ASPECTS OF THE GEOCHEMISTRY OF SOME SELECTED SOUTH AFRICAN FINE GRAINED SEDIMENTS.

VOLUME II

APPENDIX I

TABLE IA: SAMPLE LOCALITIES, HAND SPECIMEN DESCRIPTIONS, AND X-RAY DIFFRACTION DATA.

KEY

Ch	–	Chlorite
I	–	Illite
K	–	Kaolinite
M	–	Montmorillonite
Py	–	Pyrite
Go	–	Goethite
He	–	Hematite
Mt	–	Magnetite
*	–	Present in moderate amount
Tr	–	Present in trace amount

SAMPLES ARE ARRANGED IN ORDER OF DECREASING GEOLOGICAL AGE.

SWAZILAND SYSTEM

FIG TREE SERIES

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Fg 1.	Main Road from Havelock to Barberton, about 2 miles south west of Emlembe trig. beacon. Farm Josef's Dal.	Prof.J. de Villiers Precambrian Research Unit U.C.T.	Dark green, well laminated shale, remarkably well preserved.	Ch	K(Tr)		Tr				
Fg 2.	As for Fg 1.	As for Fg 1.	Brown ferruginous lenses extracted manually from Fg 1	Ch	-						GO
Fg 8.	Vicinity of Ngwenya Iron deposit. 31° 01¾'E, 26° 12'S.	Geological Survey of Swaziland	Ferruginous shale from borehole core	-	-						HE
Fg 9.	Fig Tree series to west of Piggs Peak 31° 12-1/3'E, 25° 58-1/3'S.	As for Fg 8.	Weathered shale	-	-						HE
Fg 10.	Vicinity of Ngwenya Iron deposit 31° 02'E, 26° 12⅓'S.	As for Fg 8.	Ferruginous shale	-	-						MT HE
Fg 11.	As for Fg 10	As for Fg 8.	Ferruginous shale	-	-						MT HE
Fg 12.	Taken in road cutting between Sheba and Fair-view Gold Mines. Ulundi syncline.	Dr.H.Allsopp Bernard Price Institute, Johannesburg	Dark grey well laminated shale	Ch-I	K(Tr)						
Fg 13.	As for Fg 12	As for Fg 12	Dark grey well laminated shale	CH-I	K	*					
Fg 14.	As for Fg 12	As for Fg 12	Dark grey well laminted shale	CH-I	K(Tr)	*	Tr			Tr	
Fg 15.	As for Fg 12	As for Fg 12	Grey-green poorly laminated (gray-wacke)	Ch-I	K(Tr)	*	Tr		Tr		

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Other
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Fg 16	New Water Affairs Dept. canal on Farm Louieville 467 on east side of Louw's creek	As for Fg 12	Dark grey well laminated shale	Ch-I		*					
Fg 17	As for Fg 16	As for Fg 12	Dark grey well laminated shale	I	Ch(Tr)						
SF 2	Collected from a cutting on the mountain road west of the Sheba Mine, at a point slightly east of the 5/9 milestone, Northern limb of Ulundi syncline.	Dr.H.Allsopp Bernard Price Institute, Johannesburg	Fresh, medium to fine grained graywacke.	Ch	I(Tr)	*					
SF 3	As for SF 2	As for SF 2	Fresh grey graywacke. Composed of about equal amounts of clayey material and angular mineral fragments 0.6 mm.	Ch-I	-	*		Tr			
SF4A	As for SF 2	As for SF 2	Dark grey, finely laminated shale	Ch-I	-	Tr	Tr				
SF4B	As for SF 2	As for SF 2	Fresh, grey, medium to fine grained graywacke.	Ch-I	-	*	Tr				
SF 5	As for SF 2	As for SF 2	Dark grey, finely laminated shale.	Ch-I	K(Tr)	*	Tr				
SF 6	As for SF 2	As for SF 2	Dark grey, finely laminated shale.	Ch	I	*	-				
SH 2	Borehole core ZK 40, which penetrates the core of the Zwartkoppie anticline close to the Sheba mine.	As for SF 2	Extremely fine grained, grey shale	Ch-I		*	*	Tr			

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
SH 3	As for SH 2	As for SF 2	Fresh grey, finely laminated shale	Ch-I		*					
SH 6	As for SH 2	As for SF 2	Fresh grey, finely laminated shale	Ch	I(Tr)			Tr			
SH 7	As for SH 2	As for SF 2	Medium grained gray-wacke	Ch	I(Tr)	*		Tr			
Fg comp.	As for SF 2	As for SF 2	Composite shale, not to be confused with Allsopp et al (1968) sample No. C which is a composite Fig Tree Greywacke from the New Consort Mine.	Ch	I	*	Tr				
			PONGOLA SYSTEM								
			MOZAAN SERIES								
Mz 1	Mooihoek-Kabuta Area. 31° 27½'E, 26° 53-2/3' S.	Swaziland Geological Society	Ferruginous shale top of first shale band.					Tr			MT HE
Mz 2	As for Mz I	As for Mz 1	As for Mz 1, but less ferruginous								MT HE
Mz 3	Mooihoek-Kabuta area. 31° 27'E, 26° 56'S.	As for Mz 1	Mauve weathering shale, third shale band		I(Tr)						GO
Mz 4	Mooihoek-Kabuta area. 31° 26¾'E, 26° 57'S.	As for Mz 1	Mauve shale, seventh shale band.					Tr			HE
Mz 5	As for Mz 4	As for Mz 1	Pale shale, seventh shale band.		I(Tr) K(Tr)	Tr					
Mz 6	Mozaan outlier west of Mhlosheni 31° 18⅓'E, 27° 12'S.	As for Mz 1	Yellow weathering shale					Tr			GO HE
Mz 7	As for Mz 6	As for Mz 1	Slightly ferruginous								MT

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonate			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
			KHEIS SYSTEM								
Kh 1	Sample taken below base of the Kuibis series in the Fish River Canyon, from strata dipping at an angle of 50° compared to the horizontal overlying Nama sediments.	R. Danchin	Rather altered rock	I	M(Tr)			Tr		Tr	HE
			WITWATERSRAND SYSTEM								
			GOVERNMENT REEF SERIES								
Jp 10	Anglo American Corporation Borehole JY8, near Klerksdorp, Viljoenskroon District, Farm Jersey 145. 9301-9303'	Dr. E. Antrobus, Anglo American Corp.	Finely banded grey-green shale with occasional visible quartz	Ch	I	*					
Jp 9	As for Jp 10, 9229-9331'	As for Jp 10	Dark grey-green, finely banded shale, shows cross bedding and a little visible pyrite	Ch	I	*					MT
Jp 8	As for Jp 10, 7972-7974'	As for Jp 10	Light coloured shale, considerable small scale cross bedding, variations in grain size over distances of a few inches	Ch	I	*					PY
Jp 7	As for Jp 10 7701-7699'	As for Jp 10	Light coloured, fine grained shale, with occasional quartz rich lenses	Ch-I		*					
Jp 6	As for Jp 10 7410-7414'	As for Jp 10	Light coloured, finely banded, grey-green core. Fairly coarse grained in parts.	Ch-I		*					

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonate			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
			JEPPESTOWN SERIES								
Jp 5	As for Jp 10 6801-6803'	As for Jp 10	Dark, finely banded, fine grained shale	Ch							MT
JP 4	As for Jp 10 5550-5552'	As for Jp 10	Finely banded core, light bands predominate, visible quartz	Ch	I(Tr)	*					
Jp 3	As for Jp 10 5450-5452'	As for Jp 10	Finely banded core, light grey-green bands predominate		I(Tr) Ch(Tr)	Tr					
Jp 2	As for Jp 10 4200-4202'	As for Jp 10	Finely banded light grey-green core. Quartz rich.	Ch	I(Tr)	*					
Jp 1	As for Jp 10 4000-4002'	As for Jp 10	Finely banded light grey-green core. Quartz rich.	Ch	I(Tr)	*					
			SINCLAIR FORMATION								
			KUNYAS SERIES								
Kun 1	Taken on the road from Helmeringhausen to Gamochas house, about midway from Helmeringhausen.	R.Danchin and V. von Brunn Precambrian Research Unit, U.C.T.	A white, bedded, indurated shale, the shale band is underlain by arkose and conglomerate.	I	M(Tr)				Tr		
Kun 2	As for Kun 1, 10 feet higher in succession	As for Kun 1	As for Kun 1	I	M(Tr)	*					
Kun 3	Sample taken on farm Lovedale, on the road from Helmeringhausen to Sinclair and Walvis Bay	As for Kun 1	A dark, finely layered, indurated sediment, sampled from a band about thirty feet thick	I	M(Tr)			Tr			
Kun 4A	As for Kun 3	As for Kun 1	A dark shale with white laminations	I	M(Tr)	Tr	Tr				
Kun 4B	As for Kun 3	As for Kun 1	As for Kun 4A	I		Tr	Tr				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
			DAMARA SYSTEM								
Dm 1	Sample taken near Dardabis on the Windhoek road, overlying Nossib (Kämtsas) quartzites. Situated on the south-east fringe of the Damara syncline.	H.W.Fesq. Dept. of Geochemistry U.C.T.	Phyllitic shale	I-Ch	M(Tr)	*			Tr		
			MALMESBURY FORMATION								
Mm 2	Main road north of Van Rhyn's dorp, in the vicinity of the gneiss contact at the Sout River	A.J.Erlank Dept. of Geochemistry U.C.T.	Slightly metamorphosed greyish arenite, with poorly developed laminations.	I	Ch-M(Tr)	*					
Mm 3	Ciolli's quarry near new national road from Cape Town to Malmesbury	A.T.Lloyd and A.J. Erlank	The sample was taken from very near a mineralized zone characterized by abundant chalcopyrite and calcite. The sample taken however, a medium grey shale, appears in hand specimen to be completely unaffected by the nearby mineralization	I							
Mm 4	As for Mm 3	As for Mm 3	A sample of the more arenaceous Malmesbury sediment	I	M(Tr)	*					
Mm 5	A quarry near Bellville on top of a hill on the national (N2) road from Cape Town to Paarl	As for Mm 3	A sample of more argillaceous Malmesbury sediment.	I	M(Tr)	*					
Mm 6	As for Mm 5	As for Mm 3	Medium grey Malmesbury arenite	I	M(Tr) K(Tr)	*					

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Mm 7	Table View Quarry, 5½ miles past Milnerton on the Malmesbury road	R. Danchin	Dark grey indurated argillaceous shale, extremely fresh sample	I	K-M(Tr)						
			Cango Formation								
Cg 1	From a cutting near the entrance to the Cango Caves, 35 ft. towards the caves from conspicuous fault line	A.T. Lloyd	A light grey, finely laminated, micaceous shale	I	Ch			Tr			
Cg 2	From a road cutting ¾ mile below the caves on the Oudtshoorn road	A.T. Lloyd	A greyish-white, well laminated, highly micaceous sample	I							
Cg 3	Six miles outside Calitzdorp on the Ladismith-Calitzdorp road. Huis River Pass	A.J. Erlank	Fine grained, dark grey, well laminated shale	I	Ch	Tr					
Cg 4	As for Cg 1	A.J. Erlank	Light grey, finely laminated, micaceous shale	I	Ch						
			Nama System								
			Kuibis Series								
Kui 1	Bedded shale, 900' from the top of the Fish River Canyon, taken from a two foot band over and underlain by coarser members	R. Danchin	Red, horizontally disposed shale with well developed laminations	I	M(Tr)			*			
Kui 2	The sample was taken 4.5 miles from the Fish River Canyon on the road connecting the Canyon with the National Windhoek Rd.	R. Danchin	A thin band of extremely well laminated white shale, could also possibly be from the Schwarzkalk.	I	M(Tr)		Tr				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Kui 3	Sample taken 200' below Schwarzkalk limestone in the Fish River Canyon from a 2 foot band intercalated with weathered Kuibis arkose	R. Danchin	Yellowish-white somewhat silty sample, very well indurated and probably more metamorphosed than Kui 2.	I	M(Tr)		*				
Kui 4	Fish River Canyon area Exact locality unknown	G. Germs, Precambrian Research Unit UCT.	Light coloured, fissile shale	I	M(Tr)						
			Schwarzrand Series								
Schr 1	Sample taken 4 miles from Maltahohë on the road to Helmeringhausen, just below the base of the Fish River Series	R. Danchin	A green non-laminated silty rock	I-Ch		*	*				
Schr 2	Sample taken 14 miles from Konkiep on the Seeheim road, on the farm after Farm Simplon	As for Schr 1	A well-bedded, flaky green rock, which has been fairly extensively weathered	I-Ch-M		*					
Schr 3	Fish River Canyon area. Exact locality unknown	G.J. Germs	Light coloured, finely bedded shale	I	Ch						
Schr 4	As for Schr. 3	As for Schr 3	As for Schr 3	I	Ch						
			Fish River Series								
FR 1	Luderitz-Seeheim main road, on Farm Chaub, 10 miles from Seeheim	H.W. Fesq	Red, silty shale interbedded with flagstones and overlain by Fish River quartzites		I(Tr)						
Fr 2	Sample taken 28 miles from Mariental on the Maltahohë road, at a point where two prominent koppies stand on the side of the road	R. Danchin & H. Fesq	Basal, reddish coloured Fish River mudstone. Poorly laminated, and occurs finely interbedded with a dirty red sandstone.	I	M-K(Tr)	*	*	Tr			He(Tr)

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Fr 3	Sample taken in the river bed adjacent to the turn off to the Farm Voigts-grund from the main Mariental-Maltahohë rd.	As for Fr 2	Extremely hard massive rock occurring inter-bedded with coarser members which show well developed cross bedding	I	M(Tr) K(Tr)	*	*	Tr			He(Tr)
Fr 4	Sample taken 60.4 miles from Mariental on the Maltahohë road, in a road cutting next to a river bed	As for Fr 2	The sample was taken from a one foot thick argillaceous band, from a well exposed horizontally disposed sandstone sequence which shows cross bedding	I	M(Tr)	*	Tr				
Fr 5	Sample taken 37 miles from Konkiep on the Seeheim road	As for Fr 2	A moderately well laminated shale with a brownish red colour	I	M(Tr)	*	Tr	*			He
Fr 6	As for Fr 5, ½ mile further from Seeheim	As for Fr 2	Very similar in appearance to Fr 5, but probably more weathered	I	M(Tr) K(Tr)	*	*	Tr			
Fr 7	Sample taken in a deep road cut 7 miles from Seeheim in one of the tributaries of the Fish River	As for Fr 2	A greyish red, finely laminated rock	I	M(Tr) K(Tr)	*	*				Go
Fr 8	As for Fr 7, ½ mile nearer to Seeheim	As for Fr 2	Well laminated indura-ted shale with a red-dish purple colour	I	M(Tr) K(Tr)	*	*	*			
Fr 9	Sample taken just on Seeheim side of the Fish River bridge	As for Fr 2	Massive silty rock with minor shaley intercalations		I-K-M	*	*				
AEc 8	Borehole No.1, Artnell Exploration Co., on the farm Vreda 281, Gibeon District 3931'	SWA Geologi-cal Survey	Fine grained, reddish brown micaceous shale	Ch-I	K(Tr)	*	*	*			

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
AEc 9	As for AEc 8 4209'	As for AEc 8	Fine, indurated, reddish grey, micaceous shale	I	Ch	*	*	*			
AEc 10	As for AEc 8 4253'	As for AEc 8	As for AEc 9	I	Ch	*	*	*			
AEc 11	As for AEc 8 4324'	As for AEc 8	As for AEc 9	I-Ch		*	Tr	*			
AEc 12	As for AEc 8 4422'	As for AEc 8	As for AEc 9	I-Ch		*	*	Tr			
			CAPE SYSTEM								
			BOKKEVELD SERIES								
Bk 1	Western bank of the Gamka River, in close proximity to the Table Mountain Sandstone Bokkeveld contact. Second shale horizon in first shale band.	A.T. Lloyd	Massive dark grey shale	I-Ch		*					
Bk 2	As for Bk 1, third shale horizon in first shale band.	As for Bk 1	Medium-dark grey laminated shale	Ch	I	*		Tr			
Bk 3	As for Bk 1, seventh shale horizon in first shale band.	As for Bk 1	Massive mudstone, medium to dark grey	I-Ch		*					
Bk 4a	As for Bk 1, shale horizon 10 feet below second sandstone in second shale band.	As for Bk 1	Medium grey rock, slightly laminated	Ch-I	M(Tr)	*	Tr				
Bk 4b	As for Bk 4a, six feet higher in the succession	As for Bk 1	Well laminated inhomogeneous brown to greyish white shale	I	K(Tr) M(Tr)	*					
Bk 5	Near the confluence of the Dwyka and Gamka Rivers, between the rivers, sample taken from 4th shale band ten feet above the 3rd sandstone.	As for Bk 1	A light greenish-grey slightly laminated rock		I(Tr) K(Tr) M(Tr)	*					

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Bk 6A	As for Bk 5, from 4th shale band just below the 4th sandstone band	As for Bk 1	A whitish-grey well laminated shale	I	Ch(Tr) M(Tr)	*					
Bk 6B	As for Bk 6A, 2 feet higher in the succession	As for Bk 1	A medium grey, fairly massive mudstone	I-Ch	M(Tr)	*					
Bk 7	A quarry on the right hand side of the road between Prince Albert and the Swartberg Pass, about $1\frac{1}{2}$ miles outside Prince Albert; From the fifth shale band and very near to the Bokkeveld-Witteberg contact.	As for Bk 1	A light grey micaceous shale	I-Ch		*					
Bk 8	From a road quarry just before the entrance to the Swartberg Pass, from the second shale horizon, one hundred feet above the first sandstone.	As for Bk 1	A medium greenish grey sample with $\frac{1}{2}$ inch laminations	I	Ch-M	*					Py
Bk 9	As for Bk 8, 12 feet higher in the succession	As for Bk 1	A white, slightly weathered shale	I		*			Tr	Tr	
Bk 10	Taken in new road cutting in the Gamka Poort, on the South western side of the opening, first shale band just below first sandstone band.	As for Bk 1	A medium grey, slightly laminated shale, some laminations creamy-pink in colour	Ch-I		*					
Bk 11	As for Bk 10, near the middle of second shale band	As for Bk 1	A silty rock consisting of interbedded light grey and light brown laminations	Ch -I		*					
Bk 12	As for Bk 10, just below Bk 11 in the succession	As for Bk 1	A fine grained, white shale with well developed laminations	I	Ch	*					

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Bk 13	As for Bk 10, from 10 feet below Bk 12	As for Bk 1	Light brown massive shale, containing several well preserved lamellibranchs	I-Ch		*					
Bk 14	As for Bk 10, from 10 feet below Bk 13	As for Bk 1	Very light grey, massive shale with lamellibranchs	I	M-Ch(Tr)						
Bk 16	From a road cut at the top of a hill 15 miles from Ladismith on the Gamka Poort - Ladismith Road.	As for Bk 1	A medium to light grey shale with fine banding visible on fresh surfaces	I-Ch	M(Tr)						
Bk 17	From a road cut one mile south of Bk 16.	As for Bk 1	Pinkish-grey, micaceous shale, with extremely well developed laminations	I-Ch				Tr			
Bk 18	Gydo Pass, north of Ceres 33° 15'E, 19° 21'S. First Bokkeveld shale band.	R. Danchin from Dr. G. Hart, Bernard Price Institute, Johannesburg. Samples originate from Standard Vacuum Oil Co.	Greenish, poorly laminated, brachiopod bearing shale. Trilobites present.	I-Ch	M(Tr)	Tr				Tr	
Bk 19	As for Bk 18, higher in first shale band	As for Bk 18	Dark greyish black non-laminated mudstone comparatively unweathered, Trilobites present	I-Ch	M	Tr				Tr	
Bk 20	As for Bk 19, higher in first shale band	As for Bk 18	Dark, greenish-grey non-laminated mudstone comparatively unweathered. Trilobites present	I-Ch	M(Tr)						

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Bk 21	As for Bk 20, higher in first shale band	As for Bk 18	Dark grey, non-laminated mudstone, comparatively fresh.	I-Ch	M(Tr)	Tr				Tr	
Bk 22	As for Bk 21, higher in first shale band	As for Bk 18	Dark grey moderately laminated rock, quite fresh and taken in the vicinity of well developed calcareous nodules	I-Ch		Tr					
Bk 23	As for Bk 22, higher in first shale band	As for Bk 18	Light cream coloured rock	I	M-Ch	Tr					
Bk 24	As for Bk 23, higher in first shale band	As for Bk 18	Light brownish yellow shale, quite weathered	I	Ch-M						
Bk 25	Second shale band, Gydo Pass traverse	As for Bk 18	Dirty grey siltstone with a few clayey intercalcated laminations. Occasional trilobites in the vicinity	I-Ch		Tr					
Bk 26	As for Bk 25, higher in second shale band	As for Bk 18	Light greyish-green rock with moderately well developed laminations. Quite weathered	I-Ch	M(Tr)	Tr					
Bk 27	As for Bk 26, higher in second shale band	As in Bk 18	Weathered yellowish-grey rock taken in the vicinity of sparse trilobite casts.	I-Ch		Tr					
Bk 28	As for Bk 27, higher in second shale band	As for Bk 18	Poorly sorted grey rock, indurated and poorly laminated.	I	Ch-M(Tr)	*					
Bk 29	As for Bk 28, higher in second shale band	As for Bk 18	Weathered cream-grey shale	I	Ch-M	Tr					
Bk 30	As for Bk 18, third shale band	As for Bk 18	Light green, poorly laminated claystone.	I	M-Ch						

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Bk 34	As for Bk 18, fifth shale band	As for Bk 18	Light brownish green silty rock	I	M-Ch(Tr)	*					
Bk302	Sample taken about 25 miles south-east of Grahamstown, near Martindale	Dr. D.A.M. Smith, Anglo American Corporation	Dark grey massive rock	I	M-Ch	Tr					
Bk318	Sample taken about 4 miles south-west of Prince Albert	As for Bk302	Dark greyish green weathered shale	I	M-Ch	*					
Bk321	Bokkeveld outcrops near Ladismith	As for Bk302	Dark grey massive fresh mudstone	I-Ch	M	Tr	Tr				
Bk361	Sample taken in Bokkeveld exposures at Prince Alfred Hamlet	As for Bk302	Very dark blue-grey massive rock, very fresh.	I-Ch	M(Tr)	Tr					
Bk373	About 20 miles east of Worcester	As for Bk302	Pale blue-grey massive rock	I	Ch	*	Tr				
Bk389	Bokkeveld exposures south of Villiersdorp	As for Bk302	Red-yellow-buff coloured shale	I-K		Tr	Tr				
			Witteberg Series								
Wb 1	Taken from a quarry $\frac{3}{4}$ mile from Prince Albert on the road to the Swartberg Pass near the top of the Upper Witteberg	A.J. Lloyd	A very fine grained, massive reddish-grey sample	I	M-Ch(Tr)					Tr	
Wb 2	From the same quarry as Wb 1, 35 ft. lower in the succession	As for Wb 1	A greenish-grey slightly laminated sample	I	Ch-M(Tr)						
Wb 3	From a quarry about $\frac{1}{2}$ mile beyond the Voortrekker Park Rest Camp, outside Prince Albert, from the Lower Witteberg shales	As for Wb 1	A medium, light grey sample, with well developed laminations	I-Ch	M(Tr)						

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Wb 4	Near the Witteberg-Dwyka contact in the Floris-kraal Dam area south of Laingsburg. Sample taken about 50 ft. before the first tillite 33° 5'E, 20° 55'S.	As for Wb 1	A rather coarse grained non-fissile silt-stone	I-Ch		*					
Wb 5	This sample was collected by the late A.T. Lloyd and no record was kept of its exact locality, but it is believed to be the same as Wb 4.	As for Wb 1	A brownish black quite well laminated rock	I	M(Tr)						
Wb 6	As for Wb 5	As for Wb 1	A black coloured fresh well laminated shale	I	Ch (Tr) - M(Tr)						
Wb 7	As for Wb 5	As for Wb 1	A silty rock with thin dark bands	I	M(Tr)						
			KARROO SYSTEM								
			DWYKA SERIES								
Dw 1	Floriskraaldam area, south of Laingsburg	A.T. Lloyd	A silty well laminated rock	Ch	I(Tr) M(Tr)						
Dw 4	Sample taken 42 miles from Grunau on the main Vioolsdrift road	R. Danchin	A dark fine grained mudstone devoid of laminations	I	M(Tr)	Tr		Tr			
Dw 5	As for Dw 4	As for DW 4	A lighter, greyish mud-stone with very fine laminations		I(Tr) M(Tr)	Tr	Tr				
Cv 86	Borehole SS 1, Farm Klip-drift, Sutherland District Sample taken from Upper Dwyka Shales. 4904'	S.A. Geologi-cal Survey	A dark grey mudstone	I-K	M(Tr)	Tr	Tr				
LDw3/ WB	Sample taken from the white band one mile north of Floriskraaldam in Laingsburg District.	K. Perry	Very black, well laminated, carbon-aceous shale	I	K(Tr)						

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
LDw/4 WB	As for LDw3/WB	As for LDW3/WB	As for LDW3/WB	I	K(Tr)						
			ECCA SERIES								
			NORTHERN ECCA FACIES								
BEc 4265	Borehole VB/85/65 Bothaville District. Upper Ecca shales from Vierfontein Shale and Crinkly Shale zones.	J.S.McKinney Anglo American Corporation	Black, carbonaceous well laminated shale	K	I-M(Tr)	Tr	Tr	Tr			
BEc 4266	As for BEc 4265	McKinney	Dark grey-black shale, slightly carbonaceous and finely laminated	K-I-M		*	*				Py
BEc 4267	As for BEc 4265	McKinney	Dark grey-black slightly carbonaceous shale	K-M	I	*	Tr				
BEc 4268	As for BEc 4265	McKinney	As for BEc 4267	M-K	I	Tr	Tr			Tr	
BEc 4269	As for BEc 4265	McKinney	As for BEc 4267	M-K	I(Tr)	Tr	Tr			*	
BEc 4270	As for BEc 4265	McKinney	As for BEc 4267	M	K-I(Tr)	Tr	Tr			Tr	
BEc 4286	Borehole VB/79/65 Bothaville District, Middle Ecca shale from Foss Sandstone Zone	McKinney	Greyish black, well laminated, carbonaceous shale	K	I(Tr)	*	*				
BEc 4287	As for BEc 4286	McKinney	As for BEc 4286	K	I-Ch(Tr)	*	*				
BEc 4288	As for BEc 4286	McKinney	As for BEc 4286	K	I-Ch-M(Tr)	*	*				
BEc 4292	As for BEc 4286, from Lazy Shale Zone	McKinney	As for BEc 4286	K-I	I-M(Tr)	*	*				
GB45/ 64/1	Borehole GB45/64, Glenfillian Block, Wakkerstroom District, E. Transvaal. Middle Ecca Shale. Farm Beelzebub 0-89	N.J. Reid Anglo American Corporation	Argillaceous sample from sub-carbonaceous "Crinkly Sandstone Zone".	K	I	*	Tr	*			

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
GB45/64/2	As for No. 1 89-123'	Reid	Carbonaceous shale	I-K	M	*	*	Tr			
GB45/64/3	As for No. 1 123-135'	Reid	Argillaceous sample from zone of alternating fine-grained and coarse grained sediments displaying cross bedding.	I-K	M(Tr)	*					
GB45/64/4	As for No. 1 135-190'	Reid	Argillaceous sample from silty, well bedded zone	I-K	M(Tr)	*	*				
GB45/64/5	As for No. 1 190-496'	Reid	Dark shale, possibly metamorphosed by nearby dolerite dyke.	I-K	M(Tr)	*					
GB45/64/6	As for No. 1 496-522'	Reid	Argillaceous sample from a zone of well bedded grey and brown fine grained sediments	I-K	M(Tr)	*	*				
GB45/64/7	As for No. 1 522-543'	Reid	Carbonaceous shale from cross bedded crinkly sandstone zone.	K-I	M(Tr)	*	*				
GB45/64/8	As for No. 1 543-601'	Reid	Carbonaceous shale from zone containing Fritz coal seam at its base	I-K	M(Tr)		*			Tr	Py
GB45/64/9	As for No. 1 601-658'	Reid	Grey fine-medium grained silty rock, with brown knife edge beddings	I-K	M(Tr)	*	*				
GB45/64/10	As for No. 1 658-678'	Reid	Carbonaceous shale from cross bedded sandstone zone	I-K	M(Tr)		*				
GB45/64/11	As for No. 1 678-779'	Reid	Carbonaceous shale with minor coal partings	I-K	M(Tr)	*	*	Tr			
GB45/64/12	As for No. 1 779-835'	Reid	Carbonaceous shale from Main Coal Zone, which includes Alfred, Gus and Dundas Coal seams	I-K	M(Tr)	Tr	*				
GB45/64/13	As for No. 1 835-875'	Reid	Subcarbonaceous, micaceous shale	I	M(Tr) K(Tr)		*				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
GB47/64/1	Borehole GB 47/64 Glenfillian Block, Wakkerstroom District, E.Transvaal. Prospect Farm 361-I.T. 41-375'	Reid	Grey well bedded shale, possibly metamorphosed by dolerite dyke in this zone	K-I	M(Tr)	*					
GB47/64/2	As for No. 1 375-410'	Reid	Fine grained, well-bedded brown micaceous siltstone	I	K-M(Tr)	*	*				
GB47/64/3	As for No. 1 410-425'	Reid	Carbonaceous shale from the base of a zone of well bedded "crinkly" grey sandstone	K-I	M(Tr)	*	*	Tr			
GB47/64/4	As for No. 1 425-466'	Reid	Fine grained brown well bedded, siltstone	I-K	M(Tr)	*	*	Tr			
GB47/64/5	As for No. 1 466-487'	Reid	Carbonaceous shale from zone of brown and grey, cross bedded sandstone containing garnets.	K-I	M(Tr)	*	*	Tr			
GB47/64/6	As for No. 1 487-530'	Reid	Argillaceous member from a zone of white to brown, micaceous, well bedded sandstone & siltstones.	K-I	M(Tr)	*	*	Tr			
GB47/64/7	As for No. 1 530-608'	Reid	Carbonaceous shale from sandstones zone containing Fritz Coal seam	K-I	M(Tr)	*	*	Tr			
GB47/64/8	As for No. 1 608-657'	Reid	Argillaceous member from well bedded sandstone zone	K-I	M(Tr)	*	*	Tr			
GB47/64/9	As for No. 1 657-752'	Reid	Black shale from zone containing Alfred, Gus and Dundas coal seams	I-K	M(Tr)	*	*				
GB47/64/10	As for No. 1 752-799'	Reid	Carbonaceous shale from zone of grey and brown micaceous cross bedded sandstones	I-K	M(Tr)	Tr	*				
GB47/64/11	As for No. 1 799-828'	Reid	Carbonaceous shale from zone of medium grained sandstones and Coking coal seam	I	K	*	*				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
GB48/65/1	Borehole GB48/65, Glenfillian Block, Wakkerstroom, District E.Transvaal. Prospect Farm 361-IT. 225-247'	Reid	Carbonaceous shale from base of "crinkly" Sandstone Zone	I-K	M(Tr)	*	*				
GB48/65/2	As for No. 1 247-286'	Reid	Carbonaceous shale from zone of predominantly white to grey, faintly "crinkly" sandstones	I-K	M(Tr)	*	*	Tr			
GB48/65/3	As for No. 1 286-311'	Reid	Carbonaceous shale from a zone of cross-bedded medium to coarse grained sandstones	I-K	M(Tr)	*	*				
GB48/65/4	As for No. 1 311-366'	Reid	Argillaceous sample from well-bedded sandstone zone	K-I	M(Tr)	*	*				
GB48/65/5	As for No. 1 366-389'	Reid	Carbonaceous, micaceous shale from zone of alternating shales and "crinkly sandstones"	K-I	M(Tr)	*	*	Tr		Tr	
GB48/65/6	As for No. 1 389-451'	Reid	Sub-carbonaceous shale from a zone predominantly comprised of sandstones	K-I	M(Tr)	*	*				
GB48/65/7	As for No. 1 451-493'	Reid	Carbonaceous shale from zone of alternating shales and sandstones	K-I	M(Tr)	*	*				
GB48/65/8	As for No. 1 493-612'	Reid	Argillaceous sample from sandstone zone containing abundant garnets	K	I(Tr) M(Tr)	*	*				
GB48/65/9	As for No. 1 612-649'	Reid	Carbonaceous shale from zone of alternating shales and sandstones and containing Alfred seam.	K-I	M(Tr)	*	*			Tr	Py
GB48/65/10	As for No. 1 649-702'	Reid	Carbonaceous shale from zone of alternating shales and sandstones containing globular pyrite	K-I	M(Tr)	*	*			Tr	Py

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
GB48/65/11	As for No. 1 702-758'	Reid	Carbonaceous shale from zone of medium to coarse grained sandstones with irregular coal and shale partings	K-I	M(Tr)	*	*				
GB48/65/12	As for No. 1 758-796'	Reid	Carbonaceous shale from zone of alternating shales and sandstones, as well as Gus and Dundas coal seams	K-I	M(Tr)	*	*				
GB48/65/13	As for No. 1 796-828'	Reid	Sub-carbonaceous shale from zone of cross bedded sandstones	K-I	M(Tr)	Tr	*	Tr			
A62/1	Borehole A62, Farm Klippan just south of Wonderfontein in the Hendrina-Middelburg District. E. Transvaal 91-97'	R.Whittaker. Anglo American Corporation	Extremely carbonaceous, finely laminated black shale, with very little visible arenaceous material present.	K	I(Tr) M(Tr)		Tr			Tr	
A62/2	As for No. 1 131-139'	Whittaker	As for A62/1	K	I(Tr) M(Tr)		Tr			Tr	
A62/3	As for No. 1 158-161'	Whittaker	As for A62/1	K	M(Tr)		*			Tr	
A62/4	As for No. 1 163-164'	Whittaker	As for A62/1	K	M(Tr) I(Tr)		*				
A62/5	As for No. 1 172-174'	Whittaker	As for A62/1	K	M(Tr) I(Tr)		Tr				
A62/6	As for No. 1 191-195'	Whittaker	As for A62/1	K	I(Tr) M(Tr)		*				
A76/1	Borehole A76, Farm Klippan just south of Wonderfontein in the Hendrina-Middelburg district, E. Transvaal 32-43'	Whittaker	Extremely carbonaceous, fresh, finely laminated black shale with very little arenaceous component present	K	I(Tr) M(Tr)		Tr				
A76/2	As for No. 1 97-103'	Whittaker	As for A76/1	K	M(Tr) I(Tr)		*				
A76/3	As for No. 1 103-106'	Whittaker	As for A76/1	K	M(Tr) I(Tr)		Tr				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
A76/4	As for No. 1 106-112'	Whittaker	As for A76/1	K	M(Tr) I(Tr)		Tr				
A76/5	As for No. 1 121-131'	Whittaker	As for A76/1	K	M(Tr) I(Tr)		*			Tr	
A76/6	As for No. 1 135-139'	Whittaker	As for A76/1	K	I(Tr) M(Tr)		Tr			Tr	Py
A78/1	Borehole A78, Farm Nooitgedacht, south of Farm Klippan in the Hendrina-Middelburg district. E. Transvaal. 68-69'	Whittaker	Extremely carbonaceous, fresh, finely laminated, black shale with very little arenaceous component present	K	M(Tr) I(Tr)		*				
A78/2	As for No. 1 72-74'	Whittaker	As for A78/1	K	I(Tr) M(Tr)		*				
A78/3	As for No. 1 81-84'	Whittaker	As for A78/1	K	M(Tr)		*				
A78/4	As for No. 1 88-92'	Whittaker	As for A78/1	K-I	M(Tr)		*				
A78/5	As for No. 1 109-110'	Whittaker	As for A78/1	K	I-M(Tr)		Tr				
A78/6	As for No. 1 119-133'	Whittaker	As for A78/1	K	I-M(Tr)	Tr	*			Tr	
A78/7	As for No. 1 133-136'	Whittaker	As for A78/1	K	I-M(Tr)		*			Tr	
A78/8	As for No. 1 137-144'	Whittaker	As for A78/1	K	I-M(Tr)	Tr	*			Tr	
A78/9	As for No. 1 165-169'	Whittaker	As for A78/1	K	I-M(Tr)		*				
A78/10	As for No. 1 182-192'	Whittaker	As for A78/1	K-I	M(Tr)		Tr				
A78/11	As for No. 1 197-198'	Whittaker	As for A78/1	K	I-M(Tr)						Py
A78/12	As for No. 1 201-202'	Whittaker	As for A78/1	K	I-M(Tr)		Tr				
A78/13	As for No. 1 205-211'	Whittaker	As for A78/1	K	I-M(Tr)		*				
SEc1	Borehole Somkele N1, Mtubatuba, N. Zululand. 1050'. (The Ecca Beaufort boundary in this area is not well defined, and it is probable that the first few samples are Lower Beaufort shales	G. Morano Geological Survey, Mtubatuba	Black highly carbonaceous shale	I-K	M(Tr)	*		Tr			

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
SEc 2	As for SEc 1 1085'	Morano	Black highly carbonaceous shale with plant fossils	K	I-M(Tr)			Tr			Py
SEc 3	As for SEc 1 1375'	Morano	Black massive shale	K-I	M(Tr) Ch(Tr)	*	Tr	Tr			
SEc 4	As for SEc 1 1440'	Morano	Black massive shale	I-K	M(Tr)	*		Tr			
SEc 5	As for SEc 1 1480'	Morano	Black highly carbonaceous shale	I-K	M(Tr)	*					
SEc 6	As for SEc 1 1640'	Morano	Black massive carbonaceous shale	I-K	M(Tr)	*					
SEc 7	As for SEc 1 1675'	Morano	Black massive shale	I-K	M(Tr)	*					
SEc 8	As for SEc 1 1750'	Morano	Black massive shale	I	M(Tr)	*					
SEc 9	As for SEc 1 1800'	Morano	Black massive carbonaceous shale	I	K(Tr)	*					
SEc 10	As for SEc 1 2234'	Morano	Black massive carbonaceous shale	I-K		*					
SEc 11	As for SEc 1 2262'	Morano	Black highly carbonaceous shale	I	K(Tr)	Tr					
SEc 12	As for SEc 1 2350'	Morano	Black massive carbonaceous shale	I	K	*					
SEc 13	As for SEc 1 2420'	Morano	Black highly carbonaceous shale	I-K		Tr					
SEc 14	As for SEc 1 2490'	Morano	Black carbonaceous shale	K-I	M(Tr)	Tr					
SEc 15	As for SEc 1 2745'	Morano	Black carbonaceous shale	I-K	M(Tr)	Tr					
SEc 16	As for SEc 1 2837'	Morano	Black massive shale	K-I	M(Tr)	*					
SEc 17	As for SEc 1 3055'	Morano	Black massive shale	I-K	M(Tr)	*	*				
SEc 18	As for SEc 1 3205'	Morano	Black massive shale	I-K	M(Tr)	*					Py
SEc 19	As for SEc 1 3414'	Morano	Black massive shale	I-K	M(Tr)	*	Tr				Py

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
SEc 20	As for SEc 1 3498'	Morano	Black carbonaceous massive shale	I-K	M(Tr)	*	Tr				Py
SEc 21	As for SEc 1 3525'	Morano	Black massive carbonaceous shale	K-I	M(Tr)	*					
SEc 22	As for SEc 1 3575'	Morano	Black massive carbonaceous shale	K-I	M	*					
SEc 23	As for SEc 1 3684'	Morano	Black massive carbonaceous shale	I-K	M(Tr)	*	*				
SEc 24	As for SEc 1 3730'	Morano	As for SEc 23	I-K	M(Tr)	*					
SEc 25	As for SEc 1 3893'	Morano	Black massive carbonaceous shale	K	M(Tr) I(Tr)						Py
SEc 26	As for SEc 1 4160'	Morano	As for SEc 23	K-I	M(Tr)	*					
Ec Dan 1	Middle Ecca Shales from Dannhauser Borehole G.S.O.9. 421'	Geological Survey, Pretoria	Black carbonaceous shale with fine, well developed laminations	K-I	M(Tr)	*					
Ec Dan 2	As for Ec Dan 1 473'	As for No.1	As for Ec Dan 1	K-I	M(Tr)	*					
Ec Dan 3	As for Ec Dan 1 603'	As for No.1	As for Ec Dan 1	K-I	M(Tr)	*	*				
Ec Dan 4	As for Ec Dan 1 615'	As for No.1	As for Ec Dan 1	K-I	M(Tr)	Tr	Tr				
Ec Dan 5	As for Ec Dan 1 638'	As for No.1	As for Ec Dan 1	K-I	M(Tr)						Py
Ec Dan 6	As for Ec Dan 1 875'	As for No.1	As for Ec Dan 1	K-I	M(Tr)	*	*				
Ec Dan 7	979' Borehole G.S.O.10.	As for No.1	Dark grey well laminated silty specimen	I	M(Tr) K(Tr)	*	*				
Ec Dan 8	986' Borehole G.S.O.10.	As for No.1	As for Ec Dan 7	K-I	M(Tr)	*	*			*	
Ec Dan 9	As for Ec Dan 1 1188'	As for Ec Dan 1	Black carbonaceous shale, quite well indurated, and finely laminated	K-I		*	*				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Ec Dan 10	As for Ec Dan 1 1318'	As for Ec Dan 1	As for Ec Dan 9	I-K	M(Tr)	*					
Ec 4	Springbok Colliery Ltd. Borehole BH 134. Middle Ecca Shale. 26° 05'E, 29° 21'S. 16 miles S.E. of Witbank. 117'	Danchin	Black well laminated shale, notably fine grained	K	M(Tr) I(Tr)						
Ec 5	As for Ec 4 154'	Danchin	Black shale with minor white quartzose bands	K	I	Tr				Tr	
Ec 6	As for Ec 4 221'	Danchin	Black fine grained, well laminated shale	K	I						
Ec 7	As for Ec 4 255'	Danchin	Indurated black shale	K	I		*			*	
Ec 8	As for Ec 4 380'	Danchin	Indurated, black, slightly sandy shale	K	M(Tr) I(Tr)		Tr				
Ec 9	As for Ec 4 270'	Danchin	An indurated black shale	K	I-M(Tr)		Tr			Tr	
Ec 10	As for Ec 4 277'	Danchin	As for Ec 9	K	I-M(Tr)		Tr				
Ec 11	Vierfontein Collieries, near Orkney. 27° 05'E, 26° 48'S. Borehole VG 520 Middle Ecca Shale from 132 feet, 20 feet above top coal seam	Danchin	Laminated black shale	K	I-M	Tr					
Ec 12	As for Ec 11, Borehole VG 523, depth 166 feet	Danchin	Silty black shale, well developed laminations	I-K	M	*	*				
Ec 13	As for Ec 12, depth 196 ft. 120 ft. above bottom coal seam	Danchin	Poorly laminated black shale	K	M I(Tr)						
Ec 14	As for Ec 11, hand specimen from 1 ft. above bottom coal seam	Danchin	Poorly laminated, very carbonaceous black shale	K	M(Tr)						

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Ec 15	As for Ec 14, sample from hanging of bottom seam	Danchin	Black shale, extremely carbonaceous, coaly in parts	K	M(Tr)						
Ec 16	As for Ec 14	Danchin	Non-laminated black shale	K			Tr				
Ec 17	Roadcut on the Volksrust-Newcastle road, 25 miles from Newcastle	Danchin	Dark grey poorly laminated shale, rather weathered	I	K-M						
Ec 18	Lower Ecca shale 5 miles west of Vryheid, on Vryheid-Dundee road	Danchin	Brownish grey, massive shale, laminated in rather broad bands	I	M-K(Tr)	Tr	Tr				
Ec 19	Smallish quarry 2 miles south of Vryheid (Mahlabatini) Lower Ecca shale.	Danchin	Dark grey, reasonably fresh well laminated shale	I	M(Tr) K(Tr)	Tr					
Ec 20	Anglo American borehole Bh 54/63(?) exact locality unknown	G.F.Hart Bernard Price Institute, Johannesburg	Sample taken because it consists almost entirely of massive siderite							*	
Ec 21	Unvoti river, north of New Hanover, south of Greytown 29° 09'E, 30° 38'S. Lower Ecca shale	R.Danchin & G.Hart from Standard Vacuum Oil Co.	Dark greenish-grey fissile shale	I	M(Tr)						
Ec 22	As for Ec 21, Lower Ecca shale	As for Ec21	Dark greenish grey, fissile shale		M(Tr) I(Tr) K(Tr)						
Ec 23	As for Ec 21, Lower Ecca shale	As for Ec21	As for Ec 22	I	M(Tr) Ch(Tr)	Tr	Tr				
Ec 24	As for Ec 21, Lower Ecca shale	As for Ec21	As for Ec 22	M-I	K(Tr)						
Ec 25	As for Ec 21, Lower Ecca shale	As for Ec21	Dark grey, silty indurated sediment		I(Tr) M(Tr) K(Tr)						
Ec 27	As for Ec 21, Lower Ecca shale	As for Ec21	Dense, dark, bluish grey, well laminated shale	I	M(Tr)						

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
Ec 30	As for Ec21, Upper Ecca shale	As for Ec 21	Dark black shale with occasional thin sandy bands; quite fresh	I	M(Tr)	Tr	Tr				
			SOUTHERN ECCA FACIES								
QU 19	Borehole QU1/65 Quaggasfontein, Fraserburg. 31°50'E, 21°36'S. Upper Ecca shale 2708'	Geological Survey, Pretoria	Dark grey, well laminated shale	I-Ch		*					
QU 23	As for QU 19. Middle Ecca shale. 4628'	As for QU19	Brownish grey shale notably fine grained	I	Ch(Tr)	*	*				
SA 27	Borehole SA1/66. Saambokkraal, Laingsburg. 32°40'E, 21°20'S. Upper Ecca shale 4829'	As for QU19	Fine grained, fresh, dark grey shale	I-Ch	K	*					
SA 31	As for SA 27, Middle Ecca shale, 7054'	As for QU19	As for SA 27	Ch-I		*					
SA 34	As for SA 27, Lower Ecca shale, 8889'	As for QU19	As for SA 27	I-K		*					
R 2	Top of Ecca Pass north of Grahamstown	P.J.Ryan Anglo American Corporation	Very fine grained, finely laminated shale	I							
Ec 1	Floriskraaldam area, south of Laingsburg, sample taken ½ mile north-west of the dam about 500 feet above white band. Lower Ecca shale	A.T.Lloyd	A medium grey, rather coarse grained well laminated shale	I-Ch	M(Tr)	*					
Ec 2	From a road cut 2½ miles south of Laingsburg on the road to Floriskraaldam, 750 feet above white band. Lower Ecca shale	A.T.Lloyd	Similar in appearance to Ec 1, but colour variations somewhat more marked and cross bedding visible	I	M(Tr)	*					
Ec 3	As for Ec 2, one foot higher in the succession	A.T.Lloyd	Homogeneous medium grey laminated shale	I-Ch	M(Tr)	*		*			
WEC17	Seven miles on the road to Laingsburg from the Sutherland-Matjiesfontein crossing	R.Danchin & P.Hofmeyr	Massive, dense Fe-Mn shale with metallic lustre on fresh surfaces					*			Fe-Mn oxide

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
			CENTRAL ECCA FACIES								
R 1	Port St. John's, Transkei	P.J.Ryan, Anglo American Corporation	Carbonaceous, moderately well laminated shale	I	Ch	Tr		Tr	Tr		
AB 1	Borehole No. AB1/65, Abrahamskraal, Victoria West, 31° 48'E, 22° 37'S, Upper Ecca shale - depth 4311'. Very close to the border between the Southern and Central Ecca Facies.	Geological Survey, Pretoria	Dark, grey, well laminated shale	I-Ch		*					
AB 4	As for AB1, top of Middle Ecca shale, depth 4718'	As for AB1	Dark grey, poorly laminated mudstone	I		*					
AB 7	As for AB1, Middle Ecca shale, depth 5673'	As for AB1	Dark grey, well laminated shale	I-Ch		*					
PR 40	Borehole SS3, Abrahamskraal Victoria West, depth 4393', Upper Ecca shale	M.J. Leith Geological Survey, Beaufort West.	Greyish-brown, poorly laminated silty rock	I-K		*					
PR 41	As for PR 40, Middle Ecca shale - depth 5772'	As for PR40	Light grey mudstone with moderate laminations	I	M(Tr) K(Tr)	*					
KL 14	Borehole KL1/65, NE of Sutherland, Middle Ecca shale, depth 1495' very close to junction between Western, Southern and Central Ecca Facies	Geological Survey, Pretoria	Light grey well laminated siltstone	I-Ch		*					
KL 17	As for KL 14, Lower Ecca shale, depth 2272'	As for KL14	Light grey, weathered shale	Ch-I		*					
CV 66	Borehole SS1, Farm Klip Drift, Sutherland District. Lower Ecca shale, depth 1555', very close to junction between Western, Southern and Central Ecca Facies	Geological Survey, Sutherland	Dark grey mudstone	I-K	M(Tr)	*					

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
CV 71	As for CV 66, Lower Ecca shale, depth 2360'	As for CV 66	Dark grey mudstone	K	M(Tr) I(Tr)	*					
CV 75	As for CV 66, Lower Ecca shale, depth 3493'	As for CV 66	Dark grey mudstone		M(Tr) I(Tr) K(Tr)	*				Tr	
WEc 1	5 miles from Britstown on Prieska road. New road cut	R. Danchin & P.Hofmeyr	Very fresh grey-green shale, fairly well developed laminations	I	Ch(Tr)	*				Tr	
WEc 3	About 1 mile outside Britstown, at the Vosburg turn off from the Prieska road	As for WEc 1	Moderately well bedded greenish-grey shale with dark streaks	I	Ch	*					
WEc 4	As for WEc 3	As for WEc 1	As for WEc 3	I-K	Ch(Tr)	*	Tr				
WEc 5	Jacob's Farm, Soutpan, 35 miles North West of Vosburg. Sample taken from deep, recent trenches, Middle Ecca shale.	As for WEc 1	Well bedded greenish-grey fresh shale	I	Ch(Tr)	Tr					
WEc 5B	As for WEc 5	As for WEc 1	Black shale finely laminated with alternate light and dark bands	I				*			
WEc 5C	As for WEc 5	As for WEc 1	Pure black well laminated carbonaceous shale	I							
WEc 5D	As for WEc 5	As for WEc 1	Light coloured extremely finely laminated shale	I							
WEc 5P	As for WEc 5	As for WEc 1	Carbonaceous shale with plentiful visible pyrite		K			*			Py
WEc 7	Kareekop, 31 miles from Williston on the Brandvlei road	As for WEc 1	Greenish-grey, poorly bedded, silty shale	I	Ch	*					
WEc 8	Flat lying shale collected 0.8 miles North of Sakrivier	As for WEc 1	As for WEc 7	I	Ch(Tr)	Tr	Tr				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
WEc 9	Tweeriviere, 3.7 miles north of WEc 8	As for WEc 1	Brownish-grey, fresh, shale poorly laminated	I	Ch	*		Tr			
WEc 10	Farm Enkeldoorn, 68 miles from Williston, 16.7 miles north of Sakrivier	As for WEc 1	Brownish-green weathered, well bedded siltstone	I	M(Tr)	*					
WEc 11	Tontelbos intersection on new tar road from Brandvlei to Calvinia	As for WEc 1	Blueish-grey, massive, fresh shale	I-K	Ch(Tr)	*	*				
WEc 12	New road cut 22.7 miles from Tontelbos intersection on Brandvlei-Calvinia road	As for WEc 1	Greyish-blue well bedded shale	I	Ch	*	Tr				
			<u>WESTERN ECCA FACIES</u>								
AEc 1	Borehole No. 1, Artnell Exploration Co. Farm Vreda 281, Gibeon District, S.W.A. Depth 796 ft.	Geological Survey, S.W.A.	Dark grey shale with micaceous partings	I		Tr	Tr				
AEc 2	As for AEc 1, depth 967'	As for AEc 1	Hard, black, carbonaceous shale	M-K	I(Tr)	*	*			Tr	
AEc 3	As for AEc 1, depth 1642'	As for AEc 1	Hard, light grey shale, with carbonaceous bands	I-K		*	*	Tr	Tr	*	
AEc 4	As for AEc 1, depth 1217'	As for AEc 1	Fine grained, poorly laminated, light grey sediment	K-M	I	*	Tr				
AEc 5	As for AEc 1, depth 1550'	As for AEc 1	As for AEc 4	I	K-M	*	Tr				
AEc 6	As for AEc 1, depth 1699'	As for AEc 1	As for AEc 4	I-K	M(Tr)	*	*				
AEc 7	As for AEc 1, depth 2060'	As for AEc 1	Fine, grey shale with medium size quartz pebbles	K	M(Tr)	*	Tr				
WEc 13	Road cut on Calvinia-Williston road, 10 miles from Calvinia	R. Danchin P. Hofmeyr	Light blue, massive mudstone	K-I	Ch(Tr)	*	*				

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
WEc 14	Sutherland-Matjiesfontein road, 28 miles from Sutherland. (Possibly a lower Beaufort shale)	As for WEc 13	Fresh, well-bedded, dark blue shale	I-Ch		*	*				
WEc 15	Ceres-Sutherland road, 22 miles from Ceres turn off. (Possibly a Lower Beaufort shale)	As for WEc 13	Dark, greyish blue, rather weathered siltstone	I-Ch		*	*				
			BEAUFORT SERIES								
Bf 1	Five miles outside Bloemfontein in a new road cut on the Brandfort road.	R.Danchin	Argillaceous green sediment, interbedded with green Beaufort siltstones showing prominent cross bedding	I	K(Tr) M(Tr)	*	Tr				
Bf 2	Road cut 1 mile outside Richmond, on the Richmond-Hanover Road	Danchin	Moderately well bedded reddish argillite. interbedded with coarser green siltstones	I	K(Tr) M(Tr)	*					
Bf 3	Road cut on Laingsburg-Beaufort West road, 13 miles from Laingsburg	Danchin	As for Bf 2	I	K-M	*					
Bf 4	As for Bf 3, 34 miles from Laingsburg	Danchin	Green, silty, poorly bedded rock	I	Ch M(Tr)	*					
Bf 5	Coffee Bay, Transkei, east of Elliotdale, 31°59'E, 29°09'S. Base of Beaufort	R.Danchin & G.Hart from Standard Vacuum Oil Co.	Hard, fissile, thinly bedded shale	I	K(Tr)	*		Tr			
Bf 6	As for Bf 5, but higher in the succession	As for Bf 5	As for Bf 5, but a fresher sample	I-Ch		*					
Bf 7	As for Bf 5, but several hundred feet higher in the succession	As for Bf 5	Dark grey, hard, fissile, well bedded, silty shale	I	K	Tr					
Bf 8	As for Bf 5, but several hundred ft. higher in the succession.	As for Bf 5	As for Bf 7	I	M	*					

Sample No.	Locality	Collector	Remarks	Clays		Feldspars		Carbonates			Others
				Dominant	Subordinate	Plagioclase	K-Feldspar	Calcite	Dolomite	Siderite	
WBF 6	Carnarvon-Williston road, 7 miles from Carnarvon	R. Danchin & P. Hofmeyr	Greenish-brown, well bedded stilstone	I-M	Ch(Tr)	*	Tr				
PR 38	Borehole SS3, Abrahamskraal, Victoria West, depth 1196'		Well bedded, fine-grained light grey shale	I	K(Tr) M(Tr)	*					
PR 39	As for PR 38, depth 2721'		Rather poorly bedded, fresh silty sediment		I(Tr) K(Tr)						
			<u>Dredged Agulhas Bank samples</u>								
DR 140	Sample dredged from the Agulhas Bank. 34°28'S, 19°09E.	R. Gentle Dept. of Oceanography U.C.T.	Dark grey, fresh, well bedded shale	I-Ch		*	Tr				
DR 127	34°37'S 20°29'E	As for DR140	Dark grey shale, somewhat coarser, and more weathered than DR 140, with prolific $CaCO_3$ coating (removed)	I-Ch		*		Tr			
DR 143	34°26'S 18°58'E	As for DR140	Greenish-grey, finely laminated, fresh shale	I-Ch	M(Tr)	*					
Dr 21	34°39'S 20°21'E	As for DR140	Light green, gritty, weathered shale, with prolific $CaCO_3$ coating (removed)	I-Ch		*	Tr	Tr			
DR 50	34°24'S 21°06'E	As for DR140	Dark grey, finely laminated, fresh shale	I-Ch		Tr	Tr				
LS 120	34°35'S 19°35'E	As for DR140	Dark greyish-green, finely laminated shale	I-Ch		Tr	Tr				
LS 3	34°25'S 20°50'E	As for DR140	Dark grey silty shale	I-Ch	M(Tr)	Tr	Tr				
DR 142	34°30'S 19°02'E	As for DR140	Brownish-green laminated rock with alternating fine & coarser bands	I	Ch	*					

APPENDIX II

MAJOR ELEMENT ABUNDANCE DATA AND INTER-ELEMENT RATIOS FOR SELECTED SOUTHERN AFRICAN ARGILLACEOUS ROCKS AND SEPARATED CLAY FRACTIONS. THE ROCK SEQUENCES ARE ARRANGED IN ORDER OF DECREASING GEOLOGICAL AGE. RESULTS ARE CONVENTIONALLY PRESENTED, IN WEIGHT PER CENT, AS THE OXIDES OF THE FOLLOWING ELEMENTS - SILICON (SI), TITANIUM (TI), ALUMINIUM (AL), FERROUS IRON (Fe^{2+}), FERRIC IRON (Fe^{3+}), TOTAL IRON EXPRESSED AS Fe_2O_3, MANGANESE (MN), MAGNESIUM (MG), CALCIUM (CA), SODIUM (NA), POTASSIUM (K) AND PHOSPHORUS (P). ALSO GIVEN ARE THE CARBON DIOXIDE CONTENTS OF THE ROCKS, AS WELL AS THE ABUNDANCES OF ELEMENTAL SULPHUR (S), CHLORINE (CL), AND, IN SOME CASES, CARBON (C). L.O.I. REFERS TO THE CARBON DIOXIDE CORRECTED LOSS ON IGNITION AT 950°C. (N.D. = NOT DETERMINED.)

TABLE 2A

FIG TREE SHALES

	FG12	FG13	FG14	FG16	FG17	SF4A	SF5	SF6	SH2	SH3	FG COMP
SiO_2	54.20	51.74	56.99	59.01	57.24	52.67	59.21	52.48	59.18	57.10	58.87
TiO_2	0.72	0.73	0.78	0.64	0.57	0.71	0.72	0.54	0.51	0.63	0.51
AL_2O_3	16.66	16.79	17.52	13.14	14.24	18.17	16.42	14.15	11.01	13.69	12.09
FeO	5.39	5.96	4.74	7.69	2.87	-	5.67	-	-	-	8.15
Fe_2O_3	6.69	6.66	2.97	3.66	10.11	-	1.63	-	-	-	2.80
TOTAL Fe_2O_3	12.68	13.28	8.24	12.21	13.30	10.05	7.92	17.49	7.96	10.64	11.85
MnO	0.08	0.12	0.09	0.06	0.12	0.04	0.03	0.04	0.21	0.12	0.08
MgO	5.33	6.09	5.30	6.05	4.00	5.57	5.31	6.90	5.43	6.46	5.73
CaO	0.15	0.13	0.10	0.13	0.06	0.11	0.20	0.12	3.50	1.57	1.17
Na_2O	0.97	0.85	0.73	0.87	0.00	0.30	1.05	1.06	1.40	1.54	1.20
K_2O	3.38	3.13	3.97	1.44	3.90	3.93	3.35	0.98	1.73	1.53	1.22
P_2O_5	0.11	0.11	0.09	0.09	0.08	0.10	0.10	0.09	0.09	0.10	0.08
CO_2	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	2.45	-	2.25
S	0.09	0.05	0.03	0.03	0.03	0.04	0.03	0.04	0.08	0.09	0.04
CL	0.01	0.02	0.02	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	5.92	5.85	5.42	5.20	5.52	6.60	4.66	5.84	5.36	6.22	3.59
TOTAL	100.31	98.94	99.35	98.97	99.16	98.36	99.08	99.70	98.84	99.70	98.65
C	0.26										0.66

TABLE 2A (CONTINUED)

FIG TREE GRAYWACKES AND IRONSTONES

	Fg15	SF2	SF3	SF4B	SH7	Fg1	Fg2	Fg8	Fg9	Fg10	Fg11
SiO_2	68.60	63.71	65.94	67.03	65.68	56.91	42.66	69.45	48.85	58.15	56.83
TiO_2	0.45	0.56	0.43	0.49	0.43	0.67	0.46	0.39	0.42	0.81	0.42
Al_2O_3	10.26	11.26	9.29	12.01	9.67	10.84	7.28	5.10	7.44	13.14	7.07
FeO	4.17	-	-	4.30	-	17.95	9.45	2.73	4.89	1.72	3.59
Fe_2O_3	2.30	-	-	3.54	-	3.39	29.64	14.94	31.30	12.78	24.23
Total Fe_2O_3	6.93	13.07	6.02	8.32	6.60	23.34	40.13	17.98	36.73	14.71	28.20
MnO	0.19	0.03	0.04	0.03	0.16	0.05	0.16	0.68	0.23	0.12	0.03
MgO	4.07	5.23	4.38	4.14	4.23	3.18	2.28	2.35	1.60	3.11	2.22
CaO	1.53	0.16	2.58	0.10	2.80	0.01	0.01	0.21	0.03	0.00	0.00
Na_2O	1.55	0.93	0.86	0.40	1.70	0.01	0.00	0.00	0.00	0.00	0.00
K_2O	1.64	0.75	1.55	2.23	1.50	0.82	0.43	0.34	1.57	1.94	0.34
P_2O_5	0.07	0.09	0.08	0.09	0.08	0.02	0.10	0.05	0.05	0.08	0.04
CO_2	2.55	-	-	0.10	-	0.10	0.10	0.30	0.10	0.10	0.10
S	0.04	0.05	0.05	0.02	0.10	0.04	0.03	0.03	0.02	0.02	0.03
Cl	0.04	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.01
L.O.I.	2.23	4.26	6.23	4.61	6.19	3.50	6.11	3.02	3.01	6.72	4.86
TOTAL	100.11	100.06	97.41	99.56	99.05	99.45	99.73	99.88	100.08	98.90	100.11
C	0.68					0.04					

TABLE 3A

MOZAAN, KHEIS AND DAMARA SEDIMENTS.

	MZ1	MZ2	MZ3	MZ4	MZ5	MZ6	MZ7	KH1	DM1
SiO_2	40.00	51.10	58.32	50.37	74.04	50.68	42.45	74.69	58.34
TiO_2	0.12	0.03	0.65	0.43	0.51	0.49	0.44	0.76	0.86
Al_2O_3	2.29	0.78	16.13	11.72	13.41	13.32	11.98	11.07	16.41
FeO	10.63	1.51	0.29	1.94	0.29	1.51	0.86	0.57	1.01
Fe_2O_3	42.39	44.43	13.13	28.16	3.50	24.45	31.11	5.89	6.89
Total Fe_2O_3	54.20	46.11	13.50	30.33	3.82	26.12	32.07	6.52	8.01
MnO	0.14	0.02	0.09	0.02	0.00	0.04	2.31	0.02	0.05
MgO	1.52	0.12	0.58	0.17	0.37	0.12	0.38	0.49	5.70
CaO	0.78	0.01	0.00	0.02	0.02	0.00	0.00	0.25	0.28
Na_2O	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	2.04
K_2O	0.14	0.00	2.31	0.03	2.33	0.01	1.00	3.46	4.88
P_2O_5	0.04	0.04	0.05	0.03	0.17	0.05	0.08	0.18	0.17
CO_2	0.40	0.10	0.10	0.15	0.10	0.10	0.10	0.10	0.10
S	0.02	0.01	0.01	0.01	0.01	0.03	0.04	0.01	0.01
Cl	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
L.O.I.	1.01	2.00	6.84	6.51	4.12	8.49	7.82	1.90	3.26
TOTAL	100.76	100.43	98.69	99.90	99.00	99.54	98.74	99.45	100.11

TABLE 4A

WITWATERSRAND SYSTEM

	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8	JP9	JP10
SiO_2	63.42	65.67	67.97	71.20	46.43	57.23	59.86	60.73	56.53	55.87
TiO_2	0.60	0.65	0.38	0.44	0.39	0.73	0.64	0.62	0.45	0.96
Al_2O_3	12.88	12.90	14.80	11.63	9.79	20.18	16.00	14.42	11.43	15.06
FeO	4.02	4.17	2.15	3.02	20.00	3.88	6.61	10.04	10.78	11.50
Fe_2O_3	1.76	1.99	2.53	1.71	7.00	2.30	1.19	0.61	10.02	2.80
Total Fe_2O_3	6.22	6.62	4.92	5.08	29.09	6.62	8.54	11.77	22.00	15.59
MnO	0.01	0.01	0.01	0.01	0.14	0.01	0.01	0.01	0.01	0.01
MgO	5.36	5.72	2.79	3.54	3.81	4.56	5.07	5.25	3.61	4.73
CaO	2.84	1.51	1.41	1.70	1.64	0.62	1.16	1.11	0.99	0.92
Na_2O	1.64	1.60	0.21	2.56	1.17	1.17	1.13	0.50	1.20	0.72
K_2O	1.52	1.43	3.90	1.28	0.41	3.71	2.10	1.53	1.89	1.83
P_2O_5	0.08	0.07	0.08	0.05	0.09	0.10	0.10	0.10	0.05	0.11
CO_2	1.45	0.25	0.10	0.50	0.60	0.10	0.50	0.35	0.10	0.10
S	0.09	0.12	0.06	0.08	0.07	0.05	0.07	0.14	0.18	0.11
Cl	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	2.62	3.22	2.79	1.89	5.44	3.97	3.46	3.83	1.84	3.91
TOTAL	98.65	99.66	99.37	99.90	99.31	99.01	98.60	100.21	100.11	99.82
C	0.34	0.07						0.11		

TABLE 5A

PRECAMBRIAN SOUTH WEST AFRICAN ARGILLITES

	Kun 1	Kun 2	Kun 3	Kun 4A	Kun 4B	Kui 1	Kui 2	Kui 3	Kui 4	A.V.B. Kuibis *	Schr 1	Schr 2	Schr 3	Schr 4
SiO_2	69.06	70.87	73.69	73.34	73.83	14.48	65.63	84.40	56.26	61.94	68.88	67.62	45.77	63.63
TiO_2	1.08	1.11	0.86	1.00	1.01	0.22	1.13	0.56	1.33	0.80	0.58	0.59	0.64	0.81
Al_2O_3	19.14	18.21	10.70	12.23	14.60	5.74	19.56	6.29	22.68	18.38	11.95	12.23	30.07	14.42
FeO	0.20	0.10	0.20	0.15	0.20	0.57	0.57	0.50	1.76	0.91	2.01	1.72	4.60	5.06
Fe_2O_3	0.23	1.04	3.06	4.32	1.40	2.57	0.99	1.30	1.83	4.07	4.09	3.50	2.57	0.64
Total Fe_2O_3	0.45	1.16	3.27	4.49	1.61	3.21	1.61	1.86	3.79	5.01	6.32	5.42	7.68	6.26
MnO	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.15	0.01	0.01	0.08	0.06	0.07	0.17
MgO	0.57	0.48	0.62	0.92	0.70	13.40	0.77	0.51	1.40	3.14	2.44	2.45	2.30	3.26
CaO	0.05	0.05	0.10	0.24	0.12	20.59	0.08	0.68	0.18	0.25	2.61	0.38	0.40	2.96
Na_2O	0.37	0.47	0.34	0.13	0.43	0.00	0.27	0.09	0.38	0.51	0.84	1.33	1.68	3.28
K_2O	5.24	5.01	3.48	3.73	4.29	1.73	5.79	2.71	8.57	5.68	1.92	2.48	6.83	2.77
P_2O_5	0.08	0.15	0.12	0.14	0.14	0.10	0.10	0.04	0.11	0.13	0.14	0.16	0.06	0.21
CO_2	0.10	0.10	0.10	0.10	0.10	36.00	0.10	0.10	0.20	N.D.	0.10	2.00	2.10	1.30
S	0.03	0.06	0.70	0.09	0.07	0.40	0.04	1.01	0.01	N.D.	0.03	0.04	0.01	0.01
Cl	0.01	0.01	0.01	0.01	0.01	0.03	0.04	0.02	0.01	N.D.	0.01	0.01	0.01	0.01
L.O.I.	3.33	2.06	6.03	3.59	2.85	3.69	3.67	2.00	3.66	4.19	3.25	3.91	2.41	1.10
TOTAL	99.50	99.68	99.33	99.93	99.71	99.19	98.76	99.41	98.58	100.01	99.12	98.64	100.02	100.18
C			1.28	0.58				0.03						

* Kröner (1968)

TABLE 6A

MALMESBURY AND CANGO FORMATIONS

	Mm 2	Mm 3	Mm 4	Mm 5	Mm 7	Cg 1	Cg 2	Cg 3	Cg 4
SiO_2	71.22	61.07	75.29	60.19	59.34	57.09	58.99	54.45	61.88
TiO_2	0.33	0.82	0.68	0.79	0.80	0.75	0.74	0.83	0.73
Al_2O_3	14.46	15.55	11.05	17.68	17.59	18.53	18.70	19.61	16.61
FeO	1.37	6.18	3.02	5.96	5.03	2.23	0.50	5.89	3.16
Fe_2O_3	1.69	1.69	0.86	1.33	2.59	6.59	6.36	2.92	4.25
Total Fe_2O_3	3.20	8.55	4.22	7.95	8.18	9.06	6.93	9.46	7.76
MnO	0.05	0.09	0.06	0.06	0.07	0.02	0.06	0.13	0.08
MgO	1.82	3.62	1.55	3.36	3.77	1.45	2.18	4.11	3.01
CaO	0.24	0.86	1.17	0.47	0.64	0.56	1.47	0.82	0.34
Na_2O	2.24	1.43	2.62	1.90	1.16	0.08	0.11	1.24	0.42
K_2O	3.18	4.14	2.22	4.59	4.81	6.51	5.65	4.23	4.28
P_2O_5	0.09	0.15	0.17	0.17	0.12	0.20	0.18	0.17	0.14
CO_2	0.10	0.10	0.10	0.10	0.10	0.35	0.65	0.10	0.10
S	0.02	0.08	0.06	0.11	0.03	0.02	0.03	0.02	0.03
Cl	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	2.14	1.96	0.37	2.38	2.64	5.00	4.03	3.82	4.74
TOTAL	99.09	98.35	99.51	99.65	99.23	99.61	99.70	99.00	100.10
C					0.03				0.08

TABLE 7A

FISH RIVER SERIES

	FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	AEC8	AEC9	AEC10	AEC11	AEC12
SiO_2	81.92	61.68	72.56	64.98	66.18	74.52	70.42	64.03	66.87	63.36	59.84	59.39	61.89	58.60
TiO_2	0.25	0.63	0.77	1.16	0.63	0.60	0.72	0.68	0.68	0.87	0.79	0.77	0.81	0.87
AL_2O_3	6.08	12.57	11.07	14.33	11.52	10.07	13.03	13.69	12.74	13.23	14.87	15.51	14.33	16.76
FeO	0.43	0.50	0.43	0.57	0.43	0.43	0.57	0.93	0.43	1.65	2.23	1.87	1.72	2.01
Fe_2O_3	1.17	4.39	4.27	5.17	3.72	3.43	4.22	5.32	3.50	3.27	3.93	4.89	4.39	3.87
Total Fe_2O_3	1.64	4.95	4.75	5.80	4.19	3.91	4.85	6.35	3.97	5.11	6.40	6.96	6.31	6.10
MnO	0.09	0.08	0.06	0.04	0.10	0.07	0.09	0.08	0.07	0.08	0.09	0.10	0.09	0.09
MgO	0.71	2.11	1.75	2.08	1.91	1.57	1.90	2.48	1.78	2.37	3.17	2.93	2.70	3.50
CaO	2.52	4.98	1.59	0.81	4.17	2.02	0.77	2.05	3.36	4.52	3.08	3.49	3.36	2.11
Na_2O	1.33	1.86	2.33	0.93	1.80	2.06	1.09	1.03	1.63	2.56	1.59	1.67	2.72	1.50
K_2O	1.64	2.61	2.14	3.44	2.35	1.82	3.15	3.13	3.20	2.72	3.64	3.51	3.05	4.17
P_2O_5	0.11	0.18	0.23	0.39	0.20	0.20	0.19	0.14	0.20	0.27	0.19	0.17	0.19	0.20
CO_2	2.30	3.00	1.20	0.15	2.50	1.15	0.10	1.45	2.35	3.20	2.15	3.10	2.35	1.15
S	0.08	0.12	0.02	0.01	0.03	0.04	0.06	0.03	0.03	0.00	0.00	0.01	0.01	0.01
Cl	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.02
L.O.I.	0.51	3.63	1.61	4.31	3.38	2.02	2.97	3.73	1.79	1.43	2.81	2.24	1.51	3.21
TOTAL	99.12	98.30	100.07	98.43	98.94	100.02	99.30	98.85	98.65	99.74	98.63	99.87	99.33	98.29
C		1.06			0.80									

TABLE 8A

BOKKEVELD SERIES

	Bk1	Bk2	Bk3	Bk4A	Bk4B	Bk5	Bk6A	Bk6B	Bk7	Bk8	Bk9	Bk10	Bk11
SiO_2	59.84	70.88	58.80	67.95	68.59	71.30	76.80	65.50	61.33	62.06	70.84	62.45	65.80
TiO_2	0.99	0.56	0.95	0.79	0.78	0.36	0.79	0.85	1.07	0.91	1.12	0.92	0.87
Al_2O_3	18.36	10.50	18.24	13.91	13.68	10.27	13.75	15.86	19.31	17.35	16.52	16.81	14.36
FeO	5.74	4.81	5.74	4.45	3.16	2.12	0.36	3.74	2.33	2.16	0.43	5.32	3.52
Fe_2O_3	1.29	1.19	1.46	2.00	3.42	5.38	0.27	2.53	3.36	4.72	0.60	1.41	4.07
Total Fe_2O_3	7.66	6.54	7.83	6.95	6.94	8.11	0.67	6.69	5.95	7.12	1.07	7.32	7.99
MnO	0.05	0.08	0.08	0.05	0.03	0.03	0.00	0.07	0.02	0.04	0.00	0.06	0.03
MgO	2.35	1.78	2.44	1.77	1.12	1.00	0.31	1.81	1.44	1.74	0.82	2.36	2.22
CaO	0.49	1.67	1.35	0.37	0.32	0.62	0.14	0.43	0.13	0.38	0.12	0.36	0.31
Na_2O	0.96	1.60	1.17	1.30	1.33	1.42	1.10	0.36	0.62	0.81	0.60	1.11	1.02
K_2O	4.29	1.28	3.87	2.40	2.36	1.04	2.02	2.71	3.52	3.01	4.29	3.04	2.83
P_2O_5	0.13	0.15	0.17	0.18	0.18	0.20	0.16	0.19	0.09	0.21	0.08	0.17	0.18
CO_2	0.55	2.10	1.10	0.10	0.25	0.15	0.10	0.10	0.15	0.10	0.10	0.10	0.10
S	0.05	0.04	0.40	0.03	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.02
Cl	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
L.O.I.	3.56	1.15	3.22	3.20	3.62	3.95	3.64	4.19	5.49	5.73	3.41	3.83	3.92
TOTAL	99.24	98.30	99.23	99.00	99.21	98.46	99.49	98.77	99.13	99.47	99.00	98.54	99.65
C	0.33		0.50										

TABLE 8A (CONTINUED)

	Bk12	Bk13	Bk14	Bk16	Bk17	Bk18	Bk19	Bk20	Bk21	Bk22	Bk23	Bk24	Bk25
SiO_2	59.77	66.82	68.29	68.58	67.30	65.24	56.85	60.22	58.39	58.58	59.13	60.39	67.16
TiO_2	1.05	0.90	0.97	0.75	0.75	0.98	0.98	1.03	1.01	1.03	1.07	1.10	0.92
Al_2O_3	18.57	14.83	15.41	14.25	15.47	16.58	19.25	18.76	19.71	19.96	20.43	18.90	15.00
FeO	2.51	1.60	0.65	3.16	2.51	3.16	3.59	3.88	4.38	4.25	1.44	1.15	4.02
Fe_2O_3	3.97	3.96	3.02	3.30	2.92	2.32	4.67	2.27	2.09	2.26	3.96	7.15	2.44
Total Fe_2O_3	6.76	5.73	3.73	6.82	5.71	5.83	8.66	6.59	6.97	6.98	5.56	8.42	6.91
MnO	0.03	0.07	0.01	0.05	0.05	0.04	0.05	0.04	0.04	0.04	0.02	0.02	0.03
MgO	2.48	2.06	1.62	1.86	1.74	1.78	2.53	2.09	2.26	2.09	1.83	1.14	1.53
CaO	0.19	0.17	0.22	0.22	0.18	0.01	0.16	0.11	0.11	0.11	0.01	0.01	0.08
Na_2O	0.96	0.96	0.87	1.06	1.04	0.38	0.52	0.56	0.44	0.59	0.14	0.05	0.62
K_2O	4.10	2.92	3.47	2.49	3.11	3.46	3.99	4.00	4.14	4.29	4.39	3.60	2.66
P_2O_5	0.14	0.12	0.15	0.13	0.14	0.10	0.18	0.12	0.10	0.11	0.09	0.08	0.15
CO_2	0.10	0.10	0.10	0.20	0.10	0.10	0.15	0.10	0.15	0.10	0.10	0.15	0.10
S	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.16	0.08	0.11	0.01	0.01	0.01
Cl	0.04	0.02	0.03	0.05	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	4.80	4.29	4.39	3.63	3.68	4.35	5.85	5.67	5.44	5.63	6.34	6.20	4.06
TOTAL	99.00	99.00	99.26	100.09	99.30	98.86	99.18	99.30	98.77	99.52	99.12	100.07	99.23
C								0.49			0.07		

TABLE 8A (CONTINUED)

	Bk26	Bk27	Bk28	Bk29	Bk30	Bk34	Bk302	Bk318	Bk321	Bk361	Bk373	Bk389
SiO_2	64.34	58.17	66.68	58.72	64.08	72.88	63.16	72.14	60.82	54.80	64.07	60.85
TiO_2	1.08	0.99	0.91	0.97	0.96	0.68	0.88	0.57	0.88	0.83	1.06	0.99
AL_2O_3	17.00	17.66	15.55	19.98	17.68	12.92	17.38	13.03	18.91	21.54	20.64	20.64
FeO	2.01	3.02	2.01	2.16	1.08	0.36	1.26	0.78	3.54	4.18	0.52	0.52
Fe_2O_3	3.93	6.50	3.46	4.70	3.89	3.44	5.03	4.13	4.03	1.59	1.00	5.56
Total Fe_2O_3	6.16	9.87	5.69	7.10	5.09	3.85	6.44	5.01	7.97	7.11	1.58	6.13
MnO	0.03	0.05	0.03	0.03	0.03	0.02	0.05	0.01	0.02	0.03	0.02	0.10
MgO	1.60	2.10	1.66	2.33	1.54	0.89	2.06	0.91	0.40	1.74	1.14	0.40
CaO	0.06	0.17	0.14	0.03	0.03	0.16	0.21	0.20	0.31	0.11	0.05	0.01
Na_2O	0.23	0.12	0.92	0.53	0.37	1.30	0.68	1.47	0.70	0.43	0.20	0.12
K_2O	3.50	3.14	2.88	4.42	3.67	2.13	3.52	2.16	3.42	4.76	5.00	3.60
P_2O_5	0.09	0.22	0.16	0.09	0.08	0.12	0.16	0.13	0.25	0.16	0.08	0.07
CO_2	0.10	0.10	0.10	0.10	0.10	0.10	0.30	0.10	0.25	0.28	0.30	0.10
S	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.32	0.00	0.02
Cl	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.01	0.00	0.00	0.20	0.01
L.O.I.	5.08	6.35	4.26	5.70	5.55	3.56	5.18	3.97	5.06	6.71	5.67	6.44
TOTAL	99.28	98.95	98.98	100.01	99.19	98.62	100.04	99.71	98.99	98.50	100.01	99.46

TABLE 9A

WITTEBERG AND DWYKA SERIES

	WB1	WB2	WB3	WB4	WB5	WB6	WB7	Dw1	Dw4	Dw5	Cv86	LDW3	LDW4
SiO_2	54.07	54.71	79.07	67.49	62.74	56.51	60.21	75.03	72.50	72.45	61.33	64.83	63.58
TiO_2	0.86	0.85	0.49	0.59	1.16	1.09	0.89	0.30	0.72	0.74	0.69	0.66	0.70
Al_2O_3	21.57	20.44	8.39	14.21	19.80	20.35	18.15	8.85	13.90	12.41	16.10	15.38	16.47
FeO	1.15	0.93	2.01	3.38	0.32	1.51	0.86	-	0.43	0.29	5.46	0.29	0.29
Fe_2O_3	7.79	8.49	3.00	2.82	4.57	5.96	6.93	-	0.43	0.53	2.33	0.84	1.69
Total Fe_2O_3	9.06	9.53	5.23	6.58	4.94	7.64	7.90	9.21	0.90	0.84	8.39	1.16	2.00
MnO	0.02	0.11	0.02	0.07	0.01	0.02	0.03	0.12	0.01	0.00	0.13	0.00	0.00
MgO	1.62	1.85	1.22	1.51	0.72	1.35	1.47	1.28	0.42	0.48	1.84	0.95	1.02
CaO	0.35	0.35	0.09	0.71	0.08	0.04	0.07	0.07	0.30	0.44	0.24	0.22	0.23
Na_2O	0.88	0.75	0.25	1.08	0.17	0.20	0.28	0.29	1.32	1.17	0.49	1.17	1.16
K_2O	2.92	3.07	1.24	2.40	5.04	4.46	3.75	0.93	2.88	2.85	3.66	3.46	3.65
P_2O_5	0.21	0.19	0.08	0.06	0.07	0.12	0.17	0.06	0.11	0.16	0.13	0.09	0.21
CO_2	0.40	0.30	0.10	0.50	0.20	0.10	0.25	0.10	0.10	0.10	0.10	0.11	0.10
S	0.02	0.02	0.01	0.02	0.02	0.03	0.02	0.04	0.34	0.41	0.19	0.08	0.14
Cl	0.03	0.04	0.01	0.01	0.01	0.01	0.02	0.00	0.01	0.30	0.01	0.63	0.31
L.O.I.	7.68	7.93	2.85	3.90	5.26	7.30	6.66	2.83	5.76	7.10	5.37	10.20	8.88
TOTAL	99.67	100.12	99.04	99.11	100.20	99.19	99.85	99.07	98.93	99.04	98.58	98.86	98.31
C						1.37						4.21	3.71

TABLE 10A

BOTHAVILLE BOREHOLE SEDIMENTS

	BEC4265	4266	4267	4268	4269	4270	4286	4287	4288	4292
SiO_2	40.10	61.43	61.59	52.69	49.59	50.81	72.20	65.49	72.06	54.82
TiO_2	0.74	0.87	0.87	0.85	0.76	0.81	0.60	0.63	0.50	0.94
Al_2O_3	16.79	16.69	15.57	19.44	17.99	19.25	14.38	17.27	15.47	20.71
FeO	4.31	2.87	3.16	4.31	5.68	3.16	1.58	1.94	1.15	3.88
Fe_2O_3	5.67	1.94	2.39	2.01	1.79	1.89	0.81	1.33	0.89	1.17
Total Fe_2O_3	10.47	5.14	5.91	6.81	8.09	5.40	2.58	3.49	2.16	5.49
MnO	0.10	0.02	0.02	0.11	0.13	0.04	0.02	0.01	0.01	0.06
MgO	0.86	1.46	1.56	1.52	1.48	1.31	0.47	0.70	0.39	1.60
CaO	0.24	0.72	0.59	0.59	0.67	0.57	0.49	0.61	0.66	0.49
Na_2O	0.45	1.35	1.32	1.05	1.11	1.11	1.57	2.02	2.23	1.14
K_2O	1.41	2.52	2.33	1.84	1.66	1.61	3.21	3.24	3.47	2.99
P_2O_5	0.04	0.13	0.10	0.11	0.14	0.15	0.07	0.07	0.03	0.09
CO_2	0.10	0.10	0.10	2.30	4.00	0.95	0.10	0.10	0.10	0.50
S	6.31	0.63	0.58	0.28	0.19	0.59	0.02	0.52	0.23	0.26
Cl	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01
C.O.I.	27.52	8.63	8.96	11.99	13.49	17.16	3.74	5.21	3.04	9.64
TOTAL	99.56	99.07	98.93	99.30	99.11	99.17	99.43	98.84	100.12	98.78
C					3.51	5.80				

TABLE 11A

BOREHOLE GB 45/64

	GB45/64/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
SiO_2	44.81	64.19	61.40	66.42	59.85	63.51	54.13	47.49	68.25	53.96	57.32	57.61	74.72
TiO_2	0.63	1.06	0.96	0.60	0.85	0.92	0.89	0.60	1.02	0.88	0.75	1.03	0.44
Al_2O_3	13.30	17.10	18.12	14.72	16.09	16.58	18.25	14.54	14.79	18.65	16.86	22.28	14.45
FeO	10.82	3.21	5.50	2.92	6.80	4.14	6.08	10.39	2.63	5.00	5.22	1.27	0.55
Fe_2O_3	1.66	1.31	1.34	0.89	1.46	1.11	0.80	3.06	0.61	1.09	4.00	0.43	0.30
Total Fe_2O_3	13.69	4.87	7.45	4.14	9.01	5.72	7.56	14.61	3.53	6.65	9.81	1.83	0.92
MnO	0.15	0.06	0.07	0.04	0.11	0.06	0.06	0.14	0.03	0.06	0.08	0.01	0.02
MgO	2.54	1.84	1.67	1.27	1.84	1.65	1.58	1.66	0.96	2.04	1.50	0.56	0.41
CaO	10.65	0.62	0.43	3.23	2.60	0.72	0.52	3.13	0.40	1.35	0.58	0.21	0.13
Na_2O	0.90	1.06	0.99	1.48	1.25	1.24	0.92	0.68	0.98	0.95	0.88	0.57	0.48
K_2O	1.89	3.86	3.37	3.58	3.74	3.58	3.15	2.66	3.99	3.20	3.46	3.65	4.25
P_2O_5	3.76	0.09	0.04	1.76	0.64	0.10	0.09	0.12	0.07	0.30	0.10	0.07	0.04
CO_2	3.80	0.25	0.10	0.10	0.70	0.30	0.10	4.95	0.10	0.55	0.10	0.10	0.10
S	0.59	0.02	0.06	0.08	0.15	0.05	0.15	0.96	0.22	0.25	0.84	0.12	0.03
Cl	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
L.O.I.	3.66	4.09	4.35	2.33	2.40	4.54	12.81	9.07	4.98	11.44	7.47	11.12	3.73
TOTAL	99.79	99.10	98.96	99.68	99.09	98.93	100.07	99.66	99.11	100.04	98.92	99.05	99.69
C					0.36			5.36					

TABLE 12A

BOREHOLE GB 47/64

	GB47/64/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11
SiO_2	63.29	68.20	50.67	65.83	51.58	59.28	56.05	50.53	57.74	55.16	69.10
TiO_2	0.84	1.12	0.97	0.74	0.91	0.71	0.83	0.92	1.10	0.92	0.84
Al_2O_3	17.99	16.44	17.88	16.21	17.68	15.58	16.82	18.36	20.36	21.84	14.50
FeO	4.79	2.77	6.65	3.49	9.46	6.80	7.95	6.08	2.41	2.34	2.34
Fe_2O_3	1.50	0.74	1.39	1.06	1.44	1.61	1.43	1.17	0.53	0.66	0.54
Total Fe_2O_3	6.82	3.82	8.78	4.78	11.95	9.17	10.26	7.94	3.20	3.26	3.15
MnO	0.03	0.05	0.10	0.05	0.09	0.06	0.09	0.08	0.02	0.02	0.02
MgO	1.76	1.28	1.86	1.55	1.76	1.56	2.02	1.59	1.10	0.94	0.78
CaO	0.35	0.79	4.02	0.58	1.08	1.71	1.10	1.93	0.27	0.24	0.43
Na_2O	1.41	1.45	1.16	1.13	0.92	0.92	0.78	0.87	0.69	0.64	0.87
K_2O	3.08	3.95	2.98	4.02	3.04	3.47	3.14	3.09	3.63	3.52	3.95
P_2O_5	0.08	0.08	0.63	0.08	0.15	0.09	0.09	0.28	0.07	0.07	0.08
CO_2	0.20	0.35	2.90	0.25	0.85	1.45	0.75	2.10	0.10	0.10	0.25
S	0.02	0.02	0.16	0.04	0.32	0.93	0.45	0.36	0.15	0.13	0.27
Cl	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	3.66	2.66	6.90	4.18	9.55	4.98	7.15	11.53	11.11	13.02	6.10
TOTAL	99.52	100.20	98.86	99.01	99.57	98.99	99.09	99.23	99.40	99.74	100.08
C						1.95	3.16				

TABLE 13A

BOREHOLE GB 48/65

	GB 48/65/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
SiO_2	57.59	69.85	58.02	62.56	49.85	68.17	55.93	68.84	50.36	50.73	72.01	46.59	59.29
TiO_2	0.84	0.62	0.87	0.67	0.85	0.76	1.08	0.72	0.94	0.94	0.95	0.81	0.95
Al_2O_3	17.56	14.45	17.92	17.93	16.79	14.13	19.66	15.19	17.99	19.86	14.04	18.63	20.49
FeO	6.29	2.08	4.13	2.77	5.58	2.92	4.22	2.20	5.58	5.43	1.77	1.70	2.20
Fe_2O_3	1.00	0.36	0.37	0.47	0.26	0.09	0.39	0.36	1.06	0.27	0.11	0.10	0.00
Total Fe_2O_3	8.00	2.68	4.96	3.54	6.47	3.33	5.07	2.80	7.26	6.31	2.08	1.99	2.45
MnO	0.08	0.04	0.05	0.03	0.06	0.04	0.03	0.03	0.04	0.05	0.03	0.01	0.02
MgO	1.78	0.78	1.34	1.31	1.71	1.04	1.64	0.79	1.58	1.34	0.52	0.60	0.83
CaO	1.14	0.95	0.51	0.51	2.75	0.45	0.38	0.53	0.34	0.39	0.26	0.14	0.19
Na_2O	1.20	1.08	0.77	1.05	0.75	0.97	0.91	1.29	0.85	0.70	0.56	0.18	0.48
K_2O	3.22	4.15	3.20	4.23	2.92	3.79	3.55	4.18	2.97	2.81	3.88	2.64	3.23
P_2O_5	0.12	0.07	0.10	0.06	0.40	0.06	0.10	0.07	0.08	0.14	0.09	0.06	0.08
CO_2	0.65	0.50	0.60	0.10	3.20	0.35	0.25	0.45	0.85	2.10	0.25	0.45	0.30
S	0.06	0.03	0.10	0.04	0.15	0.05	0.06	0.12	0.92	0.20	0.08	0.21	0.09
Cl	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	7.20	4.18	11.83	6.68	13.32	7.01	10.55	4.97	16.70	13.62	4.75	27.86	10.75
TOTAL	99.39	99.35	100.18	98.68	99.09	100.11	99.17	99.87	99.98	99.02	99.44	99.97	99.06
C									7.60	6.52			

TABLE 14A

BOREHOLE A/78

	A78/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
SiO_2	46.83	49.68	38.32	50.54	44.82	52.51	51.98	46.45	48.56	46.36	35.87	41.69	50.96
TiO_2	1.10	2.39	1.61	1.01	0.91	0.88	1.05	0.86	1.00	0.92	0.61	0.74	0.96
Al_2O_3	21.86	21.65	16.84	22.34	17.64	19.84	21.10	21.23	21.19	24.18	12.19	15.83	22.28
FeO	-	-	-	-	-	-	-	-	-	-	-	-	-
Fe_2O_3	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Fe_2O_3	1.72	1.75	1.21	1.60	1.55	6.91	3.61	7.23	2.02	0.64	2.35	1.02	2.56
MnO	0.01	0.01	0.01	0.01	0.01	0.12	0.05	0.14	0.01	0.01	0.04	0.01	0.01
MgO	0.56	0.30	0.25	0.48	0.49	1.63	0.95	0.96	0.68	0.32	0.47	0.57	0.94
CaO	0.15	0.10	0.11	0.09	0.21	0.23	0.16	0.26	0.12	0.16	0.67	0.50	0.25
Na_2O	0.19	0.14	0.16	0.23	0.18	0.33	0.17	0.14	0.17	0.17	0.05	0.06	0.20
K_2O	1.38	1.78	0.90	2.06	0.97	2.98	1.92	1.92	1.82	1.06	0.61	0.92	2.46
P_2O_5	0.05	0.05	0.04	0.06	0.05	0.08	0.07	0.09	0.06	0.06	0.04	0.05	0.10
CO_2	0.35	0.45	0.55	0.25	0.45	2.40	1.00	4.00	0.20	0.25	0.80	0.40	0.25
S	0.21	0.17	0.28	0.15	0.19	0.08	0.06	0.10	0.19	0.14	1.18	0.20	0.09
Cl	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	24.79	20.71	39.89	20.29	32.05	12.26	17.14	15.89	24.06	25.02	45.23	38.23	18.09
TOTAL	99.00	99.02	99.90	98.96	99.34	100.18	99.20	99.19	99.89	99.16	98.94	100.03	99.07
C									13.07		29.99		

TABLE 15A

BOREHOLES A/76 AND A/62

	A76/1	/2	/3	/4	/5	/6	A62/1	/2	/3	/4	/5	/6
SiO_2	44.61	58.81	38.76	51.12	48.31	41.99	46.41	42.22	47.30	39.86	44.81	55.39
TiO_2	0.92	1.25	0.91	1.01	1.00	0.77	0.90	0.87	1.20	1.19	0.83	1.16
Al_2O_3	22.80	19.99	16.80	22.30	22.31	16.72	22.95	17.58	17.40	23.39	25.99	20.86
FeO	-	-	-	-	-	-	-	-	-	-	-	-
Fe_2O_3	-	-	-	-	-	-	-	-	-	-	-	-
Total Fe_2O_3	0.79	0.96	1.60	3.42	4.52	1.63	4.67	2.56	1.00	0.97	1.69	1.67
MnO	0.00	0.01	0.01	0.03	0.06	0.01	0.06	0.05	0.01	0.00	0.01	0.01
MgO	0.28	0.23	0.48	0.76	0.61	0.47	0.84	0.59	0.30	0.21	0.58	0.65
CaO	0.12	0.09	0.72	0.18	0.19	0.17	0.21	0.28	0.11	0.12	0.12	0.14
Na_2O	0.02	0.01	0.00	0.07	0.06	0.05	0.09	0.09	0.10	0.06	0.11	0.12
K_2O	1.02	1.65	0.54	1.73	1.33	0.90	1.63	1.02	1.25	0.67	1.16	1.44
P_2O_5	0.04	0.05	0.30	0.10	0.10	0.07	0.11	0.11	0.04	0.04	0.04	0.04
CO_2	0.25	0.40	0.50	1.70	2.25	0.30	1.30	0.85	0.30	0.15	2.65	0.30
S	0.17	0.08	0.32	0.14	0.11	0.22	0.11	0.20	0.16	0.25	0.17	0.23
Cl	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00
L.O.I.	28.66	15.85	38.60	17.18	18.19	36.72	20.60	33.06	30.74	33.18	21.32	17.26
TOTAL	99.51	99.01	99.23	99.59	98.95	99.81	99.78	99.28	99.79	99.84	99.33	99.04
C			11.84		8.36					14.94		

TABLE 16A

SOMKELE BOREHOLE.

	Sec/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
SiO_2	61.05	65.25	64.26	65.29	63.01	64.94	65.54	68.18	56.08	65.79	69.08	64.60	53.62
TiO_2	0.59	0.40	0.68	0.67	0.65	0.67	0.70	0.61	0.65	0.74	0.76	0.81	0.53
Al_2O_3	14.64	11.72	15.45	15.95	16.63	16.62	16.02	14.86	15.32	16.70	18.08	18.42	13.70
FeO	2.01	6.83	4.02	3.31	3.16	2.44	3.09	2.87	3.23	2.59	1.58	2.30	1.51
Fe_2O_3	0.01	1.39	0.97	0.81	1.00	0.59	0.90	0.86	1.14	0.80	0.60	1.07	0.24
Total Fe_2O_3	2.25	8.98	5.44	4.49	4.52	3.31	4.33	4.05	4.74	3.67	2.37	3.64	1.92
MnO	0.02	0.24	0.06	0.05	0.03	0.01	0.04	0.06	0.10	0.03	0.01	0.02	0.00
MgO	0.86	1.52	1.45	1.54	1.37	1.22	1.22	1.15	1.09	1.17	0.85	1.11	0.72
CaO	0.52	1.09	0.82	1.04	0.52	0.28	0.60	0.53	0.33	0.24	0.19	0.17	0.14
Na_2O	0.99	0.53	1.04	1.34	0.92	0.92	1.11	1.35	0.98	0.89	1.06	0.71	0.52
K_2O	2.75	1.87	3.09	2.81	3.60	3.98	3.28	2.97	3.28	3.01	2.91	4.05	2.60
P_2O_5	0.08	0.16	0.19	0.18	0.13	0.13	0.16	0.15	0.13	0.10	0.06	0.09	0.05
CO_2	0.25	0.70	0.55	0.85	1.20	0.25	1.15	2.20	2.00	0.10	0.25	0.30	0.10
S	0.24	0.21	0.06	0.06	0.13	0.09	0.06	0.06	0.28	0.15	0.05	0.09	0.37
Cl	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
L.O.I.	15.54	7.54	5.32	4.97	7.93	7.00	5.03	3.50	14.39	7.29	4.73	5.31	25.63
TOTAL	99.54	100.01	98.36	99.16	100.51	99.31	99.17	99.60	99.10	99.73	100.34	99.42	99.52
C									9.98				18.33

TABLE 16A (CONTINUED)

	Sec/14	/15	/16	/17	/18	/19	/20	/21	/22	/23	/24	/25	/26
SiO_2	60.85	59.57	63.49	66.62	68.82	63.87	67.13	65.02	62.49	63.89	58.57	31.56	52.81
TiO_2	0.70	0.77	0.70	0.68	0.59	0.72	0.51	0.69	0.75	0.81	0.91	0.57	0.93
Al_2O_3	16.53	19.01	16.96	15.77	14.73	17.11	15.42	16.14	17.45	16.28	20.00	14.81	19.40
FeO	5.32	4.38	4.67	3.38	3.09	3.52	3.16	3.74	3.74	5.46	3.74	33.34	8.19
Fe_2O_3	1.01	1.79	1.66	0.97	0.84	1.09	1.06	0.67	1.04	1.31	0.91	0.41	1.06
Total Fe_2O_3	6.92	6.66	6.85	4.74	4.27	5.01	4.57	4.84	5.21	7.38	5.08	37.46	10.17
MnO	0.16	0.07	0.05	0.05	0.08	0.05	0.05	0.05	0.05	0.08	0.03	0.22	0.01
MgO	1.14	1.70	2.18	1.55	1.42	1.50	1.47	1.53	1.63	1.36	1.59	3.63	2.06
CaO	0.51	0.47	0.41	0.77	1.08	0.69	0.52	0.66	0.62	0.78	0.98	0.78	0.26
Na_2O	0.93	0.67	0.97	1.30	1.41	1.13	1.18	1.33	1.30	1.15	0.86	0.34	0.76
K_2O	2.72	4.04	3.37	3.29	2.99	3.08	2.98	2.82	3.14	3.02	3.65	0.87	3.42
P_2O_5	0.23	0.18	0.14	0.13	0.19	0.11	0.10	0.12	0.13	0.12	0.10	0.26	0.11
CO_2	0.45	0.20	0.20	0.40	0.25	0.25	0.10	0.10	0.10	0.10	0.10	2.10	0.10
S	0.08	0.05	0.07	0.15	0.10	0.25	0.11	0.09	0.26	0.27	0.23	0.74	0.10
Cl	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01
L.O.I.	9.02	5.78	4.44	4.70	3.03	5.70	4.61	5.30	6.22	5.27	7.19	7.53	9.65
TOTAL	100.17	99.14	99.74	99.99	98.85	99.20	98.65	98.60	99.08	100.23	99.06	100.13	99.68
C												3.27	

TABLE 17A

DANNHAUSER BOREHOLE SEDIMENTS

	Ec Dan 1	/2	/3	/4	/5	/6	/7	/8	/9	/10
SiO_2	62.23	55.29	49.92	49.97	43.98	52.28	77.02	73.41	57.85	60.30
TiO_2	0.84	0.82	0.81	0.71	0.77	0.97	0.77	0.54	0.85	0.94
Al_2O_3	17.30	18.37	18.81	17.94	20.34	21.60	10.90	11.14	17.90	19.34
FeO	4.74	6.32	5.75	4.02	4.45	2.81	2.08	3.02	5.17	3.88
Fe_2O_3	0.96	1.11	0.24	4.86	6.58	0.09	0.31	0.21	0.69	1.26
Total Fe_2O_3	6.23	8.14	6.15	9.33	11.56	3.21	2.63	3.58	6.43	5.57
MnO	0.05	0.07	0.05	0.08	0.08	0.02	0.04	0.05	0.06	0.02
MgO	1.90	2.09	1.85	1.44	1.12	1.15	0.56	0.75	1.43	1.60
CaO	0.59	0.86	0.81	0.72	0.33	0.20	0.27	0.50	0.50	0.24
Na_2O	1.20	1.09	0.94	0.59	0.34	0.78	1.36	1.34	1.16	1.30
K_2O	2.61	2.51	3.03	2.95	2.51	3.25	3.22	3.29	2.90	3.48
P_2O_5	0.09	0.14	0.09	0.06	0.06	0.11	0.07	0.07	0.11	0.10
CO_2	0.45	0.45	2.70	0.55	0.10	0.10	1.15	2.05	0.50	0.10
S	0.16	0.23	0.43	3.58	4.36	0.29	0.07	0.07	0.15	0.06
Cl	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01
L.O.I.	6.14	9.23	13.83	14.79	18.06	15.38	2.17	2.33	9.54	6.43
TOTAL	99.63	99.06	98.97	99.13	99.25	99.03	100.17	99.06	99.24	99.42
C				2.21	2.82				4.56	

TABLE 18A

SPRINGBOK AND VIERFONTEIN COLLIERIES

	Ec4	Ec5	Ec6	Ec7	Ec8	Ec9	Ec10	Ec11	Ec12	Ec13	Ec14	Ec15	Ec16
SiO_2	46.82	50.82	50.97	41.71	60.89	47.33	49.52	49.94	58.49	46.02	44.68	38.77	39.92
TiO_2	0.75	0.85	1.04	0.82	0.77	0.91	0.97	0.78	0.90	0.71	0.63	1.89	3.06
Al_2O_3	23.43	19.92	26.23	19.33	20.76	22.98	24.53	19.64	16.93	17.31	34.02	19.45	22.98
FeO	4.10	6.45	1.09	0.83	0.97	3.05	1.12	6.77	4.50	7.01	0.83	0.40	1.05
Fe_2O_3	0.54	0.70	0.27	9.75	0.73	0.00	0.40	0.89	1.63	1.13	0.03	0.14	0.07
Total Fe_2O_3	5.11	7.87	1.50	10.66	1.80	3.38	1.64	8.41	6.64	8.93	0.95	0.58	1.25
MnO	0.02	0.07	0.01	0.18	0.01	0.04	0.01	0.06	0.07	0.17	0.01	0.00	0.00
MgO	0.49	1.24	0.53	1.12	0.44	0.79	0.51	1.38	1.88	1.14	0.38	0.23	0.21
CaO	0.08	0.31	0.08	0.34	0.05	0.12	0.07	0.64	0.55	0.66	0.33	0.58	0.34
Na_2O	0.20	0.23	0.17	0.13	0.22	0.19	0.18	0.91	1.41	1.11	0.05	0.92	0.30
K_2O	1.68	2.78	1.59	1.94	1.91	1.91	1.58	1.51	2.60	1.35	0.32	0.12	0.21
P_2O_5	0.05	0.11	0.17	0.10	0.06	0.10	0.07	0.11	0.08	0.14	0.14	0.05	0.05
CO_2	0.10	3.20	0.35	4.76	0.10	1.30	0.10	0.10	0.20	3.00	0.10	0.20	0.40
S	2.46	0.28	0.10	0.15	0.32	0.12	0.15	0.68	0.16	0.94	0.06	0.10	0.30
Cl	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	20.37	12.28	16.18	18.30	13.05	20.37	20.08	16.64	9.24	18.88	17.74	37.28	30.24
TOTAL	99.08	99.67	98.82	99.40	100.07	99.43	99.28	100.11	99.00	99.43	99.36	100.06	98.97
C	5.30							7.09		6.42			

TABLE 19A

NORTHERN ECCA FACIES SHALES

	Ec17	Ec18	Ec19	Ec20	Ec21	Ec22	Ec23	Ec24	Ec25	Ec27	Ec30
SiO_2	70.87	61.39	58.27	29.47	55.88	56.15	64.49	58.32	57.23	59.06	58.20
TiO_2	0.60	0.85	0.91	0.30	0.76	0.75	0.75	0.73	0.71	0.90	0.78
Al_2O_3	14.04	21.13	22.59	7.37	18.36	18.04	17.55	19.48	16.65	21.37	19.34
FeO	1.94	1.36	0.93	24.28	0.79	0.43	1.01	0.21	0.72	0.43	0.93
Fe_2O_3	1.49	3.84	3.53	6.08	6.99	10.81	2.52	7.48	11.32	5.26	3.33
Total Fe_2O_3	3.65	5.36	4.58	33.05	7.86	11.28	3.64	7.71	12.12	5.74	4.38
MnO	0.03	0.01	0.02	0.24	0.08	0.05	0.01	0.04	0.09	0.05	0.04
MgO	1.26	0.91	0.47	2.70	0.77	0.68	0.79	0.83	0.89	0.62	1.04
CaO	0.87	0.20	0.17	1.29	0.64	0.57	0.16	0.23	1.05	1.05	0.25
Na_2O	1.51	1.42	1.51	0.17	0.34	0.36	0.83	0.61	0.58	0.84	0.56
K_2O	3.19	2.65	2.42	2.03	1.89	1.81	1.81	1.93	1.40	2.59	3.19
P_2O_5	0.16	0.22	0.15	0.18	0.42	0.42	0.14	0.14	0.80	0.62	0.11
CO_2	0.10	0.10	0.10	20.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10
S	0.02	0.01	0.02	0.17	0.03	0.01	0.03	0.01	0.01	0.01	0.02
Cl	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
L.O.I.	3.27	5.14	7.96	3.56	12.31	9.18	9.83	9.06	8.33	7.14	11.37
TOTAL	99.55	99.38	99.15	100.37	99.42	99.39	100.09	99.16	99.94	100.09	99.35

TABLE 20A

SOUTHERN ECCA FACIES

	Qu19	Qu23	SA27	SA31	SA34	R2	Ec1	Ec2	Ec3
SiO_2	63.82	64.38	58.13	59.24	66.21	49.87	71.10	71.89	63.88
TiO_2	0.73	0.82	0.74	0.69	0.55	0.23	0.55	0.62	0.76
Al_2O_3	17.04	16.44	18.99	18.33	15.91	27.93	13.15	12.67	13.28
FeO	4.42	5.20	5.44	5.86	4.36	0.50	2.59	2.01	2.44
Fe_2O_3	0.94	0.81	1.61	1.00	0.98	1.84	1.66	2.64	1.96
Total Fe_2O_3	5.85	6.59	7.66	7.51	5.82	2.41	4.53	4.87	4.68
MnO	0.06	0.09	0.11	0.10	0.06	0.01	0.07	0.06	0.13
MgO	2.08	2.21	2.29	2.09	1.55	1.80	1.39	1.36	1.50
CaO	0.83	0.73	1.02	0.74	0.38	0.26	0.95	0.89	4.59
Na_2O	1.29	1.77	1.12	1.45	1.43	0.15	2.24	2.04	1.75
K_2O	3.68	3.94	4.45	3.70	3.28	7.28	2.74	2.62	2.92
P_2O_5	0.13	0.17	0.15	0.20	0.10	0.07	0.14	0.17	0.25
CO_2	0.25	0.30	0.18	0.32	0.21	0.20	0.10	0.10	3.20
S	0.00	0.05	0.02	0.03	0.04	0.05	0.02	0.02	0.06
Cl	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.01	0.01
L.O.I.	3.66	1.96	4.55	4.55	4.08	8.25	2.31	2.59	2.56
TOTAL	99.42	99.43	99.40	98.93	99.57	98.47	99.26	99.89	99.31
C									0.98

TABLE 21A

CENTRAL ECCA FACIES

	R1	AB1	AB4	AB7	PR40	PR41	KL14	KL17	CV66	CV71	CV75	WEC1	WEC3
SiO_2	58.55	66.22	61.67	59.32	61.65	59.47	63.85	60.91	59.44	62.01	60.53	57.35	57.94
TiO_2	0.92	0.71	0.75	0.63	0.70	0.58	0.81	0.68	0.54	0.63	0.64	0.61	0.69
Al_2O_3	20.46	16.16	17.99	19.20	17.32	18.49	16.39	18.04	17.47	16.65	16.27	19.10	20.28
FeO	0.65	4.56	5.28	6.14	4.17	4.24	4.50	5.70	4.24	4.02	4.41	2.84	4.80
Fe_2O_3	5.19	0.67	0.99	0.99	2.43	2.42	0.99	0.96	2.79	2.29	2.80	3.95	2.42
Total Fe_2O_3	5.90	5.74	6.85	7.81	7.07	7.13	5.99	7.29	7.50	6.76	7.70	7.11	7.75
MnO	0.07	0.07	0.08	0.11	0.08	0.09	0.10	0.06	0.10	0.07	0.15	0.13	0.12
MgO	1.07	1.65	2.15	2.25	1.92	2.03	2.01	2.05	2.33	1.59	1.63	1.90	2.37
CaO	0.26	0.74	0.71	0.54	0.67	0.49	0.95	0.50	0.37	0.65	0.88	2.11	0.66
Na_2O	0.68	1.35	1.46	1.25	1.18	1.50	2.14	1.46	1.19	1.53	1.70	1.42	1.81
K_2O	2.89	3.64	4.25	4.42	4.09	4.08	3.05	3.69	4.01	3.10	3.25	3.76	3.97
P_2O_5	0.20	0.16	0.17	0.14	0.16	0.14	0.17	0.19	0.12	0.18	0.17	1.18	0.17
CO_2	0.15	0.25	0.45	0.25	0.10	0.30	0.27	0.30	0.30	0.55	1.75	0.10	0.10
S	0.03	0.01	0.01	0.05	0.00	0.04	0.03	0.05	0.01	0.02	0.03	0.00	0.00
Cl	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.03	0.01
L.O.I.	8.44	2.95	2.55	3.82	4.95	4.86	3.21	4.28	5.84	6.12	6.81	5.04	4.22
TOTAL	99.60	99.64	99.10	99.74	99.90	99.17	98.95	99.46	99.22	99.85	100.49	99.81	100.08

TABLE 22A

CENTRAL ECCA FACIES (CONTD.)

	WEC4	WEC5	WEC5B	WEC5C	WEC5D	WEC5P	WEC7	WEC8	WEC9	WEC10	WEC11
SiO_2	62.20	70.10	47.25	74.06	73.21	13.51	62.75	59.09	63.12	72.08	60.89
TiO_2	0.66	0.47	0.68	0.65	0.67	0.19	0.73	0.64	0.67	0.47	0.68
Al_2O_3	17.93	14.00	16.50	13.22	15.02	5.15	17.22	18.41	16.61	12.35	17.07
FeO	4.60	3.17	0.28	0.21	1.08	6.66	3.08	2.48	3.28	1.08	4.92
Fe_2O_3	1.79	1.71	0.83	0.89	0.14	3.64	3.43	4.50	2.36	3.96	1.70
Total Fe_2O_3	6.91	5.23	1.15	1.11	1.35	11.05	6.85	7.27	6.00	5.16	7.17
MnO	0.10	0.04	0.01	0.01	0.01	0.70	0.06	0.10	0.09	0.06	0.11
MgO	2.28	1.44	0.99	0.62	0.65	1.61	2.12	2.14	2.21	1.34	2.38
CaO	0.38	0.37	12.95	0.16	0.11	34.09	0.97	0.53	1.38	0.62	1.12
Na_2O	1.62	1.22	0.14	0.20	0.17	0.14	1.39	0.97	1.66	1.08	1.59
K_2O	4.33	2.28	4.16	3.54	3.88	0.27	3.49	4.38	3.09	2.14	3.68
P_2O_5	0.11	0.08	0.18	0.15	0.12	1.57	0.17	0.10	0.12	0.09	0.39
CO_2	0.10	0.10	12.91	0.27	0.13	25.14	0.20	0.20	0.88	0.10	0.10
S	0.00	0.00	0.02	0.03	0.01	1.30	0.01	0.01	0.01	0.00	0.00
Cl	0.01	0.01	0.01	0.01	0.01	0.04	0.01	0.01	0.02	0.01	0.01
L.O.I.	3.34	3.95	3.68	5.43	3.42	4.65	3.97	4.82	3.65	3.80	3.76
TOTAL	99.97	99.30	99.61	99.42	98.75	99.12	99.94	98.65	99.50	99.31	98.93

TABLE 23A

WESTERN ECCA FACIES

	AEC/1	/2	/3	/4	/5	/6	/7	WEC13	WEC14	WEC15	WEC17
SiO_2	52.87	67.37	31.75	65.40	63.37	63.93	58.62	61.07	60.99	71.69	25.51
TiO_2	0.86	0.59	0.69	0.61	0.71	0.72	0.79	0.77	0.81	0.60	0.16
Al_2O_3	17.05	13.77	14.20	15.43	15.80	15.46	16.55	17.81	16.42	12.83	5.32
FeO	1.40	1.58	12.36	2.30	3.16	3.59	4.60	4.94	2.60	1.72	0.00
Fe_2O_3	0.01	1.01	1.37	1.66	1.57	1.51	2.36	2.00	3.12	1.51	18.91
Total Fe_2O_3	1.58	2.78	15.12	4.22	5.09	5.50	7.47	7.49	6.00	3.43	18.91
MnO	0.01	0.01	0.51	0.02	0.03	0.04	0.09	0.10	0.08	0.04	5.70
MgO	0.92	1.52	3.75	1.55	1.99	1.86	2.87	2.24	2.28	1.19	1.42
CaO	0.17	0.48	6.50	0.79	0.66	0.59	0.92	0.97	1.29	1.36	19.78
Na_2O	0.62	0.83	0.24	1.24	1.74	1.57	2.05	1.38	1.51	2.48	0.00
K_2O	2.68	2.71	1.55	2.26	3.02	3.08	4.09	4.29	4.79	2.86	0.32
P_2O_5	0.05	0.09	0.96	0.08	0.10	0.09	0.27	0.19	0.19	0.17	2.23
CO_2	0.30	0.50	6.56	0.35	0.30	0.25	0.25	0.19	0.13	0.30	15.31
S	0.52	0.10	0.30	0.11	0.04	0.05	0.06	0.00	0.00	0.00	0.03
Cl	0.01	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.00	0.01
L.O.I.	23.17	8.34	17.33	7.87	7.07	6.00	4.99	3.42	4.62	2.16	3.99
TOTAL	100.29	98.71	99.15	99.82	99.88	99.10	98.96	99.92	99.12	99.11	98.66
C	16.55		7.98								

TABLE 24A

BEAUFORT SERIES

	BF1	BF2	BF3	BF4	BF5	BF6	BF7	BF8	WBF6	PR38	PR39
SiO_2	67.26	62.74	62.99	62.72	66.89	60.51	61.15	60.69	65.64	62.64	66.48
TiO_2	0.70	0.67	0.68	0.67	0.63	0.62	0.65	0.71	0.73	0.76	0.64
Al_2O_3	15.45	16.01	17.15	15.48	15.27	17.82	18.16	17.00	15.17	16.65	15.09
FeO	1.58	2.23	1.87	2.59	1.87	4.45	4.38	0.72	1.26	3.31	2.80
Fe_2O_3	3.47	5.06	5.23	3.29	3.00	2.27	2.52	6.30	4.77	3.39	1.96
Total Fe_2O_3	5.23	7.53	7.30	6.17	5.08	7.22	7.39	7.10	6.18	7.07	5.08
MnO	0.09	0.08	0.08	0.10	0.04	0.08	0.09	0.04	0.04	0.08	0.06
MgO	1.41	1.65	1.97	1.69	1.63	2.16	2.30	1.50	1.56	1.87	1.74
CaO	0.75	1.12	0.54	1.90	0.83	0.69	0.26	0.14	0.60	0.78	1.19
Na_2O	1.50	1.65	1.46	1.01	2.20	1.19	0.64	0.89	1.09	1.11	1.25
K_2O	2.85	3.02	3.64	3.65	3.34	4.63	4.75	3.74	3.14	4.18	3.46
P_2O_5	0.15	0.12	0.12	0.15	0.20	0.11	0.13	0.14	0.14	0.14	0.18
CO_2	0.10	0.40	0.10	1.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10
S	0.02	0.01	0.01	0.04	0.04	0.02	0.02	0.02	0.00	0.02	0.04
Cl	0.00	0.00	0.00	0.00	0.04	0.08	0.01	0.00	0.00	0.01	0.01
L.O.I.	4.45	3.46	4.18	3.80	3.11	4.40	3.81	6.34	5.11	3.87	3.85
TOTAL	99.94	98.45	100.21	98.53	99.36	99.53	99.42	98.38	99.50	99.25	99.10
C				0.28							

TABLE 25A

DREDGED AGULHAS BANK SEDIMENTS

	DR21	DR50	DR127	DR140	DR142	DR143	LS120	LS3
SiO_2	68.76	57.52	71.49	59.28	65.60	64.25	64.52	53.87
TiO_2	0.83	0.82	0.68	1.04	0.88	0.86	0.84	1.09
Al_2O_3	15.48	19.88	13.17	19.47	17.12	16.56	15.61	23.71
FeO	2.34	5.46	3.68	4.24	2.32	4.00	5.34	1.20
Fe_2O_3	2.17	1.80	1.00	2.27	2.75	2.12	2.24	4.43
Total Fe_2O_3	4.78	7.86	5.09	6.99	5.34	6.57	8.18	5.77
MnO	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.01
MgO	1.30	2.39	1.77	1.73	1.55	1.86	1.94	1.88
CaO	0.15	0.18	0.23	0.23	0.16	0.20	0.28	0.03
Na_2O	1.39	0.80	1.26	1.33	1.21	1.01	1.07	0.47
K_2O	3.04	3.70	2.48	3.77	3.37	3.30	2.75	5.66
P_2O_5	0.10	0.15	0.13	0.17	0.13	0.17	0.19	0.12
CO_2	0.09	0.07	0.25	0.25	0.07	0.21	0.20	0.11
S	0.01	0.01	0.01	0.01	0.03	0.03	0.05	0.02
Cl	0.07	0.01	0.06	0.04	0.05	0.11	0.05	0.03
L.O.I.	3.13	5.92	3.20	5.04	3.79	4.75	3.74	6.71
TOTAL	98.99	99.25	99.53	99.09	99.18	99.55	99.16	99.34

TABLE 26A

SEPARATED LESS THAN 2 MICRON FRACTIONS.

	FG14	FG17	FG1	JP7	KU12	KU14	SCHR3	MM7	CG1	BK7	BK14	BK18	BK21	W66
SiO_2	41.95	42.07	44.39	39.69	47.66	46.80	43.10	54.05	50.07	43.72	48.76	44.47	44.80	39.88
TiO_2	0.63	0.46	0.25	0.40	0.78	1.55	0.54	0.86	0.62	0.62	0.96	0.84	0.97	0.42
AL_2O_3	19.25	22.16	19.71	22.81	30.82	27.91	22.09	19.79	22.18	31.46	25.01	25.94	28.93	28.35
Fe_2O_3	17.18	11.99	32.98	13.12	2.03	4.73	11.19	6.61	8.89	6.94	6.78	7.25	6.48	10.33
MnO	0.19	0.17	0.06	0.12	0.01	0.02	0.18	0.04	0.02	0.02	0.02	0.02	0.04	0.03
MgO	5.82	7.24	3.52	8.30	0.99	1.87	5.69	2.58	2.56	1.59	2.93	3.19	2.33	1.48
CaO	0.19	0.09	0.00	1.15	0.48	0.25	2.33	0.77	1.24	0.25	0.35	0.77	0.09	0.09
Na_2O	0.07	0.31	0.15	0.86	0.56	0.13	0.71	0.79	0.28	0.78	0.58	0.60	0.27	0.39
K_2O	4.59	4.95	0.31	3.51	8.93	9.63	5.26	5.03	5.75	5.83	5.75	5.75	6.69	5.60
P_2O_5	0.12	0.06	0.00	0.07	0.13	0.06	0.10	0.29	0.09	0.11	0.21	0.21	0.08	0.12
L.O.I.	9.26	9.34	8.50	8.65	6.86	6.03	8.39	8.63	6.94	8.39	8.01	10.41	9.31	12.34
TOTAL	99.25	98.83	99.88	98.69	99.25	98.98	99.58	99.46	98.66	99.70	99.38	99.46	99.99	99.03

TABLE 26A (CONTINUED)

	45/64/3	47/64/7	47/64/11	48/65/11	SEC2	SEC3	SEC22	SEC23	ECDAN9	EC14	EC18	WEC1	WEC4	AB4
SiO_2	44.22	39.53	46.18	43.72	53.65	46.25	50.74	45.03	43.92	43.13	44.53	44.88	44.60	46.74
TiO_2	0.89	0.95	0.95	1.95	0.43	0.71	0.76	0.77	0.91	0.67	0.48	0.51	0.28	0.86
AL_2O_3	24.29	26.30	29.47	31.22	15.85	24.95	23.25	25.22	27.50	36.14	31.52	23.55	26.09	24.79
Fe_2O_3	9.63	11.12	4.23	3.59	9.76	8.72	6.01	9.29	8.06	0.57	7.06	10.63	10.57	9.49
MnO	0.10	0.11	0.02	0.04	0.29	0.09	0.06	0.10	0.08	0.01	0.01	0.15	0.10	0.08
MgO	3.66	2.47	1.37	1.14	2.06	2.33	2.24	2.05	1.84	0.29	1.27	2.99	3.77	3.02
CaO	0.62	1.04	0.53	0.37	1.82	0.89	0.69	0.93	0.39	0.22	0.26	2.12	0.38	0.67
Na_2O	1.33	0.84	0.88	0.31	0.68	0.62	0.66	0.66	0.91	0.13	1.91	1.36	0.96	0.95
K_2O	6.76	4.57	6.13	1.98	3.05	5.34	5.14	5.06	4.61	0.19	3.96	4.51	5.56	6.65
P_2O_5	0.14	0.07	0.05	0.05	0.13	0.10	0.06	0.07	0.08	0.02	0.28	1.12	0.09	0.12
L.O.I.	7.93	13.10	9.73	15.08	11.87	10.15	9.93	10.38	11.82	17.92	7.75	7.80	7.60	5.64
TOTAL	99.57	100.11	99.52	99.47	99.60	100.15	99.54	99.56	100.13	99.31	99.03	99.63	100.00	99.02

TABLE 26A (CONTINUED)

	Qu23	AEc4	RI	BF7	PR38
SiO_2	52.42	58.53	45.51	52.26	49.09
TiO_2	1.43	0.56	0.54	0.53	0.97
AL_2O_3	13.38	17.82	26.59	22.03	23.73
FE_2O_3	11.66	4.97	7.93	7.98	8.58
MnO	0.18	0.02	0.05	0.07	0.09
MgO	3.68	1.99	1.63	2.72	2.62
CaO	1.76	0.80	0.27	0.28	0.88
NA_2O	1.14	1.28	0.76	0.53	0.64
K_2O	5.70	2.16	3.31	6.04	6.87
P_2O_5	0.50	0.05	0.24	0.09	0.12
L.O.I.	5.38	12.09	12.37	5.38	5.73
TOTAL	97.24	100.26	99.20	97.93	99.33

TABLE 27A

LESS THAN 2 MICRON FRACTIONS. ANALYTICAL RESULTS ON A WATER-FREE BASIS.

	Fg14	Fg17	Fg1	JP7	Ku12	Ku14	Schr3	Mm7	Cg1	Bk7	Bk14	Bk18	Bk21	Wb6
SiO_2	46.23	46.40	36.56	43.44	51.17	49.80	47.05	59.16	53.80	47.72	53.01	49.63	49.40	45.49
TiO_2	0.69	0.51	0.28	0.44	0.84	1.65	0.58	0.94	0.67	0.67	1.05	0.94	1.07	0.48
Al_2O_3	21.22	24.44	21.54	24.97	33.09	29.70	24.11	21.66	23.83	34.34	27.18	28.95	31.90	32.33
Fe_2O_3	18.93	13.22	36.04	14.37	2.18	5.04	12.21	7.24	9.55	7.58	7.37	8.09	7.14	11.79
MnO	0.21	0.19	0.07	0.13	0.01	0.02	0.19	0.05	0.02	0.02	0.02	0.03	0.04	0.04
MgO	6.41	7.98	3.85	9.09	1.07	1.99	6.21	2.83	2.75	1.73	3.19	3.56	2.57	1.69
CaO	0.21	0.10	0.00	1.26	0.51	0.26	2.55	0.85	1.33	0.28	0.38	0.86	0.10	0.10
Na_2O	0.07	0.31	0.15	0.86	0.56	0.13	0.71	0.79	0.28	0.78	0.58	0.60	0.27	0.39
K_2O	5.05	5.46	0.34	3.84	9.58	10.25	5.74	5.50	6.18	6.36	6.25	6.42	7.37	6.38
P_2O_5	0.13	0.07	0.00	0.08	0.14	0.07	0.11	0.31	0.09	0.11	0.23	0.24	0.08	0.14

TABLE 27A (CONTINUED)

	45/64/3	47/64/7	47/64/11	48/65/11	SEC2	SEC3	SEC22	SEC23	ECDAN9	EC14	EC18	WEC1	WEC4	AB4
SiO_2	48.02	46.64	51.16	51.49	60.87	51.47	56.33	50.24	49.81	52.55	48.27	48.68	48.59	49.53
TiO_2	0.96	1.09	1.05	2.30	0.49	0.79	0.85	0.86	1.03	0.82	0.52	0.55	0.30	0.92
Al_2O_3	26.38	30.26	32.64	36.76	17.99	27.77	25.82	28.14	31.18	44.04	34.16	25.54	28.24	26.27
Fe_2O_3	10.46	12.80	4.68	4.23	11.08	9.71	6.68	10.37	9.14	0.70	7.66	11.53	11.44	10.06
MnO	0.11	0.12	0.02	0.04	0.33	0.10	0.06	0.11	0.09	0.01	0.01	0.17	0.11	0.09
MgO	3.97	2.85	1.52	1.35	2.34	2.59	2.49	2.29	2.09	0.36	1.37	3.25	4.08	3.20
CaO	0.67	1.20	0.58	0.43	2.06	0.99	0.77	1.03	0.45	0.27	0.28	2.30	0.41	0.71
Na_2O	1.33	0.84	0.88	0.31	0.68	0.62	0.66	0.66	0.91	0.13	1.91	1.36	0.96	0.95
K_2O	7.35	5.25	6.79	2.34	3.46	5.94	5.70	5.64	5.23	0.23	4.29	4.89	6.02	7.05
P_2O_5	0.15	0.08	0.05	0.06	0.15	0.11	0.07	0.08	0.09	0.03	0.30	1.22	0.09	0.13

TABLE 27A (CONTINUED)

	Qu23	AEc4	RI	BF7	PR38
SiO_2	55.40	66.57	51.93	55.23	52.08
TiO_2	1.51	0.63	0.61	0.56	1.03
Al_2O_3	14.14	20.27	30.34	23.28	25.18
Fe_2O_3	12.32	5.65	9.05	8.43	9.10
MnO	0.19	0.02	0.05	0.08	0.10
MgO	3.89	2.26	1.86	2.88	2.78
CaO	1.86	0.91	0.31	0.30	0.94
Na_2O	1.14	1.28	0.76	0.53	0.64
K_2O	6.02	2.46	3.78	6.38	7.29
P_2O_5	0.53	0.06	0.27	0.10	0.12

ECCA SERIES (NORTHERN FACIES, UPPER SHALES)	52.37	0.82	17.62	2.61	3.91	0.07	1.36	0.56	1.06	1.89	0.11	1.43
(NORTHERN FACIES, MIDDLE SHALES) GB SERIES BOREHOLES	58.26 (7.27)	0.86 (0.14)	17.29 (2.16)	0.99 (0.80)	4.69 (2.45)	0.06 (0.03)	1.43 (0.45)	1.29 (1.91)	0.94 (0.28)	3.40 (0.51)	0.29 (0.68)	0.24 (0.28)
(NORTHERN FACIES, MIDDLE SHALES) A SERIES BOREHOLES	46.49 (5.54)	1.04 (0.34)	20.28 (3.15)	0.11 (0.10)	2.05 (1.61)	0.01 (0.01)	0.58 (0.31)	0.23 (0.21)	0.12 (0.08)	1.40 (0.59)	0.07 (0.05)	0.21 (0.21)
(NORTHERN FACIES, MIDDLE SHALES) SOMKELE BOREHOLE	61.94 (7.49)	0.68 (0.12)	16.30 (1.80)	0.93 (0.38)	4.79 (6.01)	0.06 (0.05)	1.46 (0.55)	0.58 (0.28)	0.99 (0.28)	3.06 (0.65)	0.13 (0.05)	0.17 (0.15)
(NORTHERN FACIES, MIDDLE SHALES) DANNHAUSER BOREHOLE	58.62	0.80	17.36	1.63	4.15	0.05	1.39	0.50	1.01	2.98	0.09	0.93
ALL NORTHERN FACIES MIDDLE SHALES	54.93 (9.06)	0.88 (0.33)	18.47 (3.30)	0.88 (1.27)	3.86 (3.61)	0.05 (0.04)	1.17 (0.59)	0.69 (1.17)	0.73 (0.46)	2.59 (1.04)	0.16 (0.39)	0.31 (0.59)
(NORTHERN FACIES, LOWER SHALES)	59.41	0.81	19.97	4.71	0.81	0.03	0.77	0.38	0.87	2.35	0.26	0.02
SOUTHERN FACIES	60.54	0.64	18.27	1.30	4.03	0.08	1.93	1.22	1.28	4.18	0.15	0.03
CENTRAL FACIES	60.47 (3.93)	0.68 (0.08)	17.64 (1.39)	2.41 (1.37)	3.77 (1.59)	0.09 (0.03)	1.93 (0.40)	1.37 (2.76)	1.36 (0.43)	3.72 (0.50)	0.22 (0.23)	0.02 (0.02)
WESTERN FACIES	58.26	0.73	15.83	1.63	4.06	0.10	2.11	1.37	1.24	3.16	0.22	0.13
BEAUFORT SERIES	63.04 (2.04)	0.68 (0.04)	16.25 (1.15)	3.75 (1.39)	2.46 (1.20)	0.07 (0.02)	1.77 (0.28)	0.80 (0.48)	1.27 (0.42)	3.67 (0.62)	0.14 (0.03)	0.02 (0.01)
DREDGED AGULHAS BANK SHALES	62.91	0.87	17.63	2.35	3.64	0.03	1.89	0.19	1.15	3.49	0.15	0.01
ALL SOUTH AFRICAN SHALES	60.71 (8.12)	0.77 (0.21)	16.49 (3.77)	3.06 (4.85)	3.28 (2.57)	0.06 (0.14)	1.78 (1.22)	0.75 (1.22)	0.95 (0.63)	2.97 (1.17)	0.15 (0.25)	0.16 (0.51)
	C% 13	27	22	160	79	43	69	160	4-	39	60	31.

FOOTNOTES: SAMPLES CONTAINING MORE THAN 70% SiO_2, 15% TOTAL Fe_2O_3 OR 10% CaO HAVE BEEN EXCLUDED.

FIGURES IN PARENTHESES ARE THE STANDARD DEVIATIONS - THESE ARE GIVEN FOR SEQUENCES CONTAINING MORE THAN 10 SAMPLES.

* ALL DETERMINATIONS INCLUDED IN AVERAGE.

TABLE 28A

AVERAGE MAJOR ELEMENT ABUNDANCES IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	S
SWAZILAND SYSTEM: Fig Tree Series	59.40 (5.40)	0.59 (0.12)	13.32 (2.99)	3.69 (1.91)	6.75 (3.52)	0.08 (0.06)	5.21 (0.99)	0.90 (1.16)	0.96 (0.46)	2.07 (1.11)	0.09 (0.02)	0.05 (0.02)
PONGOLA SYSTEM: * Mozaan Series	54.49	0.42	11.22	24.13	1.07	0.41	0.29	0.01	0.10	0.95	0.07	0.02
KHEIS SYSTEM:	74.69	0.76	11.07	5.89	0.57	0.02	0.49	0.25	0.00	3.46	0.18	0.02
WITWATERSRAND SYSTEM: * Jeppestown and Government Reef Series	60.49	0.58	13.91	3.19	7.62	0.02	4.44	1.39	1.19	1.96	0.08	0.08
SINCLAIR FORMATION: * Kunyas Series	72.16	1.01	14.97	2.01	0.17	0.00	0.66	0.11	0.35	4.35	0.12	0.19
DAMARA SYSTEM:	58.34	0.86	16.41	6.89	1.01	0.05	5.70	0.28	2.04	4.88	0.17	0.01
MALMESBURY FORMATION:	60.87	0.80	16.94	1.87	5.72	0.07	3.58	0.66	1.50	4.51	0.15	0.07
* CANGO FORMATION:	58.10	0.76	18.36	5.03	2.94	0.07	2.69	0.80	0.46	5.17	0.17	0.02
NAMA SYSTEM: Kuibis Series	68.76	1.00	16.11	1.38	0.94	0.05	0.89	0.31	0.25	5.69	0.08	0.35
Schwarzrand Series	61.43	0.65	17.16	2.70	3.35	0.09	2.61	1.59	1.78	3.20	0.14	0.02
* Fish River Series	66.07 (6.75)	0.73 (0.20)	12.77 (2.53)	3.97 (1.02)	1.01 (0.70)	0.08 (0.02)	2.21 (0.72)	2.77 (1.30)	1.72 (0.55)	2.90 (0.72)	0.20 (0.07)	0.03 (0.03)
CAPE SYSTEM: Bokkeveld Series	62.57 (3.92)	0.94 (0.09)	17.55 (2.22)	3.38 (1.49)	2.90 (1.47)	0.04 (0.02)	1.53 (0.48)	0.21 (0.25)	0.66 (0.37)	3.52 (0.69)	0.14 (0.05)	0.05 (0.09)
Witteberg Series	59.35	0.88	18.09	6.09	1.36	0.04	1.40	0.25	0.54	3.40	0.14	0.02

TABLE 29A

AVERAGE MAJOR ELEMENT ABUNDANCES ON A VOLATILE FREE BASIS

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3 (Total)	MgO	CaO	K_2O
SWAZILAND SYSTEM: Fig Tree Series	63.41 (5.39)	0.63 (0.13)	14.31 (3.21)	10.56 (2.82)	5.47 (0.87)	1.02 (1.27)	2.49 (1.20)
PONGOLA SYSTEM: * Mozaan Series	55.60	0.41	10.68	31.05	0.49	0.12	0.88
WITWATERSRAND SYSTEM: * Jeppestown and Government Reef Series	62.73	0.61	14.44	12.11	4.61	1.44	2.04
SINCLAIR FORMATION: * Kunyas Series	75.10	1.05	15.57	2.30	0.68	0.11	4.51
MALMESBURY FORMATION:	64.93	0.72	16.72	7.12	3.22	0.61	4.28
* CANGO FORMATION:	61.01	0.80	19.27	8.71	2.81	0.83	5.43
NAMA SYSTEM: * Fish River Series	69.04 (6.44)	0.78 (0.23)	13.33 (2.68)	5.33 (1.48)	2.31 (0.76)	2.91 (1.39)	3.01 (0.75)
CAPE SYSTEM: Bokkeveld Series	67.35 (4.82)	0.95 (0.18)	17.69 (3.11)	6.58 (2.07)	1.79 (0.60)	0.27 (0.35)	3.47 (0.98)
Witteberg Series	66.14	0.90	18.81	7.78	1.46	0.26	3.50
KARROO SYSTEM: Ecca Series Northern Facies, Upper shales	61.93	0.97	21.10	8.49	1.61	0.66	2.23
Northern Facies, Middle Shales GB Series Boreholes	65.59 (5.48)	0.95 (0.18)	19.15 (3.18)	6.02 (3.08)	1.47 (0.51)	1.00 (1.04)	3.83 (0.36)
Northern Facies, Middle shales A Series Boreholes	63.51 (3.02)	1.43 (0.47)	27.67 (3.10)	3.18 (2.11)	0.78 (0.36)	0.34 (0.38)	1.86 (0.61)
Northern Facies, Middle shales Somkele Borehole	68.59 (3.33)	0.74 (0.12)	17.77 (1.88)	5.43 (2.10)	1.48 (0.34)	0.61 (0.30)	3.42 (0.51)
Northern Facies Middle shales Dannhauser Borehole	64.60	0.90	19.63	7.15	1.56	0.57	3.33
All Northern Facies Middle Ecca shales	65.26 (5.43)	1.06 (0.52)	21.77 (5.57)	5.22 (3.09)	1.25 (0.55)	0.64 (0.68)	3.01 (1.01)
Northern Facies Lower shales	65.52	0.84	20.64	7.28	0.90	0.56	2.49
Southern Facies	66.03	0.66	17.94	5.79	1.90	1.22	4.03
Central Facies	66.00 (4.95)	0.70 (0.11)	17.96 (2.21)	6.62 (1.87)	1.93 (0.54)	0.74 (0.46)	3.80 (0.65)
Western Facies	68.63	0.79	16.94	4.84	1.92	0.83	3.47
Beaufort Series	65.97 (1.96)	0.71 (0.05)	17.01 (1.23)	6.79 (1.03)	1.85 (0.29)	0.83 (0.50)	3.84 (0.65)
Dredged Agulhas Bank Shales	68.08	0.86	16.89	6.06	1.95	0.26	3.32
ALL SOUTH AFRICAN SHALES	66.21 (5.78)	0.90 (0.37)	18.79 (5.11)	6.18 (2.94)	1.86 (1.23)	0.78 (0.89)	3.26 (1.17)
AVERAGE SEPARATED CLAY	51.32 (4.75)	0.86 (0.40)	27.90 (5.81)	8.74 (3.23)	2.97 (1.85)	0.94 (1.13)	5.52 (2.08)

FOOTNOTES:- SAMPLES CONTAINING MORE THAN 75% SiO_2, 15% TOTAL Fe_2O_3 AND 10% CaO HAVE BEEN EXCLUDED.

* ALL DETERMINATIONS INCLUDED IN AVERAGE

FIGURES IN PARENTHESES ARE THE STANDARD DEVIATIONS - THESE ARE GIVEN FOR SEQUENCES CONTAINING MORE THAN 10 SAMPLES.

TABLE 30 A

A COMPILATION OF SELECTED INTER-ELEMENT RATIOS FOR SOME SOUTHERN AFRICAN ARGILLACEOUS ROCKS

			Si/Al	Si/Ti	Si/Mg	Si/K	Si/Na	Al/Ti	Al/Mg	Al/P	Al/K	Al/Na	Fe/Mg	Fe/Mn	Mg/Ti	Ti/P	K/Ti	Ti/Na	Ca/Mg	Mg/P	Mg/K	Mg/Na	Ca/P	K/P	Na/P	Na/K
SWAZILAND SYSTEM.		$\bar{x}$	4.11	82.59	9.08	17.46	44.77	20.27	2.28	178.9	4.61	10.03	2.29	163.8	9.17	8.96	5.19	0.59	0.22	77.77	2.23	5.21	17.11	46.60	17.17	0.61
FIG TREE SERIES — SHALES AND GRAYWACKES	(16)	*	1.24	22.84	2.28	8.02	26.79	1.58	0.47	28.6	2.18	4.89	0.60	115.1	1.69	1.42	2.06	0.43	0.29	8.62	1.37	3.21	22.22	22.75	8.90	0.34
WITWATERSRAND SYSTEM.		$\bar{x}$	3.99	75.35	11.14	17.73	57.60	21.85	2.85	211.1	4.41	11.03	3.29	673.6	7.84	10.65	6.35	0.68	0.39	73.0	1.69	4.95	29.70	54.60	20.68	0.71
JEPPESTOWN AND GOVERNMENT REEF SERIES	(10)	*	0.81	16.76	3.41	8.08	54.83	5.46	0.82	49.6	1.58	6.42	2.80	275.4	1.35	2.59	4.68	0.43	0.22	18.8	0.83	3.30	16.05	23.36	14.63	0.52
SINCLAIR FORMATION.		$\bar{x}$	4.52	56.30	88.48	9.62	158.9	12.92	21.60	153.9	2.22	27.35	4.32	290.1	0.66	11.30	5.94	2.80	0.18	7.32	0.11	2.1	1.42	68.1	5.0	0.07
KUNYAS SERIES	(5)	*	1.20	7.12	19.15	1.93	102.5	2.08	9.43	72.0	0.11	6.18	1.82	162.2	0.19	2.17	0.58	1.79	0.08	1.80	0.04	1.4	0.77	22	1.9	0.02
DAMARA SYSTEM.	(1)		3.14	53.2	7.9	6.7	18.0	16.9	2.15	117.7	2.14	5.7	1.63	144.1	6.71	7.3	7.9	0.3	0.06	46.6	0.85	2.3	2.71	54.9	21.0	0.37
MALMESBURY FORMATION.	(5)	$\bar{x}$	4.00	66.15	21.78	10.98	23.04	17.57	5.21	142.1	2.65	6.36	2.68	85.8	3.83	6.77	7.35	0.33	0.34	28.52	0.52	1.37	7.47	46.02	20.35	0.53
		*	1.29	14.44	11.68	5.19	6.42	2.53	0.51	46.7	0.37	3.01	0.40	26.8	1.46	1.56	2.86	0.18	0.31	9.91	0.08	0.86	3.07	21.07	4.95	0.33
CANGO FORMATION.	(4)		2.81	59.75	19.37	7.07	155.4	21.27	6.92	130.3	2.33	19.70	4.15	84.4	3.51	6.00	9.42	3.74	0.41	22.52	0.41	9.87	7.66	56.60	4.77	0.09
NAMA SYSTEM.		$\bar{x}$	4.44	68.12	23.33	13.18	25.98	15.51	5.01	80.38	2.89	6.07	2.84	67.73	2.93	5.13	5.45	0.40	1.44	16.18	0.57	1.20	23.26	28.0	14.73	0.57
FISH RIVER SERIES	(13)	*	0.94	14.37	7.21	4.15	9.37	2.17	0.67	20.21	0.32	2.42	0.46	29.33	0.84	0.79	1.16	0.21	0.74	5.72	0.08	0.51	11.85	7.45	4.85	0.27
CAPE SYSTEM.		$\bar{x}$	3.27	53.92	30.02	10.78	86.26	16.46	8.71	172.7	3.25	29.00	4.38	176.21	1.89	10.50	5.00	1.75	0.15	19.23	0.39	3.76	2.41	45.44	8.25	0.21
BOKKEVELD SERIES	(33)	*	0.66	11.25	14.04	3.01	73.66	1.49	2.10	75.6	0.33	28.12	1.50	80.20	0.53	4.55	1.01	1.67	0.12	6.58	0.11	4.09	2.48	20.61	4.06	0.16
WITTEBERG SERIES	(6)	$\bar{x}$	2.83	54.21	35.87	9.92	110.1	19.07	12.95	205.2	3.54	47.02	6.37	248.6	1.70	11.28	5.50	2.37	0.21	16.78	0.32	2.94	4.64	64.98	8.93	0.30
		*	0.72	18.08	16.11	3.22	80.7	2.91	5.67	98.7	0.85	29.00	0.93	181.6	0.70	6.49	0.53	2.04	0.19	8.66	0.14	1.70	7.12	44.00	10.28	0.09
KARROO SYSTEM.																										
ECCA SERIES																										
NORTHERN FACIES — UPPER SHALES	(6)	$\bar{x}$	2.65	49.43	30.60	15.93	34.77	19.27	11.87	201.4	6.23	14.23	5.00	120.1	1.66	10.32	3.17	0.72	0.50	15.98	0.53	1.11	7.40	31.60	14.10	0.49
		*	0.59	4.97	3.73	1.33	13.41	2.13	2.94	126.0	1.58	8.06	0.93	62.1	0.26	5.98	0.55	0.39	0.11	5.71	0.10	0.30	1.70	15.14	2.53	0.13
NORTHERN FACIES — MIDDLE SHALES BOREHOLE GB 45/64	(12)	$\bar{x}$	3.10	54.70	33.10	9.89	39.02	17.77	11.66	256.6	3.27	13.09	5.26	98.0	2.00	14.21	5.55	0.74	0.97	14.56	0.38	1.35	8.74	60.97	17.08	0.27
		*	0.54	11.47	18.03	1.03	10.11	2.70	7.88	143.9	0.62	5.33	2.02	20.1	0.87	9.26	1.09	0.27	0.91	9.73	0.21	0.48	4.22	48.95	12.11	0.07
NORTHERN FACIES — MIDDLE SHALES BOREHOLE GB 47/64	(11)	$\bar{x}$	3.00	51.28	33.83	9.66	38.55	17.43	11.37	235.5	3.32	13.92	5.00	126.4	1.70	12.32	5.37	0.80	0.82	19.53	0.33	1.28	10.84	68.38	16.71	0.26
		*	0.63	10.39	14.41	0.75	8.94	2.20	4.30	87.2	0.60	5.02	1.46	47.8	0.56	5.99	1.08	0.25	0.62	8.33	0.12	0.40	4.36	32.19	8.41	0.08
NORTHERN FACIES — MIDDLE SHALES BOREHOLE GB 48/65	(13)	$\bar{x}$	3.00	55.85	41.52	9.65	53.60	18.69	14.06	249.1	3.39	14.75	4.21	110.1	1.47	15.60	5.87	1.05	0.65	18.49	0.27	1.34	9.06	78.68	17.22	0.23
		*	0.75	15.98	17.78	0.61	37.95	2.08	5.66	86.2	0.81	6.33	0.76	28.9	0.44	5.52	1.85	0.89	0.52	6.45	0.11	0.60	4.24	35.52	9.55	0.05
NORTHERN FACIES — MIDDLE SHALES AVERAGE GB BOREHOLES	(35)	$\bar{x}$	3.03	54.02	36.21	9.74	43.87	17.98	12.41	246.9	3.33	13.90	4.82	111.1	1.73	14.08	5.60	0.86	0.81	17.55	0.32	1.33	9.51	69.37	17.19	0.25
		*	0.63	12.68	16.84	0.80	23.94	2.34	6.05	103.0	0.67	5.45	1.53	34.8	0.67	6.91	1.37	0.56	0.69	8.25	0.16	0.49	4.23	39.29	11.26	0.07
NORTHERN FACIES — MIDDLE SHALES		$\bar{x}$	2.06	36.90	68.51	18.51	186.3	18.44	30.81	416.4	8.97	95.79	4.48	152.5	0.72	21.46	2.28	5.97	0.52	14.57	0.31	3.55	5.35	49.15	4.71	0.10
BOREHOLE A/78	(13)	*	0.18	9.36	32.87	6.01	72.6	3.43	16.32	96.1	3.00	35.40	1.87	74.2	0.46	6.30	1.08	3.28	0.50	5.43	0.11	2.03	3.99	14.99	1.71	0.004
NORTHERN FACIES — MIDDLE SHALES BOREHOLE A/76	(6)	$\bar{x}$	2.08	37.85	73.22	24.60	736.3	18.43	29.87	337.3	12.29	323.1	4.95	121.3	0.50	18.95	1.67	32.27	0.63	7.62	0.33	9.26	3.52	31.90	1.02	0.03
		*	0.29	3.33	28.16	8.11	289.0	2.78	2.76	212.9	4.46	184.8	1.90	66.2	0.21	11.47	0.51	26.84	0.57	3.13	0.18	2.77	0.87	19.43	0.35	0.004
NORTHERN FACIES — MIDDLE SHALES BOREHOLE A/62	(6)	$\bar{x}$	1.94	35.70	82.08	22.92	295.1	19.02	33.80	511.5	10.46	162.8	4.50	142.8	0.55	25.43	1.67	8.92	0.41	12.68	0.31	4.35	4.49	42.20	3.13	0.07
		*	0.40	6.06	41.92	5.80	49.3	5.27	11.61	252.2	2.28	47.0	1.31	74.5	0.29	12.17	0.57	2.90	0.17	6.10	0.09	1.80	0.87	18.00	1.42	0.002
NORTHERN FACIES — MIDDLE SHALES AVERAGE A BOREHOLES	(25)	$\bar{x}$	2.03	36.84	72.88	21.03	222.5	18.58	31.34	420.2	10.05	152.8	4.60	142.7	0.63	21.84	1.98	12.99	0.52	12.45	0.31	4.94	4.68	43.34	3.55	0.079
		*	0.26	7.37	33.42	6.80	83.2	3.66	13.29	176.4	3.42	114.3	1.70	70.6	0.38	9.35	0.89	16.77	0.45	5.73	0.12	3.07	2.92	17.60	2.04	0.039
NORTHERN FACIES — MIDDLE SHALES SOMKELE BOREHOLE	(24)	$\bar{x}$	3.50	72.75	38.27	11.72	41.77	21.38	11.12	172.2	3.32	12.07	4.10	116.6	2.05	8.38	6.47	0.59	0.52	15.31	0.31	1.13	7.36	51.35	14.71	0.30
		*	0.46	10.94	9.77	2.26	11.89	1.88	2.88	77.0	0.33	3.49	1.10	81.3	0.61	4.42	0.84	0.17	0.27	4.27	0.09	0.42	3.26	21.57	5.75	0.08
NORTHERN FACIES — MIDDLE SHALES DANNHAUSER BOREHOLE G.S.O.9.	(8)	$\bar{x}$	2.53	49.97	26.97	10.55	41.85	20.06	11.19	260.7	4.21	14.27	4.57	136.1	1.90	11.87	4.82	0.80	0.45	23.81	0.40	1.54	9.72	61.85	16.54	0.28
		*	0.41	5.46	5.08	1.62	18.02	1.89	3.34	83.6	0.51	4.69	1.44	40.4	0.47	2.18	0.51	0.45	0.22	5.89	0.11	0.58	5.25	17.13	4.35	0.10
NORTHERN FACIES SPRINGBOK AND VIERFONTEIN COLLIERIES	(12)	$\bar{x}$	2.00	42.25	68.64	15.69	99.38	20.86	25.50	305.2	7.56	88.8	5.16	138.5	1.01	11.44	2.86	3.38	0.69	11.63	0.51	2.03	6.12	30.67	11.18	0.36
		*	0.49	14.59	41.90	3.05	68.90	4.70	14.96	150.3	2.08	119.2	2.11	76.93	0.62	5.38	1.01	2.89	0.86	8.35	0.34	1.61	5.46	22.88	10.93	0.48
ALL NORTHERN FACIES — MIDDLE SHALES	(105)	$\bar{x}$	2.74	52.25	48.49	13.62	83.21	19.40	17.44	280.6	5.41	62.12	4.62	125.0	1.47	14.03	4.57	3.98	0.67	15.55	0.35	2.22	7.43	53.69	11.80	0.24
		*	0.77	16.84	29.53	5.85	82.70	3.19	12.02	152.9	3.41	120.1	1.56	63.0	0.79	8.15	2.06	9.61	0.65	7.42	0.18	2.20	4.39	30.67	8.13	0.17
NORTHERN FACIES — LOWER SHALES	(10)	$\bar{x}$	2.88	62.12	59.40	15.75	56.40	21.48	21.89	121.4	5.60	20.46	10.06	159.0	1.11	5.23	4.13	0.94	0.76	5.81	0.27	1.01	3.03	22.46	7.87	0.33
		*	0.61	11.56	16.00	3.85	27.68	0.87	8.80	61.9	1.38	10.57	5.03	70.2	0.43	3.00	1.39	0.50	0.55	4.07	0.08	0.53	2.22	15.84	6.45	0.14
SOUTHERN FACIES	(8)	$\bar{x}$	3.72	76.10	29.05	11.11	26.10	20.66	7.74	126.6	2.96	7.49	3.80	69.33	2.68	6.02	6.97	0.36	0.85	16.21	0.38	0.98	8.73	42.90	17.97	0.45
		*	0.88	16.15	8.39	2.95	4.90	3.00	0.82	46.38	0.19	2.86	0.40	19.44	0.34	1.54	1.00	0.12	0.93	5.10	0.02	0.40	2.45	15.82	6.69	0.18
CENTRAL FACIES	(18)	$\bar{x}$	3.19	72.93	25.78	9.84	38.88	22.73	8.09	141.5	3.04	8.78	3.89	75.54	2.94	6.22	7.63	0.57	0.52	17.49	0.39	1.41	6.96	45.10	15.04	0.37
		*	0.60	13.50	6.58	2.77	45.92	2.76	1.83	42.0	0.32	1.99	0.88	25.0	0.66	1.57	1.38	0.88	0.29	7.77	0.07	1.18	2.14	19.07	6.36	0.10
WESTERN FACIES	(10)	$\bar{x}$	3.42	66.60	29.54	11.26	35.00	19.40	8.28	183.2	3.41	11.67	3.14	122.3	2.84	9.59	6.08	0.62	0.69	19.54	0.53	2.12	10.26	50.10	18.94	0.38
		*	0.82	18.54	10.81	2.99	18.12	1.49	2.91	113.1	1.07	9.77	0.78	81.0	1.15	6.66	1.59	0.56	0.56	8.31	0.44	3.31	2.97	27.83	9.82	0.18
BEAUFORT SERIES	(8)	$\bar{x}$	3.38	73.54	27.99	9.85	34.10	21.90	8.21	148.2	2.89	10.39	4.35	87.0	2.71	6.91	7.72	0.52	0.54	18.51	0.35	1.30	7.48	52.10	15.72	0.34
		*	0.34	3.97	5.24	2.01	13.43	2.06	1.05	33.7	0.37	4.88	0.69	33.6	0.56	1.31	1.66	0.29	0.40	5.75	0.03	0.74	4.49	15.96	5.15	0.16
DREDGED AGULHAS BANK SHALES	(8)	$\bar{x}$	3.07	58.10	27.60	11.09	39.85	17.85	9.14	157.3	3.21	10.28	4.12	213.6	2.08	8.80	5.45	0.77	0.13	18.35	0.42	1.59	2.12	49.22	14.09	0.38
		*	0.82	13.67	6.89	3.51	19.16	1.58	1.62	51.38	0.33	3.84	0.58	91.0	0.70	2.75	0.86	0.59	0.05	3.61	0.17	0.98	0.71	21.50	6.30	0.19
AVERAGE SEPARATED CLAY	(33)	$\bar{x}$	1.71	52.79	18.21	5.90	63.95	32.26	9.37	340.3	3.42	43.44	3.76	168.5	4.47	11.53	9.58	1.48	0.43	33.24	0.52	3.41	11.60	87.43	10.84	0.20
		*	0.54	18.92	6.40	1.47	52.98	15.32	6.91	176.6	1.47	41.77	1.38	134.0	3.94	8.61	4.31	1.87	0.35	19.37	0.45	2.39	10.10	46.34	6.65	0.26

FOOTNOTES: $\bar{x}$ ARITHMETIC MEAN

* STANDARD DEVIATION.

NUMBERS IN PARENTHESES REFER TO THE NUMBER OF SAMPLES INCLUDED IN THE CALCULATIONS.

APPENDIX III

TRACE ELEMENT ABUNDANCE DATA AND INTER-ELEMENT RATIOS FOR SELECTED SOUTHERN AFRICAN ARGILLACEOUS ROCKS AND SEPARATED CLAY FRACTIONS. THE ROCK SEQUENCES ARE ARRANGED IN ORDER OF DECREASING GEOLOGICAL AGE. RESULTS ARE PRESENTED IN PARTS PER MILLION (PPM) FOR THE ALKALI ELEMENTS LITHIUM (LI), RUBIDIUM (RB) AND CESIUM (CS); AS WELL AS THE ALKALINE EARTHS, STRONTIUM (SR) AND BARIUM (BA). ALSO RECORDED ARE K/RB, K/CS, K/BA AND SI/AL RATIOS.

(N.D. = NOT DETERMINED.)

TABLE 31A

FIG TREE SHALES

SAMPLE	FG12	FG13	FG14	FG16	FG17	SF4A	SF5	SF6	FGCOMP.
RB	137	127	170	54	190	177	147	42	48
K/RB	204	205	194	220	170	184	189	195	210
CS	7.2	5.4	9.9	3.4	10.4	8.7	4.4	2.6	2.3
K/CS	3889	4815	3333	3500	3106	3747	6318	3154	4391
SI/AL	2.8	2.7	2.8	3.9	3.5	2.6	3.2	3.2	4.3
LI	38	43	40	51	29	38	40	69	49
BA	551	522	604	290	654	685	553	227	240
K/BA	51	50	55	41	49	47	50	36	42
SR	21	18	19	23	63	12	29	20	52

TABLE 32A

FIG TREE GRAYWACKES AND IRONSTONES

SAMPLE	FG15	SF2	SF3	SF4B	SH7	FG1	FG2	FG8	FG9	FG10	FG11
RB	54	31	64	88	49	N.D.	14	17	144	95	35
K/RB	252	200	201	210	255	-	257	165	90	169	80
CS	3.6	2.6	2.5	5.0	1.8	N.D.	N.D.	2.6	32	4.3	N.D.
K/CS	3778	2385	5160	3700	6944	-	-	1077	406	3744	-
SI/AL	5.9	5.0	6.3	4.9	6.0	4.7	5.2	12	5.8	3.9	7.1
LI	27	54	22	29	26	-	16	26	41	39	32
BA	360	177	183	401	302	126	187	1017	333	1512	679
K/BA	38	35	70	46	41	54	19	3	39	11	4
SR	69	27	18	25	96	N.D.	6.5	16	39	2.4	2.5

TABLE 33A

WITWATERSRAND, KHEIS AND DAMARA SHALES.

SAMPLE	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8	JP9	JP10	KH1	DM1
RB	67	55	182	52	27	119	82	58	105	83	188	194
K/RB	188	213	178	204	125	259	213	219	150	183	152	209
CS	3.9	4.0	4.7	3.4	5.8	5.0	3.8	3.1	8.1	4.5	4.1	6.6
K/CS	3231	2925	6894	3118	586	6160	4605	4097	1938	3378	7000	6136
SI/AL	4.3	4.5	4.1	5.4	4.4	2.5	3.3	3.7	4.3	3.2	5.9	3.1
LI	47	55	16	23	23	53	62	86	44	56	10	57
BA	417	360	1125	333	196	1089	608	407	437	445	766	869
K/BA	30	32	29	32	17	28	29	31	36	34	37	47
SR	217	180	209	273	205	117	120	64	189	102	19	30

TABLE 34A

PRECAMBRIAN SOUTH WEST AFRICAN SHALES.

SAMPLE.	KUN1	KUN2	KUN3	KUN4A	KUN4B	KUI1	KUI2	KUI3	KUI4	SCHR1	SCHR2	SCHR3	SCHR4
Rb	296	276	152	191	223	113	290	114	560	112	80	116	63
K/Rb	147	151	189	162	160	126	165	197	127	142	257	488	365
Cs	8.2	2.9	2.9	5.3	5.1	3.8	9.8	2.7	22	2.9	3.3	11	N.D.
K/Cs	5305	14345	9931	5830	6980	3763	4908	8333	3364	5483	6242	5154	-
Si/Al	3.3	3.4	6.1	5.3	4.5	2.2	3.0	11.9	2.2	4.0	4.2	3.6	4.1
Li	15	14	6.9	6.3	6.0	3.4	9.8	8.0	31	32	64	41	29
Ba	499	570	883	465	503	138	625	490	831	428	300	520	340
K/Ba	87	73	33	66	71	104	77	46	86	37	69	109	68
Sr	79	174	45	64	61	67	278	26	40	N.D.	N.D.	177	309

TABLE 35A

MALMESBURY AND CANGO FORMATIONS

SAMPLE	MM2	MM3	MM4	MM5	MM7	CG1	CG2	CG3	CG4
RB	156	228	90	208	226	221	242	198	202
K/RB	169	138	204	183	177	245	194	178	176
CS	11	18	4.2	11	18	4.9	4.7	11	7.2
K/CS	2400	1906	4381	3464	2222	11041	9979	3171	4931
SI/AL	4.3	3.5	6.1	3.1	2.9	2.7	2.8	2.4	3.3
LI	30	65	36	45	48	29	18	69	51
BA	390	395	330	475	588	867	733	601	501
K/BA	68	86	56	80	68	62	64	58	71
SR	68	125	138	110	108	29	30	66	69

TABLE 36A

FISH RIVER SERIES

Sample	FR1	FR2	FR3	FR4	FR5	FR6	FR7	FR8	FR9	AEc8	AEc9	AEc10	AEc11	AEc12
Rb	71	130	91	142	110	80	190	151	180	118	180	171	132	198
K/Rb	191	166	195	189	177	189	138	172	148	191	168	170	192	175
Cs	2.1	5.9	4.0	5.1	4.3	2.4	4.8	6.4	3.0	3.4	10	12	6.6	12
K/Cs	6476	3661	4450	5275	4535	6292	5458	4063	8867	6647	3020	2425	3833	2883
Si/Al	12	4.3	5.8	4.3	5.1	6.5	4.8	4.1	4.6	4.2	3.5	3.4	3.7	3.3
Li	26	35	20	21	29	32	27	45	20	33	50	40	44	44
Ba	781	365	320	398	397	555	511	477	496	401	428	506	501	624
K/Ba	17	59	56	67	49	27	51	54	54	56	70	57	50	55
Sr	84	107	59	58	118	119	71	86	133	201	154	166	208	146

TABLE 37A

BOKKEVELD SHALES

SAMPLE	BK1	BK2	BK3	BK4A	BK4B	BK5	BK6A	BK6B	BK7	BK8	BK9	BK10	BK11
RB	211	66	190	108	103	48	98	131	176	147	201	150	121
K/RB	169	160	169	184	190	179	170	172	166	170	177	168	194
CS	13	2.3	9.1	3.9	6.1	2.9	3.7	4.0	9.8	6.9	7.9	5.9	8.1
K/CS	2738	4609	3527	5103	3213	2966	4514	5625	2980	3623	4506	4271	2901
SI/AL	2.9	5.9	2.9	4.3	4.4	6.1	4.9	3.7	2.8	3.2	3.8	3.3	4.0
LI	88	75	105	81	58	96	14	74	43	65	16	90	91
BA	884	306	745	502	515	420	517	637	993	796	1009	704	601
K/BA	40	35	43	40	38	21	32	35	29	31	35	35	39
SR	115	148	103	75	85	154	797	82	134	84	77	86	148

TABLE 37A (CONT.)

SAMPLE	BK12	BK13	BK14	BK16	BK17	BK18	BK19	BK20	BK21	BK22	BK23	BK24	BK25
RB	177	134	153	112	153	165	192	194	201	206	202	166	119
K/RB	192	181	188	185	169	174	172	171	171	173	180	180	186
CS	9.4	6.4	11	4.5	5.8	14	9.1	8.3	14	10	11	7.5	5.3
K/CS	3617	3797	2620	4600	4448	2030	3637	4000	2398	3560	3309	3987	4170
SI/AL	2.8	3.9	3.9	4.3	3.8	3.5	2.6	2.8	2.6	2.6	2.6	2.8	3.9
LI	86	79	58	63	47	75	90	94	50	88	52	162	63
BA	749	580	643	579	730	636	733	773	775	788	829	730	582
K/BA	45	42	44	36	35	45	45	43	44	45	44	41	38
SR	139	159	187	56	60	59	61	98	93	108	71	41	56

TABLE 37A (CONT.)

SAMPLE	BK26	BK27	BK28	BK29	BK30	BK34	BK302	BK318	BK321	BK361	BK373	BK389
RB	154	153	137	209	150	101	163	95	170	230	214	177
K/RB	188	170	174	176	203	175	179	189	167	172	194	169
CS	6.3	7.1	7.9	11.5	6.7	4.1	5.5	5.9	7.2	11	6.9	8.7
K/CS	4603	3676	3025	3191	4552	4317	5309	3051	3944	3591	6014	3437
SI/AL	3.3	2.9	3.7	2.6	3.2	4.9	3.2	4.9	2.9	2.2	2.8	2.6
LI	76	90	54	76	46	21	30	41	78	66	35	67
BA	668	588	537	781	720	555	899	593	751	1142	743	689
K/BA	43	44	44	46	42	32	32	30	38	35	55	43
SR	92	115	77	75	60	48	48	96	97	61	142	115

TABLE 38A

WITTEBERG AND DWYKA SERIES

SAMPLE	WB1	WB2	WB3	WB4	WB5	WB6	WB7	DW1	DW4	DW5	CV86	LDW3	LDW4
RB	164	164	59	124	206	183	171	52	144	142	186	174	183
K/RB	147	155	173	160	203	202	182	148	166	165	163	165	165
CS	11	13	3.9	3.8	8.5	9.5	7.3	4.1	9.3	9.3	7.6	7.7	10
K/CS	2200	1962	2615	5237	4929	3905	4266	1878	2570	2538	4000	3727	3030
SI/AL	2.2	2.3	8.3	4.2	2.8	2.4	2.9	7.3	4.6	5.2	3.4	3.7	3.4
LI	94	85	26	40	12	52	36	29	5.6	5.5	28	6.6	6.7
BA	733	796	291	585	1132	843	600	301	695	952	668	716	803
K/BA	33	32	35	34	37	44	51	25	34	25	45	40	38
SR	114	107	38	71	38	94	32	38	166	264	83	243	674

TABLE 39A

BOTHAVILLE BOREHOLES SEDIMENTS.

SAMPLE	BEC4265	4266	4267	4268	4269	4270	4286	4287	4288	4292
RB	72	131	125	117	112	103	104	120	110	161
K/RB	162	159	155	131	123	130	255	224	261	154
CS	7.2	6.3	6.3	10	11	9.8	2.9	3.6	3.3	8.3
K/CS	1625	3317	3079	1530	1255	1367	9172	7472	8727	2988
SI/AL	2.1	3.3	3.5	2.4	2.3	2.3	4.4	3.4	4.3	2.3
LI	132	105	90	96	116	110	33	51	30	139
BA	311	364	496	447	411	365	707	716	781	602
K/BA	38	59	39	34	34	37	38	37	37	41
SR	94	191	166	186	187	179	144	168	180	147

TABLE 40A

BOREHOLE GB45/64

SAMPLE	45/64/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
RB	102	185	171	153	147	174	155	134	163	160	149	143	149
K/RB	154	173	164	194	211	171	168	165	203	166	193	212	237
CS	5.8	7.2	8.1	3.1	3.1	5.4	6.5	5.4	4.6	8.5	4.7	4.0	3.5
K/CS	2707	4458	3456	9581	10032	5500	4015	4093	7196	3118	6106	7575	10086
SI/AL	2.8	3.3	2.9	3.9	3.3	3.3	2.6	2.8	4.1	2.5	3.0	2.3	4.6
LI	18	22	41	44	39	51	66	45	22	66	52	55	10
BA	620	1003	949	1012	938	1099	1003	848	1104	933	984	1283	1196
K/BA	25	32	29	29	33	27	26	26	30	28	29	24	29
SR	257	123	123	177	207	188	185	228	185	223	194	174	147

TABLE 41A

BOREHOLE GB47/64

SAMPLE	47/64/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11
RB	160	178	158	188	145	170	164	149	160	146	150
K/RB	159	184	156	178	174	169	159	172	188	200	150
CS	3.6	5.4	11	6.2	7.2	5.6	11	6.0	8.5	5.6	4.8
K/CS	7083	6074	2245	5387	3500	5143	2374	4283	3514	5214	6833
SI/AL	3.1	3.6	2.5	3.6	2.6	3.3	2.9	2.4	2.5	2.2	4.2
LI	69	30	108	54	81	40	101	34	22	36	17
BA	842	1142	948	1125	931	972	898	915	1093	1150	1029
K/BA	30	29	26	30	27	30	29	28	27	25	32
SR	101	170	218	153	165	175	173	201	175	193	133

TABLE 42A

BOREHOLE GB48/65

SAMPLE	48/65/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
RB	165	169	163	195	157	166	183	163	170	150	136	127	141
K/RB	162	203	163	180	155	190	161	213	145	155	237	172	190
CS	9.2	6.9	7.9	5.8	8.3	5.2	9.6	4.1	10	7.4	5.2	3.6	5.7
K/CS	2902	4986	3367	6052	2928	6058	3073	8463	2470	3149	6192	6083	4702
SI/AL	2.9	4.3	2.9	3.1	2.6	4.3	2.5	4.0	2.5	2.3	4.5	2.2	2.6
LI	106	33	102	52	73	51	82	40	97	111	69	75	51
BA	907	1028	818	1029	733	915	899	1074	756	800	955	716	931
K/BA	29	33	32	34	33	34	33	32	33	29	33	31	29
SR	198	182	176	190	224	154	160	170	159	349	137	110	161

TABLE 43A

BOREHOLE A/78

SAMPLE	A78/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
RB	68	68	33	84	56	177	109	118	111	54	25	56	132
K/RB	168	216	224	203	145	139	146	135	136	163	188	136	154
CS	6.3	3.5	3.0	4.9	4.0	9.2	6.0	7.7	8.5	5.6	2.7	5.6	7.6
K/CS	1810	4200	2467	3490	2025	2685	2650	2065	1776	1571	1741	1357	2684
SI/AL	1.9	2.0	2.0	2.0	2.2	2.3	2.2	1.9	2.0	1.7	2.0	2.3	2.0
LI	64	63	58	54	59	70	64	54	59	62	57	83	110
BA	386	552	374	586	432	871	681	677	671	479	250	360	775
K/BA	29	27	20	29	19	28	23	23	22	18	19	21	26
SR	114	101	88	110	125	148	127	159	137	125	138	81	92

TABLE 44A

BOREHOLES A/76 AND A/62

SAMPLE	A76/1	/2	/3	/4	/5	/6	A62/1	/2	/3	/4	/5	/6
RB	49	68	43	103	75	50	105	64	52	32	62	67
K/RB	171	200	105	139	148	150	130	131	200	171	156	178
CS	5.3	3.2	3.5	7.5	5.8	4.0	6.6	4.2	2.7	4.3	6.6	7.2
K/CS	1585	4250	1286	1907	1914	1875	2061	2000	3852	1279	1470	1653
SI/AL	1.7	2.6	2.0	2.0	1.9	2.2	1.8	2.1	2.4	1.5	1.5	2.3
LI	72	48	74	77	92	61	76	96	50	64	80	41
BA	415	502	694	560	588	436	631	577	436	352	316	415
K/BA	20	27	7	25	19	17	21	15	24	16	30	29
SR	149	104	883	222	167	145	288	389	97	116	113	139

TABLE 45A

SOMKELE BOREHOLE

SAMPLE	SEC/1	/2	/3	/4	/5	/6	/7	/8	/9	/10	/11	/12	/13
RB	143	96	141	137	175	186	156	142	165	180	216	224	149
K/RB	159	161	181	170	171	178	174	174	165	138	112	150	144
CS	9.9	5.8	7.9	8.1	11	8.2	8.7	7.0	11	9.1	9.9	11	12
K/CS	2303	2670	3240	2877	2718	4037	3126	3529	2482	2736	2444	3055	1792
SI/AL	3.6	4.9	3.7	3.6	3.3	3.4	3.6	4.0	3.2	3.5	3.4	3.1	3.5
LI	17	51	30	26	21	21	24	17	15	23	13	18	14
BA	1080	479	664	855	986	1112	818	815	1503	767	892	886	696
K/BA	21	32	38	27	30	30	33	30	18	32	27	38	31
SR	187	89	130	219	183	181	216	226	259	89	200	135	100

TABLE 45A (CONT.)

SAMPLE	SEC/14	/15	/16	/17	/18	/19	/20	/21	/22	/23	/24	/25	/26
RB	148	208	182	163	143	157	155	150	163	139	175	51	191
K/RB	153	161	154	167	173	163	160	156	160	180	173	243	149
CS	8.5	13	8.3	9.1	4.3	9.4	7.7	7.9	12	9.5	6.9	8.7	16
K/CS	2659	2585	3373	3000	5767	2723	3221	2962	2167	2642	4391	1425	1775
SI/AL	3.3	2.8	3.3	3.7	4.1	3.2	3.8	3.5	3.1	3.5	2.6	1.9	2.4
LI	40	19	30	34	17	21	23	24	48	51	39	208	50
BA	815	810	707	705	646	714	638	639	680	1008	1278	281	1168
K/BA	28	41	40	39	38	36	39	37	38	25	24	44	24
SR	160	121	122	181	165	198	204	190	238	167	171	121	121

TABLE 46A

DANNHAUSER BOREHOLE SEDIMENTS

SAMPLE	ECDAN/1	/2	/3	/4	/5	/6	/7	/8	/9	/10
RB	151	149	154	163	148	152	110	125	141	142
K/RB	143	140	163	150	140	178	152	218	171	202
CS	6.3	9.3	7.7	8.3	10	9.0	2.4	3.3	9.0	5.4
K/CS	3444	2237	3260	2940	2080	3000	11125	8273	2678	5333
SI/AL	3.2	2.6	2.3	2.4	1.9	2.1	6.3	5.8	2.8	2.8
LI	66	108	107	90	98	122	13	22	52	45
BA	800	801	743	528	510	1098	763	799	1211	1323
K/BA	27	26	34	46	41	24	35	34	20	22
SR	157	215	177	160	130	165	116	143	174	146

TABLE 47A

SPRINGBOK AND VIERFONTEIN COLLIERIES.

SAMPLE	Ec4	Ec5	Ec6	Ec7	Ec8	Ec9	Ec10	Ec11	Ec12	Ec13	Ec14	Ec15	Ec16
Rb	118	140	98	97	83	111	95	100	154	99	26	4	20
K/Rb	118	164	135	155	191	142	137	125	140	120	162	225	85
Cs	8.1	6.1	6.4	5.5	5.2	7.3	8.2	8.8	8.7	9.4	N.D.	N.D.	N.D.
K/Cs	1716	3770	2063	2765	3058	2164	1598	1420	2483	1266	-	-	-
Si/Al	1.8	2.2	1.7	1.9	2.6	1.8	1.7	2.2	3.0	2.3	1.2	1.8	1.5
Li	110	140	173	62	65	88	128	110	74	97	N.D.	N.D.	N.D.
Ba	655	895	787	734	456	780	784	370	889	268	166	346	325
K/Ba	21	26	17	21	35	20	17	34	24	44	16	3	5
Sr	82	145	448	222	55	113	392	96	112	86	48	156	107

TABLE 48A

NORTHERN ECCA FACIES SHALES

SAMPLE	Ec17	Ec18	Ec19	Ec20	Ec21	Ec22	Ec23	Ec24	Ec25	Ec27	Ec30
RB	145	159	133	40	120	119	104	128	83	150	192
K/RB	183	138	151	420	131	126	144	125	140	133	138
CS	6.1	4.6	4.2	5.0	10.2	3.5	5.8	9.3	7.0	7.8	7.1
K/CS	4344	4782	4786	3380	1539	4286	2586	1720	1657	2551	3732
SI/AL	4.5	2.6	2.3	3.5	2.7	2.8	3.2	2.6	3.0	2.5	2.7
LI	26	24	24	N.D.	38	32	23	20	94	112	23
BA	760	1044	836	349	571	793	760	882	1224	571	1053
K/BA	35	21	24	48	27	19	20	18	10	35	25
SR	180	239	204	56	133	78	76	105	92	N.D.	141

TABLE 49A

SOUTHERN ECCA FACIES

SAMPLE	Qu19	Qu23	SA27	SA31	SA34	R2	Ec1	Ec2	Ec3
Rb	178	182	212	179	155	291	114	111	122
K/Rb	171	180	174	171	175	207	199	195	191
Cs	10	3.7	14	11	9.1	24	4.4	4.3	5.9
K/Cs	3050	8838	2643	2791	2989	2517	5159	5047	3949
Si/Al	3.3	3.4	2.6	2.8	3.7	1.6	4.8	5.0	4.2
Li	40	50	41	40	31	11	29	35	31
Ba	649	650	790	709	701	1134	632	521	479
K/Ba	47	50	47	43	39	53	36	42	49
Sr	195	124	171	160	165	31	126	105	131

TABLE 50A

CENTRAL ECCA FACIES

SAMPLE	R1	AB1	AB4	AB7	PR40	PR41	KL14	KL17	CV66	CV71	CV75	WEC1	WEC3
RB	153	166	201	227	192	212	141	179	218	153	117	162	175
K/RB	157	182	176	162	176	159	179	171	153	168	231	192	188
CS	11	8.5	15	14	10	15	7.7	9.8	18	8.5	8.8	7.5	5.8
K/CS	2182	3553	2353	2621	3390	2253	3286	3122	1850	3024	3068	4160	5690
SI/AL	2.5	3.6	3.0	2.7	3.1	2.8	3.4	2.9	2.9	3.3	3.3	2.6	2.5
LI	88	53	49	51	62	55	53	51	31	37	38	57	75
BA	842	673	666	1077	891	818	544	677	741	629	780	731	804
K/BA	28	45	53	34	38	41	46	45	45	41	35	43	41
SR	211	153	125	124	107	187	140	134	147	134	92	113	138

TABLE 50A (CONT.)

CENTRAL ECCA FACIES (CONT.)

SAMPLE	WEc4	WEc5B	WEc5c	WEc5D	WEc5P	WEc7	WEc8	WEc9	WEc10	WEc11
RB	198	195	166	195	22	167	213	126	96	174
K/RB	181	177	177	165	105	173	171	204	185	175
CS	10.1	7.2	5.8	5.3	1.9	4.5	7.2	5.0	5.1	4.9
K/CS	3590	4792	5069	6075	1211	6422	5056	5140	3490	6224
SI/AL	3.1	2.5	4.9	4.3	2.3	3.2	2.8	3.3	5.2	3.2
LI	85	13	20	13	30	60	84	47	23	79
BA	716	818	874	834	196	653	742	686	609	760
K/BA	50	42	34	39	12	44	49	37	29	40
SR	159	406	579	427	696	164	120	151	126	330

TABLE 51A

WESTERN ECCA FACIES

SAMPLE	AEc1	AEc2	AEc3	AEc4	AEc5	AEc6	AEc7	WEc13	WEc14	WEc15	WEc17
RB	145	138	72	134	153	143	181	185	195	111	10
K/RB	153	163	215	139	164	179	187	192	204	213	260
CS	17	8.5	5.1	12	12	7.3	7.6	6.2	7.3	7.8	2.6
K/CS	1306	2647	3039	1558	2092	3507	4461	5742	5452	3038	1000
SI/AL	2.8	4.3	2.0	3.7	3.5	3.6	3.1	3.2	3.0	4.9	4.2
LI	20	31	85	37	50	66	55	70	44	33	35
BA	359	374	234	379	405	439	594	689	1137	657	138
K/BA	62	60	66	49	62	58	57	52	35	36	19
SR	108	184	247	341	201	142	110	192	184	215	413

TABLE 52A

BEAUFORT SERIES.

SAMPLE	BF1	BF2	BF3	BF4	BF5	BF6	BF7	BF8	WBF6	PR38	PR39
RB	141	163	173	176	150	238	245	184	134	198	177
K/RB	167	153	174	172	185	161	161	169	195	175	162
CS	5.2	6.1	9.6	8.2	4.8	14	15	7.5	4.2	14	13
K/CS	4538	4098	3146	3695	5771	2743	2633	4147	6214	2479	2208
SI/AL	3.8	3.5	3.2	3.6	3.8	3.0	2.9	3.1	3.7	3.3	3.8
LI	31	52	63	42	33	32	37	30	40	40	38
BA	592	582	606	450	600	519	498	971	561	532	688
K/BA	40	43	50	67	46	73	79	32	46	65	42
SR	185	212	97	86	248	111	76	97	85	79	304

TABLE 53A

SEPARATED LESS THAN 2 MICRON FRACTIONS.

SAMPLE.	FG14	FG17	FG1	JP7	KU12	KU14	SCHR3	CG1	BK7	BK14	BK18	BK21	WB6
RB	227	219	17	125	436	694	236	218	223	251	254	306	224
K/RB	168	188	147	233	170	115	185	219	217	190	188	181	207
CS	15	14	N.D.	6.2	18	37	15	5.6	15	19	24	25	14
K/CS	2471	3020	-	4691	4189	2182	2981	8550	3300	2527	1974	2186	3313
LI	32	54	13	101	17	47	82	42	55	103	95	62	58
BA	757	723	51	792	636	3083	643	664	1350	909	889	1021	859
K/BA	50	57	50	37	116	26	68	72	36	52	54	54	54
SR	43	14	6	94	581	22	126	36	112	269	242	122	135

TABLE 53A (CONT.)

SAMPLE	GB45/64/3	47/64/7	47/64/11	48/65/11	SEC2	SEC3	SEC22	SEC23	ECDAN9	EC14	EC18	WEC1	WEC4
RB	322	225	254	125	155	248	257	250	228	11	212	208	261
K/RB	174	218	201	132	163	179	166	168	167	146	155	180	177
CS	16	19	8.4	6.1	10	15	20	20	16	N.D.	7.7	11	17
K/CS	3588	2564	6065	2694	2609	2906	2150	2127	2411	-	4289	3355	2778
LI	46	113	18	150	70	59	51	74	63	N.D.	34	59	94
BA	1589	1134	1631	441	492	1143	832	1487	1693	92	1249	723	639
K/BA	35	43	31	37	51	39	51	28	23	17	26	52	72
SR	134	253	233	132	141	171	181	182	229	59	359	113	92

TABLE 53A (CONT.)

SAMPLE	AB4	QU23	AEC4	RI	BF7	PR38
RB	324	285	163	183	297	305
K/RB	174	120	110	150	169	187
CS	29	5.3	12	12	19	25
K/CS	1947	6455	1457	2236	2650	2241
LI	54	78	41	107	39	67
BA	906	1064	334	886	446	668
K/BA	62	32	54	31	112	85
SR	114	86	449	300	75	123

TABLE 54A

LESS THAN 2 MICRON FRACTIONS. ANALYTICAL RESULTS ON A WATER-FREE BASIS.

SAMPLE	FG14	FG17	FG1	JP7	KU12	KU14	SCHR3	CG1	BK7	BK14	BK18	BK21	WB6
RB	250	241	19	137	468	738	258	234	243	273	284	338	256
CS	17	15	N.D.	6.8	19	39	16	6.0	16	21	27	28	16
LI	35	59	14	110	18	50	90	45	60	112	106	69	66
BA	834	797	56	867	683	3280	702	713	1474	988	992	1126	980
SR	48	15	6	103	623	23	138	39	122	293	270	135	154

TABLE 54A (CONT.)

SAMPLE	GB45/64/3	47/64/7	47/64/11	48/65/11	SEC2	SEC3	SEC22	SEC23	ECDAN9	EC14	EC18	WEC1	WEC4
RB	350	259	281	147	176	276	285	279	259	13	230	226	283
CS	17	22	9.3	7.2	11	17	22	22	18	N.D.	8.3	12	18
LI	50	130	20	176	80	66	57	83	72	N.D.	37	64	102
BA	1725	1304	1806	519	558	1272	923	1660	1920	112	1353	784	692
SR	146	291	258	155	160	190	201	203	260	72	389	123	100

TABLE 54A (CONT.)

SAMPLE	AB4	QU23	AEC4	R1	BF7	PR38
RB	336	295	186	209	314	324
CS	30	5.5	14	14	20	27
LI	56	81	47	122	41	71
BA	940	1102	380	1012	472	709
SR	118	89	511	343	79	131

FIGURE 1.

THE AVERAGE MINERAL COMPOSITIONS OF SEDIMENTS FROM THE MISSISSIPPI RIVER DELTA. (AFTER SHAW AND WEAVER, 1965)

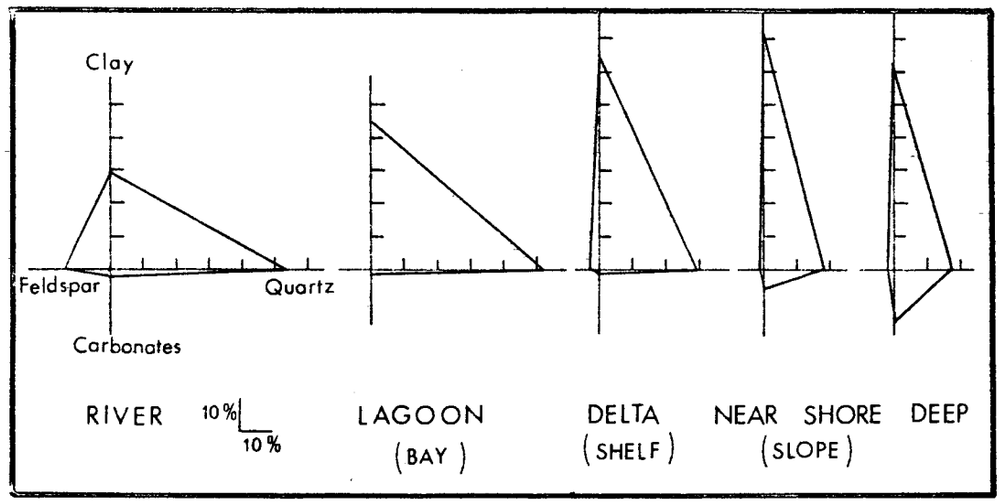
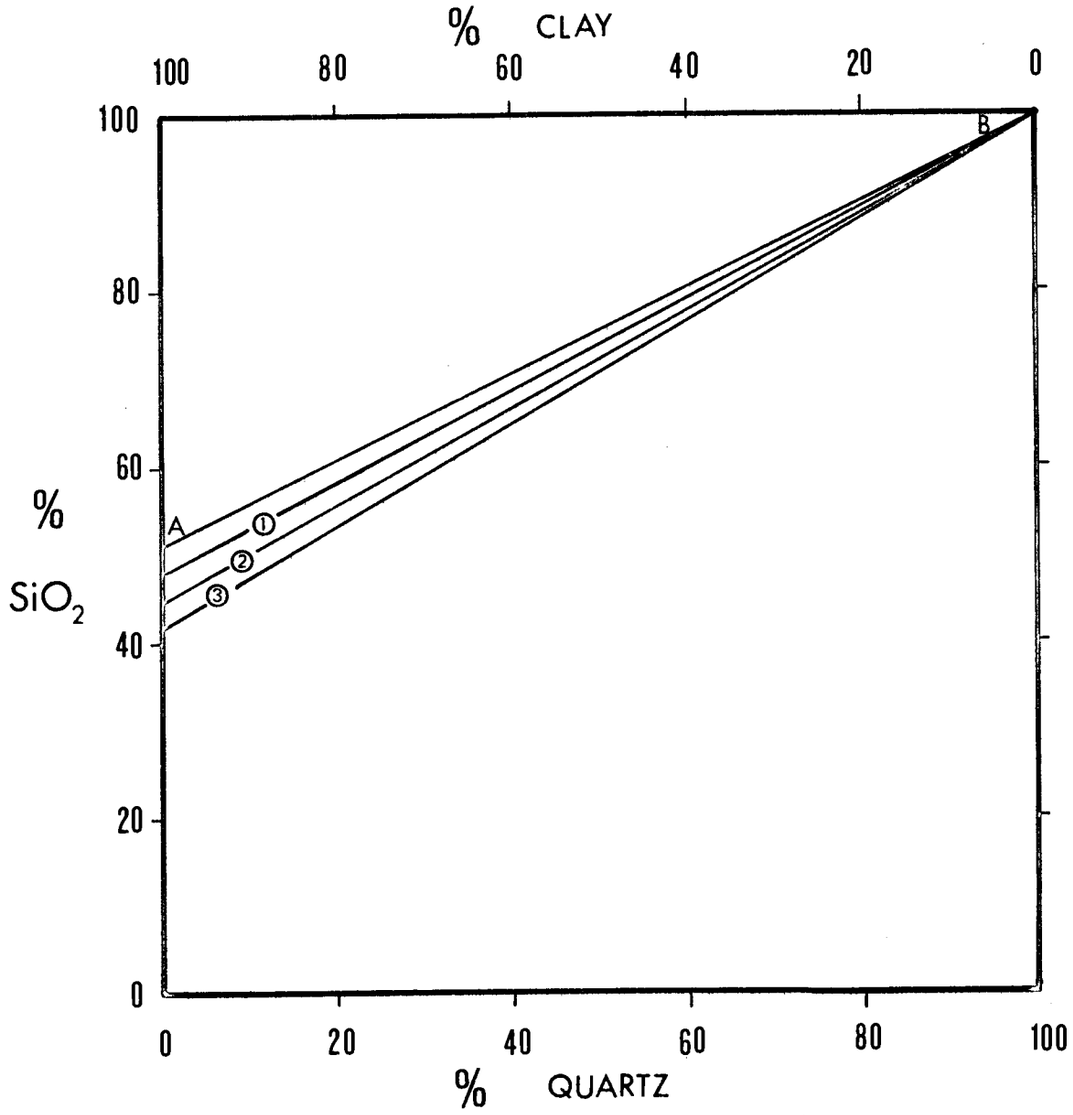

Clay
Feldspar
Quartz
Carbonates
RIVER
10%
10%
LAGOON
(BAY)
DELTA
(SHELF)
NEAR SHORE
(SLOPE)
DEEP

FIGURE 2

THE VARIATION OF SiO_2 (A), AND Al_2O_3 (B) IN A RANGE OF CLAY-QUARTZ MIXTURES, SHOWING THE ERRORS CAUSED BY VARYING DEGREES OF QUARTZ CONTAMINATION IN THE ANALYSED CLAY FRACTION.


% CLAY
100
80
60
40
20
0
100
80
60
40
20
0
% SiO_2
A
B
①
②
③
0
20
40
60
80
100
% QUARTZ

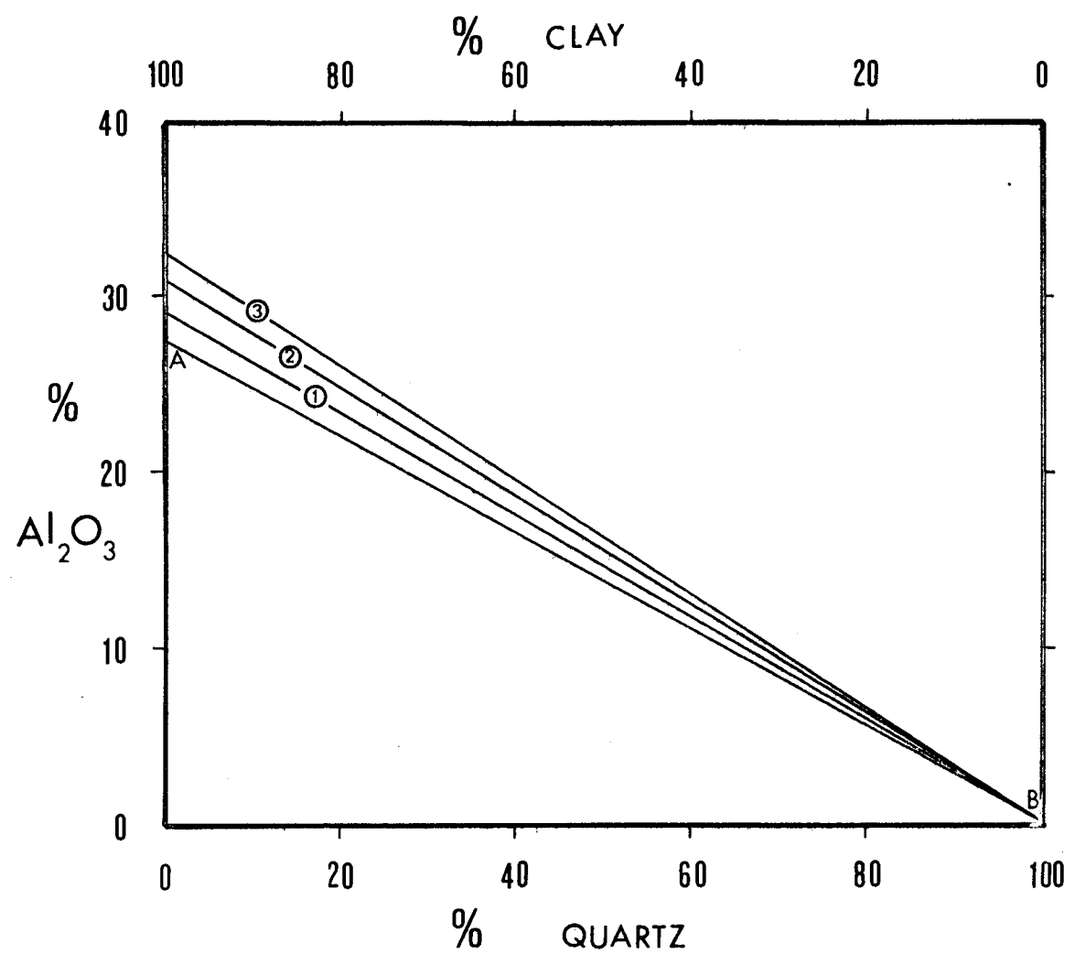

% CLAY
100
80
60
40
20
0
40
30
20
10
0
% Al_2O_3
A
B
①
②
③
0
20
40
60
80
100
% QUARTZ

FIGURE 3

STABILITY RELATIONS OF THE OXIDES, SULPHIDE AND CARBONATE OF IRON IN WATER AT 25°C AND ONE ATMOSPHERE TOTAL PRESSURE. THE ACTIVITY OF TOTAL DISSOLVED SULPHUR IS 10^{-6}, AND THAT OF TOTAL CARBONATE 10^{0}. (AFTER GARRELS AND CHRIST, 1965)

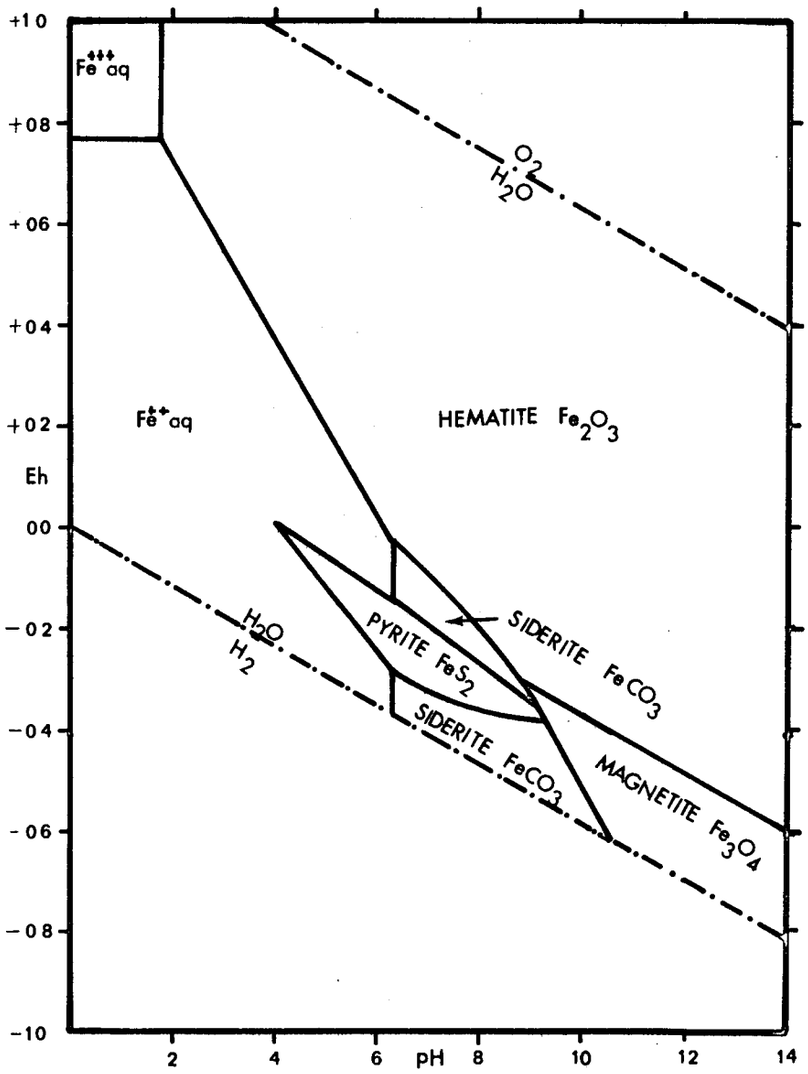

+10
+08
+06
+04
+02
Eh
00
-02
-04
-06
-08
-10
2
4
6
pH
8
10
12
14
Fe+++ aq
Fe++ aq
HEMATITE Fe2O3
O2
H2O
H2O
H2
PYRITE FeS2
SIDERITE FeCO3
SIDERITE FeCO3
MAGNETITE Fe3O4

FIGURE 4

THE VARIATION OF LOSS ON IGNITION, NORMATIVE PYRITE CONTENT, % K_2O, NORMATIVE SIDERITE CONTENT AND PPM MN IN SEDIMENTS FROM BOREHOLE A/73, HENDRINA - MIDDELBURG DISTRICT, EASTERN TRANSVAAL.

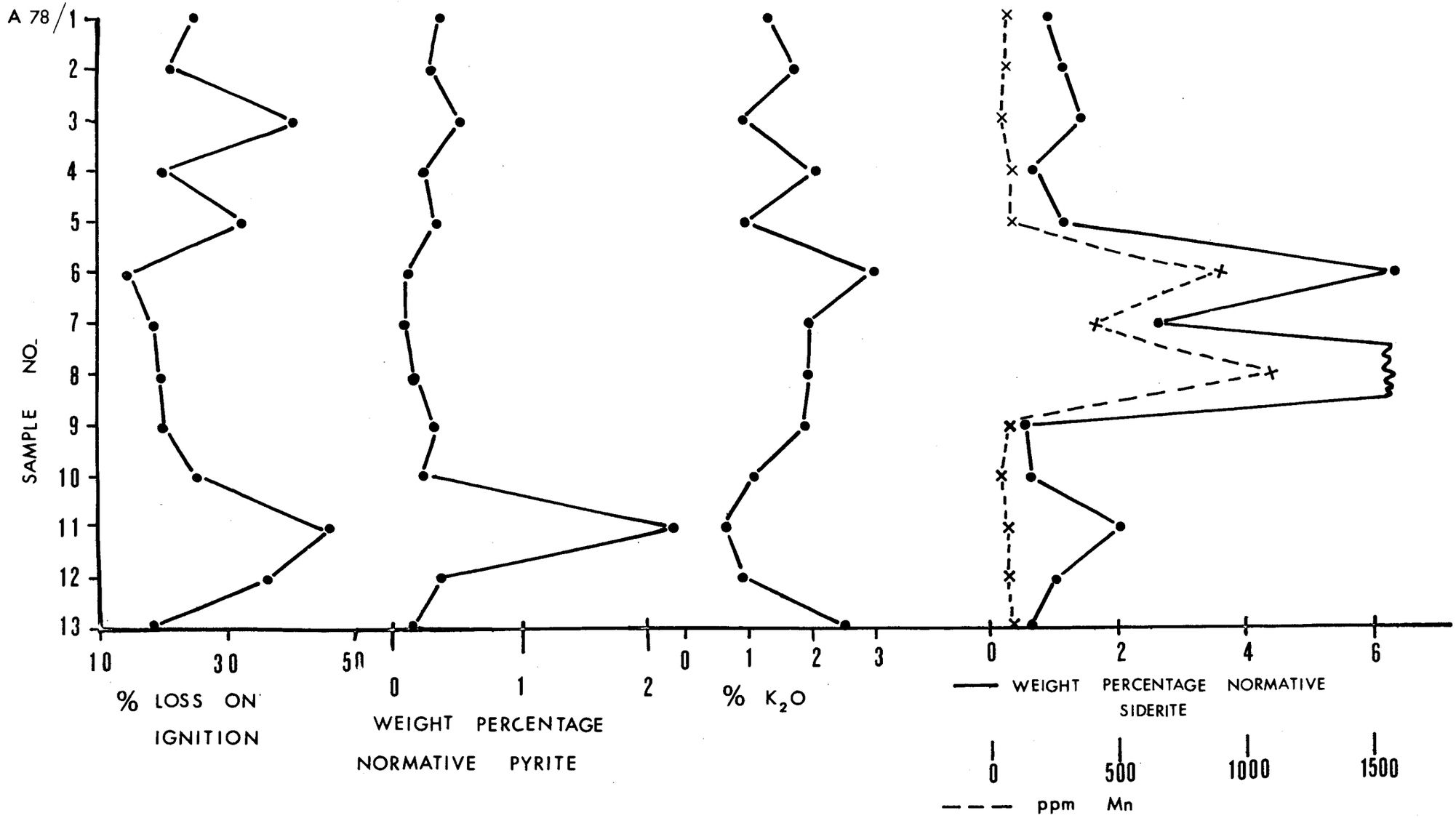

A 78/1
2
3
4
5
6
7
8
9
10
11
12
13
SAMPLE NO.
10
30
50
% LOSS ON IGNITION
0
1
2
WEIGHT PERCENTAGE NORMATIVE PYRITE
0
1
2
3
% K_2O
0
2
4
6
WEIGHT PERCENTAGE NORMATIVE SIDERITE
0
500
1000
1500
ppm Mn

FIGURE 5

THE VARIATION OF LOSS ON IGNITION, NORMATIVE PYRITE CONTENT, % K_2O, NORMATIVE SIDERITE CONTENT AND PPM MN IN SEDIMENTS FROM BOREHOLES A/76 AND A/62, HENDRINA - MIDDELBURG DISTRICT, EASTERN TRANSVAAL.

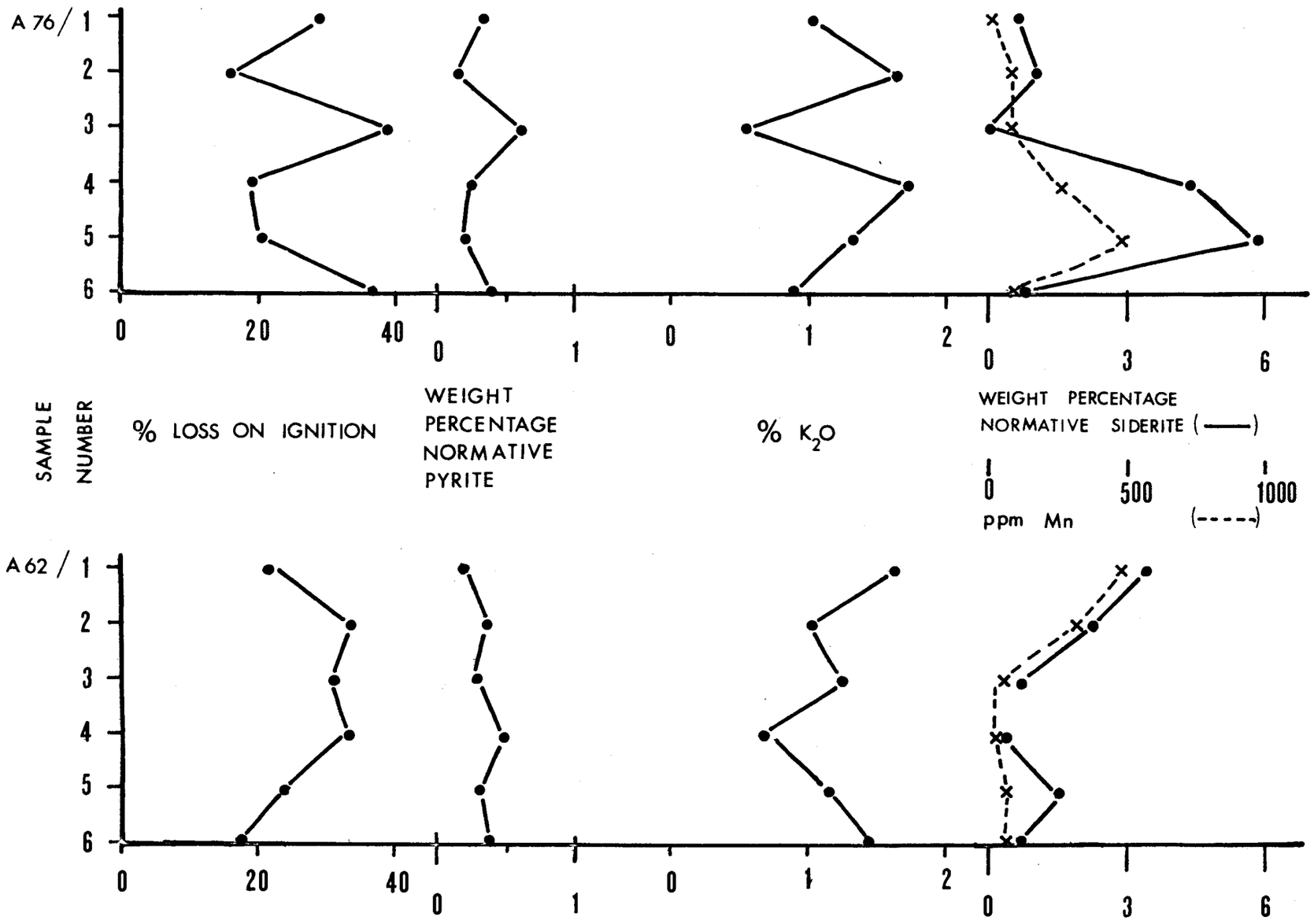

A 76 / 1
2
3
4
5
6
0
20
40
0
1
0
1
2
0
3
6
SAMPLE NUMBER
% LOSS ON IGNITION
WEIGHT PERCENTAGE NORMATIVE PYRITE
% K_2O
WEIGHT PERCENTAGE NORMATIVE SIDERITE (——)
0
500
1000
ppm Mn
(- - - -)
A 62 / 1
2
3
4
5
6
0
20
40
0
1
0
1
2
0
3
6

FIGURE 6

THE VARIATION OF LOSS ON IGNITION, NORMATIVE PYRITE CONTENT, % K_2O, NORMATIVE SIDERITE CONTENT AND PPM MN IN SEDIMENTS FROM BOREHOLE BH 134, SPRINGBOK COLLIERY, WITBANK.

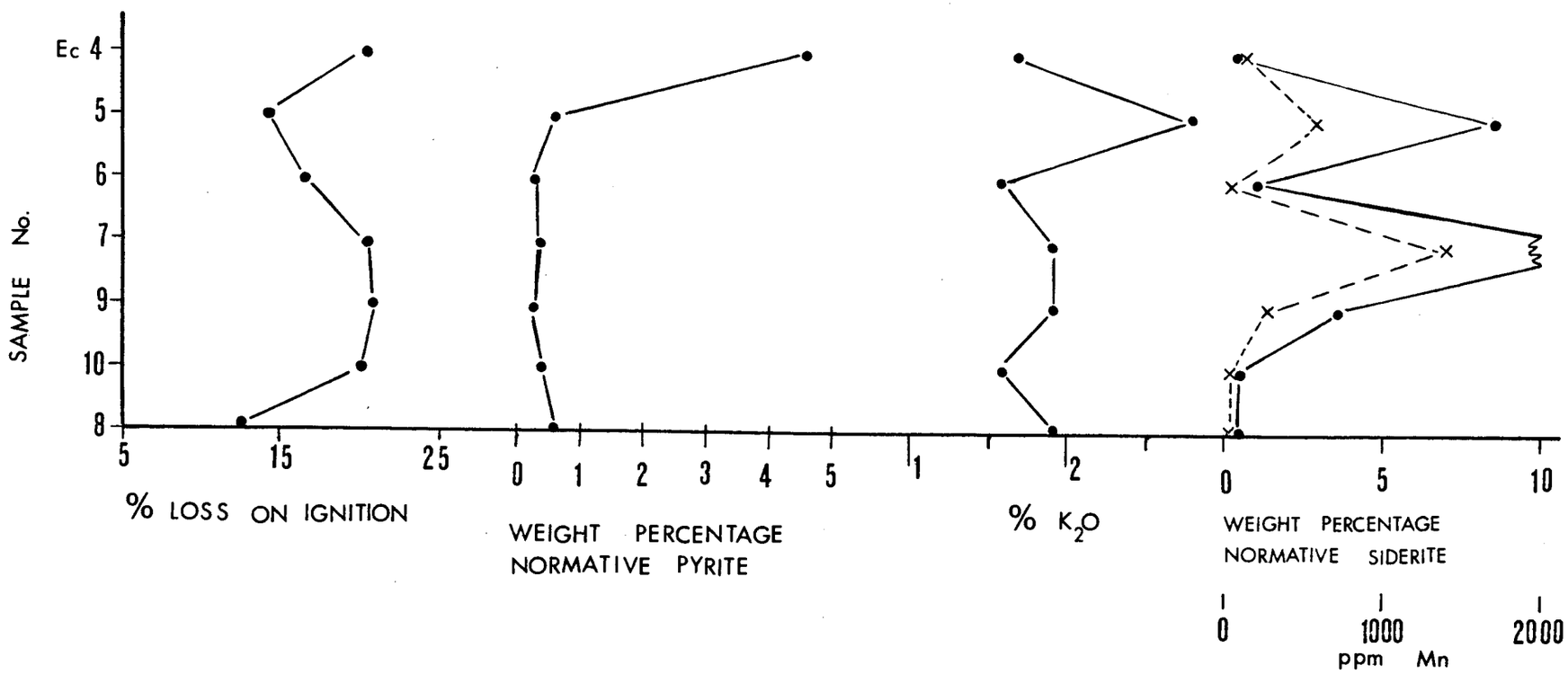

Ec 4
5
6
7
9
10
8
SAMPLE No.
5
15
25
% LOSS ON IGNITION
0
1
2
3
4
5
WEIGHT PERCENTAGE
NORMATIVE PYRITE
1
2
% K_2O
0
5
10
WEIGHT PERCENTAGE
NORMATIVE SIDERITE
0
1000
2000
ppm Mn

FIGURE 7

THE VARIATION OF LOSS ON IGNITION, NORMATIVE PYRITE CONTENT, Si/Al RATIO, NORMATIVE CARBONATE CONTENT, AND % K_2O IN SEDIMENTS FROM BOREHOLE GB48/65, WAKKERSTROOM DISTRICT, EASTERN TRANSVAAL.

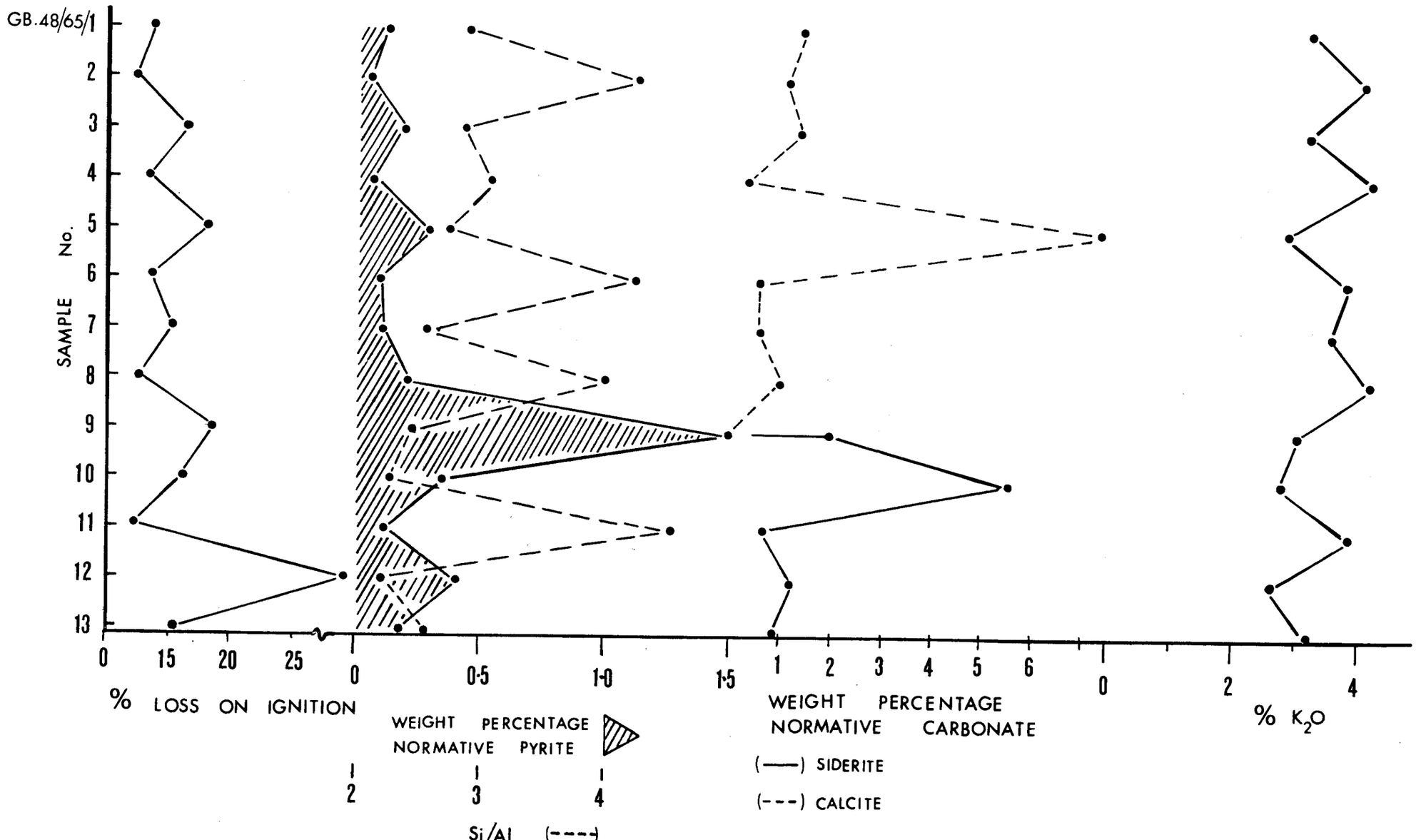

GB.48/65/1
2
3
4
5
6
7
8
9
10
11
12
13
SAMPLE No.
0
15
20
25
% LOSS ON IGNITION
0
0·5
1·0
1·5
WEIGHT PERCENTAGE NORMATIVE PYRITE
2
3
4
Si/Al (----)
1
2
3
4
5
6
0
WEIGHT PERCENTAGE NORMATIVE CARBONATE
(——) SIDERITE
(---) CALCITE
0
2
4
% K_2O

FIGURE 8

AVERAGE MINERAL COMPOSITIONS OF FOUR SEDIMENTS FROM THE WAKKERSTROOM DISTRICT, EASTERN TRANSVAAL.

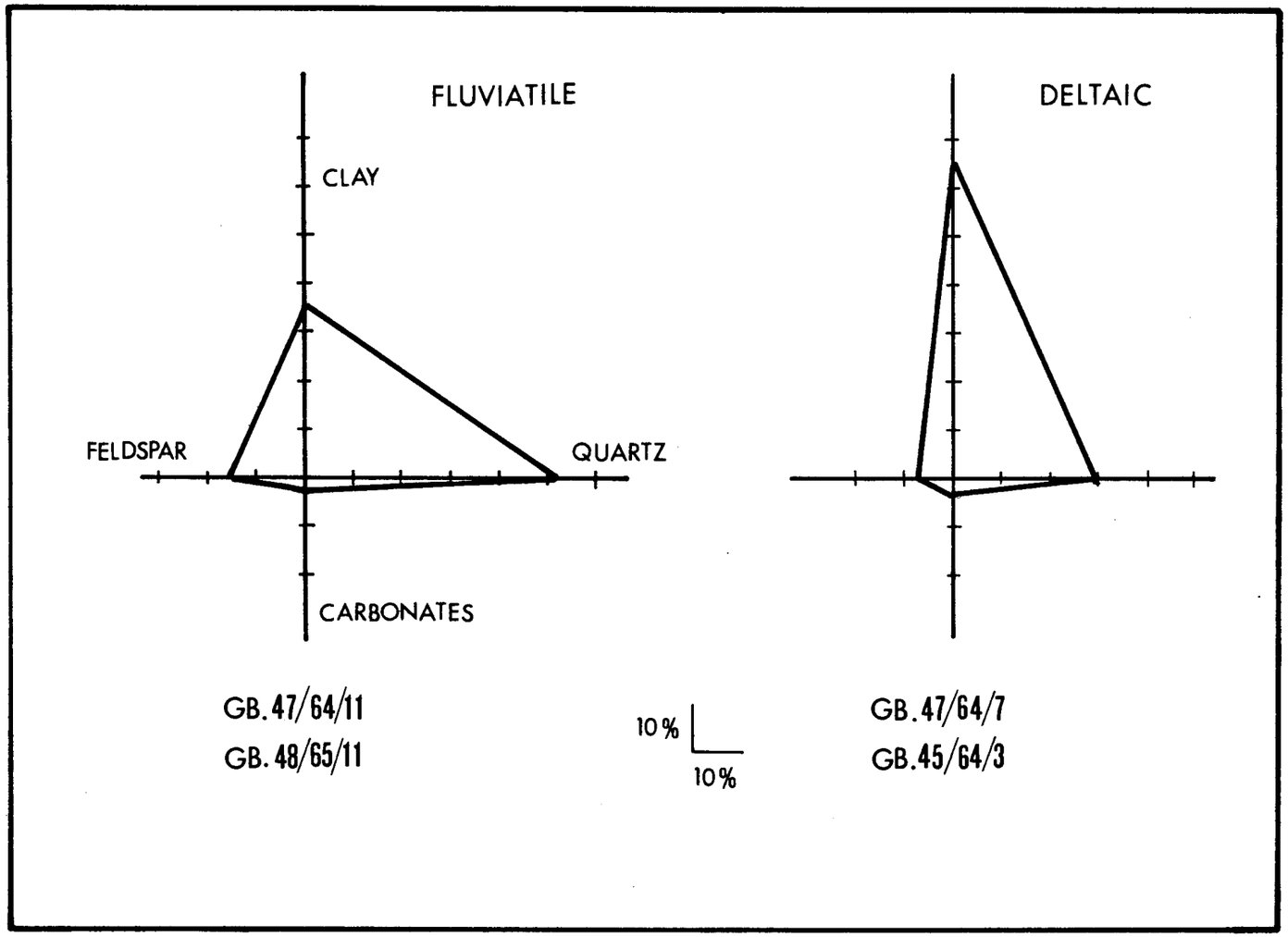

FLUVIATILE
CLAY
FELDSPAR
QUARTZ
CARBONATES
DELTAIC
GB.47/64/11
GB.48/65/11
10%
10%
GB.47/64/7
GB.45/64/3

FIGURE 9

THE VARIATION OF LOSS ON IGNITION, NORMATIVE PYRITE CONTENT, Na/K RATIO AND NORMATIVE CARBONATE CONTENT IN SEDIMENTS FROM THE SOMKELE BOREHOLE, MTUBATUBA, NORTHERN ZULULAND.

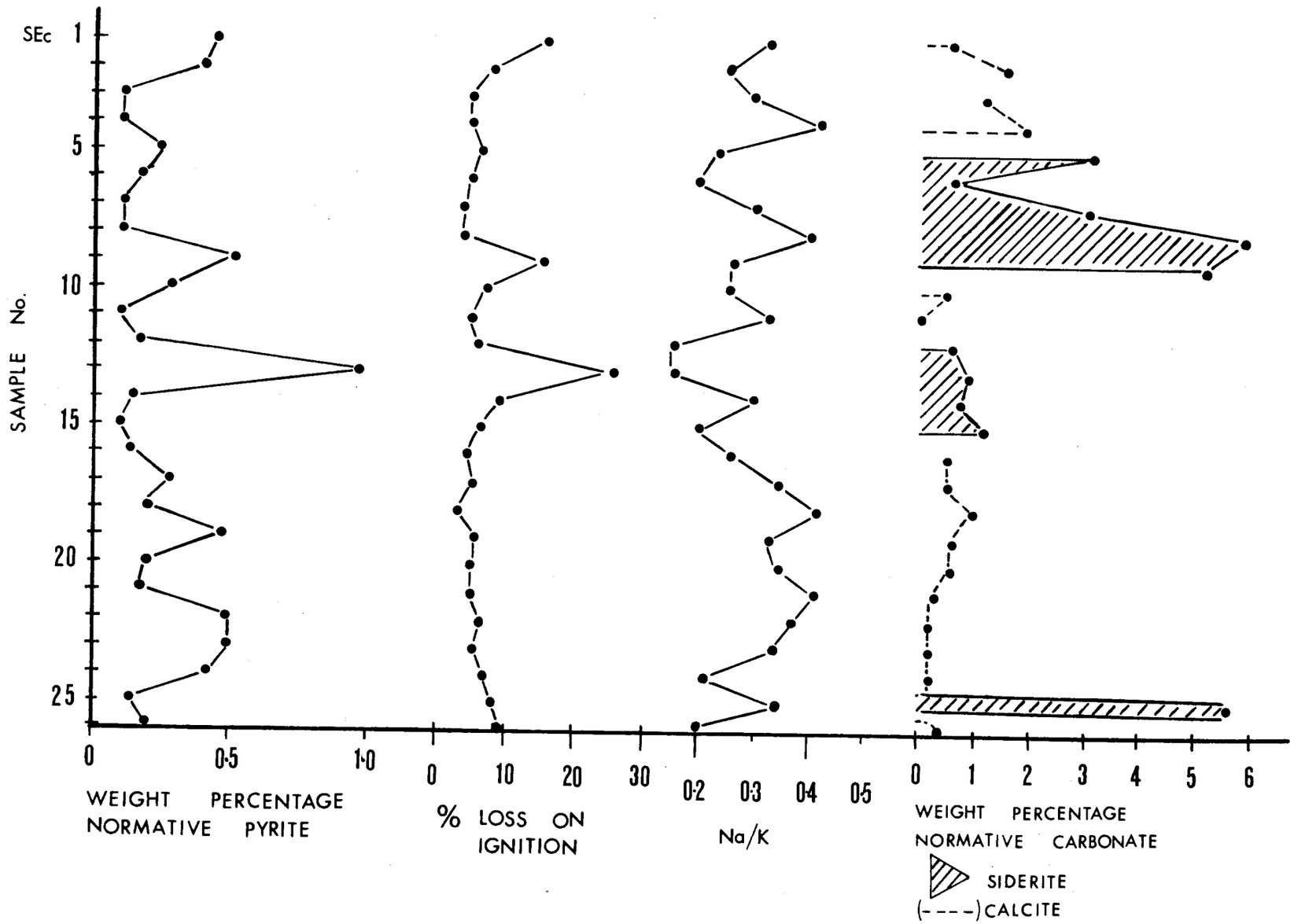

SEc
SAMPLE No.
1
5
10
15
20
25
0
0·5
1·0
WEIGHT PERCENTAGE
NORMATIVE PYRITE
0
10
20
30
% LOSS ON
IGNITION
0·2
0·3
0·4
0·5
Na/K
0
1
2
3
4
5
6
WEIGHT PERCENTAGE
NORMATIVE CARBONATE
SIDERITE
(- - - -) CALCITE

FIGURE 10

THE Si/Al - Na/K RELATIONSHIP IN SHALES OF THE BOKKEVELD SERIES OF THE CAPE SYSTEM.

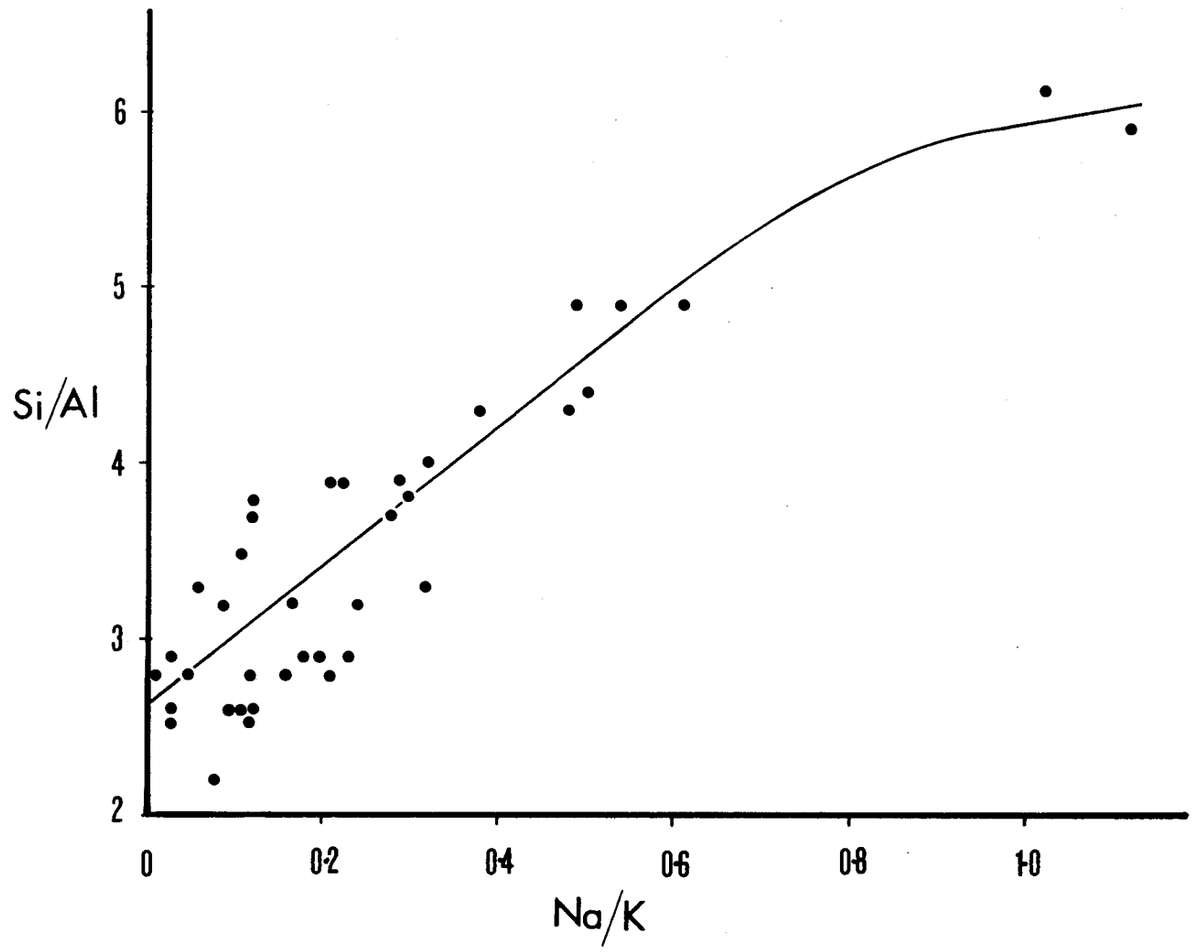

Si/Al
6
5
4
3
2
0
0·2
0·4
0·6
0·8
1·0
Na/K

FIGURE 11

THE Al_2O_3 - TiO_2 RELATIONSHIP IN SHALES OF THE BOKKEVELD SERIES OF THE CAPE SYSTEM.

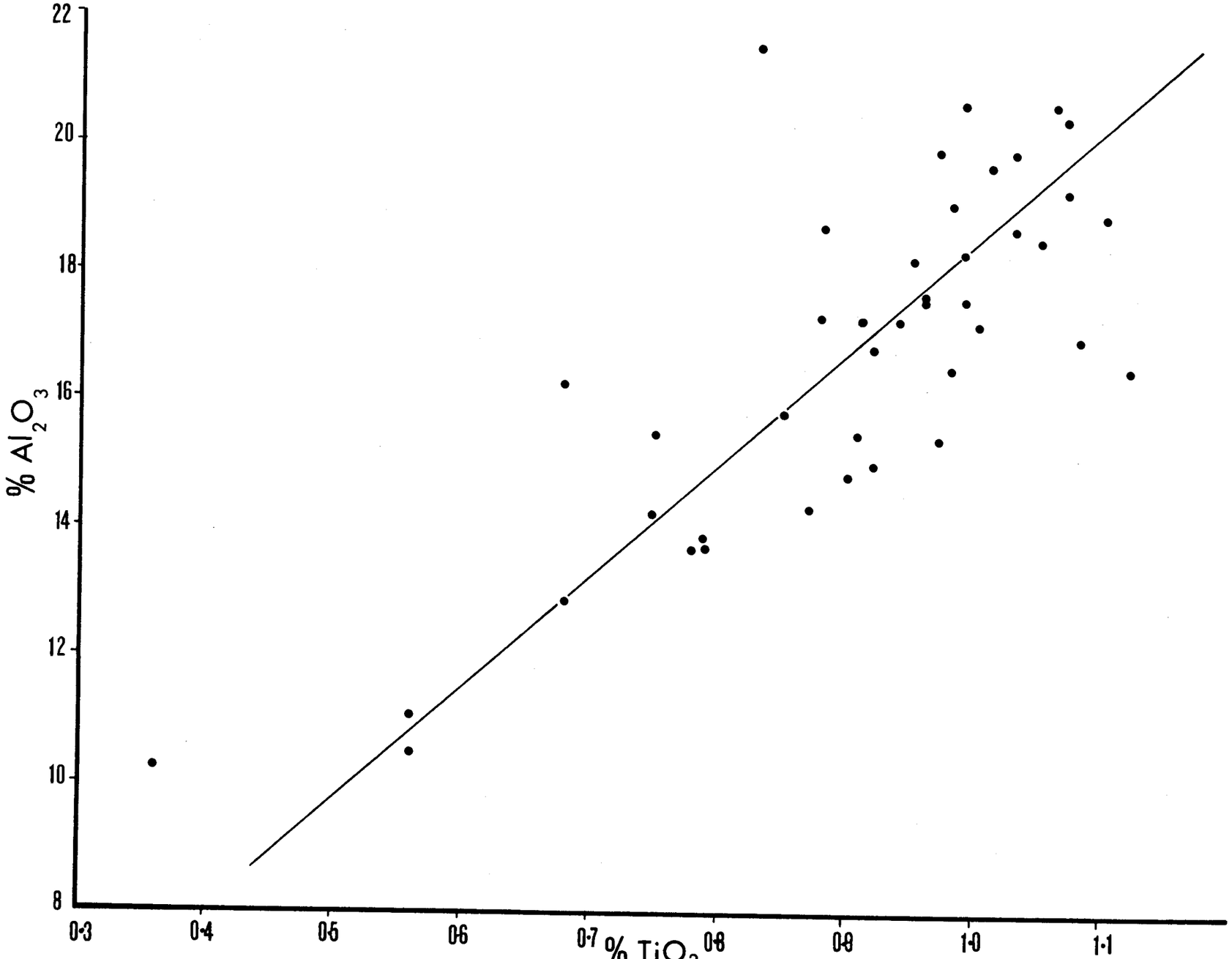

22
20
18
16
14
12
10
8
% Al_2O_3
0·3
0·4
0·5
0·6
0·7
% TiO_2
0·8
0·9
1·0
1·1

FIGURE 12

THE VARIATION WITH DECREASING GEOLOGICAL AGE OF Al_2O_3, CaO, Na_2O, K_2O AND MgO.

LEGEND.

Fg. - Fig Tree Series, Swaziland System.
Kh. - Kheis System.
Jp. - Jeppestown and Government Reef Series, Witwatersrand System.
Kun. - Kunyas Series, Sinclair Formation.
Dm. - Damara System.
Mm. - Malmesbury Formation.
Cg. - Cango Formation.
Kui. - Kuibis Series, Nama System.
Schr. - Schwarzrand Series, Nama System.
FR. - Fish River Series, Nama System.
Bk. - Bokkeveld Series, Cape System.
Wb. - Witteberg Series, Cape System.
L.Ec. - Lower Ecca shales, Karroo System.
M.Ec. - Middle Ecca shales, Karroo System.
U.Ec. - Upper Ecca shales, Karroo System.
Bf. - Beaufort Series, Karroo System.

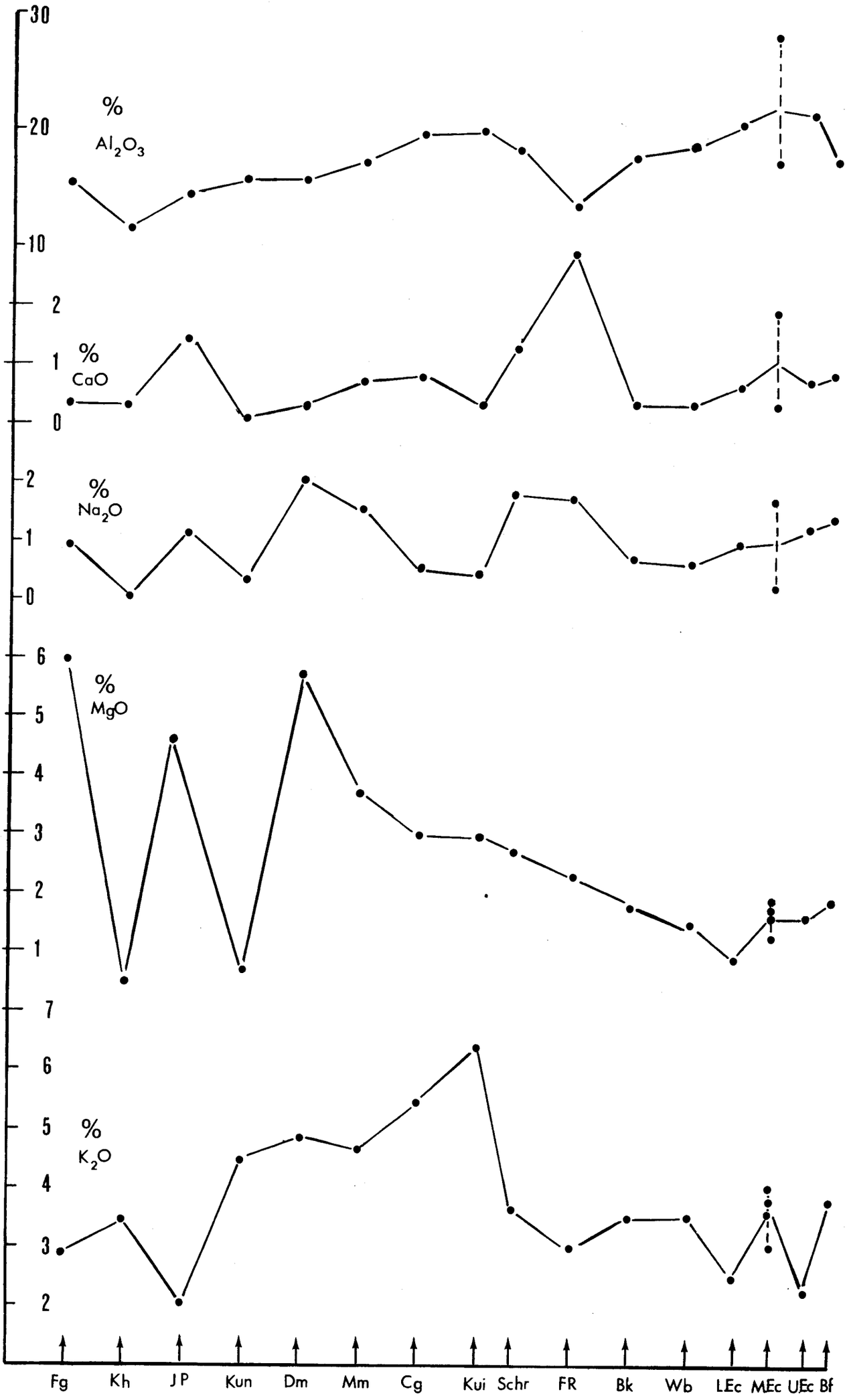
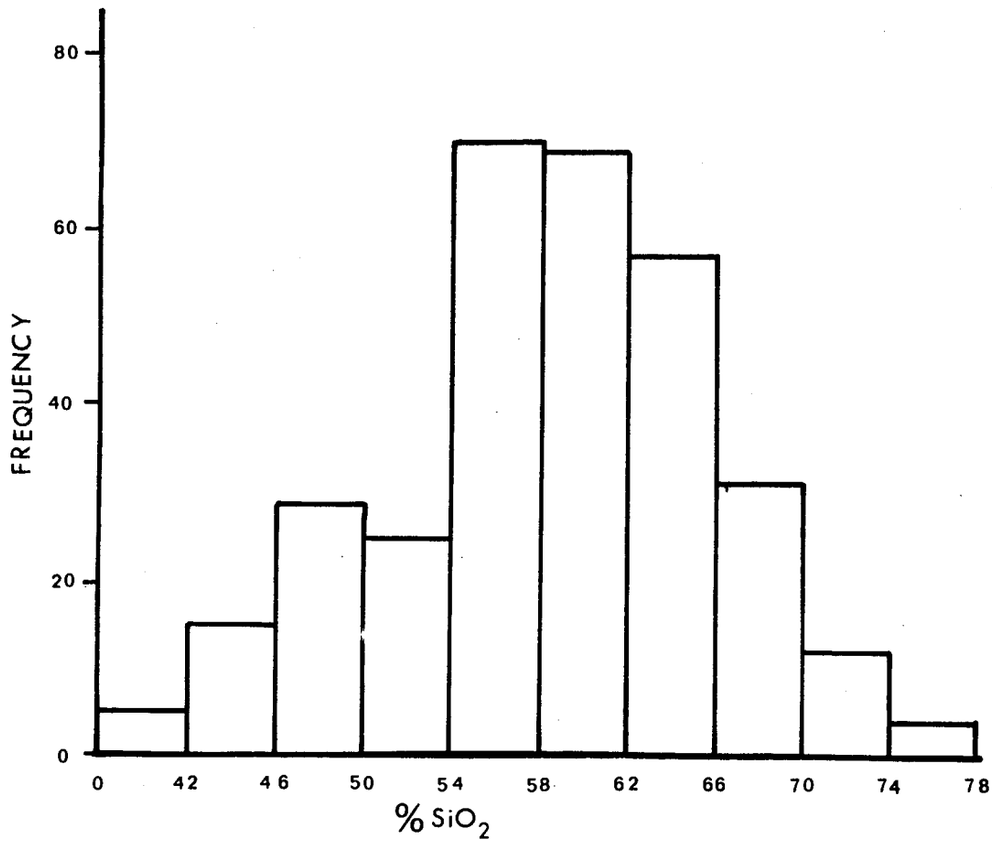

% Al_2O_3
% CaO
% Na_2O
% MgO
% K_2O
Fg
Kh
JP
Kun
Dm
Mm
Cg
Kui
Schr
FR
Bk
Wb
LEc
MEc
UEc
Bf

FIGURE 13

FREQUENCY DISTRIBUTION DIAGRAM OF SiO_2 IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

FIGURE 14

FREQUENCY DISTRIBUTION DIAGRAM OF CaO IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.


80
60
40
20
0
FREQUENCY
0
42
46
50
54
58
62
66
70
74
78
% SiO2

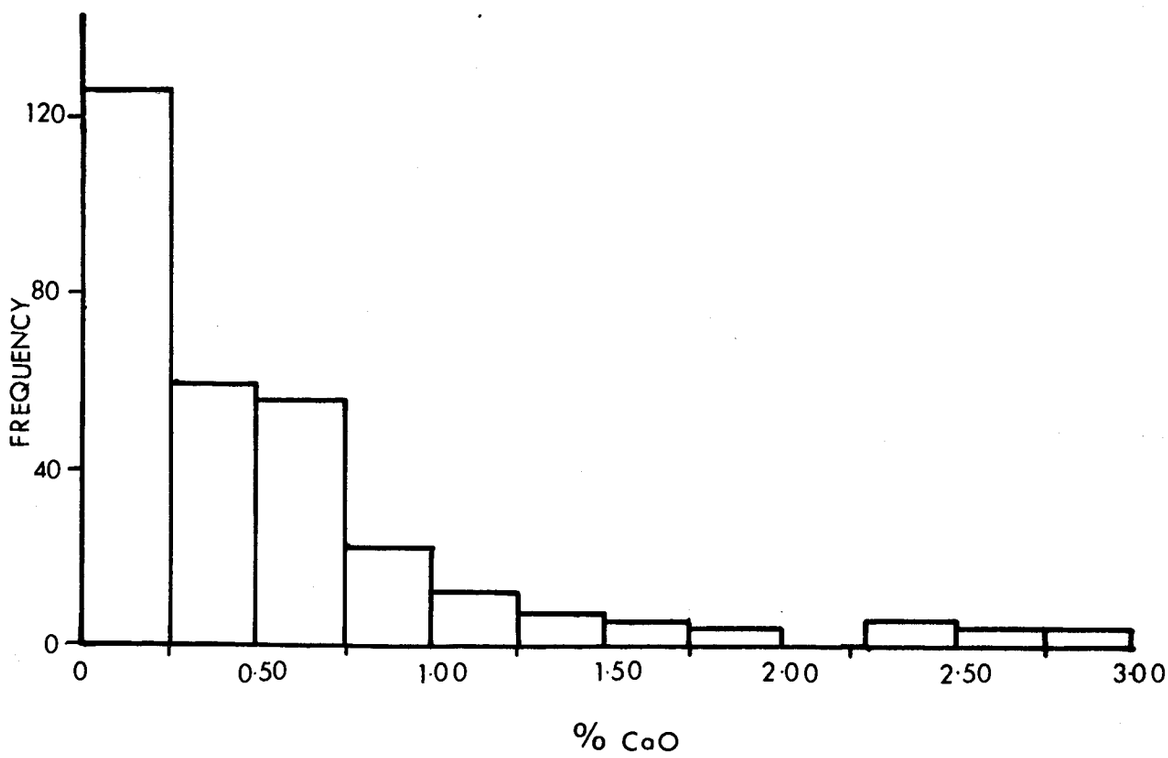
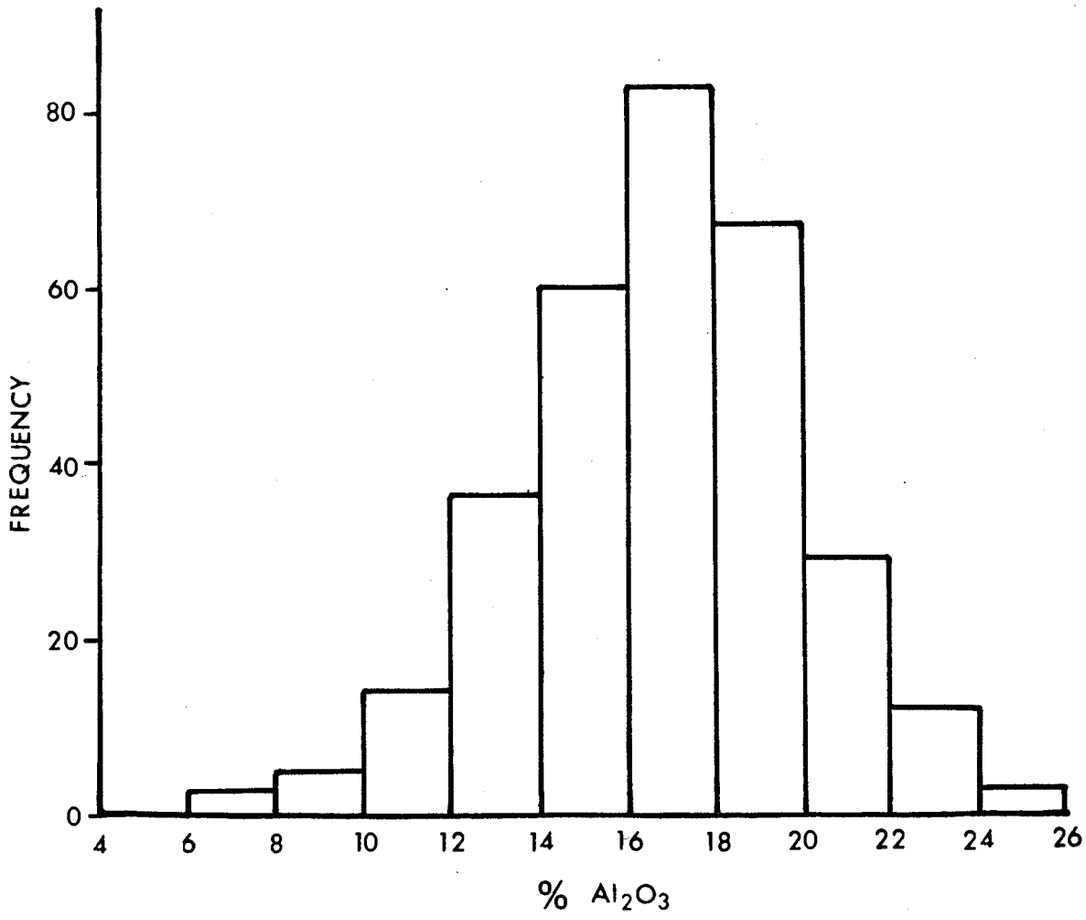

120
80
40
0
FREQUENCY
0
0·50
1·00
1·50
2·00
2·50
3·00
% CaO

FIGURE 15

FREQUENCY DISTRIBUTION DIAGRAM OF Al_2O_3 IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

FIGURE 16

FREQUENCY DISTRIBUTION DIAGRAM OF TiO_2 IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.


FREQUENCY
80
60
40
20
0
4
6
8
10
12
14
16
18
20
22
24
26
% Al_2O_3

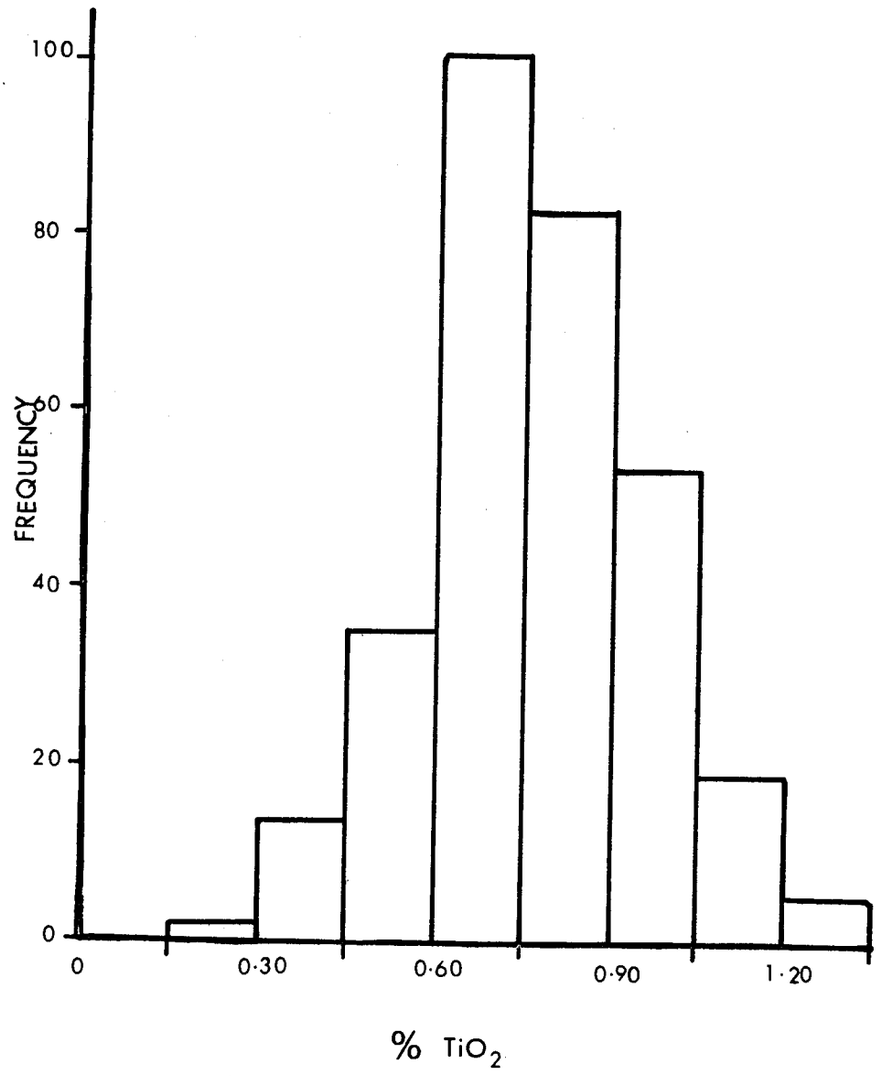

FREQUENCY
100
80
60
40
20
0
0
0·30
0·60
0·90
1·20
% TiO_2

FIGURE 17

FREQUENCY DISTRIBUTION DIAGRAM OF TOTAL IRON EXPRESSED AS Fe_2O_3 IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

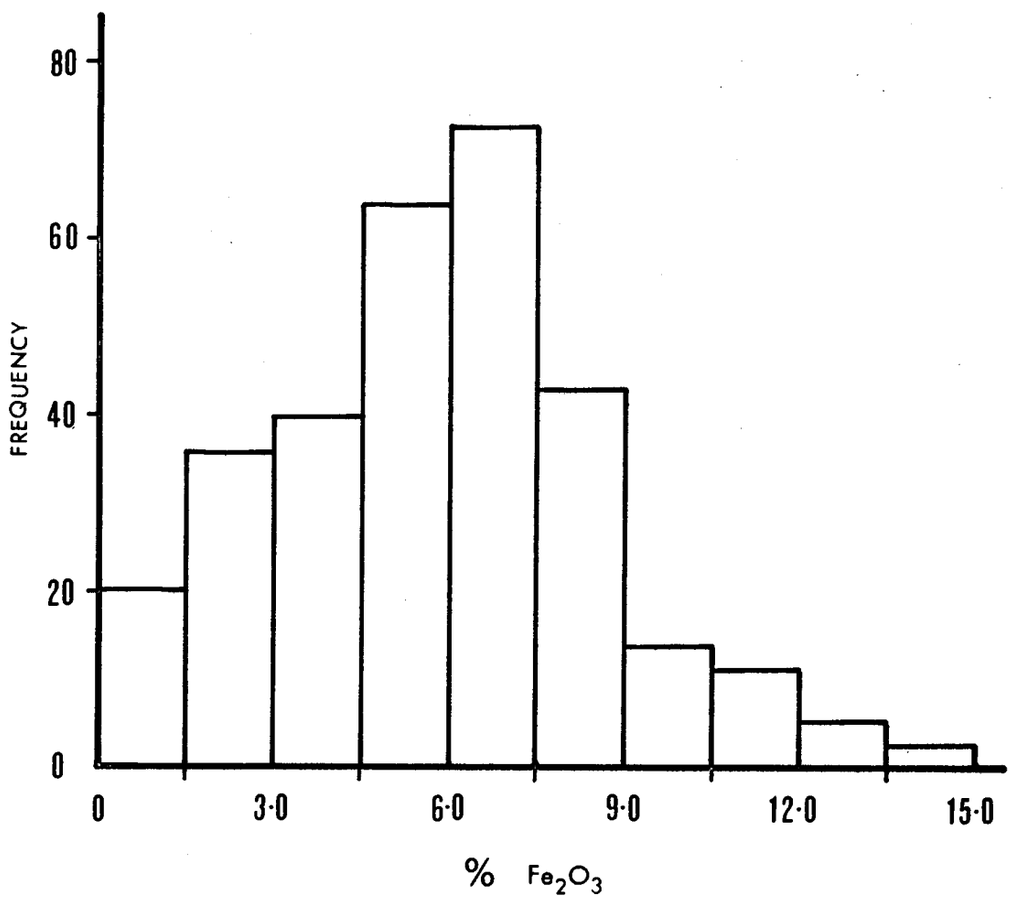

80
60
40
20
0
FREQUENCY
0
3·0
6·0
9·0
12·0
15·0
% Fe_2O_3

FIGURE 18

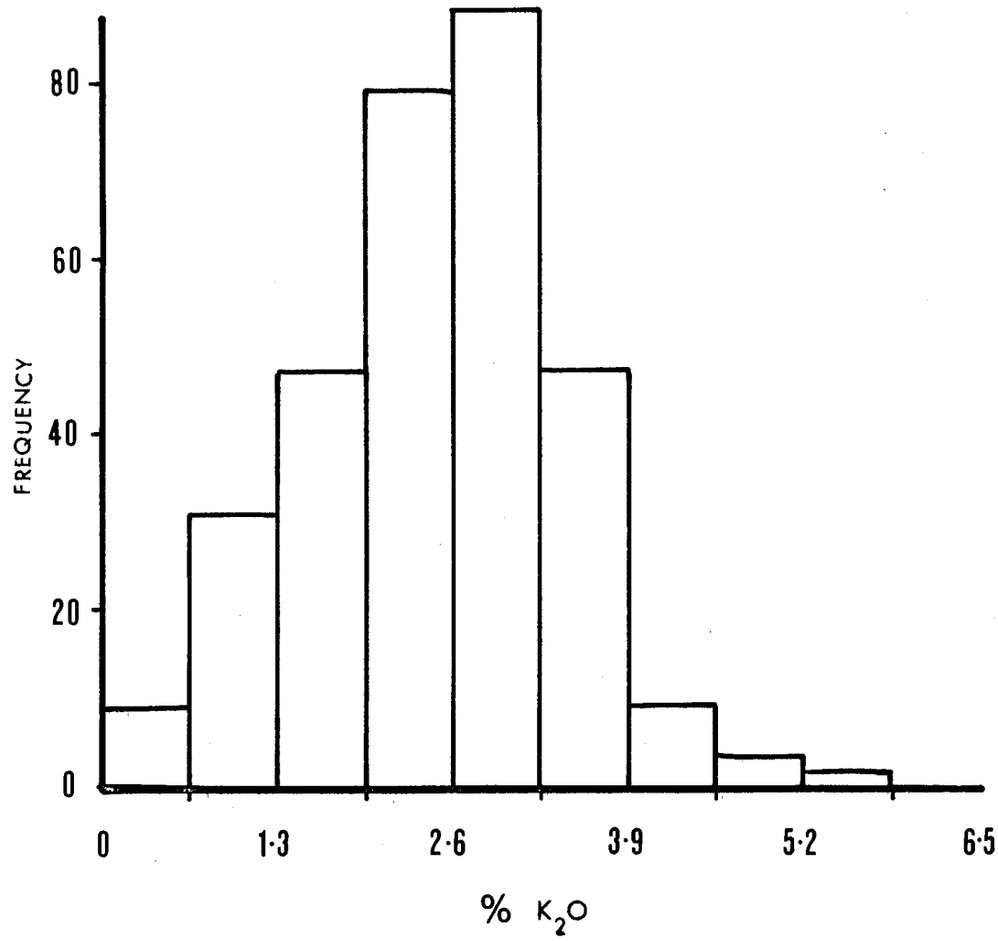
FREQUENCY DISTRIBUTION DIAGRAM OF K_2O

IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

FIGURE 19

FREQUENCY DISTRIBUTION DIAGRAM OF Na_2O

IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.


80
60
40
20
0
FREQUENCY
0
1·3
2·6
3·9
5·2
6·5
% K_2O

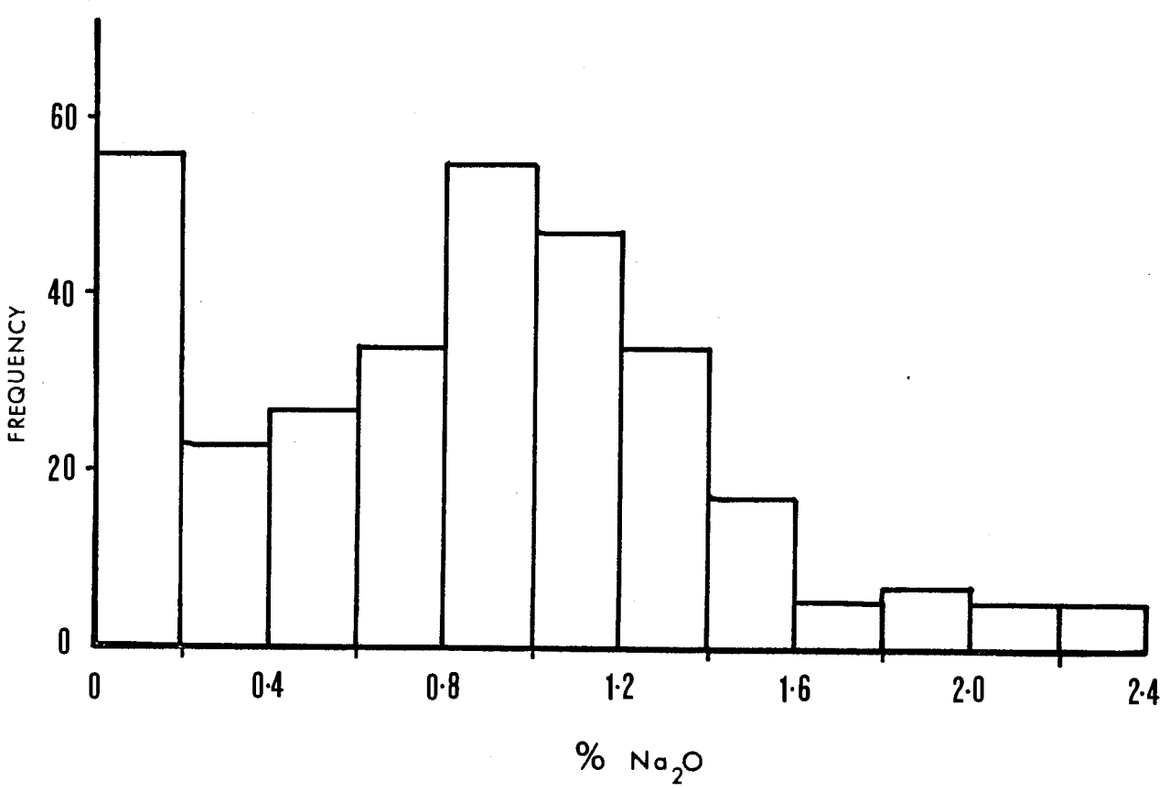

60
40
20
0
FREQUENCY
0
0·4
0·8
1·2
1·6
2·0
2·4
% Na_2O

FIGURE 20

FREQUENCY DISTRIBUTION DIAGRAM OF MgO

IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

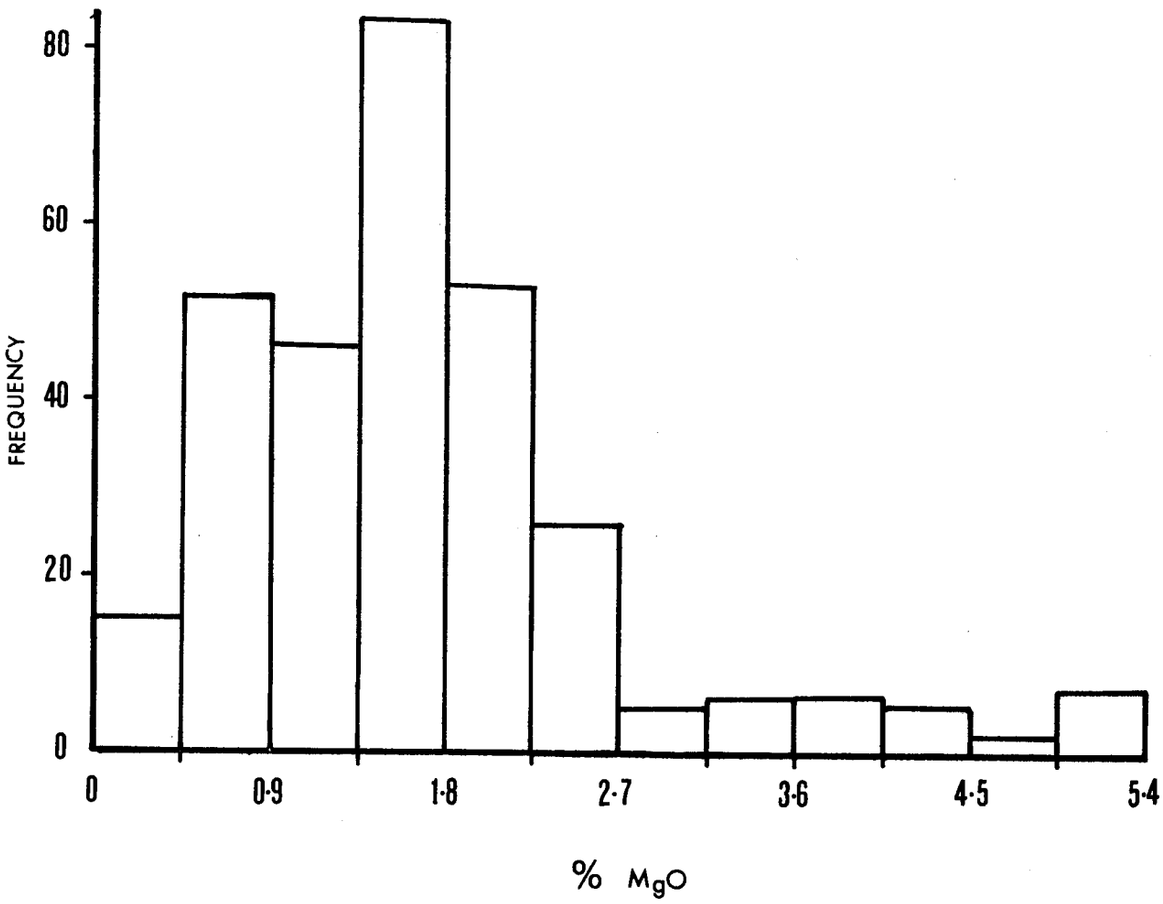

80
60
40
20
0
FREQUENCY
0
0·9
1·8
2·7
3·6
4·5
5·4
% MgO

FIGURE 21

FREQUENCY DISTRIBUTION DIAGRAM OF THE K/Rb RATIO IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

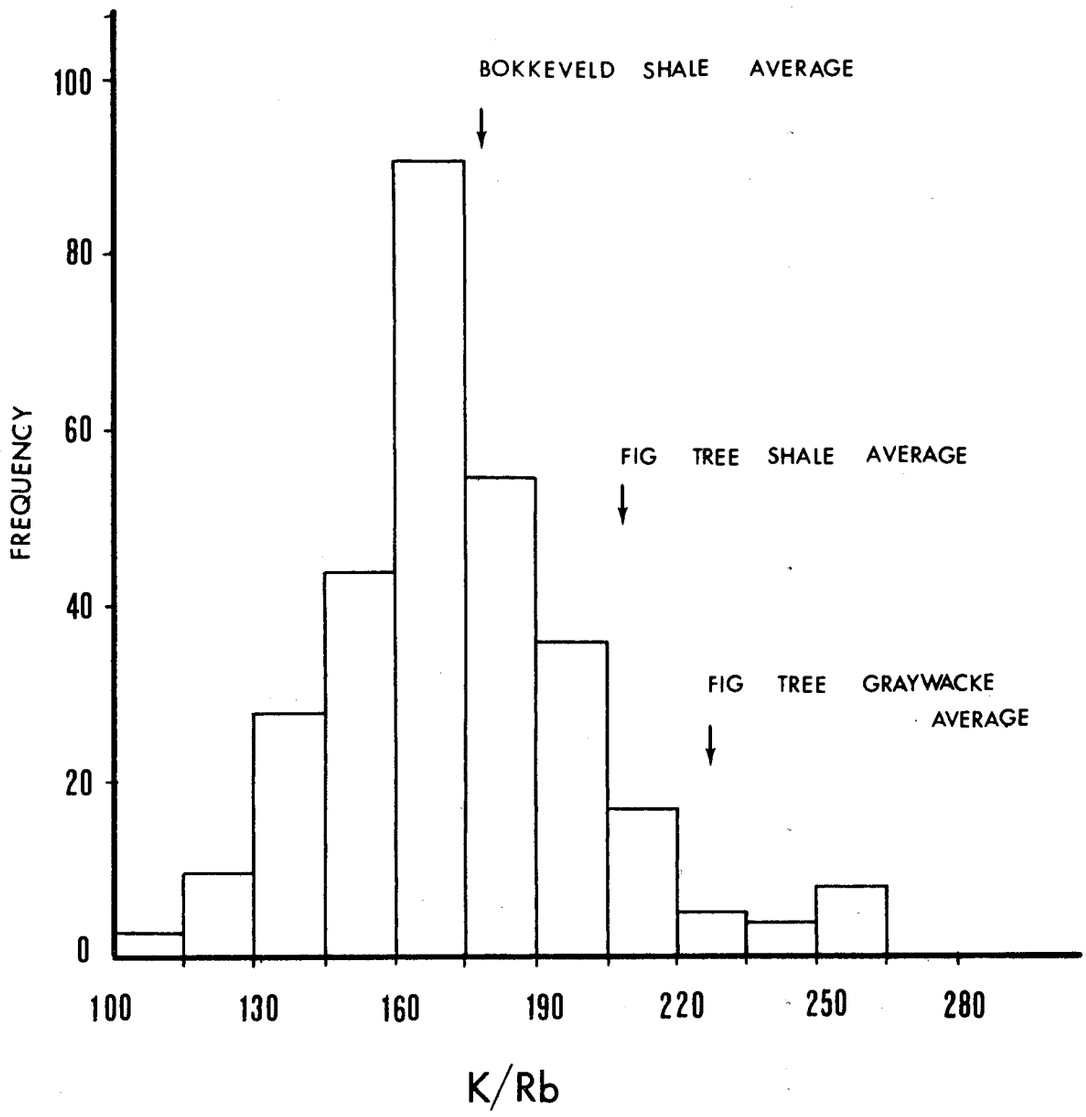

BOKKEVELD SHALE AVERAGE
FIG TREE SHALE AVERAGE
FIG TREE GRAYWACKE AVERAGE
FREQUENCY
100
80
60
40
20
0
100
130
160
190
220
250
280
K/Rb

FIGURE 22.

FREQUENCY DISTRIBUTION DIAGRAM OF THE K/Cs RATIO IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

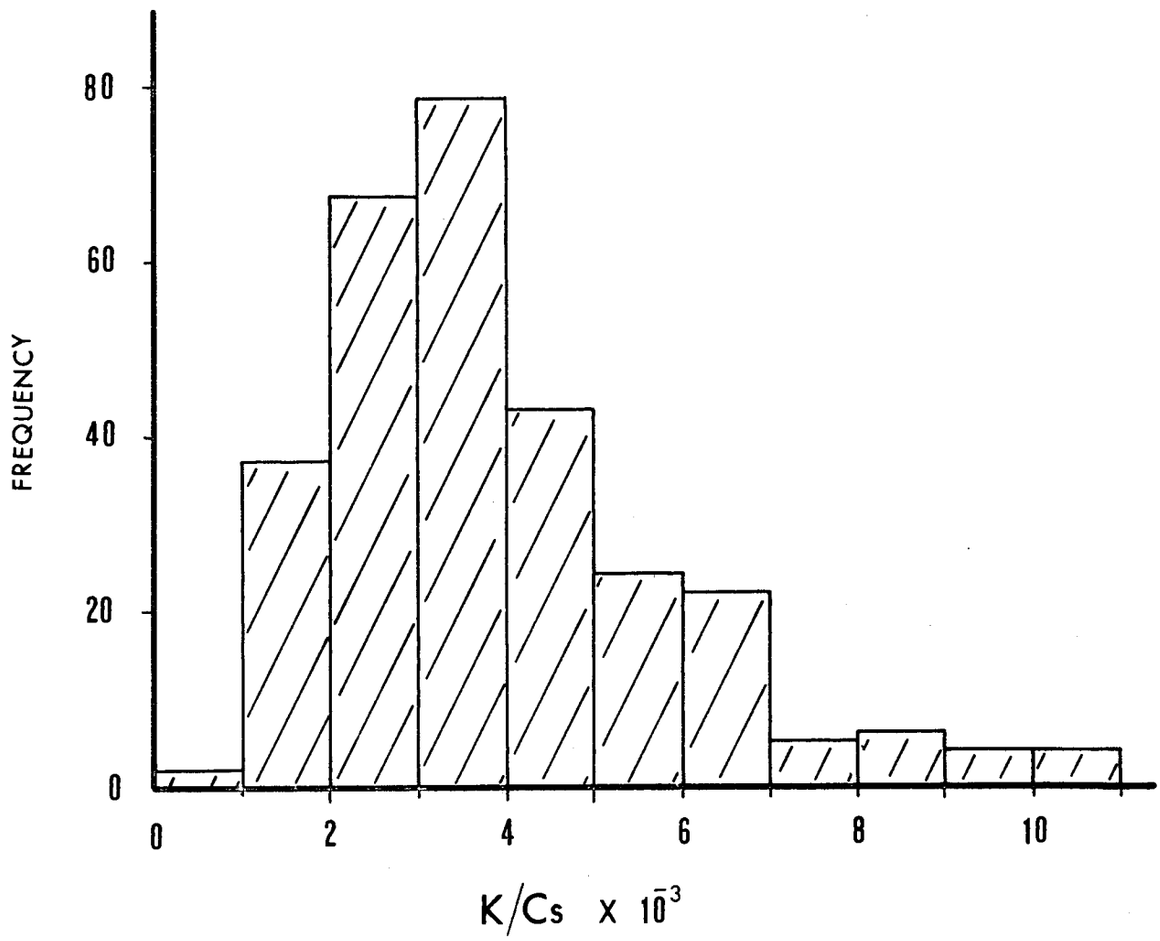

FREQUENCY
80
60
40
20
0
0
2
4
6
8
10
K/Cs x 10⁻³

FIGURE 23

K – Cs RELATIONSHIP IN SHALES OF THE BOKKEVELD SERIES OF THE CAPE SYSTEM.

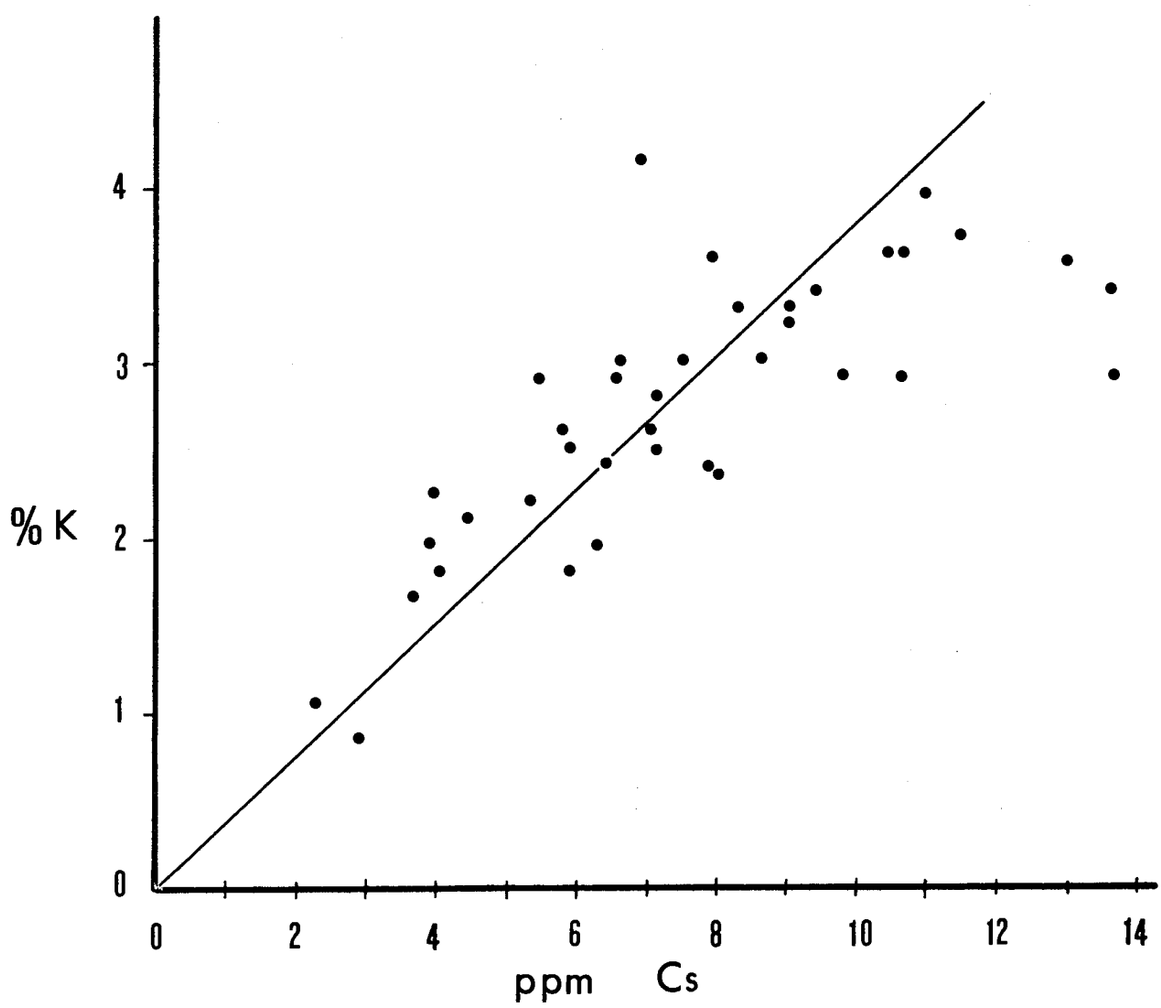

% K
4
3
2
1
0
0
2
4
6
8
10
12
14
ppm Cs

FIGURE 24

THE RELATIONSHIP BETWEEN THE K/Cs AND Si/Al RATIOS IN SEDIMENTS FROM THE GB SERIES, DANNHAUSER AND BOTHAVILLE BOREHOLES.

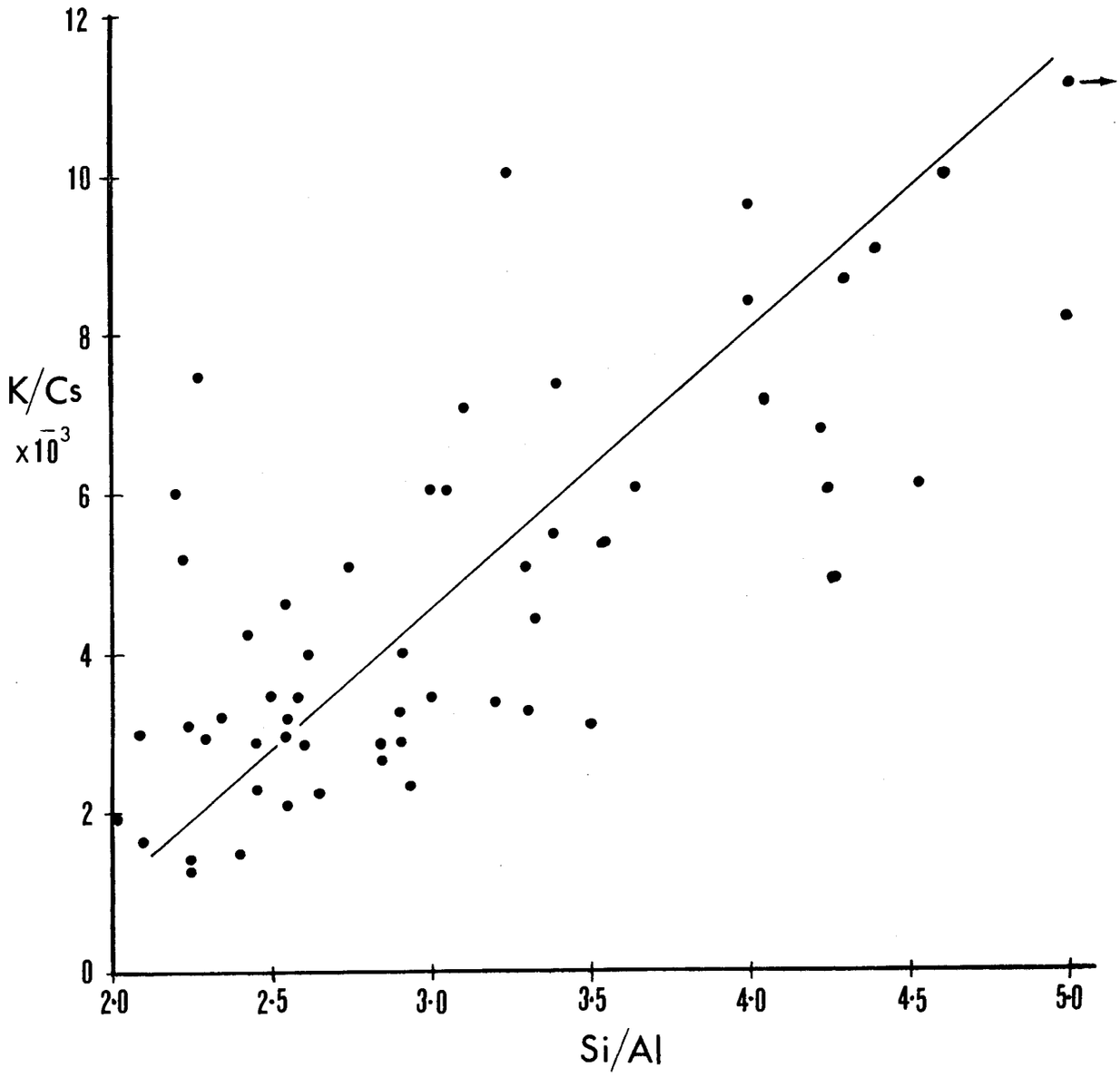

12
10
8
K/Cs
x10⁻³
6
4
2
0
2·0
2·5
3·0
3·5
4·0
4·5
5·0
Si/Al

FIGURE 25

THE RELATIONSHIP BETWEEN LOSS ON IGNITION AND K/Cs FOR COAL MEASURE SEDIMENTS FROM THE NORTHERN ECCA FACIES OF THE KARROO SYSTEM.

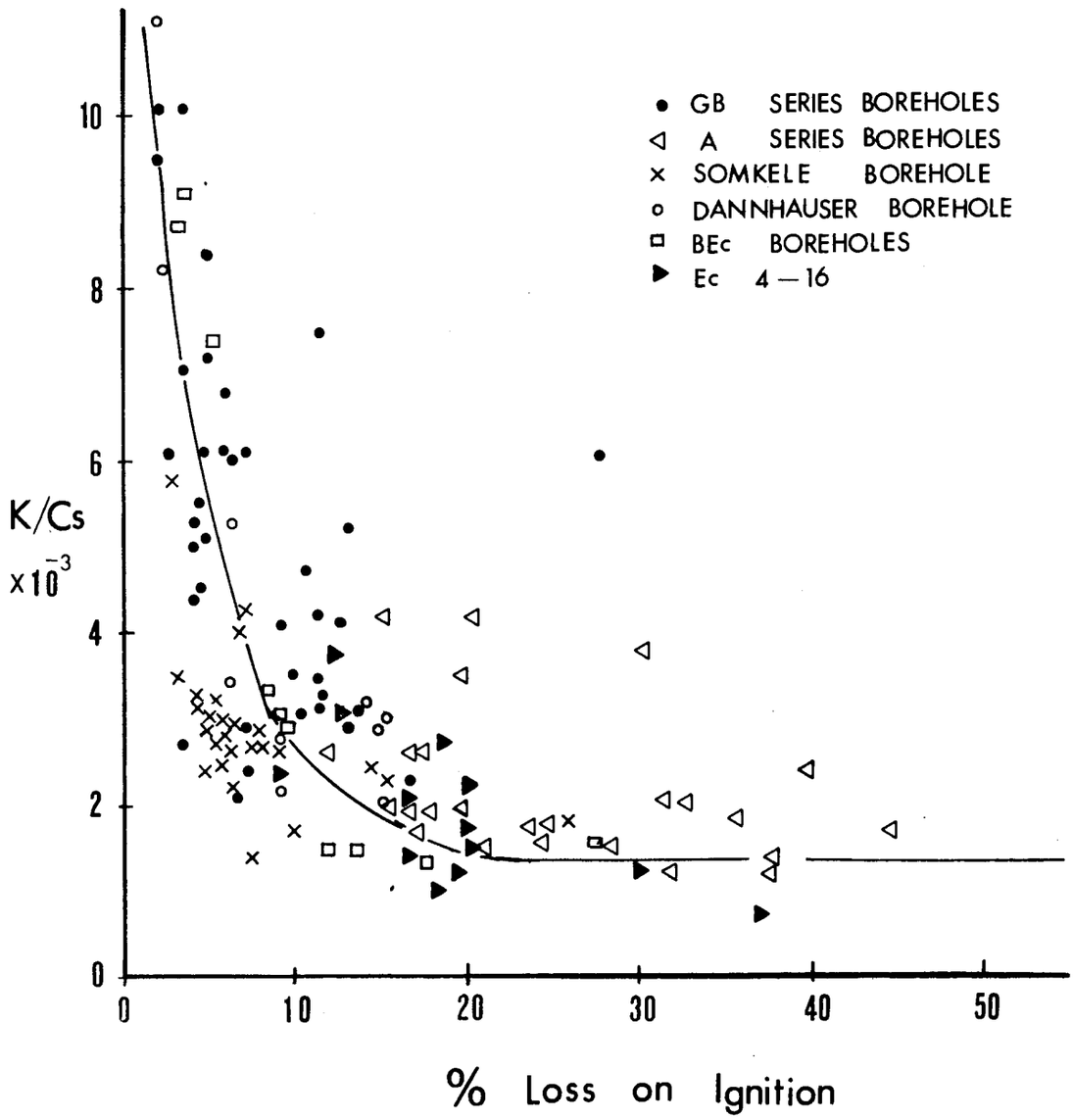

GB SERIES BOREHOLES
A SERIES BOREHOLES
SOMKELE BOREHOLE
DANNHAUSER BOREHOLE
BEc BOREHOLES
Ec 4 — 16
K/Cs
x10⁻³
0
2
4
6
8
10
0
10
20
30
40
50
% Loss on Ignition

FIGURE 26

THE MgO - Li RELATIONSHIP FOR SEDIMENTS OF THE FIG TREE SERIES OF THE SWAZILAND SYSTEM, AND BOKKEVELD SERIES OF THE CAPE SYSTEM.

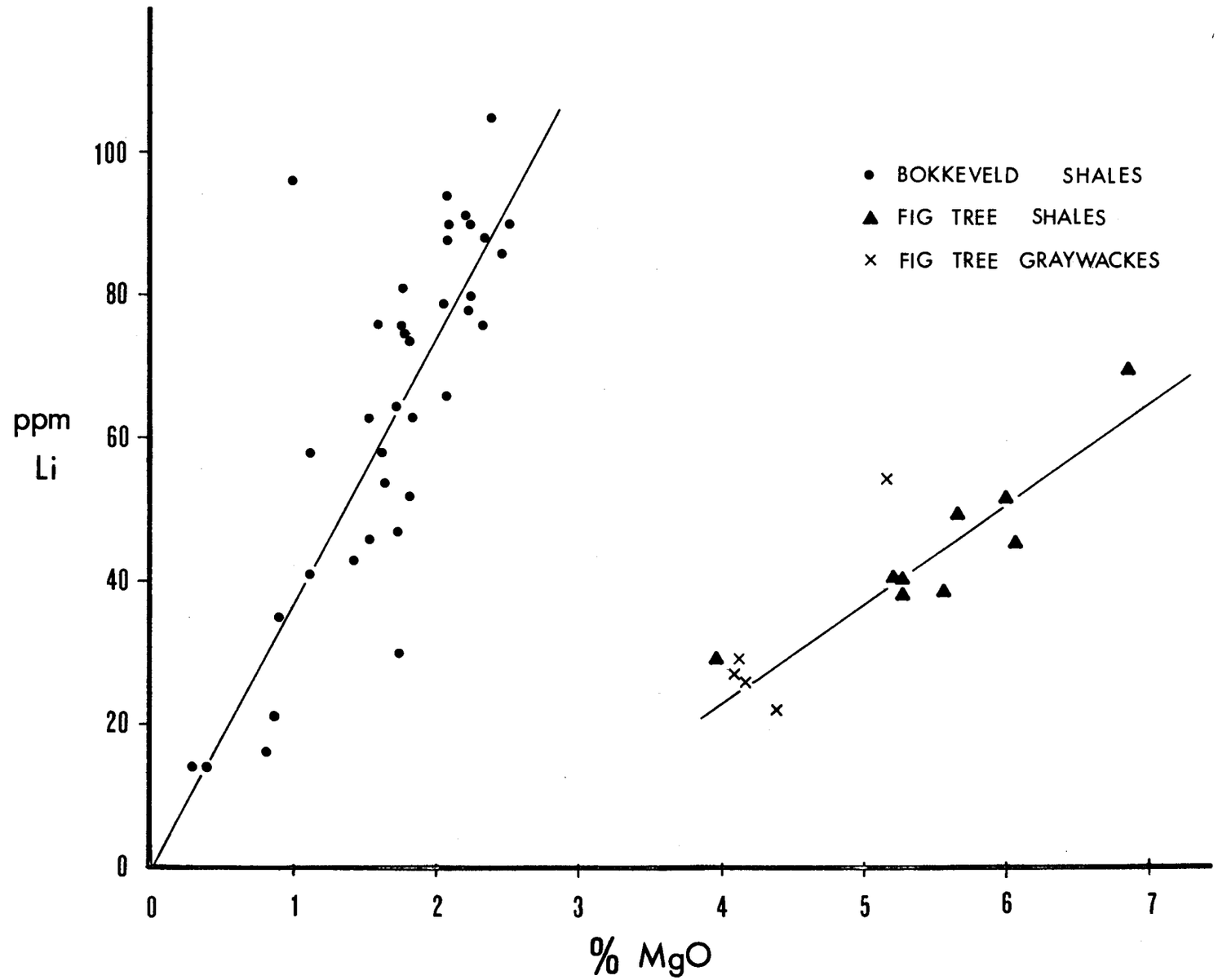

ppm
Li
100
80
60
40
20
0
0
1
2
3
4
5
6
7
% MgO
BOKKEVELD SHALES
FIG TREE SHALES
FIG TREE GRAYWACKES

FIGURE 27

THE B - Li RELATIONSHIP FOR SHALES FROM THE BOKKEVELD AND WITTEBERG SERIES OF THE CAPE SYSTEM.

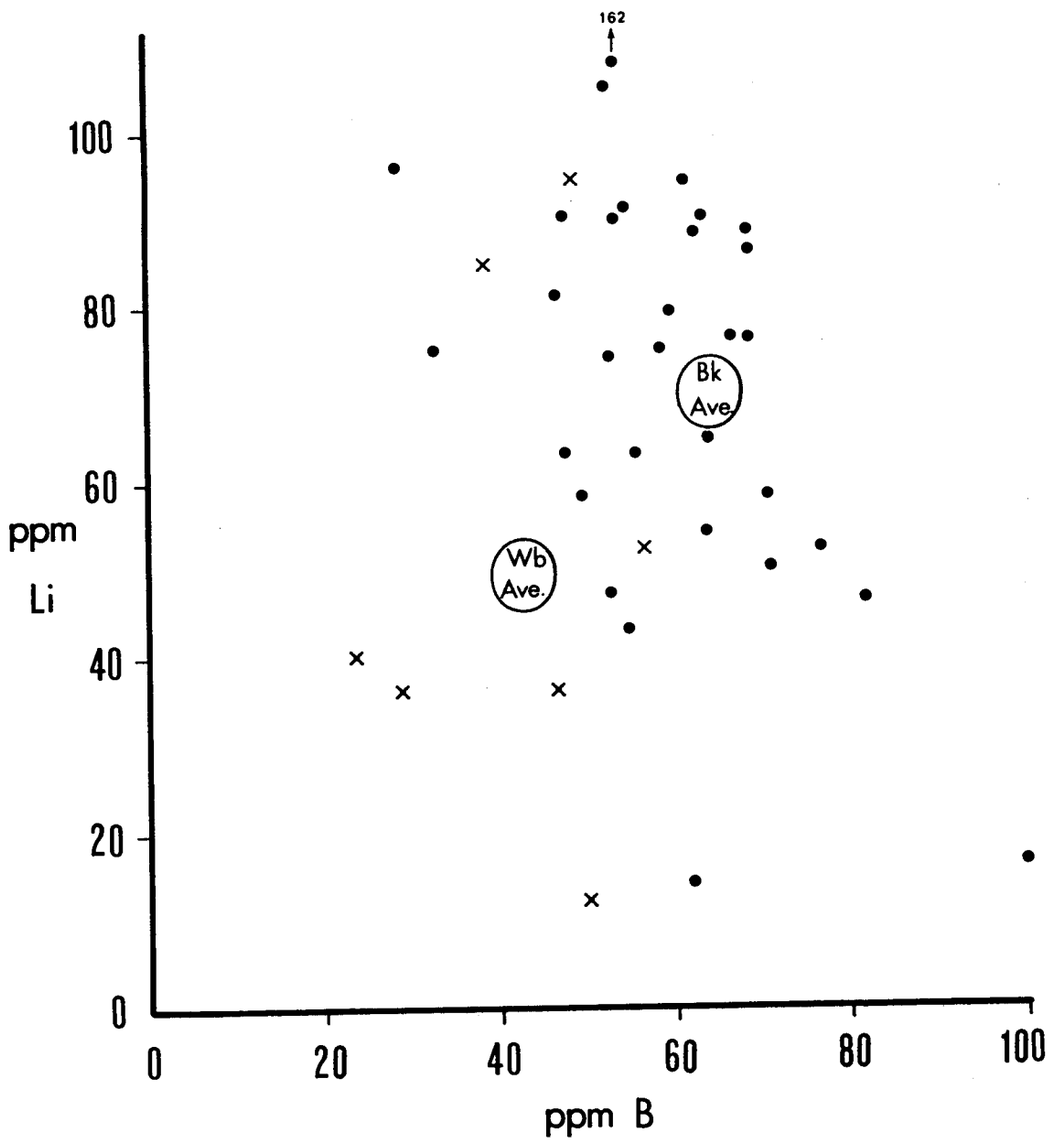

162
100
80
60
40
20
0
ppm
Li
Bk
Ave.
Wb
Ave.
0
20
40
60
80
100
ppm B

FIGURE 28

THE RELATIONSHIP BETWEEN THE BORON AND NON-DIAGENETIC IRON CONTENTS OF SEDIMENTS FROM THE SOMKELE BOREHOLE, MTUBATUBA, NORTHERN ZULULAND.

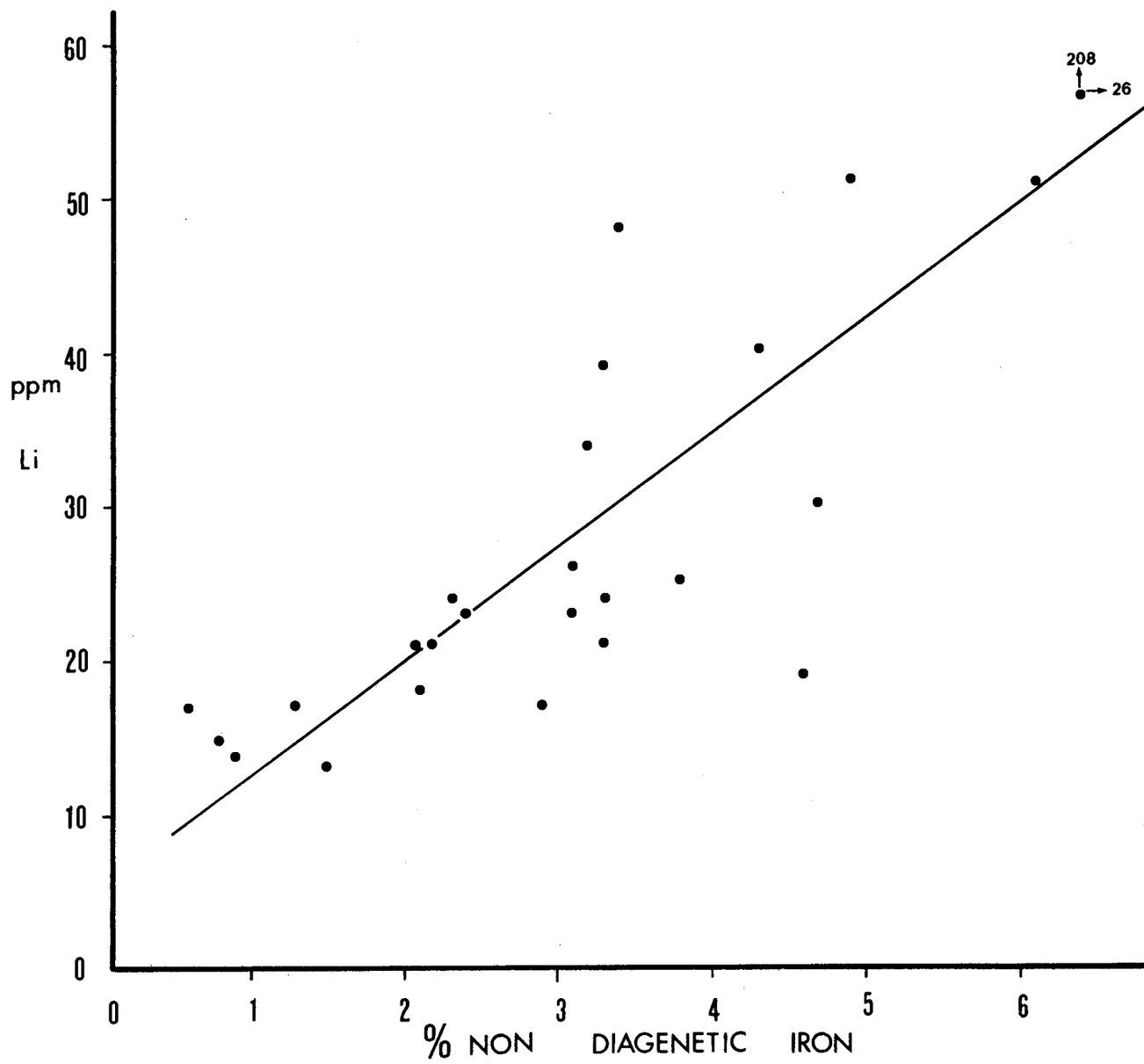

60
50
40
30
20
10
0
ppm
Li
208
26
0
1
2
3
4
5
6
% NON DIAGENETIC IRON

FIGURE 29

FREQUENCY DISTRIBUTION DIAGRAM OF BARIUM IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

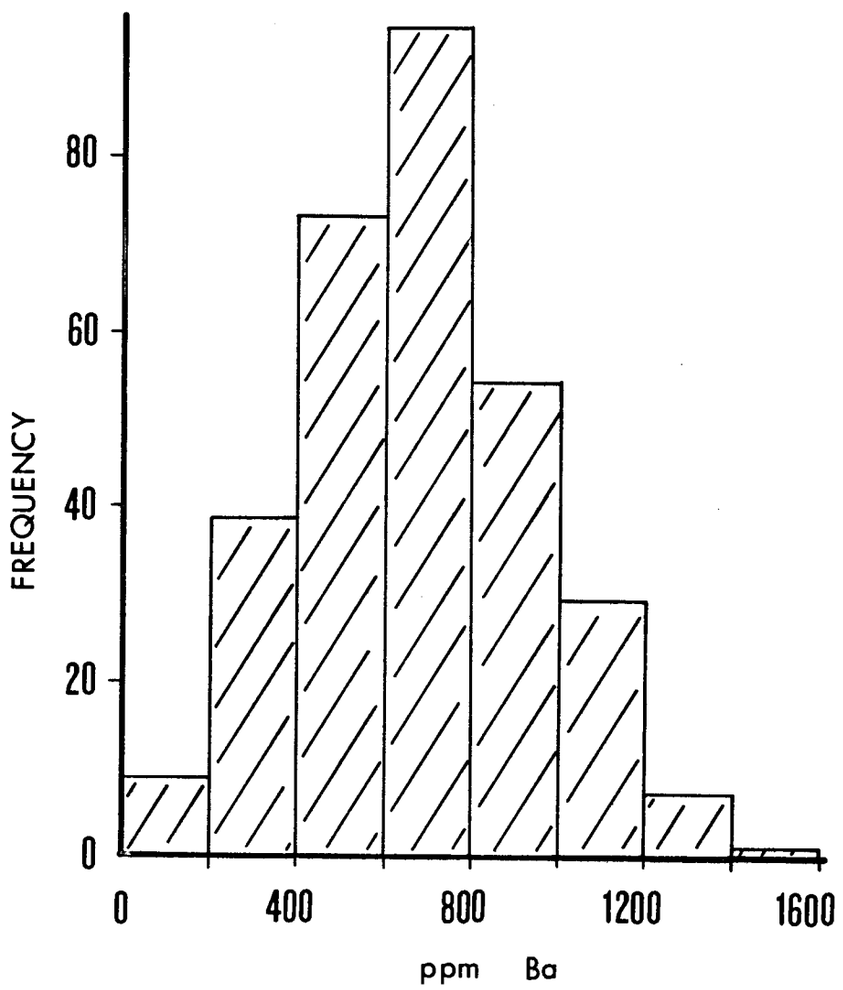

FREQUENCY
80
60
40
20
0
0
400
800
1200
1600
ppm Ba

FIGURE 30

THE K – Ba RELATIONSHIP IN SEDIMENTS FROM THE FIG TREE SERIES OF THE SWAZILAND SYSTEM AND THE BOKKEVELD SERIES OF THE CAPE SYSTEM.

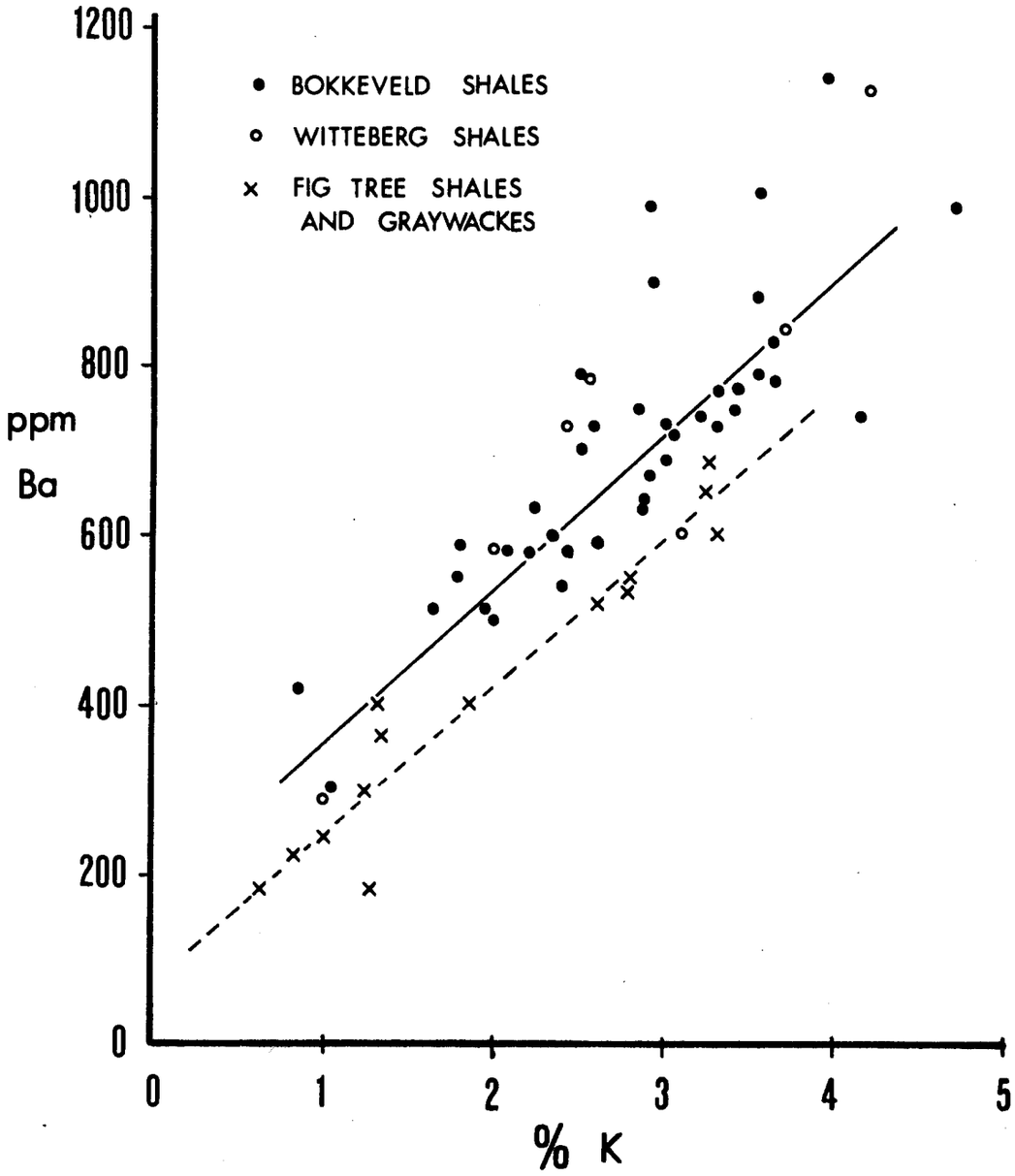

1200
1000
800
600
400
200
0
ppm
Ba
BOKKEVELD SHALES
WITTEBERG SHALES
FIG TREE SHALES
AND GRAYWACKES
0
1
2
3
4
5
% K

FIGURE 31

THE RELATIONSHIP BETWEEN K/Ba AND LOSS ON IGNITION FOR COAL MEASURE SEDIMENTS FROM THE NORTHERN ECCA FACIES OF THE KARROO SYSTEM.

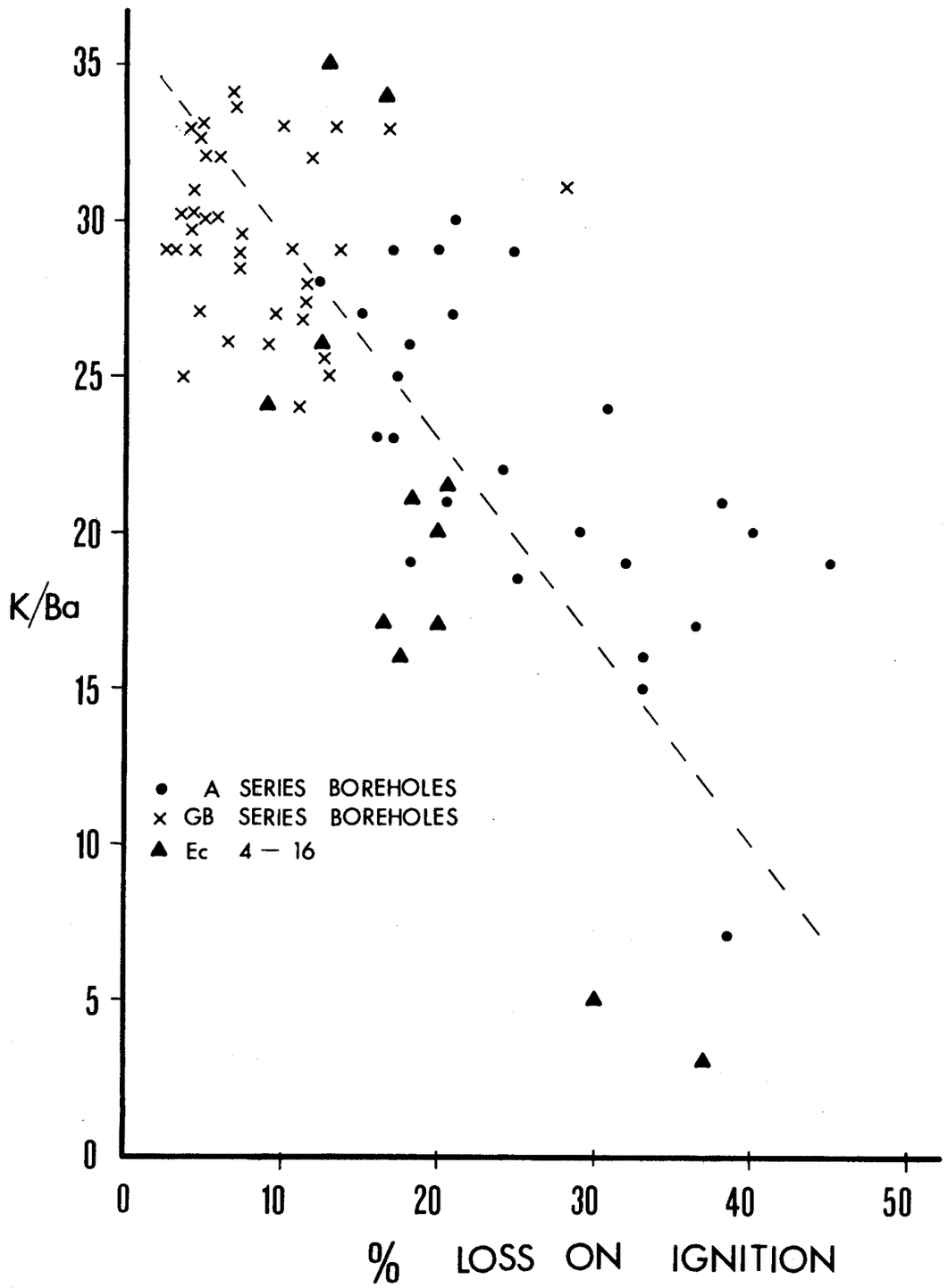

35
30
25
20
15
10
5
0
K/Ba
0
10
20
30
40
50
% LOSS ON IGNITION
● A SERIES BOREHOLES
× GB SERIES BOREHOLES
▲ Ec 4 — 16

FIGURE 32

FREQUENCY DISTRIBUTION DIAGRAM OF Sr IN SOUTHERN AFRICAN ARGILLACEOUS ROCKS.

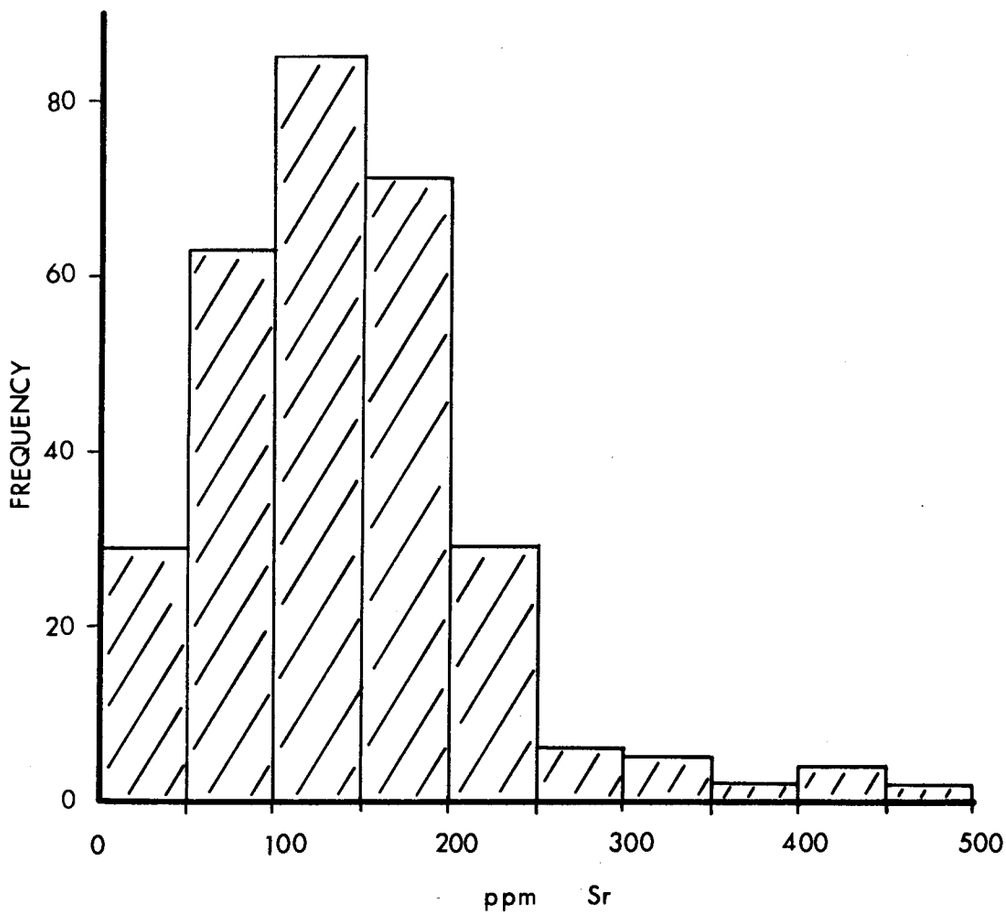

80
60
40
20
0
FREQUENCY
0
100
200
300
400
500
ppm Sr

FIGURE 33.

WORKING CURVE USED FOR THE OPTICAL SPECTROGRAPHIC DETERMINATION OF Cs.

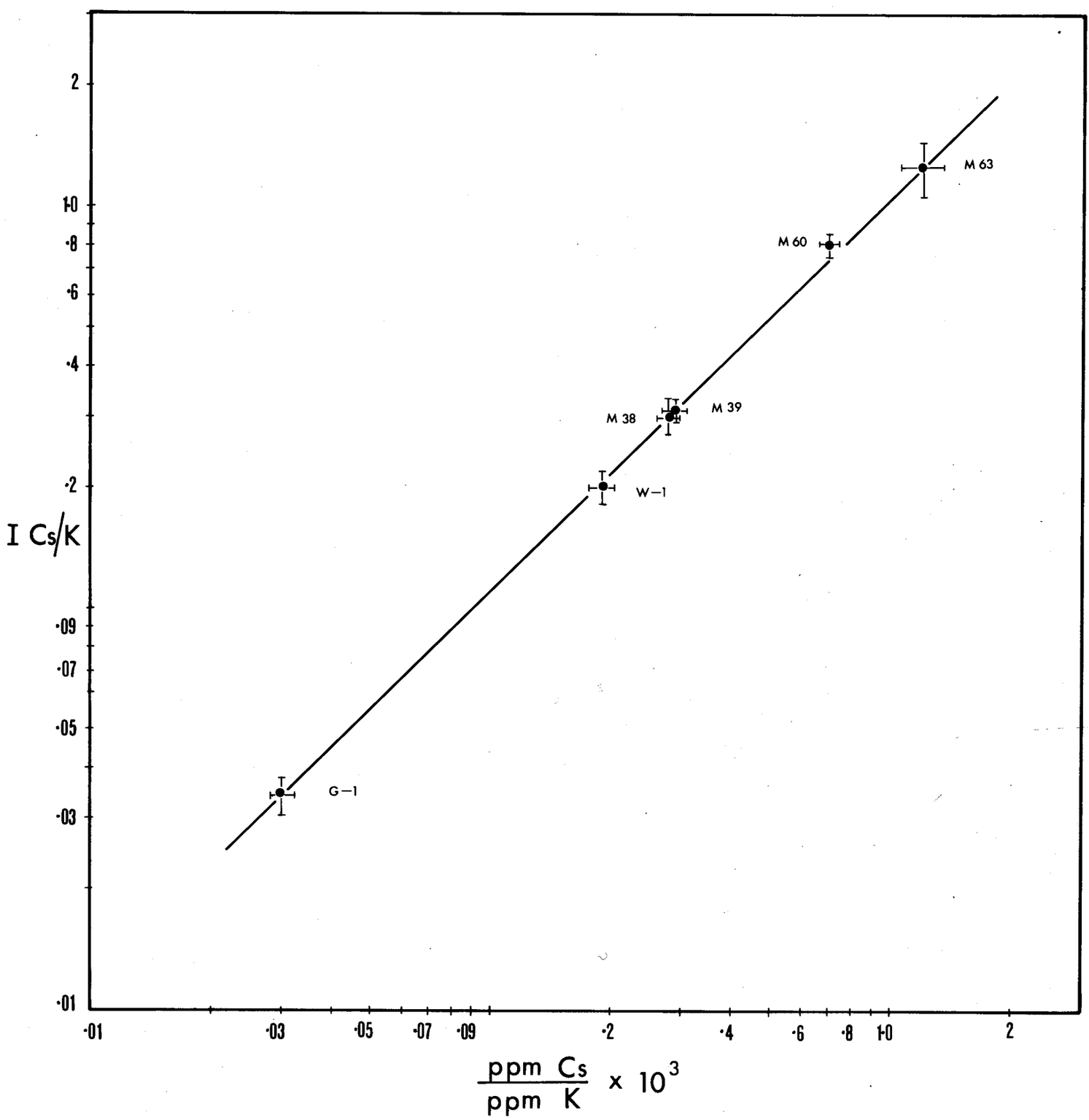

2
1·0
·8
·6
·4
·2
·09
·07
·05
·03
·01
I Cs/K
M 63
M 60
M 39
M 38
W–1
G–1
·01
·03
·05
·07
·09
·2
·4
·6
·8
1·0
2
ppm Cs / ppm K x 10³

FIGURE 34

WORKING CURVE USED FOR THE OPTICAL SPECTROGRAPHIC DETERMINATION OF Li.

LEGEND

- SWAZILAND SYSTEM – FIG TREE SERIES
- PONGOLA SYSTEM – MOZAAN SERIES
- KHEIS SYSTEM
- WITWATERSRAND SYSTEM
- SINCLAIR FORMATION – KUNYAS SERIES
- DAMARA SYSTEM
- MALMESBURY FORMATION
- CANGO FORMATION
- NAMA SYSTEM – KUIBIS SERIES
- SCHWARZRAND SERIES
- FISH RIVER SERIES

- CAPE SYSTEM – BOKKEVELD SERIES
- WITTEBERG SERIES
- KARROO SYSTEM – DWYKA SERIES
- ECCA SERIES : NORTHERN FACIES
- ECCA SERIES : CENTRAL FACIES
- ECCA SERIES : WESTERN FACIES
- ECCA SERIES : SOUTHERN FACIES
- BEAUFORT SERIES

x – Indicates borehole sample

SOUTH WEST AFRICA

TRANSVAAL

SWAZILAND

ORANGE FREE STATE

NATAL

LESOTHO

CAPE PROVINCE

ATLANTIC OCEAN

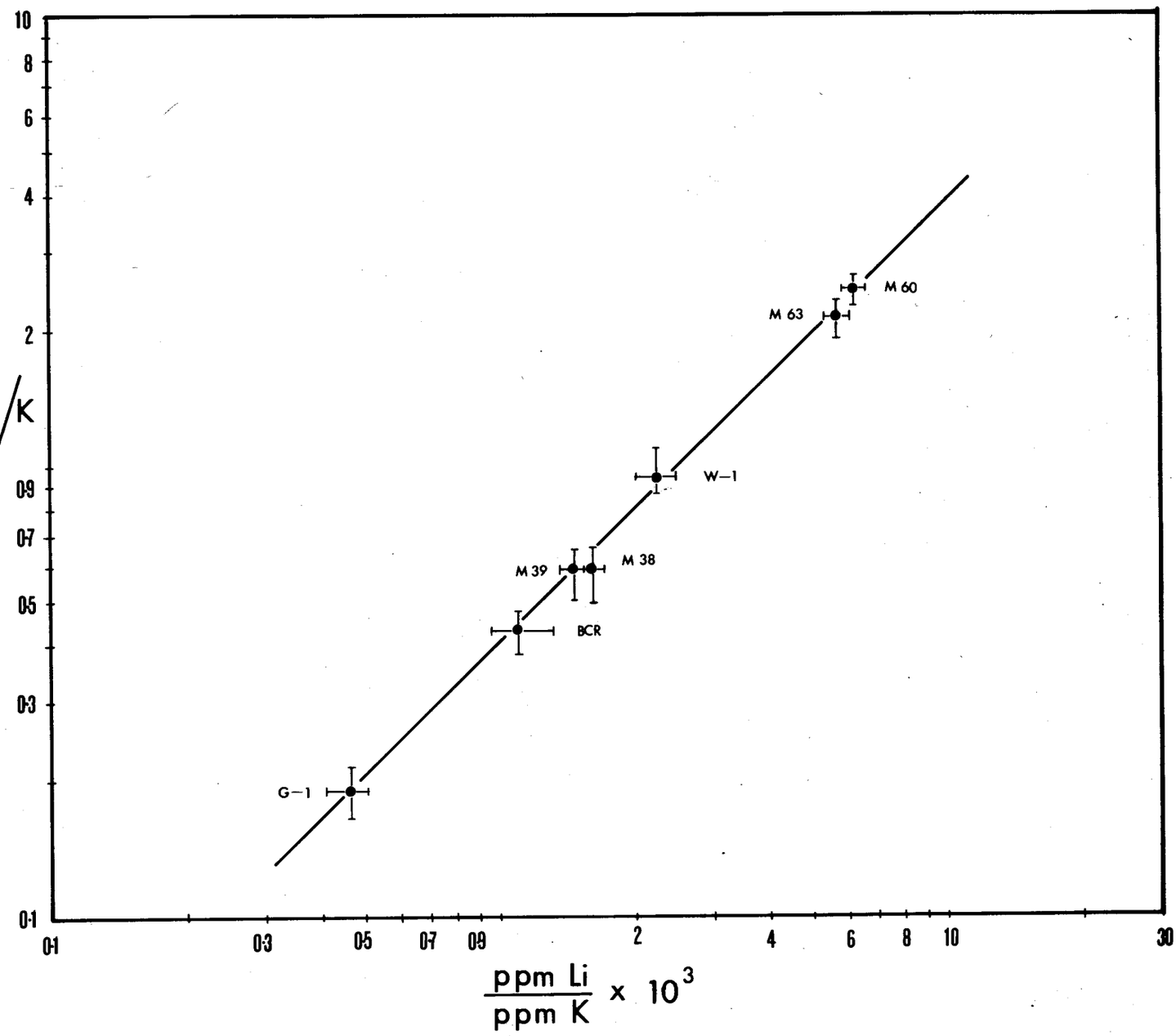
INDIAN OCEAN

1:2,000,000

Miles 10 0 20 40 60 80 100 120 140

SAMPLE LOCALITY MAP

R.V.Donchin 1970


10
8
6
4
2
K
0·9
0·7
0·5
0·3
0·1
0·1
0·3
0·5
0·7
0·9
2
4
6
8
10
30
M 60
M 63
W-1
M 39
M 38
BCR
G-1
ppm Li / ppm K x 10³