copy 3

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1967/86

PART I.   JANUARY TO JUNE, 1967.

MISCELLANEOUS CHEMICAL INVESTIGATIONS CARRIED OUT IN THE GEOLOGICAL LABORATORY.

Compiled
by

E. Woodhead

PART 1
of 2

15928/65

MISCELLANEOUS CHEMICAL INVESTIGATIONS CARRIED OUT IN THE GEOLOGICAL LABORATORY

PART I

JANUARY - JUNE, 1967.

RECORDS 1967/86

CONTENTS

/

Laboratory Report No. 1:

ZINC CONCENTRATIONS IN THE MOLONGLO RIVER

by

J.R. Beevers

The samples were collected and submitted early in January by Mr M. Elliot of the Department of the Interior. The sample locations are as previously described.

Location	Total Zinc (ppm)
A	<0.2
B	11.3
C	9.2
D	1.5
E	<0.2
F	1.2
G	0.35
H	0.20

9th January 1967

Laboratory Report No. 2

Alkali determinations on a Rock from the Kimberley Area, West Australia

by

J.R. Beevers

The rock was submitted by Geoff Derrick.

Its registered number is Y15-49-14 and is described as a corundum hornfels.

The analyses resulted as follows:

Na	1.50%
K	0.70%
Li	250 ppm

Laboratory Report No.3.

ZINC CONTENT OF MOLONGLO RIVER WATER

by

J.R. Beevers

The samples were collected and submitted on 1st February,1967, by Mr. M.Elliot of the Department of the Interior. The sample locations are as previously described.

Location	Total Zinc (p.p.m.)
A	<0.2
B	11.0
C	8.2
D	4.3
E	<0.2
F	0.6
G	<0.2
H	<0.2

Laboratory Report No.4. 14th February, 1967

AVAILABLE POTASSIUM AND SODIUM IN ALUNITE-BEARING ROCK.

by

A.D. Haldane

A sample of rock containing alunite was submitted by A.G.L. Paine for the determination of water extractable Na and K.

The sample was calcined at 750°C prior to leaching with water.

The sample locality is:

Finger and Thumb Islets, Cumberland Group, off Mackay, Queensland.

M.G.R. Zone 8, E.197600 N2404300

Results are expressed as percent of the original rock.

Na_2O	2.3%	equivalent to	1.7% Na
K_2O	2.1%	"	1.7% K

Laboratory Report No.5. 23rd February, 1967.

ANALYSIS OF A MANGANESE OXIDE PEBBLE COLLECTED FROM THE HEADWATERS OF THE TUANAKI CREEK, NEAR CASTLE HILL, CAPE VOGEL, T.P.N.G.

by

J.R. Beevers

The sample was submitted for analysis by J.E. Thompson. Dr. C.D. Branch is unable to name the mineral although definite X-ray diffraction patterns are obtained. The chemical analysis was carried out by A.A.S. following an aqua regia digestion and the results are as follows:

Mn	55.2%	
H_2O^-	0.36%	(105°C)
H_2O^+	11.91%	(900°C)
Cu	2000	ppm.
Fe	1500	"
Ba	1500	"
Zn	100	"
Pb	100	"
Co	20	"
Ni	20	"

Insol residue 2.21%

A spectrographic analysis of the insoluble residue by A.D.Haldane showed it to contain the following elements:

Ca, Sr, Ba, Cr, Mn, Al, Fe, Si, Mg, Ti, Co, Ni, Cu, Mo.

Laboratory Report No. 6:

ANALYSIS OF HOT SPRING WATERS FROM FERGUSSON ISLAND

by

D.W. Bennett

The following results were obtained for the analyses of six hot spring waters from Fergusson Island, Papua submitted by G.A.M. Taylor. All results are expressed in parts per million or milliequivalents per litre, unless otherwise indicated.

	DF1	DF2	DF3	DF4	DF5	DD6
Temperature ($^{\circ}$C)	36	86	96	99	100	53
pH	2.3	1.7	1.6	6.1	8.0	6.4
Specific conductance (μ mho cm^{-1})	3640	14900	16900	20800	13800	42300
				parts per million		
Total dissolved solid	1610	4150	5200	15030	9200	33950
Total hardness (As CaCO$_3$)	130	105	50	2380	141	5950
Na	180	800	27	4400	2950	9600
K	34	78	27	360	490	450
Li	0.6	2.2	0.05	2.0	5.7	1.9
Mg	4.3	0.2	0.2	550	0.05	1400
Ca	45	42	20	50	56	80
Fe	19.7	4.1	9.9	0.9	<0.2	0.6
Al	116	192	324	n.d.	n.d.	n.d.
Mn	0.68	<0.1	<0.1	4.56	<0.1	2.56
Cl	218	1180	<2	7950	5060	17900
HCO$_3$	Nil	Nil	Nil	39.8	42.3	513
SO$_4$	1010	2530	3960	947	110	2300
Cu	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zn	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Co	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ni	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

n.d. = not detected

	milliequivalents per litre					
Na	7.83	34.8	1.17	191	128	418
K	0.87	2.0	0.69	9.2	12.5	11.5
Li	0.09	0.32	0.007	0.29	0.82	0.27
Mg	0.35	0.02	0.02	45	0.004	115
Ca	2.2	2.1	1.0	2.5	2.81	4
Fe (ferric)	1.06	0.22	0.53	0.048	-	0.032
Al	12.9	21.3	36.0	-	-	-
Mn	0.025	-	-	0.166	-	0.093
Cl	6.15	33.3	-	224	143	505
HCO_3	-	-	-	0.653	0.694	8.42
SO_4	21.0	52.7	82.5	19.7	2.29	47.9

Sample No. DF2 smelt of hydrogen sulphide when first opened and sulphur was present also.

Sample localities were as follows:

Field No.	Registered No.	Latitude	Longitude
DF1	66400153	9.4903°	150.5166°
DF2	154	"	"
DF3	155	"	"
DF4	156	9.6778°	150.8833°
DF5	157	9.6569°	150.8569°
DD6	66400158	9.7333°	150.8666°

3rd March 1967

Laboratory Report No. 7:

SPECIFIC CONDUCTIVITY OF ANTARCTICA BRINES

by

A.D. Haldane

The following results were obtained for the specific conductivity at 20°C for water samples taken from increasing depths at Lake Dingle and Deep Lake, Vestfold Hills Antarctica. The samples were submitted by I. McLeod.

Lake Dingle	Sp. Cond.
15 feet	0.172 mho/cm
25 "	0.172
35 "	0.172
40 "	0.172
45 "	0.172

Deep Lake

Surface	0.180 mho/cm	0.176 mho/cm
25 feet	-	0.177
40 "	0.180	0.174
60 "	0.181	0.174
80 "	0.181	0.176
100 "	0.181	

The second column under Deep Lake refers to samples kept in plastic containers.

3rd March 1967

9

Laboratory Report No. 8:

ZINC ANALYSIS OF MOLONGLO RIVER WATER

by

J.R. Beevers

The samples were taken and submitted by Mr M. Elliot of the Department of the Interior on 7th March 1967.

With the exception of D2, the sample locations are as previously described. Location D2 is at Burbong, the point at which water in the Molonglo river enters the A.C.T..

Location	Total Zinc (ppm)
A	<0.1
B	12.2
C	10.8
D	3.3
D2	1.8
E	<0.1
F	0.5
G	<0.1
H	<0.1

13th March 1967

Laboratory Report No.9. 4th April, 1967.

SOLUBLE SALTS IN BRICK SHALES

by

A.D. Haldane

Following reports of discoloration in use, of bricks from the Commonwealth Brickworks, chemical testing indicated the presence of water soluble sulphates in the bricks. Four samples of brick shale were submitted by P.A. Lang to attempt to trace the source of sulphate.

The samples were tested for both water soluble sulphate and total soluble salts.

All tests for sulphate were negative and conductivity measurements on 1:5 aqueous suspensions gave values of 200 - 400 parts per million total soluble salts. These values are too small to be of any significance.

Sample details are as follows:

66360026	decomposed yellow shale, Bungendore.
66360027	partly decomposed yellow shale, Bungendore.
66360028	decomposed grey shale, Queanbeyan
66360029	partly decomposed grey shale, Queanbeyan.

Day Book entry 2270.

Laboratory Report No.10. 5th April, 1967.

ZINC CONTENT OF MOLONGLO RIVER WATER.

by

J.R. Beevers

The samples were taken by Mr. M. Elliott of the Department of the Interior on 3rd April, 1967. The sample locations are as previously described.

Location	Total Zinc (p.p.m.)
A	< 0.1
B	14.2
C	13.0
D	2.1
D2	2.0
E	< 0.1
F	0.63
G	< 0.1
H	< 0.1

Laboratory Report No. 118 18th April, 1967

ANALYSIS OF MARBLES FROM QUEANBEYAN

by

D.W. Bennett

The following results were obtained for the determination of the calcium carbonate content of two samples of marble from Queanbeyan, N.S.W., submitted by D.E. Gardner and P.A. Lang.

Sample Registered No.	% $CaCO_3$
66360030	97.9
66360031	97.0

Sample localities are

Sample Registered No.	Military grid	
66360030	225000E	0631200N
66360031	"	"

1:250,000 Sheet No. I5516. 1:50,000 Sheet No. 8727I.

Laboratory Report No. 12. 9th May, 1967.

ZINC CONTENT OF MOLONGLO RIVER WATER

by

J.R. Beevers

The waters were sampled on 2/5/67 by Mr. M. Elliott of the Department of the Interior. The sample locations are as previously described.

Location	Total Zinc (ppm).
A	< 0.1
B	14.5
C	15.5
D	1.9
D2	3.0
E	< 0.1
F	0.55
G	< 0.1
H	< 0.1

LAB. REPORT NO. 13 26th May, 1967

Analysis of Manganiferous Sample from the Mt. Garnet Area, North Queensland

by

J.R. Beevers

The sample, submitted by W.B. Dallwitz, was from an area close to the township of Mt. Garnet in North Queensland. The crushed sample was completely soluble in hot 1:1 hydrochloric acid. Analyses were carried out from 2N HCl by AAS. The results are as follows:

Loss on Ignition at 850°C	12.6%
Mn	40.6%
Fe	14.0%
Cu	1200 ppm
Pb	1170 ppm
Zn	3800 ppm
Co	800 ppm
Ni	110 ppm
Cr	< 25 ppm
Ba	not detected by sulphate ppte method

LABORATORY REPORT NO. 14 30th May, 1967.

ANALYSIS OF SAMPLES FROM CAPE YORK PENINSULA

by

D.W. Bennett

The following results were obtained for the determination of trace metals in ten samples from the Hann River and Ebagoola Sheets, Cape York Peninsula, Queensland, submitted by D. Trail.

ppm

Sample No.	Cu	Pb	Zn	Co	Ni	Cr	Mn	Remarks
T91	8	<8	8	<6	<5	12	10	Graphitic Schist
T93	5	17	24	<6	20	5	300	Aluminium sulphate encrustation
T122	<3	25	13	12	8	15	100	Magnesite
T164	4	<8	35	27	20	<3	4000	Calcium carbonate deposit
T165	<3	<8	12	30	16	<3	2600	Calcium carbonate deposit
T166	<0.1	<0.3	<0.04	<0.2	<0.2	<0.1	<0.1	Hot spring water
T172 (a)	<4	<10	18	<7	10	10	163	"Copper" plant
T172	4	<8	5	<6	<5	5	140	Soil
T173	<3	<8	21	<6	<5	5	12	Soil
A153	<3	<8	11	<6	<5	<3	62	Soil

Sample details are as follows:-

T91	Graphitic Schist from Upper Patallah Creek, Hann River Sheet.
T93	White encrustation from T91.
T122	Magnesite nodules on sericite quartz schist in a tributary of O'Lane Creek, Hann River.
T164	Hot spring deposit from Telegraph Line 25 miles north of Musgrave Homestead, Ebagoola Sheet.
T165	Deposit in hot spring of T164.
T166	Hot spring water 25 miles north of Musgrave.
T172 (a)	"Copper" Plant near Pretender Creek, Ebagoola Sheet.
T172	Soil at "Copper" Plant at T172 (a).
T173	Soil 50 yards away from "Copper" plant at T172 (a).
A153	"Copper" Plant and soil, Ebagoola Sheet.

LAB. REPORT NO. 15 5th June, 1967.

ZINC CONTENT OF MOLONGLO RIVER

by

J.R. Beevers

The samples, taken on 1/6/67 were submitted by Mr. M. Elliot of the Department of the Interior. The sample locations are as previously described. All values are in parts per million total zinc.

Location	Total Zinc
A	< 0.1
B	11.2
C	19.2
D	4.5
D2	2.1
E	< 0.1
F	0.98
G	< 0.1
H	< 0.1

Lab. Report No. 16 6th June, 1967

Analysis of Stream Sediments from the Herberton Area, N. Q'ld.

by

J.R. Beevers

The samples were collected by D.H. Blake, following up some high values obtained for copper, lead, and zinc on samples collected in 1964. The samples were from an area that was not known to be mineralized. Total analyses were determined by AAS after an aqua regia attack of the sample. Cx Zn values were determined after leaching of the sample with 0.01 MEDTA/0.1 M Na Cl solution. The results are as follows:

Sample Number	Total Cu (ppm)	Total Pb (ppm)	Total Zn (ppm)	~~Total~~ cx Zn (ppm)
H 1	<4	<20	13	3.7
H 2	<4	<20	19	2.1
H 3	<4	<20	26	7.3
H 4	<4	<20	22	8.7
H 5	<4	<20	29	2.1
H 6	<4	<20	44	3.7
H 7	<4	<20	18	3.9
H 8	<4	<20	23	3.0
H 9	<4	<20	34	2.1

These results did not confirm the previous results.

Laboratory Report No.17. 15th June, 1967.

ASSAYS FOR TIN ON SAMPLES FROM WATSONVILLE, QUEENSLAND.

by

J.R. Beevers

Eleven of the samples (S1 - S11) were from a location 800 feet south-west of the North Australian Shaft, Watsonville, and were submitted by W.B. Dallwitz. Samples Nos.S12 and S13 were from an adit and just below the adit respectively, situated 1250 feet E.S.E. of the North Australian Shaft. They were submitted by E. Sedmik, Geophysicist.

The assays were carried out by A.A.S. and the results are as follows:

Sample	% Sn
S1	<0.2
S2	<0.2
S3	<0.2
S4	<0.2
S5	<0.2
S6	<0.2
S7	<0.2
S8	<0.2
S9	1.0
S10	0.4
S11	<0.2
S12	<0.2
S13	<0.2

Laboratory Report No. 18 16th June, 1967.

ANALYSIS OF ORIENTATION SAMPLES FROM WAU, T.P.N.G.

by

D.W. Bennett

The following results were obtained for the determination of manganese and zinc in 70 soil and rock samples from the Wau area, T.P.N.G., submitted by R.G. Horne. All results in parts per million.

Details of the localities from which the samples were collected are given in file 65/6415, 9th July, 1965.

The correlation between gold assays given in the above file and manganese values is not particularly marked.

Sample No.	Mn	Zn	Sample No.	Mn	Zn
64220001	34,500	190	64220036	1,700	80
2	8,750	85	37	1,500	175
3	80	28	38	380	85
4	420,000	8,000	39	180	22
5	435,000	8,750	40	47	15
6	20,000	303	41	220	43
7	9,750	270	42	490	118
8	16,500	135	43	420	55
9	3,200	115	44	515	63
10	8,250	185	45	1,150	33
11	283	55	46	180	65
12	2,880	65	47	330	80
13	2,180	103	48	290	58
14	41,500	275	49	30	22
15	5,500	170	50	350	68
16	3,500	75	51	8	5
17	1,260	60	52	8	2.5
18	2,100	98	53	8,950	65
19	1,430	108	54	5,950	118
20	1,460	115	55	230	8
21	6,500	78	56	73	28
22	12,000	118	57	3,350	143
23	20,500	138	58	1,150	108
24	3,300	125	59	580	93
25	108	20	60	1,080	98
26	2,430	62	61	625	155
27	29,000	285	62	700	113
28	128	20	63	145	85
29	550	50	64	1,030	83
30	2,180	75	65	5,400	50
31	395	60	66	8	< 2
32	93	48	67	18	2.5
33	395	70	68	18	10
34	88	43	69	20	20
35	750	88	70	305	58

Sample Nos. 64220004 and 5 contain 66% and 69% manganese dioxide respectively.

Determinations were by the Atomic Absorption method following digestion with hydrochloric acid.

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1967/86

PART TWO

JULY - DECEMBER, 1967

MISCELLANEOUS CHEMICAL INVESTIGATIONS CARRIED OUT IN THE GEOLOGICAL LABORATORY

Compiled by

E. Woodhead

PART 2

of 2

MISCELLANEOUS CHEMICAL INVESTIGATIONS CARRIED OUT IN THE GEOLOGICAL LABORATORY

JANUARY - DECEMBER, 1967.

Compiled by

E. Woodhead

RECORDS 1967/86

INTRODUCTION

This Record is composed of reports on minor chemical investigations carried out in the geological laboratory Bureau of Mineral Resources, during the period January, 1967 to December, 1967. The Record is divided into two parts; the first deals with reports covering the period January to June, 1967, the second part deals with reports covering the period July to December, 1967. In each part the reports are in chronological order.

MISCELLANEOUS CHEMICAL INVESTIGATIONS CARRIED OUT IN THE GEOLOGICAL LABORATORY

JULY - DECEMBER, 1967

PART TWO

RECORDS 1967/86

Laboratory Report No.19. 1st July, 1967.

CHECK ANALYSIS OF CORE SAMPLES FROM D.D.H.66-11, RUM JUNGLE, NORTHERN TERRITORY.

by

A.D. Haldane

Two samples of crushed core from D.D.H. 66-11 were submitted by C.E. Prichard for check analysis for silver and cadmium.

Spectrographic analysis by Amdel of the interval 914 to 960 feet gave values of 1500 p.p.m. Ag, equivalent to 49 oz. Ag per ton (Br) and 400 p.p.m. Cd. No observable mineralization in the core was reported. Chemical analysis gave the following results.

Sample No. Depth	67120172 914-937 feet	67120173 937-960 feet
Ni	20 p.p.m.	15 p.p.m.
Co	<20 "	< 20 "
Cu	30 "	25 "
Pb	65 "	75 "
Zn	130 "	130 "
Ag	< 2 "	< 2 "
Cd	<1 "	<1 "

These results indicate barren core and do not confirm the values obtained by Amlel.

Serial No.2520.

Laboratory Report No.20 10th July, 1967.

ZINC CONTENT OF MOLONGLO RIVER

by

J.R. Beevers

The samples were submitted and sampled on 6/7/67, by Mr. M. Eliot, Department of the Interior. The sample locations are as previously described. All results are expressed as parts per million total zinc.

Location	Zinc
A	< 0.1
B	12.2
C	10.2
D	7.6
D2	6.8
E	< 0.1
F	2.0
G	< 0.1
H	< 0.1

Laboratory Report No. 21 26th July, 1967

ANALYSIS OF STREAM SEDIMENT SAMPLES FROM THE SEPIK AREA, T.P.N.G.

by

D.W. Bennett

The following results were obtained for the determination of trace metals in 91 stream sediment samples from the Sepik area, T.P.N.G., submitted by D.B. Dow. All results are in parts per million.

Sample No.	Cu	Pb	Co	Ni	Cd	Cr	Mn
Ab 30	18	15	8	< 5	3	5	380
31	18	<10	10	< 5	9	5	430
32	12	<24	18	<12	< 5	12	570
33	12	20	16	< 8	< 3	5	720
34	25	27	27	25	5	27	940
35	25	19	16	19	<3	19	570
38	15	32	27	35	2	25	800
39	57	< 60	< 35	< 30	<11	43	630
40	32	82	25	32	< 5	32	950
43	58	27	45	70	< 2	185	1050
55	46	21	32	160	10	95	760
60	45	20	32	92	5	52	750
61	70	25	45	95	45	220	950
64	83	19	41	125	11	120	970
65 A	75	< 20	30	45	15	40	1200
65 B	74	29	35	69	3	80	1400
66	58	20	25	22	11	35	850
71	55	40	45	60	20	85	1200
72	46	21	25	21	< 3	38	540
75	73	12	25	65	2	72	640
76	53	15	37	340	11	140	580
77	60	15	37	195	9	135	860
78	43	22	25	90	4	65	740
503	33	22	20	15	< 2	35	1300
519	28	45	95	70	< 2	740	640
520	25	40	45	40	< 2	230	850
523	33	27	22	20	< 2	17	700
524:							
magnetic fraction	20	47	92	70	< 2	690	890
non-magnetic fraction	93	45	57	52	< 2	52	1200
541	25	40	40	50	2	165	1700
543	20	32	40	47	2	110	1500
544	23	32	42	52	2	150	1600

Sample No.	Cu	Pb	Co	Ni	Cd	Cr	Mn
Ab 545	48	32	35	45	5	62	1030
1005	85	17	30	65	< 2	48	1600
1007	81	17	31	78	< 2	35	1200
1010	65	< 10	31	72	< 2	100	730
1014	69	< 10	37	97	5	125	780
1015	70	< 30	27	62	31	62	1150
1016	25	15	15	15	< 2	8	500
1018	48	10	34	77	2	155	900
1020	33	10	25	44	< 2	65	830
1021	36	15	19	27	2	18	670
1024	21	< 10	15	17	< 2	18	600
1028	44	12	27	21	< 2	30	1000
1032	21	10	12	17	< 2	15	650
1033	18	10	10	10	< 2	10	480
1036	30	25	25	45	< 2	60	600
1038	69	< 10	25	62	< 2	87	750
1040	38	12	19	12	< 2	18	730
1041	25	20	17	17	< 4	20	520
1042	65	50	26	26	< 3	59	1000
1043	48	25	19	12	< 2	20	850
1044	45	30	19	10	< 2	18	1150
1062	53	20	31	32	4	15	780
1065	40	15	25	57	2	32	780
1068	60	20	34	49	< 2	35	1900
1071	85	25	47	97	< 2	35	3400
1073	40	< 10	57	450	< 2	340	1020
1081	38	12	47	610	< 2	270	900
1083	41	12	27	62	< 2	40	830
1100	61	12	27	97	< 2	45	880
1501	45	22	20	20	< 2	18	880
1505	50	15	20	10	< 2	25	1050
1506	40	15	20	10	< 2	13	830
1509	25	22	15	20	< 2	15	800
1510	43	17	25	47	< 2	33	1050
1517	25	17	15	27	< 2	33	630
1521	35	15	15	35	< 2	25	450
1525	43	17	25	50	< 2	35	980
1528	53	15	25	52	6	40	1100
1533	58	15	35	65	3	60	1500
1534	50	17	30	102	< 2	58	1000
1574	20	15	12	15	< 2	18	650
1583	180	< 10	25	37	< 2	55	1000
1595	45	10	25	32	< 2	23	1020
1599	38	12	25	32	< 2	35	980
1602	70	10	25	17	< 2	20	700
Ra 2	28	17	17	32	3	18	400
6	25	20	20	37	< 2	20	700
7	30	20	20	37	< 2	20	550
10	65	15	40	200	< 2	85	780
22	53	17	20	37	< 2	25	530
23	38	20	17	40	< 2	28	450
24	40	22	20	37	< 2	25	600

Sample No.	Cu	Pb	Co	Ni	Cd	Cr	Mn
Ra 26	28	12	17	40	< 2	28	400
28	58	15	35	110	< 2	85	800
29	43	12	20	55	< 2	58	630
34	38	20	20	37	< 2	25	600
40	30	15	20	42	< 2	43	600
41	43	20	22	42	< 2	35	580
42	50	12	35	170	< 2	130	750
103	35	20	20	37	< 2	28	630

Determinations were by the Atomic Absorption method following digestion with hydrochloric acid.

Registered No. 67520320 Serial No. 2505

Laboratory Report No. 22 1st August, 1967.

ANALYSIS OF "COPPER" PLANT FROM ALICE SPRINGS AREA, NORTHERN TERRITORY.

by

D. W. Bennett.

A "copper" plant sample from the Mount Hardy copper deposit near Mount Doreen, close to the Yuendumu Aboriginal Reserve, Northern Territory, was submitted by E.C.E. Sedmik. The stems were analysed separately from the foliage and laterals for trace metals, following digestion with nitric acid.

A.H.Blissett (Quarterly Geological Notes of the Geological Survey of South Australia,No. 18,April 1966) reports that a copper plant, Millotia myosotidifolia; found near the Ukaparinga Copper Mine, Williamstown, South Australia contained approximately 2400 p.p.m. copper dry weight (approx. 4% in the ash).

All results are in parts per million of the dry weight (105°c)

Sample	Cu	Pb	Zn	Cd	Co	Ni	Cr	Mn
Stems	65	< 4	26	< 1	< 2	2	2	60
Foliage	158	< 4	43	< 1	< 2	3	3	200
Millotia sp.	2400							

Laboratory Report No. 23 1st August, 1967.

ANALYSIS OF GEOCHEMICAL SAMPLES FROM THE PAPUAN ULTRAMAFIC BELT.

by

A. D. Haldane.

The following results were obtained for the spectrochemical analysis of 24 stream sediment samples and 16 heavy mineral concentrates from the Papuan Ultramafic Belt. The samples were submitted by H. L. Davies.

The following elements were sought but not detected, Zn, Sn, Be, Mo, Ag, Au. All results are expressed in parts per million.

Sample No.	Ni	Co	Cu	Pb
65525053	10	6	10	20
5054	400	100	13	n.d.
5055	250	60	8	"
5057	600	130	6	"
5059	600	130	10	"
5060	300	80	6	"
5061	130	40	13	"
5071	60	13	10	"
5072	80	10	25	"
5073	250	40	4	"
5075	250	30	13	"
5076	180	25	3	"
5077	130	30	8	"
5078	250	60	13	"
5079	250	40	13	"
5080	180	30	10	"
5081	250	18	4	"
5082	180	40	8	"
5083	180	40	18	"
5084	130	40	40	"
5085	250	30	25	"
5086	180	40	25	"
5087	25	13	25	"
65525088	180	40	25	n.d.
65527053	60	25	13	n.d.
7054	800	400	8	"
7055	400	130	25	"
7056	800	180	4	"
7058	800	180	13	"
7059	400	250	8	"
7060	250	80	30	"
7061	300	100	25	n.d.
7071	130	13	18	13
7072	800	180	8	n.d.
7073	600	130	13	"
7074	250	130	25	"
7075	600	180	40	"
7076	800	250	3	"
7077	600	130	8	"
65527083	250	100	18	n.d.

n.d. not detected.

Plate Nos. 1053, 1054.

Laboratory Report No.24

1st August, 1967.

ANALYSIS OF GLUE FROM PAPER SAMPLE BAGS.

by

D. W. Bennett.

A series of stream sediment samples submitted by D.B.Dow for trace metal analysis were in paper bags of a type used by the Bureau for geochemical sampling. The bags had been wet during sample collection and on drying the glue used in the construction of the bags had lost its adhesion and had partly flaked off thus contaminating the samples. It was considered desireable to determine the trace metal content of the glue. The results in parts per million are given below.

Glue from:	Cu	Pb	Zn	Cd	Co	Ni	Cr	Mn
paler bags	10	<10	5700	<2	<5	7	13	50
darker bags	10	<13	1600	<3	<7	7	13	37

Clearly substantial zinc contamination could arise depending on the relative amounts of glue and sample, the latter often being only a few grams, sometimes less than 1 gram. Some of the zinc is water soluble but not in sufficient amount to seriously contaminate a sample by soakage.

Laboratory Report No.25. 3rd August, 1967.

ZINC CONTENT OF MOLONGLO RIVER

by

J.R. Beevers

The waters were sampled and submitted by Mr. M. Elliot, Department of the Interior on 31st July, 1967. The sample locations are as previously described.

All results are expressed in parts per million total zinc.

Sample Location	Zinc
A	<0.1
B	12.7
C	9.4
D	4.7
D2	6.3
E	<0.1
F	4.5
G	0.15
H	<0.1

Laboratory Report No. 26

ANALYSIS OF ELECTROYLITIC COPPER SHEET

by

A.D. Haldane

A sample of copper sheet was received from Mr B. Katter M.P. forwarded through the Director's office. The sheet had been produced by electrolytic deposition of copper from solutions obtained by leaching copper ores. The whole operation had been carried out in the field using a portable generator as a source of power. An assessment of the purity of the product was requested.

Spectrographic examination indicated the presence of the following elements in trace amounts silican, iron, aluminium, magnesium, titanium manganese, lead, silver and tin. These impurities are not soluble in concentrated nitric acid and taken together with any other insoluble material amount to 0.10%. In addition to the above impurities 0.004% of acid soluble zinc was determined by atomic absorption.

Additional elements sought but not detected were nickel, cobalt, vanadium, bismuth antimony, arsenic, boron and molybdenum.

The indicated purity is 99.90% Cu.

Laboratory Report No. 27: 7th August, 1967.

Analysis of Samples from Kimberley Area, W.A.

by

D.W. Bennett

The following results were obtained for the analyses of three samples collected 4 miles NE of Eastman's Bore, on Louisa Downs Station, Kimberley Area, W.A. and submitted by D. Gellatly. All results are given in parts per million.

Field No.	Reg. No.	Cu	Ni	Co	Cr	Fe	Zn
MR10.57.27a	64570109	190	1070	240	5,000	102,000	150
MR10.57.27b	110	210	1300	470	166,000	217,000	1040
MR10.57.27c	111	2900	1800	490	121,000	205,000	4150

Determinations were carried out by atomic absorption following fusion of the sample with sodium peroxide.

Serial No. 2541

Results

The samples sent by Mr. Webb, and considered to be prepared ready for analysis were analysed, as received, in duplicate by the A.A.S. method A. These analyses are shown in Table 1, together with assay values on the same samples supplied by Spectrometer Services and by the Department of Mining Engineering, University of Queensland.

The agreement between the three laboratories is not good, particularly in samples containing large amounts of tin, and my own duplicate analyses are often in disagreement too. Moreover, no laboratory can be said to be consistently higher or consistently lower than the other laboratories, so the question of bias does not seem to be of great significance, in spite of the known interference of silicon in the A.A.S. method. Considering my own duplicate analyses and the work done in developing the A.A.S. method, it seemed to me that the interference of silicon alone could not be held responsible for the large differences sometimes obtained in replicate analyses, nor could it be held responsible for the large differences sometimes obtained in inter-laboratory analyses. Other sources of error were therefore sought.

SAMPLE PREPARATION STUDIES

The A.A.S. method A uses only 100 mgm of sample per determination, and it is therefore essential that the sample be adequately ground and mixed, particularly as one is attempting to determine the content of a heavy mineral (cassiterite) in a much lighter matrix.

To test how well the samples provided by Mr. Webb were prepared, a set of nine samples was selected to give a range of probable tin values (based on replicate values obtained by the A.A.S. method A) from 0.2% to about 15% tin. Each of these samples was subjected to size analysis using 72, 85, 150, and 240 B.S.S. sieves. Angular pieces of metal, some weighing over 10 mgm were found in all the coarse fractions, and were removed. It is assumed that these pieces were introduced during the crushing of the samples and were in fact derived from the crushing machinery. Such metal was also removed from the +85 fractions but not from the finer fractions. All fractions were then weighed and the results are shown in Table 2. Sample preparation appears to have been better in the smaller samples.

The presence in the sample of pieces of foreign metal weighing up to 10 mgm is most undesirable, particularly as only 100 mgm of sample is used for analysis.

Each of the fractions from each of the nine selected samples were ground in an agate mortar until all passed 240 B.S.S. They were then analysed by the A.A.S. method A. The results are shown in Table 3, and one can see from these that there is a tendency for the tin to be more concentrated in the coarser fractions, although in some samples (for example, N4 148) quite the reverse is true. Clearly, any segregation of minerals brought about by differences in density of the particles would be accentuated if the particles were not of uniform size, and serious sampling problems would be unavoidable, particularly when methods of assay using only fractions of a gram of sample are used.

attempting to solve Mr. Webb's problem was to make a series of check assays on samples that had also been assayed by the various laboratories used by Mr. Webb. This was agreed on, and the meeting closed about 11.30 a.m.

Some members of the group re-assembled in Mr. Dallwitz' office to discuss details of how the B.M.R. could best analyse the check samples. These were Messrs Dallwitz, Webb and Haldane, and Dr. Beevers. Dr. Branch was invited to join the discussion but, on his suggestion, declined the invitation because at that time he was not in a position to offer any analytical help using the X-ray fluorescence unit. After some discussion between the four members of the group, it was decided to make an attack on Mr. Webb's problem along the following lines:

(a) Mr. Webb to supply a number of uncrushed concentrates, and we in the B.M.R. to prepare them for analysis.

(b) Dr. Beevers and Mr. Haldane to investigate methods for assaying of Sn concentrates, and to assay the concentrates supplied by Mr. Webb by the methods considered most suitable.

There was apparently some misunderstanding concerning the supply of uncrushed concentrates, for Mr. Webb supplied quantities of crushed concentrates, ranging from 100 gm to 300 gm, that were, according to him, prepared ready for analysis. It was subsequently found that these samples were inadequately prepared, and this point is dealt with in much greater detail later in the report.

TIN ASSAYS BY A.A.S. METHOD A.

As far as I am aware, no satisfactory method for the assay of Sn concentrates by A.A.S. has been reported. Ever since the finding, made by Allan in 1963, that an air-hydrogen flame is more sensitive for Sn determination than an air-acetylene flame, an air-hydrogen flame has been the accepted medium for the determination of Sn by A.A.S. An air-hydrogen flame was therefore used in all the early attempts to develop a method for assaying of tin concentrates. Interferences were studied by comparing results from pure tin solutions and solutions of tin containing possible interferring metal ions, added singly.

After several weeks' work using the air-hydrogen flame, no completely satisfactory method had been evolved because of the interference of silicon; no other elements were found to interfere at the maximum levels possible from panned concentrates. However, eventually a method was evolved which gives assay valves generally no more than 10% lower than the true value, though occasionally as much as 20% lower. In spite of the unsuitability of the method for good assay work, it was adequate for much of the investigational work carried out in this study (even though the assay values may have been low), and was used for all the A.A.S. assay values reported in Tables 1, 3 and 4. It will be referred to as A.A.S. method A, but it will not be described in detail in this report. The important point to know is that only 100 mgm of sample is used per assay. This necessitates that samples should be so well ground that 100 mgm is truly representative, and it is recommended that samples prepared for tin analysis should pass a sieve no coarser than 240 B.S.S.

Laboratory Report No. 28 24th August, 1967.

AN INVESTIGATION OF DISCREPANCIES IN ASSAY RESULTS ON ALLUVIAL TIN CONCENTRATES FROM KINGS PLAINS, NORTH QUEENSLAND

by

J.R. Beevers

SUMMARY

Two new methods for the assaying of Sn concentrates have been developed. Using these methods, it has been shown that discrepancies in assay results obtained from commercial laboratories, are almost entirely due to inadequate grinding of the samples prior to analysis.

INTRODUCTION

Early in 1967, Mr. Eric Webb of E.A. Webb Associates Limited, Melbourne, discussed with W.B. Dallwitz discrepancies in tin assays, carried out by various commercial laboratories, on replicate samples from the Kings Plains area, North Queensland. It was not possible to make an appraisal of the deposits until the correct assays were obtained, and Mr. Webb was anxious to know which laboratories gave the more consistent and more nearly correct results. The matter was taken up with Dr. Fisher and to discuss further the problem and to determine how best the B.M.R. could help Mr. Webb, a meeting was convened in Dr. Fisher's office at 10.30 a.m. on Wednesday, March 29th, 1967. Those present were Dr. N.H. Fisher, Messrs E.A. Webb, W.B. Dallwitz, P.W. Crohn and A.D. Haldane, and Drs. J.R. Beevers and C.D. Branch.

THE PROBLEM

At the meeting, Mr. Webb outlined the problem that faced him. He was using assay values for tin provided by at least three different laboratories. In many cases, values agreed very well, but in others, values on the same sample differed by as much as 300 - 400%. The three laboratories mainly used by Mr. Webb are A.M.D.L., Spectrometer Services, and the Department of Mining Engineering, University of Queensland. As a general rule, Spectrometer Services gave assays about 10 - 20% higher than U. of Q. A further point troubling Mr. Webb was that if the U. of Q. were correct in their assays, the super-panner used to separate the cassiterite appeared to be more than 100% efficient. This latter contingency could not of course be true, but it does not prove either that the U. of Q. assays are low. It might mean that the cassiterite grains are composite, and complete separation of cassiterite by the super-panner would therefore be impossible. This was pointed out to Mr. Webb, and he agreed that this mineralogical problem should be looked at, although he did not ask the B.M.R. to do so. Mr. Webb outlined the procedure used in the field for drilling, panning of concentrates etc., and it was evident that errors could arise from the method used to calculate the grade of alluvial material from assay values on the panned concentrates. Clearly, the B.M.R. could be of very little help in these matters. The only real contribution we in the B.M.R. could make in

TABLE 1.

ASSAY VALUES ON TIN CONCENTRATES FROM KINGS PLAINS, AS DETERMINED BY THREE LABORATORIES.

Sample No.		Assay % Sn AAS Method A.			U.of Q'ld. % Sn.	Spectrometer Services %Sn.
A 5½	22	1.27	1.28		1.40	2.10
	32.5	0.66	0.67		0.68	1.13
	53.5	3.11	3.00		2.78	3.56
	64	1.18	1.02		1.19	1.55
	74.5	6.83	7.52		5.80	7.91
	85	10.5	11.0	13.4	12.0	14.0
	95.5	8.65	10.2		6.80	9.94
B 2	85	0.18	0.12		0.23	0.29
	95.5	0.20	0.05		0.31	0.41
	106	0.77	0.68		0.98	0.94
	116.5	1.50	1.42		2.05	2.56
	127	1.12	0.88		0.90	1.00
C 17	53.5	0.23	0.33		0.48	0.79
	64	1.32	1.43		1.60	1.98
	74.5	2.06	2.30		2.12	2.80
	106	3.65	4.03		3.15	3.84
	127	11.70	11.2		9.90	10.1
	137.5	1.70	1.34		1.01	2.15
D 3	0	n.d.	n.d.		0.18	0.20
	32.5	1.83	1.95		2.05	2.63
	43	2.34	2.50		2.50	2.95
	53.5	2.80	3.02		3.05	3.41
	95.5	0.93	1.04		1.48	1.51
	106	5.40	5.14		4.70	5.25
	116.5	7.35	7.20		7.20	6.82
E 5	64	1.60	1.50		2.08	1.94
	74.5	0.41	0.30		0.36	0.72
	106	5.40	4.30		6.40	4.58
	116.5	5.60	5.40		6.90	4.99
H13	53.5	3.34	3.86		3.25	3.65
	95.5	2.33	2.60		2.80	3.21
	116.5	1.73	1.62		1.25	2.38
N 4	116.5	3.69	3.96		4.10	4.00
	127	13.4	14.1		15.6	14.7
	148	3.85	3.90		3.50	3.90
R 2	11.5	2.90	2.68		3.70	3.72
	22	4.95	5.17		4.85	4.95
	32.5	2.52	2.68		3.18	3.20
	43	3.65	3.99	3.80	6.15	4.25

n.d. not detected

TABLE 2

A SIZE ANALYSIS OF NINE SAMPLES FROM THE KINGS PLAINS AREA, NORTH QUEENSLAND

Sample No.	A5½ 85		A5½ 95.5		B2 85		B2 116.5		B2 127	
B.S.S. Size	Wt(gm)	%	Wt(gm)	%	Wt(gm)	%	Wt(gm)	%	Wt(gm)	%
+ 72	0.16	0.14	Nil		1.19	1.69	9.67	8.93	5.69	5.27
+ 85	0.43	0.38	Trace		2.41	3.41	7.46	6.89	6.67	6.18
+ 150	20.58	18.39	0.33	1.00	23.85	33.78	38.13	35.22	35.60	32.96
+ 240	16.99	15.19	0.69	2.09	10.47	14.83	14.14	13.06	15.43	14.29
- 240	73.72	65.90	31.96	96.91	32.69	46.29	38.85	35.90	44.62	41.30
Total	111.88		32.98		70.61		108.25		108.01	

Sample No.	E5 106		N4 127		N4 148		R2 32.5	
B.S.S. Size	Wt(gm)	%	Wt(gm)	%	Wt(gm)	%	Wt(gm)	%
+ 72	5.34	7.02	1.74	1.23	Nil		0.45	0.47
+ 85	4.82	6.34	4.31	3.05	Nil		0.52	0.55
+ 150	23.21	30.54	40.24	28.51	0.25	0.59	22.20	23.40
+ 240	10.31	13.56	21.02	14.90	2.50	5.85	15.60	16.44
- 240	32.35	42.54	73.81	52.31	39.95	93.56	56.10	59.14
Total	76.03		141.12		42.70		94.87	

TABLE 3

TIN ASSAYS BY AAS METHOD A, ON THE SIZE FRACTIONS OF THE NINE SELECTED SAMPLES

Sample No.	Fraction (B.S.S.)	% Sn
A 5½ 85	+ 72	9.80
	+ 85	11.3
	+ 150	12.4
	+ 240	12.7
	- 240	12.5
A 5½ 95.5	+ 150	8.40
	+ 240	8.80
	- 240	8.80
B 2 85	+ 72	0.25
	+ 85	0.20
	+ 150	0.14
	+ 240	0.30
	- 240	0.14
B 2 116.5	+ 72	2.55
	+ 85	3.08
	+ 150	1.94
	+ 240	1.64
	- 240	1.19
B 2 127	+ 72	1.52
	+ 85	1.43
	+ 150	1.00
	+ 240	0.84
	- 240	0.68
E 5 106	+ 72	7.40
	+ 85	5.00
	+ 150	6.60
	+ 240	4.75
	- 240	4.20
N 4 127	+ 72	18.0
	+ 85	13.8
	+ 150	12.7
	+ 240	11.9
	- 240	13.2
N 4 148	+ 150	2.63
	+ 240	3.08
	- 240	3.52
R 2 32.5	+ 72	4.76
	+ 85	2.51
	+ 150	2.48
	+ 240	2.90
	- 240	2.47

Weights of each fraction of each sample, in the same proportions as in the sample before size analysis, were re-combined after crushing, and thoroughly mixed by agitating in a Siebtechnik mill, without rings, for ten minutes. Each sample was then divided into four roughly equal parts using a microsplitter, and each part was bottled. Three parts of each of the samples were sent to Mr. Webb for him to distribute for analysis, to laboratories of his choice. The remaining part of each sample was analysed for tin in quadruplicate by the A.A.S. method A, and these results compared to the values calculated from the analyses of the various size fractions. All these results are shown in Table 4.

TABLE 4

ASSAYS IN QUADRUPLICATE BY A.A.S. METHOD A, OF NINE SPECIALLY PREPARED TIN CONCENTRATES

Sample No.	% Sn by analysis of composite	% Sn Average	% Sn calculated from analysis of fractions
A 5½ 85	11.7, 12.3, 11.3, 12.0	11.8	12.5
A 5½ 95.5	8.8, 8.8, 8.8, 8.8	8.8	8.8
B2 85	0.24, 0.21, 0.20, 0.20	0.21	0.17
B2 116.5	1.60, 1.70, 1.67, 1.73	1.68	1.78
B2 127	0.88, 0.90, 0.78, 0.87	0.86	0.90
E5 106	5.26, 5.26, 5.00, 5.53	5.26	5.31
N4 127	12.4, 11.6, 13.3, 13.3	12.7	12.9
N4 148	3.73, 3.73, 3.60, 3.68	3.69	3.49
R2 32.5	2.28, 2.32, 2.42, 2.53	2.39	2.55

TIN ASSAYS BY A.A.S. METHOD B

When all attempts to overcome the interference of silicon using the air-hydrogen flame had failed, a study was made of the possible interferences when using an air-acetylene flame for the assaying of tin concentrates. This study proved immediately successful. A loss in sensitivity was of course expected, but, in full compensation, the interference of silicon was eliminated. As was the case with the air-hydrogen flame, no other element was found to interfere at the levels possible in the method used.

This ability to flame directly the solutions containing Sn and Si makes the whole procedure both facile and rapid. The method will be referred to in this report as A.A.S. method B.

Results

Using A.A.S. method B, the nine carefully prepared samples were re-analysed, and the results are shown in Table 5.

TIN ASSAYS BY A.C. POLAROGRAPHY

Conventional polarography has been used for the determination of tin in steel (Allsopp & Damerall, 1949), a procedure that can be adapted quite readily to the determination of tin in geological materials, but the method is rather long. It is so involved and time-consuming that it takes longer to carry out analyses by this method, than by the standard iodometric technique, and is therefore unlikely to replace the iodometric technique for the assaying of ore-grade material.

It is not known whether a.c. polarography has previously been used for tin-assaying, but such a technique has now been developed in the B.M.R. laboratory for the assay of tin-bearing samples containing upwards of 0.2% Sn. It is much shorter than the d.c. polarographic method because preliminary chemical separations are unnecessary. The method will not be described here.

Assays of the nine carefully prepared tin samples, as determined by the a.c. polarographic method are contained in Table 5.

INTER-LABORATORY CHECK ASSAYS

In view of the inadequate preparation of the samples previously assayed by a number of laboratories, the disagreement in the inter-laboratory assays shown in Table 1 is not surprising.

The nine samples prepared in the B.M.R. laboratory have all passed 240 B.S.S., and sampling and analytical difficulties, arising from uneven grinding of the samples, should not be experienced. Differences in inter-laboratory assays should be attributable to the method used or to the operator, or to both.

Mr. Webb passed the nine well-propared samples to four laboratories for assay and their results are shown in Table 5. For convenience, the nine samples were given new numbers with a JRB prefix, and these are also shown in Table 5.

CONCLUSIONS

Two new methods for the assaying of tin concentrates have been developed. One uses A.A.S. and an air-acetylene flame; the other uses a.c. polarography. Both methods give entirely satisfactory results over the range 0.2% to 16% Sn.

It appears that the discrepancies in assays, as a result of which the work described in this report was undertaken, are due almost entirely to insufficient grinding of the samples. It is recommended that all samples prepared for Sn assay should be ground to pass 240 B.S.S. If the samples are so prepared it would seem that the choice of assayer would not influence the quality of the results.

REFERENCES

ALLSOPP, W.E., and DAMERALL, V.R., 1949 - A polarographic method for the determination of tin in steel. Anal. Chem. 21. 677.

ALLAN, J.E., 1963 - Reported in Atomic Absorption Newsletter.

TABLE 5.

INTER-LABORATORY TIN ASSAYS (VALUES IN PERCENT) ON TIN CONCENTRATES, GROUND TO PASS 240 B.S.S.

Sample No.	Sample No.	B.M.R. Polarography	B.M.R. (AAS) (METHOD B.)	B.M.R. Opt. Spect. *	Minex	Spectrometer Services	A.M.D.L.	U.of Q.
A 5½ 85	JRB 1	14.2	13.4	13.0	14.4	14.4	13.4	13.45
A 5½ 95.5	" 2	9.70	9.80	9.00	9.50	9.82	9.3	8.15
B 2 85	" 3	0.19	0.30	0.27	0.24	0.36	0.21	0.20
B 2 116.5	" 4	2.12	2.15	2.23	2.28	2.35	2.15	2.00
B 2 127	" 5	1.08	1.10	1.17	1.09	1.13	1.05	0.90
E 5 106	" 6	6.00	6.30	5.93	6.26	6.21	5.90	5.65
N 4 127	" 7	15.9	15.7	15.5	16.06	16.6	15.4	15.15
N 4 148	" 8	3.88	3.92	3.74	3.70	3.96	3.55	3.20
R 2 32.5	" 9	3.50	3.40	2.98	3.30	3.40	3.25	2.95
Standard 1% Sn		1.00	1.00					
Standard 10% Sn		10.0	9.87					
ADH(Standard 3.18% Sn)		3.14	3.16					

* Assays by optical spectrography provided by A.D. Haldane.

40

Laboratory Report No.29. 14th September, 1967.

SILICATE ANALYSIS OF ROCKS FROM THE TUMUT No.3 PROJECT, NEW SOUTH WALES.

by

C.D. Branch

Two samples of powdered rock designated M and N were submitted by the Snowy Mountains Hydro-Electric Authority for silicate analysis. The samples represent two main rock types in a sequence of volcanic units encountered in drill cores at the Tumut 3 Project.

The samples were dried at 1000°C for two hours. A lithium tetraborate fusion disc and a powder button were prepared for each sample and analysed on the Philips automatic X-ray spectrograph, PW 1210. All elements except Na_2O were calibrated against artificial standard FS24 prepared in the Divisi of Soils, C.S.I.R.O., and Na_2O was calibrated against U.S. National Bureau o Standards sample 99 containing 11.26% Na_2O.

	M (BMR/X67/133)	N(BMR/X67/134)
SiO_2	65.1	77.2
Al_2O_3	17.3	12.8
Fe_2O_3	5.34	0.86
MgO	2.56	0.73
CaO	2.35	0.43
Na_2O	5.73	7.35
K_2O	0.74	0.19
TiO_2	0.79	0.36
P_2O_5	0.07	0.00
MnO	0.07	0.02
	100.05	99.94

41

Laboratory Report No. 30: 28th September, 1967

DETERMINATION OF PHOSPHATE IN SAMPLES FROM NGALIA BASIN, N.T.

by

D.W. Bennett

The following results were obtained for the gravimetric determination of phosphate in two samples from Unit C of the Ngalia Basin Sequence, submitted by A. Wells.

Sample No.	% P_2O_5	Remarks
MD1	1.03	Fossiliferous dolomite
MD31F	1.27	Fossiliferous siltstone

The samples were collected near Yuendumu Native Settlement, Mount Doreen sheet.

42

Laboratory Report No. 31 28th September, 1967

ZINC CONTENT OF MOLONGLO RIVER WATER

by

D.W. Bennett

The following results were obtained for the determination of the zinc content of nine water samples taken on 5/9/67 from the Molonglo and Queanbeyan Rivers and submitted by Mr M Elliot of the Department of the Interior. At the time of sampling the river was in flood.

Location	ppm Zinc
A	<0.1
B	2.4
C	1.1
D	2.7
D2	3.5
E	<0.1
F	3.0
G	0.55
H	<0.1

The sampling points are as follows:

A	Molonglo River 5 miles upstream of Lake George Mine
B	Molonglo River immediately downstream of Lake George Mine
C	Molonglo River at Hoskinstown-Bungendore Road turn-off
D	Molonglo River at the 11 mile turn-off
D2	Molonglo River at Burbong Bridge
E	Queanbeyan River at Queanbeyan
F	Molonglo River at Sutton-Queanbeyan Road Bridge
G	Molonglo River at Duntroon Bridge
H	Lake Burley Griffin

Laboratory Report No. 32 22nd September, 1967

GLAUCOPHANE-BEARING ROCKS FROM THE LEONHARD SCHULTZE RIVER, SEPIK DISTRICT, NEW GUINEA

by

W.B. Dallwitz

Introduction

This report consists of brief descriptions of three epidote-muscovite-glaucophane schists from the Leonhard Schultze River, and of a sheared sericitic silty sandstone from Bomali Creek, Sepik District, New Guinea. In the glaucophane-bearing rocks glaucophane is estimated to range from 30 to 50%, muscovite from 18 to 40%, and epidote from 17 to 40%.

Petrography

Specimen 03NG0021B. Epidote-muscovite-glaucophane schist

A medium-grained schistose rock in which a well-cleaved dark grey-blue-grey mineral, muscovite, and greenish yellow epidote can be distinguished in handspecimen.

In thin section the rock is seen to consist of glaucophane (50%), muscovite (25%), epidote (17%), fine-grained (?)albite (5%), chlorite (2%), magnetite or other iron oxide (1%), and rutile (tr.). The long axes of grains of the three principal minerals and of the opaque mineral show pronounced parallelism.

The glaucophane has a low extinction-angle, and is biaxial negative. The chlorite is light green and optically positive (2V = 25 - 30°), and is probably either rumpfite or ripidolite (two optically positive chlorites with low D.R.).

Specimen 03NG0021C. Garnetiferous epidote-glaucophane-muscovite schist

A rock generally similar to 0021B is handspecimen, but containing conspicuously more muscovite. A few grains of light pinkish brown garnet form prominent knots up to 6 mm. across.

In thin section the rock is seen to consist of muscovite (40%), glaucophane (30%), epidote (20%), quartz (5%), garnet (2%), chlorite (2%), magnetite or other iron oxide (1%), and rutile (tr.).

Parallelism of the long axes of the principal constituents is not as pronounced as in 0021B. Glaucophane is markedly darker than in 0021B, and is either uniaxial negative or biaxial negative with 2V 20 to 25°; extinction angles range up to at least 32° - much too high for glaucophane - so this is a matter that will have to be investigated. Chlorite is similar to that in 0021B, but has lower 2V (10 to 20°).

Garnet (probably grossularite) occurs as a single large grain with inclusions of quartz, muscovite, epidote, and chlorite. In contrast to those in 0021B the opaque grains are more or less equidimensional or only slightly elongated.

Specimen 03NG0021A. Muscovite-glaucophane schist containing pockets, veins, and crystals of coarse epidote.

In handspecimen this rock is seen to consist of glaucophane, muscovite, pockets, veinlike-concentrations, and crystals of coarse epidote, and a few largish crystals of brown sphene. The glaucophane is paler than in that in specimens 03NG0021B and C, and for this reason its bluish colour is notably more conspicuous.

The thin section has been cut more or less parallel to the cleavage, and in it the following minerals have been identified: epidote (about 40%), glaucophane (30%), muscovite (17%), dolomite (10%), sphene (1%), chlorite (1%), and traces of rutile, garnet, and (?)albite. The glaucophane is much paler than that in 0021B, is biaxial negative, and has 2V about 40 to 45°. Chlorite is biaxial positive, and its optic axial angle is about 35°. Nearly all the carbonate occurs as fine-grained patches; it does not effervesce with 1:10 HCl, and is therefore probably dolomite. Veinlets of carbonate and possible albite are conspicuous in places, but not common. Rutile tends to occur as somewhat diffuse subparallel strings of small grains which may mark bedding.

Inclusions of small wisps and felted aggregates of glaucophane in epidote are arranged in subparallel bands which also contain some larger crystals and grains of the same mineral; these bands are parallel to the strings of rutile grains. Other inclusions in epidote are dolomite, sphene, iron oxide, rutile, and (?)albite. The epidote has probably assumed its present distribution as a result of metamorphic differentiation.

Specimen 03NG0027. Sheared clinozoisite-bearing sericitic silty sandstone

In handspecimen this rock may be described as a light yellowish grey, faintly crenulated, and slightly micaceous fine-grained sandstone.

In thin section the rock is seen to consist of quartz of fine sand size (55%) embedded in a matrix of silt-sized quartz (30%), sericite or pyrophyllite (8%), and chlorite (3%). Other minerals present are clinozoisite (2%), detrital muscovite (1%), leucoxene (1%), and traces of rutile, zircon, hematite, and brown tourmaline.

Many of the quartz grains show strain-shadows, and the long axes of elongated grains are parallel; most grains are quite irregular in outline, and their margins are strongly corroded. It is impossible to say how much of the silt-sized quartz is detrital, and how much attributable to recrystallization of the larger quartz grains; however, the presence of undamaged or more or less undamaged (by shearing) detrital muscovite flakes suggests that most of the sericite (or pyrophyllite) and silt-sized quartz is detrital rather than secondary. Clinozoisite occurs as ragged aggregates of irregular grains, flaring bunches of needles, and individual ragged grains and rare needles, and is obviously of metamorphic, and not of detrital, origin. The rock probably belongs to the greenschist faces of regional metamorphism.

Comments

It seems probable that the three glaucophane-bearing rocks were formed from dolomitic (and possibly siliceous) illitic shale.

Some useful comments on rocks of the glaucophane-schist facies are to be found in Turner and Verhoogen's 1960 edition of "Igneous and metamorphic petrology". These authors point out, for example, that unless assemblages containing lawsonite, jadeite, aegirine, or pumpellyite - and typically all four - are associated with glaucophane, the rocks would be better considered as belonging to the greenschist facies. They also state that the effects of metamorphic differentiation are commonly exemplified as monomineralic segregation-veins (cf. epidote in 0021A) in rocks of the glaucophane-schist facies.

If possible, a variety of rocks should be collected in the general area where the glaucophane-bearing rocks were found. These may provide evidence which would enable the grade of metamorphism to be more accurately assessed. Because of the abundance of muscovite it would also be advisable to collect a moderate quantity of fresh rock for isotopic dating, and possibly a check could be obtained from glaucophane as well. Specimens should, if possible, be collected from several different places to see if consistent ages are obtained.

Two recent papers on glaucophane-bearing rocks are:

Ernst, W.G., 1963 : Petrogenesis of glaucophane schists. J. Petrol. 4 (1), 1-30.

Coleman, R.G., and Lee, D.E., 1963 : Glaucophane-bearing metamorphic rock types of the Cazadero area, California. J. Petrol. 4 (2), 260-301.

Both these papers have an extensive list of references.

Laboratory Report No. 33

65/6161
12/10/67.

Examination of Salt Deposits Associated with Bituminous Concrete Road Failures

by

A.D. Haldane

Investigation by engineers of the Department of Works of a number of bituminous concrete failures in the suburbs of Downer, Watson and Hackett revealed consistent accumulation of salt below areas of damaged bituminous concrete. A sample of this salt was submitted through Dr. E.K. Carter for laboratory examination.

Subsequently additional sampling was carried out at Downer and the ABM Quarry, Federal Highway. The samples collected included the following:

(i) salt accumulations from beneath bituminous concrete failures and from the ABM Quarry

(ii) road metal base from adjacent areas of sound and damaged roadway.

(iii) uncrushed rock and fine rock fill from the ABM Quarry.

Samples of crushed rock from Federal Highway quarry (ABM), Queanbeyan quarry and Mugga quarry (BMG) were also provided by the Department of Works.

Preliminary examination of the salt deposits from under the bituminous concrete showed the salt to be a hydrated magnesium and aluminium sulphate with a trace of calcium sulphate. Four samples of salt were analysed for these constituents with the results shown in Table I.

Table I

Analysis of Salt Accumulations

All results are expressed as percent of the water soluble material free from insoluble residue.

Sample site	37 Edkins St.	29 Edkins St.	12 Edkins St.	Tardent St.
Mg	4.9%	4.3%	4.7%	4.4%
Al	6.2	6.7	6.3	6.2
SO_4	41.0	40.0	41.2	41.1
H_2O at 180°C	36.4	37.4	38.5	37.0

Table II shows the results for the determination of pH and conductivity on 1:5 suspensions of the underlying road metal and clay from the same sampling sites. All samples were screened to remove material greater than ¼".

Table II

pH and Conductivity of Road Base Samples

Sample site	37 Edkins St.	29 Edkins St.	12 Edkins St.	Tardent St.	Tardent St.
Road surface	hot mix	hot mix	hot mix	hot mix	tar seal
Condition	unsound	unsound	unsound	unsound	sound
Salt deposit	yes	yes	yes	yes	no
pH of 1:5 suspension					
Fine rock fill	3.8	3.9	3.7	4.4	8.1
Sub-grade	3.7	4.1	4.0	4.1	-
Clay	5.6	5.5	6.3	-	-
Clay base	-	7.7	7.1	6.9	5.7
Nature strip	5.7	6.0	-	-	-
Specific conductivity in micromho/cm					
Fine rock fill	2800	2300	510	790	70
Sub-grade	650	1100	670	210	-
Clay	98	170	220	-	-
Clay base	-	180	130	170	170
Nature strip	140	95	-	-	-

To obtain an approximate conversion from specific conductivity to soluble salts multiply the above values by 0.0004.

Following the determination of pH and specific conductivity the suspensions were allowed to settle and the clear supernatant liquid tested qualitatively for watersoluble sulphate. The results are set out in Table III.

Table III

Tests for Sulphate

Sample Site	37 Edkins St.	29 Edkins St.	12 Edkins St.	Tardent St.	Tardent St.
Fine rock fill	+ ve	+ ve	+ ve	+ ve	n.d.
Sub-grade	+ ve	+ ve	+ ve	+ ve	-
Clay	tr	tr	tr	-	-
Clay base	-	n.d.	n.d.	n.d.	n.d.
Nature strip	n.d.	n.d.	-	-	-

tr = just detectable   n.d. = not detected

A further series of determinations of pH and specific conducitivity and testing for soluble sulphate were carried out on samples of fresh rock and road metal. All samples of road metal were screened to pass ¼" sieve and all rock samples were ground to less than 40 mesh. The results obtained are given in Table IV.

Table IV

	pH	Sp. Cond.	Sulphate
Federal Highway quarry fine rock fill	4.5	309	+ ve
" " " Dept of Works 3958	5.6	228	+ ve
Queanbeyan quarry " " " 3915	8.1	70	n.d.
Mugga quarry (BMG) " " " S3209	8.4	106	n.d.
Federal Highway quarry weathered outcrop	6.6	22	n.d.
" " " fresh rock top bench	8.0	47	n.d.
" " " " " " "	9.0	108	n.d.

Following the preceding laboratory examinations an inspection of the ABM Quarry, Federal Highway, was made. Samples of salt encrustations were taken from the quarry face at the top, second and bottom (F) levels, also from the base of the scalpings and fine crushed rock dumps. All salt samples were examined qualitatively for ferrous and ferric iron, aluminium, magnesium, sodium, potassium, calcium, sulphate and chloride.

Salt samples taken from the top level and the south face of F level in the leached zone were found to be magnesium sulphate. Salts are not abundant in this zone.

Salt samples from the second level and the north and west faces of F level were found to contain magnesium, aluminium, sulphate in all cases. Some samples contained ferrous and/or ferric iron in addition. Salt is abundant, particularly on the north and west faces of F level. The quarry floor in places is saturated with salt.

In the upper zone with only magnesium sulphate present no acidity is found now. Where iron and aluminium appear in the salts acidity is marked. Wet areas on the quarry face and drainage water show pH values of 3 to 4.

Only trace amounts of sodium, potassium, calcium and chloride were observed in salt samples from damaged road sites and those from the ABM Quarry.

The rock being worked at the ABM Quarry is pyritic and in the course of normal oxidative weathering the pyrite is attacked with the production of ferrous sulphate in the first instance. This is readily subject to atmospheric oxidation forming ferric sulphate which then may deposit iron oxide by hydrolysis releasing sulphuric acid in the process. The sulphuric acid is then available to attack other rock minerals forming water soluble sulphates, commonly sodium, magnesium and aluminium sulphates. Aluminium sulphate is also subject to hydrolysis and as leaching proceeds the system tends toward neutrality and aluminium is removed leaving the more stable sulphates of sodium and magnesium.

49.

At the ABM Quarry the chlorite is thought to be the mineral undergoing decomposition to provide magnesium and aluminium sulphate. Decomposition of felspar would produce sodium, potassium and calcium sulphates depending on the type of felspar. No potassium and only traces of sodium and calcium were found.

From the foregoing it is reasonably established that the salt occurring beneath the bituminous concrete failures in the northern suburbs of Canberra is derived from the ABM Quarry Federal Highway. The presence of salts in the crushed rock may be readily detected by determination of the pH and specific conductivity of a 1:5 suspension of the less than $\frac{1}{4}$" fraction. Iron and aluminium sulphates give a low pH value with high conductivity while magnesium sulphate produces a neutral reaction with high conductivity.

The limited data available would suggest that pH values less than 6 and specific conductivity greater than 200 micromho/cm could indicate salt contamination.

50.

Laboratory Report No.34 11th October, 1967.

ZINC CONTENT OF MOLONGLO RIVER WATER

by

D.W. Bennett

The following results were obtained for the determination of the zinc content of nine water sampled taken on 5/10/67 from the Molonglo and Queanbeyan Rivers and submitted by Mr. M. Elliot of the Department of the Interior.

Location	p.p.m. Zinc (total)
A	< 0.1
B	6.6
C	2.75
D	2.6
D2	1.75
E	< 0.1
F	1.8
G	0.2
H	0.2

The sampling points are as follows:

A.	Molonglo River 5 mile upstream from Lake George Mine.
B.	Molonglo River immediately downstream from Lake George Mine.
C.	Molonglo River at Hoskinstown - Bungendore Road turnoff.
D.	Molonglo River at the 11 mile turnoff.
D2.	Molonglo River at Burbong bridge.
E.	Queanbeyan River at Queanbeyan.
F.	Molonglo River at Sutton - Queanbeyan Road bridge.
G.	Molonglo River at Duntroon bridge.
H.	Lake Burley Griffin.

Laboratory Report No. 35 28th October, 1967

ANALYSIS OF GEOCHEMICAL SURVEY SAMPLES FROM MOUNT ISA, QUEENSLAND

by

D.W. Bennett

The following results were obtained for the analysis of 360 auger samples taken from the Mount Isa area as part of a geochemical survey initiated by D.O. Zimmerman.

Analyses were by the Atomic Absorption method following digestion with hydrochloric acid. All results are in parts per million.

Sample No.	Cu	Pb	Zn
02 - 3434	330	120	490
35	30	60	27
36	25	170	25
37	25	40	17
38	260	< 30	20
39	20	35	15
40	< 10	< 30	12
41	65	240	25
42	30	< 30	17
43	30	< 30	15
44	75	< 30	30
45	15	35	15
46	35	35	22
47	35	35	27
48	30	< 30	22
49	15	< 30	20
50	20	35	45
51	25	< 30	45
52	35	< 30	160
53	30	< 30	45
54	35	< 30	35
55	35	< 30	25
56	40	60	175
57	30	35	560
58	30	40	300
59	25	50	107
60	135	70	165
61	45	240	85
62	30	45	60
63	60	50	67
64	20	135	47
65	75	< 30	45
66	60	< 30	15
02 - 3467	35	< 30	5
68	125	< 30	7
69	125	< 30	60
70	900	< 30	37
71	330	< 30	22
72	80	35	30
73	30	45	65
74	45	45	55
75	280	35	395
76	190	60	55
77	20	< 30	30
78	45	145	27
79	20	< 30	30
80	20	< 30	57
81	20	< 30	122
82	< 10	80	15
83	10	50	30
84	60	35	120
85	50	35	192
86	10	< 30	35
87	45	45	50
88	30	< 30	37
89	40	< 30	35
90	140	< 30	27
91	50	< 30	22
92	180	< 30	105
93	20	45	40
94	70	70	110
95	45	100	37
96	75	45	52
97	35	< 30	50
98	10	< 30	10
99	30	80	15

Sample No.	Cu	Pb	Zn
02 - 3705	45	175	240
6	25	820	40
7	210	2500	320
8	60	1850	290
9	25	140	55
10	20	150	135
11	25	115	150
12	35	75	55
13	15	70	75
14	20	70	60
15	15	70	80
16	< 10	30	15
17	12	30	45
18	20	40	45
19	25	145	50
20	25	45	55
21	20	40	35
22	15	1000	45
23	15	100	60
24	65	175	140
25	15	< 30	105
26	20	40	150
27	750	30	30
28	60	45	65
29	30	< 30	15
30	35	< 30	75
31	25	< 30	65
32	35	45	25
33	50	30	35
34	20	50	55
35	35	30	65
36	95	360	155
37	85	190	75
38	240	300	210
39	20	140	75
40	45	170	470
41	60	120	165
42	55	490	177
43	20	40	87
44	15	< 30	57
45	20	30	165
46	25	40	35
47	25	80	62
48	15	< 30	37
49	30	40	47
50	10	30	20
51	10	95	20
52	30	70	175
53	20	40	40
54	20	< 30	50
55	35	95	50
56	35	130	50
57	45	55	45

Sample No.	Cu	Pb	Zn
02 - 3758	45	55	105
59	20	40	42
60	20	< 30	65
61	20	< 30	45
62	20	< 30	12
63	45	140	65
64	65	270	87
65	25	65	95
66	20	95	37
67	30	105	55
68	20	< 30	40
69	20	< 30	37
70	45	120	72
71	50	750	260
72	160	4800	95
73	15	60	45
74	25	45	132
75	50	45	90
76	185	190	710
77	105	80	320
78	25	290	90
79	80	115	92
80	35	< 30	12
81	40	< 30	15
82	25	< 30	52
83	70	< 30	52
84	20	< 30	42
85	25	< 30	82
86	20	< 30	47
87	20	30	27
88	20	45	70
89	35	60	70
90	30	30	132
91	40	< 30	142
92	30	45	75
93	40	< 30	55
94	12	< 30	22
95	10	< 30	32
96	870	< 30	300
97	30	30	45
98	127	< 40	38
99	90	< 45	37
02 - 3800	30	< 60	20
1	75	< 150	62
2	76	< 130	65
3	146	< 45	31
4	107	< 45	54
5	230	< 270	110
6	200	< 150	50
7	195	86	77
8	120	< 120	90
9	22	< 35	52
10	15	35	40

Sample No.	Cu	Pb	Zn
02 - 3811	95	30	25
12	70	30	20
13	30	110	20
14	40	70	45
15	35	< 30	37
16	20	< 30	15
17	10	< 30	22
18	10	< 30	27
19	12	< 30	47
20	20	30	52
21	20	< 30	42
22	20	< 30	45
23	20	< 30	37
24	20	< 30	17
25	12	< 30	12
26	12	< 30	15
27	70	115	180
28	15	40	25
29	45	30	82
30	30	< 30	30
31	175	< 30	120
32	25	< 30	15
33	60	120	170
34	25	60	80
35	45	470	1600
36	60	240	360
37	75	110	150
38	60	< 30	47
39	15	< 30	10
40	150	< 30	17
41	195	30	55
42	370	< 30	7
43	240	< 30	15
44	630	< 30	25
45	290	< 30	27
46	60	< 30	15
47	22	< 30	22
48	20	< 30	25
49	40	130	850
50	35	35	500
51	40	< 30	125
52	30	< 30	160
53	30	< 30	50
54	25	< 30	142
55	55	40	85
56	30	35	230
57	15	55	7
58	< 10	70	5
59	15	55	7
60	1050	< 30	35
61	2230	< 30	17
62	2600	< 30	47
63	100	< 30	20

Sample No.	Cu	Pb	Zn
02 - 3864	970	40	12
65	800	< 30	40
66	280	< 30	20
67	45	< 30	12
68	40	< 30	5
69	110	< 30	20
70	25	< 30	5
71	25	40	12
72	85	< 30	27
73	60	35	87
74	35	< 30	170
75	40	< 30	47
76	10	50	55
77	22	40	280
78	15	40	25
79	30	35	130
80	35	< 30	107
81	15	55	35
82	45	< 30	167
83	22	< 30	122
84	< 10	< 30	5
85	< 10	< 30	5
86	310	< 30	30
87	45	< 30	75
88	170	< 30	92
89	70	< 30	155
90	15	< 30	7
91	15	< 30	102
92	< 10	< 30	17
93	40	100	320
94	25	< 30	27
95	10	< 30	12
96	10	35	14
97	50	< 30	57
98	< 10	50	7
99	20	< 30	3
02 - 3900	10	< 30	5
1	35	60	360
2	25	180	165
3	15	< 30	7
4	20	< 30	11
5	95	40	42
6	50	30	50
7	50	45	360
8	25	80	200
9	10	< 30	160
10	20	< 30	230
11	200	30	42
12	110	< 30	40
13	20	< 30	25
14	70	< 30	42
15	25	< 30	7
16	25	< 30	22

Sample No.	Cu	Pb	Zn
02 - 3917	<10	<30	7
18	<10	<30	12
19	15	<30	32
20	20	<30	52
21	15	<30	57
22	60	70	127
23	20	55	330
24	<10	35	12
25	40	100	75
26	10	55	10
27	10	<30	35
28	20	70	65
29	15	<30	30
30	52	55	85
31	10	<30	10
32	40	35	60
33	40	<30	47
34	30	<30	42
35	20	<30	47
36	34	<35	55
37	35	<30	57
38	40	<30	62
39	50	<30	72
40	20	<30	210
41	15	<30	210
42	20	<30	195
43	20	45	120
44	30	35	170
45	35	45	175
46	30	40	380
47	25	45	380
48	40	45	77
49	20	35	117
50	20	35	142
51	60	45	310
52	20	45	82
53	20	45	117
54	20	55	110
55	25	45	95
56	35	65	200
57	30	35	60
58	25	35	62
02 - 3959	50	40	70
60	25	<30	50
61	35	30	62
62	25	<30	55
63	35	40	60
64	35	<30	50
65	35	<30	40
66	35	40	50
67	35	30	57
68	20	150	45
69	15	145	15
70	25	70	17
71	20	70	360
72	80	70	620
73	20	75	87
74	20	115	30
75	320	<30	35
76	115	<30	100
77	55	<30	110
78	90	<30	140
79	190	<30	95
80	210	<30	112
81	50	<30	60
82	90	30	42
83	110	<30	20
84	65	<30	32
85	50	<30	42
86	no result		
87	25	<30	27
88	25	<30	15
89	20	<30	120
90	40	190	390
91	50	115	210
92	35	105	510
93	40	95	300
94	25	50	172
95	30	70	145
96	40	80	260
97	50	60	115
98	25	45	245
99	35	40	172

Laboratory Report No. 36

1st November, 1967.

SILICATE ANALYSES OF BOTTOM CORE SAMPLES FROM THE GULF OF CARPENTARIA

by

C.D. Branch

At the request of the B.M.R. Phosphate Group, 63 samples were analysed for the ten major oxides: SiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, TiO_2, P_2O_5, MnO. The samples represent sediments collected by Dr. C.V.G. Phipps, University of Sydney, during an oceanographic survey of the Gulf of Carpentaria.

Before the samples were received, they had been washed thoroughly in distilled water to remove all salts.

The samples were dried at 1000°c for two hours. A lithium tetraborate/lanthanum oxide fusion disc was prepared for each sample and analysed for all elements except Na on the Philips automatic x-ray fluorescence spectrometer, PW1210. The elements were calibrated against the artificial standard FS24 prepared in the Division of Soils, C.S.I.R.O. For Na determination some of the dried sample was ground to minus 200 mesh, a powder button prepared, then calibrated against U.S.N.B.S. sample 99 containing 11.26% Na_2O. However, satisfactory buttons could be prepared for only 27 samples; for the rest, the powdered sample swelled as soon as the button was removed from the hydraulic press and soon disintegrated, so these samples have not been analysed for Na.

The analytical results are recorded in Table 1.

Laboratory Report No. 36

TABLE 1.

SILICATE ANALYSES OF BOTTOM CORE SAMPLES FROM THE GULF OF CARPENTARIA.
DETERMINED BY X-RAY FLUORESCENCE ANALYSIS.

Ref.No.	X67/1	2	3	5	6	7	8	9	X67/10	11	12	15	16	17	18
Sample No.	G 160	166	168	177	193	200	227	258	G266	164	167	230	240	243	261
Lat.	11.7750S	15.4750		15.2083	9.5667	10.2750	14.2333	11.2667		15.0167	15.6833	11.5167	9.0500	8.4333	
Long.	140.4167E	140.4667		139.5250	139.4333	138.4333	137.5167	135.0833		140.4916	140.4583	137.5000	137.0750	137.0083	
S_1O_2	40.8	68.6	66.9	74.2	25.9	55.5	20.9	44.4	41.8	65.4	59.9	58.0	54.3	62.2	76.4
Al_2O_3	6.4	1.6	1.6	3.0	2.1	7.7	3.7	9.6	8.2	1.4	1.4	1.8	11.6	18.4	2.7
Fe_2O_3	2.4	0.5	0.5	1.0	4.4	3.1	2.9	3.6	3.0	0.5	0.6	0.8	4.2	6.1	1.6
MgO	4.0	2.1	2.0	3.7	8.6	6.4	8.3	7.2	7.6	4.6	4.3	5.2	6.7	4.8	3.7
CaO	44.4	26.1	27.8	16.8	57.7	25.8	62.8	33.0	36.9	27.0	31.9	33.9	20.8	4.7	14.2
Na_2O	n.d.	0.3	0.1	n.d.	n.d.	0.1	n.d.	0.3	0.2	n.d.	n.d.	0.2	0.1	0.6	n.d.
K_2O	1.0	0.7	0.5	0.7	0.2	1.1	0.6	1.3	1.2	0.5	0.5	0.5	1.5	2.5	0.5
TiO_2	0.3	0.1	0.1	0.3	0.1	0.4	0.1	0.5	0.5	0.1	0.1	0.1	0.6	1.0	0.2
P_2O_5	0.2	= 0.1	0.0	0.0	0.1	= 0.1	0.2	0.1	0.1	= 0.1	0.0	0.0	0.1	- 0.1	0.0
MnO	= 0.1	0.0	0.0	= 0.1	0.1	- 0.1	0.1	- 0.1	= 0.1	0.0	0.0	0.0	- 0.1	- 0.1	- 0.1
Total		99.6	99.5			100.1		100.0	99.5			100.5	99.9	99.4	
P_2O_5	0.20	0.02	0.0	0.0	0.15	0.04	0.20	0.10	0.13	0.04	0.00	0.00	0.10	0.07	0.00

Ref. No.	19	X67/20	21	22	23	25	26	27	28	29	32	33	34	35	37
Sample No.	264	G270	279	282	293	300	185A	186	188	191A	212	217	225	232	247A
Lat.		10.700	11.6167	12.3167		14.1000	11.4000	11.1167	10.6000	10.0167	14.8500	15.2833	14.6333	11.0000	6.5667
Long.		135.6333	137.3667	137.4833		138.1167	139.5333	139.5416	139.5416	139.4833	138.5000	137.9833	137.5167	137.4167	136.3667
S_iO_2	35.7	43.6	53.6	52.5	46.7	46.6	61.6	47.7	22.1	60.4	45.4	58.5	62.1	48.3	54.5
Al_2O_3	6.2	11.1	12.8	12.7	11.2	10.7	6.6	2.6	2.5	5.8	7.2	8.0	6.0	11.8	8.8
Fe_2O_3	2.8	3.8	4.4	4.2	3.7	3.7	2.3	1.6	2.5	4.2	2.3	2.6	2.2	4.1	16.9
MgO	7.6	7.2	6.7	7.5	6.7	6.2	4.4	5.0	6.9	5.4	5.5	4.8	4.0	5.5	5.9
CaO	45.1	31.5	19.8	20.5	28.8	29.9	23.0	42.1	65.1	22.3	37.5	23.8	24.3	27.4	10.1
Na_2O	n.d.	n.d.	0.4	0.3	n.d.	n.d.	n.d.	n.d.	0.5	n.d.	n.d.	n.d.	0.5	0.9	1.0
K_2O	0.9	1.5	1.8	1.8	1.6	1.6	1.0	0.4	0.4	1.0	1.2	1.1	0.6	1.5	1.6
TiO_2	0.4	0.6	0.7	0.7	0.6	0.6	0.4	0.1	0.1	0.3	0.3	0.4	0.3	0.6	0.5
P_2O_5	0.1	0.1	- 0.1	- 0.1	- 0.1	- 0.1	= 0.1	0.1	0.2	- 0.1	- 0.1	- 0.1	= 0.1	- 0.1	0.3
MnO	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	- 0.1
Total			100.2	100.2					100 .3				100.0	100.1	99.6
P_2O_5	0.15	0.10	0.05	0.05	0.07	0.05	0.03	0.11	0.20	0.08	0.08	0.05	0.04	0.09	0.35

Ref. No.	38	39	X67/40	41	43	45	46	47	48	49	X67/50	51	52	53	54
Sample No.	249A	276	G285	297	291	180	273	303	306	309	G312	315	318	321	324
Lat.	7.5000		12.9583	14.6667	14.0667	14.4667	10.6500	13.4833	12.9333		11.7833	11.4416	11.7333	12.3000	12.9750
Long.	135.9583		137.7333	138.0167	137.8333	139.5416	136.2833	138.2333	138.3167		138.5333	138.9000	139.2500	139.3667	139.5000
S_1O_2	70.6	21.6	48.7	45.7	46.5	61.4	30.3	46.1	46.8	36.5	47.9	56.5	58.8	46.5	35.5
Al_2O_3	4.5	6.0	8.9	6.7	7.8	5.9	8.2	11.3	11.1	8.2	10.6	7.9	7.8	8.3	8.8
Fe_2O_3	4.4	4.2	3.0	2.5	2.7	2.2	3.9	3.6	3.7	2.8	3.7	2.7	2.6	2.8	3.0
MgO	4.6	7.6	6.2	5.9	6.3	5.1	8.5	6.5	7.2	7.5	6.5	6.1	5.6	6.6	7.9
CaO	14.3	58.8	30.4	37.4	35.1	23.9	46.7	28.8	28.8	42.1	29.1	24.4	23.2	33.6	42.2
Na_2O	0.5	n.d.	n.d.	n.d.	0.3	0.6	0.4	n.d.	0.9	n.d.	0.7	0.5	0.6	0.7	n.d.
K_2O	0.8	0.8	1.3	1.0	1.2	0.6	1.0	2.3	1.3	1.2	1.4	1.2	1.2	1.2	1.2
TiO_2	0.3	0.2	0.5	0.3	0.4	0.4	0.3	0.6	0.6	0.4	0.5	0.4	0.4	0.4	0.4
P_2O_5	= 0.1	0.2	- 0.1	- 0.1	- 0.1	= 0.1	0.1	- 0.1	= 0.1	0.1	- 0.1	- 0.1	- 0.1	0.1	- 0.1
MnO	= 0.1	- 0.1	= 0.1	= 0.1	= 0.1	= 0.1	- 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1
Total	100.0				100.3	100.1	99.4		100.4		100.4	99.7	100.2	100.2	
P_2O_5	0.03	0.22	0.07	0.07	0.08	0.03	0.15	0.09	0.04	0.13	0.07	0.05	0.06	0.11	0.06

SILICATE ANALYSES OF BOTTOM CORE SAMPLES FROM THE GULF OF CARPENTARIA.
DETERMINED BY X-RAY FLUORESCENCE ANALYSIS.

TABLE 1. Cont.

Ref.No.	55	56	57	58	59	X67/60	61	63	64	65	66	67	68	69	71
Sample No.	327	330	333	336	339	G341	352	363	367	369	372	374	225	232	249
Lat.	13.5000	14.1833	14.8333	15.4333	15.9000	15.6167	14.2000	13.0583	12.5000	12.1583	11.6083	11.1416	14.6333	11.0000	7.5000
Long.	139.5833	139.6833	139.6833	139.8750	140.0333	140.4083	140.6333	140.9750	141.3416	141.0333	140.8333	140.9333	137.5167	137.4167	135.9583
S_1O_2	27.3	33.1	54.0	58.4	58.0	37.1	65.7	83.7	45.9	58.8	64.3	12.0	63.1	49.4	71.3
Al_2O_3	7.1	8.5	6.4	4.7	4.8	8.3	2.1	0.7	4.5	1.0	4.1	2.1	5.7	10.6	4.6
Fe_2O_3	2.6	2.9	2.2	1.6	1.6	2.8	0.9	0.3	1.8	0.8	1.6	2.2	2.2	3.9	1.4
MgO	8.5	8.2	6.2	5.4	5.3	7.4	4.4	2.5	6.5	3.4	3.4	8.0	3.9	5.5	5.5
CaO	49.3	44.7	29.3	27.7	28.0	41.8	26.0	11.9	40.1	34.7	25.1	72.6	23.3	27.3	14.5
Na_2O	n.d.	n.d.	n.d.	n.d.	n.d.	0.6	n.d.	0.8	n.d.	n.d.	n.d.	n.d.	0.6	1.0	n.d.
K_2O	1.1.	1.0	1.2	0.9	0.9	1.2	0.3	0.1	0.4	0.1	0.6	0.2	0.6	1.5	0.8
T_iO_2	0.3	0.3	0.3	0.2	0.3	0.4	0.1	= 0.1	0.2	- 0.1	0.2	- 0.1	0.3	0.5	0.3
P_2O_5	- 0.1	0.1	- 0.1	- 0.1	= 0.1	0.1	= 0.1	0.0	0.1	- 0.1	- 0.1	0.2	- 0.1	- 0.1	= 0.1
MnO	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1	0.0	= 0.1	0.0	= 0.1	= 0.1	= 0.1	= 0.1	= 0.1
Total						99.7		100.0					99.7	99.7	
P_2O_5	0.09	0.15	0.06	0.06	0.01	0.15	0.01	0.00	0.15	0.08	0.05	0.25	0.06	0.05	0.04

Ref. No.	72	73	74
Sample No.	355	365	383
Lat.	13.8583	12.7833	
Long.	141.2833	140.9750	
S_iO_2	74.9	77.5	50.0
Al_2O_3	2.1	1.2	2.0
Fe_2O_3	0.9	0.4	1.3
MgO	2.8	2.4	5.7
CaO	17.7	17.0	39.1
Na_2O	n.d.	n.d.	n.d.
K_2O	0.1	0.4	0.2
T_iO_2	0.2	0.1	- 0.1
P_2O_5	- 0.1	0.0	0.1
MnO	= 0.1	0.0	= 0.1
Total			
P_2O_5	0.06	0.00	0.11

\- means less than.
= means very much less than.
n.d. means not determined.

Laboratory Report No. 37 3rd November, 1967

ANALYSIS OF "COPPER" PLANT FROM ALICE SPRINGS AREA, NORTHERN TERRITORY

by

D.W. Bennett

A "copper" plant sample collected from an unmineralised area south of the Yuendumu Settlement, Northern Territory was submitted by E.C.E. Sedmik for trace metal analysis.

The results, in parts per million, are as follows:

Cu	7
Pb	< 4
Zn	2.5
Cd	< 1
Ag	< 2
Co	< 2
Ni	< 2
Cr	4
Mn	490

Determinations were by the Atomic Absorption method following digestion with nitric acid and then sulphuric-perchloric acid.

Results for another "copper" plant sample from the Mount Hardy copper deposit are given in Lab. Report No. 22.

Laboratory Report No. 38 3rd November, 1967

Analysis of Geochemical Survey Samples from Mount Isa, Queensland

by

D.W. Bennett

The following results were obtained for the analysis of 206 samples from the Mount Isa area. These samples bear the same numbers as samples taken as part of a geochemical survey initiated by D.O. Zimmerman, but also bear the grid coordinates listed below. These coordinates are thought to refer to a separate grid with origin at 76N/117. All results are in parts per million.

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3500	30	40	72	1N	00
1	25	45	125	3N	00
2	25	40	60	5N	00
3	10	< 30	27	76N	00
4	40	50	240	1S	2E
5	25	50	330	1S	3E
6	30	< 30	17	1S	14E
7	35	< 30	68	1S	4E
8	110	< 30	155	1S	5E
9	10	< 30	25	1S	6E
10	15	< 30	17	1S	12E
11	20	40	20	1S	13E
12	< 10	< 30	57	1S	2W
13	20	30	75	1S	1W
14	15	90	125	1S	1E
15	35	60	330	1N	1E
16	20	30	47	3N	1E
17	30	30	50	5N	00
18	30	75	72	7N	00
19	40	90	25	7N	13E
20	10	< 30	10	7N	12E
21	30	45	87	9N	00
22	15	< 30	42	15N	12E

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3523	20	< 30	57	17N	12E
24	20	< 30	12	17N	11E
25	10	< 30	22	19N	10E
26	< 10	< 30	7	21N	10E
27	20	< 30	17	21N	11E
28	40	< 30	20	25N	9E
29	35	45	42	25N	00
30	105	45	20	27N	00
31	< 10	< 30	10	27N	4E
32	40	40	50	27N	10E
33	55	40	122	27N	9E
34	20	55	42	29N	4E
35	35	60	12	29N	7E
36	40	45	15	29N	6E
37	15	35	10	29N	10E
38	20	45	10	29N	8E
39	17	60	15	29N	9E
40	< 10	35	< 4	31N	4E
41	< 10	< 30	10	33N	2E
42	< 10	< 30	15	33N	3E
43	25	45	15	33N	9E
44	< 10	< 30	5	33N	4E
45	< 10	< 30	15	33N	6E
46	< 10	35	5	33N	00
47	20	45	12	33N	8E
48	< 10	< 30	7	35N	2E
49	30	70	15	35N	00
50	17	< 30	22	35N	5E
51	45	35	17	37N	1E
52	< 10	< 30	5	37N	00
53	30	45	22	37N	2E
54	20	35	15	39N	2E
55	30	45	15	35N	8E
56	20	35	35	1N	2W
57	30	45	177	1N	1W

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3558	17	< 30	100	1N	3W
59	20	120	640	1N	4W
60	25	40	310	3N	4W
61	25	40	152	3N	1W
62	20	< 30	80	3N	3W
63	20	35	52	3N	2W
64	20	35	130	5N	3W
65	20	< 30	165	5N	4W
66	20	40	72	5N	2W
67	35	40	110	5N	1W
68	20	45	80	7N	4W
69	15	45	145	7N	2W
70	70	< 30	147	7N	3W
71	20	100	200	7N	1W
72	20	55	192	9N	1W
73	15	55	72	9N	2W
74	25	45	135	9N	3W
75	< 10	70	82	9N	4W
76	20	40	62	11N	2W
77	20	45	67	11N	5W
78	<10	45	95	11N	3W
79	15	<30	105	11N	4W
80	20	40	330	11N	1W
81	30	45	112	13N	1W
82	25	35	320	13N	3W
83	25	35	122	13N	2W
84	25	35	70	13N	4W
85	20	30	100	13N	5W
86	< 15	30	35	15N	5W
87	20	45	107	15N	3W
88	20	30	50	15N	4W
89	20	45	60	15N	2W
90	20	100	200	17N	3W
91	15	120	50	17N	5W
92	35	45	100	17N	4W

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3593	20	30	62	17N	2W
94	25	45	65	19N	4W
95	20	30	40	19N	2W
96	70	30	117	19N	1W
97	30	45	55	19N	3W
98	30	50	57	19N	5W
99	40	30	40	21N	3W
600	15	<30	15	21N	1W
1	40	30	50	21N	2W
2	25	45	135	21N	4W
3	35	35	95	21N	5W
4	25	30	35	23N	5W
5	50	35	52	23N	3W
6	35	<30	35	23N	4W
7	35	45	67	25N	6W
8	30	35	62	25N	5W
9	60	30	180	27N	5W
10	20	30	70	27N	6W
11	40	75	82	29N	6W
12	35	<30	75	29N	5W
13	30	30	30	31N	6W
14	40	<30	82	31N	7W
15	80	<30	20	33N	3W
16	45	145	270	33N	7W
17	35	<30	17	33N	1W
18	35	30	17	33N	6W
19	70	30	10	33N	2W
20	50	30	10	35N	2W
21	45	60	20	35N	6W
22	50	35	22	35N	3W
23	60	30	17	35N	7W
24	20	35	10	35N	1W
25	45	70	15	37N	7W
26	40	35	12	37N	1W
27	50	35	15	39N	7W

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3628	30	30	22	3N	14E
29	90	70	50	21N	12E
30	< 10	< 30	5	29N	2E
31	35	< 30	45	21N	9E
32	70	45	60	23N	10E
33	20	< 30	15	35N	4E
34	15	50	12	35N	6E
35	15	< 30	12	35N	3E
36	40	50	210	1N	13E
37	< 10	< 30	7	31N	3E
38	27	35	20	17N	10E
39	35	30	20	27N	1E
40	25	35	30	23N	8E
41	25	45	120	5N	1E
42	30	90	52	23N	9E
43	62	< 30	72	1N	14E
44	20	35	77	5N	14E
45	20	35	47	3N	13E
46	97	80	72	7N	14E
47	50	50	52	25N	10E
48	25	30	17	27N	3E
49	< 10	45	50	19N	12E
50	40	< 30	300	1N	12E
51	20	50	12	35N	9E
52	< 10	45	17	19N	11E
53	< 10	35	30	29N	5E
54	10	30	5	37N	3E
55	20	< 30	12	27N	2E
56	20	35	10	29N	3E
57	15	50	7	35N	7E
58	15	45	7	33N	2E
59	30	185	17	5N	13E
60	25	< 30	20	35N	1E
61	20	40	10	33N	7E
62	35	65	22	76N	5W

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3663	25	30	12	76N	20W
64	12	40	10	76N	3W
65	25	40	15	76N	30W
66	< 10	40	27	76N	32W
67	20	< 30	12	76N	21W
68	20	< 30	10	76N	18W
69	20	< 30	7	76N	17W
70	20	< 30	10	76N	24W
71	20	30	12	76N	7W
72	40	55	47	76N	6W
73	30	40	12	76N	2W
74	30	45	22	76N	8W
75	25	< 30	12	76N	38W
76	30	45	130	1S	00
77	40	45	20	76N	10W
78	25	45	15	76N	1W
79	25	45	17	76N	9W
80	12	< 30	7	76N	23W
81	35	40	17	76N	11W
82	50	55	55	76N	40W
83	20	45	12	76N	4W
84	25	< 30	7	76N	31W
85	40	< 30	10	76N	34W
86	55	45	37	76N	19W
87	20	< 30	7	76N	22W
88	40	40	7	76N	33W
89	20	65	75	76N	37W
90	30	< 30	7	76N	14W
91	60	< 30	10	76N	15W
92	45	30	12	76N	12W
93	25	30	10	76N	39W
94	15	30	25	76N	41W
95	15	< 30	5	76N	26W
96	60	30	40	76N	44W
97	40	40	15	76N	13W

Sample No.	Cu	Pb	Zn	Coordinates	
02 - 3698	25	30	85	76N	42W
99	15	$<$30	12	76N	29W
700	15	30	55	76N	36W
1	50	45	80	76N	43W
2	15	30	12	76N	28W
3	25	$<$30	15	76N	27W
4	15	$<$30	10	76N	35W
02 - 3705	67	30	30	76N	16W

66

Laboratory Report No. 39 8th November, 1967.

DETERMINATION OF SILICA IN HOT SPRING WATERS FROM FERGUSSON ISLAND, PAPUA.

by

D.W. Bennett

The following results were obtained for the determination of the silica in six hot spring water samples from Fergusson Island, Papua submitted by G.A.M. Taylor.

Field No.	Reg.No.	ppm SiO_2
DF1	66400153	143
DF2	154	299
DF3	155	340
DF4	156	120
DF5	157	338
DD6	66400158	74

Localities and other results for these samples are given in Laboratory Report No. 6.

Laboratory Report No. 40 8th November, 1967

ZINC CONTENT OF MOLONGLO RIVER WATER

by

D.W. Bennett

The following results were obtained for the determination of the zinc content of nine water samples taken on 7/11/67 from the Molonglo and Queanbeyan Rivers and submitted by Mr. M. Elliot of the Department of the Interior.

Location	ppm Zinc (total)
A	< 0.05
B	16.0
C	10.0
D	1.15
D2	1.25
E	< 0.05
F	1.15
G	0.07
H	0.1

The sampling points are as follows:

A. Molonglo River 5 miles upstream from Lake George Mine.
B. " " immediately downstream from Lake George Mine.
C. " " at Hoskinstown-Bungendore Road turnoff.
D. " " at the 11-mile turnoff.
D2. " " at Burbong Bridge.
E. Queanbeyan River at Queanbeyan.
F. Molonglo River at Sutton-Queanbeyan Road bridge.
G. " " at Duntroon bridge.
H. Lake Burley Griffin.

Laboratory Report No. 41 9th November, 1967.

ANALYSIS OF ROCK FROM THE WATERLOO SHEET, N.T.

by

D.W. Bennett

The following results were obtained for the analysis of a rock sample collected 5 miles east of Bullita Homestead on the Waterloo Sheet, N.T. and submitted by I.R. Pontifex.

		parts per million		
Field No.	Reg. No.	Cu	Pb	Zn
P349B	67770061B	300	< 20	17

Laboratory Report No. 42 23rd November, 1967

ANALYSIS OF GEOCHEMICAL SURVEY SAMPLES FROM MOUNT ISA, QUEENSLAND

by

D.W. Bennett

The following results were obtained for the analysis of 198 auger samples taken from the Mount Isa area as part of a geochemical survey initiated by D.O. Zimmerman.

Analyses were by the Atomic Absorption method following digestion with hydrochloric acid.

All results are in parts per million.

Sample No.	Cu	Pb	Zn	Sample No.	Cu	Pb	Zn
02 - 3500	10	35	5	02 - 3528	25	<30	15
1	<10	<30	7	29	30	<30	35
2	110	135	280	30	55	230	20
3	45	115	380	31	45	110	55
4	45	170	420	32	130	110	190
5	15	<30	107	33	50	90	520
6	10	<30	82	34	95	220	620
7	30	<30	85	35	85	195	560
8	100	<30	12	36	135	120	280
9	105	40	145	37	160	180	310
10	60	<30	200	38	35	30	165
11	30	<30	50	39	22	<30	170
12	45	<30	60	40	22	<30	170
13	35	30	70	41	60	45	140
14	30	40	52	42	60	<30	42
15	20	35	70	43	60	<30	35
16	20	35	15	44	65	40	77
17	35	<30	92	45	50	40	75
18	30	40	110	46	70	45	102
19	35	30	230	47	35	45	112
20	30	<30	50	48	50	40	200
21	30	<30	25	49	30	<30	650
22	40	<30	40	50	50	60	160
23	30	<30	10	51	22	55	200
24	35	<30	12	52	45	140	350
25	45	<30	35	53	22	45	140
26	20	<30	20	54	22	45	142
27	40	35	22	55	60	50	45

Sample No.	Cu	Pb	Zn	Sample No.	Cu	Pb	Zn
02 - 3556	35	30	40	02 - 3606	35	<30	25
57	60	45	55	7	40	35	47
58	10	50	15	8	25	<30	35
59	45	100	230	9	30	<30	32
60	35	55	75	10	20	<30	20
61	15	80	45	11	10	<30	42
62	30	45	92	12	35	<30	57
63	35	35	35	13	85	<30	145
64	20	35	15	14	35	<30	70
65	30	35	25	15	105	<30	75
66	55	<30	210	16	200	40	140
67	22	140	145	17	95	<30	32
68	22	<30	42	18	450	30	95
69	80	85	115	19	65	40	350
70	210	30	180	20	65	70	105
71	45	35	60	21	65	<30	840
72	1150	110	65	22	60	75	730
73	105	40	42	23	25	<30	37
74	35	65	100	24	35	30	32
75	90	40	25	25	20	<30	55
76	65	55	40	26	55	40	115
77	60	75	35	27	40	50	145
78	90	680	47	28	40	40	150
79	40	<30	107	29	35	70	170
80	40	<30	185	30	55	40	210
81	145	<30	50	31	40	40	130
82	165	<30	45	32	55	100	125
83	55	<30	52	33	30	70	80
84	62	<30	50	34	30	35	165
85	50	<30	50	35	40	<30	120
86	25	<30	25	36	50	35	100
87	30	35	25	37	40	35	95
88	no result			38	40	60	175
89	45	200	27	39	30	35	125
90	140	150	42	40	40	50	145
91	520	35	92	41	35	35	250
92	510	<30	115	42	40	<30	95
93	510	<30	60	43	50	<30	35
94	490	<30	50	44	40	30	57
95	280	<30	35	45	35	30	65
96	340	<30	22	46	135	30	145
97	570	<30	25	47	40	50	75
98	280	<30	27	48	30	120	67
99	87	<30	37	49	55	150	430
600	95	<30	55	50	35	40	440
1	270	<30	117	51	55	95	470
2	135	<30	420	52	35	90	250
3	220	195	230	53	40	60	200
4	105	170	880	54	50	190	470
5	40	85	32	55	45	155	400

Sample No.	Cu	Pb	Zn	Sample No.	Cu	Pb	Zn
02 - 3656	35	40	280	02 - 3680	80	30	150
57	35	70	135	81	145	200	410
58	25	45	50	82	75	570	210
59	30	60	55	83	45	370	165
60	35	55	390	84	60	6600	2200
61	45	80	590	85	30	45	130
62	1500	30	60	86	70	370	230
63	110	55	230	87	100	770	1620
64	125	40	80	88	40	510	540
65	50	40	60	89	130	370	230
66	no	result		90	30	50	47
67	"	"		91	35	70	52
68	"	"		92	55	30	65
69	"	"		93	40	40	105
70	"	"		94	35	35	105
71	40	<30	50	95	85	<30	42
72	55	<30	72	96	40	<30	45
73	35	<30	45	97	40	<30	400
74	40	<30	47	98	40	<30	260
75	35	<30	45	99	45	50	260
76	no	result		700	15	40	52
77	25	<30	62	1	45	45	72
78	25	60	50	2	15	95	37
79	55	30	80	3	45	50	130
				4	25	30	85

Laboratory Report No. 43 27th November, 1967.

PETROGRAPHIC DESCRIPTION

by

C.E. Newbigin

67370001 Sample from rock exposed by landslip in the left bank of the Ramu River Gorge, between Chasm Creek and Biriasuru River. Co-ordinates 38,200E, 96,200N, C.D.W. Drawing PH67/147

In the field this rock crops out as fresh-looking, but soft, medium grained granodiorite. The sample was submitted to determine the cause of this softness.

Under the microscope the following minerals were identified, and estimates made of the percentage composition. Quartz (10-12%), plagioclase (An50, 60-65%), orthoclase (3-5%), green hornblende (10-15%), and biotite (3-5%). This composition is in agreement with the field determination of granodiorite.

The minerals in the slide are all fresh; alteration amounts to less than 1% of the rock in the sample provided. The plagioclase contains rare amounts of sericite, and a little of the biotite is altered to chlorite. Some hornblende grains have relict cores of pyroxene and many appear to have formed originally from this mineral. None of this alteration would have contributed significantly to the large scale failure of the rock or to its present friable state in outcrop. The fabric of the rock consists of large grains of mafic minerals set in a felt of feldspar grains with interstitial quartz. Grain boundaries are rarely smooth except for biotite grains, and are strongly interlocking.

The cause of failure in the rock appears to be the intimate fracture system present in all minerals except biotite. Most minerals have broken along cleavage systems but there are also larger cracks which cut across grains and grain boundaries. This very close fracturing is probably the result of severe mechanical stress such as would be found in a zone of shearing. Outside this zone the indications are that the rock would be sound and unaltered.

Laboratory Report No. 44 27th November, 1967.

REPORT ON FOUR SPECIMENS FROM THE LOWER RAMU GORGE

by

C.E. Newbigin

67691351 - Granodiorite.

In hand specimen this is a medium grained, light coloured, acid to intermediate rock with coatings of serpentine on the joint planes.

Examination of the thin section showed that the rock was medium to coarse grained with some finer grained patches. Feldspar and quartz form an interlocking mosaic with the larger mafic minerals distributed either singly or in clusters throughout.

Quartz comprises 22% of the rock; many grains are cracked and some exhibit undulose extinction. The plagioclase crystals (46%) are mostly strongly zoned but have an average composition about sodic andesine; there is slight alteration to epidote in some grains and grain boundaries are ragged due to albite overgrowths. Albite (15%) also occurs as large slightly altered grains in the groundmass, where it fills the role of potash feldspar. Biotite (7%) altered to chlorite and epidote occurs moulded on hornblende grains or as rarely separate grains. Ragged grains of green-brown hornblende (7%) altered to tremolite-actinolite and epidote form interlocking boundaries with the other minerals.

The albite in this rock is thought to occur in place of potash feldspar and the rock has been named according to Johannsen's classification with this assumption in mind. If this assumption is rejected the rock would be called a tonalite.

The rock is strong and fresh; (alteration amounts to about 1% of the total rock). Although the quartz grains show signs of strain they are unlikely to promote failure. Serpentine coatings on joint planes and other macroscopic features are more likely to cause failure in this rock. There are no minerals present which would detract from its strength or durability.

67691352 - Highly altered ultramafic rock.

In hand specimen this rock appears to consist of rosettes of dark greenish-black fibrous crystals. In thin section large roughly square patches consisting of several minerals are seen to be set in this radiating material. The radiating mineral is tremolite-actinolite and it makes up about 50 - 60% of the rock. From relic structures and small cores it appears that this was originally hornblende. The large squarish pseudomorphs make up about 25 - 30% of the slide and consist mostly of granules of epidote with interstitial actinolite, calcite, and opaque (possibly pyrrhotite). Grains of primary hornblende, broken and disjointed by alteration make up about 5 - 10% with primary pyroxene rimmed by epidote comprising about another 3 - 5% of the rock. There are a few grains of muscovite and quartz which also may be primary.

This rock would be unstable under stress and subject to creep. The minerals present would be stable in outcrop but should be tested for reaction before use as an aggregate.

67691353 - Sub-labile feldspathic arenite.

In hand specimen this is a fine dense greenish sandstone with a few large plates of mica. In thin section the rock is shown to consist of angular to subangular grains of quartz (40 - 45%), and feldspar (5 - 8%), rounded clasts composed of clay minerals (10 - 15%), set in a matrix of poorly crystalline clay and chloritic minerals. This matrix has been altered and in places, sericite and well crystalline chlorite appear. No development of prehnite was noted. There are few grain contacts and the altered matrix forms the cement. Accessories grains of epidote, blue-green tourmaline, muscovite, and hornblende are present. Opaque grains are scattered through the matrix.

This is a sound rock without any structure or minerals visible which would promote failure in use.

67691354 - Micro-tonalite and hornblende hornfels.

In hand specimen it can be seen that this represents the contact between two rock types. One is a light coloured, medium grained, intermediate rock, and the other is a dark greenish fine grained hornfels.

The igneous rock consists of clear slightly cracked and strained quartz (35 - 40%) and plagioclase, composition zoned between sodic andesine and sodic labradorite. These two minerals form a tightly interlocking fabric in which is set greenish-brown biotite altered in part to epidote, chlorite and sphene. In the biotite are small colourless grains tentatively identified as garnet.

According to the nomenclature of Johannsen this rock is a tonalite, approaching the composition of a quartz-gabbro.

The hornfels consists of a few porphyroblasts of hornblende set in a ground mass of tiny grains of hornblende, and an interlocking, saccharoidal fabric of quartz and plagioclase (composition calcic andesine). Contamination across the contact has lead to formation of biotite in the hornfels for a distance of two to three centimetres from the contact.

The veins in the hornfels consist of either quartz and feldspar or a coarse brownish or greenish chlorite. There is a rough lineation formed by the alignment of feldspar laths parallel to the contact.

Both rocks appear to be quite sound, without minerals or structures which would impair their strength, but the nature of the contact rock would alter greatly as the distance from the contact increased.

Laboratory Report No. 45 27th November, 1967.

PHOTOGRAPHIC EXAMINATION OF SLATE FROM FORBES AND THE RESULTS OF TESTS CARRIED OUT, WITH COMPARISON AND EVALUATION

by

C. E. Newbigin

The samples submitted by Mr. A. Lea were whitish to yellowish cream with purple or, less numerous, red-brown to orange banding. The banding varies from stripes to irregular concentric rings. The bands range from ⅛ to 1½ inches in width, with some larger patches of colour (maximum dimensions in sample 3" x 8"). The samples have a dull texture; cleavage planes are powdery and slightly rough to touch. The cleavage is distinct. Bedding is parallel to the cleavage, and there appears to be a joint system normal to the cleavage.

Thin section examination shows that the slate consists of quartz and altered feldspar grains set in a fine-grained matrix. The matrix is composed of finely divided sericite with some minor clay minerals; and it contains dispersed hematite and secondary limonite. The quartz grains (average 0.02 mm) are irregular in shape and are cracked. Some feldspars are sericitised, others are altered to, and in some places entirely replaced by clay. A very few are partially replaced by carbonate minerals.

The percentage of quartz and feldspar ranges, in different laminae, from 15% to 30% but relict structures, which may represent completely altered feldspar, make up a further 10% of the rock. Sericite and minor clay minerals (av. less than 0.01 mm) constitute from 60% to 80% of the rock. Hematite is concentrated in bands and appears to be responsible for the banding visible in hand specimens.

Specimens swelled visibly when saturated with water. This indicates that some of the clays present are of the smectite (montmorillonitic) group.

RESULTS OF TESTS

	Forbes	Mintaro
Specific gravity	2.17	2.76
Water Absorption	5.99%	0.49%
Crushing Strength. Dry	6,300 lb/sq in	33,100 lb/sq in
Wet	2,450 lb/sq in	27,600 lb/sq in
Percentage loss of strength on saturation	61.2%	16.6%
Los Angeles Abrasion Value	46.42%	31.7%
Sodium Sulphate Weathering test		
Average percentage loss of weight	9.7%	less than 1%
Average number of cycles completed (max 15)	9	15

Mintaro Slate, from South Australia, is a slate known to be useful and of good endurance. On the basis of these tests, the Forbes slate appears to be of relatively low strength and poor durability. It can not be recommended for use as external facing stone. Its softness and susceptibility to abrasion indicate that it is not suitable as a paving stone for either interior or exterior use.

The stone is attractive, however, and may have some use as an interior facing stone in situations where it is not exposed to moisture or abrasion. Its usefulness would probably be improved by waterproofing.

All remarks in this report apply only to the samples submitted. No examination has been made of the source of the samples and no opinion can be expressed as to whether they are representative of the deposit.

77

Laboratory Report No. 46 28th November, 1967.

REPORT ON GOODRADIGBEE FLAGGY BASALT

by

C. E. Newbigin

A visit was made in January, 1967, to some outcrops of flaggy basalt five miles north-west of Wee Jasper. The outcrops are on the property of "Goodradigbee" belonging to Mr. D. Barber. Access is either from the Wee Jasper - Burrinjuck Dam Road and the Electricity Commission track past the Goodradigbee Homestead, or by a track from the Tumut-Yass road.

Only one large outcrop was accessible by track at the time. This is a flat-jointed basalt cliff, about 40 feet high, with two scree heaps at the foot. The heaps contain irregular, but straight-edged, slabs of basalt up to six feet long and one inch to six inches thick; most are two feet to three feet long and one inch to three inches thick.

There is little soil on the heaps but where the slabs are in contact with the soil they are stained creamy orange to red-brown. Rock that has been exposed to the weather but is unstained is light to dark grey; freshly broken rock is bluish-grey in colour. Very weathered rock (unsuitable as building stone) is spotted brown where olivine crystals have weathered out. (Weathering such as this is very unlikely to occur in fresh material during the life of a building).

In the cliff the most prominent joints are parallel and occur at irregular intervals from one to six inches, but mainly from one to three inches, apart. At the main outcrop the joint planes dip 10°E; 250 yards north, the dip is 30°S flattening to 10°S. The length and width of slabs obtainable by quarrying, depends mainly on the care with which the operation is carried out; steep joints are generally widely spaced, however in some places vertical joints three to four feet apart have divided the cliff into buttresses which would yield smaller slabs.

Slabs from the cliff are generally fresh and grey but some show iron-staining along joint planes.

Under the microscope the rock is seen to consist of a fine-grained felt of unaltered prisms of plagioclase and augite grains. Phenocrysts of olivine are set in this groundmass; they are rimmed and coated by brown alteration products but are otherwise fresh. Scattered small grains of an opaque material are fresh and do not appear to have caused staining. The fabric of the rock is interlocking, with no signs of subsidiary cleavage or microjointing.

Generally the rock is fresh and tough. Joint planes are even-smooth but not slippery; there are no vughs or voids visible. Unweathered material is generally clean and would not need washing before use. It could readily be cut to required size but sawing would probably be slow and expensive. Other methods, such as breaking, could possibly be useful but tests would be needed to determine whether controlled breaking is possible.

This rock should make a very durable dark grey cladding or flagging stone; suitability would, however, have to be confirmed by physical tests.

LABORATORY REPORT No. 47 1st December, 1967.

BEACH SAND FROM FINCHHAFEN AREA, T.P.N.G.

by

C.D. BRANCH

A sample of sand used in making concrete at Wau airport, T.P.N.G., was submitted by Dr N. H. Fisher for mineral analysis. The sand had been obtained originally from a beach in the Finchhafen area, T.P.N.G.

The sand contains about 60 to 70% dark angular grains, and the remainder is white well rounded grains which effervesce in dilute HCl.

In bromoform, all the white grains and a few black grains floated: the rest sank. The heavy minerals were then separated, using the Frantz Isodynamic Separator, into three approximately equal portions of black magnetic grains (run at 0.1 amps), a mixture of mainly composite grains of black and green minerals (run at 0.4 amps), and a nearly pure concentrate of green angular grains (run at 1 amp).

The green mineral was identified as diopside from an X-ray diffraction pattern: some small peaks in this pattern were identified as refractions from magnetite.

It is concluded that the composition of the sand is approximately:

Shell fragments	40% volume
Diopside	30% volume
Magnetite	30% volume

Laboratory Report No. 48 11th December, 1967.

ZINC CONTENT OF MOLONGLO RIVER WATER

by

D. W. Bennett

The following results were obtained for the determination of the zinc content of nine water samples taken on 7th December, 1967 from the Molonglo and Queanbeyan Rivers and submitted by Mr. M. Elliot of the Department of the Interior.

Location	ppm Zinc (total)
A	<0.05
B	18.3
C	19.4
D	1.2
D 2	0.6
E	<0.05
F	0.6
G	0.05
H	0.07

The sampling points are as follows:

A Molonglo River 5 miles upstream from Lake George Mine.

B " " immediately downstream from Lake George Mine.

C " " at Hoskinstown - Bungendore Road turnoff.

D " " at the 11 mile turnoff.

D 2 " " at Burbong Bridge.

E Queanbeyan River at Queanbeyan.

F Molonglo River at Sutton - Queanbeyan Road bridge.

G " " at Duntroon bridge.

H Lake Burley Griffin.