALLOWAY BASIN, SOUTH AUSTRALIA

GEOLOGICAL SURVEY

by

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APRIL, 1982

DME. 36/82

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 82/26
DME. No. 36/82
Disk No. 2

THE INVESTIGATION OF TERTIARY COAL IN THE WALLOWAY BASIN, SOUTH AUSTRALIA

ABSTRACT

In December, 1981, SADME hydrological bore Walloway No. 1 located in the Walloway Basin intersected 23 m of Tertiary (Eocene) coal at a depth of 244 m.

The coal intersection was identified from the interpretation of wireline borehole logs and drill cuttings.

Available geological and geophysical data have been reviewed to assess the basin's prospectivity for Tertiary coal. In Walloway No. 1 the coal occurs at depths greater than might be considered economically recoverable, but there is potential for discovering shallow coal elsewhere in the basin.

INTRODUCTION

The Walloway Basin, located 257 km north of Adelaide and 80 km east of Pt. Augusta is an elongate Tertiary Basin approximately 50 km long and up to 15 km wide. The basin is of similar age to the nearby Willochra and Pirie Torrens Basins.

The township of Orroroo is located on the southwestern margin of the basin and Johnburgh is situated in the northern part of the basin (Figure 1).

In December, 1981 the SADME hydrological investigation bore Walloway No. 1 drilled 11 km north-northeast of Orroroo, intersected 23 m of Tertiary coal at a depth of 244 m. The coal seam has been interpreted to be of lignite rank and is the thickest intersected to date in the Walloway Basin and is one of the thickest brown coal seams recorded in the State.

Following the discovery, the Coal Section initiated a review of existing geological and geophysical information to assess the basin's prospectivity for Tertiary coal.

PREVIOUS INVESTIGATIONS

The ORROROO 1:250 000 geological map (Binks, 1966) is taken as reference for the limit of the Walloway Basin and general geology of the area.

Previous interest in the basin has been groundwater orientated and the results of SADME hydrological investigations are detailed in reports by Sprigg (1949) and Hillwood (1964).

The latest available SADME reports are a refraction seismic and gravity programme by Finlayson (1980) and the Walloway No. 1 well completion report by Gerges (in prep.). The Department's geophysical programme and subsequent drilling of Walloway No. 1 were aimed at clarifying the extent of the basin and thickness of sedimentation to aid current hydrological investigations. Work was concentrated in the southern portion of the basin near Orroroo but there are plans to extend the investigation.

Stockdale Prospecting Limited were granted an Exploration Licence (EL652) for diamonds over the Walloway Basin and surrounding Adelaidean sediments in 1978. The area covering the basin was relinquished in 1981 after an aeromagnetic survey was completed to ascertain whether kimberlites were present under the basin sediments (Jones, 1981).

The Department's water bore records indicate that over 300 water bores have been drilled in the basin. Of these wells 12 have useful lithological logs of the Tertiary sediments but they are restricted to the southern part of the basin near Walloway No. 1 (Figure 2). Black clay and thin lignitic horizons have

been reported in some of these water bores and these intersections are shown on the geological cross-sections in Figure 4.

GEOLOGY

The Walloway Basin is an intermontane valley filled with fluviatile-lacustrine Tertiary sediments and younger Quaternary and Recent outwash sediments. Outcrops of these sediments have been mapped and described by Binks (1966) but the subsurface sediments of the basin have not been fully investigated or formally named.

The following interpretations of the Tertiary stratigraphy of the basin is based on lithological data from water bore records. These bores are presented on geological cross-sections (Figure 4) and in Appendix 1.

The Tertiary sediments lie unconformably on Proterozoic Adelaide system units which comprise slates with interbedded quartzites, limestones and tillites. The thickest Tertiary section recorded in the basin is 250 m thick in Walloway No. 1 and the overlying Quaternary and Recent sediments range in thickness from 10 m to 50 m.

Two lithological units are recognised in the Tertiary; a lower unit of interbedded sand, silt and clay which is overlain by an upper clay unit. The lower unit predominates and thickens along the deeper troughs of the basin and its sandy nature suggest deposition in a fluviatile environment. The overlying upper unit is a more extensive and continuous unit of grey, brown and black clay, indicating deposition in a lacustrine environment (Figure 4).

Cutting samples from the Walloway coal seam in the lower unit have been dated as Eocene by Cooper (1982, in prep.).

COAL OCCURRENCE

The coal intersected in Walloway No. 1 occurs in the lower unit of the Tertiary. The seam was not cored or sampled but interpretation of caliper, density, neutron and gamma wireline logs run by SADME Geophysics Section and examination of drill cuttings confirmed two coal seams; a 3 m thick seam between 244 m and 247 m and a 20 m thick seam between 250 m and 270 m, separated by 2.5 m of non-coal sediment (Figure 3). The marked contrast between coal and non-coal sediments on the density log suggests the Walloway seam consists of low ash (10-15% ash, dry basis) coal.

The coal seam intersected in Walloway No. 1 is the thickest intersected to date in the basin. There is no record of previous coal exploration in the basin and Walloway No. 1 is the only bore with a suitable suite of wireline geophysical logs allowing an accurate definition of coal thickness.

Water bore records indicate that lignitic sediments occur in both the lower and upper units of the Tertiary sequence in the Walloway Basin. Thin lignitic clay horizons in the lower unit occur in holes 697 and 636 at depths of 160 m and 170 m respectively. These horizons can be tentatively correlated with the coal seam intersected in Walloway No. 1. Black "peaty" horizons in holes 581 and 579 occur at a depth of 65 m in the upper unit (Figure 4). Many of the water bores in the Walloway Basin were not drilled deep enough to completely intersect the lower unit or reach basement.

EXPLORATION POTENTIAL

Water bore records indicate that carbonaceous lignitic sediments occur in both the lower and upper units of the Tertiary sequence (as defined in this report) in the Walloway Basin.

Both units have coal potential, but the primary exploration target is considered to be the lower unit containing the thick coal seam. The refraction seismic and gravity results contained in a report by Finlayson (1980) indicate that in the southern part of the basin there is a significant deepening along the western margin between Walloway Railway Station and Orroroo. It is within this trough or depression, that the lower unit thickens and thick coal seams occur. Similar trough structures could occur elsewhere in the basin but at a shallower depth.

Essentially there are no reliable subsurface data for the northern part of the Walloway Basin, therefore the depth and extent of the lower coal bearing Tertiary unit is unknown. Sprigg (1949) reported that hydrological and geophysical surveys suggest that the lower unit may continue as far north as Johnburgh.

Geophysical surveys indicate that the basin is fault-bound on the western side however there is little evidence for the age of the faulting. Sprigg (1949) concluded probable post-depositional block-faulting due to the absence of gravels and coarse sands in the Tertiary sediments. If post-depositional faulting had occurred the lower unit may have been uplifted resulting in shallow coal in parts of the basin.

CONCLUSIONS

The highly prospective lower unit containing the Walloway coal seam occurs at too great a depth in the southern part of the basin to be considered economic. However, there is no reliable sub-surface information north of Walloway No. 1 and it is possible that the lower unit could be shallower if the overlying units were thinner or if post-Tertiary up-faulting had occurred.

Prior to exploratory drilling it would be beneficial to conduct seismic and gravity profiling to delineate the structural configuration of the northern part of the basin and trace the distribution of the lower Tertiary unit.

It is considered that further investigation of the Walloway Basin might be more suited to an exploration company and the area should be offered to companies currently exploring for coal in the State.

GK:FdeA

G. KWITKO

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Binks, P.J., 1966. Geology of the Orroroo 1:250 000 area. Rept. Invest. Geol. Surv. S. Aust. 36.

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Jones, P.R., 1981. Relinquishment Report, Exploration Licence 652, Orroroo. S. Aust. Dept. Mines and Energy, Open File Env. 4162.

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APPENDIX 1

WALLOWAY BASIN, WATER BORE LITHOLOGICAL LOGS

SADME WATER BORE INDEX-1:50 000 Sheet No. 6632-IV

Hole No: 518, 536, 543, 562, 579, 581, 590, 636, 639, 673, 697 and Walloway No. 1.

BOREHOLE LITHOLOGICAL DESCRIPTIONS

Borehole No. 518

Depth From(ft.)	To(ft.)	Description of Material
0	22	Soil.
22	32	Clay and gravel.
32	60	Various clays.
60	100	Blue clay.
100	120	White clay.
120	136	Pipe clay with hard bands of "cement".
136	157	White pipe clay.
157	162	Whitish rock.
162	175	Yellow clay.
175	206	White clay.
206	232	Various clays.
232	236	Yellow clays.
236	242	Yellow rock.
242	249	Very hard rock.
249	255	Very soft clay.
255	260	Very hard rock.
260	263	Very hard slate.
263	264	Very hard blue rock.

End of Bore 264'.
Logger unknown.

Borehole No. 536

Depth From(ft.)	To(ft.)	Description of Material
0	20	Loam, clay.
20	40	Gravel and clay.
40	90	Clays, gravelly clays.
90	106	Gravel, coarse pebbles.
106	166	Yellow-brown to grey clays.
116	186	White gravelly clay.
186	286	Dark grey to blue-grey & red marbled clay-very stiff.
286	386	Dark grey marbled clay-very stiff.
386	406	Light grey clay.
406	426	Dense fine white silt with some clay.
426	460	Light grey silty clay.
460	480	White-grey sandy clay.
480	494	White clayey sand-very fine.
494	496	Fine white sand.
496	534	Grey-white very fine sandy clay.

End of Bore 534'.
Logged by K.R. Miles.

Borehole No. 543

Depth From(ft.)	To(ft.)	Description of Material
0	73	Red gravelly clay.
73	91	Coarse gravel & clay.
91	128	Silty clay.
128	138	Gravelly silt.
138	156	Sand.
156	179	Ferruginous gravel & silt.
179	191	White fine silt.
191	211	Silty clay.

End of Bore 211'.
Logged by K.R. Miles.

Borehole No. 562

Depth From(ft.)	To(ft.)	Description of Material
1	17	Loamy clay.
17	32	Clay, concrete watercut at 25'.
32	75	Clay concrete.
75	101	Concrete (travertine by description).
101	104	Wash.
104	115	Grey clay.
115	300	Grey-brown stiff clay.
300	320	Black & brown clay.
320	340	Stiff brown clay.
340	460	Sandy clay grey.
460	465	Red clay.
465	500	Grey sandy clay.
500	510	Sand coarse (7ft. thick).
510	514	Sand with clay.
514	516	Clayey sand.
516	518	Clay with sand.

End of Bore 518'.
Logger unknown.

Borehole No. 579

Depth From(ft.)	To(ft.)	Description of Material
0	22	Light red-brown marly clay.
22	66	Light greyish clay with gravel.
66	69	Sandstone - quartzite bar.
69	73	Clayey sand & gravel.
73	93	Light grey & yellow-brown mottled clay.
93	178	Yellow-brown, grey & light grey mottled clay.
178	208	Red & grey mottled clay.
208	214	Mottled grey, yellow-brown & red-brown, clay.
214	221	Black peaty clay.
221	243	Mottled grey, yellow-brown & red-brown clay.
243	263	White & light grey mottled clay.
263	285	Light grey clay.
285	296	Purplish-grey clay with yellow-brown streaks.
296	318	Grey-brown clay.
318	327	Light grey & pinkish-grey clay.
327	350	Yellowish-grey & pinkish-grey clay.
350	358	Very light grey to white silty clay with water.
358	371	White silty clay.
371	397	Very light grey clay, slightly silty.
397	404	Light grey & light yellow-grey, very fine sandy mottled clay.
404	470	Very light grey to white silty clay.
470	481	Brownish & light grey (?)laminated clays (=decomposed slate).
481	485	Grey finely laminated slate, partly decomposed.

End of Bore 485'.
Logged by K.R. Miles.

Borehole No. 581

Depth From(ft.)	To(ft.)	Description of Material
0	12	Red clay.
12	17	Red stoney clay.
17	19	Gravel.
19	25	Red stoney clay.
25	35	Brown sticky clay.
35	36	Sand.
36	39	Gravel.
39	72	Brownish sticky clay.
72	74	Gravel.
74	84	Pinkish sticky clay.
84	147	Yellow sticky clay.
147	167	Brown sticky clay.
167	187	Bluish sticky clay.
187	215	Pinkish sticky clay.
215	218	Black sticky clay.
218	296	Brownish sticky clay.
296	300	White sand.
300	306	White sandy pipe clay.
306	318	Brown sticky clay.
318	350	Whitish sandy clay.
350	357	Brown sticky clay.
357	365	White sand.
365	395	Greyish sticky clay.
395	405	White sand.

End of Bore 405'.
Logger unknown.

Borehole No. 590

Depth From(ft.)	To(ft.)	Description of Material
0	25	Clay, loam & gravel.
25	40	Gravel.
40	170	Red clay with some gravel.
170	210	Grey-yellow gravelly clay.
210	230	Mottled clay.
230	250	Grey-yellow silty clay with ironstone gravel.
250	290	Red-grey marbled clay.
290	350	Fawn coloured clay.
350	410	Fawn coloured clay with white limestone chips.
410	430	Blue-grey clay.
430	490	Grey-red marbled clay.
490	510	Dark grey clay.
510	530	Red-grey marbled clay.
530	550	Brown-grey clay.
550	570	Dark brown clay.
570	590	Buff coloured clay.
590	615	Buff grey to white clay.
615	638	Grey silty clay.

End of Bore 638'.
Logger unknown.

Borehole No. 636

Depth From(ft.)	To(ft.)	Description of Material
0	37	Loam.
37	77	Gravel & clay.
77	78	Sand & limestone.
78	88	Yellow clay.
88	89	Sand.
89	157	Clay.
157	162	Sandy clay.
162	330	Various coloured clays.
330	350	Pipe clay.
350	377	Sand & clay.
377	380	Clay.
380	422	Soft white sandstone.
422	433	Fine white sand.
433	442	White clay.
442	450	White sand.
450	502	Clay - white & pink.
502	504	Quartz sand.
504	512	White clay.
512	530	Quartz sand.
530	547	Sand & pebbles.
547	568	Sand, lignite & clay.
568	583	Quartz, sand & clay.
583	591	Sandy clay.

End of Bore 591'.
Logger unknown.

Borehole No. 639

Depth From(ft.)	To(ft.)	Description of Material
0	63	Red clays & gravels.
63	72	Sand & gravel.
72	104	Yellow clay & limestone gravel.
104	205	Yellow & grey dense clay.
205	212	Mottled red yellow, blue and grey clay.
212	230	Blue & grey clay.
230	274	Mottled yellow-grey & red clay.
274	322	Dark grey & purple clay.
322	343	White, red, grey & yellow clay.
343	349	White clayey silt.
349	366	Light grey clay.
366	374	Fine white sand.
374	379	Pink clay-silt.
379	383	Fine white silty sand.
383	394	Grey silty clay.
394	397	White clay & silt.
397	412	Grey clay-silt.
412	423	White clay & silt.
423	433	Mottled streaky grey & red clay.
433	444	Purple-red streaky clay.
444	452	Medium-fine white sand.

End of Bore 452'.
Logger unknown.

Borehole No. 673

Depth From (ft.)	To (ft.)	Description of Material
0	48	Limestone rubble & clay.
48	56	Gravel.
56	74	Yellow & grey mudstone.
74	83	Sand & gravel.
83	89	Conglomerate.
89	129	Yellow & grey-white silty clay.
129	135	Yellow-red & grey clay.
135	147	Yellow silty clay.
147	164	Very fine sand & silty clay.
164	175	Dense red & grey clay.
175	191	Dense multi-coloured clay.
191	232	Dense yellow & grey clay.
232	252	Dense multi-coloured clay.
252	274	Dense grey clay.
274	278	Grey-white & yellow clay.
278	312	Dark grey clay.
312	316	Silty grey clay.
316	335	Light grey clay.
335	338	White silty clay.
338	341	White sand.
341	347	Light grey silty clay.
347	354	Silt.
354	375	White clay.
375	382	White silty clay.
382	401	Dense white clay.
401	408	White stained clay.
408	416	Fine white sand.

End of Bore 416'.
Logged by K.R. Miles.

Borehole No. 697

Depth From(ft.)	To(ft.)	Description of Material
427	428	Sand-very fine-grained. Clayey & silty. White.
428	440	Sand-fine-grained to very fine-grained. Clayey.
440	450	Sand-very fine-grained. Clayey. Pale brown.
450	460	Clay-slightly silty & finely sandy. Pale brown.
460	475	Sand-fine-grained to very fine-grained. Pale brown.
475	486	Sand-fine-grained. Clayey. Pale brown.
486	490	Sand-very fine-grained. Clayey. Pale brown.
490	500	Sand-fine-grained. Slightly clayey. Pale brown.
500	502	Sand-very fine-grained, silty. Pale grey.
502	503	Quartz gravel-angular qtz., pebble, grit & gravel size fragments.
503	505	Sand-fine to medium-grained with iron staining. Some coarse to grit size fragments. Pale grey & red mottling.
505	521	Sand-very fine-grained & silty. Brownish-grey.
521	523	Sand-fine to medium-grained. Pale grey.
523	529	Silt-clayey, pale brown.
529	531	Clay-pale brown.
531	536	Clay-with patches of lignite & lignitic clay, brown to dark-brown.
536	583	Silt-clayey & with some fine-grained sand. Uniform pale brown.
583	585	Clay-off-white.
585	617	Silt-clayey with some fine to red sand, uniform throughout, pale brown.

End of Bore 617'.
Logged by E. Hillwood - 15/10/65 to 22/2/67.

Borehole-Walloway No. 1

Depth From(m)	To(m)	Description of Material
0	14	Sand and gravels.
14	17	Sand, gravel and clays.
17	22	Reddish-brown clays.
22	28	Hard bars sand & clay.
28	36	Reddish-brown clay.
36	54	Hard Bars - clay & sands.
54	85	Reddish-brown clay.
85	114	Blue-grey clay & hard bars.
114	120	Light yellow clay (sticky).
120	140	Reddish-brown clay (sticky).
140	182	Reddish-brown clay (sticky).
182	184	Blue-grey clays (sticky).
184	206	Limestone clay sand.
206	233	Limey clay.
233	250	Lignite white clay and (coal),
250	254	Lignite white clay and (coal).
254	282	White clays.
282	283	Hard rock.
283	286	Bedrock.

HQ CORE FROM 283-286 m
3.10 METRES CORE RECOVERY

End of Bore 286m.
Logged by R.J. Febey (9/12/81).

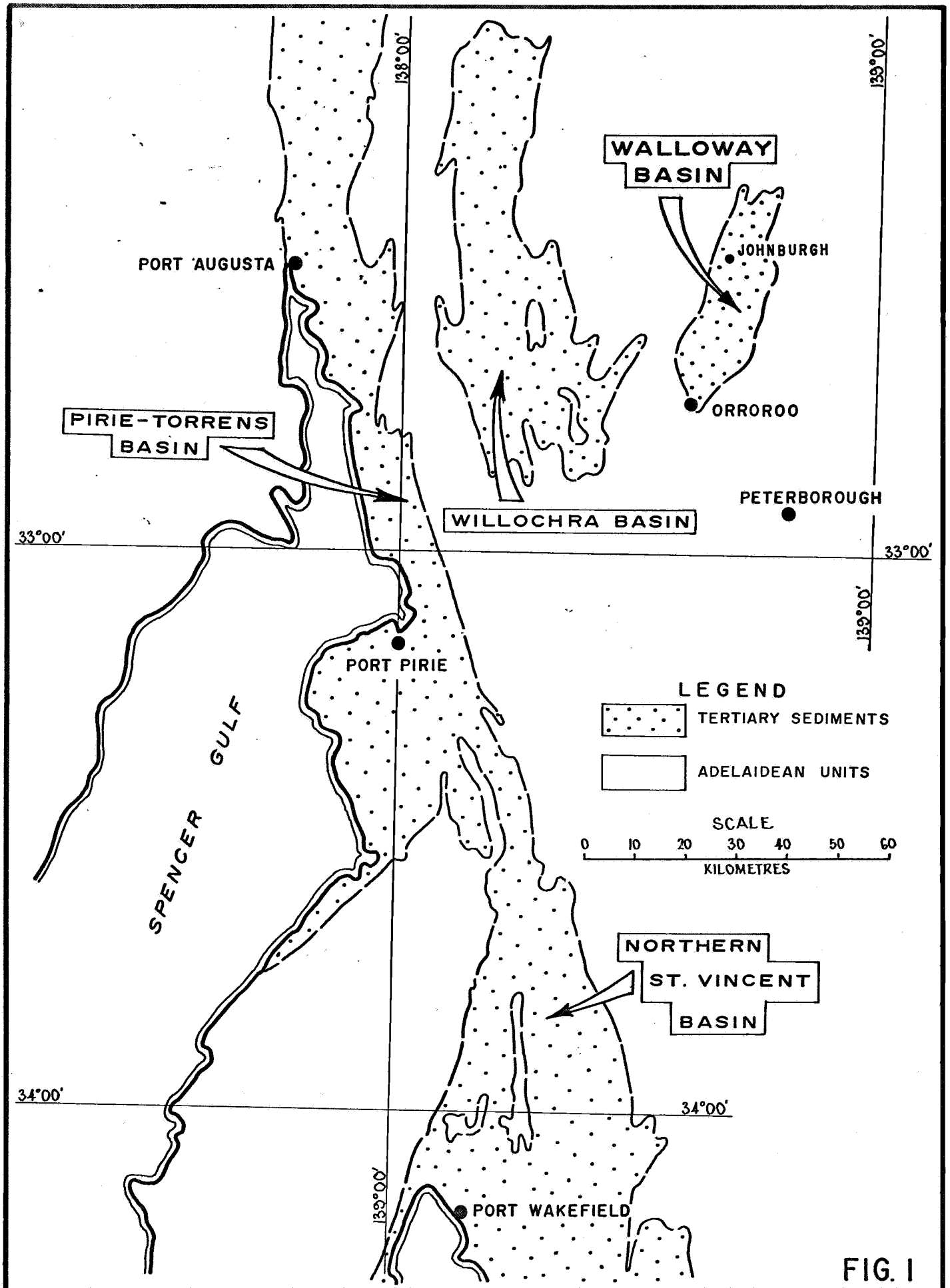


FIG. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED G. Kwitko | CDD | DATE

DRAWN R.H. | SCALE As shown

DATE Mar. 1982 | PLAN NUMBER S16101

CHECKED

WALLOWAY BASIN TERTIARY COAL INVESTIGATION

LOCALITY PLAN

2805

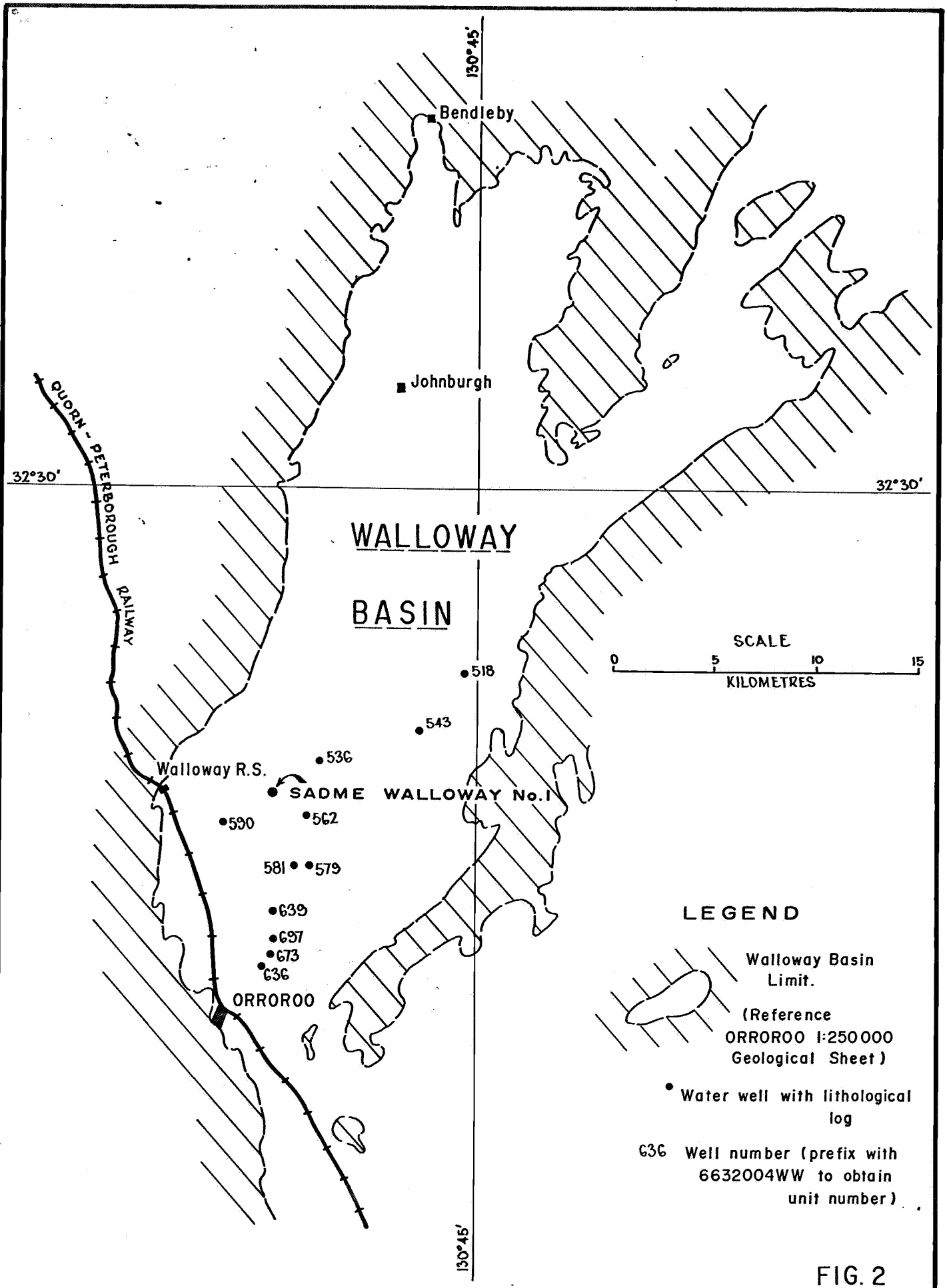


FIG. 2

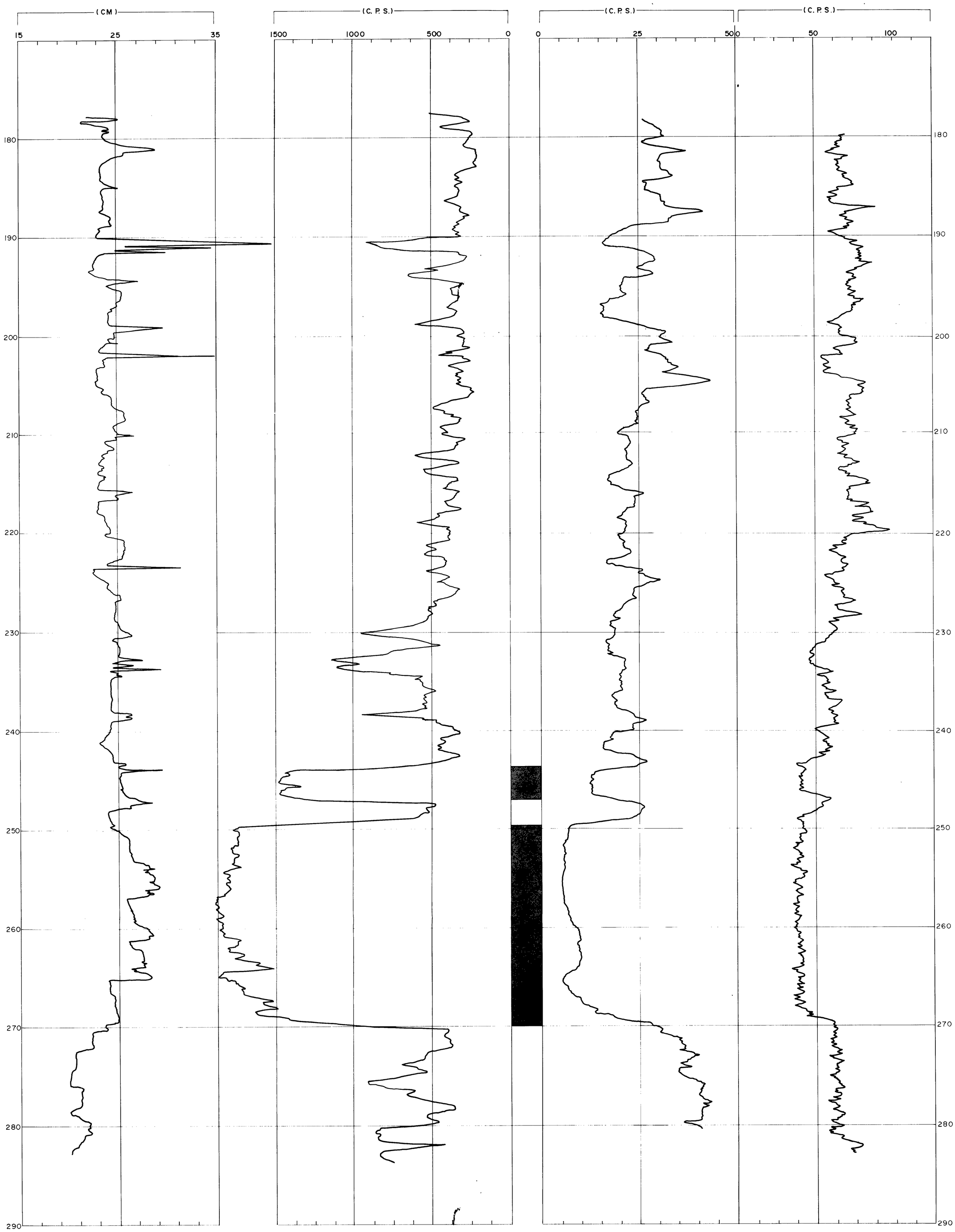
DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED G. Kwitko	CDO DATE
DRAWN R.H.	SCALE 1:250,000
DATE Mar. 1982	PLAN NUMBER S16102
CHECKED	

WALLOWAY BASIN TERTIARY COAL INVESTIGATION

WALLOWAY No.1 AND WATER WELL LOCATIONS

2805



Geophysical Logging Details

LOGGING COMPANY – S.A.D.M.E.

UNIT – FORD

OPERATOR – B. TRAEGER

DATE LOGGED – 27 – 11 – 81

DENSITY PROBE – COMPROBE

S.A.D.M.E Log Ref. nos 2692, 2693

COAL SEAM INTERPRETED FROM DENSITY

FIG. 3

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

WALLOWAY BASIN TERTIARY COAL INVESTIGATION

WALLOWAY No.1

WIRELINE GEOPHYSICAL LOGS
AND COAL SEAM INTERPRETATION

COMPILED	G. Kwitko
DRAWN	R.H.
DATE	March 1982
CHECKED	
CDO DATE	
SCALE	–
PLAN NUMBER	82-143

2025

South West

North East

ELEVATION IN METRES (approx.)

400
350
300
250
200
150
100

6632-590
S.A.D.M.E. WALLOWAY NO.1
6632-536
6632-543
6632-518

RECENT & QUATERNARY

TERTIARY "Upper Unit"

TERTIARY "Lower Unit"

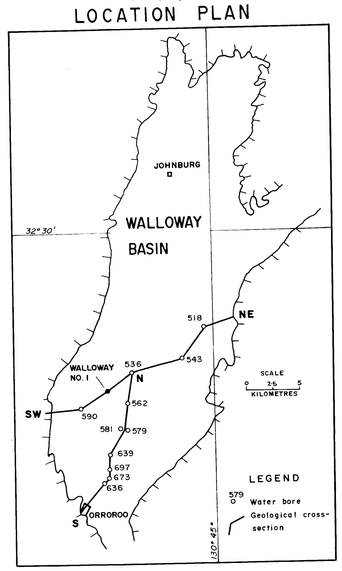
F

?

T.D. 194m
T.D. 287m
T.D. 163m
T.D. 64m
T.D. 80m

WALLOWAY COAL SEAM

LOCATION PLAN



South

North

ELEVATION IN METRES (approx.)

400
350
300
250
200
150

6632-636
6632-673
6632-697
6632-639
6632-581
6632-579
6632-562
6632-536

RECENT & QUATERNARY

TERTIARY "Upper Unit"

TERTIARY "Lower Unit"

F

?

T.D. 180m
T.D. 127m
T.D. 188m
T.D. 138m
T.D. 123m
T.D. 148m
T.D. 176m
T.D. 163m

Lignitic clay intersections

Peaty clay intersections

SCALE
0 0·5 1 2 3
KILOMETRES

LEGEND

- Gravel wash, conglomerate, etc.
- Sand, fine to medium grained
- Silty or sandy clay
- Clay
- Limestone, calcrete etc.
- Coal, lignitic or peaty clay
- Slate, shale (Adelaidean)
- 6632-536 — Water bore, S.A.D.M.E. Index No. (1:50,000 Sheet No. 6632-IV)
- ------ Interpreted Geological Boundary
- —F— Inferred Fault

FIG. 4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

WALLOWAY BASIN TERTIARY COAL INVESTIGATION

GEOLOGICAL CROSS-SECTIONS

COMPILED	G. Kwitko
DRAWN	P.D. *
DATE	March 1982
CHECKED	
C.D.D. DATE	
SCALE H	1:25,000
SCALE V	1:1000
PLAN NUMBER	82-144