RB 3845

DEPARTMENT OF MINES

SOUTH AUSTRALIA.

THE HYDROLOGY OF THE SERLE 1-MILE GEOLOGICAL SHEET.

I. ABSTRACT.

ASSOCIATED PLAN 54-114

The low rainfall and somewhat mountainous area of the Serle 1 - Mile Geological Sheet is one of predominantly Pre-Cambrian and Early Palaeozoic outcrop with only shallow depths of Quaternary alluvium and a few patches of Tertiary conglomerate.

A number of small supplies of underground water is required for watering sheep and for some supplementary domestic purposes. This demand has been met by shallow wells and bores of varying salinities supplying water from jointed older rocks and arenaceous alluvium. Additional supplies should be available if sites are chosen with care so as to tap well jointed older rock or suitable depths of Quaternary alluvium at points of ready recharge. Faults or severely crushed and mineralized areas are doubtful prospects but adjacent zones of well developed cleavage near lines of drainage may provide likely well or bore sites.

II. INTRODUCTION

The area comprising the Serle Military Sheet was mapped by M. Reyner, R. Pitman and K. Johns, from August to November, 1952, and a geological one mile sheet published, 1953. "The Geology of the Serle - 1 Mile Sheet" has been described by M. Reyner and R. Pitman, 1953, and the present text will deal only with hydrological matters, being included to be read in conjunction with the above.

In the course of the field work, water points were sampled and points of hydrological interest investigated by R. I. Chugg, the results of the detailed analyses of the water samples being appended.

III. RAINFALL AND EVAPORATION.

Mild winter temperatures and hot summers predominate in this area of low rainfall. The nearest recording station,

Copley, five and a half miles from the south-western corner of the Serle area, has an average yearly rainfall of just over twelve inches, details being shown in the following Table No. 1. In this table, abstracted from the Book of Normals No.1 Rainfall, Commonwealth of Australia, Meteorological Branch, the average monthly and yearly rainfall and number of days with precipitation in excess of 0.01 inches is given.

TABLE NO. 1.

Month	Rainfall in Inches	Number of days 0.01 inches or more.
January	0.72	3
February	0.95	3
March	0.60	2
April	0.59	4
May	1.02	6
June	1.30	8
July	1.42	9
August	1.43	9
September	1.21	6
October	0.97	5
November	0.92	3
December	0.89	3
Year	12.02	61

The rainfall is seen to be greatest in the winter months with summer rains of short duration, often occurring as thunder showers.

Maximum daily rainfall recorded for each month for a period of 68 years is given for Copley in the table below.

TABLE NO. 2.

Month	Highest daily recorded rainfall
January	1.96 inches
February	2.33 inches
March	4.51 inches

Month	Highest daily recorded rainfall
April	1.87 inches
May	2.89 inches
June	1.66 inches
July	1.09 inches
August	1.20 inches
September	1.55 inches
October	1.30 inches
November	2.55 inches
December	3.00 inches

The table suggests that rainfall intensity is relatively low in winter and early spring.

The Serle area by its distance to the north-east from Copley and by its higher and more mountainous terrain can be expected to vary from the Copley figures. Some local orographic precipitation is likely on the western sides of the hills. Rainfall figures are available for Mt. Serle Homestead for the years from 1947 to 1950 as shown in Table No.3. This station is just south of the central portion of the southern boundary of the Serle area.

TABLE NO. 3.

RAINFALL - MOUNT SERLE HOMESTEAD.

		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1947	Inches of rain	0	1.35	0.42	0.17	0	0.64	1.16	1.50	1.39	1.80	0.81	0.14	9.38
	Days of rain	0	5	1	1	0	3	5	5	3	6	3	3	3.5
1948	Inches of rain	0.94	0.68	0	0.30	0.02	0.20	0.63	0.73	0	0.48	0.19	0.28	6.45
	Days of rain	2	4	0	2	2	3	3	4	0	2	5	4	31
1949	Inches of rain	0.30	2.05	0.63	0.13	0.12	0.10	0.83	0.12	1.57	1.64	0.94	0.11	9.54
	Days of rain	3	7	5	2	5	1	8	1	4	6	3	1	46
1950 +	Inches of rain	0.01	5.39	6.38	0	2.05	1.20	0.38	0.09	0	0.75	1.80	1.45	19.50
	Days of Rain	1	7	2	0	9	8	3	3	0	4	6	3	46

Days of rain are days of 0.01 inches or more of rain.

\+ From records of Meteorological Branch, Commonwealth of Australia.

The limited records do suggest an unreliable rainfall restricted to a small number of days a year.

Nepabunna, seven and a half miles east of Mt. Serle Homestead, has yearly averages varying from 3.77 to 22.19 inches in a period from 1941 to 1950. An average of eight yearly totals in this period is eight inches a year, but this short period of records can be indicative only of a generally low and unpredictable rainfall.

Low relative humidity, high summer temperature and mild winters are conditions which favour a large annual evaporation, but the steepness and good natural drainage of most of the terrain encourages quick runoff into the natural drainage lines, and the formation of large evaporation surfaces by ponding is in this way kept to a minimum. Where the soil and subsoil are permeable, and intake conditions are favourable, a considerable percentage of the runoff water is probably disposed of by downward percolation rather than by evaporation.

IV. THE HYDROLOGICAL ENVIRONMENT.

A. TOPOGRAPHY AND DRAINAGE.

Elevations vary from about 500 feet above sea level in the relatively flat north-western portion of the area to the higher more mountainous terrain to the south and east with elevations up to 3000 feet above sea level.

A number of intermittent rivers and their tributaries provide good drainage but are dry most of the time, the larger rivers flowing only at times of relatively heavy rains. Westward draining Mundy and Burr Rivers turn north outside of the Serle area and join the north draining South Creek, Tower Gap Creek and Frome River, which, after their conjunction, eventually terminate in Lake Eyre.

B. SOIL AND VEGETABLE COVER.

A dominant feature of the land surface is the high proportion of solid rock outcrops of Proterozoic and Cambrian

Age. The steep hill slopes are almost barren of soil, and even in the valleys the basement rock pattern is often visible indicating only shallow alluvial deposition and a very limited depth of soil development. Much of the valley fill is of broken and only slightly weathered pieces from outcrops on the surrounding hills.

Mallees, small eucalypts, acacia and native pine occur as scattered thin woods, the Mallee growth being often observed in the field to be coincident with outcrops of the more intensely crushed areas. Larger gums were abundant only along the larger stream courses, while Spinifex, grazing grasses and salt bush occur generally.

V. AQUIFERS.

A. CAINOZOIC.

Recent to Tertiary sediments are generally thin and discontinuous. Along the larger stream courses where gravels and sands are present to a sufficient depth some underflow and storage can be expected and these alluvials would provide a permeable media for extraction from shallow wells and bores of what underground water that they might contain, but even along the more important drainages, the depth of such sediments is often so shallow as to provide only small storage for underground water.

A few small patches of what may be Tertiary conglomerate were observed. These rocks were well cemented and not particularly favourable for the extraction of water supplies.

B. PROTEROZOIC.

Members of the Torrensian, Sturtian and Marinoan Series of the Adelaide System were observed to be well consolidated and of low permeability. Except for possible local solution cavities in the dolomitic beds and somewhat greater permeability in the grits and sandstones, associated with the tillites, these rocks can be considered too impermeable for

ready percolation of underground water and extraction of more than small supplies from them is largely a matter of the extent of their jointing and broken nature which might provide cracks and fissures for water movement and storage.

C. CAMBRIAN.

Although the Pound Quartzite may in cases have sufficient interstitual space for some movement and storage of water, it is not sufficient for more than small supplies and unless the quartzite has additional openings along joints or fractures, it cannot be considered a good aquifer.

The Archaeocyathinae Limestone and calcareous dolomites do not appear by their poor permeability to be good aquifers except in that they may be subject to joint cracks and local solution cavities.

VI. FAULTS AND CRUSH ZONES.

Although faults sometimes have large interstitual rock space favourable for the movement of underground water, the faults observed in the region of the Serle Geological Sheet are for the most part well cemented and often mineralized with iron, silica and carbonates, constituting an unfavourable zone from which to pump water. Wide fault or crush zones with considerable recrystallization are a feature of the area, and such rocks because of the extent of their cementation and recrystallination are poor aquifers. Although these mineralised fault zones are unsatisfactory, the associated development of cleavage and fractures in rocks neighbouring the faults may, if not mineralised, provide openings for the storage of underground water.

VII. UNDERGROUND WATER SUPPLIES.

The main factor limiting the occurrence of underground water supplies in the area as a whole is the small quantity of surface water available for charging of the aquifers. Experience in the Adelaide hills where there is a greater rainfall has shown that quite large supplies are possible from similar rock types. But in the Serle area the low rainfall combined with

the ready run-off of surface water does not allow for downward percolation of large amounts of water to underground storage. Charging of the aquifers would be most effective along stream courses which traverse moderate thicknesses of arenaceous alluvium or the more permeable or better jointed older rock.

Requirements at individual water points have not been large and the waterpoints have generally not been tested for more than windmill supplies, so that the water producing potential of the area can only be estimated. The only large supply proved, over 3000 gallons per hour, is Mandarin Bore which has penetrated slates and dolomites of the Torrensian Series near an intermittent drainage. A solution cavity in the dolomite is suggested by reports of a cavity struck in drilling which contained small frogs. A well at Yankannina Station (Wooltana Military Sheet), in probable Torrensian Series slates, has been pumped in excess of 1000 gallons per hour. A supply of 1500 gallons per hour has been estimated from a well at Mount Serle Homestead (Angipena-1 Mile Sheet) in Cambrian slates.

VIII SALINITY

A. Range of Salinity

The waters analysed show a wide range of salinity values but only No.16 (792.78 gr/gall.) is of questionable stock use. Most of the underground waters are of sufficiently low salinity to be used on lucerne and three (Nos. 4, 17, 28) are suitable for the irrigation of all garden plants and fruit trees.

B. ASSOCIATIONS OF THE WATERS.

Since a variety of rock types are present in the area with little soil or alluvium cover, the lithological environment of many of the water points is to some extent determinable. Drainage conditions in terms of area and rock type drained can be qualitatively appreciated by study of the Serle 1-Mile Sheet.

Hence it was thought that a comparison between the chemical natures of the underground waters and their associated rock types might result in some correlations.

Except that it may be significant that Bore No. 16 with the highest total salt content is located in an extensively crushed and recrystallized area no significant associations were made. It is noted that underground water has been tapped most frequently in the Tapley Hill Slates, but analyses show a wide range of total salinity in these sediments.

IX. UTILIZATION.

The underground water is used primarily for stock and particularly sheep and, although rain tanks are available at the homesteads and living quarters, the subsurface water serves as supplementary domestic supplies.

Future demands for stock supplies may possibly be met by drilling at sites chosen with a view to penetrating well jointed or fractured rocks where they are exposed to optimum intake conditions, such as their intersection by stream and watercourses. Some of such sites may provide sufficiently low salinity water for domestic or limited garden purposes.

X. CONCLUSION.

The area has not been well tested for large supplies, but waters suitable for stock have been tapped in at least small supplies near drainages both in alluvium and basement rock, particularly Tapley Hill Slates. Additional supplies for stock and some domestic use in excess of present requirements probably can be developed provided care is taken in the selection of sites near points of recharge in the more permeable or better jointed rocks. Areas of severe crushing and remineralization would appear to provide only doubtful supplies of questionable salinity.

RIC/JEA
5/8/54.

R. K. Clegg

Table No.

DEPARTMENT OF MINES—ADELAIDE

Hd.

DETAILED ANALYSES OF UNDERGROUND WATERS IN PORTION OF CO. SERLE GEOLOGICAL SHEET (1 MILE)

5m—2.49 265

Serial No.	Section No.	Chlorine, Cl.	Sulphuric Acid radicle, SO_4	Carbonic Acid radicle, CO_3	Nitric Acid radicle, NO_3	Sodium, Na	Potassium, K	Calcium, Ca	Magnesium, Mg	Iron, Fe.	Silica, SiO_2	Total Saline Matter Grains/Gall.	Total Saline Matter Ounces/Gall.	Assumed Composition of Salts: Calcium carbonate	Calcium sulphate	Calcium chloride	Magnesium carbonate	Magnesium sulphate	Magnesium chloride	Sodium carbonate	Sodium sulphate	Sodium chloride	Sodium nitrate	Potassium chloride	Silica	Hardness (degrees English): Total	Temporary	Permanent	Due to calcium	Due to magnesium	Analysis No.
1		12.25	37.78	15.00	Nil	14.39		8.15	7.30			94.87	0.22	20.35			3.94	30.49			19.89	20.20	Nil			50.38	25.04	25.34	20.35	30.03	W2646/52
2		11.35	48.60	14.10	Trace	15.20		8.93	8.46			106.64	0.24	22.30			1.03	40.39			24.21	18.71	Trace			57.10	23.53	33.57	22.30	34.80	W2645/52
3		47.78	68.02	23.07	Trace	55.41		6.58	9.92			211.41	0.48	16.43			19.46	21.33			75.42	78.77	Trace			57.26	39.52	17.74	16.43	40.83	W3238/52
4		16.10	7.70	17.55	Trace	12.79		4.54	5.05			63.76	0.15	11.41			15.05	13.51			7.25	26.54	Trace			32.19	29.27	2.92	11.41	20.78	W3239/52
5		24.22	16.58	18.75	present	19.64		5.93	6.12			91.24	0.21	14.81			13.87	10.49			12.14	39.93	Present			39.99	31.27	8.72	14.81	25.18	W3345/52
6		34.30	57.75	23.80	Trace	24.80		1.00	24.32			170.95	0.39	2.50			38.36	65.64			7.91	56.54	Trace			102.60	48.03	54.57	2.50	100.10	W3260/52
7		115.15	143.43	15.60	Present	86.72		21.72	23.09			405.71	0.93	26.02	38.39			114.31			37.15	189.34	Present			149.28	26.02	123.26	54.24	95.04	W3261/52
8		46.55	32.38	21.00	Present	36.28		7.43	8.98			152.62	0.35	18.56			13.87	24.65			18.80	76.74	Present			55.51	35.02	20.49	18.56	36.95	W3262/52
9		42.00	23.82	14.40	Present	30.74		3.50	7.89			122.35	0.28	8.74			12.87	20.69			10.81	69.24	Present			41.22	24.02	17.20	8.74	32.48	W3263/52
10		43.55	24.48	17.40	Present	31.54		5.79	8.00			130.76	0.30	14.46			12.27	22.07			10.16	71.30	Present			47.37	29.02	18.35	14.46	32.91	W3264/53
11		72.45	160.68	8.10	Present	56.74		45.59	11.14			354.70	0.81	13.51	136.48			55.15			30.12	119.44	Present			159.69	13.51	146.18	113.84	45.85	W3346/52
12		30.27	119.33	10.65	Present	34.32		30.30	8.37			233.24	0.53	17.76	78.78			41.43			45.37	49.90	Present			110.10	17.76	92.34	75.66	34.44	W3347/52
13		94.15	37.53	17.55	Present	46.29		19.80	12.41			227.75	0.52	29.27	27.45			22.76	30.58			117.67	Present			100.50	29.27	71.23	49.45	51.05	W3348/52
14		28.99	38.02	25.20	Trace	21.65		2.29	16.95			133.10	0.30	5.71			30.61	40.19			8.80	47.79	Trace			75.44	42.03	33.41	5.71	69.73	W3265/53
15		36.27	37.40	15.75	Present	29.89		8.15	7.54			135.00	0.31	20.34			5.00	30.20			19.67	59.79	Present			51.39	26.28	25.11	20.34	31.05	W3266/52
16		342.15	186.31	5.55	Nil	182.93		14.79	61.05			792.78	1.81	9.26	37.64			200.20	80.67			465.01	Nil			288.12	9.26	278.86	36.92	251.20	W3267/52
17		6.30	4.81	8.70	Present	5.48		3.64	1.79			30.72	0.07	9.10			4.55	2.38			4.30	10.39	Present			16.48	14.50	1.98	9.10	7.38	W3268/52
18		74.55	75.05	21.60	trace	46.40		2.29	27.40			247.29	0.57	5.71		25.55	94.05	4.03				117.95	Trace			118.46	36.03	82.43	5.71	112.75	W3269/52
19		51.27	32.67	18.00	Nil	36.31		10.86	7.36			156.47	0.36	27.12			2.45	32.92			9.46	84.52	Nil			57.39	30.02	27.37	27.12	30.27	W3349/52
20		127.05	31.93	73.50	Present	149.46		1.72	1.38			385.04	0.88	4.29			4.78			119.29	47.22	209.46	Present			9.95	9.95	Nil	4.29	5.66	W3350/52
21		23.59	11.56	5.25	Present	17.37		3.36	1.92			63.05	0.14	8.39			0.31	9.06			6.40	38.89	Present			16.29	8.76	7.53	8.39	7.90	W3351/52
22		40.32	28.43	9.45	Present	27.26		5.14	7.32			117.92	0.27	12.84			2.46	32.72			3.43	66.47	Present			42.96	15.76	27.20	12.84	30.12	W3352/52
23		115.00	37.65	10.95	Nil	69.65		14.22	7.95			255.42	0.58	18.26	23.47			26.43	10.22			177.04	Nil			68.22	18.25	49.97	35.51	32.71	W3353/52
24		64.97	39.51	17.70	2.67	54.55		5.43	7.84			192.67	0.44	13.56			13.45	19.60			35.30	107.10	3.66			45.82	29.53	16.29	13.56	32.26	W3591/52
25		81.09	58.22	15.00	Present	64.91		7.50	9.72			236.44	0.54	18.73			5.30	40.62			38.11	133.68	Present			58.73	25.03	33.70	18.73	40.00	W3354/52
26		36.43	19.75	8.35	Present	24.74		3.86	5.11			98.24	0.22	9.64			3.61	20.19			5.36	59.44	Present			30.67	13.92	16.75	9.64	21.03	W3355/52
27		47.18	24.65	21.45	Present	27.86		13.72	8.06			142.92	0.33	34.26			1.28	30.89	5.68			70.81	Present			67.43	35.78	31.65	34.26	33.17	W3356/52
28		10.90	5.02	16.35	3.83	15.23		3.29	2.34			56.96	0.13	8.21			8.11			10.00	7.42	17.97	5.25			17.84	17.84	Nil	8.21	9.63	W3592/52
29		72.67	41.48	10.80	Nil	50.57		5.00	10.03			190.55	0.44	12.49			4.65	43.01			10.59	119.81	Nil			53.75	18.00	35.75	12.49	41.26	W3593/52
30		18.55	17.41	17.55	Present	17.17		6.22	5.03			81.93	0.19	15.53			11.58	8.37			15.87	30.58	Present			36.22	29.27	6.95	15.53	20.69	W3594/52
31		63.70	47.45	17.85	Nil	39.47		13.30	12.15			193.92	0.44	29.77	4.69			55.31	3.84			100.31	Nil			83.22	29.77	53.45	33.22	50.00	W3595/53
32		88.20	43.87	15.00	Trace	57.26		13.08	9.22			226.63	0.52	25.02	10.40			45.64			0.16	145.41	Trace			70.60	25.02	45.58	32.66	37.94	W3590/53
33		73.92	35.84	10.35	Nil	44.50		8.58	9.88			183.07	0.42	17.26	5.67			39.90	7.13			113.11	Nil			62.08	17.26	44.82	21.43	40.65	W3589/52

DEPARTMENT OF MINES, ADELAIDE

SUMMARY OF BORE RECORDS

Table No. 4 Hundred :

Underground Water Survey of County SERLE GEOLOGICAL SHEET (1 MILE) AND PROXIMITY

2m—3.59 1033

Serial No.	Military Section No. Sheet	Total Depth Ft.	Depth at which Water Cut, Ft. below Surface	Static Level, Ft. Below Surface	Tested Output, Gall. per Hour	Analysis No.	Total Salinity, Grains per Gall.	NOTES ON USAGE FOR: Stock	Lucerne	Garden and Domestic	SURFACE ELEVATION: Form	Height above Sea Level	Remarks and Strata	Occupier's Name
1	Serle	shallow		20		W2646/52	94.87	Yes		Washing & drinking	gully		Weedna Hut Well stream gravels Tapley Hill slates.	Kent
2	"	50		20		W2645/52	106.64	Yes					Well in stream alluvium and Tapley Hill slates with banks of dolomite.	Kent
3	"	200		72		W3238/52	211.41	Yes			gully		Mount Rose Mine shaft. Crushed zone with copper mineralization.	A.K. Lillecrapp
4	"	115		50	150a.p.	W3259/52	63.76	Yes		Washing & drinking	gully		Bore at Winyaguwna Hut Localised drainage Tapley Hill slates.	A.K. Lillecrapp
5	"					W3345/52	91.24	Yes			gully		Saint Patricks Bore slates and dolomites.	A.K. Lillecrapp
6	"	135		60	100+	W3260/52	170.95	Yes			gully		Dolomites and some slates.	A.K. Lillecrapp
7	"	57		20	poor	W3261/52	405.71	Yes			gully		Old Well in slates.	A.K. Lillecrapp
8	"	12		8	200+	W3262/52	152.62	Yes			gully		Apex Well Tillite somewhat crushed.	A.K. Lillecrapp
9	"	11		10		W3263/52	122.35	Yes		Washing	level		Owleandinna woolshed Well (S.W. from Hut) Purple slates.	A.K. Lillecrapp
10	"	12		7	150	W3264/52	130.76	Yes		Washing & drinking	level		Owleandinna Woolshed Well (N.E. from Hut) Slates.	A.K. Lillecrapp
11	Wootana	11		7	200a.p.	W3346/52	354.70	Yes			gully		Taylor Well grey silicious slates.	A.K. Lillecrapp
12	"	12		5	150a.p.	W3347/52	233.24	Yes			gully		Mulga Well slates.	A.K. Lillecrapp
13	"	40		22	100+	W3348/52	227.73	Yes		Garden	level		Kankannina H.S. Well.	A.K. Lillecrapp
14	Serle	115		35	3000+	W3265/53	133.10	Yes			gully		Mandarin Bore Slate and dolomite with cavities.	A.K. Lillecrapp
15	"	61		30	100	W3266/53	135.00	Yes		Washing & drinking	gully		Dougless Hut. Tapley Hill slates.	A.K. Lillecrapp
16	"					W3267/52	792.78	Yes			gully		Bore in stream alluvium overlying extensively crushed zone including dolomites.	Kent
17	"					W3268/52	30.72	Yes					Ultimo Bore in slates near limestone.	
18	"					W3269/52	247.29	Yes			gully		Alluvium over brecciated dolomites and slates.	Kent
19	"	12		6		W3349/52	156.47	Yes		Not now in use	gully		Stream alluvium over brecciated fault zone.	P. Hoare

DEPARTMENT OF MINES, ADELAIDE

SUMMARY OF BORE RECORDS

Table No. A 4

Hundred :

Underground Water Survey of County ERUDINA GEOLOGICAL SHEET AND PROXIMITY

2M—8.53 1033

Serial No.	Section No.	Total Depth Ft.	Depth at which Water Cut, Ft. below Surface	Static Level, Ft. Below Surface	Tested Output, Gall. per Hour	Analysis No.	Total Salinity, Grains per Gall.	NOTES ON USAGE FOR			SURFACE ELEVATION		Remarks and Strata	Occupier's Name
								Stock	Lucerne	Garden and Domestic	Form	Height above Sea Level		
22	Serle	101		87		W3352/52	117.92						Tower Gap Well	
23	Myatle					W3353/52	255.42	Yes			gully		Mundy Waters Bore Pound Quartzite	Leigh Creek Station
24	Serle					W3591/52	192.67	Yes			level		Alluvium underlain by slates and dolomites	Leigh Creek Station
25	"	30		25		W3354/52	236.44	Yes			gully		Appealinna Well Tapley Hill slates	L.J. Kent
26	"	60+		60		W3355/52	98.24	Yes			Valley		Euromulka Well Tapley Hill slates	L.J. Kent
27	Angepena	75	27	67	1500	W3356/52	142.92	Yes		Garden	Valley		Mt.Serle H.S. Bore slates	L.J. Kent
28	"	80		60		W3592/52	56.96	Yes			Valley		Wundowie Bore alluvium	P.Hoare
29	"					W3593/52	190.55				Gully		Depot Springs Water Hole slates and tillite	P. Hoare
30	"	30+		25		W3594/52	81.93	Yes			Gully		Oodnapanakan Well Tapley Hill Slates	P. Hoare
31	"	70		58		W3595/52	193.92	Yes			level		Burr Well Alluvium & slates	P. Hoare
32	"				100+	W3590/52	226.63	Yes					Mundy Creek Bore alluvium	P. Hoare
33	"	10		4		W3598/52	183.07						Boolooroo Water-Hole River conglomerate over slates	P. Hoare

To accompany report by R J Chugg

Map based on Serle 1 Mile Geological Sheet.

S.A. DEPARTMENT OF MINES

SERLE 1 MILE SHEET

HYDROLOGICAL PLAN

Req. No.	
D.M.	
Compiled from	
Approved	Passed
Director of Mines	
Scale	1 mile to 1 in
Dwn.	
Tcd.	
Ckd.	
Exd.	
No.	54-114
Date	20·5·54
Associated Drawing	