DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

GEOCHEMICAL MAP COMPILATION - SERLE AREA

By

R.S. ROBERTSON

Rept.Bk.No.78/151
G.S. No.6112
D.M. No.105/78

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GEOCHEMICAL MAP COMPILATION - SERLE AREA

ABSTRACT

Maps have been produced of the Serle 1: 63 000 sheet area showing the areas covered by seven company and departmental stream sediment surveys for Cu, Pb and Zn and the anomalies found. As a check on the previous surveys, nine areas of the Serle sheet were resampled and 297 stream sediment samples analysed for Cu, Pb, Zn, Co, Ni and Au (some samples were also analysed for Mn). The data from the check survey and areas of overlap of previous surveys showed that there were considerable differences in the detection of anomalies and in the background values obtained. The ratio of background values for different surveys also changes with locality. Coverage of the area for Pb and Zn is incomplete.

This study points to the need for caution in using the results of past stream sediment surveys. It is suggested that certain basic information should be required in reports supplied to the Department about geochemical surveys carried out in Exploration Licence areas. It is also suggested that there is a need for the routine use of standard samples and check samples in geochemical surveys to determine the reliability of the sampling and analytical techniques used.

The most prominent geochemical feature of the Serle area is the concentration of Cu anomalies in and on the margins of diapirs, particularly the Burr Diapir. The anomalies around the margins of the diapirs are often located in the Merinjina tillite or the base of the Tapley Hill Formation. Pb and Zn anomalies are located west of Mt. Ogilvie (associated with limestone of the Balcanoona Formation), in the area between White Well and Voca Vocana Hill (Tapley Hill Formation and Balcanoona Formation) and near Oodnapanicken Hut and Appealinna Well (Wonoka Formation and Brachina Formation).

INTRODUCTION

A large amount of geochemical exploration, particularly stream sediment sampling, has been carried out in the Flinders Ranges. The data from this work, contained in the Mines and Energy Department's file of company exploration and in various departmental reports, represent a large monetary investment and a potential source of useful information. However it is difficult to gain any comprehensive view of the data in their present form.

As a pilot study, an attempt has been made in the Serle area to use the data from five past surveys to produce regional geochemical maps in the form of contoured rolling geometric means. The Serle 1: 63 360 sheet area (comprising the Burr Well and Serle 1: 50 000 sheet areas) was chosen for this study as it has a fairly complete coverage of stream sediment surveys. Of the areas not covered by the five previous stream sediment surveys, including areas of transported soil and part of the Gammon Ranges National Park, only an area around Mt. Ogilvie was considered worth sampling and this was done as a preliminary part of this project (Robertson 1977).

To try to overcome the problem of variability between surveys, small areas within each survey area were resampled as a check on the reliability of these surveys and to provide a quantitative basis for comparison of the surveys. This field work was carried out by the author and field assistant S. Kent.

GEOCHEMICAL COMPILATION

RESAMPLING

In this survey (survey S7 in Table 1) 297 stream sediment samples were taken in 9 different areas across the Serle area (Fig. 3). The areas were chosen to include both anomalous and background values from each of the previous surveys. Sample sites were located as close as possible to those of the original surveys.

The analytical work was carried out by AMDEL. Samples were sieved and the -180 micron fraction analysed by atomic absorption spectroscopy for Cu, Pb, Zn, Co, Ni, Au and some samples also for Mn. The analytical methods used are described in Table 1 and the Appendix.

Locations of samples and sample numbers for survey S7 are shown on Fig. 3. Cu, Pb and Zn results are shown on Figs. 4,5 and 6. Sample numbers and all results are listed in the Appendix. No Au values above the detection limit (0.05 p.p.m.) were obtained. Statistical data and a discussion of the results are contained in the following section.

TABLE 1

Summary of Stream Sediment Surveys

Survey No.	Company & Consultant (if any)	Reference	E.L.or M.L.	Number of Samples	Area	Size Fraction Analysed	Analytical Technique	Elements Analysed
S1	Dept. of Mines	RB 64/17	-	1064	260 km^3	-80 mesh	A.A.S. at AMDEL	Cu only
S2	For Andromeda Pty.Ltd. by McPhar Geophysics Pty. Ltd.	Env.1526	S.M.L.249	756	270 km^2	-80 mesh a few samples on -40 mesh.	A.A.S. following a hot 25% HNO_3 leach for 1 hour on 0.25g sample.	Cu,Pb & Zn
S4	For Andromeda Pty.Ltd. by General Mineral Inv. Pty. Ltd.	Env.1526	S.M.L.429	280	130 km^3	-20 + 40 80 pound channel samples taken & split later.	A.A.S. AMDEL & A.A.S. Geochem. & Mineralogical lab. Pty.Ltd.	Cu,Pb,Zn
S3	For Southern Cross Expl. & Boolooroo Mining Co. by McPhar Geophysics Pty.Ltd.	Env. 1272 Env.1339	S.M.L.366 S.M.L.385	1653 (only819 for Pb)	400 km^2	-80 mesh, some -40	As for S2.	Cu,Zn,Pb (only 819 for Pb)
S5	For Mt. Rose Mines Ltd. by McPhar Geophysics Pty. Ltd.	Env.852	S.M.L.132	2232	360 km^2	-80 mesh?	A.A.S. following a hot HNO_3 leach	Cu,Pb & Zn
S6	Dept. of Mines (1977)	RB 78/23	-	144	20 km^2	-80 mesh (-180 microns)	AMDEL A.A.S. analysis schemes C_1 & C_3 0.5 gm sample wt. C_1: hot perchloric C_3: aqua-regia	Cu,Pb,Zn,Co, Ni (some for Mn) Au
S7	Dept. of Mines (1977)	This Report		344	9 areas 40 km^2 total	" "	" "	" "

TABLE 2

Comparison of Previous Surveys & Resampled Areas

Area	Survey		No. of Samples	Mean Values (p.p.m.) Cu	Pb	Zn
1	S7 (Dept. of Mines 1977)		56	54.6	14.5	29.8
	S1 (" " 1967)		56	56.0	-	-
	Anomalous Values	S7		120.0 (16 values)	95 (1 value)	75 (2 values)
		S1		123.0 (17 values)	-	-
2	S7 (Dept. of Mines 1977)		42	26.6	16.2	47.6
	S2 (Andromeda)		42	16.4	21.3	30.6
	S4 (Andromeda)		42	44.6	22.7	61.7
	Anomalous & Sub-Anomalous Values	S7		52.5 (4 values)	43.2 (5 values)	102.5 (10 values
		S2		-	37.5 (4 values)	-
		S4		84.6 (11 values)	60.9 (10 values)	157.7 (11 values
3	S7		46	35.1	16.5	56.6
	S3 (Boolooroo Mining Co.)		46	32.6	-	43.5
4	S7		13	92.1	15.2	36.1
	S3		13	61.9	13.3	23.4
5	S7		34	26.1	19.6	60.6
	S3		34	21.9	29.6	60.0
6	S7		25	29.9	30.4	70.6
	S3		25	16.4	34.1	64.2
Areas 3,4,5 & 6 Combined		S7	118	37.5	20.1	58.5
		S3	118	29.3	(76) 28.0	50.5
Anomalous Values Areas 3,4,5, & 6		S7		163.9 (9 values)	66.1 (8 values)	92.5 (4 values)
		S3		109.2 (13 values)	61.4 (8 values)	-
7	S7		32	23.7	12.7	39.0
	S5 (Mt. Rose Mines)		32	26.9	27.2	65.3
8	S7		32	32.2	9.0	19.1
	S5		32	26.6	57.2	28.4
9	S7		35	24.7	16.0	60.3
	S5		35	15.9	33.1	51.9

- means not analysed.

PREVIOUS SURVEYS

The stream sediment surveys carried out on the Serle area have been summarised in Table 1. Samples were collected by the Department (S1, S6 and S7), McPhar Geophysics Pty. Ltd. (S2, S3 and S5) and General Mineral Investigations Pty. Ltd. (S4). Analytical work was carried out by AMDEL, McPhar Geophysics Pty. Ltd. and Geochemical and Mineralogical Laboratories Pty. Ltd. Survey S4 was a resampling of part of an area already covered by S2 during the term of the same S.M.L.

Figures 6,7 and 8 show the area covered by each of the surveys for Cu, Pb and Zn. The anomalous values obtained in each survey are also shown. A value of about twice the background was used as the threshold for the anomalous values. Note that although coverage of the map area is almost complete for Cu, coverage for Pb and Zn is much less complete.

Maps of contoured rolling means for Cu, Pb and Zn are not included in this report as intended because the apparent inconsistent quality of the surveys made their production impractical. The problems are discussed below.

Comparison of Individual Samples

The sample sites of the resampling survey (S7) were chosen to correspond to those of the previous surveys. Examples of scattergrams of results for corresponding samples are shown in Fig. 2.

Some correlation between different surveys is evident in a few cases (e.g. S1/S7), but for most there is little or no correlation (e.g. S3/S7 - Cu, Pb and Zn). This lack of correlation may be due simply to slight differences in sample site. Where some correlation is evident anomalous and sub-anomalous values are present.

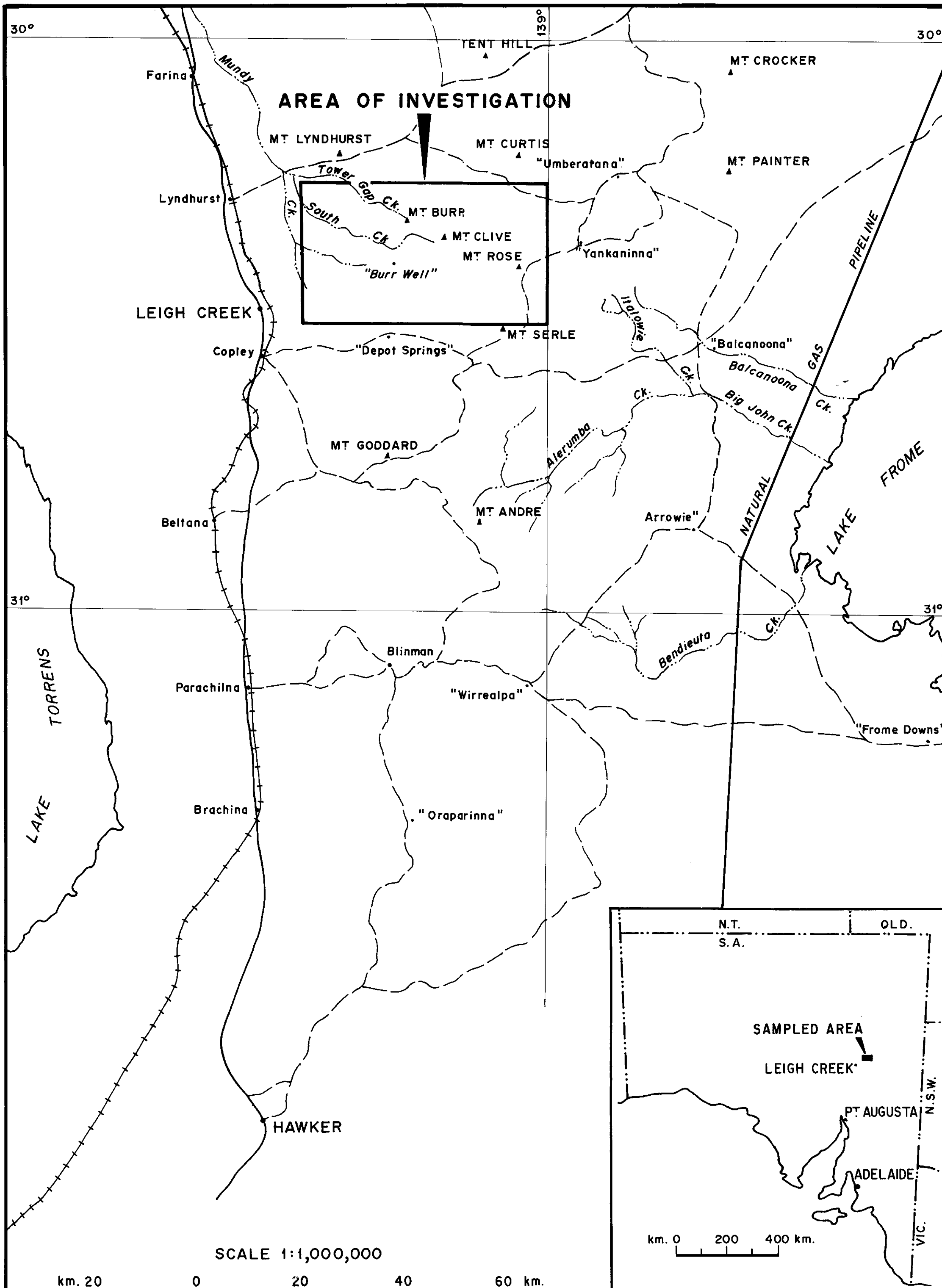
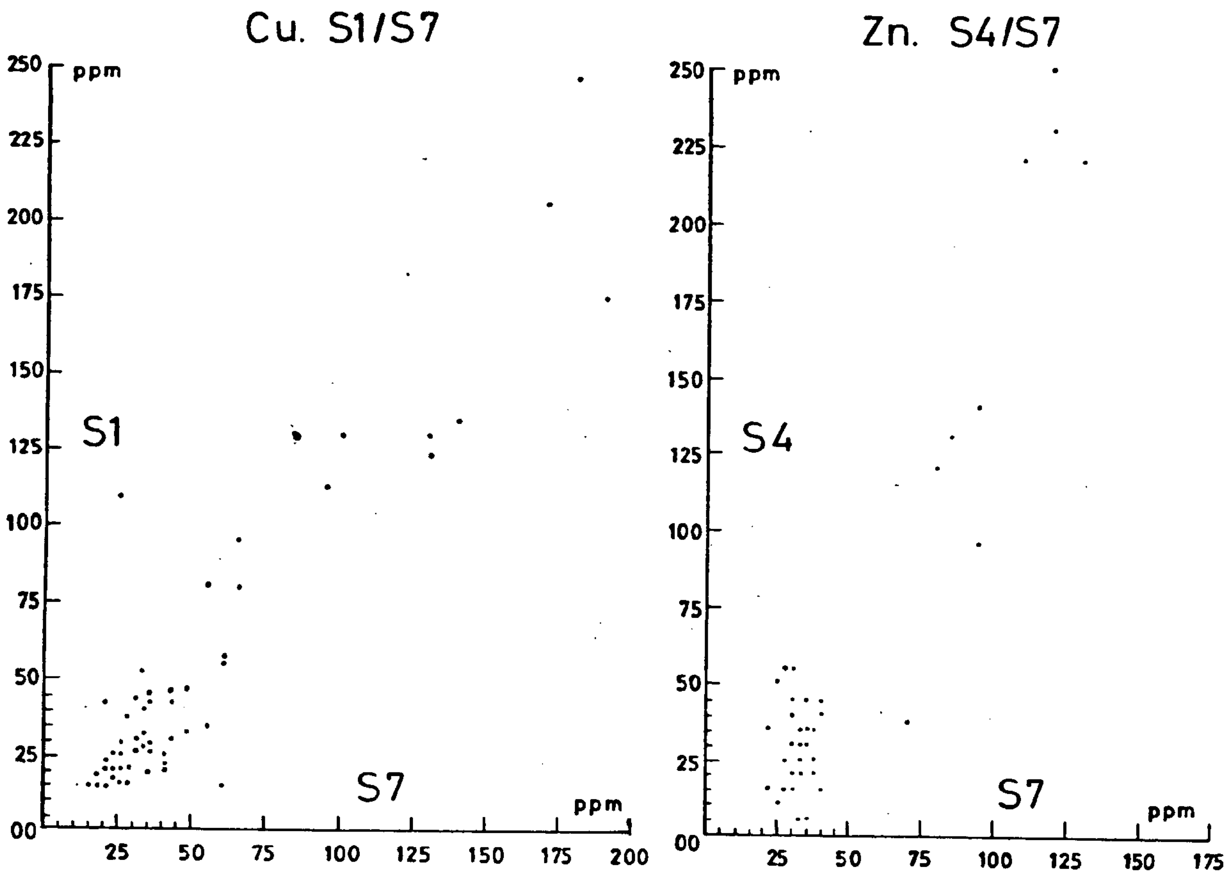


FIG 1.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:1000 000
COMPILED: R.S.R.	GEOCHEMICAL MAP COMPILATION	DATE: August 1978
DRN: G.J.T. CKD: A.F.	SERLE AREA	PLAN NUMBER
	LOCALITY MAP	S13642

FIG. 2(a)



SCATTERGRAMS OF EQUIVALENT SAMPLE VALUES FROM DIFFERENT SURVEYS

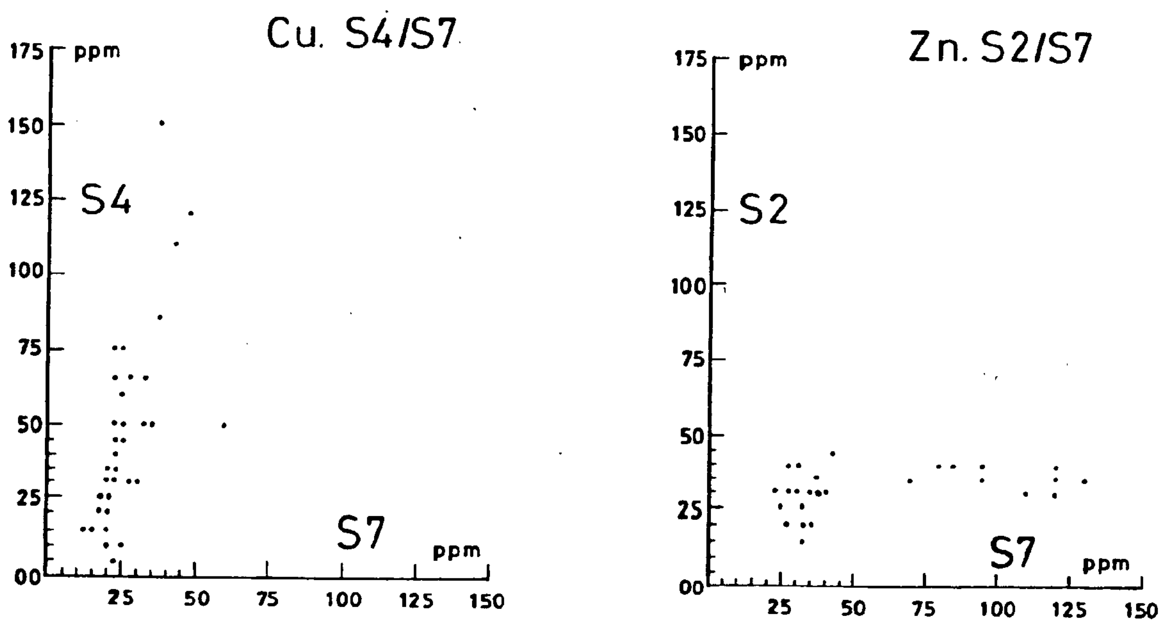
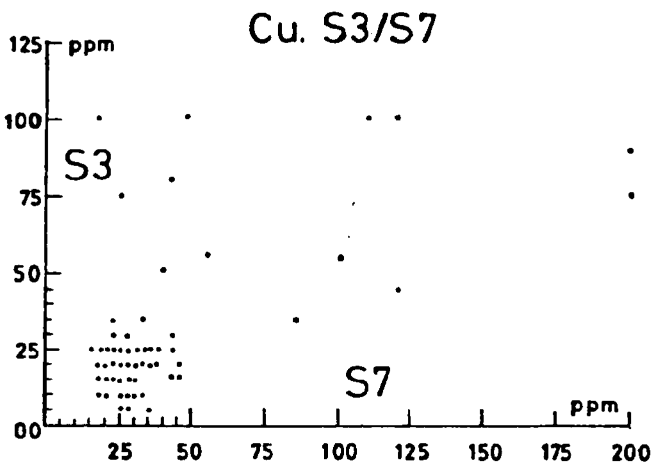
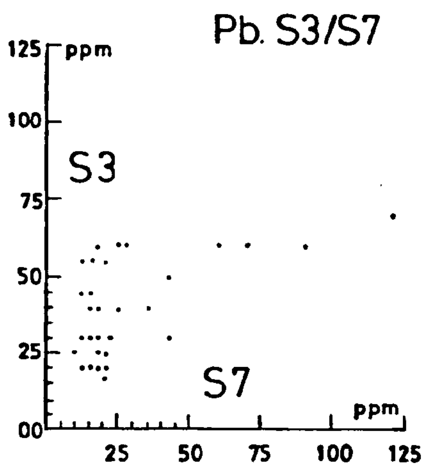
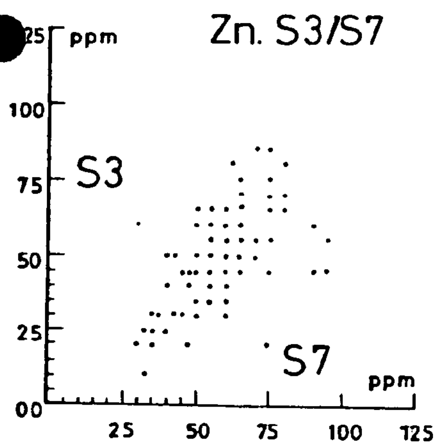


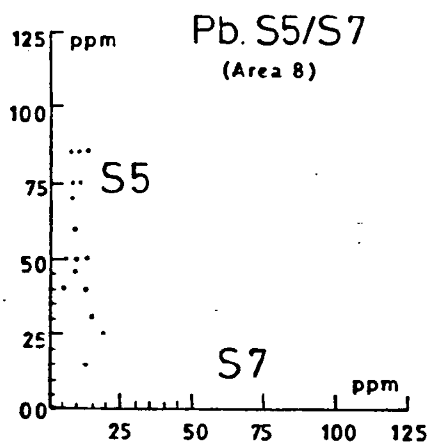
FIG. 2 (b)





SCATTERGRAMS OF EQUIVALENT SAMPLE VALUES FROM DIFFERENT SURVEYS





However a problem is evident in the plots of S2/S7 - Zn S3/S7 - Pb, and S5/S7 - Pb. Here higher values in one survey have no corresponding higher values in the other survey.

Comparison by Areas

This section compares the previous surveys with the resampled areas (S7) and other surveys where these overlap. The areas referred to are shown on Fig. 3.

Table 2 compares, for each area, the data from previous surveys with that for the same sample sites from survey S7. Anomalous values obtained in each survey are also compared for some areas.

In area 1 the means for Cu for surveys S1 and S7 are similar and the anomalous values correspond well both in location and magnitude. Pb and Zn were not analysed in S1.

For area 2 the differences between the surveys (S7, S2, S4) are quite marked. The sampling method in S4 was completely different to that used in the other surveys; 80-pound channel samples were taken across the stream bed, split in the laboratory, sieved and the - 20 + 40 # fraction analysed. S4 produced higher mean values for Cu, Pb and Zn and more Cu and Pb anomalies than S7; however the anomaly/background contrasts of the two surveys are similar and S7 detected the same anomalous areas as S4. By contrast survey S2 although using the same sampling method as S7 was ineffective in detecting the anomalous areas. Reasons for this are not known.

Areas 3,4,5 and 6 are all covered by the same survey (S3). Pb was not analysed in area 3 in survey S3. Table 2 shows that mean values for Cu and Zn are mostly higher in S7 than in S3 but Pb is higher in S3. However the ratios of mean metal values in the two surveys changes quite markedly in different areas. There is good correspondence in the anomalies obtained in S7 and S3. The presence of anomalous Pb values in areas 5 & 6 where there are only marginal or sub anomalous Zn values, emphasizes the value of analysing for at least Cu, Pb and Zn.

Areas 7,8 and 9 all lie in the area of survey S5. As can be seen in Table 2 the ratio of mean metal values between surveys S5 and S7 varies considerably between areas. In area 8, in particular the Pb value obtained in S5 (57.2 p.p.m.) is considerably higher than that for S7 (9.0 p.p.m.). The Pb value in S5 is considerably higher than the Zn value; this is the reverse of the situation for S7 and of that for other areas. A number of anomalous Pb values are present in survey S5 in area 8 but there are no corresponding anomalous Pb values in S7 although both surveys have coincident Cu anomalies in the area (in the vicinity of the Apex Mine). The inconsistency between the two surveys may be caused by the differences in acid leaches used or it is possiblé that the Pb and Zn results have been reversed at the drafting stage in survey S5.

DISCUSSION

It was decided the production of contoured rolling mean maps was impractical because of the apparent inconsistent quality of the stream sediment surveys. This inconsistency is indicated by the lack of agreement between surveys in areas of overlap. The background values obtained often differ considerably and the surveys also differ markedly in their detection of anomalies. The resampling of portions of previous surveys (S7) cannot be used to provide a quantitative basis for comparison because the ratio of mean values for the old and new surveys changes in different areas.

APPRAISAL OF AREA

GEOLOGY AND MINERALISATION

The geology of the map area (Fig. 2) is shown on the Serle 1: 63 360 geological sheet (Parkin et al. 1953) and the COPLEY 1: 250 000 geological sheet (Coats et al. 1973). The geology of the area has also been described by Reyner and Pitman (1955) and Barnes (1970).

The northern half of the Serle area consists of Adelaidean sedimentary rocks folded in an east-west trending elongated dome. In the centre of the dome is a zone of complex deformation. Coats (1973) considers this zone to be diapiric (Burr Diapir) and Barnes (1970) considers it simply a crush zone (Burr Crush Zone). Rocks of the central zone are probably mostly brecciated Burra Group with some blocks which possibly correlate with the Callanna Beds of Willouran Age. Igneous rocks occur in the crush zone in the form of micro-diorites, diorites, micro-gabbros and amygdaloidal basalts. Sedimentary rocks of the Burra, Umberatana and Wilpena Groups occur in normal stratigraphic sequence around the Burr Diapir.

In the southern half of the Serle area folded and faulted rocks of the Umberatana and Wilpena Groups predominate. Cambrian rocks are present north of Bunyeroo Hill in the south-west corner of the area. Small diapiric structures are scattered across the southern part of Serle.

Known mineralisation in the Serle area mostly consists of small Cu mines associated with diapirs. Mines are located both within the diapirs and in the rocks on the margins of the diapirs. Around the Burr Diapir mineralisation occurs persistently in the Merinjina Tillite (Forbes, Coats, Preiss - in preparation) and the base of the Tapley Hill Formation. The copper mineralisation generally occurs in quartz and carbonate veins as secondary copper carbonates and oxides and lesser sulphides. The larger copper mines in the area include the Federal, Victory, Broken Range, Paull's Consolidated, Mt. Burr, Nichol's Nob and Mt. Rose Mines.

Several small copper shows are located in the Bunyeroo Formation north of Mt. Serle. Small copper and lead diggings occur in the Wonoka Formation in the vicinity of Oodnapanicken Well. Small alluvial goldfields occur at Boolooroo and Mt. Ogilvie. At Mt. Ogilvie gold, copper, nickel and cobalt mineralisation also occurs in quartz and carbonate veins in shales of the Tapley Hill Formation.

DISCUSSION OF GEOCHEMICAL FEATURES

Anomalous values obtained in each survey are shown in Figs 8,9 and 10.

Most Cu anomalies are located in areas where some Cu mineralisation is already known to occur. Numerous anomalies occur within the Burr Diapir particularly in the vicinity of mines such as the Federal, Broken Range, Clive and Mandarin. Cu anomalies are also concentrated around the margins of the diapir and in the adjacent Merinjina Tillite and basal Tapley Hill Formation in the areas of the Paull's Consolidated, Paull's North, Mount Burr and Nichol's Nob Mines.

Cu anomalies are associated with the margins of areas of diapiric rocks near the Apex and Mount Rose Mines. Rocks of the Tapley Hill Formation, Merinjina Tillite and upper Burra Group between these two mines also have Cu anomalies associated with them.

Smaller areas of anomalous copper occur south of Depot Spring in the vicinity of Stone's Claim, and in limestone of the Balcanoona Formation west of Jeremiah Creek and near the Mt. Ogilvie Goldfield.

The most prominent area of Pb and Zn anomalies is located west of Mt. Ogilvie. Here most of the Pb anomalies and the highest Zn anomalies are in streams draining the Balcanoona Formation.

An interesting area of Pb anomalies and a few Zn anomalies occurs around Oodnapanicken Hut and Appealinna Well. The anomalies are located mostly in rocks of the Wonoka Formation with a few in the underlying Brachina Formation in a locality where the Wonoka Formation was apparently deposited in an erosional depression within the Brachina Formation. The Bunyeroo Formation, which normally separates the two units, is absent.

Zn anomalies of survey S5 are scattered across the area between White Well and Voca Vocana Hill in rocks of the Tapley Hill Formation and Balcanoona Formation. Scattered Pb anomalies also occur in the area of survey S5, however as discussed in the previous section these may be spurious.

SUMMARY & CONCLUSIONS

The production of geochemical maps showing contoured rolling means using data from previous stream sediment surveys was found to be impractical. Where surveys overlapped and where resampling was carried out there were considerable differences in the detection of anomalies and the background values obtained. The ratio of background values for different surveys also changes with locality. Coverage of the area for Pb and Zn is incomplete.

As a result, maps showing only the areas covered for Cu, Pb and Zn and all Cu, Pb and Zn anomalies are included in this report.

Although the variations between surveys could be due to differences in methods of sample collection and preparation, size fraction analysed and method of analysis, reasonable correlation was obtained between two surveys (S4 and S7) where most of these factors were different. This study seems to indicate basic flaws in some of the surveys.

It is considered that similar problems are likely to be encountered in other areas of the Flinders Ranges and therefore the production of contoured regional geochemical maps using existing stream sediment data in not feasible.

The apparent unreliability of some past surveys, particularly the non detection of some anomalous areas, emphasizes that areas covered by stream sediment surveys should not be considered to have no potential for base metal mineralisation.

The problems encountered in this study point to the need for certain information about geochemical surveys supplied in reports of work carried out in Exploration Licence areas. It is recommended that, as a minimum the following information should be required:

Type of survey and method of sample collection (perhaps including identity of sampling personnel)

Analytical information including - Size fraction analysed
Name of laboratory
Method of analysis
Acid leach used
Detection limit
Copy of laboratory results sheet.

Maps of sample locations with sample numbers and results for each element.

It is also recommended that all samples should be analysed for at least Cu, Pb and Zn.

This study also suggests that there is a need for the routine use of standard samples and check samples in geochemical surveys to determine the reliability of the sampling and analytical techniques used. These results together with the results of any orientation studies should be included in reports.

Appraisal of the Serle Area

Most of the Cu anomalies located by the stream sediment surveys are associated with diapirs, particularly the Burr Diapir. Anomalies occur both within the diapirs and around their margins particularly in the Merinjina Tillite and basal/Tapley Hill Formation. Many of the anomalies are in the vicinity of known mines.

Pb and Zn anomalies are located west of Mt. Ogilvie in streams draining limestone of the Balcanoona Formation. Zn anomalies are scattered across the area between White Well and Voca Vocana Hill in rocks of the Tapley Hill Formation and Balcanoona Formation.

Near Oodnapanicken Hut and Appealinna Well, Pb anomalies and a few Zn anomalies occur in an area where the Wonoka Formation was deposited in an apparent erosional depression in the Brachina Formation.

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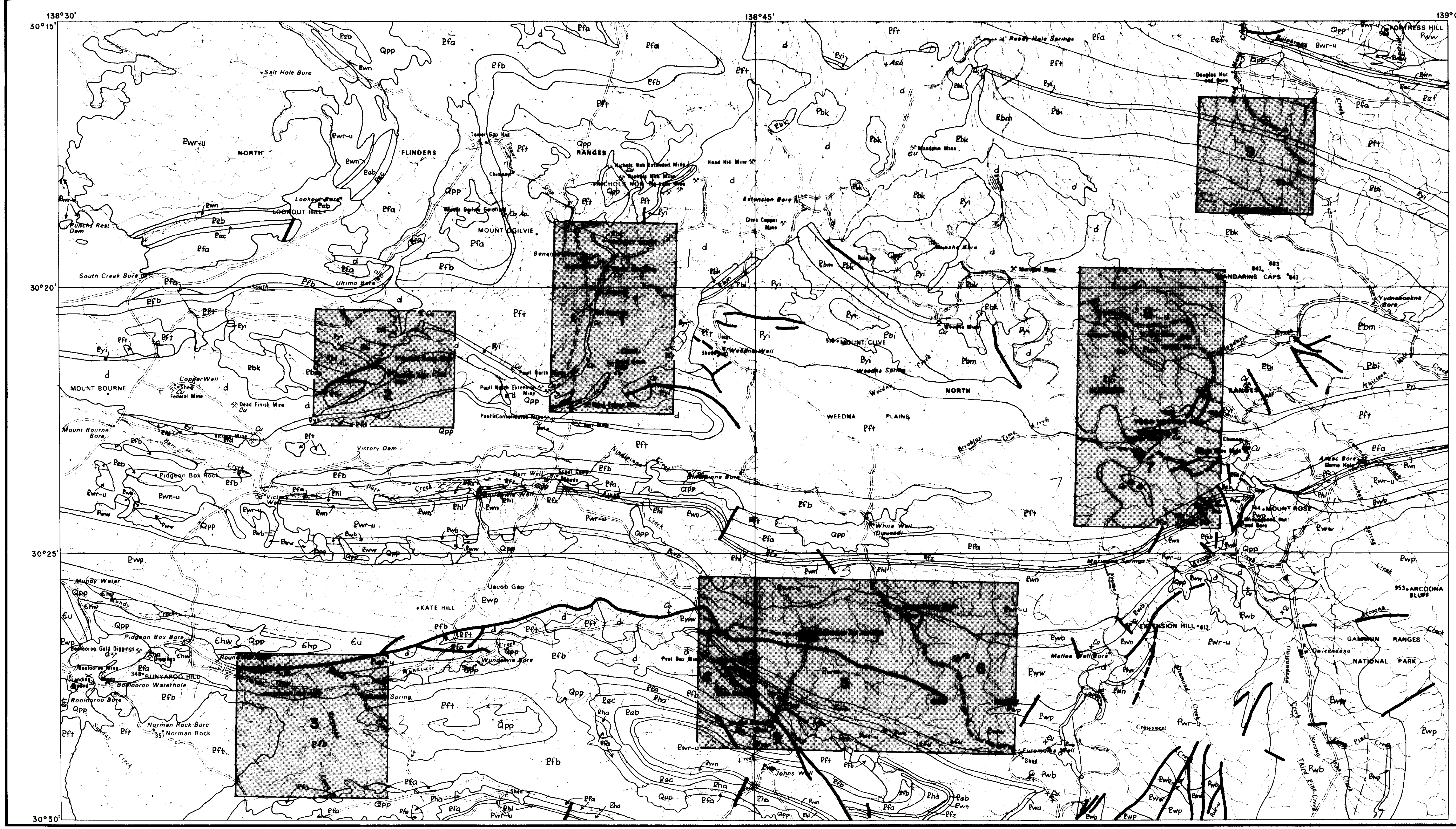


LEGEND

QUATERNARY		Qpp	Soil and alluvium.
ADELAIDEAN	WILPENA GROUP	Ꞓwp	POUND QUARTZITE – Feldspathic quartzite and sandstones.
		Ꞓww	WONOKA FORMATION – Grey-green shales, sandy limestones, siltstones and dolomites.
		Ꞓyb	BUNYEROO FORMATION – Red-brown or purple shales, minor limestones, carbonaceous shales and dolomites.
		Ꞓwr-u	BRACHINA FORMATION – Green, red-brown and purple siltstones, shales and minor sandstones.
		Ꞓwn	NUCCALEENA FORMATION – Purple dolomitic shales and cream dolomites.
	UMBERATANA GROUP	Ꞓhl	ELATINA FORMATION – Pink sandstone or feldspathic granule greywacke.
		Ꞓeb	BALPARANA SANDSTONE – Feldspathic sandstone.
		Ꞓac	MT CURTIS TILLITE – Grey-green, dolomitic pebble and boulder tillite.
		Ꞓef	FORTRESS HILL FORMATION – Grey-green siltstone, minor quartzite, lenses of limestone.
		Ꞓfz	TREZONA FORMATION – Grey-green calcareous shales, interbeds of breccia limestone or dolomites.
		Ꞓfa	AMBEROONA FORMATION – Laminated grey-green siltstones and shales, minor sandy limestone.
		Ꞓha	ANGEPENA FORMATION – Red or purple siltstone and shales, green shales, dolomites and limestones.
		Ꞓfb	BALCANOONA FORMATION, (Brighton Limestone Equivalent) – Brown weathering, pale-grey dolomite and dark-grey limestone.
		Ꞓft	TAPLEY HILL FORMATION – Laminated blue-grey silty shales, minor limestone, siltstone. TINDELPINA SHALE MEMBER (at base) – Dark finely laminated carbonaceous and pyritic shales.
		Ꞓyi	MERINJINA TILLITE – Massive boulder tillite, green shales, arkosic and conglomeratic quartzites, dolomitic tillite.
	BURRA GROUP	Ꞓbi	Unnamed grey-green dolomitic siltstones, shales, minor dolomites.
		Ꞓbm	MYRTLE SPRINGS FORMATION – Green siltstones and sandstones with quartzites and dolomites.
		Ꞓbk	SKILLOGALEE DOLOMITE – Blue-grey dolomites, dolomitic shales, minor quartzites.
		d	Diapiric breccia with carbonate matrix. Includes intrusive dolerites and grabbros. Rafts of quartzites, shales, dolomites, siltstones.

Geological boundary.
Fault.
Mine.
Mineral occurrence.
1 Sampled areas.

Geology from Copley 1:250,000 sheet. (Coats et. al. 1973.)

SCALE 1:100,000

KILOMETRES 2 0 2 4 6 8 10 KILOMETRES

FIG 3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA		SCALE 1:100 000
COMPILED R.S.R.	GEOCHEMICAL MAP COMPILATION	DATE September 1978
DRN G.J.T. CKD A.F.	SERLE AREA GEOLOGICAL PLAN & SAMPLED AREAS	PLAN NUMBER 78-799

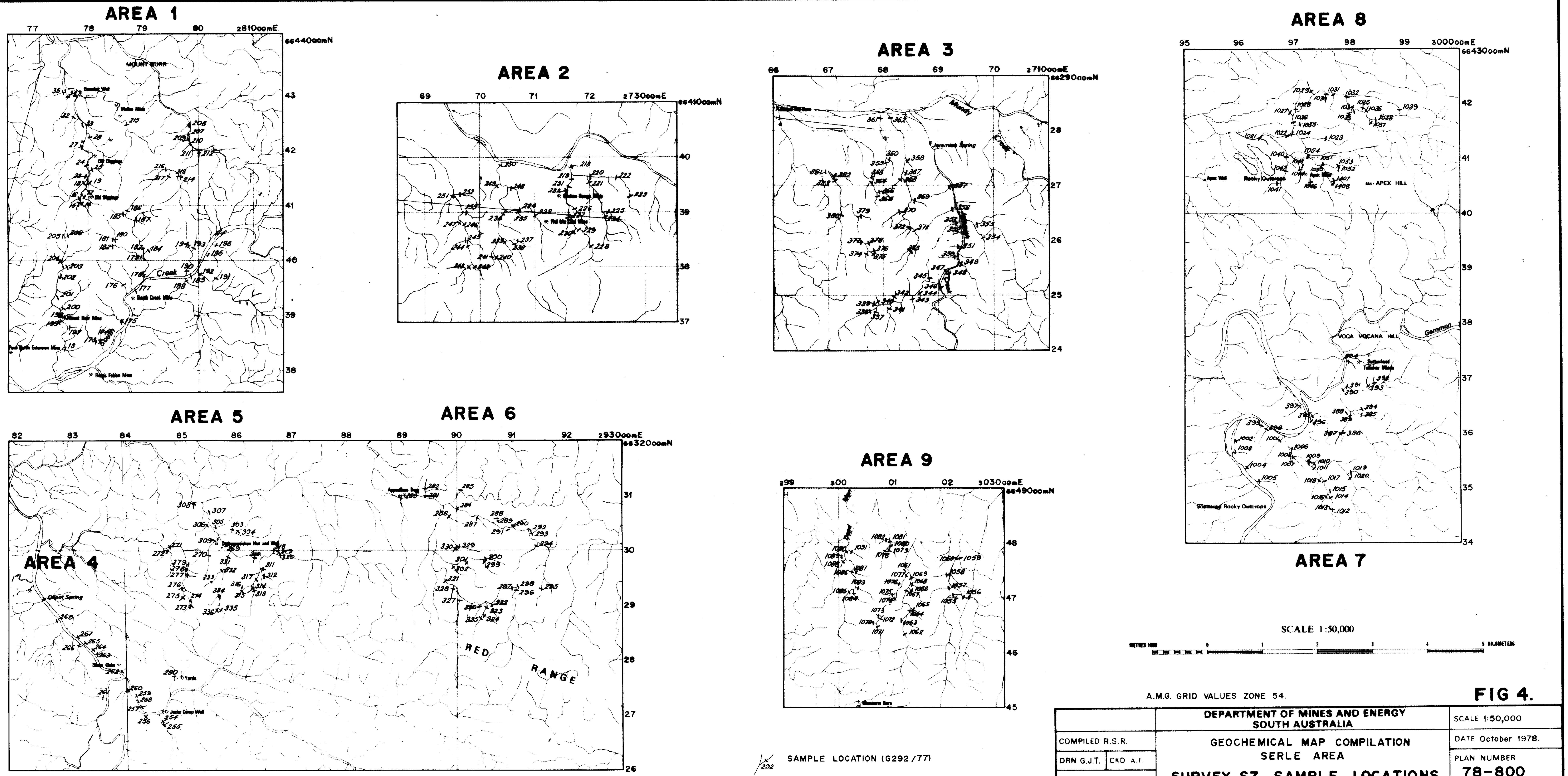
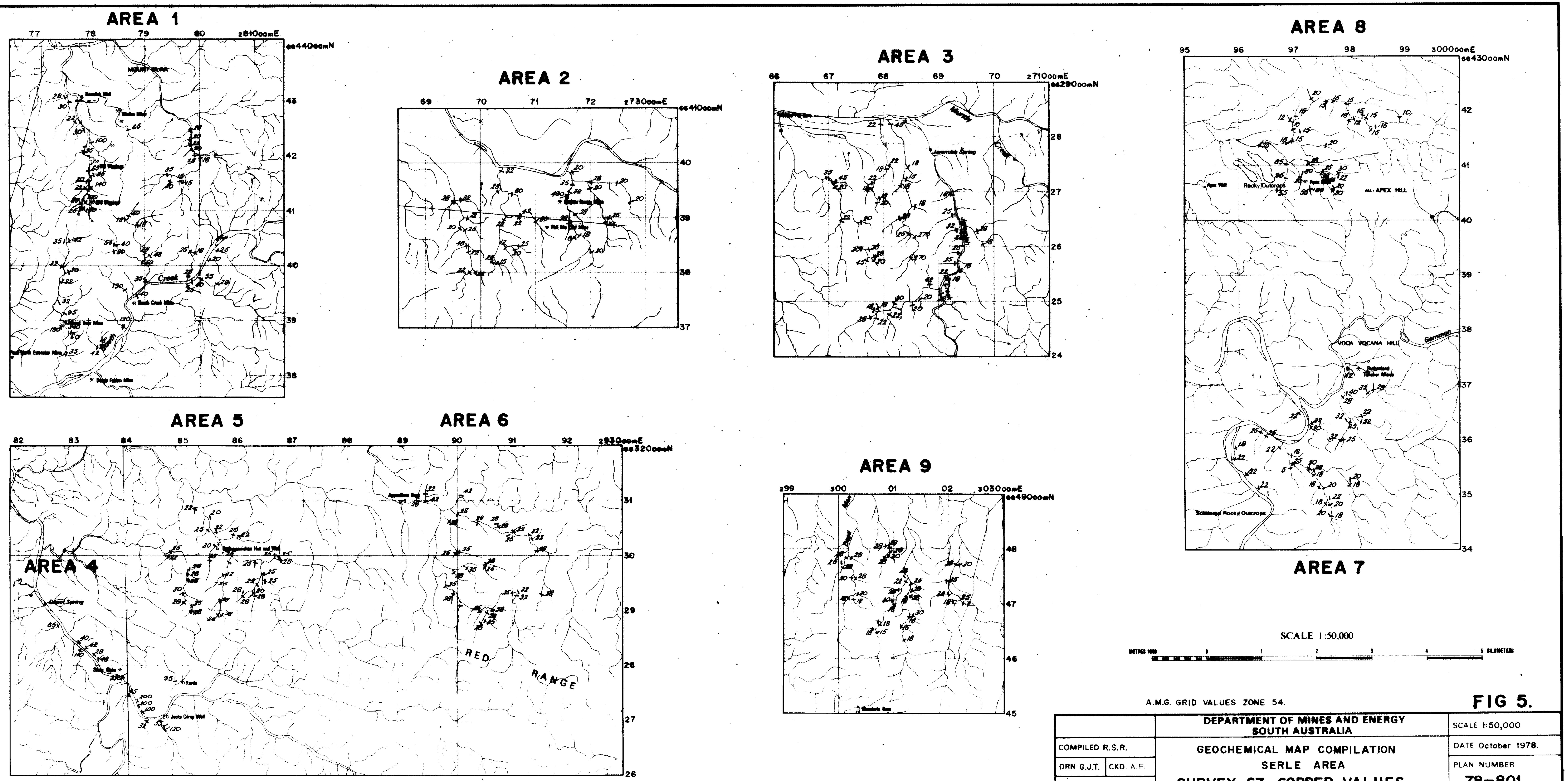


FIG 4.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:50,000
COMPILED R.S.R.	GEOCHEMICAL MAP COMPILATION SERLE AREA	DATE October 1978.
DRN G.J.T. CKD A.F.	SURVEY S7 SAMPLE LOCATIONS	PLAN NUMBER 78-800



A.M.G. GRID VALUES ZONE 54.

FIG 5.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:50,000
COMPILED R.S.R.	GEOCHEMICAL MAP COMPILATION	DATE October 1978.
DRN G.J.T. CKD A.F.	SERLE AREA	PLAN NUMBER
	SURVEY S7 COPPER VALUES	78-801

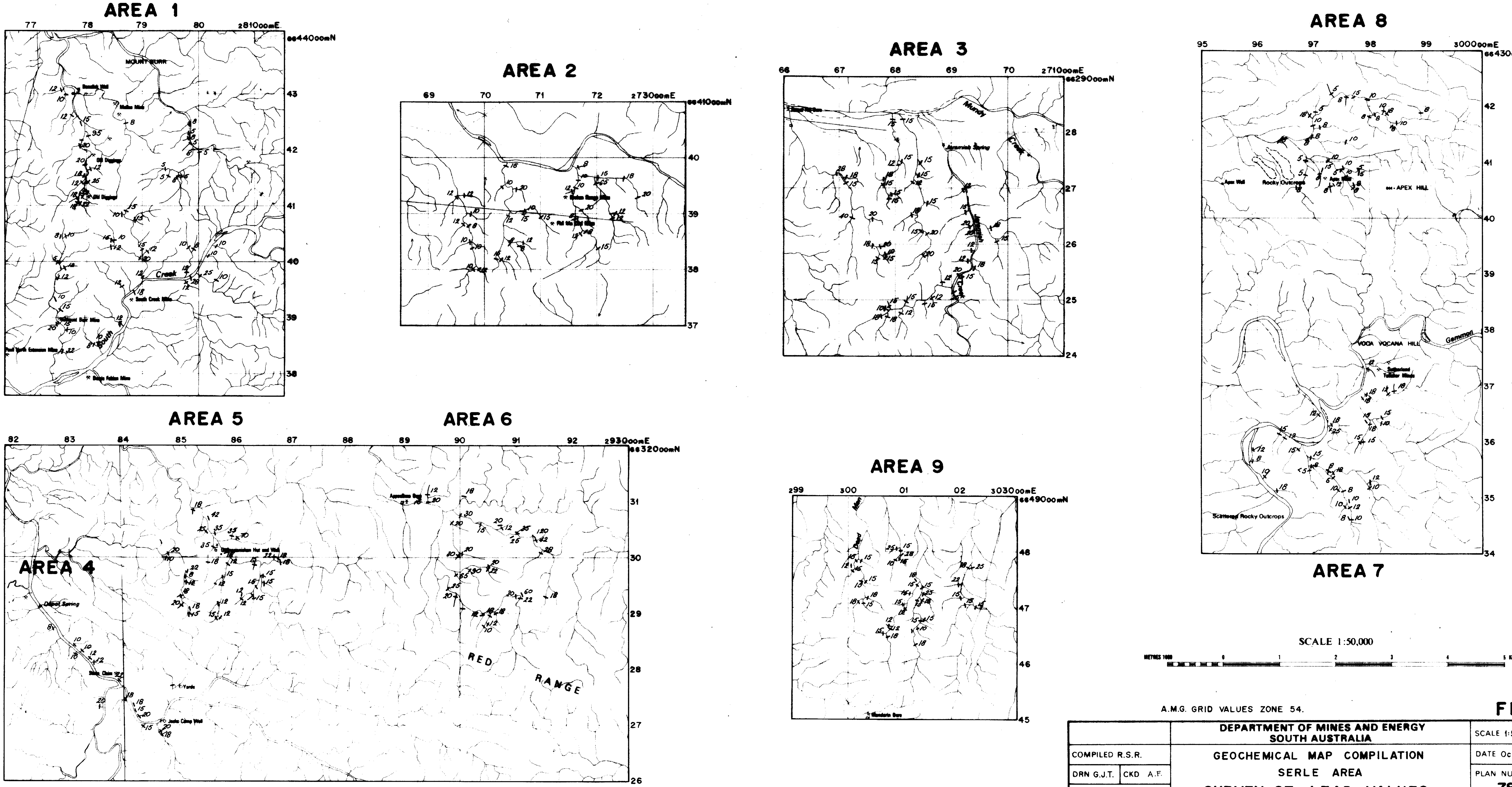
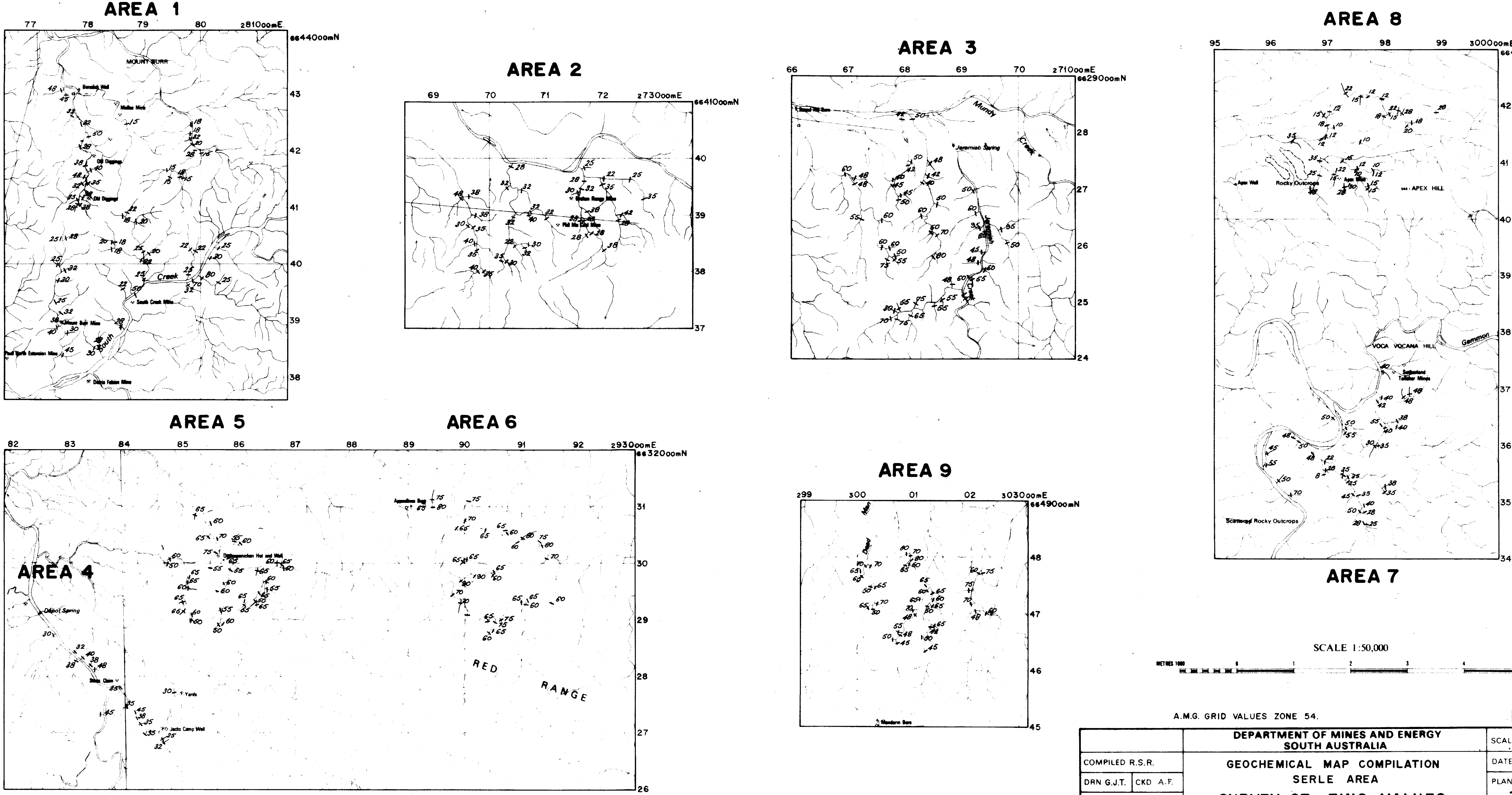


FIG 6.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:50,000
COMPILED R.S.R.	GEOCHEMICAL MAP COMPILATION	DATE October 1978.
DRN G.J.T. CKD A.F.	SERLE AREA	PLAN NUMBER
	SURVEY S7 LEAD VALUES	78-802



SCALE 1:50,000

A.M.G. GRID VALUES ZONE 54.

FIG 7.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE 1:50,000
COMPILED R.S.R.	GEOCHEMICAL MAP COMPILATION SERLE AREA	DATE October 1978.
DRN G.J.T. CKD A.F.	SURVEY S7 ZINC VALUES	PLAN NUMBER 78-803

REFERENCE

BOUNDARY OF STREAM SEDIMENT SURVEY	ANOMALOUS VALUES	SURVEY No.	REFERENCE	ORGANIZATION	THRESHOLDS USED
———	○80	S1	R.B.64/17	Deptartment of Mines (1966)	Cu. 60p.p.m.
— — —	●	S2	Env.1526	McPhar Geophysics Pty. Ltd. for Andromeda Pty. Ltd.	Cu. 35p.p.m. Pb.50p.p.m. Zn. no anom. values.
———	◐	S3	Env.1272 Env.1339	McPhar for Boolooroo Mining Co. McPhar for Southern Cross Exploration N.L.	Cu. 45p.p.m. Zn. 90p.p.m. Pb. 60p.p.m.

BOUNDARY OF STREAM SEDIMENT SURVEY	ANOMALOUS VALUES	SURVEY No.	REFERENCE	ORGANIZATION	THRESHOLDS USED
— — — —	◐ 85	S4	Env.1526	General Mineral Investigations Pty.Ltd. for Andromeda Pty. Ltd.	Cu.90. Pb.50. Zn.70p.p.m.
— — —	◓	S5	Env.852	McPhar for Mount Rose Mines Ltd.	Cu.50. Pb.65. Zn.90p.p.m.
— — — —	◒	S6	R.B. 78/23	Department of Mines (1977)	Cu.60. Pb.40. Zn.85 p.p.m.
—·—·—	⊙	S7	This Report	Department of Mines & Energy	Cu.55. Pb.40 Zn.85p.p.m.

FIG 8

DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

GEOCHEMICAL MAP COMPILATION — SERLE AREA

SUMMARY OF STREAM SEDIMENT SURVEYS FOR COPPER

	COMPILED: R.S.R.	DRN: G.J.T.	SCALE: 1:50,000	PLAN NUMBER
DIRECTOR GENERAL		CKD: A.F.	DATE: October 1976	78-804

FIG 9

SCALE 1:50,000

NOTE - FOR LEGEND SEE PLAN 78-804 (FIG 8).

DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

GEOCHEMICAL MAP COMPILATION — SERLE AREA

SUMMARY OF STREAM SEDIMENT SURVEYS

FOR LEAD

	COMPILED: R.S.R.	DRN: G.J.T.	SCALE 1:50,000	PLAN NUMBER
DIRECTOR GENERAL		CKD: A.F.	DATE October 1976	78-805

FIG 10

DEPARTMENT OF MINES AND ENERGY—SOUTH AUSTRALIA

GEOCHEMICAL MAP COMPILATION—SERLE AREA

SUMMARY OF STREAM SEDIMENT SURVEYS

FOR ZINC

COMPILED: R.S.R.	DRN: G.J.T.	SCALE 1:50,000	PLAN NUMBER
DIRECTOR GENERAL	CKD: A.F.	DATE October 1976	78-806

SCALE 1:50,000

NOTE—FOR LEGEND SEE PLAN 78-804 (FIG 8.).

APPENDIX

Listing of Sample Numbers & Results Survey S7 (New Sampling)

Notes: - All analyses by AMDEL

Method - Atomic Absorbtion Spectroscopy

Analysis scheme C1: Upper detection limit 10 000 ppm Lower detection limit in brackets (p.p.m.).

Co (5), Cu (2), Mn (5), Ni (5), Pb (5), Zn (1)

0.5 gm sample digested in hot perchloric acid.

Analysis scheme C3: Au. Detection limits 50 ppb to 10 ppm

0.5 gm sample digested in hot aqua-regia.

All results ppm

- means not analysed.

APPENDIX

Listing of Sample Numbers & Results Survey S7 (New Sampling)

Sample Nos.	Cu	Pb	Zn (C_1)	Co	Ni	Mn	Au (C_3)
G 13 /77	35	32	45	18	20	525	
G 14	180	22	38	28	38	545	
15	25	18	28	15	30	375	
16	28	18	35	15	30	415	
17	170	22	38	22	28	415	
18	32	12	32	18	38	455	
19	140	25	35	20	22	460	
22	30	18	48	20	30	545	
23	85	12	40	15	28	480	
24	65	20	38	15	32	515	
27	25	20	28	15	35	420	
28	100	95	50	20	35	-	
32	22	12	32	15	28	390	
33	30	15	32	15	35	495	
34	30	10	45	15	38	500	
35	28	12	48	15	32	515	
173	42	8	30	12	22	470	
174	18	10	28	8	18	450	
175	130	12	28	12	22	535	
176	130	12	22	25	28	625	
177	40	18	50	15	35	600	
178	38	12	25	12	20	445	
179	60	20	22	30	22	525	
180	40	10	18	20	20	340	<0.05 p.p.m.
181	55	15	20	18	25	550	
182	30	12	18	18	28	545	
183	28	15	25	15	25	445	
184	48	12	20	18	25	605	
185	18	10	18	12	28	385	
186	40	15	22	12	28	520	
187	18	15	20	15	22	345	
188	25	12	32	15	22	575	
189	40	28	70	15	35	680	
190	25	12	25	18	22	525	
191	28	10	25	12	20	520	
192	55	25	80	15	35	600	
193	18	8	22	15	18	630	
194	25	10	22	15	25	460	
195	20	10	30	15	22	400	
196	25	10	25	15	20	595	
197	60	10	30	22	20	480	
198	340	15	38	28	25	445	
199	190	20	40	48	30	540	
200	95	15	32	28	38	685	
201	32	10	25	22	35	540	
202	32	12	30	15	32	565	
203	30	12	32	15	38	495	
204	32	5	25	20	40	640	
205	35	8	25	15	40	470	
206	42	10	28	20	48	635	
207	20	5	18	12	22	385	
208	28	8	18	12	20	635	
209	22	8	32	15	22	470	
210	25	8	28	15	12	555	

Sample Nos.	Cu	Pb	Zn	Co	Ni	Mn	Au
G 211/77	20	5	20	12	12	560	
212	18	5	15	15	22	375	
213	15	8	18	15	22	365	
214	15	5	15	18	25	410	
215	65	8	15	38	30	515	
216	35	5	15	15	20	500	
217	20	15	15	12	25	445	
254	55	20	32	20	25	770	
255	120	18	25	30	38	1420	
256	32	15	35	15	22	530	
257	100	20	35	20	20	750	
258	200	15	38	35	28	920	
259	200	18	45	35	28	1050	
260	45	18	35	15	25	780	
261	120	20	45	22	28	870	
262	330	22	35	38	35	1330	
263	48	12	48	15	28	630	
264	28	12	38	12	22	520	
265	42	10	40	15	22	550	
266	110	10	38	20	28	650	
267	40	10	32	12	25	530	
268	85	8	30	20	32	740	
269	25	18	65	12	20	500	
270	25	18	65	15	28	600	
271	25	20	60	15	28	600	
272	22	10	50	15	25	620	<0.05 p.p.m.
273	28	15	50	15	25	650	
274	35	18	60	18	25	710	
275	28	20	65	18	25	640	
276	30	18	65	10	20	590	
277	28	12	60	12	25	730	
278	28	8	65	15	28	690	
279	28	22	65	15	25	650	
280	95	15	30	18	28	950	
281	32	12	75	18	32	700	
282	42	20	80	25	32	700	
283	28	15	65	18	25	590	
284	28	30	70	12	25	550	
285	42	18	75	25	35	690	
286	28	20	65	20	28	540	
287	28	15	65	15	28	570	
288	28	20	65	15	25	580	
289	28	12	60	12	25	530	
290	32	35	80	22	28	650	
291	25	25	60	12	25	590	
292	32	120	75	25	30	880	
293	32	42	80	30	35	940	
294	28	28	70	20	25	570	
295	28	18	60	18	25	720	
296	22	22	60	15	20	500	
297	25	30	65	15	28	560	
298	32	60	65	18	25	770	
299	25	22	60	12	22	630	
300	28	20	65	12	22	510	
301	35	90	90	18	25	530	
302	28	65	90	20	25	680	
303	20	35	55	12	18	540	
304	22	70	60	15	25	560	
305	32	35	75	18	28	570	

Sample Nos.	Cu	Pb	Zn	Co	Ni	Mn	Au
G 306/77	25	25	65	12	22	530	<0.05 p.p.m.
307	20	42	60	10	20	530	
308	22	18	65	12	65	530	
309	30	35	75	25	32	730	
310	25	15	65	15	25	520	
311	25	15	60	15	28	580	
312	25	15	55	20	25	690	
313	28	15	65	15	28	700	
314	30	12	50	12	28	580	
315	28	12	55	18	28	630	
316	28	12	65	15	28	580	
317	22	15	65	10	25	530	
318	25	22	60	12	25	640	
319	25	18	65	12	25	510	
320	25	18	60	10	25	480	
321	25	25	70	10	25	650	
322	28	18	75	12	22	610	
323	28	18	75	10	25	560	
324	35	12	65	15	28	490	
325	28	10	60	15	25	600	
326	25	12	65	15	25	690	
328	28	20	70	12	25	460	
329	25	20	65	15	25	550	
330	25	30	65	15	28	690	
331	25	12	55	12	28	770	
332	22	15	60	12	28	630	
333	25	12	60	10	28	680	
334	28	12	55	15	28	650	
335	28	12	60	12	30	720	
336	25	15	50	12	28	660	
337	22	18	75	12	18	-	
338	25	18	70	10	25	-	
339	18	10	30	8	12	-	
340	18	15	55	8	18	-	
341	22	12	65	10	18	-	
342	30	15	75	12	20	-	
343	20	15	55	8	18	-	
344	20	12	55	8	18	-	
345	42	12	48	10	18	-	
346	28	25	70	18	28	-	
747	22	20	60	15	25	-	
348	18	15	55	10	15	-	
349	18	18	60	12	18	-	
350	25	12	48	12	15	-	
351	25	12	45	15	15	-	
352	22	20	60	15	22	-	
353	32	20	95	12	18	-	
354	18	15	50	10	18	-	
355	28	18	95	15	22	-	
356	25	15	60	10	18	-	
357	18	12	50	12	15	-	
358	18	15	48	10	15	-	
359	18	12	42	10	15	-	
360	22	15	50	8	15	-	
361	22	15	42	10	15	-	
362	45	15	50	8	15	-	
363	22	18	40	8	15	-	
364	18	15	45	10	15	-	
365	20	15	50	12	20	-	
366	18	15	45	8	18	-	
367	15	15	42	8	15	-	
368	18	12	40	8	18	-	

Sample Nos.	Cu	Pb	Zn	Co	Ni	Mn	Au
G 369/77	18	15	50	8	15	-	<0.05 p.p.m.
370	28	18	60	10	18	-	
371	270	20	70	15	22	-	
372	25	15	50	8	15	-	
373	270	20	80	15	25	-	
374	45	15	75	15	25	-	
375	30	15	55	12	18	-	
376	38	10	50	10	18	-	
377	30	18	60	10	20	-	
378	28	20	60	10	20	-	
379	20	20	60	10	20	-	
380	22	40	55	18	25	-	
381	35	28	60	12	22	-	
382	45	18	48	10	15	-	
383	20	15	48	10	20	-	
384	22	15	38	15	25	-	
385	22	10	40	15	25	-	
386	25	15	35	12	22	-	
387	32	15	30	18	35	-	
388	32	15	55	15	28	-	
389	25	18	40	15	22	-	
390	28	18	42	12	25	-	
391	40	18	40	18	38	-	
392	28	18	48	12	28	-	
393	32	12	48	18	30	-	
394	42	12	40	15	18	-	
395	22	18	50	10	18	-	
396	30	25	53	15	28	-	
397	22	12	50	10	20	-	
398	25	12	50	12	20	-	
399	25	15	48	12	25	-	
1001	22	15	48	12	20	-	
1002	18	12	45	8	18	-	
1003	22	8	55	10	25	-	
1004	22	10	50	15	20	-	
1005	22	18	70	10	18	-	
1006	18	15	22	15	28	-	
1007	5	<5	8	8	18	-	
1008	25	8	28	10	20	-	
1009	20	8	35	10	20	-	
1010	28	18	35	25	30	-	
1011	18	5	25	15	25	-	
1012	18	10	25	15	22	-	
1013	20	8	28	12	20	-	
1014	20	12	28	15	25	-	
1015	22	10	40	10	20	-	
1016	18	10	50	12	25	-	
1017	20	8	35	12	22	-	
1018	18	10	45	12	22	-	
1019	20	12	38	10	18	-	
1020	18	10	35	10	20	-	
1021	75	18	35	18	20	-	
1022	28	8	12	12	18	-	
1023	20	10	10	28	32	-	
1024	15	8	12	15	22	-	
1025	10	8	10	15	20	-	
1026	15	10	18	12	20	-	
1027	12	18	15	12	20	-	
1028	15	5	12	18	22	-	
1029	20	5	22	12	25	-	
1030	15	8	15	18	25	-	

Sample Nos.	Cu	Pb	Zn	Co	Ni	Mn	Au
G 1031/77	15	15	12	12	25	-	
1032	15	10	12	15	18	-	
1033	18	8	18	12	25	-	
1034	12	8	15	12	22	-	
1035	15	10	22	10	20	-	
1036	15	8	28	8	18	-	
1037	15	8	20	20	25	-	
1038	15	10	18	20	25	-	
1039	10	8	28	5	12	-	
1040	85	5	35	15	25	-	
1041	55	8	48	15	25	-	
1042	95	5	25	22	22	-	
1043	80	15	22	22	25	-	
1044	20	8	15	18	25	-	
1045	55	8	28	15	18	-	
1046	80	12	30	18	25	-	
1047	20	8	15	22	20	-	
1048	30	8	15	18	28	-	
1049	55	10	18	22	28	-	
1050	38	5	10	25	28	-	
1091	25	10	12	18	28	-	
1052	22	5	12	15	30	-	
1053	30	5	10	15	28	-	
1054	28	10	15	15	25	-	
1055	18	15	48	10	18	-	
1056	25	15	60	15	22	-	
1057	32	15	70	18	28	-	
1058	35	22	75	18	25	-	
1059	30	25	75	15	25	-	
1060	28	18	60	15	22	-	
1061	28	18	65	15	22	-	
1062	18	18	45	15	18	-	
1063	15	10	50	10	15	-	
1064	18	15	42	10	15	-	
1065	30	15	65	18	25	-	
1066	28	18	65	18	25	-	
1067	18	15	50	10	18	-	
1068	25	25	60	15	22	-	
1069	28	15	65	18	22	-	
1070	18	15	50	12	15	-	
1071	15	18	45	12	15	-	
1072	18	12	48	15	18	-	
1073	20	12	55	15	18	-	
1075	30	15	70	22	25	-	
1076	28	15	65	18	25	-	
1077	22	15	60	15	20	-	
1078	28	10	65	18	25	-	
1079	30	15	60	18	25	-	
2080	28	28	80	15	28	-	
1081	28	15	70	18	28	-	
1082	28	25	80	12	28	-	
1083	30	18	70	15	25	-	
1084	18	15	50	8	18	-	
1085	28	18	65	15	22	-	
1086	20	15	50	10	18	-	
1087	28	15	65	20	25	-	
1088	28	15	65	15	22	-	
1087	25	12	65	15	25	-	
1090	28	15	70	18	25	-	
1091	28	15	70	18	25	-	