APPENDICES 6-15

Volume 7

CYPRUS

APPENDICES 6-15

Volume 7

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Appendix 6

BROCKS CREEK 1992 DRILLING (ASSAY COMPARISONS)

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
PROGRAMME 1. (Rockdril - Face Sampling)										
Faded Lilly										
56(D) (Diamond core "twin" of 48)	10150	1519	54	68	14	5.94	5.86			
57	9850	1500	Low grades. Hole abandoned in stope before target depth.							
58	9900	1500	No significant mineralisation.							
59	9950	1510	Low grades							
60	10000	1520	Low grades							
61	10050	1555	0 incl 8	23 23	23 15	3.97 5.68	2.99 4.18	4.14 6.05	3.21 4.63	
62	10100	1550	0 24	4 34	4 10	2.21 3.94		3.17 2.79		
63	10150	1554	0 incl 10 32	22 18 40	22 8 8	2.20 4.38 2.30		2.38 5.12 2.77		
64	10200	1552	1 26	3 28	2 2	1.66 1.97				
65	10300	1550	0	7	7	1.60		1.78		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
66	10300	1505	13 68	19 86 (EoH)	6 18	2.69 2.06		3.47 1.93		
67	10350	1555	37	42	5	1.64		1.80		
68	10350	1490	46 61 80 102	47 63 83 105	1 2 3 3	5.11 2.09 1.37 4.70		2.60 1.02 0.98 6.60		
69	10550	1467	56	63	7	3.45		1.93		
70	10600	1583	12	22	10	1.77		1.59		
71	10650	1550	49	57	7	0.99		0.83		
72	10650	1490	2 12 89	4 17 109	2 5 20	21.36 1.28 3.65	11.48	17.91 1.34 3.03	10.09	
Crocodile										
73	8200	1740	17	19	2	1.48				
74	8250	1725	Low grades only							
Alligator										
75	8650	1583	41	47	6	1.23				
76	8750	1515	56	65	9	1.00				

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
Faded Lilly										
77 (twin of 48 and 56(D))	10150	1519	54	68	14	7.32	6.26			
78	10600	1518	0 63 71 83	5 69 76 89	5 6 5 6	1.72 2.19 1.52 2.12		1.36 1.49 1.52 1.36		
79	10100	1565	0	23	23	1.78		1.74		
80	10100	1520	36 incl 58	63 63	27 5	5.25 7.15	4.16	3.88 5.93	3.52	
81	10050	1512	0 16 42 incl 54	3 23 63 58	3 7 21 4	1.97 4.46 1.97 4.50		1.77 2.51 0.99 2.67		
Alligator										
82	8550	1465	30	93 (EoH)	63	3.03	3.00	FA 1.80 SFA 1.82		138D (twin) 1.95 FA 1.86 SFA

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
83	9850	1501	0 34	1 (possibly eluvial) 41	1 7	8.74 0.57	 0.57	8.90 1.00		
Faded Lilly										
84	10150	1502	10 52 68 incl 71 74	19 63 84 72 83	9 11 16 1 9	1.63 2.11 33.48 316.50 23.16	 8.68 20.00 12.02	1.96 1.37 28.14 319 13.87	 6.94 20 9.40	visible gold
85	10200	1518	26 34 61	28 56 74	2 22 13	7.10 8.90 3.29	 6.24	7.25 7.32 2.11	 5.16	
86	10250	1473	19 76 95 100	22 92 96 108	3 16 1 8	1.19 3.90 9.01 6.41		 1.56 9.80 3.16		
87	10250	1504	60 71 78	67 75 85	7 4 7	1.63 1.57 1.12				

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
PROGRAMME 2. (Gomex - Face Sampling)										
Alligator										
88	8450	1505	21 incl 30 74 100	51 39 84 104	30 9 10 4	1.11 1.98 2.04 4.06		1.39 1.71 2.51 4.06		
89	8650	1430	44 incl 45 79 90	52 51 84 93	8 6 5 3	2.82 3.51 1.40 1.40		4.98 6.51 1.62 1.20		
90	8750	1410	44 53 80 87 104	50 56 84 89 105	6 3 4 2 1	1.14 1.83 1.61 1.82 3.00		0.75 1.22 1.17 1.17 2.72		
91	8850	1345	7 59 86 107 118 122	8 60 94 109 119 124	1 1 8 2 1 2	1.54 1.02 0.80 11.94 1.70 2.31		1.50 0.87 0.94 6.39 2.14 4.28		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
92	8600	1445	22	23	1	6.98		0.83		
			37	48	11	1.52		2.29		
			54	57	3	2.15		3.86		
			83	89	6	1.44		2.12		
			115	118	3	1.47		1.64		
93	8500	1485	28	85	57	2.53	2.36	2.15		
Faded Lilly										
94	10000	1545	1	10	9	2.24		3.60	3.49	
95	10050	1470	26	34	8	1.93		2.80		
			68	73	5	16.55	4.88	24.77	5.87	
			incl 71	72	1	78.55	20.00	114.50	20.00	
			80	95	15	0.67		1.00		
96	10100	1435	59	72	13	1.84		1.96		
			incl 63	69	6	3.00		2.47		
			115	122	7	0.97		0.92		
97	10200	1460	12	14	2	0.86				
			99	123	24	5.02	4.71	4.63	4.18	
			incl 107	10	10	9.60	8.85	8.88	7.82	

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
98	10300	1470	80	91	11	6.88	3.42	8.19	4.73	
			incl 80	81	1	58.05	20.00			
			96	98	2	3.76		1.83		
			104	112	8	6.21	4.00	6.63	4.16	
			incl 104	105	1	37.65	20.00	39.8	20.00	
99	10350	1450	60	66	6	4.13		3.44		
			85	88	3	1.53		2.40		
			119	126	7	3.92		4.33		
100	10400	1440	47	49	2	2.15				
			83	85	2	2.67		2.19		
			92	98	6	1.69		1.34		
101	10400	1505	20	26	6	1.93		1.96		
			64	65	1	10.10		8.77		
			75	76	1	1.19		0.40		
102	10550	1430	62	63	1	2.32		1.33		
			66	68	2	1.27		0.95		
103	10600	1450	61	66	5	1.36		1.83		
			115	122	7	7.60	6.49	6.95		
104	10650	1450	63	81	18	1.45		1.37		
			118	131	13	1.52		1.08		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
Alligator										
105	8550	1435	59	75	16	2.52		2.51		
			84	120	36	3.01	2.55	3.19	2.93	
106	8550	1494	0	38	38	2.49		2.85		
			53	55	2	4.95		10.88	10.31	
			59	62	3	2.22		1.47		
107	8950	1415	4	7	3	1.02		0.6		
			26	28	2	1.23		0.33		
			33	35	2	2.06		2.29		
108	8400	1525	40	47	7	3.20		2.23		
			61	69	8	1.64		1.65		
109	8450	1545	3	11	8	1.43		2.10		
			25	37	12	4.33	4.07	3.98		
			40	45	5	1.25		4.43		
110	8450	1525	2	9	7	2.62		5.97		
			18	21	3	1.27		1.27		
			26	37	11	4.88	4.45	5.90	4.62	
			51	66	15	2.60		3.07	2.94	
111	8500	1515	3	32	29	1.73				
			6	22	14	2.26		2.40		
			45	54	9	3.10		3.22		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
112	8500	1455	59 77 96	68 83 111	9 6 15	1.62 2.32 3.63	 3.51	3.10 2.11 3.62	 3.57	
113	8600	1475	15 36 54	22 38 59	7 2 5	2.29 6.04 2.26		2.75 13.01 1.34	 12.09	
114	8600	1415	66 (67	94 93	28 26	3.09 3.17		3.94 4.16)		
Faded Lilly										
117	10550	1500	20	35	15	1.39		2.34		
22 (extended)	10500	1500	76	92	16	3.10		2.58		
PROGRAMME 3.										
119(D)	10100	1478	0 incl 18	20 20	20 2	2.42 16.10				
122(D)	10150	1460	24 101	26 104	2 3	1.32 5.58				

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
125(D)	10250	1452	52	56	4	11.88		9.96	6.50	
			91	104	13	4.31				
			106	107	1	6.46				
			111	122	11	8.84	4.94			

NOTES

1. All holes 5¼ - 5½ inch face sampling RC, except BKRC(D) 56, 119, 122 and 125 which were triple tube HQ core (HQ_3). (½ core assayed)
2. All holes declined at -60 degrees to grid north.
3. Original assays by Assaycorp, Pine Creek, resplit assays by Amdel, Darwin (50gm fire assays by both laboratories).
4. True widths at Faded Lilly are 90-100% of listed, at Alligator 80-85%.
5. Water table at about 35 metres at Faded Lilly; 25 metres at Alligator.

Appendix 7

BROCKS CREEK 1991 DRILLING (ASSAY COMPARISONS)

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
Faded Lilly										
18	10550	1565	19	25	6	9.34	5.53	2.75		
			incl 23	24	1	43.40	20	0.89		
			27	39	12	0.69				
								1.37		
19	10550	1540	0	4	4	0.76		0.42		
			38	40	2	1.22		0.40		
			47	50	3	1.10		1.32		
20	10550	1490	30	43	13	0.70		0.64		
21	10500	1550	32	42	10	1.89		1.63		
22	10500	1500	21	34	13	1.54		0.53		
23	10450	1545	23	25	2	2.76		0.87		
24	10450	1495	33	35	2	1.98		2.09		
			64	69	5	1.36		0.59		
			78	94	16	1.53		2.01		
25	10400	1495	3	5	2	1.47		0.45		
			37	46	9	1.50		1.43		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
26	10350	1520	7 29	11 36	4 7	3.68 1.87		2.85 0.49		
27	10350	1570	18 29	19 33	1 4	11.96 0.81		17.85 2.44		
28	10250	1505	50 incl 60	89 67	39 7	1.70 4.19		1.31 2.20		
29	10150	1565	2 7 22	4 10 24	2 3 2	9.90 1.07 8.40		9.11 1.06 1.79		
30	10150	1540	21 incl 42	61 54	39 12	2.93 6.05	2.75 5.47	2.89 4.67	2.81 4.44	
31	8850	1500	6 14	7 17	1 3	5.00 1.68				
32	8750	1475	0 10 51 73	4 12 52 74	4 2 1 1	0.69 2.01 3.72 1.19		0.68 0.77 1.05 0.28		
33	8750	1550	6 83	12 89	6 6	0.88 0.98		0.21 1.14		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
34	10050	1540	0	2	2	1.47				
			8	21	13	1.76		1.37		
			28	36	8	6.78		4.62		
			42	46	4	0.95		0.90		
			62	64	2	2.10		6.08		
<u>Alligator</u>										
35	8650	1550	23	24	1	1.44		1.58		
			32	33	1	1.39		1.73		
			52	54	2	1.26		0.40		
<u>Faded Lilly</u>										
36	9950	1525	3	11	8	1.22				
			4	11	7			1.01		
<u>Alligator</u>										
37	8650	1500	6	11	5	1.57		1.92		
			21	23	2	13.70	12.31	12.30		
			33	34	1	2.08		1.35		
			101	102	1	1.77		0.31		
<u>Crocodile</u>										
38	8300	1700	No significant mineralisation							
39	8200	1725	4	6	2	0.87		0.37		

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
40	8200	1675	No significant mineralisation							
41	8200	1625	26	32	6	0.51		0.46		
42	8100	1750	No significant mineralisation							
John Bull										
43	6600	1840	73	74	1	1.43				
44	6500	1880	No significant mineralisation							
45	6400	1915	0 21 46	1 22 47	1 1 1	4.48 2.46 3.57				
46	6300	1950	No significant mineralisation							
Faded Lilly										
47	10100	1535	8 22 38 incl 41	9 23 57 52	1 1 19 11	6.96 4.40 3.38 5.45		9.72 4.44 5.67 9.08	 5.10 8.09	
48	10150	1520	42 55 55 55	53 69 69 69	11 14 14 14	0.90 14.28 13.97 19.14	 7.67 7.95 8.98	 15.36 (check lab 1) (check lab 2)	 9.60	)) 1991 re-splits)

DRILL HOLE (BKRC)	DRILL SECTION Easting	NORTHING	INTERSECTIONS							ADDITIONAL DATA
			FROM	TO	WIDTH (m)	GOLD GRADE g/t				
						INITIAL SPLIT		RESPLITS FROM BIG BAGS		
						UNCUT	20 g/t cut	UNCUT	20 g/t cut	
49	10250	1520	8 38	9 39	1 1	1.21 2.22		1.44 2.82		
50	10250	1540	7 14 45	9 16 46	2 2 1	1.32 3.01 2.98		0.39 0.90 2.14		
51	10500	1530	2 44 58	7 47 61	5 3 3	0.94 0.79 1.01				
52	10550	1510	11 incl 19	30 25	19 6	2.73 6.70		1.67 3.56		
53	10600	1490	0 10 37 86 incl 91	3 13 42 105 100	3 3 5 19 9	1.14 3.90 1.30 2.19 3.14		 1.81 2.43		
54	10600	1550	55 94	58 109	3 15	2.64 1.12		 1.19		
55	10200	1535	17 30 48 52	26 44 49 53	9 5 1 1	3.66 3.42 5.84 12.85	3.27	2.43 4.80 2.04 0.84	 4.68	

NOTES

1. All holes drilled by Rockdril using a 5½ inch hammer with coventional - crossover sub - sample return).

2. All holes declined at -60 degrees to grid north

3. Original assays by Analabs, Darwin, resplit assays by Amdel, Darwin. (50 gram fire assays by both laboratories)

Appendix 8

STUDY OF THE HETEROGENEITY OF GOLD IN THE BROCKS CREEK DEPOSIT: RECOMMENDED SAMPLING PROTOCOLS

May 26, 1993

Prepared for

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ABSTRACT

The sampling characteristics of gold in the Brocks Creek deposit located north of the mining town of Pine Creek in the Northern Territory are determined. This study uses the principles of the Pierre M. Gy's sampling theory. [1]

Taking these sampling characteristics into consideration, an appropriate sampling nomograph for this deposit is established.

The sampling nomograph is used to optimize sampling protocols during RCV and core drilling campaigns, or any other operations performed on the same ore (e.g., bulk sampling, future mill sampling, blasthole sampling, and all laboratory subsampling).

Also, the Fundamental Sampling Error affecting past sampling protocols of others, when sampling the same ore, can be quickly assessed with this nomograph.

The present study is an essential document to assess the validity of a feasibility study performed on the Brocks Creek project.

The possible consequences of non-compliance with the recommended sampling protocol are emphasized.

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INTRODUCTION

The objective of this report is to provide a guideline to the geologist, miner, metallurgist, chemist, or whoever will be involved with the Brocks Creek project, in sampling and subsampling requirements. It is a detailed review of observations, conclusions, and recommendations following discussions between Francis Pitard (Francis Pitard Sampling Consultants) and Robert Blair (Cyprus Exploration and Development).

For this report to be of any practical help to the Cyprus personnel, it covers the subject of interest in a comprehensive way. As described in Appendix 1, coarse gold can generate huge nugget effects, and therefore lead to extravagant sampling errors: You must know these errors, and how to prevent them or minimize them.

In this report, we will mainly emphasize the Fundamental Error, but there are many more sampling errors. It is, however, beyond the scope of this report to cover all these sources of errors, and should be the object of much longer involvement of Francis Pitard Sampling Consultants in the Brocks Creek project.

During the past 10 years, Francis Pitard Sampling Consultants have been involved in more than 60 gold projects around the world (e.g., Papua New Guinea, Australia, Canada, Chile, USA, etc...). I know for a fact that the Brocks Creek project is dealing with one of the toughest gold deposits to sample and subsample in a reliable way. In this report I intend to address some of the possible economic consequences that would be the result of using a casual sampling protocol for too long. It is of the utmost importance that this report be read by top management involved in the final decision making process of this project.

CONCLUSIONS

* The existing sampling protocol for RVC samples is completely inappropriate for assessing in any reliable way the gold potential existing in the Brocks Creek deposit:

    1. The volume of the primary sample delineated by the RVC drilling machine is too small, and introduces a primary skewness in gold results: There is nothing much you can do about it.
    2. The 3 to 5-Kg sample going to the laboratory is ridiculously too small, and superposes a secondary skewness in gold results on the primary skewness.

  You may survive one skewness, with appropriate Poisson statistics analysis. You cannot survive the combination of two superposed skewnesses: The entire data base becomes highly questionnable in many ways, but may tend to underestimate the deposit.

* If a similar sampling protocol is used for the future blasthole samples, the mill feed will always fall short of the mine estimates: In the long run, you will loose many millions of dollars in invisible losses, and never find the amount of gold your geological model predicted. This is the major reason why geostatistics don't work well: Because the statistician is filled with unreliable, skewed data.

* All the many duplicate analyses performed on RVC, core, laboratory samples, pulps, etc... shows mass confusion about the true nature of the problem. You spent a lot of money, but failed to ask the right questions:
  What is the intrinsic heterogeneity of gold carried by the Brocks Creek ore?
  What is the most appropriate statistical gold cutoff? And, how does it compare with the accountant/economical gold cutoff? What can be done about this?
  What is the typical proportion of finely disseminated gold in the ore near the economical cutoff ore boundaries? How can you turn this into an asset for developing the right mining strategy in the open pit?
  Why do you have many high values above 20g/t you want to cut out? What are these values trying to tell you? Etc...
  An investment should be made to answer all these questions.

* The use of disc pulverizers followed by quartz cleaning is a source of negative bias everywhere you have gold particles that can liberate during this process. Experience proves you can loose between 10 to 15% of the gold that way.

* The splitting of core samples is another source of excessive primary skewness, making the sample volume way too small. Furthermore, it is a good way to loose some of the gold particles. Even more, the cutting of veins in half by the operator is not an equitable procedure: It is too much operator dependent. You must crush the entire core, after you carefully performed your geology. If metalurgists want samples, you must drill only to this effect: This is not a copper deposit, and the subtleties you have to deal with are far more complex.

* The analysis of 50-gram subsamples at the laboratory is affected by an unsolvable Grouping and Segregation Error, because most of the gold is liberated.

RECOMMENDATIONS

* For all sampling protocols (i.e., RVC, core, blasthole), you should crush as large a sample as possible (e.g., 40-Kg for RVC and blasthole, and the entire recovered sample for core drilling) to 95% minus 24 mesh (i.e., 710 micron), prior to splitting a 5-Kg sample.

* You should pulverize the 5-Kg samples with a large capacity ring mill, like the Labtechnics LM5 available in Australia, then split a 1200-gram subsample using an automated rotary splitter like the one described in Appendix 2. Reject plate pulverizers unconditionally.

* Perform systematic metallic screen assay to minimize the risk inherent to a large Grouping and Segregation Error always possible with liberated gold. And, it will drastically minimize your uncertainty about the true position of your good/bad ore boundaries, by minimizing artificial skewness.

* All the above must be budgeted for in all your feasibilty studies.

* From all the documentation I read, there is an obvious need for the Cyprus personnel to attend a short course on sampling of gold: It would allow a lot of people to ask the right questions on a major project like the Brocks Creek project. The most economical way is an in-house course, either in Colorado or in Australia, or both. Such a course is necessary in order to fully understand and apply the following recommendations.

* You should thorougly investigate what is the Heterogeneity of gold carried by the ore around the economical cutoff, and be able to quantify the amount of gold that is finely disseminated (i.e., easy to sample) and the amount of gold that is coarse or clustering (i.e, difficult to sample) in that zone: Crucial decisions on the appropriate mining strategy depend on it.

* You should compare the most appropriate gold grade cutoff based on Poisson statistical evidence, with your wishful/accounting gold grade cutoff. If these cutoffs are compatible: That is good news. But, if they are not compatible: You must change your economical strategy as soon as possible, or face a major disappointment a few years down the road.

* Do not cut more than 1 to 2% of the high gold values that seem unreasonable to you. If it is common practice in the neighborhood, it does not make it necessarily a good practice. It is just one of those silly ceremonies people come out with once awhile: I call that tampering with the original data that is nicely trying to tell you something.

* If you want a healthy and dynamic Gold Division at Cyprus, your gold deposits cannot be treated like copper deposits. Gold deposits are far more subtle. As far as sampling and variability understanding are concerned, a copper deposit can be forgiving for your mistakes, to some extent. But, for a gold deposit, what you may loose is staggering. Why the difference? Because gold deposits are economical at the trace level. The statistics of trace elements have nothing in common with the statistics of major constituents, and trace elements are far more abstract in nature.

* With a coarse gold deposit, you are taking a huge risk with RVC: This is a one-man opinion. Too many things can go wrong, over which you have no control. You should put more emphasis on core drilling, especially for deep holes showing gold values below an upper rich interval. The last thing you want are reserves that do not exist.

QUICK STUDY OF THE HETEROGENEITY CARRIED BY GOLD IN THE BROCKS CREEK ORE (A PARAMETRIC APPROACH)

Usually, for most gold ore deposits, I recommend tedious heterogeneity tests in order to characterize the heterogeneity carried by gold in a given ore. But, the Brocks Creek ore is characterized by very coarse gold, or clusters of fine gold particles which behave exactly like a coarse gold particle. Therefore, from Cyprus mineralogical studies, we already know upfront that we are dealing with one of the worst possible scenarios.[2], [3], [4]

So, in order to save time and bypass the heterogeneity tests, I can make one justified assumption:

> From Cyprus metallurgical testings, I assume that if the ore is crushed to 95% minus 300 micron (i.e., 48 mesh) prior to being sent to the gravity circuit, the recovery of gold from that circuit can be as high as 70%. Therefore, it is not unreasonable to assume that the liberation factor of gold for material ground to 95% minus 300 micron is around 0.70.

Now, we can use a quick method based on the approximate estimate of four basic parameters accounting for the total heterogeneity of the ore.

The product of these four parameters is called the sampling constant C for a given stage of comminution.

$$C = f \times g \times c \times l \qquad [1]$$

where:

f is a fragment shape factor,
g is a fragment size distribution factor,
c is a mineralogical factor,
l is the liberation factor.

This sampling constant C is then used to calculate the variance of the Fundamental Sampling Error FE or the optimum sample weight for a given stage of comminution, using the following formula:

$$s^2FE = \left[\frac{1}{M_S} - \frac{1}{M_L} \right] \times C \times d^3 \qquad [2]$$

where:

s^2FE is the relative variance of the Fundamental Sampling Error FE,

M_S is the weight of the sample to be collected for a given sampling stage or comminution stage,

M_L is the weight of the starting lot in a given sampling stage or comminution stage,

d is the maximum fragment size involved in a given sampling stage, and defined as the square opening of a sieve that would retain no more than 5% oversize.

Now, let's calculate these factors one at a time.

THE FRAGMENT SHAPE FACTOR f

In formula [2], d^3 is the volume of a cube. But, fragments to be sampled are not necessarily cubes. Therefore, a correcting factor needs to be estimated: It is called the fragment shape factor f. This factor is dimensionless. From our experience with unliberated gold ores, the value for the shape factor is close to $f = 0.5$.

THE FRAGMENT SIZE DISTRIBUTION FACTOR g

In formula [2], d is the size of the coarsest fragments to be sampled. But, fragments to be sampled are not all that size. Many of them are much smaller. Therefore, a correcting factor needs to be estimated: It is called the fragment size distribution factor g.

From many tests that have been performed with similar material, it has been established that for unclassified ores (i.e., materials that are a mixture of many fragment size classes as delivered by a crusher), the value for the fragment size distribution factor is around $g = 0.25$. This factor is dimensionless.

THE MINERALOGICAL FACTOR c

The mineralogical factor is a measurement of the maximum possible heterogeneity carried by a given constituent such as gold, for a given average gold content. Therefore, it is a limit case assuming the gold is completely liberated for a given stage of comminution.

The mineralogical factor c for gold is calculated with the following approximate formula:

$$c = D_{Au} / a \qquad [3]$$

where:

D_{Au} is the density of native gold, which is around 16.0 grams/cm^3.

a is the average gold content expected from the sample, expressed as a proportion, or as part of one.

Example: If the average gold content is 3.1 gram/ton:

$$c = 16.0 / 0.0000031 = 5,161,290$$

THE LIBERATION FACTOR l

Remark: l is "little L" and not "one".

The mineralogical factor c assumes that the constituent of interest such as gold is completely liberated for a given comminution stage. We know for most sampling stages the liberation of the gold is not complete. Therefore, we must introduce another correcting factor that is called the liberation factor l.

The liberation factor is calculated with the following formula:

$$l = \sqrt{dL / d} \qquad [4]$$

where:

d is the actual maximum particle size of the material to be sampled.

dL is the size below which the material needs to be crushed for the gold to become mostly liberated.

For the Brocks Creek ore we can write:

$$0.70 = \sqrt{dL / 300 \text{ microns}}$$

The liberation factor is dimensionless.

From the above equation, we can deduct the value of dL:

$$dL = 300 \times [0.70]^2 = 147 \text{ microns}$$

VARIABILITY OF THE SAMPLING CONSTANT C AS A FUNCTION OF THE MAXIMUM FRAGMENT SIZE d

Now, we have everything we need to calculate the value of the sampling constant C for various stages of comminution:

d = 1 inch (2.5 cm) gives $C = f \times g \times c \times 1$

$$C = \underbrace{0.5 \times 0.25 \times 5{,}161{,}290}_{645{,}161} \times \sqrt{0.0147 / 2.5} = 49{,}472$$

d = 1/2 inch (1.25 cm)	gives $C = 645{,}161 \times \sqrt{0.0147 / 1.25}$ =	69,963
d = 1/4 inch (0.625 cm)	" $C = 645{,}161 \times \sqrt{0.0147 / 0.625}$ =	98,943
d = 6 mesh (0.335 cm)	" $C = 645{,}161 \times \sqrt{0.0147 / 0.335}$ =	135,146
d = 10 mesh (0.17 cm)	" $C = 645{,}161 \times \sqrt{0.0147 / 0.17}$ =	189,715
d = 24 mesh (0.071 cm)	" $C = 645{,}161 \times \sqrt{0.0147 / 0.071}$ =	293,560
d = 48 mesh (0.03 cm)	" $C = 645{,}161 \times \sqrt{0.0147 / 0.03}$ =	451,612
d = 150 mesh (0.0106 cm)	" $C = 645{,}161 \times 1$ =	645,161

With these values, it becomes easy to find out the places of the various lines representing a series of various comminution stages, as a function of sample weight and the variance of the Fundamental Sampling Error. The resulting nomograph is very useful to assess the validity of existing sampling protocols, to address their limitations, and to optimize them. The nomograph is illustrated in figure 1.

ASSESSMENT OF THE VALIDITY OF THE SAMPLING PROTOCOL USED FOR RVC DRILLING

Existing procedure: A sample weighing between 3000 and 5000 grams is sent to the laboratory, where it is entirely pulverized to 95% minus 100 microns. Then, a 50-gram analytical subsample is submitted to fire assay.

Let's put this procedure in the context of the sampling nomograph in figure 2. On this figure, you should notice the presence of a safety line set at ± 16% for one standard deviation of the Fundamental Sampling Error FE. Any point that falls above this safety line introduces an artificial skewness in your results because you operate in the domain of Poisson's variance. You may start in this domain in-situ when drilling the primary sample because you have no choice, though you should minimize the problem as much as possible in all further subsampling operations: You have not been doing this. After the primary

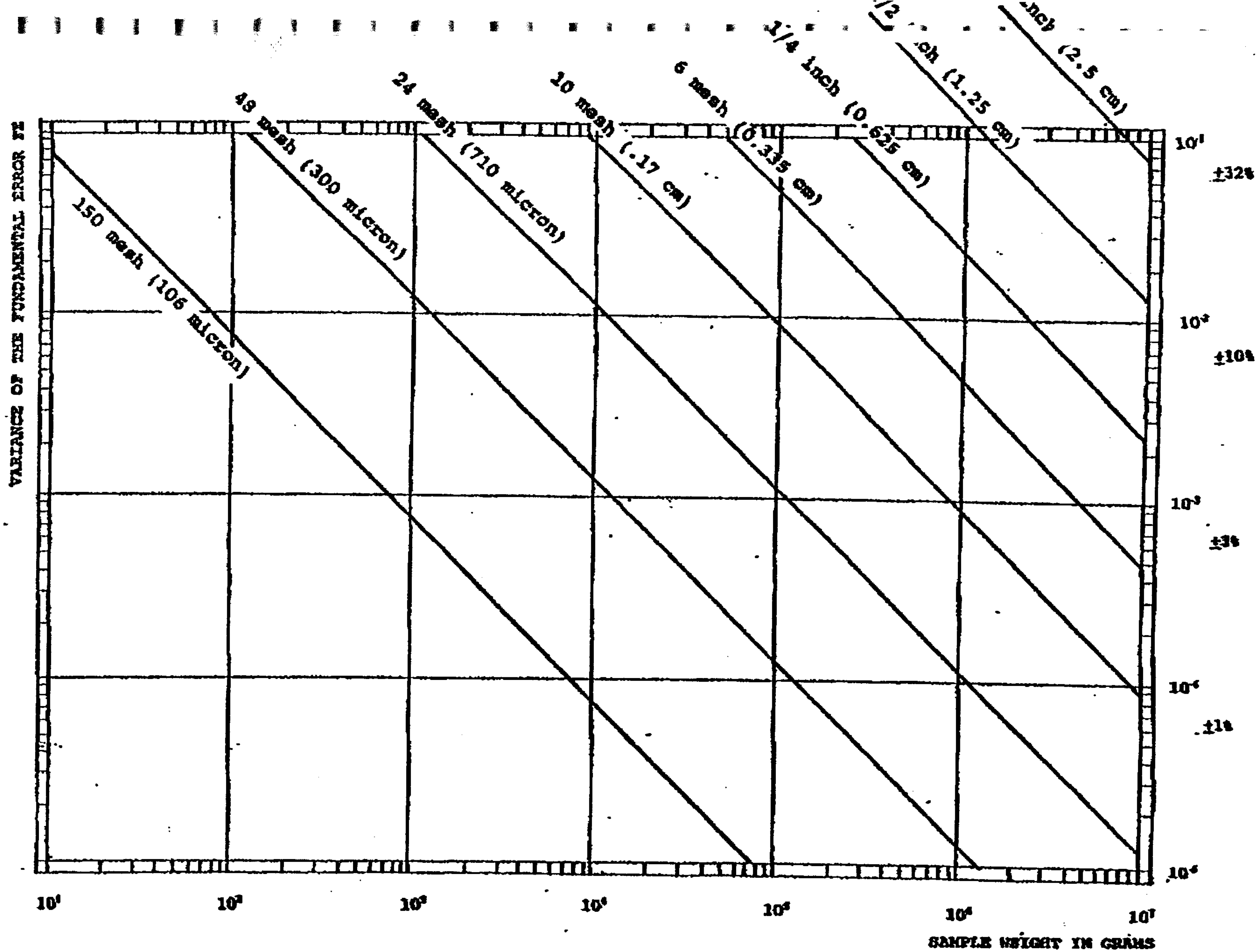


Figure 1. Sampling nomograph for gold at the Brocks Creek project.

sampling stage is done, it is an absolute must that no more skewness be introduced in the subsampling process.

CONCLUSION #1: Looking at figure 2, point A which represents the primary field sample, introduces a huge skewness which means you have inharent strong nugget effect due to the fact that your drilling diameter is too small. You should worry about this because it may become impossible for you to detect all valuable intercepts in your geological model. It also can explain why you have isolated high values that seem out of place, and some good mineralogical intercept with no apparent gold: Many results are too low, and only a few are way too high.

CONCLUSION #2: Always looking at figure 2, point B which represents the secondary sample sent to the laboratory introduces another skewness, much worse than the first one.

Now, I have a question for you: Do you really believe that two consecutive skewnesses introduced in your exploration data can deliver a reliable image of what your deposit is? The answer is no, you don't stand a chance.

CONCLUSION #3: All your existing data is not suitable for creating a reliable feasibility study. Your existing data cannot provide any serious basis for a successful geostatistical study.

Let's keep going in figure 2. Pulverizing the entire 5000-gram sample to minus 100 microns leads to point C on the nomograph, and analysing a 50-gram subsample by fire assay leads to point D on the nomograph: Fortunately, there is no more skewness introduced. So, you may think the procedure is safe. Indeed, if the Fundamental Sampling Error was the only sampling error to worry about, this would be a safe sampling stage. However, at 100 microns you already liberated most of your gold, therefore you generate a new problem, a huge and unsolvable segregation problem. Now, I have another question for you: Do you really believe that it is possible to scoop out a 50-gram subsample from a little bag full of liberated tiny gold particles. The answer is no, you don't stand a chance.

CONCLUSION #4: The only way to correct for this segregation error is to analyze much larger samples. This is the true reason why you should perform systematic metallic screen assays.

Let's talk about metallic screen assays. I have another question for you: Do you believe the only reason for performing metallic screen assays is to prevent the introduction of a bias (i.e., accuracy problem) in gold content in your data? The answer is no. A bad reproducibility (i.e., precision problem) can be even worse than a bias because it becomes impossible to locate your good/bad ore boudaries with reasonable confidence: This can generate 10 to 30% gold losses during the operating phase of your project.

CONCLUSION #5: With the kind of ore you have at Brocks Creek, it is an absolute must to perform systematic metallic screen assays on at least 1200-gram samples. It will cost you a few hundred thousand dollars every year, but it will save you many millions of dollars from indirect, invisible losses during the same period of time.

CONCLUSION #6: In your feasibility study, you must include a systematic metallic screen assay procedure on all your future blasthole samples.

Recommended sampling procedure for RVC drilling: I am going to recommend several procedures with different degrees of reliability, and I will state the advantages and disadvantages for each. First of all, it should be clearly understood that the present sampling protocol your are using is not an option: It must be eliminated with no compromise possible.

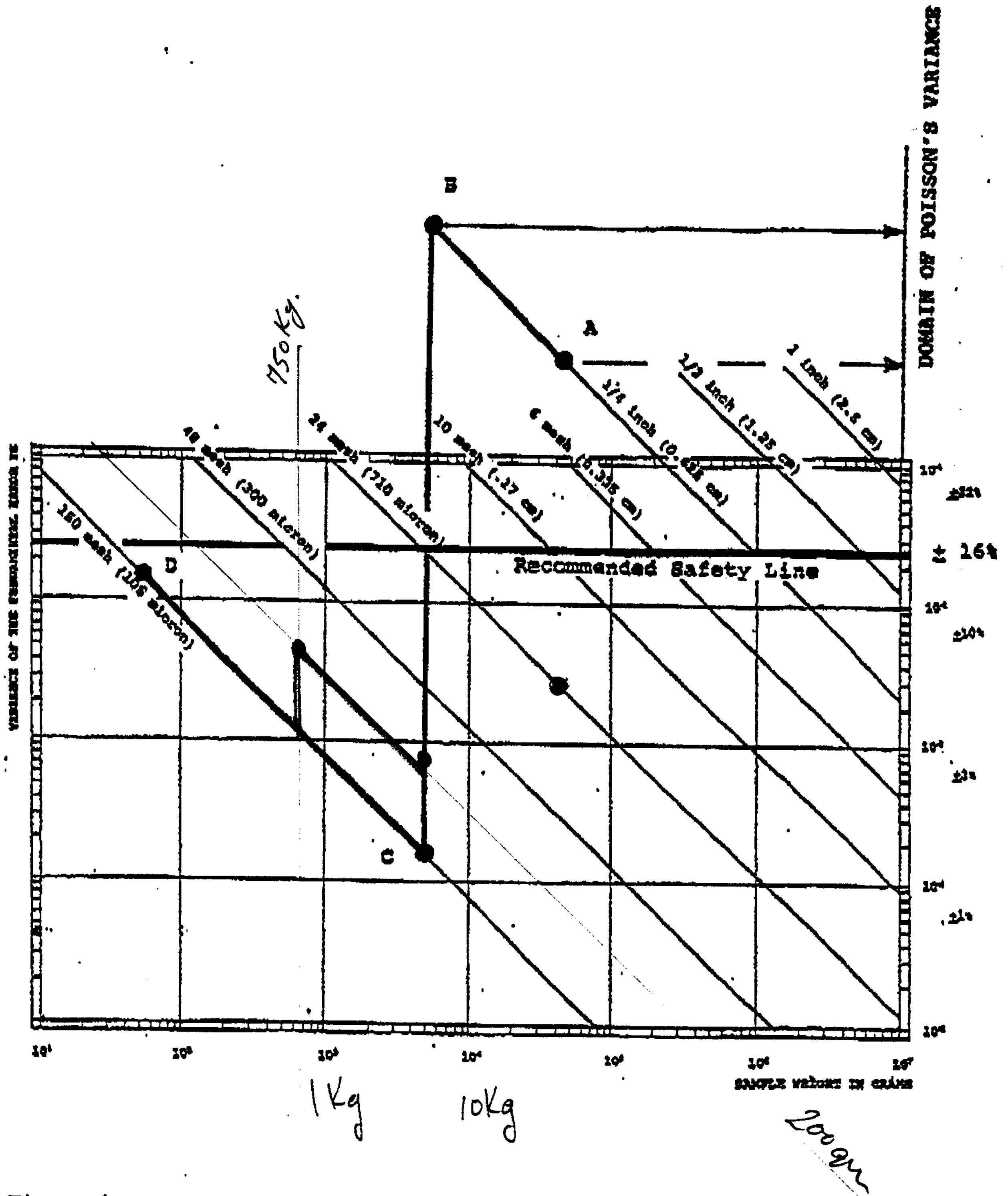


Figure 2. Assessment of the existing sampling protocol for RVC drilling samples: Points A and B should come much closer to the safety guideline. Points C and D are allright as far as the Fundamental error is concerned: However, the protocol does not make it necessarily safe for the Grouping and Segregation Error.

Procedure #1: Save the entire RVC sample (i.e., between 10 to 40 Kg) and crush it to about 95% minus 710 microns (i.e., 24 mesh). Split a 5000-gram sample and pulverize it to about 95% minus 100 microns using a large capacity ring pulverizer (e.g., Labtechnics LM5 available in Australia). The plate pulverizer presently used is a disaster for coarse gold, which smears on the discs and is lost with the quartz cleaning stage. Between 10 to 15% of the gold can be lost that way. [5] Split a 1200-gram subsample, and proceed with a metalic screen assay using a 18-inch diameter 100-micron sieve.

Advantages:

* Slight skewness affecting only the primary sample
* No problem with segregation
* Very little problem with smearing

Disadvantages:

* Slow and expensive
* Requires good operator training
* Not popular for the office based accountant

Procedure #2: Save the entire RVC sample and screen it on a large diamater 0.710 micron sieve (i.e., 24 mesh). Crush the + 24 mesh fraction to minus 24 mesh, and recombine the two fractions. If you use one of our rotary splitters, the re-homogenization of the sample is not necessary: See appendix 2. Split a 5000-gram sample and pulverize it in a Labtechnics LM5 rotary mill. Split a 1200-gram subsample, and proceed with a metallic screen assay using an 18-inch diameter 100-micron sieve.

Advantages:

* Same as for procedure #1
* Quicker and possibility for automation

Disadavantages:

* expensive
* high preventive maintenance
* Not popular with those whom do not understand the consequences of poor sampling protocols

Figure 3 illustrates how these two procedures fit with the requirements of the nomograph. When comparing the two procedures (i.e., old one and new one), you may notice that it takes an average of 8 old samples to obtain the same information as 1 new sample, if only the Fundamental Error was involved. Unfortunately, a large Fundamental Error is an open door for all other sampling errors (i.e., segregation error, delimitation error, extraction error, preparation error, interpolation error) to become overwhelming, removing any practical value from your old data as far as gold is concerned. Of course, the samples are still good enough to perform your geology.

Recommended sampling procedure for Core Drilling: You must crush the entire core to 95% minus 710 microns (i.e., 24 mesh), then proceed as described for RVC. Splitting the core in half unnecessarily increases the in-situ nugget effect by depriving the sample from its original volume which is already too small. Furthermore, you are likely to loose some gold in the process. And, I certainly do not believe in the statistical integrity of being careful about cutting veins, half to the laboratory sample, and half to the archives.

All this bad news may be frustrating to the reader, but I am only trying to help you. What you have at stake is too important. What you have at stake are many millions of dollars you may loose through the twilight of ambiguity, if you don't fix these problems.

Recommended sampling procedure for future blastholes: You will have to collect 40-Kg samples and proceed with the procedure recommended for RVC samples. This

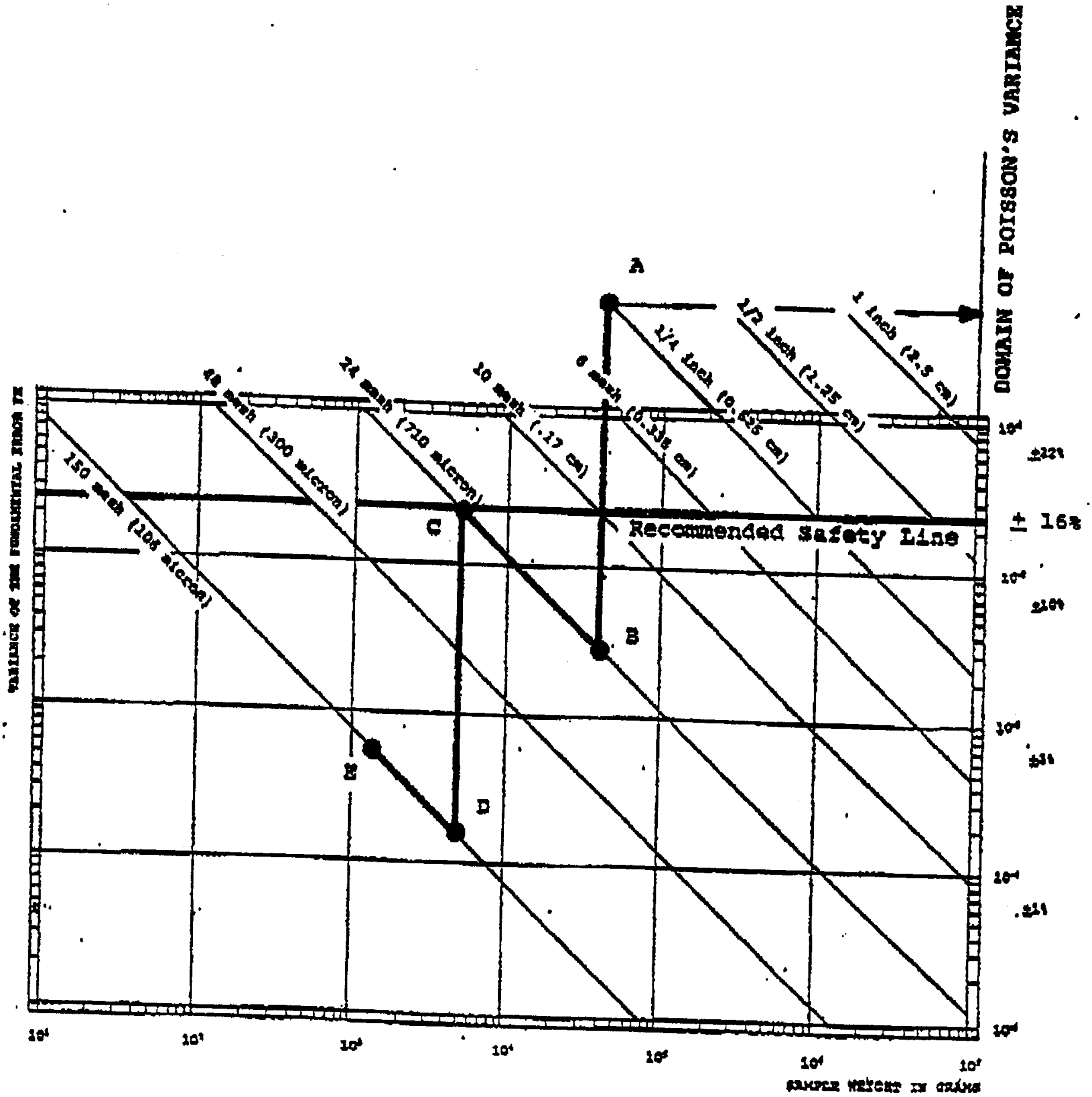


Figure 3. Recommended sampling protocol for RVC drilling: You may notice that even this procedure is far from perfect.

is something you must include in your feasibility studies, if you don't want a major disillusion with too little gold going to your future mill when compared to your ore grade control model. Now, let's talk more about this.

AFTERMATH OF A PROTOCOL INTRODUCING A VERY LARGE FUNDAMENTAL ERROR

Figure 4 illustrates roughly what happens on the boundaries you map from blasthole results, when the Fundamental Sampling Error increases. The higher the Fundamental Error, the less successful you will be in sending what you think you do to the mill. And, if you enter too far inside the domain of Poisson skewness, you can very well ruin the project and never see 10 to 30% of the gold you are supposed to extract. In all cases, the gold grade of the mill feed can go only one way, which is down. This is not ore dilution as you mine, this is ore dilution on the paper, or on your maps: There is a difference.

How is it possible to overcome such monumental failure, which is not rare in this industry? You have several ways of doing this, if you ask yourself the right questions.

First and above all, how do you know the 1 gram/ton economical cutoff is a statistically reliable/optimum cutoff, and not only an accountant wishful/unrealistic cutoff? This is a very tough question most companies completely fail to address. Yet, the answer to this question can make an historical difference to the success or failure of your project.

The first thing to do is to proceed with a thorough investigation of the distribution of the gold around the 1 gram/ton gold ore boundaries. In all gold deposits, there are two different kinds of gold mineralizations near cutoff grade:

* There is the coarse gold, which can be made of clusters of small gold particles, difficult to sample, and
* there is the finely disseminated gold, easy to sample.

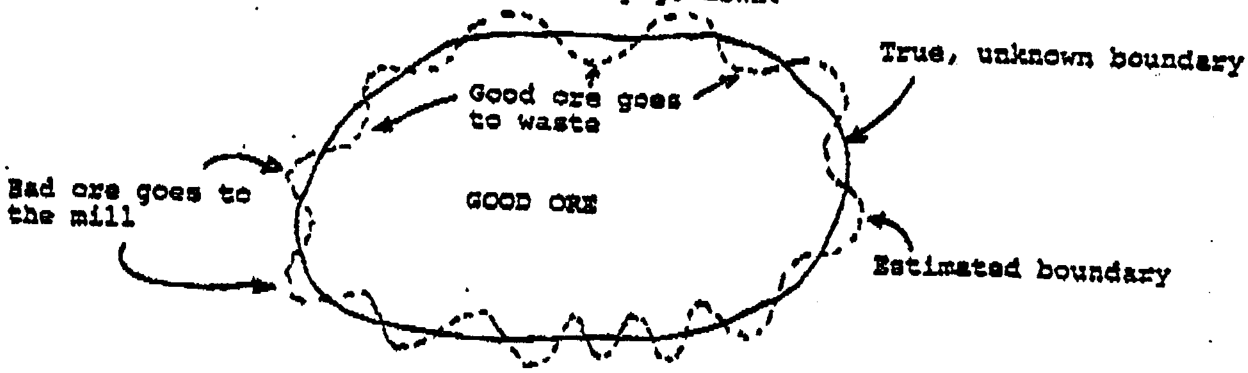
What is typical of the Brocks Creek deposit? You cannot afford not to know, because if the finely disseminated gold dominates near cutoff, then the sampling protocols may drastically be simplified. However, if it is not the case, and if you have a strong nugget effect near cutoff boundaries, the only way you will ever win the ore grade control battle is to select an economical cutoff as low as possible, coupled with the use of an outstanding sampling protocol. Carefully study the sketch I drew in figure 5, and carefully read Appendix 1.

Recommendation: As you mine, you must adjust your cutoff all the time, depending if you are in a zone with lot of coarse gold or clusters of very fine gold near boundaries (i.e., selection of very low cutoffs), or if you are in a zone with mainly finely disseminated gold with no clustering effect (i.e., selection of higher cutoffs as you wish). If it is not done that way, you are likely to loose a staggering amount of gold through the mapping of illusions. Today, more than half the gold mining companies around the world are loosing huge amounts of money that way: Many are not aware of it.

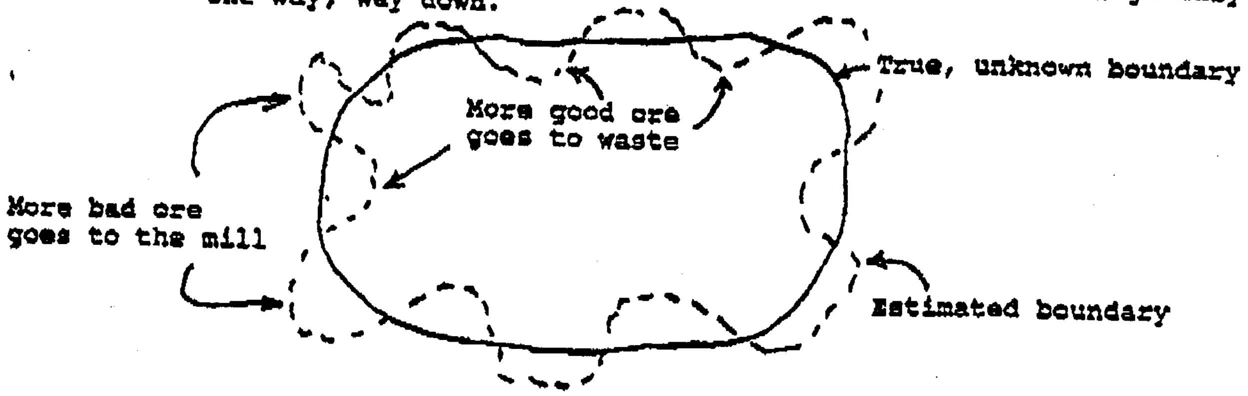
In this study of the low background gold content near cutoff boundaries, I can help you. This is a subject in which I have a unique experience, and it is something you will not find in the literature.

CONCLUSION #7: With coarse gold deposits, it is of the utmost importance to select a gold grade cutoff as close as economically possible to the low background gold content, regardless of wishful/unrealistic/apparent cutoff more attractive to the economist who knows nothing about the subtleties of gold ore grade control.

Scenario #1: A reasonable Fundamental Error (e.g., ± 5%) will generate a small bias between mine estimates and mill estimates: But, it can go only one way. It can only go down.



Scenario #2: A large Fundamental Error (e.g., ± 15%) will generate a larger bias between mine estimates and mill estimates: It can go only one way, way down.



Scenario #3: A very large Fundamental Error (e.g., ± 30% or more) will generate a huge negative bias. Because of the skewness on boundary, you are sure to lose millions of dollars in the long run.

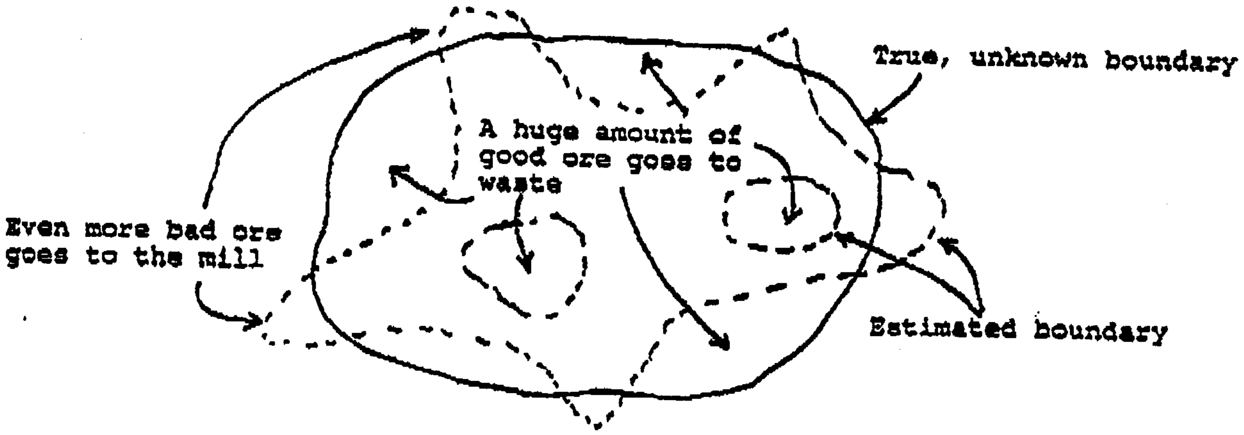


Figure 4. Uncertainty of true boundary definition can be financially devastating to a mining company. You should notice that in the third scenario, the good ore going to the waste far outweighs the bad ore going to the mill: It is the end.

Now, let's ask another good question: Because of the likely large Fundamental Sampling Error, is it possible to delineate the boundaries of smaller targets within the general boundaries (i.e., case of patchy gold mineralization)? The answer is a definite no. Because of the multiple skewness, many results are too low, and a few are too high. But, you have no way of knowing which data are at fault, and here is where you loose the battle. In other words, the economical gold grade cutoff is no longer capable of fulfilling its function, as illustrated in figure 5.

CONCLUSION #8: The above discussion explains one of the major reasons why the mill feed is often lower than what the mine model predicts, yet everybody wrongly believes that a casual sampling protocol is good enough and will do the job. If they knew how many millions of dollars they loose this way in invisible figures, they may be willing to do something about it. Well, to win big in the gold business, you must have a deep vision in advanced statistical thinking: This is my message to your upper management.

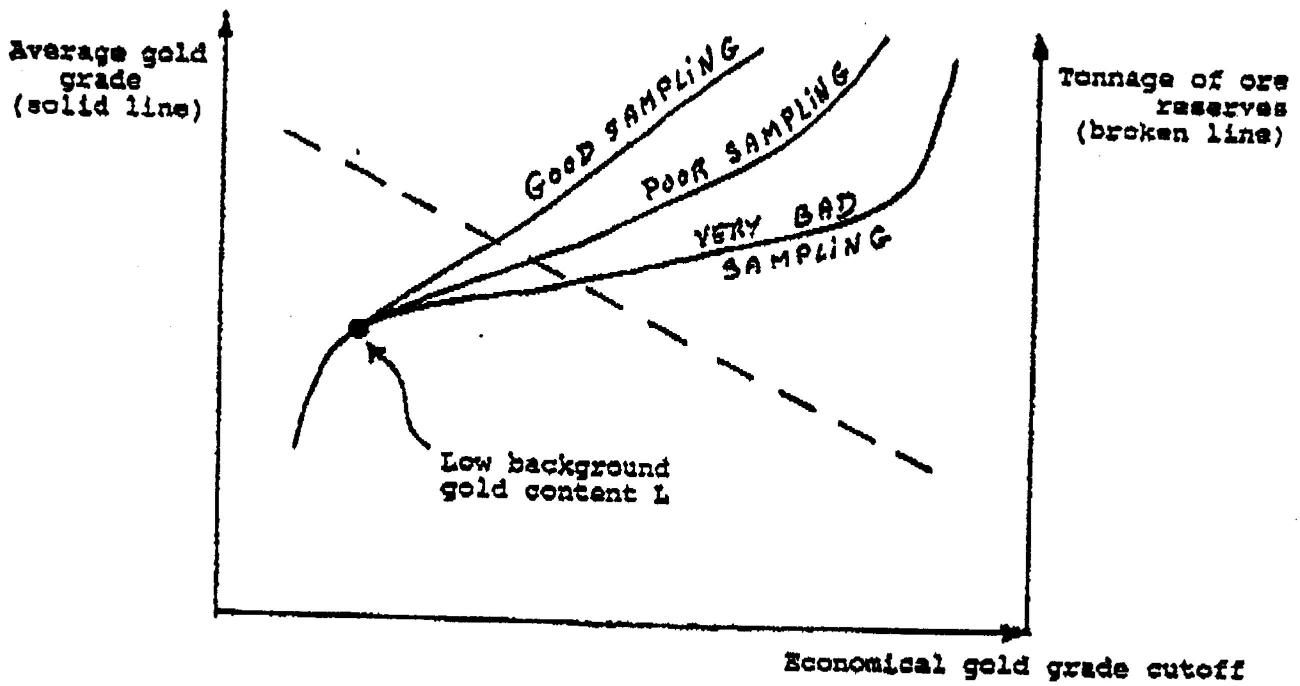


Figure 6. Approximate sketch illustrating what is happening if a highly skewed artificial Poisson distribution is introduced in the mine data.

THE HIGH GRADE CUTOFF

In your ore reserve estimations, you selected a 20 gram/ton cutoff, in order to eliminate the unrealistic, high gold values. The problem with this is the fact that there is no simple way of finding out what is the right thing to do with what looks like outliers, and current practices in the industry are totally empirical, and do not address the problems I mentionned above. Something is sure: A few gold results are grossely over estimated, so you want to correct for this, which is legitimate. But, what about the many gold results that are underestimated? Is it satisfactory to keep them that way?

The high values are often the results of a Poisson phenomenon, and are unbiased estimators of the true unknown gold average content, taking into account the fact that a large population of gold results are underestimated. However, the problem is that you want to assign a place to each data: With data generated by a casual sampling protocol you cannot do that.

CONCLUSION #9: It is wrong to apply a high grade cutoff. Or, at least you should take it easy: As a guideline, I would say that you should not cut more than 1 to 2% of your gold results. This percentage applies only to gold results within ore boundaries. However, you must find the reasons why you have such values in the first place: They are trying to tell you that you have a monumental sampling problem either in-situ, or during subsampling, or both. It is a very valuable red flag.

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APPENDIX 1

A paper presented by Francis F. Pitard (Francis Pitard Sampling Consultants) at the forum on Geostatistics: Geostatistics for the Next Century. An international forum in honour of Michel David's contribution to Geostatistics. June 3-5, 1993. Montreal, Quebec, Canada.

EXPLORATION OF THE "NUGGET EFFECT"

INTRODUCTION

Many people believe the "Nugget Effect" is the result of rapid in-situ changes in the concentration of a given constituent of interest, taking place on a very small scale. They are right, however, there is much more to it. Indeed, the "Nugget Effect" is the result of at least seven types of variability:

1. The true in-situ, small-scale, random variability,
2. The variability introduced by Constitution Heterogeneity during all sampling and subsampling stages, which is a function of fragment size and sample or subsample weight,
3. The variability introduced by small-scale Distribution Heterogeneity during all sampling and subsampling stages, which is a function of transient segregation as soon as the material has been broken up,
4. The variability introduced by any deviation from an isotropic module of observation ensuring sampling equiprobability in all relevant dimensions, during all sampling and subsampling stages,
5. The variability introduced by selectivity and poor recovery during all sampling and subsampling stages,
6. The variability introduced by contamination, losses, alteration of physical or chemical properties, and human errors, and
7. The variability introduced by the analytical procedure.

The misunderstanding of all these variability components prevents the effective minimization of the errors they generate. Accordingly, discrepancies between exploration estimates and production realities are likely to occur. This paper intends to be pragmatic in order to set a logical strategy that minimizes the "Nugget Effect", allowing good Geostatistics to proceed smoothly and sucessfully: Failure to do so can precipitate a feasibility study into total chaos.

THE TRUE IN-SITU "NUGGET EFFECT"

As David Michel says, "The "Nugget Effect" is a Chaotic Component. It can be considered as the variance of a totally random component superimposed on the regionalized variable." [1] This random variance is a problem in many gold mines, but experiance proves that it can become a problem for many other metals as well, and even for precise and accurate environmental assessments of certain pollutants. More often than not, the question is not to find out if there is a "Nugget Effect" or not, the question is how much "Nugget Effect" (i.e., Vo) there is. A good way to quantify this is by performing very short-range variographic experiments. Then, when Vo is quantified, what is the next logical step?

If Vo is small and acceptable, allowing a good definition of the regionalization, chances are that sampling and subsampling protocols are adequate and under control. If Vo is large and unacceptable, interfering with a good definition of the regionalization, sampling and subsampling protocols must be thoroughly investigated. Furthermore, it is suggested to find out how much this Vo term can interfere with a good definition of ore boundaries, at a preselected ore grade economical cutoff: This can be done by investigating the proportion L of the mineral of interest that is finely disseminated in the ore near that cutoff. The following procedures on how to estimate L are not very academic and need more research, which could provide an excellent project to a student.

Collection of Very Small Samples

If a long series of very small samples is taken near boundaries, there is a probability that at least one of the samples does not contain any high grade nugget, or geological micro-structure, or veinlet, or blob. In that case, L is given by the lowest available result.

Search for Discrete Differences Between Samples

If the size of the nuggets or blobs is relatively uniform, L may be found from a series of determinations, even when the actual number of blobs in all samples is superior to zero. The method depends on detecting discrete differences between successive determinations Xi due to the varying number of blobs, following the laws of chance, among the several subsamples taken for analysis. Each analytical value generates a series of possible estimates Li of L for each Xi:

$$Li = [1/2][Xi + X] \pm [1/2]\sqrt{[Xi - X]^2 + 4s^2 Zi}$$

Where s is the standard deviation in a single assay value, Zi the number of blobs in the ith sample which can be estimated with an histogram, and X is the overall average from all Xi. The most recurring value of L can be selected by inspection of the results, using an histogram.

Shift of the Mode in Two Series of Results from Two Different Size Samples

This method is the most convenient to use, however it has its limitations when the assay values follow unknown laws of distribution. Analysis of two series of samples of different weights Ms1 and Ms2 are likely to yield two different skew distributions, when such skewness do exist. Ms2 must be at least ten times larger than Ms1.

As sample weight in a series of determinations diminishes, assay results become distributed less symmetrically: The mean and the mode move farther apart. If the mode value is taken as the most probable result Y of a single determination, two sets of results using samples of weights Ms1 and Ms2 will yield two modes Y1 and Y2. Then, L may be calculated with the following formula:

$$L = \frac{Y1\ Ms2\ [X - Y2] - Y2\ Ms1\ [X - Y1]}{Ms2\ [X - Y2] - Ms1\ [X - Y1]}$$

The harmonic mean may provide a useful estimate of the modes Y1 and Y2 in series of assay results.

Discussion About Values of L when Compared to X

L can play an important role in ore grade control, yet L does not get the attention it deserves. If L has a value near the economical cutoff, then nature gave a gift to the ore control engineer: Even a weak sampling protocol can locate the boundary of the minable ore. However, it often happens that L is much below the economical cutoff: The farther L is from this cutoff, the more Vo is likely to have an impact on the precision and accuracy with which the boundary is located. This leads to important ore dilution. It is not dilution during the mining operation, it is dilution on the maps: There is a difference. This raises the question about the wisdom of high cutoffs too close to the overall average X, which often leads to the pursuite of an illusory average ore grade the mill will never see, and the devastation of ore reserves. This phenomenon is even amplified when artificial skewnesses due to poor sampling and subsampling are likely to take place: Many assay values are too low, and we have no way of knowing which ones. A few assay values are much too high, and we have no way of knowing which ones. At this stage, we lost the battle, and the company involved is likely to loose millions of dollars in invisible figures: This is why nobody worries about it.

Discussion About the True In-Situ "Nugget Effect"

If we call Vo the total "Nugget Effect", and Vo' the true in-situ "Nugget Effect", Vo' can be calculated from Vo when, and only when, all the sampling, subsampling, and analytical errors are under control and second order of magnitude. Vo' is a function of the original sample volume and mass taken in-situ by the drilling machine.

EFFECT OF CONSTITUTION HETEROGENEITY ON Vo

After the ore has been broken up, either by a reverse circulation drilling machine or at the laboratory by a jaw crusher, individual fragments are likely to have different contents. Therefore, it is logical to think that the more the differences between individual fragments, the more the sampling challenge: This is intuitive. Constitution Heterogeneity at any given stage of comminution is defined as the average difference between individual fragments: The Sampling Theory easily demonstrates that the coarsest fragments at any stage of comminution play the most important role.[2]

Constitution Heterogeneity is responsible for the Fundamental Sampling Error FE for all sampling and subsampling stages. The variance of FE can be calculated with the following formula:

$$S^2_{FE} = \left(\frac{1}{M_S} - \frac{1}{M_L} \right) Cd^3$$

where C is a characteristic of the Constitution Heterogeneity for a given stage of comminution, which can be estimated by conducting some tests.[2]
d is the size of the largest fragments for a given stage of comminution, defined as the square opening of a screen that retains no more than 5% of the material.
M_S and M_L are the masses of the sample and of the original lot from which that sample is collected, respectively.

When S^2_{FE} is not optimized for each sampling and subsampling stage, it becomes a major component of Vo. Indeed, experience at hundreds of mines around the world proves that Vo is often artificially introduced because sample and subsample weights are not optimized. A thorough study of the Constitution Heterogeneity of an ore for a given constituent of interest should be the prerequisite to any feasibility study: Yet, it is very rarely done. It is believed that the Geostatistician will fix it: Maybe yes, maybe not. Furthermore, if SFE (i.e., coefficient of variation) goes beyond ± 15%, it is most likely to introduce an artificial skewness distorting the lognormal model, if such a model applies, and generate an illusion around ore boundary that is very difficult to correct for.

EFFECT OF SMALL SCALE DISTRIBUTION HETEROGENEITY ON Vo

After the sample has been broken up, either by the drilling machine of by the jaw crusher, fragments may segregate because of the omnipresence of gravity in everything we do to that sample. Segregation may take place because fragments have different sizes, different densities, different shapes, different moisture contents, different physical or chemical compositions, etc... Therefore, we can define small scale Distribution Heterogeneity as differences between groups of fragments or increments making up the sample or the subsamples. This Distribution Heterogeneity depends on three factors: The Constitution Heterogeneity and the state of segregation of the material. It is responsible for an additional sampling error affecting each sampling and subsampling stage: The Grouping and Segregation Error GE.

The variance S^2GE of the Grouping and Segregation Error can be minimized by acting on three factors:

1. Minimizing the variance of the Fundamental Error in sampling protocols,
2. Minimizing a grouping factor, by collecting as many increments as practically possible for a given sample weight, with respect to other sampling errors such as DE, EE, and PE which will be defined later in this article. This is very easy to do, and nearly always successful, therefore nobody does it.
3. Minimize a segregation factor, by homogeneizing the material before taking a subsample. This is time consuming, expensive, and provides no guarantee for succes, therefore everybody does it.

EFFECT OF SAMPLING EQUIPROBABILITY IN ALL RELEVANT DIRECTIONS ON Vo

A sample and its subsamples must be probabilistic. However, for them to be accurate, they must be equiprobabilistic. So, any lot (e.g., ore block, sample, subsamples) must be scanned by an isotropic module of observation giving a constant sampling probability in all relevant directions. For a three-dimensional lot, the isotropic module of observation is a sphere. For a two-dimensional lot, the module is a cylinder from the top of the lot to the bottom. For a one-dimensional lot, the module is a cross section with parallel plans representing the entire width and entire thickness of the lot which is a stream. For a pie shapped lot, the module is a radial sector. Etc...

Any deviation from such an isotropic module of observation introduces a sampling bias, therefore alters the accuracy of sampling: It is called the Increment Delimitation Error DE. Furthermore, because of the transient nature of Distribution Heterogeneity (i.e.,segregation), there is no such thing as a constant bias in sampling. Consequently, DE always inflates Vo. This is a dangerous error, because it is very difficult to account for it with statistics.

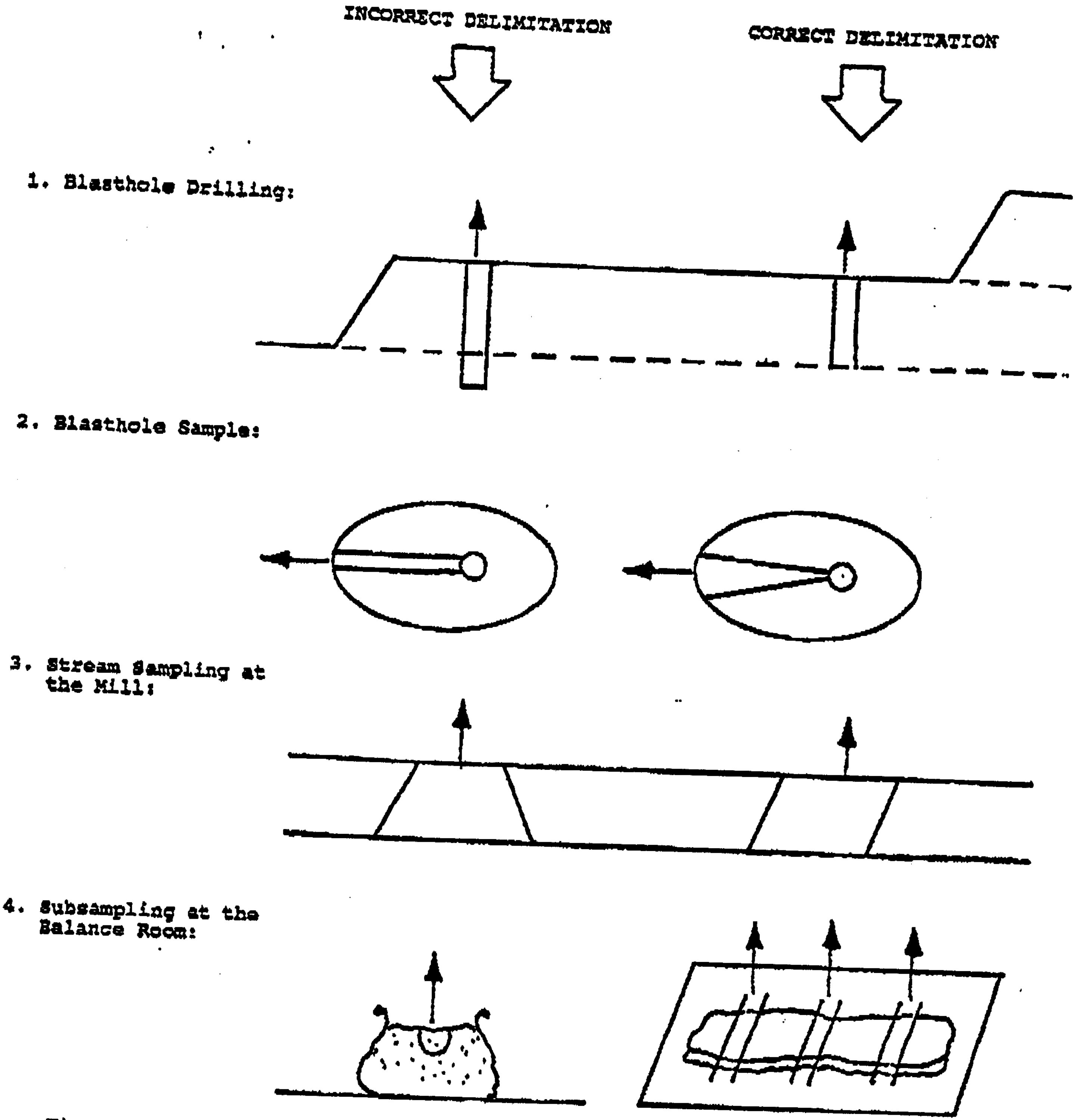

Figure 1. Illustration of a few typical sources of Delimitation bias.

EFFECT OF SAMPLING SELECTIVITY AND POOR RECOVERY ON Vo

Sampling equiprobability must be preserved during the impact of the sampling device with the material to be sampled. In other words, everything that belongs to the isotropic volume of observation must be recovered into the sample or the subsample. The sampling tool is often designed in such a way that some selection takes place: Either too many fine particles are collected, producing a sample with not enough coarse fragments, or vice versa. A poor recovery of the core during drilling is a typical example of this error. This error is called the Increment Extraction Error EE, which is responsible for the largest biases encountered in sampling. Again, this bias is not constant. Consequently, EE always inflates Vo. This is also a dangerous error, because it is very difficult to account for it with statistics.

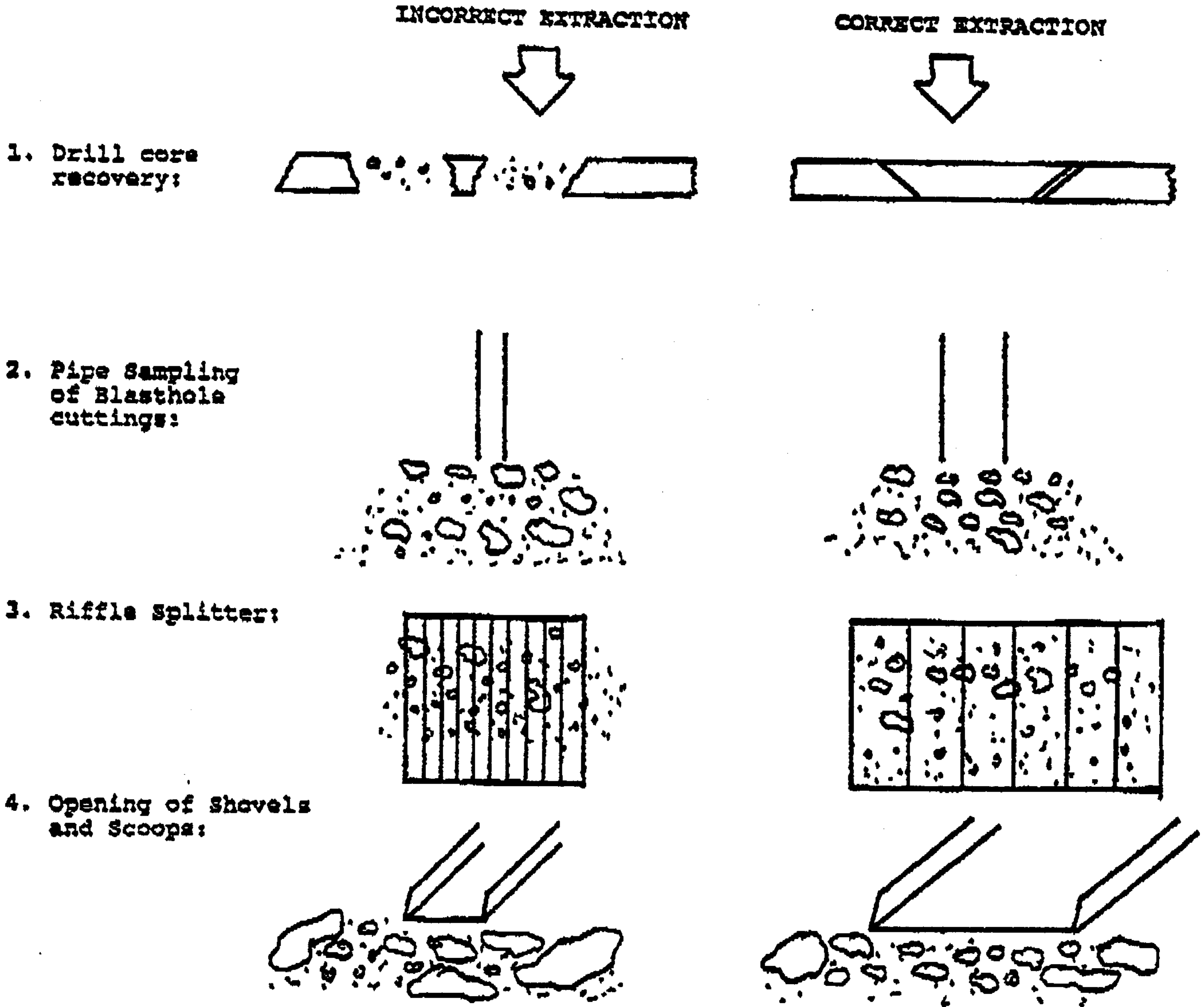

Figure 2. Illustration of a few typical sources of Extraction bias.

EFFECT ON Vo OF CONTAMINATION AND LOSSES DURING SAMPLE PREPARATION

All the sources of errors we saw so far are, one way or another, part of a selecting process taking place at each sampling and subsampling stage. But, there are other errors which are not part of a selective process: They take place between each sampling or subsampling stage. We can indeed contaminate the sample or subsamples with the sampling equipment or the surrounding equipment. We can loose part of the sample or subsamples as dust, sticky particles remaining in the sampling circuit, smearing on sampling equipment, etc... We can alter the physical or chemical composition of some critical constituents during sampling. We can introduce human errors. All these errors are referred to as the Preparation Error PE. This error is also responsible for non-constant biases, therefore inflates Vo.

EFFECT ON Vo OF THE ANALYTICAL ERROR

There is no doubt that the Analytical Error AE can inflate the variance Vo. However, only precision problems will. Contrary to sampling biases, analytical biases can be constant, either relative or absolute: The variogram cannot see such biases, neither directly nor indirectly. Therefore, it is of the utmost importance to prevent analytical biases in ore grade control or exploration. So, the set up of a rapid analytical method for ore grade control or exploration can be a risky task if no reliable strategy is used. The method must be carefully tested through an iterative process, and shaped up to its final form before the evaluation has started. A recommended approach is illustrated in figure 3, where 6 areas usually responsible for analytical failure are listed.[3]

CONCLUSION

The total variance Vo of the "Nugget Effect", is the sum of many components. If n sampling or subsampling stages (i.e., n = 1,2,3,...,N) are involved between the collection in the field and the last stage at the analytical balance room, Vo can be expressed as follows:

$$Vo = Vo' + S^2AE + \sum_{n=1}^{N} [S^2FE_n + S^2GE_n + S^2DE_n + S^2EE_n + S^2PE_n]$$

So, if preventive precautions are not taken, the Geostatistician cannot and will not obtain reliable data to work with.

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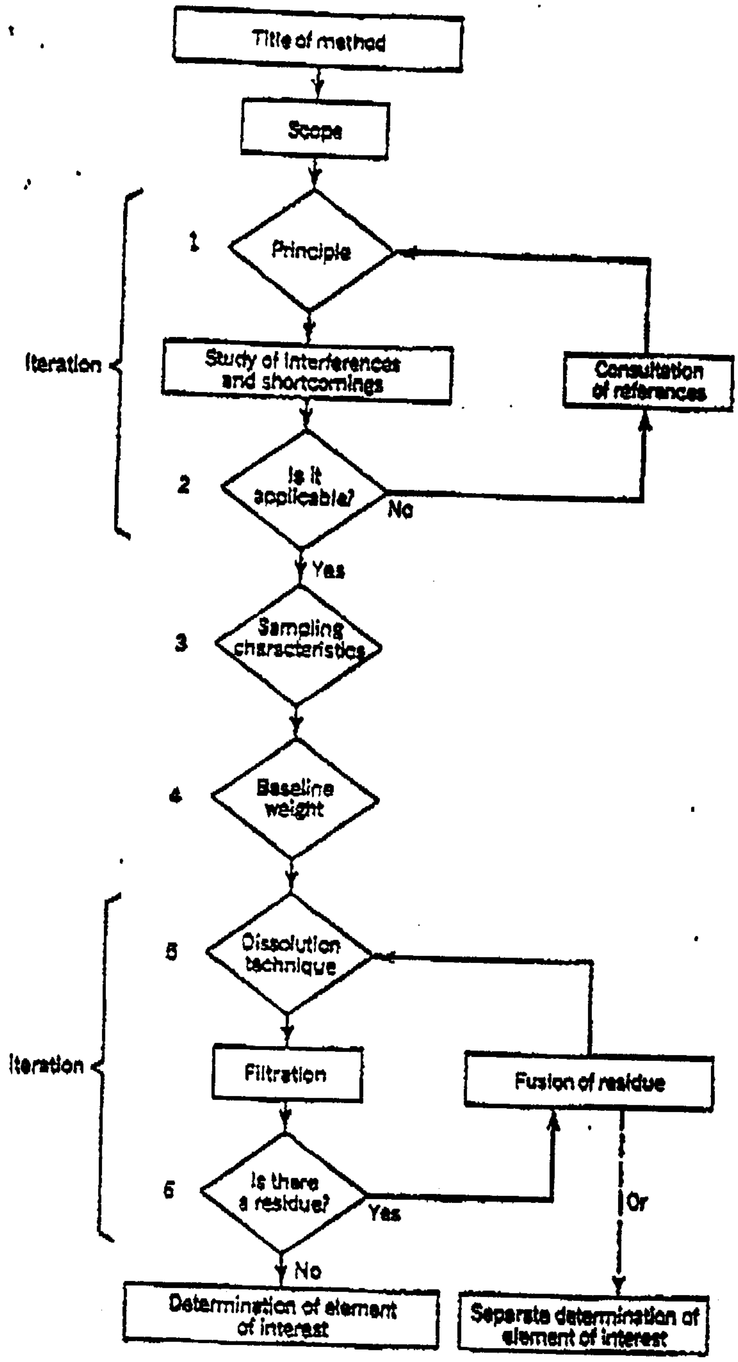


Figure 3. Illustration of a recommended iterative approach for tailoring and testing a rapid analytical method.

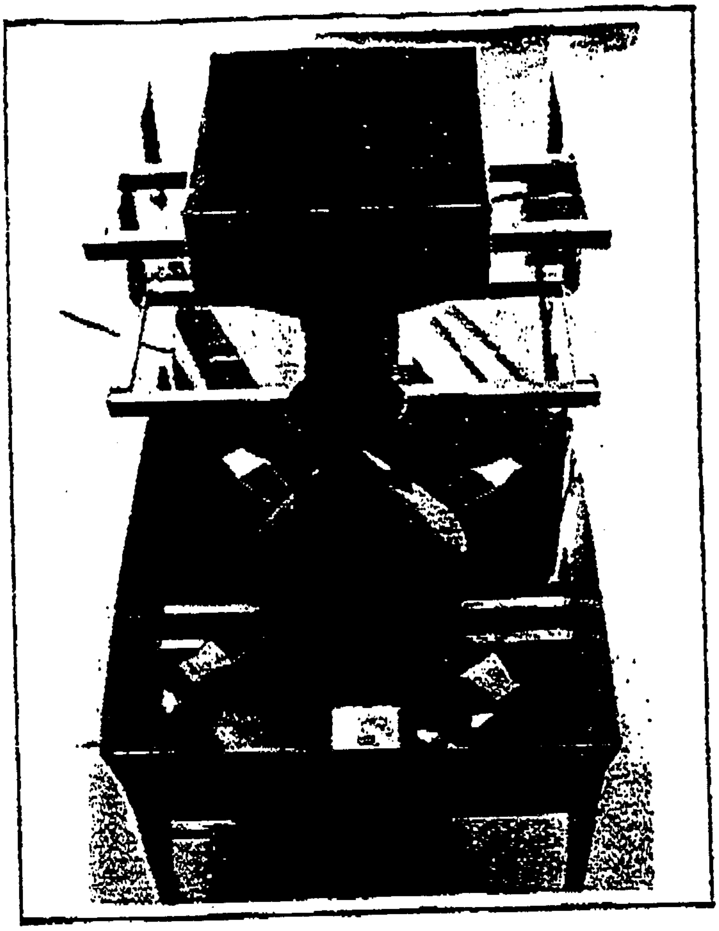
APPENDIX 2

S D I

SAMPLING DEVICES, INC.
14710 Tejon Street
Broomfield, Colorado, 80020
USA
Phone: (303) 451-7893
Fax: (303) 280-1396
Contact: Mr. Francis Pitard

LABORATORY SAMPLE DIVIDER MODEL CU 301 SD

* Divides exploration samples, blasthole samples, or any other production samples into 4% by weight subsamples.
* Divides one sample in less than one minute in most cases.
* Suppresses the time consuming and costly riffle splitting.
* Saves manpower for production laboratories.
* Ensures a well done, reliable splitting operation.
* Pays for itself in less than one year.



WHY DID WE BUILD CU 301 SD?

Mr. Francis Pitard, president of SDI, and also president of Pierre Gy & Francis Pitard Sampling Consultants, saw a need for such a sampler. In many laboratories he has visited, obsolete and manpower consuming riffle splitters are used. Or, sometime, much too slow automated rotary samplers are used. All these splitting systems have the same defects: Either they frustrate the operator because they are too slow, or they require ridiculously intensive manpower. So, there was a need for something better. This is why we are proud to propose CU 301 SD to our clients.

SIZE AND WEIGHT OF CU 301 SD

The sampler weighs about 180 pounds. It is 48" tall, 32" deep, and 25" wide.

POWER REQUIREMENTS: 110 V

PRINCIPLE OF CU 301 SD

A conical deflector feeds one of the rotating, radial buckets. Each receiving bucket is designed to easily feed a bag or any other recipient. The sampling ratio can be adjusted by using one (4%), two (8%), three (12%), or four (16%) buckets. Special sampling ratios can be provided on request at the purchasing time. The sampler can also be oversized or undersized on request. This sampler is particularly suitable for installation directly under a crusher or pulverizer, saving even more manpower. All parts are easily accessible for effective cleaning between samples. As all splitters, CU 301 SD may be dusty and should be installed inside a ventilated hood.

CONSTRUCTION

The entire sampler is built with good quality stainless steel. Motor torque is generous. The electric motor is dust proof. In general, the sampler is sturdy and should last many years.

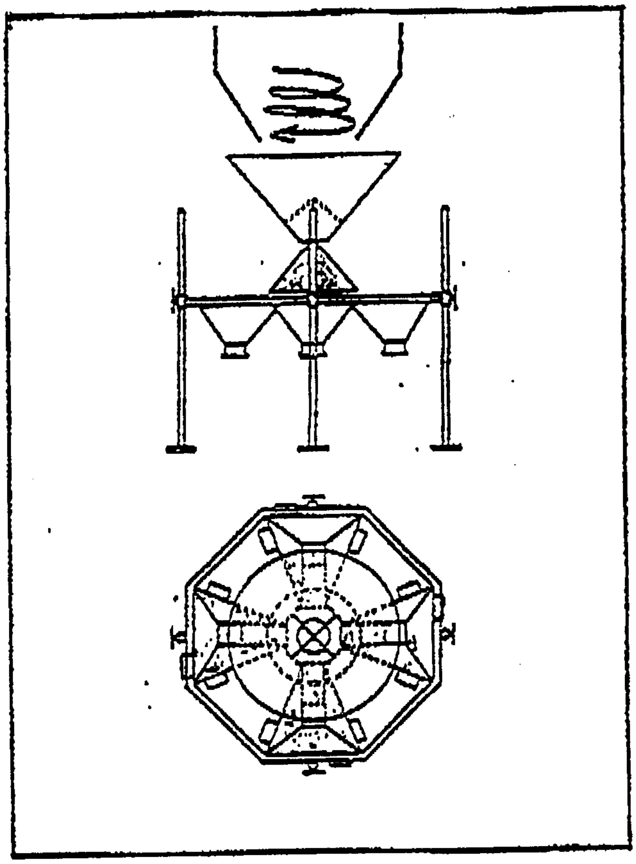
SDI

3000

150 lbs

SAMPLING DEVICES, INC.
14710 Tejon Street
Broomfield, Colorado, 80020
USA
Phone: (303) 451-7893
Fax: (303) 280-1396
Contact: Mr. Francis Pitard

FIELD SAMPLE DIVIDER
MODEL CU 101 SD



* Divides exploration samples from reverse circulation drilling, into 1/2, 3/8, 1/4, or 1/8 of the original sample weight.

* Provides unbiased split samples that can be relied upon.

* The sampler is particularly suitable if a large quantity of water is likely to alter the integrity of your samples.

* The sampler also works very well with dry material.

WHY DID WE BUILD CU 101 SD?

Mr. Francis Pitard, president of SDI, and also president of Pierre Gy & Francis Pitard Sampling Consultants, saw a need for such a sampler. In many exploration drilling programs he has consulted for, splitting reverse circulation samples in the field is often poorly done. The use of the riffle splitter in the field is not practical, not reliable, and often misused by the untrained operator. Yet, important decisions must be made by geologists who assume their subsamples are accurate. So, there was a need for something better. This is why we designed and built CU 101 SD. It will provide good services to our clients.

SIZE AND WEIGHT OF CU 101 SD

The sampler weighs about 150 pounds. Its height is adjustable to fit under the cyclone of the drilling machine. It takes 5 minutes to assemble it or disassemble it between each drilling site. It can be easily handled by one man.

PRINCIPLE OF CU 101 SD

A conical deflector feeds one of the fixed radial buckets. Because of harsh field working conditions, there are no moving parts. All parts are easily accessible, and none are enclosed, therefore the sampler is easy to clean between samples. It is built in such a way that no Delimitation Error nor Extraction Error can take place. These errors are often responsible for biases. The sampler is set in such a way that there is only one way to use it. It is not as dependant on well-trained operators as other devices are. It also helps the driller to work faster.

CONSTRUCTION

The sampler is sturdy, and will last for many years. It requires very little maintenance.

Appendix 8

METCON PTY LIMITED
METALLURGICAL CONSULTANTS

TRIAL LABORATORY HEAP LEACH TESTS

BROCKS CREEK PRIMARY & OXIDE SAMPLES

FOR

CYPRUS GOLD AUSTRALIA CORPORATION

S.F.RAYNER
REPORT 93072
JANUARY 1994

11 STIRLING PLACE, BELROSE NSW 2085, ph & fax 451 3085 ACN 052 514 208
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CONTENTS

SUMMARY

Five samples of Brocks Creek ore in the form of 1/4 core were submitted for testing to determine their amenability to heap leaching. The first four of the samples, listed below were described as 'primary' and the fifth as 'oxide'.

Testing was carried out in 2m x 100mm diameter columns after crushing the ore to minus 12.5mm, such size deemed as approaching the finest practical size for heap leaching. The columns were halted at 26 days and a mass balance carried out on the tailings, leach liquors and activated carbon. The results are presented below were they are compared with results obtained from 1kg portions of the ore cut out and subjected to an agitation leach to simulate a CIP plant.

Sample 1293:	15	16	17	18	19
heap leach					
% Au extraction	44	58	37	71	61
tail g/t Au	0.61	1.00	3.02	0.70	2.13
calc. head g/t Au	1.09	2.35	4.78	2.41	5.40
agitation leach					
% Au extraction	96	97	98	97	95
tail g/t Au	0.04	0.08	0.11	0.06	0.35
calc. head g/t Au	1.03	3.18	6.56	2.19	7.31

The heap leach result on each sample, compared to the agitation leach result, is obviously reduced on a percentage basis, on average approaching one half the agitation leach result. Gold losses to the heap leach tailings appear excessive.

Evaluation of the gold distribution in the tailings size fractions from samples 17 and 19 shows that the undissolved portion is concentrated in the coarser fractions where presumably it is unliberated or encapsulated and unaccessible to the leach liquor. Variation in the calculated gold head assays above seems to be a reflection of the habit and nature of the gold in the deposit, being consistent with variation obtained on previous samples. We would argue that the heap leach assay approaches the true figure on the basis that it is effectively an assay of 10kg of material.

1. INTRODUCTION

Five samples of 1/4 core, each approximately 10-12kg, were submitted to determine their response to heap leaching. The first four samples, numbered 1293- 15 to 18 were designated 'primary' and the fifth sample, 1293-19, was designated 'oxide', the classifications being broadly applied.

Each sample was to be treated in similar fashion, through the following steps;

- ⇨ Crush to 90% minus 12.5mm (1/2")
- ⇨ Blend and cut out 1 - 1.5kg
- ⇨ Crush the 1 - 1.5kg to minus 1.7mm and cut out a 200g head sample for Au analysis
- ⇨ Grind and leach the 1kg sample
- ⇨ Heap leach the ~10kg of minus 12.5mm material

2. PROCEDURE

Each sample was jaw crushed in closed circuit with a 12.5mm screen, blended by cone mixing twice and about 1.2kg cut out. This was further crushed to minus 1.7mm, blended on a rolling mat and 200g cut out, pulverised and fire assayed for gold.

The 1kg, minus 1.7mm, portion was wet rod milled to 85-95% passing 75µm and leached at 50% solids in a rolling bottle with 1.5kg/t NaCN for 48 hours. Dissolved oxygen, cyanide strength and pH were monitored and controlled with liquor samples assayed at 24 & 48 hours. The final tailings were washed free of soluble gold and fire assayed to determine the residual gold.

The remaining, approximately 10kg, minus 12.5mm material was preblended with 3kg/t of hydrated lime and loaded into a 2m high x 100mm diameter column, supported by a perforated disc covered with filter cloth. Fines were screened from the ore so that the first layer of ore above the filter cloth was free of fines that might cause a blockage. An initial soak of 800ml of liquor containing 1kg/t (1.25%) NaCN was added and allowed to stand for 24 hours. A closed circuit loop was then set up around the column. Liquor was pumped at a drip rate from a recycle reservoir bucket, initially containing 8 litres of water, through a packed column containing about 100g of activated carbon to the top of the heap leach column. Percolation liquor was collected at the bottom were the volume was measured and an assay sample taken before the liquor was transferred to the recycle reservoir. The transfer was made daily during the initial leach period and then less frequently as the gold dissolution rate slowed. After 26 days the columns were halted and 1-2 litres of fresh wash water was percolated to flush any soluble gold from the column. A gold mass balance was carried out by measuring the amount and assaying the component parts: reservoir liquor, wash liquor, tailings and activated carbon. Dissolution rate was estimated by proportioning the cumulative soluble gold determined from the progressive liquor assays with the total gold dissolved as determined from the gold mass balance. The sample of tailings for assay was taken by sampling about 1/4 of the blended tailings, fine crushing this to minus 1.7mm, blending on a rolling mat and dip sampling.

Another 1/4 portion of the heap leach tailings from the tests on samples 17 (primary) and 19 (oxide) were wet screened at 9.5, 4.75, 2.36 and 0.5mm with the entire fractions pulverised for assay to determine the gold distribution.

3. RESULTS AND DISCUSSION

3.1 Head Assays

Head assays were carried out on the splits described in section 2 and confirmed by the calculated head assays from the bottle roll and heap leach tests, as follows, together with assays quoted by Cyprus from their assaying of other portions of the core.

Sample 1293-	**15**	**16**	**17**	**18**	**19**
Cyprus g/t Au	2.30	4.04	3.88	3.54	2.46
Metcon assay g/t Au	0.82	1.36	27.0	1.38	7.36
Bottle roll g/t Au	1.03	3.18	6.56	2.19	7.31
Heap leach g/t Au	1.09	2.35	4.78	2.41	5.40

The considerable scatter reflects problems in accurately sampling this ore. The Cyprus assays were carried out on other portions of core so can be partly explained but the other three assays were on the test portion of ore. The scatter represents poor sampling or inaccurate assaying. Based on our confidence in the fire assaying over an extended time we are inclined to the poor sampling as the cause of the assay variation. The poor sampling we feel is a reflection of the crushed sizes at which subdivision took place and localized gold distribution. Of the three assays quoted the Metcon assay represents an assay of 50g taken from a split of the bottle roll material. The bottle roll assay represents an assay of 1kg of material while the heap leach assay represents an assay of 10kg of ore. For this reason we are inclined to the heap leach assay as being more accurate, although we would have had more confidence in this assay if leaching had been more efficient and the gold transferred to the activated carbon. Note also that both the Metcon assay and bottle roll fractions were split from minus 12.5mm crushed core, not a very accurate sampling based on the observation of sulphide mineral clusters in some rocks.

3.2 Agitation Leaching

Bottle roll leach tests were carried out to establish the leach efficiency that could be expected on the test samples if treated in a CIP process plant using ball mill grinds of 80-90% passing 75μm. The test details and result calculations are presented in Table 1 showing highly efficient leaching of between 95 and 98% for the five samples. Tailings assays were respectively 0.04, 0.08, 0.11, 0.06 and 0.35g/t Au. These tailings values, other than the last one could not be realistically improved on. Notably the last assay of 0.35g/t Au relates to the oxidized ore sample. Leaching was carried out for 48 hours but the results indicate that leaching was essentially finished within 24 hours, the slight increases recorded nearly within assay reproducibility of the liquors.

These levels of gold extraction by agitation leaching are consistent with previously tested samples, the high level exceptional for sulphide type primary ore but obviously reflecting the mode and occurrence of gold in this deposit.

Table 1 - Bottle Roll Leach Tests

Sample	15	16	17	18	19
weight kg	0.826	0.958	0.996	0.978	0.985
grind					
% solids	60	60	60	60	60
minutes	25	25	25	25	16
% passing 75um	87.2	84.9	93.8	95.6	94.0
leach					
liquor litres	0.826	0.958	0.996	0.978	0.985
% solids	50	50	50	50	50
pH	8.5	8.3	6.1	6.9	5.8
hyd. lime g	0.8	0.8	2.0	1.8	3.6
start pH	11.3	11.4	11.6	10.7	11.6
NaCN g	1.25	1.45	1.50	1.50	1.50
NaCN kg/t	1.5	1.5	1.5	1.5	1.5
1 hour					
pH	11.1	11.1	10.8	10.8	11.1
% NaCN	0.136				0.126
24 hour					
pH	10.7	10.8	10.7	10.7	10.8
DO	5.8	5.8	6.6	5.6	3.0
% NaCN	0.124	0.134	0.114	0.126	0.116
48 hour					
pH	10.4	10.6	10.5	10.6	10.5
DO	4.8	5.4	7.2	6.6	4.2
% NaCN	0.100	0.109	0.106	0.115	0.102
24hr liquor mg/l Au	1.00	2.95	6.26	1.95	6.58
48hr liquor mg/l Au	0.99	3.10	6.45	2.13	6.96
tails assay g/t Au	0.03,0.04	0.08,0.08	0.11,0.11	0.06,0.06	0.34,0.35
tails average g/t Au	0.04	0.08	0.11	0.06	0.35
24hr liquor mg Au	0.83	2.83	6.23	1.91	6.48
48hr liquor mg Au	0.82	2.97	6.42	2.08	6.86
tails mg Au	0.03	0.08	0.11	0.06	0.34
total mg Au	0.85	3.05	6.53	2.14	7.20
calc. head g/t Au	1.03	3.18	6.56	2.19	7.31
assay head g/t Au*	0.82	1.36	27.0	1.38	7.36
24hr % Au leached	98	93	95	89	90
48hr % Au leached	96	97	98	97	95
kg/t hyd. lime	1.0	0.8	2.0	1.8	3.7
kg/t NaCN	0.5	0.4	0.4	0.4	0.5

* head assay samples taken from minus 12.5mm crushed ore and thus the representative nature is suspect. More confidence is attributed to the calculated head assay, being an assay of 1kg of sample.

3.3 Heap Leach Tests

The heap leach test information is presented in attached data sheets, showing the results of leaching for 26 days. The levels of gold extraction were respectively 44, 58, 37, 71 and 61% or broadly speaking nearly half the extraction obtained by agitation leaching. Tailings grades were, again respectively, 0.61, 1.0, 3.02, 0.70 and 2.13g/t Au. Reference to the dissolution rate curves on the data sheets shows that the majority of the dissolution that took place occurred within the first 10 days, and that although ongoing at 26 days the rate of dissolution had slowed to the extent that even at an undiminished rate it would take extended leach times for high extraction levels to be obtained.

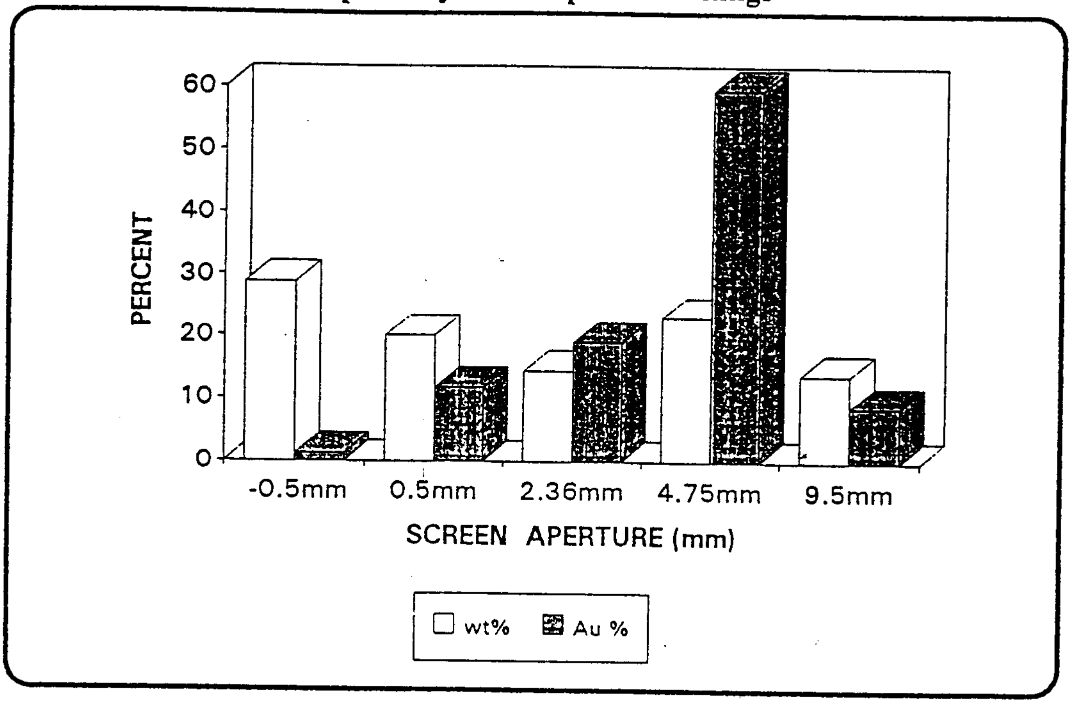
In terms of being physically practical the tests carried out on unagglomerated material showed no signs of percolation problems, recorded almost zero slump over the 26 days and used manageable amounts of lime (3kg/t) and cyanide (0.7 to 2kg/t NaCN). The leach solutions were colourless and showed no additional gypsum build up than might be expected in the best of operations.

3.4 Heap Leach Tailings Size Analysis.

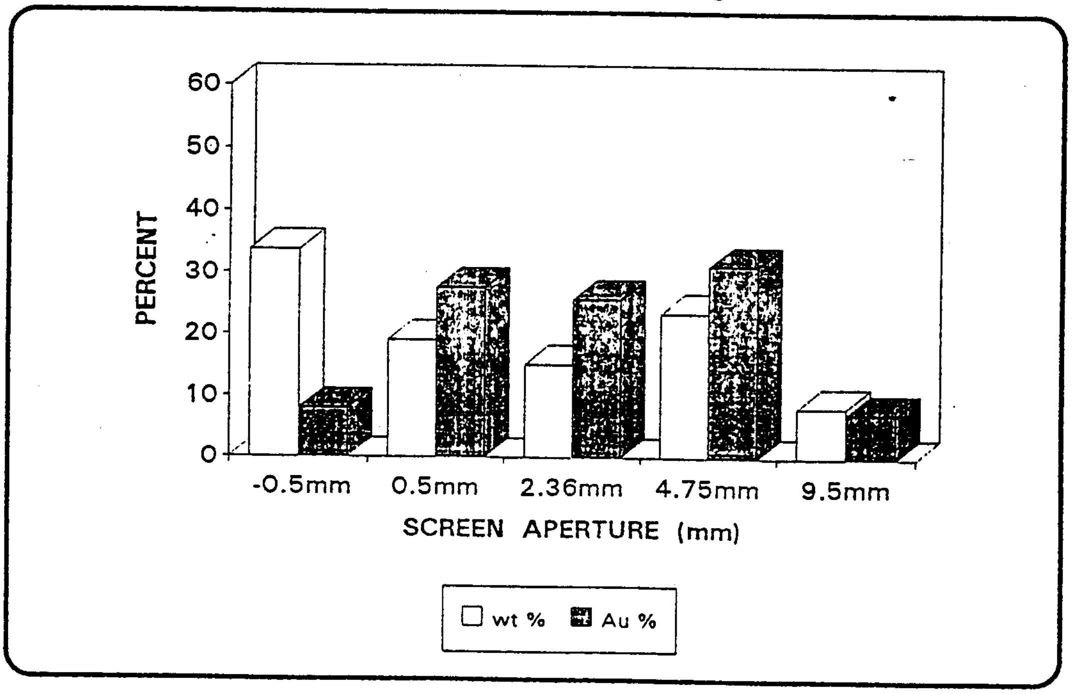
Approximately 2kg of the heap leach tailings from tests on samples 17 (primary) and 19 (oxide) were sized at 9.5, 4.75, 2.36 and 0.5mm and the fractions assayed for gold. The results are shown on the appropriate heap leach data sheets and are presented graphically in Figure 1 as a bar chart of weight percent retained in each fraction to the distribution percent of gold retained. For an equal distribution both bars should be capable of being superimposed. For the coarser 4.75, 2.36 and 0.5mm fractions it can be seen that the darker gold distribution bar exceeds the weight distribution bar indicating a retarding of gold dissolution. This contrasts markedly to the situation for the finest minus 0.5mm fraction were the gold distribution is much less than the weight distribution and the assay levels begin to approach the levels obtained by agitation leaching.

Figure 1: Distribution of Gold in Heap Leach Tailings Size Fractions

Sample 1293-17 primary ore heap leach tailings



Sample 1293-19 oxide ore heap leach tailings



BROCKS CREEK SIMULATED HEAP LEACH TEST DATA SHEET

Project	Brocks Creek	preblended hyd. lime	32.4g (3kg/t)
Sample	**1293-15**	initial soak	800ml
weight kg	10.8	initial cyanide	10.8g (1kg/t)
crushed size	12.5mm	cure	24 hours
		26 day slump	nil

Time days	grams NaCN	grams lime	pH	% NaCN	liquor L	feed mg/l Au	mg/l Au	mg Au	cum mg	% Au ext'n
0										
1			12.6		0.83		2.61	2.17	2.17	16.9
2			12.8		1.96		0.44	0.86	3.03	23.5
3			12.6	0.120	2.07		0.11	0.21	3.24	25.2
4			12.7		1.72		0.09	0.15	3.39	26.3
5			12.7		2.07		0.09	0.19	3.58	27.8
7			12.3		1.91	<0.01	0.11	0.21	3.79	29.4
14			11.4	0.080	1.26		0.18	0.23	4.02	31.2
22			10.8	0.080	3.10		0.22	0.68	4.70	36.5
26			10.4		1.33		0.13	0.17	4.87	37.8
liquor			10.3	0.058	4.70		0.16	0.75	5.62	43.7
wash			10.8	0.022	1.58		0.02	0.03	5.65	43.9

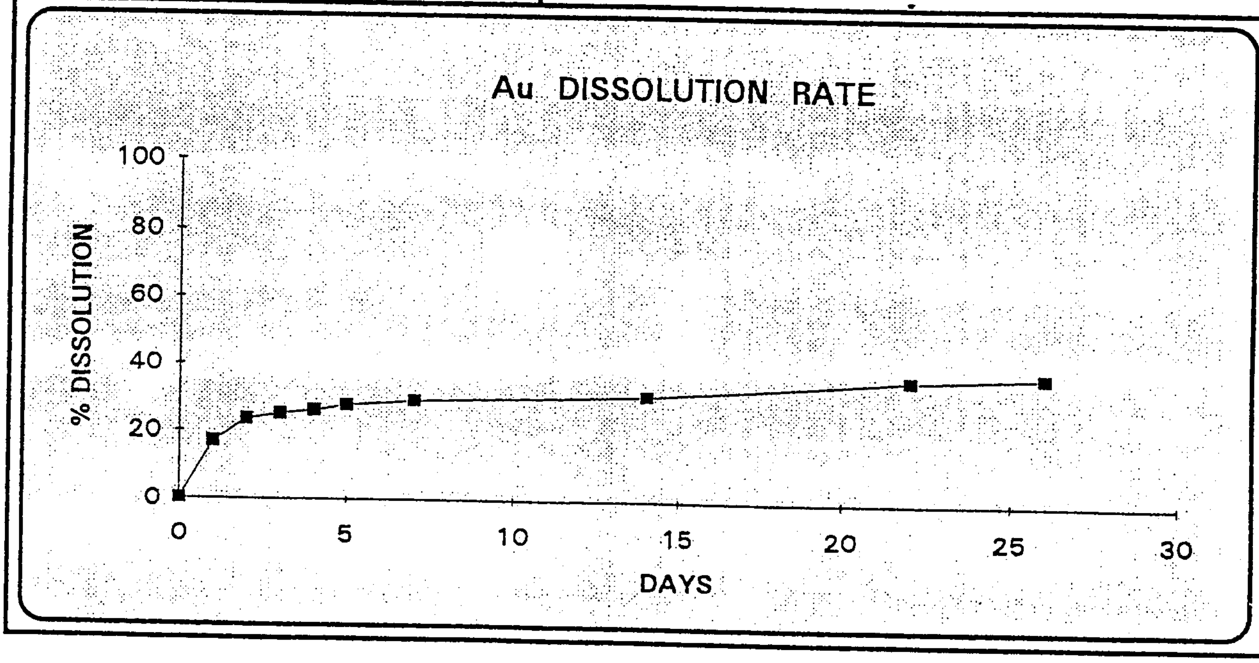
GOLD BALANCE

amount	material	assay g/t	mg Au	dist'n %
96.4g	carbon	45.20	4.36	37.2
4.70L	liquor	0.16	0.75	6.4
1.58L	wash	0.02	0.03	0.3
10.8kg	residue	0.61	6.59	56.1
	total	1.09	11.73	100.0

hydrated lime addition = 3.0kg/t
NaCN consumption = 0.71kg/t
total Au dissolution = 43.9%

TAILS SIZING ANALYSIS

screen microns	weight grams	wt. % ret	wt % pass	g/t Au	units Au	dist'n % Au



BROCKS CREEK SIMULATED HEAP LEACH TEST DATA SHEET

Project	Brocks Creek	preblended hyd. lime	31.8g (3kg/t)
Sample	**1293-16**	initial soak	800ml
weight kg	10.6kg	initial cyanide	10.6g (1kg/t)
crushed size	12.5mm	cure	24 hours
		26 day slump	2cm in 132cm

Time days	grams NaCN	grams lime	pH	% NaCN	liquor L	feed mg/l Au	mg/l Au	mg Au	cum mg	% Au ext'n
0										
1			12.7		1.15		5.06	5.82	5.82	19.7
2			12.7		1.98		1.18	2.34	8.16	27.6
3			12.7	0.134	2.05		0.46	0.94	9.10	30.8
4			12.7		1.62		0.47	0.76	9.86	33.4
5			12.7		1.96		0.34	0.67	10.53	35.7
7			12.3		1.82	<0.01	0.46	0.84	11.37	38.5
14			11.3	0.084	1.20		0.65	0.78	12.15	41.1
22			11.0	0.072	2.98		0.59	1.76	13.91	47.1
26			10.4		0.89		0.34	0.30	14.21	48.1
liquor			10.5	0.042	4.46		0.59	2.63	16.84	57.0
wash			10.9	0.018	1.71		0.08	0.14	16.98	57.5

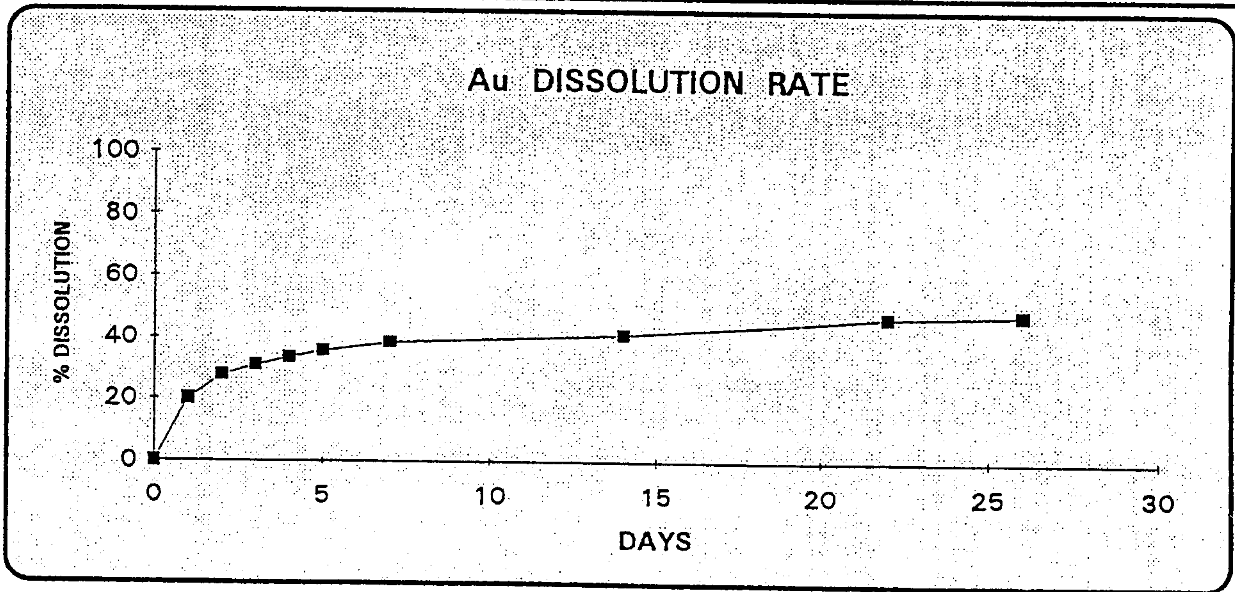
GOLD BALANCE

amount	material	assay g/t	mg Au	dist'n %
94.5g	carbon	122	11.53	46.3
4.46L	liquor	0.59	2.63	10.6
1.71L	wash	0.08	0.14	0.6
10.6kg	residue	1.00	10.60	42.5
	total	2.35	24.90	100.0

hydrated lime addition = 3kg/t
NaCN consumption = 0.79kg/t
total Au dissolution = 57.5%

TAILS SIZING ANALYSIS

screen microns	weight grams	wt. % ret	wt % pass	g/t Au	units Au	dist'n % Au



BROCKS CREEK SIMULATED HEAP LEACH TEST DATA SHEET

Project	Brocks Creek	preblended hyd. lime	27.0g (3kg/t)
Sample	**1293-17**	initial soak	800ml
weight kg	9.0	initial cyanide	9.0g (1kg/t)
crushed size	12.5mm	cure	24 hours
		26 day slump	3cm in 141cm

Time days	grams NaCN	grams lime	pH	% NaCN	liquor L	feed mg/l Au	mg/l Au	mg Au	cum mg	% Au ext'n
0										
1			12.1		2.82		2.77	7.80	7.80	15.6
2			12.1		2.26		0.28	0.63	8.43	16.8
3			11.9	0.070	2.20		0.47	1.03	9.46	18.9
4			11.7		1.64		0.56	0.92	10.38	20.7
5			11.5		2.10		0.38	0.80	11.18	22.3
7			10.9		1.97	0.01	0.47	0.93	12.11	24.2
14	3.00	2.00	10.0	0.020	1.30		0.56	0.73	12.84	25.6
22	3.00	2.00	10.0	0.030	3.16		0.66	2.09	14.93	29.8
26			9.7		1.31		0.39	0.51	15.44	30.8
liquor			10.7	0.066	4.34		0.60	2.60	18.04	36.0
wash			10.4	0.038	1.55		0.25	0.39	18.43	36.8

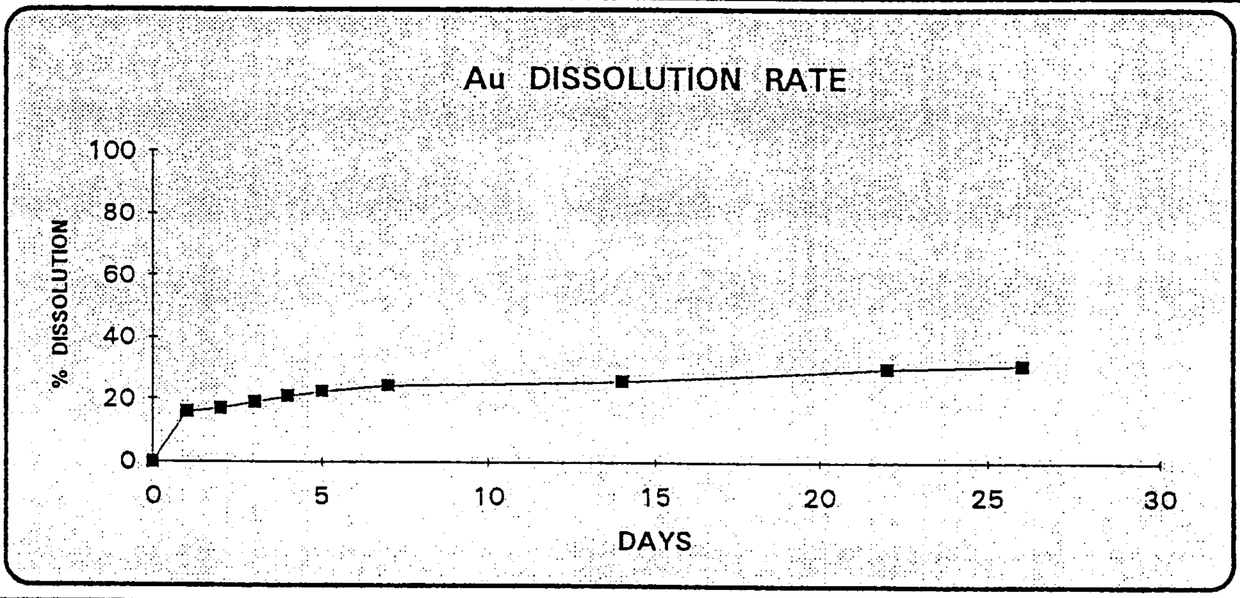
GOLD BALANCE

amount	material	assay g/t	mg Au	dist'n %
88.4g	carbon	145	12.82	29.8
4.34L	liquor	0.60	2.60	6.1
1.55L	wash	0.25	0.39	0.9
9.0kg	residue	3.02	27.18	63.2
	total	4.78	42.99	100.0

hydrated lime addition = 3.4kg/t
NaCN consumption = 1.28kg/t
total Au dissolution = 36.8%

TAILS SIZING ANALYSIS

screen mm	weight grams	wt. % ret	wt % pass	g/t Au	units Au	dist'n % Au
9.5	295.4	13.8	86.2	1.52	21.0	8.6
4.75	494.6	23.0	63.2	6.32	145.4	59.5
2.36	309.3	14.4	48.8	3.20	46.1	18.9
0.5	426.5	19.9	28.9	1.44	28.7	11.7
-0.5	620.5	28.9		0.11	3.2	1.3
total	2146	100.0		2.44	244	100.0



BROCKS CREEK SIMULATED HEAP LEACH TEST DATA SHEET

Project	Brocks Creek	preblended hyd. lime	32.4g (3kg/t)
Sample	1293-18	initial soak	800ml
weight kg	10.8	initial cyanide	10.8g (1kg/t)
crushed size	12.5mm	cure	24 hours
		26 day slump	nil

Time days	grams NaCN	grams lime	pH	% NaCN	liquor L	feed mg/l Au	mg/l Au	mg Au	cum mg	% Au ext'n
0										
1			12.4		2.46		3.12	7.68	7.68	25.2
2			11.2		0.40		0.82	0.33	8.01	26.3
3			12.4	0.062	1.88		0.70	1.32	9.33	30.7
4			12.3		1.58		0.94	1.48	10.81	35.5
5			12.1		1.93		0.66	1.27	12.08	39.7
7			11.6		1.82	0.02	0.77	1.40	13.48	44.3
14			11.5	0.074	1.18		0.88	1.04	14.52	47.7
22			10.7	0.072	2.91		0.87	2.53	17.05	56.0
26			10.2		1.25		0.45	0.56	17.61	57.9
liquor			10.2	0.056	4.46		0.81	3.61	21.22	69.7
wash			10.6	0.034	1.38		0.26	0.36	21.58	70.9

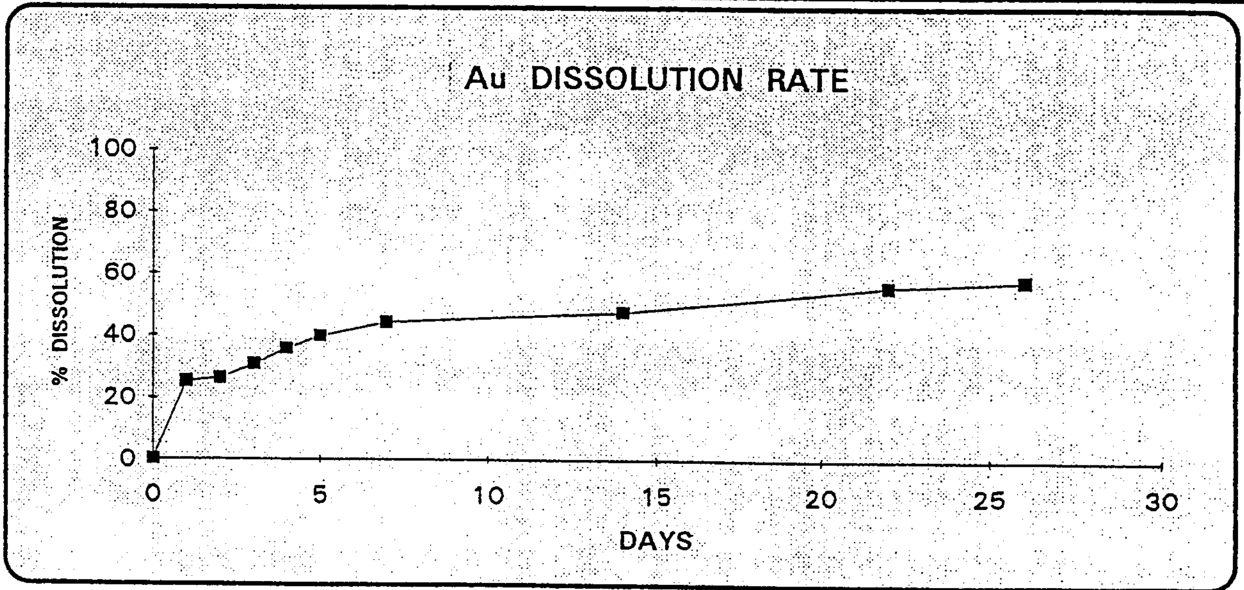
GOLD BALANCE

amount	material	assay g/t	mg Au	dist'n %
87.6g	carbon	165	14.45	55.6
4.46L	liquor	0.81	3.61	13.9
1.38L	wash	0.26	0.36	1.4
10.8kg	residue	0.70	7.56	29.1
	total	2.41	25.98	100.0

hydrated lime addition = 3.0kg/t
NaCN consumption = 0.73kg/t
total Au dissolution = 70.9%

TAILS SIZING ANALYSIS

screen microns	weight grams	wt. % ret	wt % pass	g/t Au	units Au	dist'n % Au



BROCKS CREEK SIMULATED HEAP LEACH TEST DATA SHEET

Project	Brocks Creek	preblended hyd. lime	23.1g (3kg/t)
Sample	**1293-19**	initial soak	800ml
weight kg	7.7	initial cyanide	7.7g (1kg/t)
crushed size	12.5mm	cure	24 hours
		26 day slump	nil

Time days	grams NaCN	grams lime	pH	% NaCN	liquor L	feed mg/l Au	mg/l Au	mg Au	cum mg	% Au ext'n
0										
1			10.6		1.36		16.30	22.17	22.17	42.2
2			12.0		1.14		0.78	0.89	23.06	43.9
3	5.80		11.8	0.040	1.78		0.41	0.73	23.79	45.3
4			11.3		1.06		0.55	0.58	24.37	46.4
5			10.9		0.42		0.97	0.41	24.78	47.2
7			10.6		1.55	0.02	0.82	1.27	26.05	49.6
14	2.00	2.00	10.4	0.014	1.48		0.37	0.55	26.60	50.7
22	2.00	4.00	9.7	0.014	3.07		0.54	1.66	28.26	53.8
26			9.6		1.40		0.43	0.60	28.86	55.0
liquor			11.1	0.042	3.94		0.65	2.56	31.42	59.9
wash			10.2	0.020	1.36		0.29	0.39	31.81	60.6

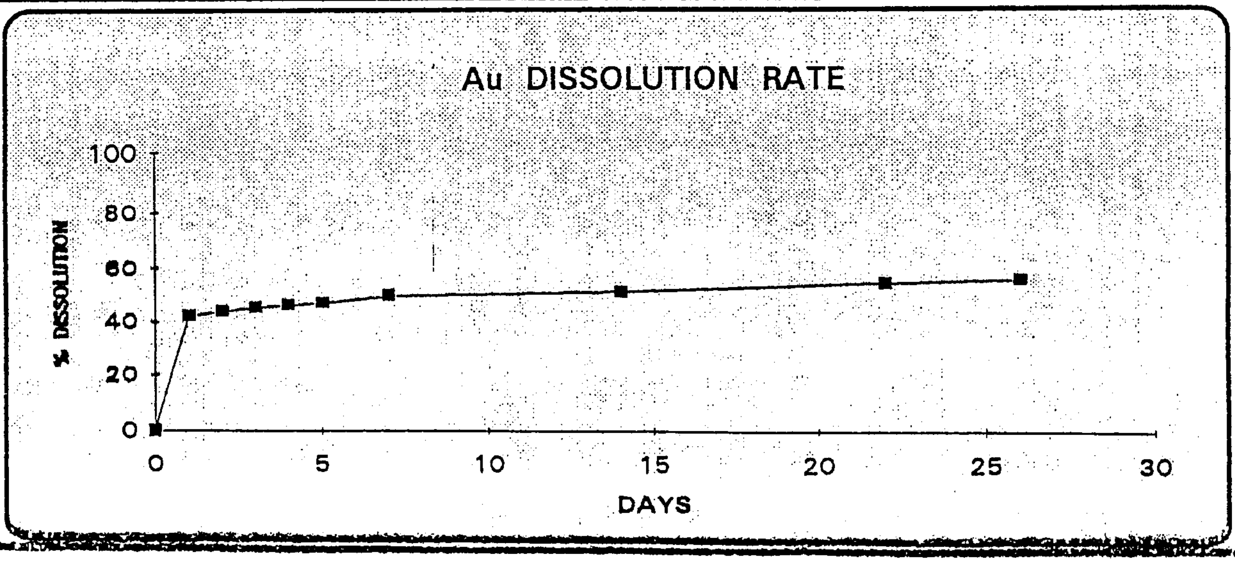
GOLD BALANCE

amount	material	assay g/t	mg Au	dist'n %
93.0g	carbon	239	22.23	53.5
3.94	liquor	0.65	2.56	6.2
1.36L	wash	0.29	0.39	0.9
7.7kg	residue	2.13	16.40	39.4
	total	5.40	41.58	100.0

hydrated lime addition = 3.8kg/t
NaCN consumption = 2.0kg/t
total Au dissolution = 60.6%

TAILS SIZING ANALYSIS

screen mm	weight grams	wt. % ret	wt % pass	g/t Au	units Au	dist'n % Au
9.5	167.8	8.4	91.6	2.62	22.0	7.4
4.75	471.2	23.5	68.1	3.96	93.1	31.2
2.36	304.8	15.2	52.9	5.04	76.6	25.7
0.5	382.6	19.1	33.8	4.30	82.1	27.6
-0.5	674.5	33.8		0.72	24.3	8.1
total	2001	100.0		2.98	298	100



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25 OCT 1993

METCON PTY LIMITED
METALLURGICAL CONSULTANTS

CONFIRMATORY BOTTLE ROLL CYANIDE LEACH TESTS ON BROCKS CREEK SULPHIDE SAMPLES

FOR

CYPRUS GOLD AUSTRALIA CORPORATION

S.F.RAYNER
REPORT 93062
OCTOBER 1993

11 STIRLING PLACE, BELROSE NSW 2085, ph & fax 451 3085 ACN 052 514 208
UNSW LABORATORY HUT D8, GATE 2 HIGH ST KENSINGTON 2033, ph 697 4365, fax 313 6402

DESCRIPTION

Four samples each approximately 9-10kg weight were submitted for a bottle roll cyanide leach test, similar to that described in Metcon Report 93059. In addition the tailings from sample 893-3 previously tested were retested to clarify the poor result of 19% gold extraction reported. The low result was due to the sample consuming all of the 3kg/t NaCN added.

The procedure used was as described previously, with approximately 4kg split from the blended samples. The restriction to 4kg was to facilitate treating the samples in 20L drums without the weight, after water addition, threatening to break the drums whilst unattended overnight. It seems a good practical compromise on size.

Prior to despatch to Metcon the samples had been analysed in another laboratory with the following head grades provided.

	g/t Au		
893-3	3.15,3.72,3.29	= 3.39	from previous test
993-11	1.73,1.74,1.78,1.81	= 1.76	
993-12	20.7,20.6,22.8,22.5	= 21.65	
993-13	0.89,0.90,0.90,0.90	= 0.90	
993-14	0.66,0.68,0.85,0.80	= 0.75	

The test data is presented in Table 1, the samples responding in similar manner to the previous set. Sample 893-3 leached well with the additional cyanide with 97% extraction which, when considered in conjunction with the previous test, resulted in 98% total gold extraction for a cyanide addition of 5.3kg/t.

Of the other samples only sample 993-11 required a lot of lime and consumed 2.3kg/t NaCN but still leached 94% of the contained gold.

Sample 993-12 which was high grade at around 22g/t Au leached 98% of the contained gold without a high reagent demand. This is a significant result as it confirms that the refractory gold component is not fixed but appears to be lower on a percentage basis in high grade than in low grade ore.

Sample 993-14 leached to 85% of the gold, the lower figure a reflection of the low head grade of around 1g/t for this sample.

BROCKS CREEK BOTTLE ROLL LEACH TESTS

Sample	893-3##	993-11	993-12	993-13	993-14
weight kg	3.00	3.54	3.66	4.00	3.74
liquor L	3.00	3.54	3.66	4.00	3.74
% passing 75 micron	66.4	78.7	83.2	80.6	77.6
initial pH	8.4	5.8	7.8	5.9	6.5
hyd. lime g	8.10	23.80	6.59	18.39	9.69
NaCN g	6.00	3.54	3.66	4.00	3.74
1hour pH	11.2	10.6	10.8	10.9	10.7
% NaCN	0.164	0.004	0.076	0.040	0.076
hyd. lime g		1.0			
NaCN g		7.1		2.0	
24 hour pH	10.9	10.7	10.6	10.6	10.5
% NaCN	0.146	0.090	0.066	0.070	0.064
liquor mg/l Au	2.45	1.72	23.30	1.22	0.81
liquor mg Au	7.35	6.09	85.28	4.88	3.03
48 hour pH	10.8	10.5	10.4	10.5	10.3
DO	8.3	8.0	7.8	8.1	7.7
% NaCN	0.134	0.074	0.058	0.068	0.054
liquor mg/l Au	2.62	1.78	24.20	1.38	0.99
tails g/t Au	0.06	0.11	0.41	0.08	0.15
	0.08	0.10	0.37	0.09	0.20
average	0.07	0.11	0.39	0.09	0.18
liquor mg Au	7.86	6.30	88.57	5.52	3.70
tails mg Au	0.21	0.39	1.43	0.36	0.67
calc head g/t Au	2.69	1.89	24.59	1.47	1.17
assay head *g/t Au	3.39#	1.76	21.65	0.90	0.75
24hr % Au leached	91	91	95	83	69
48hr % Au leached	97	94	98	94	85
kg/t hyd. lime	2.7	7.0	1.8	4.6	2.6
kg/t NaCN	0.7	2.3	0.4	0.8	0.5

This sample is leach tailings from Metcon report 93059
This value is the tailings assay from treatment of this sample described in Metcon report 93059. The test then ran out of cyanide.
Total gold extraction from the sample is 19% originally + 97% of the residual 81% ie. 98%, consuming 5.3kg/t NaCN.
* assay head supplied by Cyprus

METCON PTY LIMITED
METALLURGICAL CONSULTANTS

CONFIRMATORY 5-10KG BOTTLE ROLL CYANIDE LEACH TESTS ON BROCKS CREEK SULPHIDE SAMPLES

FOR

CYPRUS GOLD AUSTRALIA CORPORATION

S.F.RAYNER
REPORT 93059
SEPTEMBER 1993

11 STIRLING PLACE, BELROSE NSW 2085, ph & fax 451 3085 ACN 052 514 208

1. INTRODUCTION

Ten samples, numbered MET 893- 1 to 10, were submitted for bottle roll cyanide leach tests. The objective of the work was to test for conformity of response with previous metallurgical testwork on nearer surface ore. A higher sulphide (pyrite) content was acknowledged, possibly leading to a refractory gold component, as with other ores in the vicinity.

The original work proposal was based on 1-2kg bottle roll tests on RC chips. This was modified by increasing the sample size to 5-10kg, supplied pulverised (nominal minus 100 microns) to make it more representative and increasing the leach time from 24 to 48 hours to compensate for any coarse free gold that might be present. The samples had been thoroughly mixed, sampled and assayed in duplicate, as shown below, prior to despatch to Metcon.

Sample MET 893-	duplicate Au	average Au	sample average Au
1	2.78,2.96	2.87	
	2.58,2.57	2.57	2.72
2	4.30,4.34	4.32	
	4.84,4.63	4.73	4.52
3	4.34,4.22	4.28	
	3.89,4.15	4.02	4.15
4	3.71,3.79	3.75	
	3.42,3.49	3.45	3.60
5	1.70,1.78	1.74	
	1.95,1.76	1.85	1.79
6	5.50,5.64	5.57	
	5.07,5.08	5.07	5.32
7	2.51,2.59	2.55	
	2.33,2.24	2.28	2.41
8	5.55,5.59	5.57	
	4.56,4.44	4.50	4.53
9	2.99,2.99	2.99	
	2.81,2.80	2.80	2.89
10	1.68,1.75	1.71	
	1.56,1.72	1.64	1.67

In response to variability in behaviour exhibited by some of the samples diagnostic assays were added to the program ie.,

* analysis of the leach tailings for sulphur to see if there was a correlation with gold extraction
* analysis of the leach liquor for copper and iron to see if there was a correlation with gold extraction and reagent consumption.

2. PROCEDURE

Each of the samples was leached at 50% solids in 20 litre wide mouth drums mounted on rollers. They were processed in two batches, in the first batch all of the sample available was processed but one sample drum with 8kg sample weight developed a leak over the last 10 hours. For the second batch half the available sample was used, reducing the weight in the drums and hence the stress on the drum while allowing for repeating of the test should the drum break.

The procedure involved first adjusting the pH with hydrated lime until a value of pH10-11 was established. Cyanide at 1kg/t was then added, with a pH check at 1 hour. At 24 hours the liquor was sampled and assayed for pH, dissolved oxygen, residual cyanide and dissolved gold. Adjustment was made to the pH and cyanide if necessary and rolling continued. Where pH and cyanide appeared unstable check/adjustments were also carried out at 30 hours.

On completion at 48 hours the liquor was sampled for Cu,Au & Fe analysis along with residual cyanide, dissolved oxygen & pH. Samples of the washed tailings were sized at 75μm and assayed for gold in duplicate and sulphur.

3. RESULTS AND DISCUSSION

The test data and results are presented in Table 1. They showed variation in response, were different in subtle ways from other ores but generally were characterised by high gold extraction. Assay and calculated head grade agreement was reasonable and the 48 hours of leach time appeared necessary. All samples when pulped with water had a hydrophobic film of mineral on the surface, assumed to be (gold bearing) sulphides and as such a restrictive refractory gold component was anticipated but did not eventuate.

The samples fell into three categories based on reagent consumption.

a) Samples 5 & 6 required <2kg/t of hydrated lime to maintain the pH levels. They used <0.5kg/t NaCN and leached rapidly .

b) Samples 1, 2, 7, 9 & 10 required 2 - 3kg/t of hydrated lime and slightly more cyanide. However by 48 hours all had achieved between 94 and 97% gold extraction.

c) The third group of samples 3, 4 & 8 required more hydrated lime, nearly 10kg/t for sample 3 and subsequently more cyanide, although the later was affected by losses as HCN when the pH fell below 10. Gold extraction from these samples was 19, 82 & 97% respectively. It is important to note here that these levels are not necessary the limiting values. Sample 3 for instance simply reflects that all of the 3kg/t cyanide added was used in reaction with other elements prefferentially to gold and as HCN gas.

Report 93059

In looking for the common factor affecting the later samples analysis of the tails was carried out for sulphur and of the liquors for copper, iron and dissolved oxygen. The listing below shows the consistent factors are the increasing level of iron in solution and the reduction in dissolved oxygen ie those samples, particularly 3, 4 and 8 contain a species that;

* reacts with hydrated lime
* consumes oxygen
* contains cyanide soluble iron

samples	**5 & 6**	**1, 2, 7, 9, 10**	**3, 4, 8**
% S range	0.7-1.6	1.6-4.4	1.3-1.8
% S average	0.68	2.80	1.65
mg/l Fe range	25-29	12-88	180-260
mg/l Fe average	27	50	213
mg/l Cu range	16-26	11-38	4-24
mg/l Cu average	21	28	13
final mg/l diss O2	8.0	8.0	4.8

The sulphur assays indicate a significant sulphide mineral content while the level of cyanide soluble copper sulphides are not prohibitive.

It is suggested that the above comments be correlated with mineralogy. On the basis of these results, ignoring sample 3 which suffered from insufficient cyanide, sample 4 with 0.57g/t Au in the tailings is the most refractory sample.

Sample 3 tails could be releached with additional cyanide to establish overall potential gold extraction or alternatively a fresh sample, if available, could be leached using the knowledge from the first test as a basis.

BROCKS CREEK BOTTLE ROLL LEACH TESTS

Table 1

Sample 893-	1	2	3	4	5	6	7	8	9	10
weight kg	4.708	8.008	7.928	8.904	4.776	4.526	4.510	4.638	4.468	4.206
liquor L	4.716	8.098	7.928	8.942	4.776	4.554	4.510	4.638	4.468	4.240
% passing 75 micron	68.2	75.4	66.4	74.4	82.8	75.2	73.2	57.2	88.2	78.8
initial pH	7.6	7.1	5.9	6.6	8.8	7.4	7.1	4.7	7.0	6.9
hyd. lime g	8.35	15.08	65.68	29.17	2.74	6.31	8.82	25.07	9.38	8.21
NaCN g	4.70	8.10	8.00	8.90	4.80	4.60	4.50	4.60	4.50	4.20
1hour pH	10.8	10.9	11.0	11.3	11.0	11.0	10.6	10.7	10.4	10.1
24 hour pH	9.9	10.1	9.2	10.2	10.5	10.7	10.6	10.2	10.6	10.3
DO	5.4	5.8	1.6	2.0	5.8	8.1	8.1	2.7	8.1	8.2
% NaCN	0.032	0.054	0.006	0.006	0.078	0.080	0.038	0.002	0.074	0.064
hyd. lime g	1.00	1.00	4.00	4.00	0.30			2.00		1.00
NaCN g			8.00	8.00				9.20		
liquor mg/l Au	1.81	3.80	0.08	0.16	1.35	5.07	2.11	1.20	2.36	1.52
liquor mg Au	8.54	30.77	0.63	1.43	6.45	23.09	9.52	5.57	10.54	6.44
30 hour										
pH	10.1		9.8	10.5						
% NaCN	0.026		0.003	0.042						
hyd. lime g	1.50		5.50	1.00						
NaCN g	2.50		8.00							
48 hour pH	10.4	10.1	10.4	10.5	10.4	10.5	10.5	10.7	10.6	10.3
DO	7.8	8.0	1.8	5.8	8.0	8.1	8.1	6.8	8.4	7.8
% NaCN	0.066	0.046	0.002	0.040	0.064	0.072	0.030	0.082	0.070	0.060
liquor mg/l Cu	23.1	38.7	4.4	23.7	26.3	16.4	32.3	11.8	11.0	34.4
liquor mg/l Fe	88	48	260	180	29	25	86	200	12	14
liquor mg/l Au	2.62	4.95	0.82	2.55	1.48	5.74	2.37	6.49	2.59	1.64
tails % S	1.84	1.62	1.33	1.78	0.73	1.63	3.34	1.84	4.42	2.67
tails g/t Au	0.17	0.18	3.15,3.72	0.56	0.09	0.13	0.07	0.21	0.14	0.08
	0.17	0.16	3.29	0.57	0.09	0.14	0.08	0.23	0.15	0.10
average	0.16	0.17	3.39	0.57	0.09	0.14	0.08	0.22	0.15	0.09
liquor mg Au	12.36	40.09	6.50	22.80	7.07	26.14	10.69	30.10	11.57	6.95
tails mg Au	0.75	1.36	26.88	5.08	0.43	0.63	0.36	1.02	0.67	0.38
calc head g/t Au	2.78	5.18	4.21	3.13	1.57	5.92	2.45	6.71	2.74	1.74
assay head *g/t Au	2.72	4.52	4.15	3.60	1.79	5.32	2.41	4.53	2.89	1.67
24hr % Au leached	65	74	2	5	86	86	86	18	86	88
48hr % Au leached	94	97	19	82	94	98	97	97	95	95
kg/t hyd. lime	2.3	2.0	9.5	3.8	0.6	1.4	2.0	5.8	2.1	2.2
kg/t NaCN	0.9	0.5	3.0	1.5	0.4	0.3	0.7	2.2	0.3	0.4

Appendix 9

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MINERALOGICAL REPORT NO. 6377
by A.C. Purvis, PhD & I.R. Pontifex

May 28th, 1993

TO:	Cyprus Gold Aust. Corp. 9th Floor, 5 Mill St PERTH WA 6000 Attention : Mr Graham Miller
COPY TO :	Cyprus Gold Aust. Corp. Brocks Creek via Hayes Creek, N.T. Attention: Clive Kirk
YOUR REFERENCE:	Your Order No. E29532
MATERIAL:	Core and rock chip samples, Brocks Creek Prospect (17 samples in all)
IDENTIFICATION:	BRRCD118, 121, 123, 138, 152 (various depths) 13 samples 4 surface rock chip samples, co-ordinates given.
WORK REQUESTED:	Thin section preparation and comprehensive descriptions, selected photomicrographs.
SAMPLES & SECTIONS:	Returned to Clive Kirk, Brocks Creek.

PONTIFEX & ASSOCIATES PTY LTD

SUMMARY COMMENTS

Thirteen drill core samples and four outcrop samples from the Cyprus Brocks Creek Prospect (Pine Creek Geosyncline) are described in this report from normal thin sections. The section offcuts were stained to aid in the identification of extremely fine plagioclase (± fine K-spar). The generally minor opaque minerals (oxides and sulphides) were identified as accurately as possible under binocular microscope, however six polished sections were also used to confirm opaque mineral identities, mostly where they formed up to 5% of the rock. Apart from confirming 'iron-sulphide' (but not always pyrite), many of the polished sections revealed sparse extremely fine galena, sphalerite and rare chalcopyrite, and trace minute gold grains in BRRCD118, 136.5; also crystals of arsenopyrite in 138, 638.m.

The samples are listed, together with the rock types identified and comments in Table 1, selected photomicrographs are appended. Three lithological groups are represented as discussed below.

1) Low grade metamorphosed sandstones, mostly with poorly sorted coarse to very coarse detrital quartz > > felspar > lithic grains supported by extensive matrix ie. a wacke facies, probably at least partly volcanically derived. Matrices in this rock suite are mostly recrystallised to very fine quartz > felspar, incorporating minor to subordinate and weakly schistose biotite and muscovite, variably altered mostly to clays. Minor garnet, epidote, carbonate, pyrite, opaque oxides, leucoxene, tourmaline, zircon and veining occur variously in different samples. Most of the micas appear to be basically metamorphic, but muscovite/sericite, and even some fine quartz, may hydrothermal alteration.

   The samples in this group, (noting some individual characteristics) are :

   BRRCD 138, 63.8m
   118, 146.6m possible ex-hornfelsic-amphibole in matrix
   118, 153.4m
   118, 161.85m with residual medium grade garnet ± biotite and a
   118, 12.85m retrograde muscovite-chlorite ± epidote ± carbonate assemblage

2) Facies of massive, weakly lenticular layered micromosaic rocks (i.e. cherty textured), composed mostly of quartz and plagioclase, but locally including K-spar. Also incorporating minor fine (schistose) sericite and/or biotite, pyrite, leucoxene with minor slightly coarser and relatively discrete single grains of quartz and plagioclase, vaguely layered in some samples. Minor very small diffuse to elongate patches of micropoikiloblastic muscovite ± quartz and minor veinlets/stringers of quartz ± muscovite ± felspar ± pyrite are also present. Samples in this group are :

10140E, 1594N		
10142E, 1593N		
BRRCD,	138, 68.05m	banded
	138, 69.25m	minor interlayered fine graphite biotite schist
	138, 108.55m	abundant intercalated graphitic layers and cherts
	152, 447.6m	

The exact genesis of this facies is uncertain, but they all appear to include an original tuffaceous component, the extent of which is difficult to determine, but some may consist entirely of extuff. The prevailing micromosaic texture appears to be essentially metamorphic.

3) Graphitic 'schists'

As noted in Group 2 above, fine layers of graphitic ± biotite schist are intercalated with the micromosaic facies of that group, including quartzose micromosaic layers which may be regarded as 'genuine' cherts. These graphitic schists occur in BRRCD138, 69.25m, 108.55m. Relatively more massive compact graphite rock forms BRRCD123, 157.8m and this sample is also characterised by dispersed extremely fine tourmaline, and scattered small elliptical bodies composed of tourmaline, biotite ± microcline, also quartz veins with similar mineralogy + rare pyrite.

4) Miscellaneous

Sample BRRCD 118, 136.5m is extensively altered to decussate sericite, scattered fine quartz, with residuals of altered biotite. Genesis is uncertain, but numerous residuals of extremely fine, slender apatite crystals suggest an igneous precursor, possibly an ex-biotite-porphyritic micro-granitoid, (possibly a more mafic rock, even lamprophyric??). This rock contains minor pyrite (some after pyrrhotite) scattered and in a vein, also leucoxene, rarer very fine galena, trace gold.

Sample 10139E, 1552N is a biotite-rich schist, possibly a meta-sediment, possibly a reconstituted igneous rock. Sample 10145.4E, 1571N is a fine quartz mica schist, probably a metasediment, and may be a fine grained variant of the sandstone facies group 1.

TABLE 1 : SAMPLES, INTERPRETED ORIGINAL ROCK TYPE AND COMMENTS ON METAMORPHIC/ALTERATION ASSEMBLAGES

BRRCD118		
136.5m	Biotite-microgranitoid?, or as possibly lamprophyric rock	Extensive quartz-sericite alteration; accessory leucoxene, pyrite and apatite rarer galena, trace gold.
146.6m	Coarse poorly sorted sandstone, matrix-rich (wacke)	Quartz-sericite-biotite with abundant clay-altered grains. Accessory rutile, zircon, graphite and pyrite.
153.4m	as above	Quartz > plagioclase (detritus). Muscovite > biotite (matrix), minor pyrite, tourmaline, zircon, leucoxene
161.8m	as above	Quartz-rich. Minor garnet. Retrograde quartz-chlorite-muscovite with clays after ?biotite; minor pyrite, rarer finer. pyrrhotite, chalcopyrite, galena
BRRCD121		
112.85m	as above	Quartz-rich. Minor garnet and biotite. Retrograde chlorite-sericite-epidote-calcite-actinolite. Minor ilmenite > pyrite > sphalerite.
BRRCD123		
157.8m	Massive graphite	Small elliptical bodies of tourmaline, microcline, altered biotite. Rare pyrite in veins with quartz, tourmaline, altered biotite and microcline.
BRRCD138		
63.8m	Coarse poorly sorted, matrix-rich sandstone	Quartz > K-spar, muscovite, biotite, magnetite. Accessory pyrite, leucoxene, tourmaline, zircon, arsenopyrite, chalcopyrite.
68.05m	Quartz-plagioclase micromosaic rock, banded.	Quartz, plagioclase, K-spar-biotite-rich (various). Veins of quartz + muscovite and biotite + pyrite.
69.25m	Banded micromosaic rock. Minor interlayered graphitic schist	Variously quartz > plagioclase to K-spar > quartz > biotite-rich. Biotite-plagioclase-graphite schist; vein of muscovite, plagioclase and biotite.

108.55m	Banded sequence of micromosaic rock, quartzite/graphitic chert	a) Quartz > plagioclase; biotite, graphite, pyrite, muscovite b) Quartz graphite, sericite, garnet, chlorite, pyrite. Quartz-pyrite veins.
BRRCD152		
45.2m	Cherty micromosaic rock	Quartz dominant over sericite, muscovite-quartz lenses. Quartz veins.
47.6m	Quartz-plagioclase micromosaic rock	Plagioclase (± quartz), minor muscovite, altered biotite, K-spar; accessory leucoxene and pyrite, trace chalcopyrite.
82.65m	Medium quartz sandstone, matrix-rich	Extensive pervasive sericite > biotite alteration, accessory pyrite after pyrrhotite.
10139E, 1552N	Schist	Quartz-biotite-sericite with clays after ?felspar
10140E, 1594N	Quartz-plagioclase micromosaic rock	Quartz-plagioclase-[minor scattered muscovite-leucoxene-?pyrite (leached)] ?tuffaceous
10142E, 1593N	Quartz-plagioclase Micromosaic rock	Quartz-plagioclase-minor K-spar -muscovite-leucoxene. Possible tuff.
10145.4E, 1571N	Metasandstone (very fine grained)	Quartz-muscovite-leucoxene with muscovite + leucoxene after biotite

INDIVIDUAL DESCRIPTIONS (in sequence as presented in your covering letter)

10140E, 1594N

Massive, microcrystalline, quartz-plagioclase (micromosaic) rock, incorporating minor to subordinate slightly coarser plagioclase and quartz grains, vaguely layered. Minor muscovite scattered, and in several quartz veinlets (with rare leucoxene and voids possibly after pyrite). Possibly a metatuff.

The essential mineralogy of this sample is :

Quartz	50%
Plagioclase	45%
Muscovite	5-%
Leucoxene	<1%
?Leached pyrite	<1%

The two major minerals, quartz and sodic plagioclase form the greater bulk of this rock as a very fine grained (30 to 50 micron) massive micromosaic, albeit microscopically somewhat heterogeneous. This appears to be an essentially metamorphic micromosaic, but its heterogeneity tends to be emphasised by the presence of scattered subordinate larger single albite grains/crystals 0.2 to 0.5mm and lesser quartz grains to 0.5mm. The nature and crudely layered distribution of these grains suggests an inherited tuffaceous character.

The muscovite listed above occurs partly as scattered individual poikiloblastic flakes about 0.8mm size, but some small clusters of these. Muscovite is also relatively concentrated as flakes and small clusters in and adjacent to several random quartz veins to 0.5mm wide. These veins also contain several lead voids ± clays (possibly after pyrite or carbonate), and rarer micro-skeletal leucoxene (possibly after biotite). Accessory fine leucoxene is also disseminated.

10142E, 1593N

Massive to vaguely fine layered, quartz-plagioclase micromosaic rock, incorporating minor alkali felspar and scattered fine muscovite, also very small quartz patches ± fine muscovite. [cf. 10140E. 1594N, possibly tuffaceous].

Quartz	30-35%
Plagioclase	60-65%
Alkali felspar	3%
Muscovite	2%
Leucoxene	<1%

The massive to vaguely fine layered quartz-plagioclase micromosaic which dominates this sample is similar to that at 10140E, 1594N but appears to be more felspathic , slightly finer and more homogeneous since it contains only rare scattered single crystals of these minerals. The exact proportions are not clear, there are suggestions that the quartz is about a third of the mosaic, and staining indicates very minor K-spar. The muscovite content is also less that in the previous sample, with scattered rare poikiloblastic muscovite flakes. However, minor scattered patches of coarser quartz to 2mm diameter which possibly represent incipient manifestations of the quartz veining in the previous sample, contain rare leached out cores and some also contain muscovite. Accessory very fine leucoxene is disseminated.

BRRCD138, 63.8m

Coarse (?lithic, plagioclase) quartz sandstone with a finer meta-quartz plagioclase-rich matrix including a subordinate (biotite) muscovite schistosity. Minor grains of secondary pyrite after pyrrhotite, weakly elongate along bedding/schistosity, rarer arsenopyrite > finer chalcopyrite.

The gross mineralogy of this rock is

Quartz	50-55%
Plagioclase	25-30%
K-spar	5%
Muscovite	12%
Biotite	2-3%
Magnetite	2-3%
Secondary pyrite after pyrrhotite	5-7%
Leucoxene	<1%
Tourmaline, zircon	<1%
Arsenopyrite, chalcopyrite	

Clearly defined generally subangular grains of (mostly single-crystal) quartz-grains, 0.25mm to (rarely) 1.5mm have a random (unsorted) weakly layered distribution to form about 25% of this rock. Other, subordinate to minor detrital components within this same coarse grain size range are :

- single crystal albite, including normal and checkerboard (?albitised K-spar) varieties.
- composite quartz-albite grains
- K-spar grains
- grains derived from granophyre?
- grains of very fine (recrystallised) quartz mosaic, generally elongate (to 0.4mm x 2mm) parallel to the bedding/schistosity.
- irregular, but commonly elongated to lenticular grains of microporous secondary pyrite after pyrrhotite, mostly 0.5 to 2mm long, lying in the plane of bedding/schistosity.

These relatively coarse, 'bedded' components, collectively from 50-60% of the rock, and occur within a matrix of finer metamorphic quartz plagioclase micromosaic. This incorporates numerous closely spaced shred-like foliae of muscovite >> biotite which defines a schistosity coincidental with the crude bedding. Biotite is commonly concentrated around lenses of iron-suphide.

Accessory minerals include several euhedral crystals of arsenopyrite up to 1mm, generally accompanying iron sulphides; detrital very small zircon grains, locally with metamict cores, tourmaline and leucoxene. Rare very small grains of chalcopyrite rarely accompany pyrite grains.

This sandstone may be partly reworked from a tuffaceous and/or volcanic source.

BRRCD138, 68.05m

Massive quartzo-felspathic micromosaic rock, banded, oblique to the coarser axis on a scale of about 15mm, and variously rich in quartz, plagioclase>K-spar and biotite. Minor veinlets, crosscutting stingers of quartz + muscovite ± carbonate. A conformable vein of pyrite + biotite. Minor sericitic alteration.

The petrography and staining of the section offcut for felspars indicates that this rock consists of a heterogeneous micromosaic, grain size mostly about 0.03mm, and composed variably of quartz and different felspars. There is a central band about 15mm thick of predominantly of quartz (± albite), and diffuse bands at either end with >50% plagioclase. Minor diffuse lenses rich in K-spar separate the central quartz-rich core from one of the plagioclase-rich zones. The banding is oblique to the core axis, at about 45°.

The plagioclase-rich zone adjacent to the K-spar-rich lenses also contains subzones rich in extremely fine schistose biotite (10%).

There is a variety of relatively minor components 'superimposed' on this quartzofelspathic micromosaic :

* local discontinuous veinlets of quartz and ragged 'poikiloblastic' muscovite at a low angle to the schistosity/layering. Sparse quartz-muscovite is scattered.
* relatively thinner stringers, discontinuous, of very fine carbonate, and/or leucoxene, sparse fine muscovite, at right angles to the layering.
* a single concordant vein to 2mm of pyrite rimmed by biotite.

Weak to locally strong, very narrow sericitic alteration margins along some of these 'veins'.

BRRCD138, 69.25m

Banded micromosaic rock, with compositional contacts between zoned quartz-rich plagioclase to K-spar > quartz > biotite. This sequence in contact with a fine biotite-plagioclase-graphite schist, with a veinlet of fine microcline, plagioclase and biotite; trace pyrite. (Possibly tuffaceous).

Banding/layering in this rock is about 80° to the core axis, with almost all layers having a compact, extremely fine (0.03mm) micromosaic texture, as in most of the samples described above.

This fine granular mosaic which constitutes the main layer in this sample varies from quartz > plagioclase at one end of the section to K-spar > quartz > biotite at the other end of the band, and this end is in contact with a fine, darker, plagioclase, biotite, graphitic schist.

The quartz > plagioclase zone is microbanded with some bands having plagioclase > quartz. Most of the grains are ~30μm in size, but some larger grains of plagioclase to 200μm or more in length suggest a tuffaceous component. Accessory very fine authigenic carbonate and tourmaline, together with chlorite, leucoxene and apatite are scattered.

Fine schistose biotite, trace extremely fine graphite, leucoxene and fine pyrite increase in abundance across the K-spar-rich zone, towards the graphitic schist. Two bands rich in fine schistose biotite and leucoxene occur within this zone, locally with trace pyrite.

The layer of dark fine schist is composed essentially of biotite, plagioclase and graphite in subequal amounts, with rare fine lenses of microcline and biotite possibly representing disrupted veins. A later vein 1.5mm wide, in the graphitic schist, has microcline in a small lens at one end, but plagioclase in the remainder, as grains to 0.8mm in size. A narrow rim of biotite is present on this vein.

BRRCD138, 108.55m

Fine banded/laminated sequence of quartzo-felspathic micromosaic facies as in rocks above, variably intercalated fine quartz/graphite metasediment with fine biotite, chlorite, sericite, pyrite and rare garnet. One conformable quartz vein with relicts of adjacent rock.

This sample consists of a planar/laminated sequence, oriented at about 80° to the axis, the bands are variably light and dark coloured and consist variously of :

1) A layer, minimum thickness of about 10mm, composed of a micromosaic (0.03mm grain size) of quartz (60%), untwinned felspar (30%), sparser, equally fine biotite, graphite, leucoxene and pyrite. Minor slightly coarser pyrite occurs in small lenses with quartz and muscovite, as in several samples above.
2) Layer, 1mm thick of compact extremely fine schistose graphite, pulled apart on a fine scale into polygonal microdomains separated by sericite. This is apparently an insoluble residue adjacent to a vein. Two narrow quartz veins cut across this layer.
3) The adjacent vein is 7mm wide and consists of coarse granular quartz, containing lenses of pyrite to 4 x 2mm and narrow screens of graphite + chlorite ± sericite. One of the screens expands into an area of graphitic chert.
4) The graphite-rich selvedge on the other side of the vein is <0.5mm thick with minor sericite and rare tourmaline.
5) An 8-10mm thick band of micromosaic quartz with fine biotite, muscovite and garnet. Diffuse veins contain graphite and pyrite and there is minor leucoxene.
6) A mostly microbanded quartz/graphite unit, 20mm thick, of which the first 6mm is quartz-rich with lenses of vein quartz and patches of coarse pyrite to 3mm diameter (5-10%) also patches of muscovite and clays after biotite. The other bands are mostly planar, with nearly pure quartz mosaics and bands with 30 to nearly 100% graphite. Boudinaged layer-parallel quartz veins occur mostly in the more graphitic bands. Minor pyrite is disseminated.
7) A return to a fine mosaic of quartz (65%) and untwinned felspar (35%) with minor graphite, biotite and pyrite, locally interrupted by graphitic layers, but similar to band (1).

BRRCD118, 136.5m

Massive microcrystalline primary igneous rock of uncertain original composition possibly a biotite-porphyritic microgranitoid; possibly biotite-rich/more mafic, even lamprophyric?? Advanced pervasive sericitic alteration > scattered quartz, pyrite, finer leucoxene, sparse fine galena and trace gold. Veinlet of pyrite > leucoxene. Most pyrite probably secondary after pyrrhotite.

sericite	50%
quartz	35%
altered biotite	10%
leucoxene	1%
pyrite	3-5%
apatite	1-2

This macroscopically structureless fine rock is dominated by a microscopically rather heterogeneous mass of decussate sericite (including random fine muscovite), incorporating numerous, small (<0.5mm), rather diffuse grains of quartz as individuals, some in very small patches. Patches and fans of random biotite flakes to 2mm are scattered and have been altered to sericite + leucoxene. Pyrite occurs as disseminated patches to 1.5mm diameter, and as segments to 2mm long along narrow quartz veins (0.2 - 0.6mm wide). Much of this pyrite is secondary-marcasitic, and some is relict lamellar-form. These characteristics indicate that some, probably most pyrite, is secondary after pyrrhotite. Leucoxene is also disseminated, and occurs in the pyrite-rich vein. Abundant slender needles of apatite 5 micron x 100 micron are scattered throughout to indicate a former igneous rock. Some of the apatite needles are selectively enclosed in quartz.

The original rock type seems almost certainly to have been microcrystalline igneous. Assuming that at least some (?most) of the quartz is primary, and that the extensive sericite is altered felspar, then the primary rock would be a biotite-porphyritic microgranitoid. If the fine scattered quartz is regarded as secondary (even some late magmatic-interstitial), then the original rock may have been more basic, possibly biotite-rich, doleritic, even lamprophyric; now with advanced sericitic alteration + pyrite, sparse fine base-metal sulphides, and rare-trace gold.

BRRCD118, 146.6m

Poorly sorted, coarse quartz sandstone with a fairly extensive matrix with weakly schistose biotite, and 'clay', possibly after amphibole or pyroxene, (possibly ex-hornfelsic). Accessory fine pyrite, graphite.

quartz	55-60%
clay	30-35%
sericite	5%
biotite	5%
rutile, zircon, graphite, pyrite	accessory

Angular to subangular detrital quartz grains 0.05 to 0.5mm in size (35%) form a very loosely packed, weakly bedded aggregate basically forming a poorly sorted sandstone.

These occur within a matrix which has a micro-hornfelsic texture, with minor decussate to weakly schistose fine biotite, within a more abundant mosaic totally altered to a distinctively olive-brown, virtually isotropic clay ± sericite. Textures within the clay indicate that at least some of the original mineral had a good cleavage, and may have included amphibole or pyroxene (or biotite).

Scattered accessories include finely disseminated probable graphite, rutile, tourmaline, zircon and rare pyrite.

Some of the pyrite in this rock is in a 1-2mm wide vein of granular quartz, also contain up to 25% alkali felspar (?adularia), minor rutile, trace pyrite.

BRRCD118, 153.4m

Coarse detrital sand grains of quartz >> plagioclase > lithic weakly bedded within a finer matrix of crenulated quartz-muscovite-biotite schist. Accessory pyrite, mostly in poorly defined, discontinuous stringers. [Meta sandy pelitic facies].

quartz	55-60%
muscovite	30%
biotite	7%
plagioclase	5%
pyrite	1-2%
tourmaline, zircon, leucoxene	accessory

Angular detrital grains from 0.2mm to 1mm in size of quartz (25-30%) > plagioclase (10%) have an unsorted weakly bedded distribution throughout this rock. Rare polycrystalline quartzofelspathic grains are present.

The matrix is a fine grained quartz-sericite schist, with two schistosities at about 30° to each other (S_1 and S_2). Lenses of biotite and most of the elongate detrital grains tend to follow S_2 but more of the muscovite is parallel to S_1 than to S_2. Overprinting relationships are not clear, however, but muscovite seems to bend from S_1 to S_2.

Discontinuous planar to stylolite-like stringers of biotite ± sericite contain some of the accessory pyrite in the rock, but most in the core of a veinlet zoned outwards from pyrite to quartz to biotite.

Scattered fine accessory grains include zircon about 100μm long, brown tourmaline, and leucoxene.

BRRCD118, 161.8m

Coarse meta pelitic sandstone. Minor scattered poikiloblastic garnet grains. Matrix of retrograde quartz-chlorite-muscovite-carbonate with clays possibly after biotite and possibly partly involving silicification. Minor scattered pyrite, partly after pyrrhotite; also rarer fresh pyrrhotite, chalcopyrite, galena, sphalerite.

quartz	75%
muscovite	15%
chlorite/chlorite clays	6-7%
garnet	3-4%
leucoxene	<1%
pyrite	5-7%
carbonate, apatite	<1%
pyrrhotite, chalcopyrite, galena, sphalerite	<<1%

Up to 50% of this rock consists of poorly sorted, loose packed, weakly bedded aggregate of angular to subangular grains of quartz to 1mm in size, and possible minor lithic detritus, which are difficult to distinguish from the meta-matrix.

Scattered poikiloblastic garnet grains to 2mm long are of prograde origin. Much of the matrix however appears to have been retrogressed, with silicification accompanying the retrogression.

Random flakes of muscovite to 0.3mm size occur as fine decussate patches and as lamellae in coarse unoriented chlorite. Some separate coarse poikiloblastic muscovite is also present. Scattered patches of clays may be partly after decussate biotite, and are commonly partly rimmed by ragged sulphide grains. Minor fine carbonate is scattered but locally abundant. Abundant fine quartz intergrown with fine muscovite may be of secondary origin, suggesting incipient hydrothermal alteration.

Pyrite occurs mostly as scattered small (1-2mm) skeletal/filamentous networks; with microporous ragged grains probably after pyrrhotite. Indeed, rare grains of fresh pyrrhotite are present. Rare very small grains of chalcopyrite and galena occur locally, but only rarely directly associated with iron-sulphide. Trace sphalerite accompanies galena.

BRRCD121, 112.85m

Meta-impure sandstone, with coarse unsorted quartz sand grains weakly bedded within a random, non schistose matrix of biotite, largely retrograded to chlorite, minor garnet, finer retrograde sericite-epidote-calcite-actinolite. Accessory scattered ilmenite > pyrite > sphalerite.

quartz	50%
chlorite	15%
sericite	15%
biotite, clays	5-7%
epidote	5%
garnet	3%
calcite	3%
actinolite	2%
pyrite	<1%
ilmenite (± leucoxene)	3-5%
sphalerite	<<1%

Subangular to angular quartz grains to 1mm in maximum dimension have a similar abundance and distribution as at 118, 161.85m, poikiloblasts of garnet are also present but less abundant than in that previous sample.

This rock tends to be characterised however, by small scattered patches of randomly interlocking (i.e. distinctly non-schistose) probably prograde biotite (5-7%); and by more abundant chlorite (15%) with the same mode of occurrence as the biotite patches and almost certainly retrograde after them.

Other scattered components, variably fine grained to small patchy essentially as part of the matrix to the coarser sand grains include sericite, epidote and patches of carbonate. Some of the calcite is intergrown with actinolite and separate grains of actinolite are also present. Accessory small (0.3mm) ragged grains of opaque oxide > pyrite are scattered. Patches of clay possibly after biotite rarely enclose pyrite. The opaque oxide was identified in reflected light as ilmenite and is commonly party rimmed by leucoxene and/or 'sphene'. A ragged grains of sphalerite 0.8mm in size, encloses minute exsolution inclusions of chalcopyrite.

BRRCD123, 157.8m

Compact (quartz)-graphite rock, minor dispersed extremely fine tourmaline and quartz crystals; also numerous elliptical 'spots' with common alignment, of fine biotite, tourmaline, microcline. Rare veinlets of quartz, biotite, microcline, trace pyrite.

At least 80% of the rock consists of very compact 'dense' black opaque graphite. Numerous very small (<0.15mm) crystals of brown tourmaline and of apparent quartz and of lesser possible brown biotite are dispersed. Ultrafine quartz may be intricately mixed with the graphite but camouflaged by it.

The other approximate 20% of the rock consists of ovoid/elliptical bodies, 0.5 to 2mm, scattered at irregular intervals but with the long axis of each commonly oriented in the plane of the 'schistosity'. These are evident macroscopically. They consist of various concentrations of extremely fine and basically decussate (?altered) pale-brown biotite, fine tourmaline crystals, microcrystalline microcline and rare rutile.

Several veinlets, parallel to the long axis of the voids consist of fine quartz, tourmaline, microcline and clay-altered biotite; with rare local pyrite.

BRRCD152, 45.2m

Vaguely, irregularly lenticular-layered quartz-sericite micromosaic rock; minor 'conformable' lenses and small grains of slightly coarser quartz, sericite micro-muscovite poikiloblasts.

At least 75% of this rock consists of a vague fine, irregularly-lenticular-layered mass of cryptocrystalline to microcrystalline (micromosaic), on a scale of 20 to 50 micron. Individual grains in this micromosaic appears to be mostly quartz, but there is fairly extensive indefinite 'sericite', possibly after felspar, but the relative abundance of quartz v. felspar is indeterminate (and staining the offcut does not help).

The remaining approximate 25%, of somewhat coarser material, includes small ragged 'lenses', basically 'conformable', of quartz and/or sericite/muscovite, also of small single poikiloblastic muscovite flakes, and rare stringers of quartz in a similar plane.

These scattered heterogeneities are possibly ex-tuffaceous as noted, in some descriptions above.

BRRCD152, 47.6m

Fine weakly layered and schistose-sericitic-plagioclase-micromosaic metasediment. Minor biotite, K-spar, rarer leucoxene, also pyrite, partly in quartz-(K-spar) veinlets. Darkish small biotite lenses may be intraclasts, ?tuffaceous.

plagioclase + quartz	70%
muscovite	15%
altered biotite	5%
K-spar	5%
leucoxene	<1%
pyrite	<1%
chalcopyrite	rare-trace

Most of this sample is a very fine mosaic which appears to be predominantly plagioclase, with an extremely fine scale anastomosing schistosity, defined by fine sericitic muscovite. Rare small lenses of fine K-spar ± pyrite have a vaguely layered distribution.

The sericite outlines lenses about 1 x 0.5mm in size, poor in sericite, in a sericite-rich host. Some of these contain twinned plagioclase, but most of the mosaic consists of untwinned grains. Possible intraclasts of biotite-plagioclase-?graphite schist are also evident locally enclosing sparse extremely fine pyrite, but biotite-quartz lenses with minor sericite may represent boudinaged layers of veins of 'residual' nature. (They are enriched in leucoxene compared with the host).

Several narrow subparallel veinlets oblique to the prevailing layering contain mostly quartz with sparse fine pyrite, K-spar, altered biotite and sericite. One of these veins shows en-echelon offsetting. In polished section, the pyrite is rarely seen to be marcasitic, suggesting replacement of former pyrrhotite. Trace minute grains of chalcopyrite accompany some of the pyrite grains, in veinlets.

BRRCD152, 82.65m

Fine to coarse (unsorted) quartz sand with an extensive matrix of decussate sericite > altered biotite, possibly reconstituted sedimentary matrix ± altered lithics, but numerous minute inclusions of tourmaline suggest a largely hydrothermal-alteration genesis. Accessory disseminated pyrite after pyrrhotite.

Approximately 50% of this rock consists of quartz 'grains', variably single and composite, 0.1mm to (rarely) 1mm; the other approximate 50% consists of patchy phyllosilicates, with sericite > altered biotite, essentially as a matrix to the quartz grains, but at least partly possibly replacing former felspathic components (including possible ex-detritus).

Most of the quartz grains, particularly the coarser ones, appear to be detrital (angular to sub-rounded) and the quartz grains of fine mosaic ± felspar, appear to be lithic detritus as seen in previous samples. Finer 'blebby' quartz, within sericite, may be straightforward metamatrix material, possibly partly a 'silicification'.

The extent to which the sericite represents metamorphosed and/or altered original sedimentary matrix, versus altered lithics, is indeterminate. The scattered patchy incorporated biotite, generally altered ± leucoxene, can be compared with similar (non-schistose) biotite in other samples above. The sericite in this sample does however, incorporate more minute crystals of tourmaline > apatite > zircon, than in other meta sandstone matrices, which appear to be largely authigenic, and suggesting a dominantly hydrothermal alteration genesis for this sericite.

Accessory 3% small (to 0.6mm) grains of pyrite are scattered, most of these are seen in polished section to be microscopically porous, and marcasitic, and almost certainly pseudomorphically replace pyrrhotite.

10139E, 1552N

Quartz-biotite-sericite schist with lenses rich in altered biotite, and other clay-fine quartz ± biotite of uncertain genesis.

quartz	20%
biotite	30-35%
sericite	30%
clays	15%
leucoxene + limonite	3%

The biotite which forms about 35% of this rock is partly schistose, in discontinuous foliae, but partly occurs in closely associated lenses, where it is weakly decussate. This biotite is partly altered to clay-leucoxene-limonite, and occurs throughout a matrix of intricately mixed metamorphic microcrystalline quartz and sericite. Most of the quartz is about 0.05mm grain size, but lenses of quartz with a grain size of about 0.2mm, are scattered, and are up to 4mm long.

Lenses of clays possibly after biotite, and other clays possibly after felspar, occur locally and some of these pass into quartz-rich lenses, which may represent disrupted veins. The origin of these other lenses is not clear however.

10145.4E, 1571m

Quartz-muscovite schist with muscovite + leucoxene after biotite. Patches of limonite and leached out areas. Possibly derived from a fine to very fine pelitic sandstone.

quartz	40-45%
muscovite	50%
leucoxene	1-2%
limonite	1-2%

This rock consists essentially of schistose muscovite flakes to 0.2mm, crowded within a somewhat micro-heterogeneous metamorphic mosaic of quartz grains 0.05mm to 0.15mm in size.

Some of the muscovite has lamellar leucoxene inclusions, indicating possibly 20-25% biotite in the original rock. Minor limonite is scattered rather irregularly, locally lining leached out areas to 3mm in maximum dimension.

The rock appears to be a metamorphosed, impure (pelitic) fine to very fine grained sandstone.

Appendix 10

BKK Southern Grid, Vacdril Logs

APPENDIX 11 - LITHOLOGY

File : VD_ALL.WS 30/3/94

HoleNO	Depth(m)	East	North	South	Intvl	Litho
BKV 265	5.0	11200	1200		0 - 4	Silty clay and residual clay
					4 - 5	Clay alt. silty mic. shale
BKV 266	6.0		1150		0 - 5	Silty clay, gravel and residual clay
					5 - 6	Clay alt. mic. siltstone
BKV 267	6.0		1100		3 - 4	Silty clay and gravel
					4 - 5	Gravel and clay alt.mic. siltstone
					5 - 6	Clay alt. mic. siltstone
BKV 268	5.0		1050		0 - 4	Silty clay, sand, gravel and residual clay
					4 - 5	Clay alt. silty mic. greywacke
BKV 269	5.0		1000		0 - 4	Silty clay and residual clay
					4 - 5	Very clay alt. silty mic. greywacke
BKV 270	4.0		950		0 - 3	Silty clay, sand and gravel
					3 - 4	Very clay alt.mic. silty greywacke
BKV 271	5.0		900		0 - 4	Silty clay, stiff clay and minor gravel
					4 - 5	Very clay alt. mic. siltstone
BKV 272	3.0		850		0 - 3	Silty clay, gravel and residual clay
BKV 273	4.0		800		0 - 3	Pisolitic silty clay, gravel and stiff clay
					3 - 4	Very clay alt. mic. siltstone and silty greywacke
BKV 274	5.0		750		0 - 4	Silty clay, gravel, gravelly clay and residual clay
					4 - 5	Very clay alt. silty mic. greywacke and siltstone
BKV 275	5.0		700		0 - 4	Silty clay, sand, gravel and residual clay
					4 - 5	Very clay alt. silty mic. greywacke
BKV 276	6.0		650		0 - 5	Silty clay, sand, gravel and residual clay
					5 - 6	Clay alt. mic. silty shale and minor greywacke
BKV 277	6.0		600		0 - 5	Silty sand, gravel and residual clay
					5 - 6	Silty mic. residual greywacke/siltstone
BKV 278	8.0	10400	1050		0 - 7	Silty clay, stiff clay, sandy clay, gravel and puggy clay
					7 - 8	Very clay alt. mic. siltstone and minor greywacke
BKV 279	7.0		1000		0 - 6	Silty clay, silt, sand, gravel and residual clay
					6 - 7	Very clay alt. silty mic. greywacke
BKV 280	7.0		950		0 - 6	Silty clay, stiff clay, sand, gravel and residual clay
					6 - 7	Very clay alt. silty mic. shale
BKV 281	7.5		900		0-7.5	Silty clay, stiff clay, puggy clay and gravelly clay - NFP
BKV 282	5.0		800		0 - 4	Silty clay, gravel and residual clay
					4 - 5	Very clay alt. silty mic. shale
BKV 283	6.0		750		0 - 5	Silty clay, sand and gravel
					5 - 6	Very clay alt. mic. siltstone and minor silty greywacke
BKV 284	4.0		700		0 - 3	Silty clay, sand and gravel

					3 - 4 Very clay alt. mic. siltstone
BKV 285	1.5		650		0-1.5 Silty clay and puggy stiff clay - NFP
BKV 286	7.0		600		0 - 5 Silty clay, sand and gravel 5 - 6 Kaol. silty mic. resid. clay 6 - 7 Very clay alt.kaol. siltstone
BKV 287	6.0		550		0 - 4 Silty clay, silt, sand and gravel 4 - 5 Gravel and clay alt. silty greywacke 5 - 6 Clay alt. mic. silty greywacke
BKV 288	2.0		500		0 - 1 Silty clay 1 - 2 Clay alt. mic. shale
BKV 289	3.0		450		0 - 2 Silty clay and resid. clay 2 - 3 Very clay alt. mic. siltstone
BKV 290	3.0	11200		1600	0 - 2 Silty sand, gravel and resid. clay 2 - 3 Clay alt. mic. silty shale
BKV 291	3.0			1650	0 - 2 Silty sand, gravel and resid. clay 2 - 3 Clay alt. mic. siltstone
BKV 292	3.0			1700	0 - 2 Silty sand, eluvial gravel and resid.clay 2 - 3 Sil. mic. greywacke
BKV 293	5.0			1750	0 - 4 Silty clay, sandy clay and gravelly clay 4 - 5 Clay alt. mic. siltstone
BKV 294	6.0			1800	0 - 5 Silty clay, sand, gravel and resid. clay 5 - 6 Clay alt. sil. mic. greywacke
BKV 295	4.0			1850	0 - 3 Silty clay, sand and gravel 3 - 4 Clay alt. sil. mic. greywacke
BKV 296	3.0			1900	0 - 2 Silty clay, sand and gravel 2 - 3 Clay alt. sil. mic. greywacke
BKV 297	5.0			1950	0 - 4 Silty clay, sand, gravel and resid. clay 4 - 5 Sil. mic. greywacke
BKV 298	7.0			2000	0 - 5 Silty clay, sand and gravel 5 - 7 Clay alt. mic. siltstone
BKV 299	5.0			2050	0 - 4 Silty sand and gravel 4 - 5 Clay alt. sil. mic. greywacke
BKV 300	7.0			2100	0 - 6 Silty clay, sand, gravel and resid. clay 6 - 7 Clay alt. sil. mic. greywacke
BKV 301	7.0			2150	0 - 6 Silty clay, sand and gravel 6 - 7 Clay alt. mic. greywacke
BKV 302	7.0			2200	0 - 6 Silty clay, gravel and resid. clay 6 - 7 Clay alt. silty mic. greywacke
BKV 303	2.0			2250	0 - 1 Gravel 1 - 2 Mic. sil. greywacke
BKV 304	2.0			2300	0 - 1 Gravel

			1 - 2 Mic. sil. greywacke
BKV 305	3.0	2350	0 - 1 Silty clay and gravel 1 - 2 Gravel and sil. mic. greywacke 2 - 3 Clay alt. sil. mic. greywacke
BKV 306	6.0	2400	0 - 5 Silty clay and gravel 5 - 6 Mic. sil. greywacke
BKV 307	6.0	2450	0 - 4 Silty clay, silty sand and gravel 4 - 5 Gravel and clay alt. greywacke 5 - 6 Clay alt. sil. mic. greywacke
BKV 308	6.0	2500	0 - 4 Silty clay and gravel 4 - 5 Gravel and clay alt. greywacke 5 - 6 Sil. mic. greywacke
BKV 309	4.5	2550	0 - 4 Silty clay and residual clay 4-4.5 Sil. mic. greywacke
BKV 310	1.5	2600	0 - 1 Silt and gravel 1-1.5 Sil.mic. greywacke
BKV 311	2.0	2650	0 - 1 Gravel 1 - 2 Sil.mic. greywacke
BKV 312	2.0	2700	0 - 1 Gravel 1 - 2 Sil. mic. greywacke
BKV 313	7.0	2750	0 - 6 Silty clay, sand and gravel 6 - 7 Clay alt. mic. siltstone
BKV 314	6.0	2800	0 - 5 Silty, clay , sand and gravel 5 - 6 Sil. mic. greywacke
BKV 315	6.0	2850	0 - 5 Silty clay and sand 5 - 6 Clay alt. silty mic. greywacke
BKV 316	4.0	2900	0 - 3 Silty clay and gravel 3 - 4 Clay alt. mic. siltstone and greywacke
BKV 317	4.0	2950	0 - 3 Silty clay 3 - 4 Clay alt. mic. silty greywacke
BKV 318	3.0	3000	0 - 2 Silty clay, gravel and resid. clay 2 - 3 Clay alt. mic. greywacke
BKV 319	3.0	3050	0 - 2 Pisolitic silty clay and sand 2 - 3 Silty mic. greywacke
BKV 320	3.0	3100	0 - 2 Silty clay and gravel 2 - 3 Mic. sil. siltstone and greywacke
BKV 321	3.0	3150	0 - 2 Pisolitic silty clay, gravel and residual clay 2 - 3 Clay alt. mic. greywacke
BKV 322	3.0	3200	0 - 2 Silty clay, gravel and residual clay 2 - 3 Clay alt. mic. siltstone and minor greywacke
BKV 323	3.0	3250	0 - 2 Eluvium and resid. clay 2 - 3 Clay alt. mic. sil. siltstone

BKV 324	3.0		3500	0 - 2 Clay, silt, sand and silty sand 2 - 3 Very clay alt. mic. silty shale
BKV 325	6.0		3550	0 - 5 Silty clay, sand, gravel and residual clay 5 - 6 Very clay alt. mic. siltstone and greywacke
BKV 326	3.0		3600	0 - 2 Silty clay 2 - 3 Very clay alt. mic. siltstone
BKV 327	3.0		3650	0 - 2 Silty clay, sand and residual clay 2 - 3 Clay alt. siltstone
BKV 328	4.0		3700	0 - 3 Silty clay, sand and gravel 3 - 4 Clay alt. mic. siltstone
BKV 329	3.0		3750	0 - 2 Silty clay and resid. clay 2 - 3 Clay alt. mic. siltstone and minor geywacke
BKV 330	2.0		3800	0 - 1 Eluvium 1 - 2 Clay alt. mic. siltstone
BKV 331	3.0		4000	0 - 2 Silty clay, sand and gravel 2 - 3 Clay alt. mic. siltstone
BKV 332	2.0	10400	3250	0 - 1 Eluvium 1 - 2 Clay alt. mic. siltstone
BKV 333	2.0		3200	0 - 1 Silty clay and gravel 1 - 2 Clay alt. mic. greywacke
BKV 334	3.0		3150	0 - 2 Silty clay, gravel and mic. clay 2 - 3 Clay alt. mic. siltstone
BKV 335	3.0		3100	0 - 2 Pisolitic silty clay. sand and gravel 2 - 3 Clay alt. mic. greywacke
BKV 336	3.0		2000	0 - 2 Silty clay, eluvium and resid.clay 2 - 3 Clay alt. mic. siltstone
BKV 337	3.0		1950	0 - 2 Silty clay, eluvium and resid. clay 2 - 3 Very clay alt. mic. greywacke and siltstone
BKV 338	3.0		1900	0 - 2 Silty clay, eluvium and resid. clay 2 - 3 Clay alt. silty mic. greywacke
BKV 339	3.0		1850	0 - 2 Silty clay, eluvium and resid. clay 2 - 3 Clay alt. silty mic. greywacke
BKV 340	3.0		1800	0 - 2 Silty clay, eluvium and resid. clay 2 - 3 Clay alt. mic. greywacke
BKV 341	3.0		1750	0 - 2 Eluvium 2 - 3 Clay alt. silty mic. greywacke
BKV 342	3.0		1700	0 - 2 Eluvium and mic. resid. clay 2 - 3 Clay alt. mic. resid. greywacke
BKV 343	3.0		1650	0 - 2 Gravel and resid. clay 2 - 3 Very clay alt. silty greywacke

BKV 344	3.0			1600	0 - 2 Eluvium and resid. clay 2 - 3 Clay alt. mic. silty greywacke
BKV 345	3.0			1550	0 - 2 Eluvium and resid. clay 2 - 3 Clay alt. mic. greywacke
BKV 346	3.0			1500	0 - 2 Silty clay and resid. clay 2 - 3 Very clay alt. mic. greywacke
BKV 347	3.0			1450	0 - 2 Silty sand and silty clay 2 - 3 Very clay alt. mic. silstone
BKV 348	5.0			1400	0 - 4 Silty clay. silty sand and resid. clay 4 - 5 Clay alt. mic. greywacke
BKV 349	4.0			1350	0 - 3 Silty clay, minor gravel and resid. clay 3 - 4 Very clay alt. mic. siltstone
BKV 350	7.0			1300	0 - 6 Silt, sand and gravel 6 - 7 Clay alt. mic. greywacke
BKV 351	7.0			1250	0 - 6 Silty clay, sand, gravel and resid. clay 6 - 7 Clay alt. mic. siltstone and minor greywacke
BKV 352	7.0			1200	0 - 6 Silty clay, sand, gravel and resid. clay 6 - 7 Clay alt. siltstone
BKV 353	7.0	9600	1300		0 - 6 Silty sand, gravel and gravelly clay 6 - 7 Clay alt. mic. siltstone and greywacke
BKV 354	6.0		1250		0 - 5 Silty clay, sand, gravel and mic. clay 5 - 6 Very clay alt. mic. shale
BKV 355	4.0		1200		0 - 4 Pisolitic gravel & sand, silty clay & puggy ?resid.clay- NFP
BKV 356	5.0		1150		0 - 4 Gravel, sand and mic,. clay 4 - 5 Very clay alt. mic. shale
BKV 357	4.0		1100		0 - 3 Gravel and mic. clay 3 - 4 Very clay alt. mic. silty shale
BKV 358	4.0		1050		0 - 3 Gravel and mic. clay 3 - 4 Very clay alt. mic. silty shale
BKV 359	4.0		1000		0 - 3 Sand, gravel and mic. clay 3 - 4 Very clay alt. silty greywacke
BKV 360	4.0		950		0 - 3 Silty sand, gravel and mic. clay 3 - 4 Sil. mic. greywacke
BKV 361	5.0		900		0 - 4 Silty clay, gravelly sand and gravel 4 - 5 Clay alt. mic. greywacke
BKV 362	7.0		850		0 - 5 Silty clay, sand and gravel 5 - 7 Clay alt. mic. siltstone and greywacke
BKV 363	7.0		800		0 - 6 Silty clay, silty sand, gravel and resid. clay 6 - 7 Very clay alt. mic. siltstone
BKV 364	5.0		750		0 - 4 Silty clay, sand , gravel and resid. clay 4 - 5 Clay alt. mic. greywacke

BKV 365	7.0	700		0 - 6 Silty sand, clay, gravel and mic. clay 6 - 7 Clay alt. mic. greywacke and quartz
BKV 366	8.0	650		0 - 7 Gravel, pebbly sand and resid. clay 7 - 8 Clay alt. mic. greywacke
BKV 367	3.0	600		0 - 2 Gravel and residual clay 2 - 3 Clay alt. mic. siltstone and greywacke
BKV 368	3.0	550		0 - 2 Gravel and mic. resid. clay 2 - 3 Clay alt. mic. silty shale
BKV 369	3.0	500		0 - 2 Gravel, sand, pebbly sand and resid. clay 2 - 3 Clay alt. mic. greywacke
BKV 370	3.0	450		0 - 2 Gravel, sand and resid. clay 2 - 3 Clay alt. mic. siltstone
BKV 371	2.0	400		0 - 1 Gravel and sand 1 - 2 Sil. mic. greywacke
BKV 372	3.0	350		0 - 2 Gravel, sand and resid. clay 2 - 3 Clay alt. mic. shale
BKV 373	3.0	300		0 - 2 Gravel, sand and resid. clay 2 - 3 Very clay alt. mic. siltstone
BKV 374	3.0	250		0 - 2 Gravel, sand and silty clay 2 - 3 Clay alt. mic. shale
BKV 375	3.0	200		0 - 2 Eluvium, silty sand and mic. resid. clay 2 - 3 Clay alt. mic. silty shale
BKV 376	3.0	150		0 - 2 Pisolitic silty sand, silty clay and resid. clay 2 - 3 Clay alt. mic. greywacke
BKV 377	3.0	100		0 - 2 Silty pisolitic gravel and silty clay 2 - 3 Clay alt. mic. silstone and minor greywacke
BKV 378	5.0	50		0 - 4 Silty clay 4 - 5 Clay alt. silty mic. greywacke
BKV 379	8.0	0		0 - 7 Silty clay, silty sand, gravel and resid. clay 7 - 8 Clay alt mic. silty shale
BKV 380	7.0		50	0 - 6 Silty clay, gravel and resid. clay 6 - 7 Very clay alt. mic. silty shale
BKV 381	7.0		100	0 - 6 Silty clay, sand gravel and resid. clay 6 - 7 Clay alt. mic. greywacke
BKV 382	5.0		150	0 - 4 Silty sand, gravel and mic. clay 4 - 5 Clay alt. mic. siltstone
BKV 383	6.0		200	0 - 5 Silty clay, sand, gravel and resid. clay 5 - 6 Clay alt. mic. sil. greywacke
BKV 384	5.0		250	0 - 4 Silty sand and gravel 4 - 5 Mic. silty shale

BKV 385	7.0	300	0 - 6 Silty clay, gravel and resid. clay 6 - 7 Very clay alt. mic. greywacke
BKV 386	9.0	350	0 - 8 Silty sand, gravel and resid. clay 8 - 9 Very clay alt. mic. greywacke
BKV 387	7.0	400	0 - 6 Silty clay, stiff clay, mic. clay, silty sand & resid. clay 6 - 7 Clay alt. mic. greywacke
BKV 388	6.0	450	0 - 5 Silty clay, gravelly sand, gravel and resid. clay 5 - 6 Clay alt. mic. greywacke
BKV 389	6.0	500	0 - 5 Silty clay, silty sand, clay and gravel 5 - 6 Clay alt. mic. greywacke
BKV 390	4.0	550	0 - 3 Clay, silt, gravel and resid. clay 3 - 4 Clay alt. mic. silty shale
BKV 391	3.0	600	0 - 2 Silty clay 2 - 3 Clay alt. silty mic. shale
BKV 392	10.0	650	0 - 8 Silt, gravel, sand, pebbly sand and silty sand 8 - 9 Silty sand and clay alt. mic. greywacke 9 - 10 Very clay alt. mic. greywacke
BKV 393	3.0	700	0 - 2 Sandy gravel and clay 2 - 3 Clay alt. silty mic. shale
BKV 394	3.0	750	0 - 2 Pisolitic silty clay and mic. clay 2 - 3 Clay alt. mic. greywacke
BKV 395	3.0	800	0 - 2 Eluvium and silty clay 2 - 3 Very clay alt. silty greywacke
BKV 396	3.0	850	0 - 2 Silty clay and sandy clay 2 - 3 Clay alt. mic. greywacke
BKV 397	4.0	2750	0 - 3 Silty sand, pisolitic clay and silty clay 3 - 4 Clay alt. mic. greywacke
BKV 398	3.0	2800	0 - 2 Silty sand and clay rich pisolitic silty sand 2 - 3 Clay alt. greywacke
BKV 399	2.0	2850	0 - 1 Clay rich silty sand 1 - 2 Mic. sil. greywacke
BKV 400	3.0	2900	0 - 2 Eluvium and resid. clay 2 - 3 Clay alt. greywacke and siltstone
BKV 401	3.0	2950	0 - 2 Pisolitic gravel and sand, and mic. resid. clay 2 - 3 Clay alt. mic. siltstone
BKV 402	3.0	3000	0 - 1 Pisolitic gravel and sand 1 - 2 Pisolitic clay and mic. greywacke 2 - 3 Sil. mic. greywacke
BKV 403	3.0	3050	0 - 2 Pisolitic gravel and sand, and resid. mic. clay 2 - 3 Clay alt. mic. greywacke
BKV 404	3.0	3100	0 - 2 Silty clay 2 - 3 Very clay alt. mic. greywacke

BKV 405	3.0		3150	0 - 2 Gravel, silty clay and resid. clay 2 - 3 Clay alt. mic. greywacke
BKV 406	2.0		3200	0 - 1 Sandy gravel 1 - 2 Clay alt. mic. greywacke
BKV 407	2.0		3250	0 - 1 Gravel 1 - 2 Clay alt. mic. siltstone and minor greywacke
BKV 408	3.0		3300	0 - 2 Silty sand and clay 2 - 3 Clay alt. mic. greywacke
BKV 409	4.0		3350	0 - 3 Silty sand and gravel 3 - 4 Clay alt. mic. greywacke
BKV 410	5.0		3400	0 - 4 Silty clay and gravel 4 - 5 Clay alt. mic. siltstone and minor greywacke
BKV 411	3.0		3450	0 - 2 Silty clay and cemented silty clay 2 - 3 Clay alt. mic. greywacke
BKV 412	4.0		3500	0 - 3 Pisolitic gravel and resid. clay 3 - 4 Sil. mic. greywacke
BKV 413	4.0		3550	0 - 3 Silty sandy clay and resid. clay 3 - 4 Sil. mic. siltstone and greywacke
BKV 414	5.0		3600	0 - 4 Silty sand, sandy clay and resid. clay 4 - 5 Clay alt. silty mic. greywacke
BKV 415	5.0		3650	0 - 4 Silty sandy clay and gravelly clay 4 - 5 Clay alt. mic. siltstone
BKV 416	5.0		3700	0 - 4 Silty sand, pisolitic cemented silty clay 4 - 5 Clay alt. mic. silty greywacke
BKV 417	5.0		3750	0 - 4 Silty sand, pisolitic cemented sandy clay, silty clay & gravel 4 - 5 Clay alt. mic. greywacke
BKV 418	4.0		3800	0 - 3 Silty clay, pisolitic cemented sandy clay and gravelly clay 3 - 4 Very clay alt. greywacke
BKV 419	5.0		3850	0 - 4 Silty sand, cemented silty sand and sandy resid. clay 4 - 5 Clay alt. mic. greywacke
BKV 420	4.0		3900	0 - 2 Clay, silt and sand, and silty pisolitic gravel 2 - 3 Gravel and clay alt. greywacke 3 - 4 Mic. sil. greywacke
BKV 421	3.0		3950	0 - 2 Silty clay and pisolitic gravel 2 - 3 Clay alt. mic greywacke
BKV 422	3.0	8800	3500	0 - 2 Eluvium and stiff clay 2 - 3 Clay alt. greywacke
BKV 423	4.0		3450	0 - 3 Eluvial & pisolitic gravel, cemented pisolitic clay & silty resid.clay 3 - 4 Clay alt. mic. greywacke
BKV 424	3.0		3400	0 - 2 Silty clay, gravel and mic. clay 2 - 3 Clay alt. mic. greywacke

BKV 425	3.0			3350	0 - 1 Silty gravel 1 - 2 Silty gravel and clay alt. greywacke 2 - 3 Clay alt. mic. greywacke
BKV 426	3.0			3300	0 - 1 Silty gravel 1 - 2 Gravel and clay alt. siltstone 2 - 3 Clay alt. mic. siltstone
BKV 427	3.0			3250	0 - 1 Silty gravel 1 - 2 Silty clay and greywacke 2 - 3 Clay alt. sil. mic. greywacke
BKV 428	3.0			3200	0 - 2 Silty pisolitic gravel and stiff clay 2 - 3 Clay alt. mic. greywacke
BKV 429	3.0			3150	0 - 2 Silty sandy pisolitic gravel and stiff clay 2 - 3 Very clay alt. siltstone and minor greywacke
BKV 430	3.0			3100	0 - 2 Pisolitic sandy gravel and stiff clay 2 - 3 Clay alt. mic. siltstone
BKV 431	4.0			3050	0 - 3 Sandy pisolitic gravel, silty sand and mic. resid. clay 3 - 4 Sil. mic. siltstone and minor greywacke
BKV 432	4.0			3000	0 - 3 Silt, clay, gravelly cemented clay and gravel 3 - 4 Clay alt. sil. mic. siltstone
BKV 433	4.0			2950	0 - 3 Silty sand, cemented sandy clay, gravel and resid. clay 3 - 4 Clay alt. sil. mic. siltstone
BKV 434	4.0			2900	0 - 2 Silty sand and cemented pisolitic clay 2 - 4 Clay alt. mic. siltstone and greywacke, and quartz
BKV 435	3.0			2850	0 - 2 Gravelly sand and mic. resid. clay 2 - 3 Clay alt. sil. mic. siltstone and greywacke
BKV 436	3.0			2800	0 - 2 Gravel and mic. resid. clay 2 - 3 Clay alt. mic. siltstone and greywacke
BKV 437	4.0			2400	0 - 3 Pisolitic gravelly sand and mic. residual clay 3 - 4 Clay alt. mic. siltstone and minor greywacke
BKV 438	3.0			2350	0 - 2 Clay, minor pisolitic gravel and residual clay 2 - 3 Clay alt. mic. silty shale
BKV 439	3.0			2300	0 - 2 Stiff clay and mic. resid. clay 2 - 3 Clay alt. mic. silty shale
BKV 440	5.0			2250	0 - 4 Silty sand, gravelly sand and resid. mic. clay 4 - 5 Clay alt. mic. siltstone
BKV 441	5.0			2200	0 - 4 Silty clay and gravel 4 - 5 Clay alt. mic. greywacke
BKV 442	4.0			2150	0 - 3 Silty clay, stiff clay, gravel and resid. clay 3 - 4 Clay alt. silty mic. shale
BKV 443	3.0	8800	1350		0 - 2 Clay, gravel and chert 2 - 3 Shale minor chert 5% quartz

BKV 444	3.0	1300	0 - 2 Clay and shale 2 - 3 Clay and shale
BKV 445	3.0	1250	0 - 2 eluvial gravel 2 - 3 quartz vein, clay and shale
BKV 446	3.0	1200	0 - 2 eluvium, clay and shale 2 - 3 micaceous shale
BKV 447	4.0	1150	0 - 3 clay and shale 3 - 4 clay and shale
BKV 448	3.0	1100	0 - 2 clay and shale 2 - 3 clay and shale
BKV 449	3.0	1050	0 - 2 clay and gravel 2 - 3 shale
BKV 450	3.0	1000	0 - 2 clay and gravel 2 - 3 shale
BKV 451	4.0	950	0 - 2 clay, eluvium, quartz 2 - 3 shale, greywacke and quartz 3 - 4 greywacke and quartz
BKV 452	4.0	900	0 - 3 clay, eluvium 3 - 4 clay, shale
BKV 453	5.0	850	0 - 4 clay 4 - 5 micaceous shale
BKV 454	5.0	800	0 - 4 clay 4 - 5 clay , shale and minor calcrete
BKV 455	5.0	750	0 - 4 clay, gravel 4 - 5 micaceous shale
BKV 456	4.0	700	0 - 3 clay 3 - 4 clay and micaceous shale
BKV 457	5.0	650	0 - 4 clay 4 - 5 clay and micaceous shale
BKV 458	6.0	600	0 - 5 clay and eluvium 5 - 6 micaceous shale and clay
BKV 459	7.0	550	0 - 6 silty clay, gravel at base 6 - 7 micaceous shale and minor quartz
BKV 460	7.0	500	0 - 6 clay, gravel and eluvium 6 - 7 micaceous shale minor quartz and clay
BKV 461	6.5	450	0 - 4 clay and silt 4 - 5 gravel 5 - 6.5 gravel and eluvium (too wet to deepen)
BKV 462	8.0	400	0 - 7 silty clay 7 - 8 micaceous shale and clay
BKV 463	7.0	350	0 - 6 silt and clay 6 - 7 clay and shale

BKV 464	9.0	300		0 - 8 clay 8 - 9 greywacke minor quartz
BKV 465	8.0	250		0 - 7 silt, sand, gravel and clay 7 - 8 shale
BKV 466	8.0	200		0 - 7 sand, clay and eluvium 7 - 8 shale
BKV 467	6.0	150		0 - 5 clay, silt and eluvium 5 - 6 shale
BKV 468	7.0	100		0 - 6 clay, silt and eluvium 6 - 7 shale
BKV 469	7.0	50		0 - 6 silt, clay gravel 6 - 7 shale
BKV 470	8.0	0		0 - 7 clay, silt and eluvium 7 - 8 shale
BKV 471	7.0		50	0 - 6 clay, sand/silt 6 - 7 shale
BKV 472	8.0		100	0 - 7 clay, silt and gravel 7 - 8 shale
BKV 473	8.0		150	0 - 7 clay, silt and gravel 7 - 8 shale
BKV 474	9.0		200	0 - 8 clay, silt and gravel 8 - 9 shale
BKV 475	7.0		250	0 - 2 sand and clay 2 - 6 silt 6 - 7 micaceous shale
BKV 476	4.0		300	0 - 3 silt and clay 3 - 4 micaceous shale
BKV 477	4.0		350	0 - 2 silt and clay 2 - 3 micaceous shale 3 - 4 micaceous shale and greywacke
BKV 478	3.0		400	0 - 2 clay and micaceous shale 2 - 3 micaceous shale
BKV 479	4.0		450	0 - 3 clay 3 - 4 clay and shale
BKV 480	4.0		500	0 - 2 clay and soil 2 - 4 micaceous shale
BKV 481	3.0		550	0 - 1 clay and soil 1 - 3 clay and greywacke
BKV 482	3.0		600	0 - 1 clay and silt 1 - 3 micaceous shale and clay
BKV 483	6.0		650	0 - 4 clay and silt

			4 - 5 clay, silt and gravel 5 - 6 micaceous shale
BKV 484	3.0	700	0 - 1 clay 1 - 3 clay and shale
BKV 485	5.0	750	0 - 2 clay and sand 2 - 3 sand and gravel 3 - 4 clay and shale 4 - 5 micaceous shale
BKV 486	6.0	800	0 - 2 clay and sand 2 - 5 gravel 5 - 6 micaceous shale and greywacke
BKV 487	5.0	850	0 - 3 clay 3 - 5 clay shale and greywacke
BKV 488	5.0	900	0 - 3 silty clay 3 - 4 gravel 4 - 5 micaceous shale and greywacke
BKV 489	7.0	950	0 - 5 clay and sand 5 - 6 gravel 6 - 7 micaceous shale
BKV 490	7.0	1000	0 - 6 clay, silt and gravel 6 - 7 micaceous shale
BKV 491	4.0	1050	0 - 3 clay, silt and gravel 3 - 4 gravel, quartz- too hard
BKV 492	5.0	1100	0 - 2 silty clay 2 - 4 gravel 4 - 5 greywacke
BKV 493	6.0	1150	0 - 5 silty clay and gravel 5 - 6 shale and clay
BKV 494	3.0	1200	0 - 2 gravel 2 - 3 micaceous shale
BKV 495	3.0	1250	0 - 2 silty clay 2 - 3 gravel (too hard)
BKV 496	5.0	1300	0 - 4 clay and gravel 4 - 5 greywacke
BKV 497	6.0	1350	0 - 4 clay 4 - 5 gravel 5 - 6 greywacke and clay
BKV 498	5.0	1400	0 - 4 clay, silt and gravel 4 - 5 clay, greywacke and shale
BKV 499	5.0	1450	0 - 4 clay, silt and gravel 4 - 5 clay, greywacke and shale
BKV 500	5.0	1500	0 - 4 clay, silt and gravel 4 - 5 clay, greywacke and shale

BKV 501	5.0			1550	0 - 4 clay, silt and gravel 4 - 5 micaceous shale
BKV 502	6.0			1600	0 - 5 clay, silt and gravel 5 - 6 shale
BKV 503	6.0			1650	0 - 5 clay, silt and gravel 5 - 6 micaceous shale
BKV 504	6.0			1700	0 - 5 clay, silt and gravel 5 - 6 micaceous shale
BKV 505	7.0			1750	0 - 6 silty clay and gravel 6 - 7 greywacke
BKV 506	4.5			1800	0 - 4 silty clay 4 - 4.5 greywacke
BKV 507	7.0			1850	0 - 6 silty clay and gravel 6 - 7 greywacke
BKV 508	9.0			1900	0 - 7 silty clay and gravel 7 - 8 hematitic greywacke 8 - 9 greywacke
BKV 509	7.0			1950	0 - 6 silty clay and gravel 6 - 7 greywacke and clay
BKV 510	5.0			2000	0 - 4 silty clay and gravel 4 - 5 micaceous shale
BKV 511	6.0			2050	0 - 5 silty clay and gravel 5 - 6 micaceous shale
BKV 512	5.0			2100	0 - 4 silty clay and gravel 4 - 5 micaceous shale
BKV 513	3.0	8000	1500		0 - 2 clay and shale 2 - 3 shale
BKV 514	3.0		1450		0 - 2 gravel and clay 2 - 3 shale and minor chert
BKV 515	3.0		1400		0 - 2 clay, soil, minor shale 2 - 3 shale, minor chert
BKV 516	3.0		1350		0 - 2 clay, soil, minor shale 2 - 3 micaceous shale
BKV 517	3.0		1300		0 - 2 soil, clay, minor greywacke 2 - 3 greywacke
BKV 518	3.0		1250		0 - 2 clay, soil, minor shale 2 - 3 micaceous shale
BKV 519	3.0		1200		0 - 2 soil, clay, minor greywacke 2 - 3 greywacke
BKV 520	4.0		1150		0 - 2 soil, clay 2 - 3 gravel and quartz 3 - 4 clay and shale

BKV 521	3.0	1100	0 - 2 soil, clay and gravel 2 - 3 micaceous shale and clay
BKV 522	4.0	1050	0 - 3 soil, clay, silt and gravel 3 - 4 clay, micaceous shale
BKV 523	6.0	975	0 - 5 soil, clay and gravel 5 - 6 shale, clay
BKV 524	6.0	925	0 - 5 soil, clay and gravel 5 - 6 shale, clay
BKV 525	6.0	850	0 - 5 soil, clay and gravel 5 - 6 shale, clay
BKV 526	7.0	800	0 - 5 soil, clay and gravel 5 - 7 shale, clay
BKV 527	6.0	750	0 - 5 soil, clay and gravel 5 - 6 shale, clay
BKV 528	5.0	700	0 - 5 soil, clay and gravel(too hard)
BKV 529	7.0	650	0 - 6 soil, clay and gravel 6 - 7 shale, clay
BKV 530	7.0	600	0 - 2 clay, silt 2 - 6 gravel, clay 6 - 7 shale and clay
BKV 531	7.0	550	0 - 6 clay and gravel 6 - 7 clay and shale
BKV 532	10.0	500	0 - 9 clay and gravel 9 - 10 clay and shale
BKV 533	8.0	450	0 - 7 clay and gravel 7 - 8 clay and shale
BKV 534	9.0	400	0 - 8 clay and gravel 8 - 9 clay, micaceous shale
BKV 535	7.0	350	0 - 6 clay and gravel 6 - 7 clay and shale
BKV 536	6.0	300	0 - 5 clay, sand and gravel 5 - 6 clay and shale
BKV 537	7.0	250	0 - 6 clay, sand and gravel 6 - 7 clay and micaceous shale
BKV 538	6.0	200	0 - 5 clay, sand and gravel 5 - 6 clay and shale
ns	1.0	150	0 - 1 puggy clay - too wet, abandoned
ns	1.0	100	0 - 1 puggy clay - too wet, abandoned
ns		50	0 puggy clay - too wet, abandoned

ns		0	puggy clay and gravel - too wet, abandoned
BKV 539	5.0	50	0 - 5 clay, sand and gravel 5 - 6 shale
BKV 540	7.0	100	0 - 6 silt, sand and gravel 6 - 7 shale, quartz
BKV 541	7.0	150	0 - 6 silt, sand and gravel 6 - 7 clay, shale
BKV 542	7.0	200	0 - 6 silt, sand and gravel 6 - 7 clay, shale
BKV 543	8.0	250	0 - 7 silt, sand and gravel 7 - 8 clay, shale
ns		300	missed - isolated on island (breached meander)
ns		350	missed - isolated on island (breached meander)
BKV 544	9.0	400	0 - 8 clay, silt and gravel 8 - 9 micaceous shale and clay
BKV 545	6.0	450	0 - 5 clay, sand and gravel 5 - 6 greywacke and clay
BKV 546	6.0	500	0 - 5 clay, sand and gravel 5 - 6 greywacke and clay
BKV 547	5.0	550	0 - 3 clay, silt, gravel 3 - 5 clay and shale
BKV 548	3.0	600	0 - 2 clay and silt 2 - 3 shale
BKV 549	3.0	650	0 - 2 clay and silt 2 - 3 shale
BKV 550	3.0	700	0 - 2 clay and silt 2 - 3 clay and greywacke
BKV 551	4.0	1900	0 - 2 clay and silt 2 - 4 greywacke
BKV 552	3.0	1950	0 - 2 clay and silt 2 - 3 micaceous shale
BKV 553	3.0	2000	0 - 2 clay and silt 2 - 3 micaceous shale
BKV 554	3.0	2050	0 - 2 clay and silt 2 - 3 micaceous shale
BKV 555	3.0	2100	0 - 2 clay, silt shale and greywacke 2 - 3 shale and greywacke
BKV 556	4.0	2150	0 - 3 silt, gravel and shale 3 - 4 shale, clay
BKV 557	7.0	2200	0 - 6 clay, silt and gravel

			6 - 7 clay and greywacke
BKV 558	7.0	2250	0 - 6 clay, silt and gravel 6 - 7 clay and shale
BKV 559	5.0	2300	0 - 3 clay, silt and gravel 3 - 5 shale and greywacke
BKV 560	4.0	2350	0 - 3 clay, silt and gravel 3 - 4 chert, shale, quartz, hematite, gravel - too hard
BKV 561	5.0	2400	0 - 4 clay, silt and gravel 4 - 5 micaceous shale and calcrete
BKV 562	6.0	2450	0 - 5 clay, silt and gravel 5 - 6 shale, minor quartz
BKV 563	5.0	2500	0 - 4 clay, silt and gravel 4 - 5 clay and shale
BKV 564	6.0	2550	0 - 5 silt, clay and gravel 5 - 6 greywacke
BKV 565	5.0	2600	0 - 4 silt, clay and gravel 4 - 5 clay and shale
BKV 566	6.0	2650	0 - 5 silt, clay and gravel 5 - 6 shale and greywacke
BKV 567	3.0	2700	0 - 2 silt, clay 2 - 3 micaceous shale and clay
BKV 568	4.0	2750	0 - 3 silt, clay and gravel 3 - 4 shale and clay
BKV 589	4.0	2800	0 - 4 clay and silt 4 - 5 clay and greywacke
BKV 570	4.0	2850	0 - 3 clay and silt 3 - 4 micaceous shale and clay
BKV 571	7.0	2900	0 - 6 clay, silt and gravel 6 - 7 micaceous shale
BKV 572	3.0	2950	0 - 2 silt and clay 2 - 3 greywacke
BKV 573	3.0	3000	0 - 2 silt and clay 2 - 3 micaceous shale
BKV 574	3.0	3050	0 - 2 silt and clay 2 - 3 greywacke and minor quartz
BKV 575	5.0	3100	0 - 4 silt, clay and gravel 4 - 5 shale and clay
BKV 576	4.0	3150	0 - 3 silt, clay and gravel 3 - 4 greywacke
BKV 577	4.0	3200	0 - 3 clay and minor silt 3 - 4 micaceous shale and clay

BKV 578	3.0		3250	0 - 2 clay and silt 2 - 3 micaceous shale
BKV 579	3.0		3300	0 - 2 clay and silt 2 - 3 micaceous shale, clay
BKV 580	3.0		3350	0 - 2 clay and silt 2 - 3 micaceous shale, clay
BKV 581	5.0		3400	0 - 4 silt, clay, sand, gravel 4 - 5 micaceous shale, clay
BKV 582	5.0		3450	0 - 4 silt, clay, sand, gravel (NB. Possibble mismatch with BKV 583) 4 - 5 micaceous shale, clay (sample numbers doubled)
BKV 583	3.0		3500	0 - 2 silt, clay and gravel 2 - 3 micaceous shale, clay
BKV 584	3.0		3550	0 - 2 silt, clay and minor shale 2 - 3 micaceous and hematitic shale
BKV 585	3.0		3600	0 - 2 silt, clay and gravel 2 - 3 micaceous shale and clay
BKV 586	3.0		3650	0 - 2 silt, clay 2 - 3 clay and greywacke
BKV 587	5.0		3700	0 - 4 silt, gravel and clay 4 - 5 clay, micaceous shale
BKV 588	3.0	7200	2500	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 589	3.0		2450	0 - 2 silt, clay, gravel 2 - 3 micaceous shale
BKV 590	3.0		2400	0 - 2 silt, clay, gravel 2 - 3 micaceous shale
BKV 591	3.0		2350	0 - 1 silt, clay 1 - 3 micaceous shale and greywacke
BKV 592	3.0		2300	0 - 1 silt, clay 1 - 3 micaceous shale
BKV 593	3.0		2250	0 - 2 silt and clay 2 - 3 micaceous shale
BKV 594	4.0		2200	0 - 3 clay, silt and weathered shale 3 - 4 sericitic shale, clay and 5% quartz
BKV 595	3.0		2150	0 - 2 silt and clay 2 - 3 greywacke
BKV 596	3.0		2100	0 - 2 silt and clay 2 - 3 micaceous shale, 2% quartz
BKV 597	3.0		2050	0 - 2 silt and clay 2 - 3 greywacke

BKV 598	3.0			2000	0 - 2 clay and silt 2 - 3 micaceous greywacke
BKV 599	3.0			1950	0 - 2 clay and silt 2 - 3 micaceous shale
BKV 600	3.0			1900	0 - 2 clay, silt and weathered greywacke 2 - 3 sericitic greywacke
BKV 601	3.0			500	0 - 2 silt, gravel 2 - 3 clay, micaceous shale
BKV 602	3.0			450	0 - 2 silt, gravel 2 - 3 clay, micaceous shale, chert?
BKV 603	3.0			400	0 - 2 silt, clay 2 - 3 clay, micaceous shale
BKV 604	9.0			350	0 - 8 silt, sand, gravel 8 - 9 micaceous shale
BKV 605	6.0			300	0 - 5 silt, sand, gravel 5 - 6 micaceous shale
BKV 606	3.0			250	0 - 2 silt, sand, gravel 2 - 3 micaceous shale and greywacke
BKV 607	4.0			200	0 - 3 sand, clay 3 - 4 clay, micaceous shale
BKV 608	5.0			150	0 - 4 silt, sand, gravel 4 - 5 micaceous shale
BKV 609	4.0			100	0 - 4 silt, sand, gravel - too hard
BKV 610	7.0			50	0 - 6 clay, sand, gravel 6 - 7 clay, micaceous shale
BKV 611	10.0	7200		0	0 - 9 silt, sand, gravel 9 - 10 micaceous shale
BKV 612	9.0	7200	50		0 - 8 silt, sand, clay 8 - 9 micaceous shale
BKV 613	6.0		100		0 - 5 clay, gravel 5 - 6 micaceous shale
BKV 614	5.0		150		0 - 4 clay, sand, gravel 4 - 5 clay, micaceous shale
BKV 615	7.0		200		0 - 5 clay, sand, gravel 5 - 7 clay, micaceous shale
BKV 616	7.0		250		0 - 6 clay, gravel 6 - 7 micaceous shale
BKV 617	6.0		300		0 - 5 silt, clay, gravel 5 - 6 micaceous shale
BKV 618	6.0		350		0 - 5 clay, gravel 5 - 6 micaceous shale, clay

BKV 619	7.0	400	0 - 6 silt, clay, gravel 6 - 7 clay, micaceous shale
BKV 620	6.0	450	0 - 5 silt, clay 5 - 6 shale
BKV 621	7.0	500	0 - 6 silt, clay, gravel 6 - 7 micaceous shale and greywacke
BKV 622	8.0	550	0 - 7 silt, clay, gravel 7 - 8 shale, trace quartz
BKV 623	6.0	600	0 - 5 silt, clay, gravel 5 - 6 micaceous shale and quartz vein.
BKV 624	7.0	650	0 - 6 silt, clay, gravel 6 - 7 shale
BKV 625	7.0	700	0 - 6 silt, clay, gravel 6 - 7 clay, shale
BKV 626	4.0	750	0 - 3 silt, clay 3 - 4 greywacke
BKV 627	3.0	800	0 - 2 silt, clay 2 - 3 shale, greywacke
BKV 628	3.0	850	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 629	2.0	900	0 - 1 silt 1 - 2 micaceous shale
BKV 630	5.0	950	0 - 2 silt, clay 2 - 5 micaceous shale, clay
BKV 631	3.0	1000	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 632	3.0	1050	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 633	4.0	1100	0 - 3 silt, clay 3 - 4 micaceous shale and minor quartz
BKV 634	3.0	1150	0 - 1 silt 1 - 3 micaceous shale and greywacke
BKV 635	2.0	1200	0 - 1 silt, gravel 1 - 2 greywacke
BKV 636	3.0	1250	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 637	2.0	1300	0 - 1 silt 1 - 2 micaceous shale
BKV 638	2.0	1350	0 - 1 silt 1 - 2 micaceous shale

BKV 639	3.0	6400	1650	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 640	2.0		1600	0 - 1 silt 1 - 2 micaceous shale, quartz
BKV 641	3.0		1550	0 - 1 silt 1 - 3 micaceous shale
BKV 642	2.0		1500	0 - 1 silt, micaceous shale 1 - 2 micaceous shale and sugary quartz
BKV 643	2.0		1450	0 - 1 silt, micaceous shale 1 - 2 micaceous shale
BKV 644	3.0		1400	0 - 2 silt, gravel 2 - 3 greywacke
BKV 645	4.0		1350	0 - 4 silt, clay 4 - 5 micaceous shale
BKV 646	4.0		1300	0 - 3 silt, clay 3 - 4 micaceous shale
BKV 647	3.0		1250	0 - 2 silt, clay 2 - 3 micaceous shale, clay
BKV 648	3.0		1200	0 - 2 silt, clay 2 - 3 greywacke
BKV 649	3.0		1150	0 - 2 silt, clay 2 - 3 sericitic shale
BKV 650	4.0		1100	0 - 3 silt, clay 3 - 4 clay and greywacke
BKV 651	3.0		1050	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 652	3.0		1000	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 653	2.0		950	0 - 1 silt 1 - 2 micaceous shale
BKV 654	3.0		900	0 - 1 silt 1 - 3 clay, greywacke
BKV 655	2.0		850	0 - 1 silt, micaceous shale 1 - 2 micaceous shale
BKV 656	3.0		800	0 - 2 silt, clay 2 - 3 clay, micaceous shale
BKV 657	3.0		750	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 658	3.0		700	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 659	3.0		650	0 - 2 silt, clay

				2 - 3 micaceous shale
BKV 660	3.0	600		0 - 2 silt, clay 2 - 3 clay, greywacke
BKV 661	3.0	550		0 - 2 silt, clay 2 - 3 micaceous shale
BKV 662	3.0	500		0 - 2 silt, clay 2 - 3 micaceous shale
BKV 663	4.0	450		0 - 3 silt, clay 3 - 4 clay, greywacke
BKV 664	3.0	400		0 - 2 silt, clay 2 - 3 clay, greywacke
ns	1.0	350		0 - 1 wet puggy clay
BKV 665	3.0	300		0 - 2 silt, clay 2 - 3 clay, greywacke
BKV 666	3.0	250		0 - 2 silt, clay 2 - 3 clay, micaceous shale
BKV 667	4.0	200		0 - 3 silt, clay 3 - 4 greywacke
BKV 668	4.0	150		0 - 3 silt, clay 3 - 4 micaceous shale
BKV 669	4.0	100		0 - 3 silt, clay 3 - 4 micaceous shale
BKV 670	7.0	50		0 - 6 silt, clay 6 - 7 micaceous shale
BKV 671	7.0	0		0 - 6 silt, clay 6 - 7 quartz, limonite, shale?
BKV 672	5.0		50	0 - 4 silt, clay 4 - 5 micaceous shale
BKV 673	4.0		100	0 - 3 silt, clay 3 - 4 micaceous shale
BKV 674	7.0		150	0 - 6 silt, sand, gravel 6 - 7 micaceous shale
BKV 675	9.5		200	0 - 9 silt, sand, gravel 9 - 9.5 clay
BKV 676	9.0		250	0 - 8 silt, sand, gravel, clay 8 - 9 micaceous shale
BKV 677	7.0		300	0 - 6 silt, sand, gravel, clay 6 - 7 micaceous shale
BKV 678	5.0		350	0 - 4 silt, clay 4 - 5 clay, greywacke

BKV 679	7.0	400	0 - 6 silt, sand, gravel, clay 6 - 7 sericitic shale, clay
BKV 680	5.0	450	0 - 4 silt, clay, sand 4 - 5 micaceous shale
BKV 681	5.0	500	0 - 4 silt, clay, gravel 4 - 5 micaceous shale
BKV 682	5.0	550	0 - 4 silt, clay, gravel 4 - 5 micaceous shale
BKV 683	5.0	600	0 - 4 silt, gravel, clay 4 - 5 micaceous shale, clay
BKV 684	4.0	650	0 - 3 silt, clay, gravel 3 - 4 clay, micaceous shale
BKV 685	5.0	700	0 - 4 silt, clay, gravel 4 - 5 micaceous shale
BKV 686	3.0	750	0 - 2 silt, clay 2 - 3 micaceous shale, clay
BKV 687	3.0	800	0 - 2 silt, clay 2 - 3 clay, micaceous shale
BKV 688	4.0	850	0 - 3 silt, clay 3 - 4 micaceous shale, clay
BKV 689	4.5	900	0 - 4 clay, silt, gravel 4 - 4.5 greywacke
BKV 690	3.0	950	0 - 2 silt, clay 2 - 3 greywacke
BKV 691	3.5	1000	0 - 3 silt, clay, greywacke 3 - 3.5 greywacke
BKV 692	3.0	1050	0 - 2 silt, clay 2 - 3 clay, shale
BKV 693	3.0	1100	0 - 2 silt, clay 2 - 3 clay, shale
BKV 694	4.0	1150	0 - 3 silt, clay, gravel 3 - 4 micaceous shale
ns		1200	Middle of dam
BKV 695	4.0	1250	0 - 3 silt, clay, gravel 3 - 4 clay, micaceous shale
BKV 696	4.0	1300	0 - 3 silt, clay 3 - 4 clay, shale
BKV 697	4.0	1350	0 - 3 silt, clay 3 - 4 clay, shale
BKV 698	4.0	1400	0 - 3 silt, clay 3 - 4 clay, shale

BKV 699	5.0	1450	0 - 4 silt, clay, gravel, quartz 4 - 5 clay, greywacke
BKV 700	3.0	1500	0 - 2 silt, clay 2 - 3 clay, shale
BKV 701	5.0	1550	0 - 4 silt, clay, sand, gravel, quartz 4 - 5 micaceous shale
BKV 702	4.0	1600	0 - 3 silt, clay, gravel 3 - 4 clay, micaceous shale
BKV 703	4.0	1650	0 - 3 silt 3 - 4 clay, micaceous shale
BKV 704	4.0	1700	0 - 3 clay, gravel 3 - 4 clay, micaceous shale
BKV 705	4.0	1750	0 - 3 silt, clay 3 - 4 greywacke
BKV 706	4.0	1800	0 - 3 silt, clay 3 - 4 greywacke
BKV 707	5.0	1850	0 - 4 clay, gravel 4 - 5 clay, micaceous shale
BKV 708	5.0	1900	0 - 4 silt, clay 4 - 5 micaceous shale
BKV 709	4.5	1950	0 - 4 silt, clay, sand gravel 4 - 4.5 gravel - too hard
BKV 710	4.0	2000	0 - 3 silt, clay, gravel 3 - 4 micaceous shale, greywacke
BKV 711	4.0	2050	0 - 3 silt, clay, gravel 3 - 4 clay, shale
BKV 712	4.0	2100	0 - 3 silt, clay 3 - 4 quartz, clay, gravel
BKV 713	3.0	2150	0 - 2 silt, gravel 2 - 3 gravel, clay, quartz
BKV 714	6.0	2200	0 - 4 silt, gravel, clay 4 - 6 clay, quartz, micaceous shale
BKV 715	3.0	2250	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 716	4.0	2300	0 - 3 silt, clay, gravel 3 - 4 clay, micaceous shale
BKV 717	4.0	2350	0 - 3 silt, clay, gravel 3 - 4 clay, micaceous shale
BKV 718	4.0	2400	0 - 3 silt, clay, gravel 3 - 4 clay, micaceous shale

BKV 719	3.0		2450	0 - 2 silt, clay 2 - 3 clay, greywacke
BKV 720	3.0	6400	2500	0 - 2 silt, clay 2 - 3 greywacke, clay
BKV 721	4.0	5600	2350	0 - 3 silt, clay, gravel 3 - 4 micaceous shale
BKV 722	6.0		2300	0 - 5 silt, sand, clay, gravel 5 - 6 micaceous shale
BKV 723	6.0		2250	0 - 5 silt, sand, gravel 5 - 6 micaceous shale
BKV 724	5.0		2200	0 - 4 silt, clay 4 - 5 clay, micaceous shale, chert?
BKV 725	5.0		2150	0 - 4 silt, sand, gravel, clay 4 - 5 micaceous shale
BKV 726	5.0		2100	0 - 4 silt 4 - 5 hematitic greywacke
BKV 727	6.0		2050	0 - 5 silt, clay, gravel 5 - 6 clay, shale
BKV 728	5.0		2000	0 - 4 silt, clay, gravel 4 - 5 clay, shale
BKV 729	4.0		1950	0 - 3 clay, silt 3 - 4 micaceous shale
BKV 730	3.0		1900	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 731	3.0		1850	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 732	3.0		1800	0 - 2 silt, clay 2 - 3 micaceous greywacke and shale
BKV 733	3.0		1750	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 734	3.0		1700	0 - 2 silt, clay 2 - 3 shale
BKV 735	3.0		1650	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 736	3.0		1600	0 - 2 silt, clay 2 - 3 greywacke
BKV 737	3.0		1550	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 738	3.0		1500	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 739	2.0		1150	0 - 1 silt, shale

			1 - 2 sericitic shale
BKV 740	2.0	1100	0 - 1 gravel 1 - 2 sericitic greywacke and quartz
BKV 741	3.0	1050	0 - 2 silt, gravel, shale 2 - 3 micaceous shale
BKV 742	3.0	1000	0 - 2 silt, gravel 2 - 3 micaceous shale
BKV 743	3.0	900	0 - 2 silt, gravel 2 - 3 micaceous shale
BKV 744	4.0	850	0 - 3 silt, clay 3 - 4 micaceous shale, trace quartz
BKV 745	4.0	800	0 - 3 silt, clay, gravel 3 - 4 shale, clay
BKV 746	4.0	750	0 - 3 silt, clay 3 - 4 micaceous shale
BKV 747	4.0	700	0 - 3 silt, clay 3 - 4 micaceous shale
BKV 748	3.0	650	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 749	3.0	600	0 - 2 silt, clay 2 - 3 greywacke, clay
BKV 750	3.0	550	0 - 2 silt, clay 2 - 3 micaceous shale, clay
BKV 751	2.0	500	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 752	3.0	450	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 753	3.0	400	0 - 2 silt, clay, gravel 2 - 3 micaceous shale
BKV 754	2.0	350	0 - 1 silt, micaceous shale 1 - 2 micaceous shale
BKV 755	2.0	300	0 - 1 silt, micaceous shale 1 - 2 micaceous shale
BKV 756	2.0	250	0 - 1 silt, micaceous shale 1 - 2 micaceous shale, clay
BKV 757	3.0	200	0 - 2 silt, clay 2 - 3 clay, micaceous shale
BKV 758	9.0	150	0 - 8 silt, clay, sand and gravel 8 - 9 clay, quartz
BKV 759	9.0	100	0 - 8 silt, clay, sand and gravel 8 - 9 micaceous shale

BKV 760	9.0	50	0 - 8 silt, clay, sand and gravel 8 - 9 micaceous shale
BKV 761	8.0	0	0 - 7 silt, clay, sand and gravel 7 - 8 micaceous shale
BKV 762	6.0	50	0 - 5 silt, sand, clay 5 - 6 micaceous shale
BKV 763	5.0	100	0 - 4 silt, clay 4 - 5 strongly sericitic shale
BKV 764	5.0	150	0 - 4 silt, clay 4 - 5 clay, micaceous shale
BKV 765	5.0	200	0 - 4 silt, clay, gravel 4 - 5 sericitic shale, minor quartz
BKV 766	2.0	250	0 - 1 silt, micaceous shale 1 - 2 micaceous shale
BKV 767	3.0	300	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 768	2.0	350	0 - 1 silt, gravel 1 - 2 micaceous shale, greywacke
BKV 769	3.0	400	0 - 2 silt, clay 2 - 3 micaceous shale, clay
BKV 770	2.0	450	0 - 1 clay, silt 1 - 2 micaceous shale, clay
BKV 771	2.0	500	0 - 1 Quartz, shale 1 - 2 micaceous shale and quartz vein.
BKV 772	2.0	550	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 773	2.0	600	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 774	3.0	650	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 775	2.0	700	0 - 1 silt, clay 1 - 2 clay, shale
BKV 776	3.0	750	0 - 2 silt, clay 2 - 3 greywacke
BKV 777	2.0	800	0 - 1 silt, clay 1 - 2 greywacke
BKV 778	2.0	850	0 - 1 silt 1 - 2 micaceous shale
BKV 779	3.0	900	0 - 2 silt, clay, gravel 2 - 3 micaceous shale

BKV 780	3.0		950	0 - 2 silt, clay shale 2 - 3 very micaceous shale
BKV 781	2.0		1000	0 - 1 silt 1 - 2 greywacke
BKV 782	2.0		1050	0 - 1 silt 1 - 2 micaceous shale
BKV 783	3.0		1100	0 - 2 silt, clay, shale 2 - 3 micaceous shale
BKV 784	2.0		1150	0 - 1 silt, shale 1 - 2 micaceous shale
			1500	Not Drilled
			1550	Not Drilled
			1600	Not Drilled
			1650	Not Drilled

Brocks Creek, Howley Creek Prospect, Vacuum drill Logs

BKV 825	3	13300	1500	0 - 2 silt, clay 2 - 3 spotted micaceous shale
BKV 826	3		1450	0 - 2 silt, clay 2 - 3 spotted micaceous shale
BKV 827	4		1400	0 - 3 silt, clay, gravel 3 - 4 micaceous shale, chert
BKV 828	2		1350	0 - 1 silt 1 - 2 pughy clay - too wet
BKV 829	1		1300	0 - 1 silt, puggy wet clay
BKV 830	4		1250	0 - 3 silt, sand, gravel 3 - 4 micaceous shale, chert, trace quartz
BKV 831	4		1200	0 - 3 silt, sand, gravel 3 - 4 micaceous shale
BKV 832	1		1150	0 - 1 puggy clay - too wet
BKV 833	5		1100	0 - 4 silt, clay 4 - 5 clay, micaceous shale
BKV 834	5		1050	0 - 4 silt, sand, gravel 4 - 5 clay, shale
BKV 835	5		1000	0 - 4 silt, sand, gravel 4 - 5 shale, chert, garnet BIF?
BKV 836	5		950	0 - 4 silt, clay, sand, gravel 4 - 5 micaceous shale
BKV 837	4		900	0 - 3 silt, sand 3 - 4 micaceous shale

BKV 838	6	850		0 - 5 silt, sand 5 - 6 micaceous shale, clay
BKV 839	6	800		0 - 5 clay, sand, gravel 5 - 6 shale, greywacke
BKV 840	5	750		0 - 4 sand, clay, gravel 4 - 5 greywacke, 5% quartz
BKV 841	6	700		0 - 5 clay, gravel 5 - 6 greywacke, minor quartz
BKV 842	5	650		0 - 4 clay, sand 4 - 5 greywacke, 10% quartz
BKV 843	3	600		0 - 2 clay, silt, shale 2 - 3 micaceous shale, tr quartz
BKV 844	2	550		0 - 1 silt, clay 1 - 2 greywacke
BKV 845	3	500		0 - 2 silt, clay 2 - 3 micaceous shale
BKV 846	1	450		0 - 1 micaceous shale, greywacke
BKV 847	2	400		0 - 2 stiff wet clay
BKV 848	2	350		0 - 1 clay, silt 1 - 2 micaceous shale
BKV 849	2	300		0 - 1 silt, clay 1 - 2 micaceous shale
BKV 850	2	250		0 - 1 silt, clay 1 - 2 greywacke, clay
BKV 851	3	200		0 - 2 silt, clay 2 - 3 greywacke, clay
BKV 852	2	150		0 - 1 silt, clay 1 - 2 greywacke, clay
BKV 853	3	100		0 - 2 silt, clay 2 - 3 greywacke
BKV 854	2	50		0 - 1 silt, greywacke 1 - 2 greywacke
BKV 855	3	0		0 - 2 silt, clay 2 - 3 micaceous shale
BKV 856	1		50	0 - 1 stiff wet clay
BKV 857	2		100	0 - 1 clay 1 - 2 micaceous shale
BKV 858	2		150	0 - 1 silt, clay 1 - 2 greywacke , clay
BKV 859	2		200	0 - 1 silt, clay

					1 - 2 greywacke , clay
BKV 860	2			250	0 - 1 silt 1 - 2 greywacke
BKV 861	2			300	0 - 1 silt 1 - 2 greywacke
BKV 862	2			350	0 - 1 silt 1 - 2 greywacke
BKV 863	2			400	0 - 1 silt 1 - 2 greywacke
BKV 864	2			450	0 - 1 silt 1 - 2 shale
BKV 865	3			500	0 - 2 clay 2 - 3 micaceous shale
BKV 866	2	16000	1300		0 - 1 clay 1 - 2 greywacke
BKV 867	2	16000	1350		0 - 1 silt 1 - 2 greywacke
BKV 868	2	16000	1400		0 - 1 silt, clay 1 - 2 shale
BKV 869	2	16000	1450		0 - 1 silt, clay 1 - 2 greywacke
BKV 870	2	16000	1500		0 - 1 silt, greywacke 1 - 2 greywacke
BKV 871	2	16000	1550		0 - 1 silt, pisoliths 1 - 2 greywacke
BKV 872	2	16000	1600		0 - 1 silt, shale 1 - 2 micaceous shale
BKV 873	3	16000	1650		0 - 2 clay, gravel, shale 2 - 3 shale
BKV 874	3	16000	1700		0 - 2 clay, gravel, shale 2 - 3 shale
BKV 875	1	16000	1750		0 - 1 greywacke
BKV 876	2	16000	1800		0 - 1 silt, shale 1 - 2 micaceous shale
BKV 877	2	16000	1850		0 - 1 silt, shale 1 - 2 micaceous shale
BKV 878	2	16000	1900		0 - 1 silt, shale 1 - 2 micaceous shale
BKV 879	2	16000	1950		0 - 1 silt, shale 1 - 2 micaceous shale

BKV 880	3	16000	2000	0 - 2 silt, clay 2 - 3 limonite, shale, 10% quartz
BKV 881	2	16000	2050	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 882	2	16000	2100	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 883	2	16000	2150	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 884	2	16000	2200	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 885	2	16000	2250	0 - 1 silt, clay 1 - 2 micaceous shale, 10% quartz
BKV 886	3	16000	2300	0 - 2 silt, clay 2 - 3 clay, greywacke
BKV 887	2	16000	2350	0 - 1 silt, clay 1 - 2 shale
BKV 888	3	16000	2400	0 - 2 silt, clay, shale 2 - 3 shale
BKV 889	2	16000	2450	0 - 1 silt, shale 1 - 2 shale
BKV 890	2	16000	2500	0 - 1 silt, greywacke 1 - 2 greywacke
BKV 891	2	16000	2550	0 - 1 silt, greywacke 1 - 2 greywacke
BKV 892	2	16000	2600	0 - 1 silt, greywacke 1 - 2 greywacke
BKV 893	2	16000	2650	0 - 1 silt 1 - 2 micaceous shale
BKV 894	3	16000	2700	0 - 2 clay, silt, shale 2 - 3 micaceous shale
BKV 895	2	16000	2750	0 - 1 silt, clay 1 - 2 greywacke
BKV 896	3	16000	2800	0 - 2 silt, clay, shale 2 - 3 spotted micaceous shale
BKV 897	3	16000	2850	0 - 2 silt, clay, shale 2 - 3 micaceous shale, clay
BKV 898	4	16000	2900	0 - 2 silt, clay 2 - 3 micaceous shale, chert?, clay
BKV 899	3	16000	2950	0 - 2 silt, clay, greywacke 2 - 3 greywacke, 5% quartz
BKV 900	3	16000	3000	0 - 2 silt, sandy clay

				2 - 3 greywacke
BKV 901	3	16000	3050	0 - 2 silt, sand, cemented gravel 2 - 3 clay, greywacke
BKV 902	2	16000	3100	0 - 1 silt, clay 1 - 2 clay, greywacke
BKV 903	2	16000	3150	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 904	2	16000	3200	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 905	2	16000	3250	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 906	3	16000	3300	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 907	5	16000	3350	0 - 4 silt, clay, greywacke 4 - 5 clay, greywacke
BKV 908	3	16000	3400	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 909	2	17000	3700	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 910	2	17000	3650	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 911	2	17000	3600	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 912	2	17000	3550	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 913	2	17000	3500	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 914	2	17000	3450	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 915	3	17000	3400	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 916	2	17000	3350	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 917	3	17000	3300	0 - 2 silt, clay, quartz gravel 2 - 3 clay, shale
BKV 918	3	17000	3250	0 - 2 silt, clay 2 - 3 clay, shale
BKV 919	2	17000	3200	0 - 1 silt, clay 1 - 2 clay, shale
BKV 920	2	17000	3150	0 - 1 silt, clay 1 - 2 shale, minor quartz

BKV 921	2	17000	3100	0 - 1 silt, clay 1 - 2 greywacke
BKV 922	3	17000	3050	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 923	3	17000	3000	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 924	2	17000	2950	0 - 1 silt, clay 1 - 2 micaceous shale
BKV 925	2	17000	2900	0 - 1 silt, clay 1 - 2 greywacke
BKV 926	2	17000	2850	0 - 1 silt, clay 1 - 2 greywacke
BKV 927	3	17000	2800	0 - 2 silt, clay, greywacke 2 - 3 clay, greywacke
BKV 928	3	17000	2750	0 - 2 silt, clay, greywacke 2 - 3 greywacke, 10%quartz, limonite
BKV 929	3	17000	2700	0 - 2 silt, clay, greywacke 2 - 3 clay, greywacke
BKV 930	3	17000	2650	0 - 2 silt, clay, greywacke 2 - 3 clay, greywacke
BKV 931	3	17000	2600	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 932	3	17000	2550	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 933	3	17000	2500	0 - 2 silt, clay 2 - 3 micaceous shale
BKV 934	2	17000	2450	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 935	2	17000	2400	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 936	3	17000	2350	0 - 2 silt, micaceous shale 2 - 3 micaceous shale
BKV 937	2	17000	2300	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 938	3	17000	2250	0 - 2 silt, clay, shale 2 - 3 micaceous shale
BKV 939	2	17000	2200	0 - 1 silt, shale 1 - 2 micaceous shale
BKV 940	2	17000	2150	0 - 1 silt, shale 1 - 2 greywacke

BKV 941	2	17000	2100	0 - 1 shale 1 - 2 micaceous shale
BKV 942	3	17000	2050	0 - 2 silt, shale 2 - 3 micaceous shale
BKV 943	3	17000	2000	0 - 2 silt, shale 2 - 3 siliceous shale
BKV 944	5	17000	1950	0 - 4 silt, clay 4 - 5 clay, shale?/mafic?, 10% quartz
BKV 945	3	17000	1900	0 - 2 silt, clay, micaceous shale 2 - 3 micaceous shale
BKV 946	2	17000	1850	0 - 1 silt, clay 1 - 2 greywacke
BKV 947	2	17000	1800	0 - 1 silt, greywacke 1 - 2 lithic greywacke

APPENDIX 11 - ASSAYS

Vacumm Bedrock Drilling File: VACSARPT.WS 30/03/94

Prospect	HoleID	North	East	mRL	AuAVG ppb	AsAVG ppm	Au ppm 0.01	Au(R) ppm 0.01	As ppm 1	Au ppb 1	Au(R) ppb 1	Au(R) ppb 1	Cu ppm 1	Pb ppm 2	Zn ppm 1	Ag ppm 0.5
	11181															
	E30194									11181 E3019811363						
SouthREG	BKV265	1200.0	11200.0	1000.0	6	81	L	-	81	6	6	-	43	30	104	L
SouthREG	BKV266	1150.0	11200.0	1000.0	3	28	L	-	28	3	-	-	22	22	63	L
SouthREG	BKV267	1100.0	11200.0	1000.0	1	18	L	-	18	1	1	-	13	15	72	L
SouthREG	BKV268	1050.0	11200.0	1000.0	5	11	L	-	11							
SouthREG	BKV269	1000.0	11200.0	1000.0	5	6	L	-	6							
SouthREG	BKV270	950.0	11200.0	1000.0	5	8	L	-	8							
SouthREG	BKV271	900.0	11200.0	1000.0	5	4	L	L	4							
SouthREG	BKV272	850.0	11200.0	1000.0	5	4	L	-	4							
SouthREG	BKV273	800.0	11200.0	1000.0	5	4	L	-	4							
SouthREG	BKV274	750.0	11200.0	1000.0	5	4	L	-	4							
SouthREG	BKV275	700.0	11200.0	1000.0	5	3	L	-	3							
SouthREG	BKV276	650.0	11200.0	1000.0	5	2	L	-	2							
SouthREG	BKV277	600.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV278	1050.0	10400.0	1000.0	5	3	L	L	3							
SouthREG	BKV279	1000.0	10400.0	1000.0	5	4	L	-	4							
SouthREG	BKV280	950.0	10400.0	1000.0	1	4	L	-	4	1	-	-	28	12	93	L
SouthREG	BKV281	900.0	10400.0	1000.0	5	82	L	-	82	5	-	-	34	38	31	L
SouthREG	BKV282	800.0	10400.0	1000.0	2	4	L	-	4	2	-	-	37	15	91	L
SouthREG	BKV283	750.0	10400.0	1000.0	5	1	L	-	1							
SouthREG	BKV284	700.0	10400.0	1000.0	5	3	L	-	3							
SouthREG	BKV285	650.0	10400.0	1000.0	5	8	L	-	8							
SouthREG	BKV286	600.0	10400.0	1000.0	5	10	L	-	10							
SouthREG	BKV287	550.0	10400.0	1000.0	5	2	L	L	2							
SouthREG	BKV288	500.0	10400.0	1000.0	5	3	L	-	3							
SouthREG	BKV289	450.0	10400.0	1000.0	5	4	L	-	4							
SouthREG	BKV290	-1600.0	11200.0	1000.0	5	3	L	-	3							
SouthREG	BKV291	-1650.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV292	-1700.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV293	-1750.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV294	-1800.0	11200.0	1000.0	5	2	L	-	2							
SouthREG	BKV295	-1850.0	11200.0	1000.0	5	1	L	L	L							
SouthREG	BKV296	-1900.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV297	-1950.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV298	-2000.0	11200.0	1000.0	5	2	L	-	2							
SouthREG	BKV299	-2050.0	11200.0	1000.0	5	9	L	-	9							
SouthREG	BKV300	-2100.0	11200.0	1000.0	5	13	L	-	13							
SouthREG	BKV301	-2150.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV302	-2200.0	11200.0	1000.0	5	2	L	-	2							
SouthREG	BKV303	-2250.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV304	-2300.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV305	-2350.0	11200.0	1000.0	5	3	L	L	3							
SouthREG	BKV306	-2400.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV307	-2450.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV308	-2500.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV309	-2550.0	11200.0	1000.0	5	2	L	-	2							
SouthREG	BKV310	-2600.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV311	-2650.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV312	-2700.0	11200.0	1000.0	5	6	L	-	6							
SouthREG	BKV313	-2750.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV314	-2800.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV315	-2850.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV316	-2900.0	11200.0	1000.0	5	1	L	L	L							
SouthREG	BKV317	-2950.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV318	-3000.0	11200.0	1000.0	5	3	L	-	3							
SouthREG	BKV319	-3050.0	11200.0	1000.0	5	1	L	-	L							

SouthREG	BKV320	-3100.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV321	-3150.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV322	-3200.0	11200.0	1000.0	5	3	L	-	3							
SouthREG	BKV323	-3250.0	11200.0	1000.0	5	4	L	-	4							
SouthREG	BKV324	-3500.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV325	-3550.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV326	-3600.0	11200.0	1000.0	5	1	L	-	1							
SouthREG	BKV327	-3650.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV328	-3700.0	11200.0	1000.0	5	1	L	L	L							
SouthREG	BKV329	-3750.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV330	-3800.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV331	-4000.0	11200.0	1000.0	5	1	L	-	L							
SouthREG	BKV332	-3250.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV333	-3200.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV334	-3150.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV335	-3100.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV336	-2000.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV337	-1950.0	10400.0	1000.0	5	5	L	L	5							
SouthREG	BKV338	-1900.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV339	-1850.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV340	-1800.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV341	-1750.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV342	-1700.0	10400.0	1000.0	5	1	L	-	1							
SouthREG	BKV343	-1650.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV344	-1600.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV345	-1550.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV346	-1500.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV347	-1450.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV348	-1400.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV349	-1350.0	10400.0	1000.0	5	1	L	L	L							
SouthREG	BKV350	-1300.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV351	-1250.0	10400.0	1000.0	5	1	L	-	L							
SouthREG	BKV352	-1200.0	10400.0	1000.0	5	1	L	L	L							
SouthREG	BKV353	1300.0	9600.0	1000.0	6	62	L	-	62	6	-	-	29	13	127	L
SouthREG	BKV354	1250.0	9600.0	1000.0	4	73	L	-	73	4	-	-	33	9	39	L
SouthREG	BKV355	1200.0	9600.0	1000.0	5	9	L	-	9	5	4	-	32	45	49	L
SouthREG	BKV356	1150.0	9600.0	1000.0	3	53	L	L	53	3	-	-	10	12	46	L
SouthREG	BKV357	1100.0	9600.0	1000.0	3	5	L	-	5	3	-	-	39	23	60	L
SouthREG	BKV358	1050.0	9600.0	1000.0	4	15	L	-	15	4	4	-	12	14	54	L
SouthREG	BKV359	1000.0	9600.0	1000.0	79	3	0.09	0.10	3	73	84	-	21	10	63	L
SouthREG	BKV360	950.0	9600.0	1000.0	5	1	L	-	1	5	4	-	10	12	37	L
SouthREG	BKV361	900.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV362	850.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV363	800.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV364	750.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV365	700.0	9600.0	1000.0	5	4	L	-	4							
SouthREG	BKV366	650.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV367	600.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV368	550.0	9600.0	1000.0	5	1	L	L	L							
SouthREG	BKV369	500.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV370	450.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV371	400.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV372	350.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV373	300.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV374	250.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV375	200.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV376	150.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV377	100.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV378	50.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV379	0.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV380	-50.0	9600.0	1000.0	5	1	L	-	L							

SouthREG	BKV381	-100.0	9600.0	1000.0	1	9	L	-	9	1	1	-	14	10	50	I
SouthREG	BKV382	-150.0	9600.0	1000.0	240	1	0.30	0.26	L	230	250	-	31	17	33	[
SouthREG	BKV383	-200.0	9600.0	1000.0	1	1	L	L	L	L	1	2	17	11	44	[
SouthREG	BKV384	-250.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV385	-300.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV386	-350.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV387	-400.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV388	-450.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV389	-500.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV390	-550.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV391	-600.0	9600.0	1000.0	5	2	L	-	2							
SouthREG	BKV392	-650.0	9600.0	1000.0	5	3	L	-	3							
SouthREG	BKV393	-700.0	9600.0	1000.0	5	2	L	L	2							
SouthREG	BKV394	-750.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV395	-800.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV396	-850.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV397	-2750.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV398	-2800.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV399	-2850.0	9600.0	1000.0	5	1	L	L	1							
SouthREG	BKV400	-2900.0	9600.0	1000.0	5	2	L	-	2							
	11285															
	E30195															
SouthREG	BKV401	-2950.0	9600.0	1000.0	5	5	L	-	5							
SouthREG	BKV402	-3000.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV403	-3050.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV404	-3100.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV405	-3150.0	9600.0	1000.0	5	1	L	L	L							
SouthREG	BKV406	-3200.0	9600.0	1000.0	5	2	L	-	2							
SouthREG	BKV407	-3250.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV408	-3300.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV409	-3350.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV410	-3400.0	9600.0	1000.0	5	1	L	-	L							
SouthREG	BKV411	-3450.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV412	-3500.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV413	-3550.0	9600.0	1000.0	5	3	L	-	3							
SouthREG	BKV414	-3600.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV415	-3650.0	9600.0	1000.0	5	1	L	L	1							
SouthREG	BKV416	-3700.0	9600.0	1000.0	5	3	L	-	3							
SouthREG	BKV417	-3750.0	9600.0	1000.0	5	2	L	-	2							
SouthREG	BKV418	-3800.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV419	-3850.0	9600.0	1000.0	5	2	L	-	2							
SouthREG	BKV420	-3900.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV421	-3950.0	9600.0	1000.0	5	1	L	-	1							
SouthREG	BKV422	-3500.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV423	-3450.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV424	-3400.0	8800.0	1000.0	5	1	L	L	1							
SouthREG	BKV425	-3350.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV426	-3300.0	8800.0	1000.0	5	1	L	-	L							
SouthREG	BKV427	-3250.0	8800.0	1000.0	5	1	L	-	L							
SouthREG	BKV428	-3200.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV429	-3150.0	8800.0	1000.0	5	1	L	-	L							
SouthREG	BKV430	-3100.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV431	-3050.0	8800.0	1000.0	5	1	L	L	1							
SouthREG	BKV432	-3000.0	8800.0	1000.0	5	2	L	-	2							
SouthREG	BKV433	-2950.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV434	-2900.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV435	-2850.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV436	-2800.0	8800.0	1000.0	5	1	L	-	L							
SouthREG	BKV437	-2400.0	8800.0	1000.0	5	1	L	-	1							
SouthREG	BKV438	-2350.0	8800.0	1000.0	5	3	L	-	3							

SouthREG	BKV439	-2300.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV440	-2250.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV441	-2200.0	8800.0	1000.0	5	1	L	L	1
SouthREG	BKV442	-2150.0	8800.0	1000.0	5	6	L	-	6
SouthREG	BKV443	1350.0	8800.0	1000.0	5	69	L	-	69
SouthREG	BKV444	1300.0	8800.0	1000.0	5	140	L	-	140
SouthREG	BKV445	1250.0	8800.0	1000.0	5	270	L	-	270
SouthREG	BKV446	1200.0	8800.0	1000.0	5	18	L	-	18
SouthREG	BKV447	1150.0	8800.0	1000.0	5	24	L	-	24
SouthREG	BKV448	1100.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV449	1050.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV450	1000.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV451	950.0	8800.0	1000.0	5	1	L	-	L
SouthREG	BKV452	900.0	8800.0	1000.0	5	1	L	-	L
SouthREG	BKV453	850.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV454	800.0	8800.0	1000.0	5	1	L	L	1
SouthREG	BKV455	750.0	8800.0	1000.0	5	1	L	-	L
SouthREG	BKV456	700.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV457	650.0	8800.0	1000.0	5	7	L	-	7
SouthREG	BKV458	600.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV459	550.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV460	500.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV461	450.0	8800.0	1000.0	5	117	L	-	117
SouthREG	BKV462	400.0	8800.0	1000.0	5	5	L	L	5
SouthREG	BKV463	350.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV464	300.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV465	250.0	8800.0	1000.0	5	8	L	-	8
SouthREG	BKV466	200.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV467	150.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV468	100.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV469	50.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV470	0.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV471	-50.0	8800.0	1000.0	10	21	0.01	-	21
SouthREG	BKV472	-100.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV473	-150.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV474	-200.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV475	-250.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV476	-300.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV477	-350.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV478	-400.0	8800.0	1000.0	5	1	L	-	L
SouthREG	BKV479	-450.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV480	-500.0	8800.0	1000.0	5	1	L	L	L
SouthREG	BKV481	-550.0	8800.0	1000.0	5	1	L	-	L
SouthREG	BKV482	-600.0	8800.0	1000.0	5	1	L	-	L
SouthREG	BKV483	-650.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV484	-700.0	8800.0	1000.0	5	1	L	-	1
SouthREG	BKV485	-750.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV486	-800.0	8800.0	1000.0	5	11	L	-	11
SouthREG	BKV487	-850.0	8800.0	1000.0	5	4	L	-	4
SouthREG	BKV488	-900.0	8800.0	1000.0	5	4	L	-	4
SouthREG	BKV489	-950.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV490	-1000.0	8800.0	1000.0	5	2	L	L	2
SouthREG	BKV491	-1050.0	8800.0	1000.0	5	41	L	-	41
SouthREG	BKV492	-1100.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV493	-1150.0	8800.0	1000.0	5	21	L	-	21
SouthREG	BKV494	-1200.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV495	-1250.0	8800.0	1000.0	5	39	L	-	39
SouthREG	BKV496	-1300.0	8800.0	1000.0	5	2	L	L	2
SouthREG	BKV497	-1350.0	8800.0	1000.0	5	2	L	-	2
SouthREG	BKV498	-1400.0	8800.0	1000.0	5	3	L	-	3
SouthREG	BKV499	-1450.0	8800.0	1000.0	5	3	L	-	3

SouthREG	BKV500	-1500.0	8800.0	1000.0	5	30	L	-	30		
	11333										
	E30196										
SouthREG	BKV501	-1550.0	8800.0	1000.0	2	5			5	2	-
SouthREG	BKV502	-1600.0	8800.0	1000.0	2	4			4	2	-
SouthREG	BKV503	-1650.0	8800.0	1000.0	2	5			5	2	1
SouthREG	BKV504	-1700.0	8800.0	1000.0	1	2			2	L	-
SouthREG	BKV505	-1750.0	8800.0	1000.0	1	9			9	L	-
SouthREG	BKV506	-1800.0	8800.0	1000.0	38	60			60	41	34
SouthREG	BKV507	-1850.0	8800.0	1000.0	4	7			7	4	-
SouthREG	BKV508	-1900.0	8800.0	1000.0	5	10			10	5	-
SouthREG	BKV509	-1950.0	8800.0	1000.0	5	4			4	6	4
SouthREG	BKV510	-2000.0	8800.0	1000.0	3	2			2	3	-
SouthREG	BKV511	-2050.0	8800.0	1000.0	3	3			3	3	-
SouthREG	BKV512	-2100.0	8800.0	1000.0	2	3			3	2	-
SouthREG	BKV513	1500.0	8000.0	1000.0	1	230			230	L	1
SouthREG	BKV514	1450.0	8000.0	1000.0	3	87			87	3	-
SouthREG	BKV515	1400.0	8000.0	1000.0	2	99			99	2	-
SouthREG	BKV516	1350.0	8000.0	1000.0	2	8			8	2	-
SouthREG	BKV517	1300.0	8000.0	1000.0	3	5			5	3	-
SouthREG	BKV518	1250.0	8000.0	1000.0	2	3			3	2	-
SouthREG	BKV519	1200.0	8000.0	1000.0	2	2			2	2	-
SouthREG	BKV520	1150.0	8000.0	1000.0	4	4			4	4	-
SouthREG	BKV521	1100.0	8000.0	1000.0	5	7			7	5	-
SouthREG	BKV522	1050.0	8000.0	1000.0	7	7			7	7	7
SouthREG	BKV523	975.0	8000.0	1000.0	4	3			3	4	-
SouthREG	BKV524	925.0	8000.0	1000.0	4	3			3	4	-
SouthREG	BKV525	850.0	8000.0	1000.0	3	4			4	3	-
SouthREG	BKV526	800.0	8000.0	1000.0	2	4			4	2	-
SouthREG	BKV527	750.0	8000.0	1000.0	4	8			8	4	-
SouthREG	BKV528	700.0	8000.0	1000.0	18	150			150	20	16
SouthREG	BKV529	650.0	8000.0	1000.0	1	3			3	L	-
SouthREG	BKV530	600.0	8000.0	1000.0	4	8			8	4	-
SouthREG	BKV531	550.0	8000.0	1000.0	6	10			10	7	5
SouthREG	BKV532	500.0	8000.0	1000.0	3	4			4	3	-
SouthREG	BKV533	450.0	8000.0	1000.0	4	8			8	4	-
SouthREG	BKV534	400.0	8000.0	1000.0	3	4			4	3	-
SouthREG	BKV535	350.0	8000.0	1000.0	2	3			3	2	-
SouthREG	BKV536	300.0	8000.0	1000.0	3	13			13	3	-
SouthREG	BKV537	250.0	8000.0	1000.0	2	5			5	1	2
SouthREG	BKV538	200.0	8000.0	1000.0	2	2			2	2	-
SouthREG	BKV539	-50.0	8000.0	1000.0	2	3			3	2	-
SouthREG	BKV540	-100.0	8000.0	1000.0	1	3			3	L	-
SouthREG	BKV541	-150.0	8000.0	1000.0	1	4			4	1	-
SouthREG	BKV542	-200.0	8000.0	1000.0	1	2			2	1	-
SouthREG	BKV543	-250.0	8000.0	1000.0	3	5			5	3	3
SouthREG	BKV544	-400.0	8000.0	1000.0	2	1			1	2	-
SouthREG	BKV545	-450.0	8000.0	1000.0	1	1			L	1	-
SouthREG	BKV546	-500.0	8000.0	1000.0	2	1			L	2	-
SouthREG	BKV547	-550.0	8000.0	1000.0	1	1			1	1	-
SouthREG	BKV548	-600.0	8000.0	1000.0	3	2			2	3	2
SouthREG	BKV549	-650.0	8000.0	1000.0	1	2			2	1	-
SouthREG	BKV550	-700.0	8000.0	1000.0	1	1			L	L	-
SouthREG	BKV551	-1900.0	8000.0	1000.0	1	1			1	1	-
SouthREG	BKV552	-1950.0	8000.0	1000.0	2	1			1	2	-
SouthREG	BKV553	-2000.0	8000.0	1000.0	1	1			1	1	-
SouthREG	BKV554	-2050.0	8000.0	1000.0	3	1			L	3	-
SouthREG	BKV555	-2100.0	8000.0	1000.0	1	1			1	1	-
SouthREG	BKV556	-2150.0	8000.0	1000.0	1	1			1	L	-
SouthREG	BKV557	-2200.0	8000.0	1000.0	1	2			2	1	L

SouthREG	BKV558	-2250.0	8000.0	1000.0	2	1	1	2	-
SouthREG	BKV559	-2300.0	8000.0	1000.0	2	2	2	2	-
SouthREG	BKV560	-2350.0	8000.0	1000.0	4	75	75	4	4
SouthREG	BKV561	-2400.0	8000.0	1000.0	2	3	3	2	1
SouthREG	BKV562	-2450.0	8000.0	1000.0	2	3	3	2	-
SouthREG	BKV563	-2500.0	8000.0	1000.0	1	2	2	1	-
SouthREG	BKV564	-2550.0	8000.0	1000.0	2	4	4	2	-
SouthREG	BKV565	-2600.0	8000.0	1000.0	2	8	8	2	-
SouthREG	BKV566	-2650.0	8000.0	1000.0	1	1	1	L	-
SouthREG	BKV567	-2700.0	8000.0	1000.0	2	1	1	2	-
SouthREG	BKV568	-2750.0	8000.0	1000.0	3	7	7	3	2
SouthREG	BKV569	-2850.0	8000.0	1000.0	1	1	L	1	-
SouthREG	BKV570	-2900.0	8000.0	1000.0	2	7	7	2	-
SouthREG	BKV571	-2950.0	8000.0	1000.0	2	3	3	2	2
SouthREG	BKV572	-3000.0	8000.0	1000.0	2	6	6	2	-
SouthREG	BKV573	-3050.0	8000.0	1000.0	2	1	1	2	-
SouthREG	BKV574	-3100.0	8000.0	1000.0	2	9	9	2	-
SouthREG	BKV575	-3150.0	8000.0	1000.0	1	1	1	L	-
SouthREG	BKV576	-3200.0	8000.0	1000.0	1	14	14	L	-
SouthREG	BKV577	-3250.0	8000.0	1000.0	1	6	6	L	-
SouthREG	BKV578	-3300.0	8000.0	1000.0	2	1	1	2	-
SouthREG	BKV579	-3350.0	8000.0	1000.0	1	2	2	1	-
SouthREG	BKV580	-3400.0	8000.0	1000.0	1	1	1	1	-
SouthREG	BKV581	-3450.0	8000.0	1000.0	1	1	L	1	-
SouthREG	BKV582	-3500.0	8000.0	1000.0	2	1	1	2	2
SouthREG	BKV583	-3550.0	8000.0	1000.0	1	1	1	L	-
SouthREG	BKV584	-3600.0	8000.0	1000.0	1	3	3	L	-
SouthREG	BKV585	-3650.0	8000.0	1000.0	1	1	L	1	-
SouthREG	BKV586	-3700.0	8000.0	1000.0	2	1	1	2	2
SouthREG	BKV587	-2500.0	7200.0	1000.0	1	1	L	L	-
SouthREG	BKV588	-2450.0	7200.0	1000.0	1	1	1	1	-
SouthREG	BKV589	-2800.0	7200.0	1000.0	1	1	L	1	-
SouthREG	BKV590	-2400.0	7200.0	1000.0	1	1	L	L	-
SouthREG	BKV591	-2350.0	7200.0	1000.0	1	1	L	L	-
SouthREG	BKV592	-2300.0	7200.0	1000.0	3	1	L	3	3
SouthREG	BKV593	-2250.0	7200.0	1000.0	3	1	L	3	3
SouthREG	BKV594	-2200.0	7200.0	1000.0	2	7	7	2	2
SouthREG	BKV595	-2150.0	7200.0	1000.0	1	5	5	L	-
SouthREG	BKV596	-2100.0	7200.0	1000.0	2	3	3	2	-
SouthREG	BKV597	-2050.0	7200.0	1000.0	1	2	2	1	-
SouthREG	BKV598	-2000.0	7200.0	1000.0	1	53	53	L	-
SouthREG	BKV599	-1950.0	7200.0	1000.0	1	36	36	1	-
SouthREG	BKV600	-1900.0	7200.0	1000.0	2	39	39	2	2
	11357								
	E30199								
SouthREG	BKV601	-500.0	7200.0	1000.0	4	3	3	4	3
SouthREG	BKV602	-450.0	7200.0	1000.0	2	1	1	2	-
SouthREG	BKV603	-400.0	7200.0	1000.0	2	1	L	2	-
SouthREG	BKV604	-350.0	7200.0	1000.0	2	2	2	2	-
SouthREG	BKV605	-300.0	7200.0	1000.0	2	1	1	2	-
SouthREG	BKV606	-250.0	7200.0	1000.0	3	1	1	3	-
SouthREG	BKV607	-200.0	7200.0	1000.0	2	1	1	2	-
SouthREG	BKV608	-150.0	7200.0	1000.0	2	1	L	2	-
SouthREG	BKV609	-100.0	7200.0	1000.0	11	14	14	9	13
SouthREG	BKV610	-50.0	7200.0	1000.0	6	1	1	6	-
SouthREG	BKV611	0.0	7200.0	1000.0	2	1	1	2	-
SouthREG	BKV612	50.0	7200.0	1000.0	5	7	7	5	-
SouthREG	BKV613	100.0	7200.0	1000.0	5	7	7	5	-
SouthREG	BKV614	150.0	7200.0	1000.0	3	1	1	3	-
SouthREG	BKV615	200.0	7200.0	1000.0	2	1	1	2	-

SouthREG	BKV616	250.0	7200.0	1000.0	4	2	2	4	-
SouthREG	BKV617	300.0	7200.0	1000.0	9	2	2	11	7
SouthREG	BKV618	350.0	7200.0	1000.0	5	10	10	5	-
SouthREG	BKV619	400.0	7200.0	1000.0	8	1	L	8	8
SouthREG	BKV620	450.0	7200.0	1000.0	3	10	10	3	-
SouthREG	BKV621	500.0	7200.0	1000.0	4	2	2	4	-
SouthREG	BKV622	550.0	7200.0	1000.0	4	8	8	4	-
SouthREG	BKV623	600.0	7200.0	1000.0	4	3	3	4	-
SouthREG	BKV624	650.0	7200.0	1000.0	2	5	5	2	-
SouthREG	BKV625	700.0	7200.0	1000.0	17	19	19	19	15
SouthREG	BKV626	750.0	7200.0	1000.0	5	8	8	6	4
SouthREG	BKV627	800.0	7200.0	1000.0	1	1	L	1	-
SouthREG	BKV628	850.0	7200.0	1000.0	2	1	L	2	-
SouthREG	BKV629	900.0	7200.0	1000.0	1	1	L	1	-
SouthREG	BKV630	950.0	7200.0	1000.0	1	0		1	1
SouthREG	BKV631	1000.0	7200.0	1000.0	1	1	L	1	-
SouthREG	BKV632	1050.0	7200.0	1000.0	1	1	L	L	-
SouthREG	BKV633	1100.0	7200.0	1000.0	1	2	2	1	-
SouthREG	BKV634	1150.0	7200.0	1000.0	2	1	1	2	-
SouthREG	BKV635	1200.0	7200.0	1000.0	1	1	1	1	1
SouthREG	BKV636	1250.0	7200.0	1000.0	1	1	L	L	-
SouthREG	BKV637	1300.0	7200.0	1000.0	1	1	L	1	-
SouthREG	BKV638	1350.0	7200.0	1000.0	2	1	L	2	-
SouthREG	BKV639	1650.0	6400.0	1000.0	23	7	7	26	20
SouthREG	BKV640	1600.0	6400.0	1000.0	17	21	21	18	15
SouthREG	BKV641	1550.0	6400.0	1000.0	6	18	18	6	-
SouthREG	BKV642	1500.0	6400.0	1000.0	5	7	7	5	-
SouthREG	BKV643	1450.0	6400.0	1000.0	2	1	1	2	-
SouthREG	BKV644	1400.0	6400.0	1000.0	3	1	1	3	-
SouthREG	BKV645	1350.0	6400.0	1000.0	2	9	9	2	-
SouthREG	BKV646	1300.0	6400.0	1000.0	1	3	3	1	-
SouthREG	BKV647	1250.0	6400.0	1000.0	2	3	3	2	-
SouthREG	BKV648	1200.0	6400.0	1000.0	2	1	L	2	-
SouthREG	BKV649	1150.0	6400.0	1000.0	20	20	20	19	21
SouthREG	BKV650	1100.0	6400.0	1000.0	6	4	4	6	-
SouthREG	BKV651	1050.0	6400.0	1000.0	1	1	1	L	-
SouthREG	BKV652	1000.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV653	950.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV654	900.0	6400.0	1000.0	1	1	1	1	-
SouthREG	BKV655	850.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV656	800.0	6400.0	1000.0	1	1	1	1	-
SouthREG	BKV657	750.0	6400.0	1000.0	9	3	3	8	9
SouthREG	BKV658	700.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV659	650.0	6400.0	1000.0	1	1	L	1	1
SouthREG	BKV660	600.0	6400.0	1000.0	1	1	L	L	-
SouthREG	BKV661	550.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV662	500.0	6400.0	1000.0	2	1	L	2	-
SouthREG	BKV663	450.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV664	400.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV665	300.0	6400.0	1000.0	2	1	L	2	-
SouthREG	BKV666	250.0	6400.0	1000.0	3	1	L	2	3
SouthREG	BKV667	200.0	6400.0	1000.0	1	1	L	1	-
SouthREG	BKV668	150.0	6400.0	1000.0	3	1	L	3	-
SouthREG	BKV669	100.0	6400.0	1000.0	1	1	1	L	1
SouthREG	BKV670	50.0	6400.0	1000.0	1	1	1	1	-
SouthREG	BKV671	0.0	6400.0	1000.0	32	32	32	32	31
SouthREG	BKV672	-50.0	6400.0	1000.0	1	1	1	L	-
SouthREG	BKV673	-100.0	6400.0	1000.0	2	2	2	2	-
SouthREG	BKV674	-150.0	6400.0	1000.0	1	18	18	1	-
SouthREG	BKV675	-200.0	6400.0	1000.0	3	3	3	3	-
SouthREG	BKV676	-250.0	6400.0	1000.0	3	5	5	3	2

SouthREG	BKV677	-300.0	6400.0	1000.0	1	2			2	1	-
SouthREG	BKV678	-350.0	6400.0	1000.0	10	53			53	10	-
SouthREG	BKV679	-400.0	6400.0	1000.0	1	4			4	1	-
SouthREG	BKV680	-450.0	6400.0	1000.0	6	13			13	6	-
SouthREG	BKV681	-500.0	6400.0	1000.0	6	7			7	5	7
SouthREG	BKV682	-550.0	6400.0	1000.0	2	7			7	2	-
SouthREG	BKV683	-600.0	6400.0	1000.0	3	8			8	3	-
SouthREG	BKV684	-650.0	6400.0	1000.0	21	22			22	21	20
SouthREG	BKV685	-700.0	6400.0	1000.0	6	6			6	6	5
SouthREG	BKV686	-750.0	6400.0	1000.0	3	5			5	3	3
SouthREG	BKV687	-800.0	6400.0	1000.0	5	4			4	5	-
SouthREG	BKV688	-850.0	6400.0	1000.0	13	7			7	14	12
SouthREG	BKV689	-900.0	6400.0	1000.0	1	9			9	1	1
SouthREG	BKV690	-950.0	6400.0	1000.0	1	7			7	1	-
SouthREG	BKV691	-1000.0	6400.0	1000.0	2	18			18	2	-
SouthREG	BKV692	-1050.0	6400.0	1000.0	8	29			29	8	-
SouthREG	BKV693	-1100.0	6400.0	1000.0	7	66			66	6	8
SouthREG	BKV694	-1150.0	6400.0	1000.0	36	40			40	38	34
SouthREG	BKV695	-1250.0	6400.0	1000.0	8	38			38	8	-
SouthREG	BKV696	-1300.0	6400.0	1000.0	6	3			3	6	-
SouthREG	BKV697	-1350.0	6400.0	1000.0	12	50			50	12	11
SouthREG	BKV698	-1400.0	6400.0	1000.0	87	11			11	90	83
SouthREG	BKV699	-1450.0	6400.0	1000.0	3	3			3	2	3
SouthREG	BKV700	-1500.0	6400.0	1000.0	60	75			75	60	60
	11398										
	E30200										
SouthREG	BKV701	-1550.0	6400.0	1000.0	3		1	4			
SouthREG	BKV702	-1600.0	6400.0	1000.0	144	86	168	120	86		
SouthREG	BKV703	-1650.0	6400.0	1000.0	2	19	2	2	19		
SouthREG	BKV704	-1700.0	6400.0	1000.0	1		L	1			
SouthREG	BKV705	-1750.0	6400.0	1000.0	2		1	3			
SouthREG	BKV706	-1800.0	6400.0	1000.0	5		2	7			
SouthREG	BKV707	-1850.0	6400.0	1000.0	1		L	2			
SouthREG	BKV708	-1900.0	6400.0	1000.0	2		1	3			
SouthREG	BKV709	-1950.0	6400.0	1000.0	9	75	9	9	75		
SouthREG	BKV710	-2000.0	6400.0	1000.0	2		1	3			
SouthREG	BKV711	-2050.0	6400.0	1000.0	1		1	L			
SouthREG	BKV712	-2100.0	6400.0	1000.0	6	20	5	6	20		
SouthREG	BKV713	-2150.0	6400.0	1000.0	650	23	650	650	23		
SouthREG	BKV714	-2200.0	6400.0	1000.0	4		2	5			
SouthREG	BKV715	-2250.0	6400.0	1000.0	11	25	11	11	25		
SouthREG	BKV716	-2300.0	6400.0	1000.0	2	6	2	2	6		
SouthREG	BKV717	-2350.0	6400.0	1000.0	74	8	72	76	8		
SouthREG	BKV718	-2400.0	6400.0	1000.0	11	8	11	11	8		
SouthREG	BKV719	-2450.0	6400.0	1000.0	4		2	6			
SouthREG	BKV720	-2500.0	6400.0	1000.0	2		2	2			
SouthREG	BKV721	-2350.0	5600.0	1000.0	2		2	2			
SouthREG	BKV722	-2300.0	5600.0	1000.0	4	6	4	3	6		
SouthREG	BKV723	-2250.0	5600.0	1000.0	13	11	12	13	11		
SouthREG	BKV724	-2200.0	5600.0	1000.0	87	5	93	81	5		
SouthREG	BKV725	-2150.0	5600.0	1000.0	215	33	220	210	33		
SouthREG	BKV726	-2100.0	5600.0	1000.0	135	140	130	140	140		
SouthREG	BKV727	-2050.0	5600.0	1000.0	3	23	4	2	23		
SouthREG	BKV728	-2000.0	5600.0	1000.0	2	5	2	1	5		
SouthREG	BKV729	-1950.0	5600.0	1000.0	3		2	4			
SouthREG	BKV730	-1900.0	5600.0	1000.0	1	1	L	1	L		
SouthREG	BKV731	-1850.0	5600.0	1000.0	1		L	L			
SouthREG	BKV732	-1800.0	5600.0	1000.0	2		L	3			
SouthREG	BKV733	-1750.0	5600.0	1000.0	1		1	1			
SouthREG	BKV734	-1700.0	5600.0	1000.0	2	4	2	1	4		

SouthREG	BKV735	-1650.0	5600.0	1000.0	3		L	5	
SouthREG	BKV736	-1600.0	5600.0	1000.0	3		L	6	
SouthREG	BKV737	-1550.0	5600.0	1000.0	1		L	1	
SouthREG	BKV738	-1500.0	5600.0	1000.0	3		L	5	
SouthREG	BKV739	-1150.0	5600.0	1000.0	1		1	L	
SouthREG	BKV740	-1100.0	5600.0	1000.0	2		1	2	
SouthREG	BKV741	-1050.0	5600.0	1000.0	1		1	L	
SouthREG	BKV742	-1000.0	5600.0	1000.0	1		1	L	
SouthREG	BKV743	-900.0	5600.0	1000.0	1		2	L	
SouthREG	BKV744	-850.0	5600.0	1000.0	1		2	L	
SouthREG	BKV745	-800.0	5600.0	1000.0	1		1	1	
SouthREG	BKV746	-750.0	5600.0	1000.0	1		2	L	
SouthREG	BKV747	-700.0	5600.0	1000.0	3	1	3	3	L
SouthREG	BKV748	-650.0	5600.0	1000.0	1		1	L	
SouthREG	BKV749	-600.0	5600.0	1000.0	1		L	L	
SouthREG	BKV750	-550.0	5600.0	1000.0	1	1	1	1	L
SouthREG	BKV751	-500.0	5600.0	1000.0	1	1	1	1	1
SouthREG	BKV752	-450.0	5600.0	1000.0	1		L	L	
SouthREG	BKV753	-400.0	5600.0	1000.0	1		L	L	
SouthREG	BKV754	-350.0	5600.0	1000.0	1		L	L	
SouthREG	BKV755	-300.0	5600.0	1000.0	2		1	2	
SouthREG	BKV756	-250.0	5600.0	1000.0	3		1	4	
SouthREG	BKV757	-200.0	5600.0	1000.0	2	13	2	2	13
SouthREG	BKV758	-150.0	5600.0	1000.0	15	50	15	15	50
SouthREG	BKV759	-100.0	5600.0	1000.0	4		2	6	
SouthREG	BKV760	-50.0	5600.0	1000.0	3		L	5	
SouthREG	BKV761	0.0	5600.0	1000.0	14	10	16	11	10
SouthREG	BKV762	50.0	5600.0	1000.0	1		1	L	
SouthREG	BKV763	100.0	5600.0	1000.0	1		L	1	
SouthREG	BKV764	150.0	5600.0	1000.0	5		2	7	
SouthREG	BKV765	200.0	5600.0	1000.0	8	40	8	7	40
SouthREG	BKV766	250.0	5600.0	1000.0	2		1	3	
SouthREG	BKV767	300.0	5600.0	1000.0	3		1	4	
SouthREG	BKV768	350.0	5600.0	1000.0	1		2	L	
SouthREG	BKV769	400.0	5600.0	1000.0	5	4	5	4	4
SouthREG	BKV770	450.0	5600.0	1000.0	1		1	L	
SouthREG	BKV771	500.0	5600.0	1000.0	1		1	1	
SouthREG	BKV772	550.0	5600.0	1000.0	2	1	2	1	L
SouthREG	BKV773	600.0	5600.0	1000.0	2		3	1	
SouthREG	BKV774	650.0	5600.0	1000.0	1		1	L	
SouthREG	BKV775	700.0	5600.0	1000.0	1		2	L	
SouthREG	BKV776	750.0	5600.0	1000.0	1		L	L	
SouthREG	BKV777	800.0	5600.0	1000.0	1		1	L	
SouthREG	BKV778	850.0	5600.0	1000.0	3	2	3	3	2
SouthREG	BKV779	900.0	5600.0	1000.0	1		L	L	
SouthREG	BKV780	950.0	5600.0	1000.0	1		1	L	
SouthREG	BKV781	1000.0	5600.0	1000.0	1		L	L	
SouthREG	BKV782	1050.0	5600.0	1000.0	4		2	5	
SouthREG	BKV783	1100.0	5600.0	1000.0	1		L	2	
SouthREG	BKV784	1150.0	5600.0	1000.0	1	27	1	1	27
	11443								
	E30358								
HowleyCK	BKV825	1500.0	13300.0	1000.0	2		2	2	
HowleyCK	BKV826	1450.0	13300.0	1000.0	90	7	90	90	7
HowleyCK	BKV827	1400.0	13300.0	1000.0	23	4	23	22	4
HowleyCK	BKV828	1350.0	13300.0	1000.0	22	8	23	20	8
HowleyCK	BKV829	1300.0	13300.0	1000.0	2	2	1	2	2
HowleyCK	BKV830	1250.0	13300.0	1000.0	260	8	260	260	8
HowleyCK	BKV831	1200.0	13300.0	1000.0	330	6	340	320	6
HowleyCK	BKV832	1150.0	13300.0	1000.0	1		1	L	

HowleyCK	BKV833	1100.0	13300.0	1000.0	1		L	1	
HowleyCK	BKV834	1050.0	13300.0	1000.0	1	4	1	1	4
HowleyCK	BKV835	1000.0	13300.0	1000.0	17	13	17	17	13
HowleyCK	BKV836	950.0	13300.0	1000.0	4	1	3	4	L
HowleyCK	BKV837	900.0	13300.0	1000.0	205	9	200	210	9
HowleyCK	BKV838	850.0	13300.0	1000.0	2	5	2	2	5
HowleyCK	BKV839	800.0	13300.0	1000.0	1		L	L	
HowleyCK	BKV840	750.0	13300.0	1000.0	7		1	12	
HowleyCK	BKV841	700.0	13300.0	1000.0	1		1	L	
HowleyCK	BKV842	650.0	13300.0	1000.0	2		1	2	
HowleyCK	BKV843	600.0	13300.0	1000.0	1		1	L	
HowleyCK	BKV844	550.0	13300.0	1000.0	1	1	1	1	L
HowleyCK	BKV845	500.0	13300.0	1000.0	1		L	L	
HowleyCK	BKV846	450.0	13300.0	1000.0	2		1	2	
HowleyCK	BKV847	400.0	13300.0	1000.0	1		1	1	
HowleyCK	BKV848	350.0	13300.0	1000.0	1		1	L	
HowleyCK	BKV849	300.0	13300.0	1000.0	1	2	1	1	2
HowleyCK	BKV850	250.0	13300.0	1000.0	1		L	L	
HowleyCK	BKV851	200.0	13300.0	1000.0	1		L	L	
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HowleyCK	BKV855	0.0	13300.0	1000.0	1		L	1	
HowleyCK	BKV856	-50.0	13300.0	1000.0	1	3	1	1	3
HowleyCK	BKV857	-100.0	13300.0	1000.0	1	1	L	L	L
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	11444								
	E30365								
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HowleyCK	BKV875	1750.0	16000.0	1000.0	2		L	4	
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HowleyCK	BKV877	1850.0	16000.0	1000.0	2		2	2	
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HowleyCK	BKV915	3400.0	17000.0	1000.0	150	1	120	180	1
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HowleyCK	BKV937	2300.0	17000.0	1000.0	1		L	L	
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HowleyCK	BKV939	2200.0	17000.0	1000.0	1		L	L	
HowleyCK	BKV940	2150.0	17000.0	1000.0	190	1	200	180	L
HowleyCK	BKV941	2100.0	17000.0	1000.0	6	1	7	4	L
HowleyCK	BKV942	2050.0	17000.0	1000.0	1		2	L	
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HowleyCK	BKV945	1900.0	17000.0	1000.0	1		L	L	
HowleyCK	BKV946	1850.0	17000.0	1000.0	1		1	L	
HowleyCK	BKV947	1800.0	17000.0	1000.0	1		L	L	

Appendix 12

BROCK'S CREEK CHINATOWN

REPORT ON A PRELIMINARY SURVEY OF SITES OF CULTURAL HERITAGE SIGNIFICANCE AND A REVIEW OF LIKELY IMPACT OF MINERAL EXPLORATION PROPOSALS

prepared for -

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BROCK'S CREEK CHINATOWN

REPORT ON A PRELIMINARY SURVEY OF SITES OF CULTURAL HERITAGE SIGNIFICANCE AND A REVIEW OF LIKELY IMPACT OF MINERAL EXPLORATION PROPOSALS

TABLE OF CONTENTS

ACKNOWLEDGMENTS

The consultant would like to record his appreciation of the assistance given by a number of people during the project. This assistance greatly facilitated the work.

Graham Miller of Cyprus Gold Australia Corporation commissioned and directed the project and facilitated its conduct. Senior exploration geologist Clive Kirk assisted the field stages of the project. Their assistance was effective and greatly appreciated.

Thanks are extended to Phillip Hughes of Kinhill and to Pamela Ruppin of Minenco for making available the very useful reports on relevant work in the region undertaken by Kinhill.

My colleagues Peter Dermoudy and Scott Mitchell greatly assisted the project with their specialist contributions in architectural assessment and measurement (Dermoudy) and archaeology (Mitchell).

BRIEF FOR HERITAGE SITE SURVEY
BROCKS CREEK CHINATOWN AREA

Preamble.

Cyprus Gold Australia Corporation ("Cyprus") is currently undertaking mineral exploration work in the vicinity of an historic site known as the former Brock's Creek Chinatown. The site area is that described by Pearce (1983) from page 234, particularly the area shown in Site Map 54 and map at page 482.

Cyprus is anxious to avoid or minimise any adverse impacts which its exploration work may have upon the site. It therefore desires to commission work which will clearly identify the site and define the area of significance; which will suggest measures which may be taken to avoid or moderate any adverse impacts; and which will serve as a basis for any official consideration of the proposals, particularly in the context of Conservation Commission proposals for heritage site presentation and interpretation in the area.

To that end Cyprus has engaged Peter Forrest ("the consultant") to undertake the work specified in this Brief.

The Brief

The consultant will compile a report which will -

1. Identify, survey, record the current physical and historic status of historic sites in the area, including a review of the documentation compiled by Pearce;

2. Assess and describe the significance of historic sites so identified, having regard to established criteria, including that laid down by the Australian Heritage Commission;

3. Determine the impact of proposed mining exploration activities in or near the area;

4. Make recommendations designed to avoid or minimise disturbance of identified sites;

5. Suggest ongoing management strategies, having regard to proposals advanced by the Conservation Commission of the NT to develop heritage site presentation and interpretation facilities in the area.

The consultant will submit a draft of his report to Cyprus before finalisation. At the conclusion of the project the consultant will submit to Cyprus three copies of his final report, which will include maps, plans, and photographs sufficient to illustrate location, current physical status, and the mining exploration proposals.

1.00 INTRODUCTORY

1.01 THE TASK

This work arose out of the proposals of Cyprus Gold Australia Corporation (Cyprus) to intensify its mineral exploration activities in the vicinity of the former Brock's Creek Chinatown.

The site, although generally known to be an area of potentially considerable heritage significance, was not listed under the heritage protection provisions of any law of the Commonwealth or the Northern Territory, and was not subject to any legal constraints on the intended exploration activity. Cyprus nevertheless resolved that the site should be surveyed with a view to determining the location and extent of heritage values, and that those values should be taken into account during future exploration activity.

The consultant was therefore asked to assess and describe the area of potential significance, and to suggest measures which might be taken to avoid adverse impacts. (see Brief, pages ii - iii hereof).

The consultant visited the site on 20 July 1993, when the project and the site was discussed with Cyprus representatives, and with Bob Alford, Director of the National Trust of Australia (NT). Subsequently a Brief for the required work was drafted and approved by Cyprus and noted by Mr. Alford.

Documentary research was then undertaken. Field work at the site was conducted on 2 August 1993, by the consultant, assisted by Peter Dermoudy (architectural considerations) and Scott Mitchell (archaeological considerations). Maps and drawings were then compiled, and this report was then drafted.

During field work the boundaries of the suggested areas of significance as defined by the field team were discussed with Cyprus representatives. During these discussions it proved to be possible for Cyprus to define the locations of its exploration works in such a way as to avoid any direct physical impact on areas of suggested heritage significance. Those areas of suggested significance were flagged with coloured plastic tape.

1.02 THE SITE

Reference should be made to the maps and photographs herewith.

The site is described as the former Brock's Creek Chinatown site and environs. There are no intact structures in the area, which could best be described as including a number of building foundations and a wide scatter of artefacts, indicating the site of former habitation.

It is located on the southern edge of Brock's Creek township, some 800 metres from the former Brock's Creek railway siding.

The site includes the ruins of the former Kwan Sing Di Temple, situated on the bottom of a slope which rises in a northerly direction toward the township and railway siding. South and east of the temple site, on generally lower ground falling away to a creek flat, is a former Chinese residential area. An outlier of this latter area was found, about 600 m to the west of the temple site. It appeared that gardening may have been carried out on the creek flats to the south of the temple and habitation sites - although it was not necessary to validate this supposition because no exploration works were proposed on or near those flats.

The whole area showed signs of radical recent disturbance, particularly by bottle collectors who appear to have recently excavated at many places. In some places discarded bottles lay on the ground, and at others broken glass indicated that bottles had been broken during or after excavation. Recent mineral exploration work has also taken place in the area, although generally it was obvious that care had been taken to avoid damaging sites of suggested significance. However, it was noted that one costean had recently been cut northward from near the dry well or shaft, and between the temple site and the adjacent levelled earthen floor area to the west (see measured drawing).

Conditions for field work were good, with almost all ground surfaces revealed by recent burning of grass and other vegetation.

PLATE ONE - Looking northward to the temple site (middle ground), from the habitation area to south. Note track intersecting area, between temple site and habitation area.

PLATE TWO - Temple site - detail.

PLATE THREE - Toppled concrete bases which once supported stone lions at temple entry.

PLATE FOUR - Fireplace on eastern side of temple site.

2.00 HISTORIC AND PHYSICAL STATUS

2.01 HISTORICAL OVERVIEW

The general history of the Brock's Creek Chinatown locality was very adequately outlined by Pearce in his 1982 report. (References here are to Volume 4 of that report). It was not necessary or possible within the scope of the present work to undertake an investigation of original sources, and Pearce's report is substantially relied upon here.

According to Pearce, Chinese prospectors began arriving in the nearby Howley and John Bull reef areas from 1878. Many left for Margaret River and Fountainhead in 1880, but drifted back from 1881. A rush to the line of reef between John Bull and Brock's Creek broke out in mid 1884, involving about 400 Chinese. About 300 Chinese were working near Brock's Creek in early 1885, and a Chinese township of bark huts had been established on Burgan's Creek at the present Brock's Creek Chinatown site. (Pearce 87).

Chinese were active on both reef and surface claims "throughout the 1890s and 1900s", and Chinese businesses and market gardens were established. In 1895 the Brock's Creek Chinatown mining population was estimated at between 245 and 286. (Pearce 87 - 88).

On 7 November 1895 a great fire destroyed much of Brock's Creek Chinatown, including several shops and 30 grass humpies. More damage was done in 1900 when Europeans went on a destructive rampage through Chinatown. (Pearce 88).

By 1905 the Brock's Creek population had dwindled to between 100 and 150. In 1917 only 17 Chinese from Brock's Creek applied for miner's rights, and by the early 1940s only a few pensioners remained.

Pedersen also treats the general history of Brock's Creek. She says that Brock's Creek "began as a mining camp in the early 1870s but by 1886 a large Chinese population, housed in bark humpies was well established." (Pedersen 11)

The population of the town fluctuated through the 1880s, being at times "quite large", but it seems that a fair average figure would have been about 20 or 30 Europeans and up to 200 Chinese people. The Chinese came and went, periodically forsaking Brock's Creek for places such as the Margaret River diggings, but returning when ephemeral fields petered out, or when dry weather made alluvial working difficult. (see Pedersen 60, and generally).

In common with other Top End mining areas, Brock's Creek diminished in population and importance from the first years of this century. However, with the exception of Pine Creek, Brock's Creek was more enduring than the other Top End mining settlements. In 1907/1908 it had five registered Chinese owned businesses, and one Chinese business in fact survived until 1939. (Pedersen 63).

By 1891 the town is said to have had a European population of 20, and a Chinese population of 120 - lower than in earlier years. (Pedersen 66). The Chinese population in the Top End generally dwindled from about this time, having peaked in 1888.

THE KWAN SING DI TEMPLE

The Kwan Sing Di temple is presumed to have been built circa 1894 - 1897. It was constructed of a bush timber frame, clad and roofed in corrugated galvanised iron, on a concrete slab. (Pearce 85). A forecourt extended south from the main building, and two large stone lions were originally supported by the concrete plinths which are still on the site, but are now rolled aside and pushed askew. (Pearce 85).

The temple was in use until early 1942. Then, in late 1942 or early 1943, soldiers from the military police detachment based at the Brock's Creek Detention Barracks destroyed much of the temple. The stone lions were broken and removed, while the interior of the temple was looted and burned. After the war the stone lions were located by members of Darwin's Chinese community. They were repaired and incorporated in the 1959 restoration of the Sing Goon Temple in Darwin. (Pearce 86).

The Brock's Creek Chinese temple was one of several temples on the mining fields, others being located at Pine Creek, Union Reefs, and the Twelve Mile. (McCarthy 9).

PLATE FIVE - Notched log at temple site entry, between concrete post bases.

PLATE SIX - Wrought iron angle wall support - noted at several places at the former temple site and at adjacent foundations to west of temple.

PLATE SEVEN - Slotted post at temple site, probably once used to support a flagpole.

2.02 PHYSICAL STATUS OF THE SITE

THE TEMPLE

Reference should be made to the measured drawings with this report. These drawings document the physical status of the temple site as observed on 2 August 1993.

Little significant variation from Pearce's 1981 observations was noted. (See Pearce 85).

CHINATOWN RESIDENTIAL AREA

This area, to the south and east of the temple site, has previously been described by Pearce (1982), McCarthy (1986), and Kinhill (1993).

McCarthy said that "this site has an extensive array of surface remains. The layout of buildings and structures is obvious with many foundation walls and floors (with evidence of door openings) still intact. The most dominant feature is the temple area with huge timber posts cut off at a low level. Obvious artefacts include ceramics, glass, and ironware representing many aspects such as cooking, sleeping, and day to day life. ... Although some ransacking for bottles has taken place, there are many undisturbed areas, especially in and around the structures, which would undoubtedly reveal much about the form and function of the buildings. The integrity of this site is much higher than at Pine Creek ... " (McCarthy 58).

Kinhill reviewed a number of sites in the Pine Creek region in an effort to create a basis for the comparative assessment of site of Chinese origin in the Union Reefs area. Kinhill concluded that Chinese sites the region contain several types of structures, including ovens, building floors, fireplaces, forges, and temple remnants. Brock's Creek was one of three places having temple sites - the others were Twelve Mile and Pine Creek.

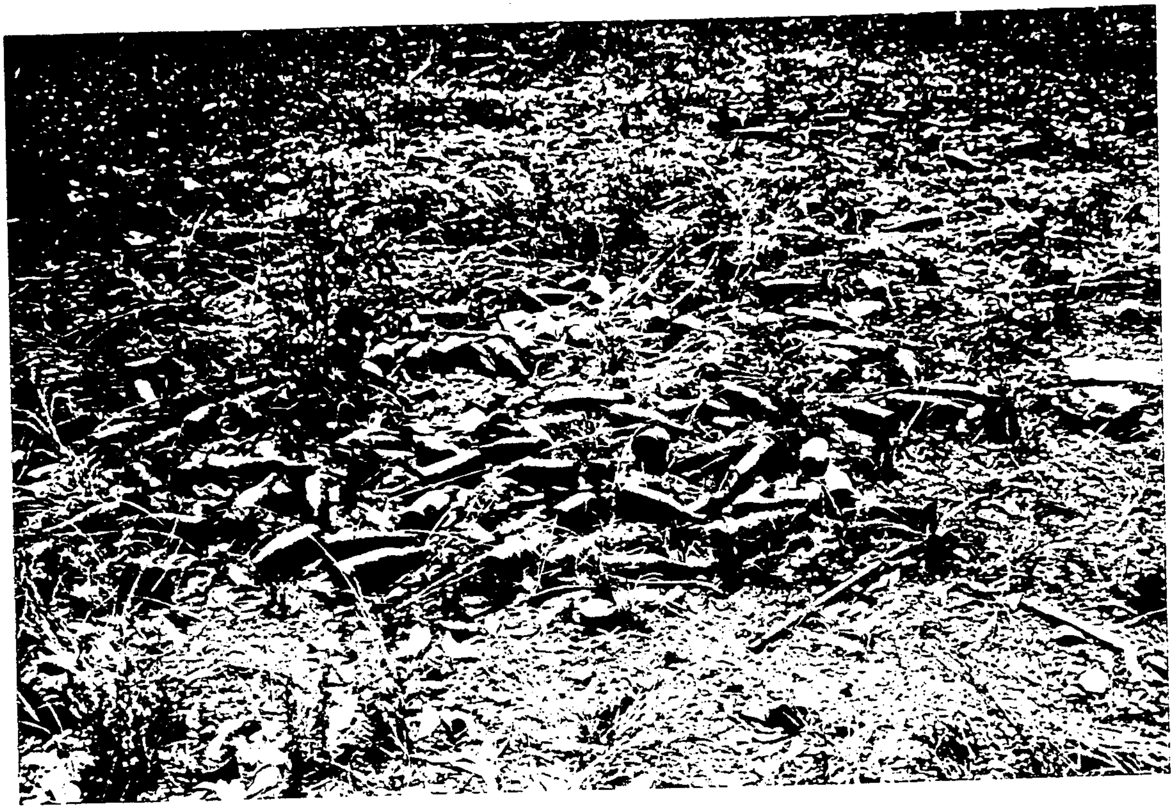

PLATE EIGHT - Bottle dump, located to north east of temple site. The bottles appear to be of World War Two and more recent origin.

PLATE NINE - Costean, looking southwards to the end of the costean, between the temple site and foundations located to west of temple.

PLATE TEN - Foundations, located to west of temple site (see measured drawing).

PLATE ELEVEN - Dry well or shaft, to west of temple site.

ARCHAEOLOGICAL OBSERVATIONS

Note that in the case of each of the four areas of scatter referred to below the areas were selected after being seen to contain artefact densities exceeding 1 artefact per square metre. The boundaries of these areas were marked (see map).

AREA ONE - THE TEMPLE COMPLEX

Previous archaeological research at this locality revealed a concentration of Chinese structures, and a rich, though highly disturbed, scatter of glass and ceramics (Bell 1983: 120-121; Pearce 1982 Vol 4: 85-87). A central feature of these remains was the temple, consisting in 1981 of a concrete floor, two concrete encased post holes, a section of a rock and concrete plinth and a 2.1m high standing wooden post. Pearce (1982 Vol 4: 85-86) also recorded four or five earth floors edged with rock, a rock hearth, and a small iron and concrete fireplace. All structural features described by Pearce (1982 Vol 4:85-87) were relocated and found to be intact.

It is likely that more structural features remain to be identified at this site. Two collapsed rock platforms, a possible collapsed rock fireplace, a packed earth floor with cement edging and a cement basin were also noted. The latter had been excavated into the ground and measured approximately 1m x 1m x 20cm. Nonetheless, the boundaries of many features are indistinct, due to the density of archaeological remains and prior disturbance of the ground surface. Detailed archaeological mapping and test-pitting will be required to confidently identify the complete set of structures on the site.

A dense and diverse assemblage of artefacts has been deposited on and around the temple and the associated habitation structures (marked by earthen foundation platforms, some including stone elements). This scatter covers an area of 180m (N-S) by 150m (E-W) (see map). Artefacts tend to be distributed in a highly clustered pattern, with the highest densities on and adjacent to the earth platforms. Densities in these areas reached >100/m2, while averaging 5-10/m2 elsewhere. Site boundaries are highly distinct, with artefact densities falling quickly to nil with distance from the main temple/habitation complex.

Artefacts on the Brock's Creek Chinese habitation site appear to date from two distinct periods of occupation. The most common type of artefacts are whole or broken beer bottles, occurring individually or in clusters containing up to approximately 100 bottles. Most bottled bear raised letters on the base consisting of the letter "M" and 3 digits. These bottles almost certainly date from World War Two, when a large military base was established in the immediate vicinity.

The artefact scatter also includes large quantities of highly fragmented artefacts dating to the late nineteenth or early twentieth century. Older glass fragments are mostly pieces of rolled-lip Hoboken case gin bottles, together with some light green beer bottles with an omphalos base, and some dark green beer bottles with an omphalos base. Pottery consists mostly of highly fragmented, undecorated celadon bowls and cups. Ceramics also include shards from at least two large earthenware storage jars, bases from a small number of hard paste porcelain bowls with blue dynastic seals, several types of stoneware, and a small number of hard paste porcelain shards decorated with Chinese symbols.

Bricks, numerous sheets of corrugated iron, iron machinery fragments, metal drums, a square based metal tank, iron pipes and metal buckets (of which only one was intact), were also observed on this site. Smaller artefacts included iron rings, food tins with soldered lids, frying pans, a shovel, a tin matchbox, metal door hinges and door locks, fragments of metal pots and bowls, enamelled billies and basins, and wire billyhooks.

AREA TWO - CORRUGATED IRON AND MACHINERY

A scatter of corrugated iron sheets, iron bars and iron machinery fragments measuring 8m x 5m. The ground surface on which this material has been deposited is mounded to a height of 10 - 20 cm. It is not clear whether this material was deposited as a result of early mining activities or later occupation during WWII.

AREA THREE - CHINESE ARTEFACT SCATTER

A dense and relatively discrete scatter of bottle glass and ceramics spread over an area of 20m x 10m. The ground surface in this locality has been extensively excavated, probably with a mechanical excavator. These excavations, almost certainly the work of bottle collectors, have exposed large numbers of artefacts on the ground surface. Artefact densities are greater than 50 / m2 across most of

PLATE TWELVE - Broken pottery and other scatter in former habitation area.

PLATE THIRTEEN - Iron tank or container in former habitation area.

the area, and most exposed artefacts are highly fragmented. Glass fragments dominate the assemblage, although it also includes fragments of a brown stoneware jug, several blue porcelain bowls with blue dynastic seals, a fragment of a light blue porcelain bowl with dark green Chinese characters, and fragments of a light blue porcelain cup. No structural remains were observed within the scatter. It is probable that any associated structural remains have been destroyed.

AREA FOUR - CHINESE AND WORLD WAR TWO SCATTER

An assemblage of material dating to the WWII period, together with some distinctively Chinese artefacts. The most common artefacts on the site consist of bottles, metal drums, cans and machinery fragments which date to the World War Two period. Several standing wooden posts, and a platform constructed from rock and iron sheeting are also likely to date from this period. Sheets of corrugated iron are features of the scatter, although it is not clear to which period these date to.

Although dominated by World War Two material, the assemblage also includes a relatively small number of artefacts that are either clearly Chinese in origin, or date to the late nineteenth or early twentieth century. These include fragments of large stoneware jars, pale blue porcelain fragments with blue Chinese decoration, Hoboken gin bottles, shovels, numerous buckets, a horse's bridle, lengths of chain, and food tins with soldered lids. An unusual artefact was a shovel filed on three sides to form a post-hole digger. Artefacts pre-dating the World War Two period occur in densities of between 1 / 10m2 and 1 / m2.

The area of this scatter may have served as the habitation site for Chinese market gardeners, who are known to have worked on the alluvial flats immediately to the south (cf. Pearce 1982: Site Plan 51). Agricultural activities are reflected by an iron hoe found approximately 50m to the south of Scatter 4.

3. 00 ASSESSMENT OF SIGNIFICANCE

3.01 METHODOLOGY FOR ASSESSMENT

In assessing the possible heritage significance of the elements of the Brock's Creek Chinatown area, regard has been had to established definitions and criteria, especially those employed by the Australian Heritage Commission.

The consideration of whether a site has heritage significance, and the degree of that significance, needs to be undertaken in several steps.

Firstly, the question must be asked whether the site has any particular heritage value (significance) at all. If it is thought that the site has some heritage significance, then it must be asked what degree or level of significance does it have?

The answers to these questions will inevitably be subjective, but the application of established criteria will reduce the degree of subjectivity.

There are many definitions of the term "heritage" and the synonymous term "national estate". A simple definition is - "A nation's heritage is the stock of things and places which the community wants to keep and look after because those things have special scientific or cultural value for present or future generations of people."

Alternatively, heritage is "the things we ought to keep", or "those natural, Aboriginal and historic places in Australia which should be kept for present and future generations".

The Hope Committee of Inquiry Into the National Estate (1974) defined the national estate as "those elements of the natural environment, the Aboriginal environment, and the historic environment which are of special value to the Australian community, present and future."

One of the results of the Hope Committee's work was the eventual passage of the Australian Heritage Commission Act (1975), and the establishment in 1976 of the Australian Heritage Commission. The Act contained a definition of the national estate which has come to be generally adopted since 1976, and the

Commission has devised a set of criteria which assist in the application of the definition.

Because the definition and the criteria are authoritative, and are widely known and understood, they have been adopted and applied for the purposes of this report.

Section 4 (1) of the Australian Heritage Commission Act provides that the national estate (which may be taken as being synonymous with heritage) consists of "those places, being components of the natural environment of Australia or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations as well as the present community."

Section 4 (1A) goes on to provide (without limiting the generality of the above definition) that a place will be part of the national estate if it has significance because of any of the following criteria:

"(a) its importance in the course, or pattern, of Australia's natural or cultural history;
(b) its possession of uncommon, rare, or endangered aspects of Australia's natural or cultural history;
(c) its potential to yield information that will contribute to an understanding of Australia's natural or cultural history;
(d) its importance in demonstrating the principal characteristics of:
(i) a class of Australia's natural or cultural places; or
(ii) a class of Australia's natural or cultural environments;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(h) its special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history."

It should be noted that the Australian Heritage Commission Act definition and criteria make no reference to considerations such as resource use or economic value, which are not relevant factors in determining national estate or heritage value. Such matters may affect management decisions, but they do not assist in the process of deciding what constitutes heritage.

The Australian Heritage Commission has developed guide-lines to assist in applying the criteria laid down in (a) to (h) above. So far as sites of possible cultural heritage significance are concerned, these guide-lines are -

Criterion (a) - importance in the course or pattern of Australia's natural or cultural history -

* importance in exhibiting unusual richness or diversity of ... cultural features.

* importance for their associations with events, developments, or cultural phases which have had a significant role in the human occupation and evolution of the nation, State, region, or community.

Criterion (b) - its possession of uncommon, rare or endangered aspects of Australia's natural or cultural history -

* importance in demonstrating a distinctive way or life, custom, process, land use, function or design no longer practised, in danger of being lost, or of exceptional interest.

Criterion (c) - its potential to yield information that will contribute to an understanding of Australia's natural or cultural history -

* importance for information contributing to a wider understanding of the history of human occupation of Australia.

Criterion (d) - its importance in demonstrating the principal characteristics of a class of Australia's natural or cultural places or a class of Australia's natural or cultural environments -

* importance in demonstrating the principal characteristics of the range of human activities in the Australian environment (including way of life, philosophy, custom, process, land use, function, design or technique).

Criterion (e) - its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group -

* importance for a community for aesthetic characteristics valued by a community or particular cultural group.

Criterion (f) - its importance in demonstrating a high degree or creative or technical achievement at a particular period -

* importance for their technical, creative, design or artistic excellence, innovation or achievement.

Criterion (g) - its strong associations with a particular community or cultural group for social, cultural or spiritual reasons -

* importance as places highly valued by a community for reasons of religious, spiritual, cultural, educational or social associations.

Criterion (h) - its special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history -

* importance for their close associations with individuals whose activities have been significant within the history of the nation, State, or region.

These guide-lines are applied by the Australian Heritage Commission in considering nominations for inclusion of places on its Register of the National Estate.

It should be noted that a site is not required to possess more than one of the characteristics referred to in the definition and guide-lines before it acquires national estate significance. However, in practice many sites will have multiple values justifying a ranking of national estate value.

The Northern Territory has recently enacted the Heritage Conservation Act 1991. This legislation does not in itself define criteria for the assessment of heritage significance, but it does establish a framework designed to ensure that sites having the following characteristics are most likely to be identified -

(a) of significance in the evolution and pattern of the Territory's natural or cultural history;
(b) possessing rare, endangered or uncommon aspects of the Territory's natural or cultural history;

(c) demonstrating the prime characteristics of a class of the Territory's heritage places or objects;
(d) of significance for their strong association with the life or works of a notable person or persons associated with the Territory;
(e) possessing technical, design, or aesthetic qualities of significance;
(f) of significance because of special association with a Territory community for social, cultural or spiritual reasons; or
(g) of significance for their potential to yield information which will contribute to a better understanding of Territory heritage.

The Heritage Conservation Act 1991 provides for the further development and adoption of criteria for the assessment of significance by regulation. Regulations to this effect have not yet been promulgated, but their form has been under active consideration.

It is understood that the criteria proposed to be adopted under the Northern Territory Heritage Conservation Act will be identical, for all practical purposes, with the Australian Heritage Commission definitions and criteria.

Both the Australian Heritage Commission Act and the proposed Territory legislation leave the level of significance as a matter of professional judgment. However, established processes exist to assist the objectivity of that judgment.

These processes involve -
(i) assembling the data known about a place;
(ii) assessing each piece of data against the relevant criterion and applying a qualitative rating;
(iii) making an overall assessment of the significance of the place based on the assessments against individual criteria.

This process will result in a place having either very low; low; moderate; high; or very high to outstanding significance. (Australian Heritage Commission working paper 1990 p. 10).

Places which have very low, low, or even moderate ratings of significance may not deserve inclusion on the Register of the National Estate, but nevertheless they may be of interest or value in the regional or local context.

For the purposes of this study the Australian Heritage Commission's definitions and criteria are adopted and applied, on the basis that sites which achieve a high to very high or outstanding ranking of significance are regarded as being of national estate value, sufficient to justify inclusion on the Register of the National Estate. Sites of lesser levels of significance might be regarded as having local, regional, or Territory significance.

3.02 THE SUBJECT SITES - ASSESSMENT OF SIGNIFICANCE

Clearly, the Brock's Creek Chinatown sites are of heritage significance when tested against any one or several of the above criteria.

The involvement of Chinese people in Top End mining from 1874 was of great historical consequence. The Chinese dominated on the Top End goldfields (their population there in 1888 of about 6,000 outnumbering whites by almost ten to one), and although they were numerous and important on other goldfields, nowhere else did they achieve the same numerical dominance as they did in the region north of Katherine. Even after the mining activity petered out, the Chinese remained a most important group in the Top End community.

Sites and artefacts left behind on the mining fields by the Chinese are therefore of potential value in illustrating or evidencing important themes or sub-themes in Australia's history.

It is thought that the Brock's Creek sites are of national estate value under the Australian Heritage Commission criteria because they -

* exemplify a major theme in Australian history;
* have the potential (archaeological) to yield information which will contribute to an understanding of Australia's history;
* in the case of the Temple site, there are strong associations with the spiritual values of an important cultural group.

Similarly, the sites are of significance when tested against the parallel criteria used under the Northern Territory's Heritage Conservation Act. It is understood that the National trust of Australia (NT) has now nominated the sites for registration under the provisions of that Act.

The above findings concerning confirm the results of work undertaken by Kinhill in a 1993 study. Kinhill approached the question of significance from a standpoint of comparative assessment of numerous Chinese sites in the region, and a consideration of their value for the archaeological evidence they were thought to contain.

After analysing field data, Kinhill concluded that the most valuable and significant Chinese sites in the region, from an archaeological viewpoint, were those at Union Reefs and Pine Creek. These sites were thought to contain the largest number and highest diversity of structural remains, and the highest diversity of artefacts. These sites were therefore thought to be of high significance, while other Chinese sites, including Brock's Creek, were not archaeologically comparable. (Kinhill 8).

Thus Kinhill stressed the value of the sites because of the evidence they contained, evidence which was thought likely to yield information which will contribute to an understanding of Australia's history.

Brock's Creek Chinatown, in Kinhill's view, "holds great historic significance as a centre for Chinese residential and cultural activity in the area. It was the longest continually occupied Chinese settlement in the Pine Creek region, and one of the first to be established. The site contains remains of wide variety of Chinese activities, and large quantities of glass, ceramic and metal artefacts remain. Nonetheless, this site is in a relatively poor state of preservation, and is under possible threat of destruction from resumption of mining activity." (Kinhill 12).

It should be noted that in the view of the National Trust Kinhill's comparative analysis of the Union Reefs Chinatown sites and Brock's Creek "may now be outdated in view of the impending (mining) works at Union Reefs. The Brock's Creek precinct in toto, and the Chinatown sites in particular tend to take on enhanced significance as a result." (letter Alford to Forrest, 15 September 1993).

4.00 IMPACT OF PROPOSED MINERAL EXPLORATION WORKS

Upon conclusion of field work to locate and describe sites of possible significance, discussions were held with Clive Kirk, senior exploration geologist.

It was noted that proposals for drilling in the area involve a line of drill holes running from east to west, about 300 metres north of the temple site. This work will have no direct impact on the sites of significance, provided that care is taken not to allow machinery to cross the area of significance. This can be avoided by the measures described in the following section of this report.

5.00 MANAGEMENT CONSIDERATIONS

The exploration works as presently proposed (drilling and costean trenches) do not involve any work closer than an east - west line about 300 m. north of the temple site, thus well clear of sites of significance.

The main risk of damage to the sites thus arises not from direct impacts, but rather from incidental careless human activity. The risk of this can be minimised, and discussions were held between the field team and Cyprus representatives to achieve this minimisation.

The sites were flagged so as to clearly define them, and the ambit of the flagged area was then discussed with the Exploration Manager. It was agreed that steps would be taken by Cyprus and its contractors and employees to keep all machinery and other possible adverse agencies well clear of the flagged areas.

It is believed that these steps should adequately safeguard the sites during the exploration phase.

It should be noted that the Brock's Creek area has been suggested as an area for possible visitor presentation within a proposed Northern Territory wide scheme for the presentation of cultural heritage sites, along the Stuart Highway spine from Kulgera to Darwin. It is suggested that the proponents of this scheme (National Trust and the Conservation Commission) should consider the values of the Brock's Creek area, and the possibility of integrating the interpretation of heritage sites with the presentation of modern mining activity.

6.00 SOURCES AND REFERENCES

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McCarthy, J & Associates 1986.	Pine Creek Heritage Zone Archaeological Survey. A report for the National Trust of Australia (NT)
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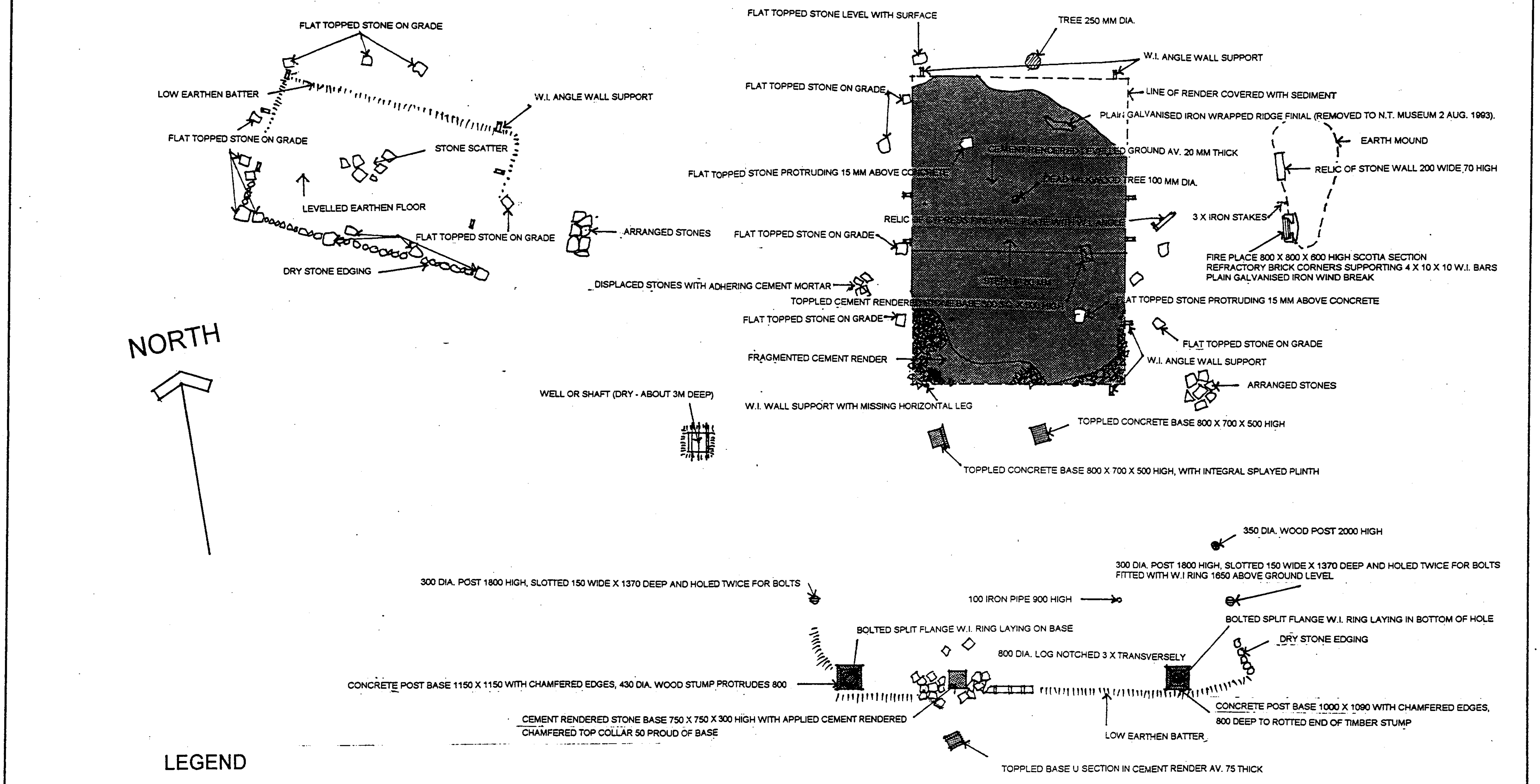
Pedersen-McLaren, BM 1990	Brock's Creek: A History of Mining - Its Expectations and Disappointments 1870 - 1911.



LEGEND

CONCRETE / CEMENT RENDER

60 X 10 THICK W.I. ANGLE WALL SUPPORT BRACKETS
(PROTRUDE 150 ABOVE GROUND, TOP LEG PROJECTS 100 AWAY FROM BUILDING, PUNCHED 10 HOLE)

MEASURED DRAWING

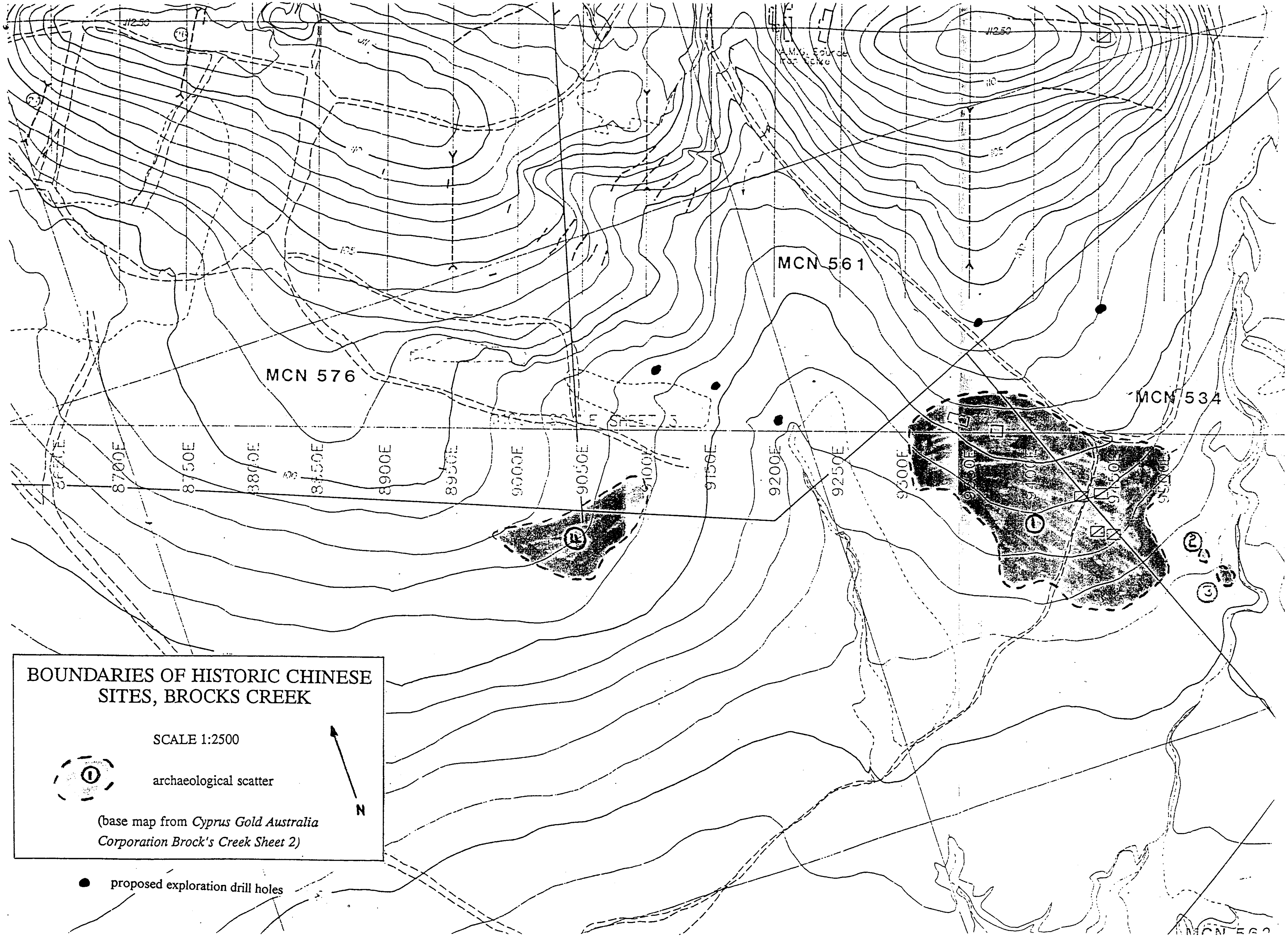
KWANG SING DI TEMPLE SITE, BROCK'S CREEK

PETER FORREST
HERITAGE CONSULTANT

AUGUST 1993

DRAWN: PETER DERMOUDY
ALL DIMENSIONS ARE IN MM

SCALE 1:100



BOUNDARIES OF HISTORIC CHINESE SITES, BROCKS CREEK

QASCO

29 OCT 1993

Professional Consultants in Surveying, Mapping, Land Development, Land Information Systems, Aerial Photography.

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Our Ref: 6434
22 October, 1993

CYPRUS GOLD AUSTRALIA
BROCKS CREEK PROJECT

GPS observations were undertaken on the attached 41 points during mid-October 1993 in order to establish accurate AMG/AHD coordinates for an extensive exploration control network in the Brocks Creek area.

Baseline points BL01, BL02, BL03, BL04 and BL05 were observed within the network to establish transformation parameters between AMG and Mine Grid coordinates.

The derived AMG/AHD coordinates are based on the following information:

- Horizontal Datum of Mt. Osborne NTS 309
  First Order Trig Station
  AGD84 coordinates E 769236.375
  N 8504444.254

- Vertical Datum of Dept. of Lands & Housing
  Bench Mark BM4019
  AHD RL 107.50

The GPS observations undertaken were of a far greater accuracy than any gridding surveys carried out in the past. In order to calculate the transformation parameters from AMG to Mine Grid and reverse it was necessary to adopt one point of known mine grid coordinates as a 'fixed point' from which to recalculate actual mine grid coordinates for the remaining points. ie. Station BL04 at 9700E, 1600N remains 'fixed' while stations BL01,BL02,BL03 and BL05 will have new coordinates based on the GPS observations.

Transformation Parameters

	AMG		MINE		
	E	N	E	N	RL
BL04	762041.868	8509434.404	9700	1600	98.96

AMG to Mine Grid
Scale Factor 0.999550712
Azimuth Swing -18°51'20"

Mine Grid to AMG
Scale Factor 1.00044949
Azimuth Swing + 18°51'20"

CYPRUS GOLD AUSTRALIA

BROCKS CREEK CONTROL

STN NUMBER	A.M.G. EASTING	A.M.G. NORTHING	MINE GRID EASTING	MINE GRID NORTHING	RL	GL
MT OSB	769236.375	8504444.254	18117.374	-796.138	235.60	Horz Datum
MT WELLS	793475.646	8505444.262	40722.530	7979.992	261.78	Horz Tie
4019	759140.795	8504090.582	8682.102	-4391.938	107.50	Vert Datum
4013	755334.585	8508647.134	3609.824	-1311.396	82.50	Vert Tie
BL01	760432.514	8509984.843	7999.881	1600.784	97.67	97.47
BL02	760562.024	8510363.426	8000.089	2000.726	95.08	94.84
BL03	758858.744	8510946.712	6200.514	2002.238	117.51	117.24
BL04	762041.868 762046	8509434.404 8509443	9700.000	1600.000	98.96	98.96
BL05	764692.259	8508529.267	12499.428	1599.998	103.74	103.62
BL06	764627.602	8508339.950	12499.425	1400.035	102.49	102.41
BL07	764595.268	8508245.303	12499.415	1300.062	101.78	101.39
BL08	767910.672	8507120.604	15998.813	1307.199	115.44	115.17
BC01	763584.325	8508707.464	11393.857	1410.652	95.54	95.46
BC02	763317.518	8508681.819	11149.765	1300.205	94.79	94.66
BC03	765714.184	8506668.882	14067.054	170.360	99.09	98.95
BC04	767025.598	8507505.412	15037.304	1385.280	123.38	123.24
BC05	767749.075	8508285.198	15469.748	2356.599	118.55	118.47
BC06	764885.260	8509419.945	12394.267	2504.847	107.75	107.56
BC07	770303.736	8506589.144	18434.121	1577.536	125.89	125.70
BC08	764122.508	8508483.502	11975.278	1372.657	104.07	103.89
BC09	763206.498	8509501.975	10779.808	2040.136	101.92	101.74
BC10	762867.591	8511443.932	9831.906	3767.575	122.08	121.94
BC11	764416.616	8510963.788	11452.251	3813.796	125.55	125.46
BC12	761974.172	8511492.159	8971.232	3524.585	117.39	117.28
BC13	764805.151	8511967.336	11495.586	4888.575	125.59	125.46
BC14	761833.175	8509943.778	9338.048	2014.407	109.39	109.23
BC15	761303.934	8510644.680	8611.015	2506.433	120.63	120.34
BC16	761612.397	8508500.633	9595.402	578.000	93.56	93.42
BC17	756870.225	8512198.833	3915.069	2544.266	92.64	92.38
BC18	755050.685	8512782.234	2005.485	2508.330	75.84	75.63
BC19	754574.107	8517126.315	151.380	6463.492	65.19	64.98
BC20	753078.755	8513813.985	-193.081	2847.266	74.98	74.80
BC21	757944.699	8507705.490	6382.947	-1358.941	85.54	85.36
BC22	762654.799	8504878.941	11751.367	-2511.063	101.77	101.59
BC23	762260.124	8504007.979	11659.394	-3462.411	178.09	177.97
BC24	761926.871	8505923.521	10725.373	-1758.132	94.53	94.26
BC25	760972.432	8504122.821	10404.253	-3769.754	111.78	111.66
BC26	760344.956	8503091.009	10144.031	-4948.456	128.15	128.00
BC27	751960.756	8509565.467	121.825	-1532.611	94.05	93.91
BC28	762518.724	8511755.426	9401.285	3949.523	121.58	121.40
BC29	776171.814	8507839.134	23581.007	4655.529	110.86	110.71

Appendix 14

Alligator 0.5 g/t — File: AGRPT_C.WS 25/10/93

Section	Block No	Oxide Tonnes	Oxide GRADE (g/t) Uncut	Oxide GRADE (g/t) Cut	Oxide TONNESxGRADE Uncut	Oxide TONNESxGRADE Cut	Oxide GOLD (ounces) Uncut	Oxide GOLD (ounces) Cut	Sulphide Tonnes	Sulphide Grade g/t Uncut	Sulphide Grade g/t Cut	Sulphide TONNESxGRADE Uncut	Sulphide TONNESxGRADE Cut	Sulphide GOLD (ounces) Uncut	Sulphide GOLD (ounces) Cut	TOTAL Tonnes	TOTAL Grade g/t Uncut	TOTAL Grade g/t Cut	TOTAL GOLD (ounces) Uncut	TOTAL GOLD (ounces) Cut
8300	1								29721	1.62	1.62	48,148	48,148	1,548	1,548					
	2								14727	2.84	2.84	41,825	41,825	1,345	1,345					
Section total									44,448	2.02	2.02	89,973	89,973	2,893	2,893	44,448	2.02	2.02	2,893	2,893
8350	1								18287	0.65	0.65	11,887	11,887	382	382					
	2	8001	0.86	0.86	6,881	6,881	221	221												
	3								17161	0.86	0.86	14,758	14,758	475	475					
	4								26967	3.17	3.17	85,485	85,485	2,748	2,748					
Section total		8,001	0.86	0.86	6,881	6,881	221	221	62,415	1.80	1.80	112,130	112,130	3,605	3,605	70,416	1.69	1.69	3,826	3,826
8400	1	27488	1.41	1.41	38,758	38,758	1,246	1,246												
	2								22766	2.95	2.95	67,160	67,160	2,159	2,159					
	3								16109	1.38	1.38	22,230	22,230	715	715					
	4								51087	2.06	2.06	105,239	105,239	3,384	3,384					
	5								36183	1.35	1.35	48,847	48,847	1,570	1,570					
Section total		27,488	1.41	1.41	38,758	38,758	1,246	1,246	126,145	1.93	1.93	243,476	243,476	7,828	7,828	153,633	1.84	1.84	9,074	9,074
8450	1	17703	1.34	1.34	23,722	23,722	763	763												
	2	6635	1.11	1.11	7,365	7,365	237	237												
	3								25813	1.84	1.84	47,496	47,496	1,527	1,527					
	4	23733	1.42	1.42	33,701	33,701	1,084	1,084												
	5								18254	4.58	4.15	83,603	75,754	2,688	2,436					
	6								21123	0.98	0.98	20,701	20,701	666	666					
	7	18010	1.12	1.12	20,171	20,171	649	649												
	8	16721	3.79	3.79	63,373	63,373	2,038	2,038												
	9								60262	2.35	2.35	141,616	141,616	4,553	4,553					
	10								30813	2.04	2.04	62,859	62,859	2,021	2,021					
	11								48999	4.55	4.55	222,945	222,945	7,168	7,168					
	12								19001	2.02	2.02	38,382	38,382	1,234	1,234					
	13								7570	2.73	2.73	20,666	20,666	664	664					
Section total		82,802	1.79	1.79	148,332	148,332	4,769	4,769	231,835	2.75	2.72	638,268	630,418	20,521	20,269	314,637	2.50	2.48	25,290	25,038
8500	1	77140	1.66	1.66	128,052	128,052	4,117	4,117												
	2	20580	4.12	4.12	84,790	84,790	2,726	2,726												
	3	21507	1.04	1.04	22,367	22,367	719	719												
	4	22237	1.76	1.76	39,137	39,137	1,258	1,258												
	5								25393	0.81	0.81	20,568	20,568	661	661					
	6								148342	2.16	2.16	320,419	320,419	10,302	10,302					
	7								121869	1.25	1.25	152,336	152,336	4,898	4,898					
	8								61586	1.17	1.17	72,056	72,056	2,317	2,317					
	9								51753	1.38	1.38	71,419	71,419	2,296	2,296					
	10	12282	1.47	1.47	18,055	18,055	580	580												
	11								26501	1.47	1.47	38,956	38,956	1,252	1,252					
	12								27096	3.11	3.11	84,269	84,269	2,709	2,709					
	13								92454	2.41	2.35	222,814	217,267	7,164	6,985					
	14								23789	0.96	0.96	22,837	22,837	734	734					
	15								13918	1.11	1.11	15,449	15,449	497	497					
Section total		153,746	1.90	1.90	292,401	292,401	9,401	9,401	592,701	1.72	1.71	1,021,124	1,015,576	32,830	32,652	746,447	1.76	1.75	42,231	42,053
8550	1	93920	2.60	2.60	244,192	244,192	7,851	7,851												
	2	18730	3.52	3.52	65,930	65,930	2,120	2,120												
	3								213116	1.71	1.67	364,428	355,904	11,717	11,443					
	4								57152	2.53	2.53	144,595	144,595	4,649	4,649					
	5								18419	1.17	1.17	21,550	21,550	693	693					
	6								20306	1.35	1.35	27,413	27,413	881	881					
	7								17385	0.71	0.71	12,343	12,343	397	397					
	8								54643	1.14	1.14	62,293	62,293	2,003	2,003					
	9								15686	2.82	2.82	44,235	44,235	1,422	1,422					
	10								14353	2.22	2.22	31,864	31,864	1,024	1,024					
	11								147748	2.69	2.30	397,442	339,820	12,778	10,926					
	12								29271	1.39	1.39	40,687	40,687	1,308	1,308					
	13								42175	0.91	0.91	38,379	38,379	1,234	1,234					
	14								88032	1.31	1.31	115,322	115,322	3,708	3,708					
	15								12249	2.56	2.56	31,357	31,357	1,008	1,008					
Section total		112,650	2.75	2.75	310,122	310,122	9,971	9,971	730,535	1.82	1.73	1,331,908	1,265,762	42,823	40,696	843,185	1.95	1.87	52,793	50,667
8600	1	45935	1.43	1.43	65,687	65,687	2,112	2,112												
	2	6896	1.45	1.45	9,999	9,999	321	321												
	3								33342	1.45	1.45	48,346	48,346	1,554	1,554					
	4								127892	2.67	2.67	341,472	341,472	10,979	10,979					
	5								111738	2.01	2.01	224,593	224,593	7,221	7,221					
	6								107316	1.31	1.31	140,584	140,584	4,520	4,520					
	7	20280	1.58	1.58	32,042	32,042	1,030	1,030												
	8								1753	6.05	6.05	10,606	10,606	341	341					
	9								9430	2.16	2.16	20,369	20,369	655	655					
	10								61625	2.28	2.28	140,505	140,505	4,517	4,517					
	11								33263	1.00	1.00	33,263	33,263	1,069	1,069					
	12								24970	1.53	1.53	38,204	38,204	1,228	1,228					
	13								17828	1.70	1.70	30,308	30,308	974	974					
	14								24816	1.40	1.40	34,742	34,742	1,117	1,117					
	15								18715	1.45	1.45	27,137	27,137	872	872					
	16								33505	0.96	0.96	32,165	32,165	1,034	1,034					
	17								14249	1.24	1.24	17,669	17,669	568	568					
Section total		73,111	1.47	1.47	107,729	107,729	3,464	3,464	620,442	1.84	1.84	1,139,962	1,139,962	36,651	36,651	693,553	1.80	1.80	40,115	40,115
8650	1	14774	1.84	1.84	27,184	27,184	874	874												
	2								60466	3.03	3.03	183,212	183,212	5,890	5,890					
	3								42243	1.76	1.76	74,348	74,348	2,390	2,390					
	4								61182	1.68	1.68	102,786	102,786	3,305	3,305					
	5	9112	2.24	2.24	20,411	20,411	656	656												
	6								11688	4.26	4.26	49,791	49,791	1,601	1,601					
	7								24605	0.96	0.96	23,621	23,621	759	759					
	8								13852	1.37	1.37	18,977	18,977	610	610					
	9								75908	1.75	1.75	132,839	132,839	4,271	4,271					
	10	8063	13.74	12.32	110,786	99,336	3,562	3,194												
	11								22885	0.88	0.88	20,139	20,139	647	647					
	12								12383	1.28	1.28	15,850	15,850	510	510					
	13								7653	20.88	6.84	159,795	52,347	5,138	1,683					
Section total		31,949	4.96	4.60	158,381	146,931	5,092	4,724	332,865	2.35	2.02	781,357	673,909	25,122	21,667	364,814	2.58	2.25	30,214	26,391
8700	1								10849	16.24	5.85	176,188	63,467	5,665	2,041					
	2								25428	2.42	2.42	61,536	61,536	1,978	1,978					
	3								28562	1.66	1.66	47,413	47,413	1,524	1,524					
	4								11817	2.95	2.95	34,860	34,860	1,121	1,121					
	5								9719	1.13	1.13	10,982	10,982	353	353					
	6								25783	0.99	0.99	25,525	25,525	821	821					
	7								13593	1.12	1.12	15,224	15,224	489	489					
	8								13196	1.93	1.93	25,468	25,468	819	819					
Section total									138,947	2.86	2.05	397,197	284,476	12,770	9,146	138,947	2.86	2.05	12,770	9,146
8750	1	5027	1.14	1.14	5,731	5,731	184	184												
	2								25565	1.14	1.14	29,144	29,144	937	937					
	3								37410	1.36	1.36	50,878	50,878	1,636	1,636					
	4								14946	1.83	1.83	27,351	27,351	879	879					
	5								25185	1.48	1.48	37,274	37,274	1,198	1,198					
	6								20296	1.62	1.62	32,880	32,880	1,057	1,057					
	7								49491	0.91	0.91	45,037	45,037	1,448	1,448					
Section total		5,027	1.14	1.14	5,731	5,731	184	184	172,893	1.29	1.29	222,563	222,563	7,156	7,156	177,920	1.28	1.28	7,340	7,340
8800	1								21226	1.38	1.38	29,292	29,292	942	942					
	2								26104	1.53	1.53	39,939	39,939	1,284	1,284					
Section total									47,330	1.46	1.46	69,231	69,231	2,226	2,226	47,330	1.46	1.46	2,226	2,226
8850	1	14485	1.11	1.11	16,078	16,078	517	517												
	2								35698	0.80	0.80	28,558	28,558	918	918					
	3								8231	11.94	11.94	98,278	98,278	3,160	3,160					
	4								18343	5.25	5.25	96,301	96,301	3,096	3,096					
Section total		14,485	1.11	1.11	16,078	16,078	517	517	62,272	3.58	3.58	223,137	223,137	7,174	7,174	76,757	3.12	3.12	7,691	7,691
8900	1	24533	0.88	0.88	21,589	21,589	694	694												
	2								14516	1.74	1.74	25,258	25,258	812	812					
Section total		24,533	0.88	0.88	21,589	21,589	694	694	14,516	1.74	1.74	25,258	25,258	812	812	39,049	1.20	1.20	1,506	1,506
8950	1								17115	1.55	1.55	26,528	26,528	853	853					
	2								18679	5.59	5.59	104,416	104,416	3,357	3,357					
	3								30263	1.11	1.11	33,592	33,592	1,080	1,080					
Section total									66,057	2.49	2.49	164,536	164,536	5,290	5,290	66,057	2.49	2.49	5,290	5,290
9000	1								37853	1.17	1.17	44,288	44,288	1,424	1,424					
	2								37616	1.38	1.38	51,910	51,910	1,669	1,669					
	3								35249	2.52	2.52	88,827	88,827	2,856	2,856					
	4								25348	3.39	3.39	85,930	85,930	2,763	2,763					
Section total									136,066	1.99	1.99	270,955	270,955	8,712	8,712	136,066	1.99	1.99	8,712	8,712
9050	1	6153	5.61	5.61	34,518	34,518	1,110	1,110												
	2								12423	5.61	5.61	69,693	69,693	2,241	2,241					
	3								11424	4.30	4.30	49,123	49,123	1,579	1,579					
	4								25974	2.57	2.57	66,753	66,753	2,146	2,146					
	5								16343	0.89	0.89	14,545	14,545	468	468					
Section total		6,153	5.61	5.61	34,518	34,518	1,110	1,110	66,164	3.02	3.02	200,115	200,115	6,434	6,434	72,317	3.24	3.24	7,544	7,544
9100	1								18766	1.60	1.60	30,026	30,026	965	965					
	2								20367	2.29	2.29	46,640	46,640	1,500	1,500					
Section total									39,133	1.96	1.96	76,666	76,666	2,465	2,465	39,133	1.96	1.96	2,465	2,465
Totals:		539,945	2.11	2.09	1,140,519	1,129,069	36,669	36,301	3,484,764	2.01	1.92	7,007,855	6,708,143	225,311	215,675	4,024,709	2.02	1.95	261,980	251,976

Faded Lilly 0.5 g/t — File: FLAPT_C.WS 26/10/93

Section	Block No	Oxide Tonnes	Oxide GRADE (g/t) Uncut	Oxide GRADE (g/t) Cut	Oxide TONNESxGRADE Uncut	Oxide TONNESxGRADE Cut	Oxide GOLD (ounces) Uncut	Oxide GOLD (ounces) Cut	Sulphide Tonnes	Sulphide Grade g/t Uncut	Sulphide Grade g/t Cut	Sulphide TONNESxGRADE Uncut	Sulphide TONNESxGRADE Cut	Sulphide GOLD (ounces) Uncut	Sulphide GOLD (ounces) Cut	TOTAL Tonnes	TOTAL Grade g/t Uncut	TOTAL Grade g/t Cut	TOTAL GOLD (ounces) Uncut	TOTAL GOLD (ounces) Cut
9900	1	23186	1.83	1.83	42,430	42,430	1,364	1,364												
	2								44716	3.71	3.71	165,896	165,896	5,334	5,334					
	3	67577	2.30	2.30	155,427	155,427	4,997	4,997												
	4								21254	2.30	2.30	48,884	48,884	1,572	1,572					
Section total		90,763	2.18	2.18	197,857	197,857	6,361	6,361	65,970	3.26	3.26	214,781	214,781	6,905	6,905	156,733	2.63	2.63	13,267	13,267
9950	1	11112	1.22	1.22	13,557	13,557	436	436												
	2	5171	0.87	0.87	4,499	4,499	145	145												
Section total		16,283	1.11	1.11	18,055	18,055	581	581								16,283	1.11	1.11	581	581
10000	1	14824	2.24	2.24	33,206	33,206	1,068	1,068												
Section total		14,824	2.24	2.24	33,206	33,206	1,068	1,068								14,824	2.24	2.24	1,068	1,068
10050	1								15253	0.88	0.88	13,423	13,423	432	432					
	2	23231	3.88	3.88	90,136	90,136	2,898	2,898												
	3								8815	11.99	3.65	105,692	32,175	3,398	1,034					
	4								38741	11.99	3.65	464,505	141,405	14,934	4,546					
	5								70582	1.45	1.45	102,344	102,344	3,290	3,290					
	6	8340	0.51	0.51	4,253	4,253	137	137												
	7	40542	3.92	3.11	158,925	126,086	5,110	4,054												
	8	39006	1.54	1.54	60,069	60,069	1,931	1,931												
	9								31600	1.32	1.32	41,712	41,712	1,341	1,341					
	10	10488	6.77	6.77	71,004	71,004	2,283	2,283												
	11								45277	1.97	1.97	89,196	89,196	2,868	2,868					
	12								38575	0.72	0.72	27,774	27,774	893	893					
Section total		121,607	3.16	2.89	384,387	351,548	12,359	11,303	248,843	3.39	1.80	844,645	448,038	27,156	14,405	370,450	3.32	2.16	39,515	25,707
10100	1								22,768	2.69	2.69	61,301	61,301	1,971	1,971					
	2	108810	1.61	1.61	175,184	175,184	5,632	5,632												
	3								42,412	1.76	1.76	74,646	74,646	2,400	2,400					
	4	5,055	0.85	0.85	4,297	4,297	138	138												
	5	5,900	3.70	3.70	21,831	21,831	702	702												
	6	8,048	2.43	2.43	19,556	19,556	629	629												
	7	8,796	14.31	7.63	125,878	67,117	4,047	2,158												
	8								31,342	1.93	1.93	60,491	60,491	1,945	1,945					
	9	74,386	2.26	2.26	168,111	168,111	5,405	5,405												
	10								38,654	4.78	4.78	184,765	184,765	5,940	5,940					
Section total		210,995	2.44	2.16	514,857	456,096	16,553	14,664	135,197	2.82	2.82	381,202	381,202	12,256	12,256	346,192	2.59	2.42	28,809	26,920
10150	1	6706	1.52	1.52	10,193	10,193	328	328												
	2								59404	1.52	1.52	90,294	90,294	2,903	2,903					
	3								13292	10.97	7.82	145,813	103,943	4,688	3,342					
	4								13626	3.58	3.58	48,781	48,781	1,568	1,568					
	5								14361	16.52	12.47	237,244	179,082	7,628	5,758					
	6								25473	1.39	1.39	35,407	35,407	1,138	1,138					
	7	20693	1.53	1.53	31,660	31,660	1,018	1,018												
	8								23405	1.81	1.81	42,363	42,363	1,362	1,362					
	9	18859	0.94	0.94	17,727	17,727	570	570												
	10								27643	2.12	2.12	58,603	58,603	1,884	1,884					
	11	30694	2.81	2.81	86,250	86,250	2,773	2,773												
	12	27696	1.81	1.81	50,130	50,130	1,612	1,612												
	13	25716	3.01	3.01	77,405	77,405	2,489	2,489												
	14								34023	4.41	4.03	150,041	137,113	4,824	4,408					
	15								58030	6.90	5.07	400,407	294,212	12,874	9,459					
	16								37204	29.85	7.80	1,110,539	290,191	35,705	9,330					
	17								1741	4.51	4.51	7,852	7,852	252	252					
	18								13600	4.41	4.41	59,976	59,976	1,928	1,928					
	19								40407	1.52	1.52	61,419	61,419	1,975	1,975					
Section total		130,364	2.10	2.10	273,366	273,366	8,789	8,789	362,209	6.76	3.89	2,448,740	1,409,236	78,730	45,309	492,573	5.53	3.42	87,519	54,098
10200	1								19657	4.73	4.73	92,978	92,978	2,989	2,989					
	2								18991	0.94	0.94	17,852	17,852	574	574					
	3	8317	1.21	1.21	10,064	10,064	324	324												
	4								28800	0.89	0.89	25,632	25,632	824	824					
	5								31093	1.28	1.28	39,799	39,799	1,280	1,280					
	6	58864	3.85	3.31	226,626	194,840	7,286	6,264												
	7								21087	9.81	8.13	206,863	171,437	6,651	5,512					
	8								50802	1.86	1.86	94,492	94,492	3,038	3,038					
	9								50198	2.64	2.64	132,523	132,523	4,261	4,261					
	10								4755	2.12	2.12	10,081	10,081	324	324					
	11								8391	1.41	1.41	11,831	11,831	380	380					
	12								15458	3.40	3.40	52,557	52,557	1,690	1,690					
	13								13743	1.26	1.26	17,316	17,316	557	557					
	14								42623	4.61	4.37	196,492	186,263	6,317	5,989					
	15								11429	1.29	1.29	14,743	14,743	474	474					
	16								16912	2.54	2.10	42,956	35,515	1,381	1,142					
Section total		67,181	3.52	3.05	236,690	204,903	7,610	6,588	333,939	2.86	2.70	956,115	903,018	30,740	29,033	401,120	2.97	2.76	38,350	35,621
10250	1								32407	1.50	1.50	48,611	48,611	1,563	1,563					
	2								19179	8.17	8.17	156,692	156,692	5,038	5,038					
	3								23770	2.04	2.04	48,491	48,491	1,559	1,559					
	4	14256	1.46	1.46	20,814	20,814	669	669												
	5								75513	1.27	1.27	95,902	95,902	3,083	3,083					
	6								42791	3.91	3.91	167,313	167,313	5,379	5,379					
	7								50645	3.92	3.92	198,528	198,528	6,383	6,383					
	8								37589	4.81	4.81	180,803	180,803	5,813	5,813					
	9								31427	8.82	4.95	277,186	155,564	8,912	5,002					
	10								48291	1.42	1.42	68,573	68,573	2,205	2,205					
Section total		14,256	1.46	1.46	20,814	20,814	669	669	361,612	3.43	3.10	1,242,099	1,120,476	39,935	36,025	375,868	3.36	3.04	40,604	36,694
10300	1	29,045	2.43	2.43	70,579	70,579	2,269	2,269												
	2								57,385	3.75	3.57	215,194	204,865	6,919	6,587					
	3	31,065	1.66	1.66	51,567	51,567	1,658	1,658												
	4								15,366	0.92	0.92	14,137	14,137	455	455					
	5								77,903	4.66	2.66	363,029	207,223	11,672	6,662					
	6								72,712	2.21	2.21	160,693	160,693	5,166	5,166					
	7								7,410	2.14	2.14	15,857	15,857	510	510					
	8								32,630	2.27	2.27	74,070	74,070	2,381	2,381					
	9								75,142	2.06	2.06	154,793	154,793	4,977	4,977					
	10								35,968	6.22	4.01	223,723	144,233	7,193	4,637					
Section total		60,109	2.03	2.03	122,146	122,146	3,927	3,927	374,516	3.26	2.61	1,221,496	975,070	39,273	31,375	434,626	3.09	2.53	43,200	35,303
10350	1								34215	1.69	1.69	57,823	57,823	1,859	1,859					
	2	8709	2.84	2.84	24,734	24,734	795	795												
	3								47259	1.13	1.13	53,403	53,403	1,717	1,717					
	4	10603	3.61	3.61	38,277	38,277	1,231	1,231												
	5								31029	3.27	3.27	101,465	101,465	3,262	3,262					
	6								14564	30.93	13.95	450,465	203,168	14,483	6,532					
	7								28352	0.91	0.91	25,800	25,800	830	830					
	8	26287	0.87	0.87	22,870	22,870	735	735												
	9								92522	1.00	1.00	92,522	92,522	2,975	2,975					
	10	9726	2.75	2.75	26,747	26,747	860	860												
	11	31417	1.19	1.19	37,386	37,386	1,202	1,202												
	12								48757	0.84	0.84	40,956	40,956	1,317	1,317					
	13								45013	3.04	3.04	136,840	136,840	4,400	4,400					
	14								17358	3.70	3.70	64,225	64,225	2,065	2,065					
	15								27294	1.35	1.35	36,847	36,847	1,185	1,185					
	16								12069	4.70	4.70	56,724	56,724	1,824	1,824					
Section total		86,742	1.73	1.73	150,013	150,013	4,823	4,823	398,432	2.80	2.18	1,117,069	869,772	35,915	27,964	485,174	2.61	2.10	40,738	32,787
10400	1	24,951	1.93	1.93	48,156	48,156	1,548	1,548												
	2								6,634	2.01	2.01	13,335	13,335	429	429					
	3								25,152	1.65	1.65	41,501	41,501	1,334	1,334					
	4								2,812	10.10	10.10	28,403	28,403	913	913					
	5	29,332	1.51	1.51	44,291	44,291	1,424	1,424												
Section total		54,283	1.70	1.70	92,447	92,447	2,972	2,972	34,599	2.41	2.41	83,239	83,239	2,676	2,676	88,882	1.98	1.98	5,649	5,649
10450	1	14,334	1.03	1.03	14,764	14,764	475	475												
	2	8,110	2.76	2.76	22,384	22,384	720	720												
	3								21,824	1.22	1.22	26,626	26,626	856	856					
	4								22,935	1.80	1.80	41,283	41,283	1,327	1,327					
	5								10,894	2.19	2.19	23,858	23,858	767	767					
	6								30,848	1.64	1.64	50,592	50,592	1,627	1,627					
Section total		22,444	1.66	1.66	37,148	37,148	1,194	1,194	86,502	1.65	1.65	142,358	142,358	4,577	4,577	108,946	1.65	1.65	5,771	5,771
10500	1	4918	2.65	2.65	13,033	13,033	419	419												
	2	12,565	0.78	0.78	9,801	9,801	315	315												
	3								4,974	7.06	7.06	35,119	35,119	1,129	1,129					
	4	33,501	1.90	1.90	63,652	63,652	2,046	2,046												
	5								59,191	2.97	2.97	175,796	175,796	5,652	5,652					
	6								44,587	1.65	1.65	73,568	73,568	2,365	2,365					
Section total		50,985	1.70	1.70	86,486	86,486	2,781	2,781	108,752	2.62	2.62	284,483	284,483	9,146	9,146	159,736	2.32	2.32	11,927	11,927
10550	1	5,292	3.25	3.25	17,201	17,201	553	553												
	2	74,897	1.66	1.66	124,329	124,329	3,997	3,997												
	3								21,885	3.45	3.45	75,502	75,502	2,427	2,427					
	4	15,735	7.49	5.21	117,858	81,981	3,789	2,636												
	5	11,442	0.69	0.69	7,895	7,895	254	254												
	6	11,324	0.92	0.92	10,418	10,418	335	335												
	7								9,691	1.62	1.62	15,699	15,699	505	505					
Section total		118,692	2.34	2.04	277,701	241,825	8,928	7,775	31,575	2.89	2.89	91,201	91,201	2,932	2,932	150,267	2.45	2.22	11,861	10,707
10600	1	11,023	3.90	3.90	42,989	42,989	1,382	1,382												
	2	8,961	1.72	1.72	15,412	15,412	496	496												
	3								18,298	1.36	1.36	24,885	24,885	800	800					
	4	16,759	1.31	1.31	21,954	21,954	706	706												
	5								16,759	0.91	0.91	15,251	15,251	490	490					
	6	37,339	1.78	1.78	66,464	66,464	2,137	2,137												
	7	6,206	1.45	1.67	8,999	10,364	289	333												
	8								13,916	1.67	1.67	23,240	23,240	747	747					
	9								83,117	1.51	1.51	125,506	125,506	4,035	4,035					
	10								78,820	2.20	2.20	173,403	173,403	5,575	5,575					
	11								27,139	6.76	5.77	183,458	156,591	5,898	5,035					
Section total		80,288	1.94	1.96	155,818	157,183	5,010	5,054	238,048	2.29	2.18	545,744	518,876	17,546	16,683	318,336	2.20	2.12	22,556	21,736
10650	1	5,219	21.35	11.48	111,416	59,909	3,582	1,926												
	2								59,490	1.45	1.45	86,261	86,261	2,773	2,773					
	3	16,026	0.99	0.99	15,866	15,866	510	510												
	4								17,444	0.99	0.99	17,269	17,269	555	555					
	5								58,656	1.72	1.72	100,888	100,888	3,244	3,244					
	6								61,725	3.65	3.65	225,296	225,296	7,244	7,244					
	7								32,442	1.45	1.45	47,041	47,041	1,512	1,512					
	8								42,957	1.05	1.05	45,105	45,105	1,450	1,450					
	9								22,708	1.71	1.71	38,831	38,831	1,248	1,248					
	10								11,565	4.31	4.31	49,844	49,844	1,603	1,603					
Section total		21,245	5.99	3.57	127,282	75,775	4,092	2,436	306,987	1.99	1.99	610,536	610,536	19,629	19,629	328,232	2.25	2.09	23,722	22,066
10700	1	13534	1.18	1.18	15,970	15,970	513	513												
	2	23860	3.54	3.54	84,464	84,464	2,716	2,716												
	3								30647	0.89	0.89	27,276	27,276	877	877					
	4								39125	3.30	3.30	129,113	129,113	4,151	4,151					
	5								51085	1.71	1.71	87,355	87,355	2,809	2,809					
	6								56058	2.49	2.49	139,584	139,584	4,488	4,488					
	7								75129	1.78	1.78	133,730	133,730	4,300	4,300					
	8								54003	1.68	1.68	90,725	90,725	2,917	2,917					
Section total		37,394	2.69	2.69	100,435	100,435	3,229	3,229	306,047	1.99	1.99	607,783	607,783	19,541	19,541	343,441	2.06	2.06	22,770	22,770
10750	1								19305	1.33	1.33	25,676	25,676	826	826					
	2								9990	1.36	1.36	13,586	13,586	437	437					
	3								9802	3.77	3.77	36,954	36,954	1,188	1,188					
	4								25801	1.91	1.91	49,280	49,280	1,584	1,584					
	5								9124	13.65	13.65	124,543	124,543	4,004	4,004					
	6								16996	0.90	0.90	15,296	15,296	492	492					
	7								39325	1.53	1.53	60,167	60,167	1,934	1,934					
Section total									130,343	2.50	2.50	325,502	325,502	10,465	10,465	130,343	2.50	2.50	10,465	10,465
10800	1								26537	0.70	0.70	18,576	18,576	597	597					
	2								78613	8.04	4.59	632,049	360,834	20,321	11,601					
Section total									105,150	6.19	3.61	650,624	379,410	20,918	12,198	105,150	6.19	3.61	20,918	12,198
10850	1								18904	0.81	0.81	15,312	15,312	492	492					
	2								47808	2.06	2.06	98,484	98,484	3,166	3,166					
Section total									66,712	1.71	1.71	113,797	113,797	3,659	3,659	66,712	1.71	1.71	3,659	3,659
Totals:		1,198,454	2.36	2.19	2,828,708	2,619,303	90,946	84,214	3,695,434	3.22	2.57	11,881,414	9,479,569	382,002	304,780	4,893,888	3.01	2.47	472,949	388,994

Appendix 15

BROCKS CREEK PROJECT
Northern Territory, Australia

Mineable Diluted Reserve Estimate

, and

Preliminary Open Pit Design

For
Mr. Robert Handfield
Cyprus Gold Australia Corporation

By
Tyrell Tanner
Cyprus Exploration Mine and Development Geology Group

and

Steve Bruff
Humboldt Mining Services

December 1993
Reno, Nevada

Table of Contents

Tables

Maps

Cross Sections

One set of 1:250 working cross sections for the Alligator and Faded Lilly areas were sent to the Sydney Exploration office.

SUMMARY

Open pit mine plans were manually designed and visually optimized for the Alligator and Faded Lilly ore zones. Diluted mineable in-pit reserves, based upon an in-pit predilution cutoff of ± 0.50 grams per tonne, were estimated at 6,861,000 tonnes with an unadjusted grade of 2.02 grams per tonne and a cut grade of 1.77 grams per tonne. Using the adjusted 1.77 grams per tonne, the estimated reserve contains 390,440 ounces of gold (see Table 1).

The cut grade estimate resulted from the downward adjustment of erratic and significantly higher grade assays that overly influence the average mining headgrade and generally result in overestimation of contained deposit ounces.

The average mineable reserve grade of 1.77 grams per tonne is significantly lower than the in-pit resource grade of 2.5 grams reported in the March 1993 "Brocks Creek Project Pre-Feasibility Study" by Graham Miller, Peter Ingram, and Geoff Hart. The variance between the two grades is due to a higher overall in-pit cutoff (± 1.00 gram/tonne) used in the March study and the inclusion of more lower grade (minus 1.00 gram/tonne) material, within the definite mineral/ore zone boundaries, in the current study. The inclusion of low grade assays within the ore blocks is certainly subjective at this point but is based upon the apparent variation and erratic distribution of gold grades within the confining boundaries of the individual ore streaks. I believe the lower grade assays (minus 1.00 gram) are an integral part of each individual ore zone and cannot easily be separated from the higher grade sample population within each zone without the excessive loss of gold values. A very dedicated grade control procedure based upon a higher grade cutoff (1.00 gram/tonne), geologic mapping, close spaced drilling (both development and production), bench sampling, bench to bench ore zone projections, and short mining bench heights (± 2.5 meters) would certainly result in a higher headgrade than 1.77 grams per tonne. I do not believe however, it is realistic to expect an overall headgrade higher than approximately 2.2 grams per tonne without applying highgrading techniques which generally always result in the excessive loss of resource values.

Detailed development drilling is recommended on at least 25 meter centers. This drilling will not likely add or subtract significant tonnage but is needed to delineate the reserves before extraction.

Brocks Creek Project
Summary of Diluted Mineable In-pit Reserves
(Proven/Probable)

Table 1

	OXIDE			SULFIDE			TOTAL				
Undiluted Ore Blocks	Tonnes	Uncut Grade	Cut Grade	Tonnes	Uncut Grade	Cut Grade	Tonnes	Uncut Grade	Cut Grade	Contained Uncut Ounces	Contained Cut Ounces
Alligator Pit	540,000	2.10	1.86	1,558,380	2.05	1.92	2,098,380	2.06	1.90	139,246	128,250
Faded Lilly Pit	1,426,540	2.10	1.92	2,228,980	2.95	2.41	3,655,520	2.62	2.22	307,922	260,911
Subtotal	1,966,540	2.10	1.90	3,787,360	2.58	2.21	5,753,900	2.42	2.10	447,680	388,483
Dilution											
Alligator Pit	106,560	0.19	0.19	219,740	0.20	0.20	326,300	0.20	0.20	2,046	2,046
Faded Lilly Pit	465,490	0.21	0.21	455,570	0.21	0.21	921,060	0.21	0.21	6,219	6,219
Subtotal	572,050	0.21	0.21	675,310	0.21	0.21	1,247,360	0.21	0.21	8,422	8,422
Diluted Ore											
Alligator Pit	646,560	1.78	1.58	1,778,120	1.82	1.71	2,424,680	1.81	1.67	141,099	130,185
Faded Lilly Pit	1,892,030	1.64	1.50	2,684,550	2.49	2.04	4,576,580	2.14	1.82	314,880	267,795
Total	2,538,590	1.68	1.52	4,462,670	2.22	1.91	7,001,260	2.02	1.77	456,944	398,419
Mine Call Factor Loss (2%)	(-) 50,770	1.68	1.52	(-) 89,250	2.22	1.91	(-)140,020	2.02	1.77	(-) 9,137	(-) 7,967
TOTAL	2,488,000	1.68	1.52	4,373,000	2.22	1.91	6,861,000	2.02	1.77	445,580	390,440

% Block Edge Tonnage Dilution = 22%
Total Excavated Tonnage = 26,956,000 tonnes
Total Waste = 20,095,000 tonnes
Stripping Ratio = 2.93

INTRODUCTION

The project site at Brocks Creek and the regional office at Perth were visited in early October to review and gather data/maps that were required to manually design a preliminary open pit mining scheme and manually estimate a diluted mineable reserve. Maps, cross sections, and project data were taken to Reno, Nevada where the mine plan and reserve estimate were completed by myself and Steve Bruff, a local mining engineer and geological consultant.

The intent of the exercise was an up-dated look at the mineable reserves after the 1993 drilling season was completed. After several delays caused by other assignments, the work was completed in late December, 1993.

Detailed results of this reserve study and discussions of the procedure used, follow this section under specific headings.

GENERAL PROCEDURE

Geology, mineral distribution, and ore zone geometry were reviewed on plans, longitudinal projections, and cross sections. Each one meter assay interval on the set of 1:250 cross sections was color coded to a specific grade range to help visualize the ore zone geometry and metal distribution. Confining boundaries were then broadly drawn along the footwall and hanging wall borders of the distinct mineral zones that exhibited recognizable continuity. Ore blocks, using an average prediluted grade of approximately 0.50 grams per tonne and a minimum thickness of two to three meters, were then drawn around significant ore zones within the earlier outlined ore zones. Blocks were also drawn on some selected ore zones outside of the distinct and obvious zones if they were of the required grade and size and exhibited some probable continuity or zone strength.

Open pit mining plans were designed for the Alligator and Faded Lilly areas by first visually determining from the blocked out ore zones on cross sections where the pit bottom and pit walls should be placed to extract the maximum amount of plus one gram per tonne material without removing excessive waste. Visually optimizing the ore and waste extraction limits is certainly not a precise technique to be used in a final design but generally produces a good "ballpark" mining scheme. Most of the limits and design for the two pits appears to be fairly obvious.

Once the pits were drawn on the sections and on plan each ore block within the pit outline was planimetered to measure the cross sectional area which was then multiplied by the strike influence distance of the section and then that block volume was multiplied by a density factor to produce a block tonnage.

The weighted average of the block intercept assays was used for the undiluted block grade.

Oxide ore reserves and sulfide ore reerves were estimated separately.

Average block edge dilution was added by calculating a one meter "rind" of waste around each ore block. The average dilutent grade was estimated from the actual assayed grades within the one meter wide block edge border.

A two percent "mine call" loss factor was applied to the total diluted pit tonnage to account for losses in gold values due to ore/waste decision errors.

Table 2 is a list of design criteria and ore reserve assumptions.

ALLIGATOR ORE ZONE

Reserves - Mineable diluted reserves for the Alligator zone total 2,424,680 tonnes with an average uncut grade of 1.81 grams per tonne and a cut grade average of 1.67 grams per tonne (see Table 3). The estimated tonnage at the cut grade contains 130,185 ounces of gold.

Waste calculation for the pit design totals 7,057,150 tonnes which produces a stripping burden of 2.91 tonnes of waste for each tonne of ore.

A plan map of the mine design is presented with this sections a Map ONE.

Block edge dilution for the zone is 326,300 tonnes at a dilutent grade of 0.20 grams per tonne. This tonnage produces a 16 percent block edge dilution factor.

Drawing ore blocks on the Alligator mineralization required some degree to subjectiveness, but in general, was fairly easy to do with a moderate to high level of confidence in the central and thicker portion of the zone (8450East to 8600East) which contains over 85 percent of the total Alligator reserve. The main portion of the zone has a strike length of approximately 150 to 200 meters and "feathers" out rapidly to the east and west.

The geometry of the undiluted blocks in general is very similar to the geometry of the geologic resource blocks designed by Graham Miller. A detailed block-by-block comparison was not made with the geologic resource, but it appears that if a 16 percent dilution factor with a grade of 0.20 grams per tonne were applied to the average geologic resource, a diluted grade close to the 1.67 diluted mineable grade would be the result.

A few blocks were classified as possible during the Alligator study but were not included in the reported reserve estimate. These possible blocks total 71,160 tonnes with an uncut grade of 1.58 grams per tonne and a cut grade of 1.49 grams per tonne. The blocks could add approximately 3,400 ounces to the Alligator total (see Tables 4 & 5).

Recommendations - Detailed drilling on a 25 meter spacing is necessary to better delineate the reserves prior to detailed/final mine planning and mineable proven reserve estimation. Development drilling at a 25 meter spacing along with close production drill hole spacing will be necessary as part of an efficient grade control system during production.

Table 2
Mine Design Criteria
and
Ore Reserve Assumptions

MINE DESIGN CRITERIA - The March study mine design guidelines appear to be very adequate at this time and until additional geotechnical and development drilling data are available. The current study used the same general design criteria. Location of pit bottoms and pit walls are different.

- 10% maximum haulage
- 20 meter wide haulage road
- 5 meter wide catch bench every 20 meters.
- 60 to 70 degree slope angle between 20 meter benches.
- 15 meter minimum turning radius.

ORE RESERVE ASSUMPTIONS -

- 2.5 meter bench height
- 2 to 3 meter minimum mining width
- Grade cutting
  - Alligator plus 10 g/t cut to 10 g/t
  - Faded Lilly plus 20 g/t cut to 20 g/t
- Rock Density
  - Oxide 2.4 tonnes/cubic meter
  - Sulfide 2.6 tonnes/cubic meter
- Design cutoff of 1 g/t
- In-pit cutoff $\pm$ 0.50 g/t

  Cutoff grades were used only as a general guideline. Block limits were also often picked at obvious zone boundaries.

- Dilution - one meter rind around ore blocks at average assayed grade.

	Oxide								
	Ore Blocks			Block Edge Dilution			Total Diluted Oxide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
8400E	28,440	1.41	1.41	8,040	0.28	28	36,480	1.161	1.161
8450E	81,720	1.87	1.64	24,000	0.27	29	105,720	1.507	1.329
8500E	163,080	2.05	1.62	15,600	0.14	10	178,680	1.883	1.491
8550E	117,120	2.67	2.67	6,720	0.14	6	123,840	2.533	2.533
8600E	76,200	1.50	1.50	16,680	0.11	22	92,880	1.250	1.250
8650E	45,240	3.20	2.28	23,760	0.19	53	69,000	2.164	1.560
8700E	NO	ORE	BLOCKS	------	------	------	------	------	------
8750E	NO	ORE	BLOCKS	------	------	------	------	------	------
8800E	NO	ORE	BLOCKS	------	------	------	------	------	------
8850E	12,480	1.11	1.11	5,280	0.14	42	17,760	0.822	0.822
8900E	9,960	1.55	1.55	3,840	0.18	39	13,800	1.169	1.169
8950E	5,760	0.80	0.80	2,640	0.28	46	8,400	0.637	0.637
TOTAL	540,000	2.098	1.856	106,560	0.191	20	646,560	1.784	1.582

	Sulfide								
	Ore Blocks			Block Edge Dilution			Total Diluted Sulfide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
8400E	59,600	2.28	2.12	17,460	0.20	29	77,060	1.809	1.685
8450E	192,280	2.72	2.34	34,970	0.28	18	227,250	2.345	2.023
8500E	482,300	1.79	1.71	37,180	0.21	8	519,480	1.677	1.603
8550E	434,200	2.01	1.82	43,420	0.20	10	477,620	1.845	1.673
8600E	310,050	2.01	2.00	52,260	0.14	17	362,310	1.740	1.732
8650E	79,950	2.24	2.21	34,450	0.18	43	114,400	1.620	1.599
8700E	------	------	------	------	------	------	------	------	------
8750E	------	------	------	------	------	------	------	------	------
8800E	------	------	------	------	------	------	------	------	------
8850E	------	------	------	------	------	------	------	------	------
8900E	------	------	------	------	------	------	------	------	------
8950E	------	------	------	------	------	------	------	------	------
TOTAL	1,558,380	2.052	1.917	219,740	0.197	14	1,778,120	1.822	1.705

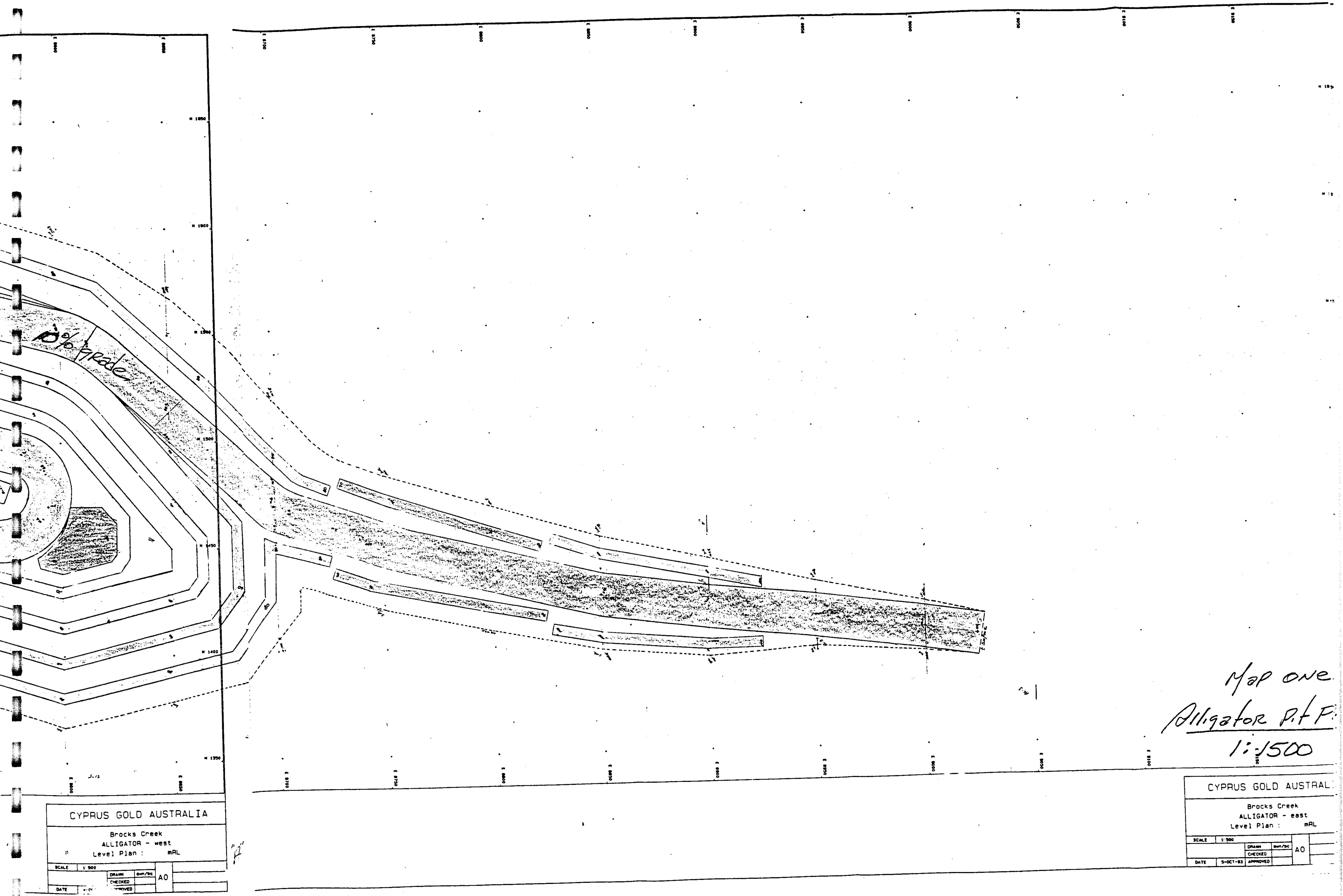
Summary	Tonnes	Uncut Grade	Cut Grade	Total *1 Contained Uncut Ounces	Total *1 Contained Cut Ounces
Oxide Ore	540,000	2.098	1.856	36,424	32,223
Sulfide Ore	1,558,380	2.052	1.917	102,811	96,047
Subtotal	2,098,380	2.064	1.901	139,246	128,250
Oxide Dilution	106,560	0.191	0.191	654	654
Sulfide Dilution	219,740	0.197	0.197	1,392	1,392
Subtotal	326,300	0.195	0.195	2,046	2,046
Diluted Oxide	646,560	1.78	1.58	37,001	32,844
Diluted Sulfide	1,778,120	1.82	1.71	104,045	97,757
TOTAL	2,424,680	1.81	1.67	141,099	130,185

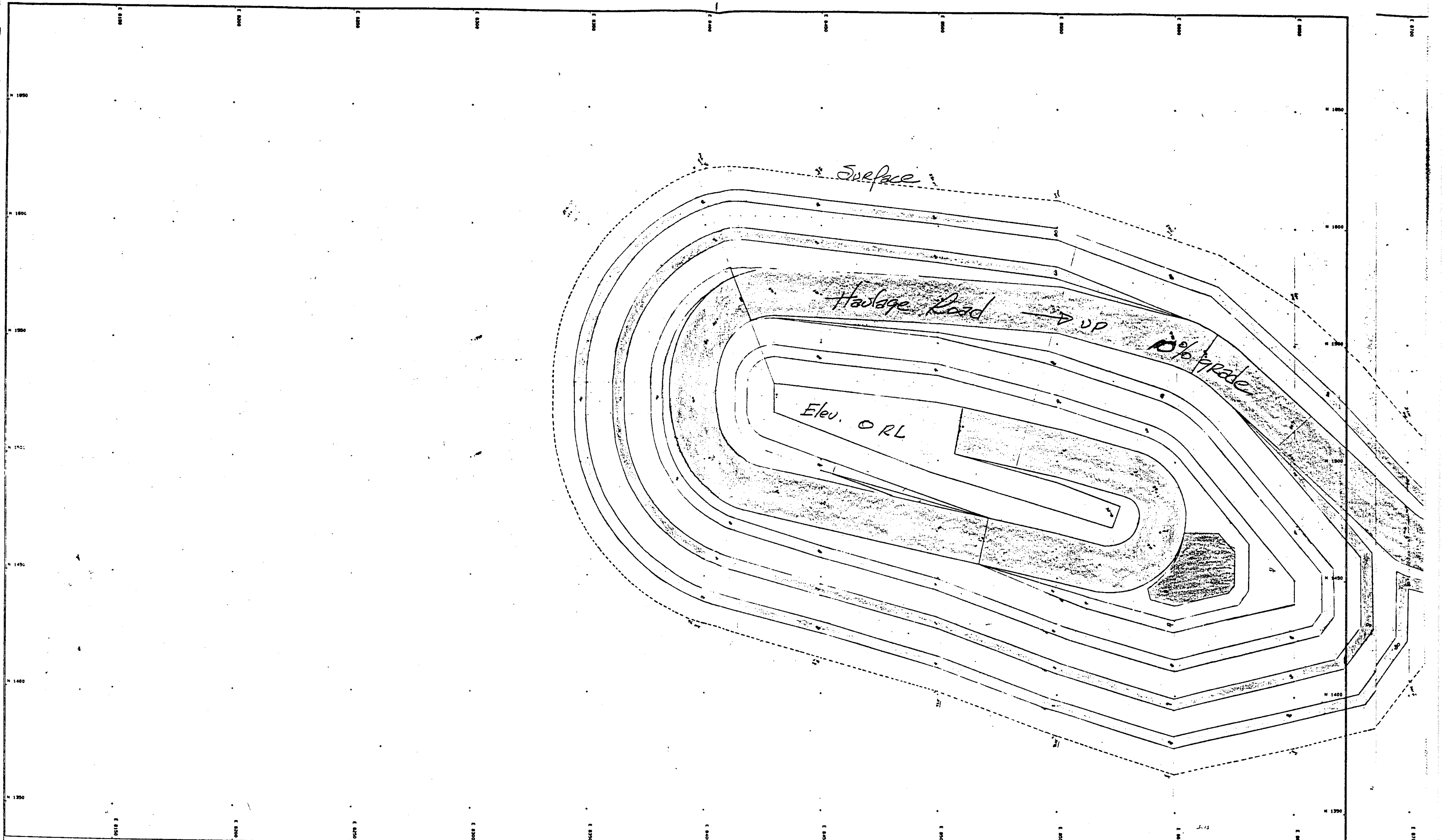
Total Block Edge Dilution = 16% @ 0.195 grams/tonne

Total Pit Tonnage = 9,481,830
Total Diluted Ore = 2,424,680
Total Waste 7,057,150

Stripping Ratio = 2.91

*1 Slight variances in ounce totals from column to column are due to grade rounding


10% grade
Map one.
Alligator Pit F
1:1500
CYPRUS GOLD AUSTRALIA
Brocks Creek
ALLIGATOR - west
Level Plan : mRL
SCALE 1:500
A0
CYPRUS GOLD AUSTRAL
Brocks Creek
ALLIGATOR - east
Level Plan : mRL
SCALE 1:500
DATE 5-OCT-93
A0



CYPRUS GOLD AUSTRALIA

Brocks Creek
ALLIGATOR - west
Level Plan : mRL

SCALE	1:500			A0
		DRAWN	dwn/bc	
		CHECKED		
DATE		APPROVED		

"A"

Alligator Pit
Possible Reserves **Table 4**

	Oxide								
	Ore Blocks			Block Edge Dilution			Total Diluted Oxide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
8550E	19,680	2.60	2.60	2,280	0.17	12	21,960	2.35	2.35
8600E	2,520	1.58	1.58	960	0.10	38	3,480	1.17	1.17
8650E	8,880	2.94	2.28	6,240	0.21	70	15,120	1.82	1.43
8700E	21,000	1.35	1.35	9,600	0.09	46	30,600	0.96	0.96
TOTAL	52,080	2.11	1.99	19,080	0.14		71,160	1.58	1.49

Sulfide								
Ore Blocks			Block Edge Dilution			Total Diluted Sulfide		
Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
	gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
--- No Sulfide Ore Blocks ---								

<u>Summary</u>	Tonnes	Uncut Grade	Cut Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces
Oxide Ore	52,080	2.11	1.99	3,533	3,332
Oxide Dilution	19,080	0.14	0.14	86	86
Total	71,160	1.58	1.49	3,615	3,409

Total Block Edge Dilution = 37%

Brocks Creek Project
Summary of Combined Oxide & Sulfide
Diluted Mineable In-pit Reserves
(Proven - Probable - Possible)

Table 5

Area	Tonnes	Uncut Gold Grade	Cut Gold Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces	Waste	Total Pit Tonnage	Stripping Ratio
Proven/Probable								
Alligator Pit	2,425,000	1.81	1.67	141,117	130,202	7,057,000	9,482,000	2.91
Faded Lilly Pit	4,577,000	2.14	1.82	314,909	267,820	12,897,000	17,474,000	2.82
Subtotal	7,002,000	2.02	1.77	456,992	398,461	19,954,000	26,956,000	2.85
Possible								
Alligator Pit	71,000	1.58	1.49	3,607	3,401	NA	NA	NA
Faded Lilly Pit	192,000	1.23	1.12	7,593	6,914	NA	NA	NA
Subtotal	263,000	1.32	1.22	11,161	10,316	NA	NA	NA
Proven/Probable/Possible								
Alligator Pit	2,496,000	1.80	1.67	144,447	134,014	6,986,000	9,482,000	2.80
Faded Lilly Pit	4,769,000	2.10	1.79	321,986	274,455	12,705,000	17,474,000	2.66
Subtotal	7,265,000	2.00	1.75	467,150	408,756	19,691,000	26,956,000	2.71
Mine Call Factor Loss (2%)	(-) 145,000	2.00	1.75	9,324	8,158	+ 145,000	NA	NA
Total	7,120,000	2.00	1.75	457,826	400,598	19,836,000	26,956,000	2.79

The first phase of development drilling should be on sections 8625E, 8575E, 8525E, and 8475East. Approximately two well placed holes on each of these sections could confirm at least 50 percent of the estimated reserves and raise the confidence level of that portion of the reserves to a proven category. Additional drilling would be required to fully detail delineate the entire reserve prior to final design.

FADED LILLY ORE ZONE

Two estimates of in-pit reserves were calculated for this zone. The first estimate which included several small (2 to 3 meter wide) low grade blocks totaled 4,940,070 tonnes with an uncut grade of 2.01 grams per tonne and a cut grade of 1.72 grams per tonne (see Table 6). After further review of the diluted grade of the small blocks, it was decided that after dilution, most of the blocks would be below a reasonable in-pit cutoff and could not be profitably mined. A second calculation was made after the small low grade blocks were removed from consideration. The calculation of the second estimate is being used for the Faded Lilly diluted mineable reserve estimate (see Table 7). The estimate totals 4,567,580 tonnes with an uncut grade of 2.14 grams per tonne and a cut grade of 1.82 grams per tonne. Estimated tonnage with the cut grade average contains 267,795 ounces of gold. The small low grade blocks that were rejected in the second estimate contained approximately 372,000 tonnes with an average diluted cut grade of 0.49 grams per tonne. These blocks are indicated on the cross sections with a small blue dot.

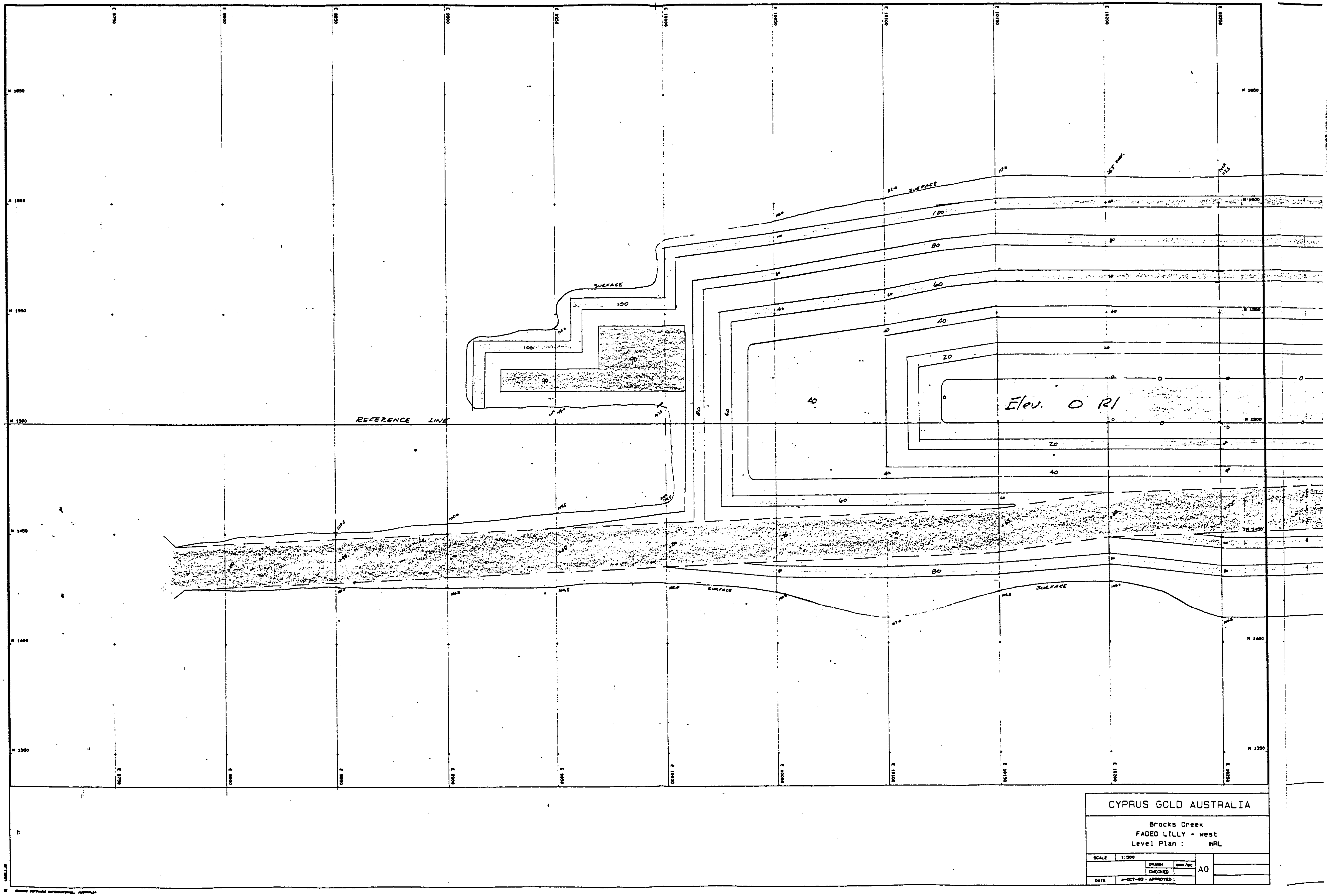
The pit design contains 12,897,640 tonnes of waste which produces a stripping burden of 2.82 tonnes of waste for every tonne of ore.

Block edge dilution for the zone is 921,060 tonnes at a grade of 0.21 grams per tonne. The dilution tonnage is 25 percent of the undiluted ore block tonnage. Although 25 percent is not an extremely high dilution factor for open pit mining, it is much higher than the 16 percent for the Alligator zone because there is a higher percentage of thinner ore zones and much more feathering out geometry in the Faded Lilly mineable area. The Faded Lilly zone appears to be composed of two main zones (10,050East to 10,350East and 10,500East to 10,650East) that feather out between the zones and also to the east and west.

Very tight grade control techniques along with possible stock-pile "re-sampling" of ore zone block edge selvages could probably reduce the ore block edge dilution, but at a higher operating cost.

Drawing ore blocks on the Faded Lilly mineralization was much more subjective in general than for the Alligator mineralization. A higher confidence in the detail geometry and location of Faded Lilly ore blocks will require additional drilling prior to a development decision and detail mine planning. Several holes should also be twinned and a good conclusion as to why the three vertical holes on section 10,200East indicate a significantly different geometry and average grade than the angle holes for the same section.

A few blocks in the Faded Lilly pit were classified as possible but are not included in the mineable reserve estimate. A diluted estimate for these blocks total 192,290 tonnes with a cut grade of 1.12 grams per ton. The possible tonnage at the cut grade estimate contains approximately 6900 ounces (see Table 8).


N 1650
N 1600
N 1550
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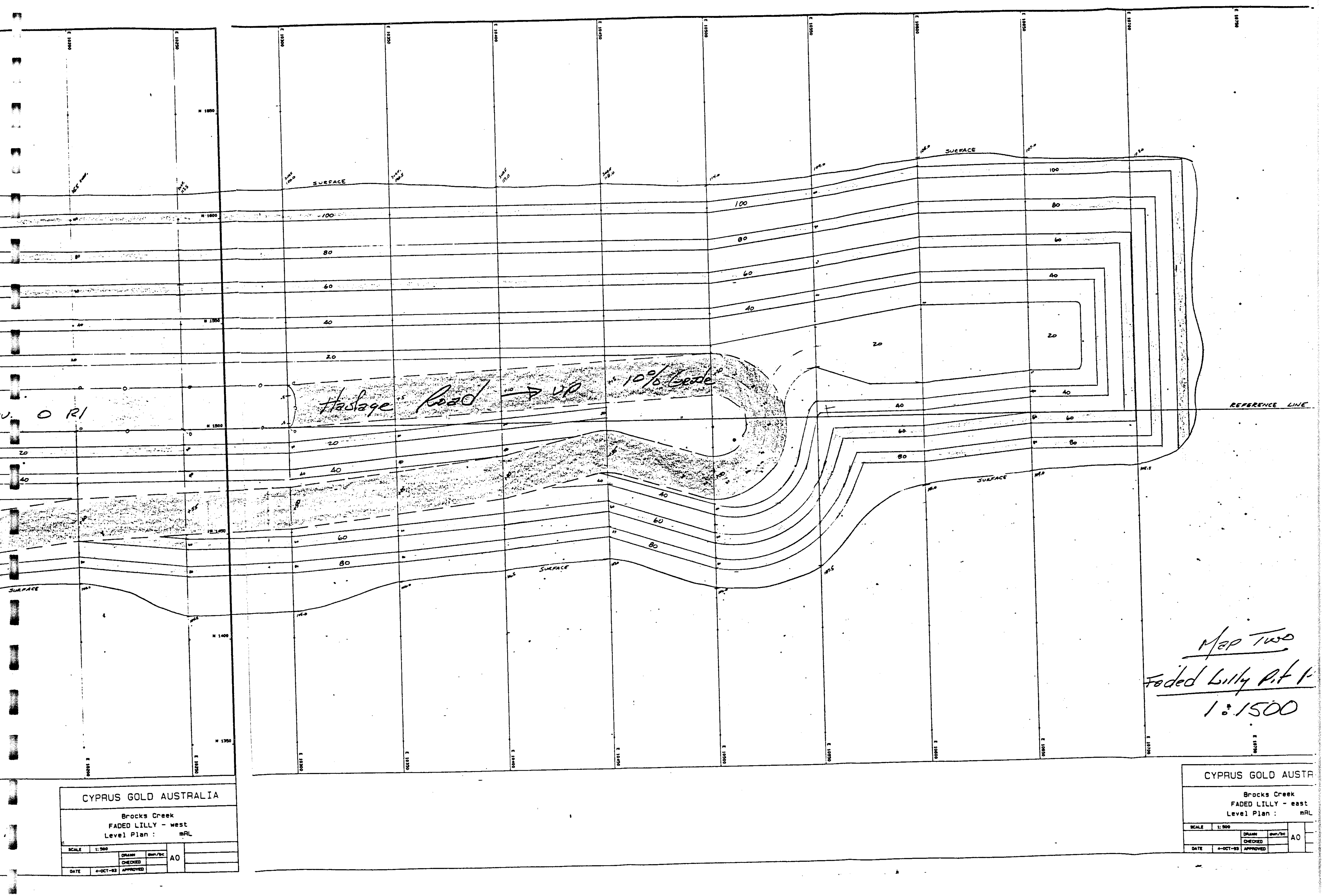
N 1450
N 1400
N 1350
SURFACE
100
80
60
40
20
90
REFERENCE LINE
Elev. O Rl
CYPRUS GOLD AUSTRALIA
Brocks Creek
FADED LILLY - west
Level Plan : mAL
SCALE 1: 500
DRAWN
CHECKED
APPROVED
DATE 4-OCT-93
A0


SURFACE
REFERENCE LINE
Haulage Road → UP 10% Grade
Map Two
Faded Lilly Pit
1:1500
CYPRUS GOLD AUSTRALIA
Brocks Creek
FADED LILLY - west
Level Plan : mRL
SCALE 1:500
DATE 4-OCT-93
DRAWN
CHECKED
APPROVED
A0
CYPRUS GOLD AUSTR
Brocks Creek
FADED LILLY - east
Level Plan : mRL
SCALE 1:500
DATE 4-OCT-93
DRAWN
CHECKED
APPROVED
A0

	Oxide								
	Ore Blocks			Block Edge Dilution			Total Diluted Oxide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
9900E	9,240	1.83	1.83	3,240	0.09	35	12,480	1.38	1.38
9950E	14,520	1.15	1.15	5,760	0.28	40	20,280	0.90	0.90
10,000E	16,800	2.07	2.07	5,040	0.36	30	21,840	1.68	1.68
10,050E	175,800	2.80	2.57	47,760	0.27	27	223,560	2.26	2.08
10,100E	176,130	2.33	2.18	36,170	0.22	21	212,300	1.97	1.85
10,150E	132,960	2.09	2.09	37,080	0.14	28	170,040	1.67	1.67
10,200E	106,920	3.45	2.73	45,960	0.22	43	152,880	2.48	1.98
10,250E	50,880	1.09	1.09	41,400	0.23	81	92,280	0.70	0.70
10,300E	82,200	1.68	1.68	28,680	0.18	35	110,880	1.29	1.29
10,350E	116,040	1.48	1.48	70,200	0.18	61	186,240	0.99	0.99
10,400E	90,360	1.45	1.45	22,920	0.22	25	113,280	1.20	1.20
10,450E	70,320	1.17	1.17	32,880	0.17	47	103,200	0.85	0.85
10,500E	77,880	1.32	1.32	31,560	0.23	41	109,440	1.01	1.01
10,550E	180,000	2.26	1.80	46,320	0.23	26	226,320	1.85	1.48
10,600E	181,970	1.24	1.24	50,040	0.15	28	232,010	1.01	1.01
10,650E	37,320	2.93	2.07	19,920	0.22	53	57,240	1.99	1.43
10,700E	8,650	1.91	1.91	3,440	0.36	40	12,090	1.47	1.47
TOTAL	1,527,990	2.00	1.83	528,370	0.21	35	2,056,360	1.54	1.40

	Sulfide								
	Ore Blocks			Block Edge Dilution			Total Diluted Sulfide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
9900E	------	------	------	------	------	------	------	------	---
9950E	------	------	------	------	------	------	------	------	---
10,000E	------	------	------	------	------	------	------	------	---
10,050E	151,450	3.02	1.71	27,950	0.24	19	179,400	2.59	1.4
10,100E	151,060	2.81	2.11	39,780	0.27	26	190,840	2.28	1.7
10,150E	222,300	6.15	3.98	51,610	0.16	23	273,910	5.02	3.2
10,200E	282,490	3.16	2.96	61,880	0.23	22	344,370	2.63	2.4
10,250E	293,540	3.09	2.76	39,260	0.19	13	332,800	2.75	2.4
10,300E	334,360	2.94	2.20	72,410	0.23	22	406,770	2.46	1.8
10,350E	251,160	1.53	1.53	59,410	0.16	24	310,570	1.27	1.2
10,400E	31,460	2.12	2.12	29,250	0.23	93	60,710	1.21	1.2
10,450E	124,150	1.45	1.45	43,160	0.19	35	167,310	1.13	1.1
10,500E	129,350	2.16	2.16	35,100	0.23	27	164,450	1.75	1.7
10,550E	60,970	2.01	2.01	30,550	0.19	50	91,520	1.40	1.4
10,600E	209,820	1.66	1.65	25,220	0.21	12	235,040	1.50	1.5
10,650E	105,220	2.18	2.18	14,790	0.17	14	120,010	1.93	1.9
10,700E	4,370	3.31	3.31	1,640	0.33	38	6,010	2.50	2.5
TOTAL	2,351,700	2.83	2.33	532,010	0.21	23	2,883,710	2.35	1.9

Summary	Tonnes	Uncut Grade	Cut Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces
Oxide Ore	1,527,990	2.00	1.83	98,252	89,900
Sulfide Ore	2,351,700	2.83	2.33	213,973	176,169
Subtotal	3,879,690	2.50	2.13	311,837	265,685
Oxide Dilution	528,370	0.21	0.21	3,567	3,567
Sulfide Dilution	532,010	0.21	0.21	3,592	3,592
Subtotal	1,060,380	0.21	0.21	7,159	7,159
TOTAL	4,940,070	2.01	1.72	319,242	273,182

Total Block Edge Dilution = 27%

Total Pit Tonnage = 17,474,220
Total Diluted Ore = 4,940,070
Total Waste 12,534,150

Stripping Ratio = 2.54

NOTE: This estimate includes several small low grade blocks.

Alligator Pit
Possible Reserves **Table 4**

Oxide

Section	Ore Blocks Tonnes	Ore Blocks Uncut Grade	Ore Blocks Cut Grade	Block Edge Dilution Tonnes	Block Edge Dilution Grade	Block Edge Dilution % Tonnes Dilution	Total Diluted Oxide Tonnes	Total Diluted Oxide Uncut Grade	Total Diluted Oxide Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
8550E	19,680	2.60	2.60	2,280	0.17	12	21,960	2.35	2.35
8600E	2,520	1.58	1.58	960	0.10	38	3,480	1.17	1.17
8650E	8,880	2.94	2.28	6,240	0.21	70	15,120	1.82	1.43
8700E	21,000	1.35	1.35	9,600	0.09	46	30,600	0.96	0.96
TOTAL	52,080	2.11	1.99	19,080	0.14		71,160	1.58	1.49

Sulfide

Ore Blocks Tonnes	Ore Blocks Uncut Grade	Ore Blocks Cut Grade	Block Edge Dilution Tonnes	Block Edge Dilution Grade	Block Edge Dilution % Tonnes Dilution	Total Diluted Sulfide Tonnes	Total Diluted Sulfide Uncut Grade	Total Diluted Sulfide Cut Grade
	gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
--- No Sulfide Ore Blocks ---								

<u>Summary</u>	Tonnes	Uncut Grade	Cut Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces
Oxide Ore	52,080	2.11	1.99	3,533	3,332
Oxide Dilution	19,080	0.14	0.14	86	86
Total	71,160	1.58	1.49	3,615	3,409

Total Block Edge Dilution = 37%

	Oxide								
	Ore Blocks			Block Edge Dilution			Total Diluted Oxide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
9900E	9,240	1.83	1.83	3,240	0.09	35	12,480	1.38	1.38
9950E	14,520	1.15	1.15	5,760	0.28	40	20,280	0.90	0.90
10,000E	16,800	2.07	2.07	5,040	0.36	30	21,840	1.68	1.68
10,050E	175,800	2.80	2.57	47,760	0.27	27	223,560	2.26	2.08
10,100E	176,130	2.33	2.18	36,170	0.22	21	212,300	1.97	1.85
10,150E	132,960	2.09	2.09	37,080	0.14	28	170,040	1.67	1.67
10,200E	106,920	3.45	2.73	45,960	0.22	43	152,880	2.48	1.98
10,250E	50,880	1.09	1.09	41,400	0.23	81	92,280	0.70	0.70
10,300E	82,200	1.68	1.68	28,680	0.18	35	110,880	1.29	1.29
10,350E	116,040	1.48	1.48	70,200	0.18	61	186,240	0.99	0.99
10,400E	90,360	1.45	1.45	22,920	0.22	25	113,280	1.20	1.20
10,450E	70,320	1.17	1.17	32,880	0.17	47	103,200	0.85	0.85
10,500E	77,880	1.32	1.32	31,560	0.23	41	109,440	1.01	1.01
10,550E	180,000	2.26	1.80	46,320	0.23	26	226,320	1.85	1.48
10,600E	181,970	1.24	1.24	50,040	0.15	28	232,010	1.01	1.01
10,650E	37,320	2.93	2.07	19,920	0.22	53	57,240	1.99	1.43
10,700E	8,650	1.91	1.91	3,440	0.36	40	12,090	1.47	1.47
TOTAL	1,527,990	2.00	1.83	528,370	0.21	35	2,056,360	1.54	1.40

	Sulfide								
	Ore Blocks			Block Edge Dilution			Total Diluted Sulfide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
9900E	------	------	------	------	------	------	------	------	------
9950E	------	------	------	------	------	------	------	------	------
10,000E	------	------	------	------	------	------	------	------	------
10,050E	151,450	3.02	1.71	27,950	0.24	19	179,400	2.59	1.48
10,100E	151,060	2.81	2.11	39,780	0.27	26	190,840	2.28	1.73
10,150E	222,300	6.15	3.98	51,610	0.16	23	273,910	5.02	3.26
10,200E	282,490	3.16	2.96	61,880	0.23	22	344,370	2.63	2.47
10,250E	293,540	3.09	2.76	39,260	0.19	13	332,800	2.75	2.46
10,300E	334,360	2.94	2.20	72,410	0.23	22	406,770	2.46	1.85
10,350E	251,160	1.53	1.53	59,410	0.16	24	310,570	1.27	1.27
10,400E	31,460	2.12	2.12	29,250	0.23	93	60,710	1.21	1.21
10,450E	124,150	1.45	1.45	43,160	0.19	35	167,310	1.13	1.13
10,500E	129,350	2.16	2.16	35,100	0.23	27	164,450	1.75	1.75
10,550E	60,970	2.01	2.01	30,550	0.19	50	91,520	1.40	1.40
10,600E	209,820	1.66	1.65	25,220	0.21	12	235,040	1.50	1.50
10,650E	105,220	2.18	2.18	14,790	0.17	14	120,010	1.93	1.93
10,700E	4,370	3.31	3.31	1,640	0.33	38	6,010	2.50	2.50
TOTAL	2,351,700	2.83	2.33	532,010	0.21	23	2,883,710	2.35	1.94

<u>Summary</u>	Tonnes	Uncut Grade	Cut Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces
Oxide Ore	1,527,990	2.00	1.83	98,252	89,900
Sulfide Ore	2,351,700	2.83	2.33	213,973	176,169
Subtotal	3,879,690	2.50	2.13	311,837	265,685
Oxide Dilution	528,370	0.21	0.21	3,567	3,567
Sulfide Dilution	532,010	0.21	0.21	3,592	3,592
Subtotal	1,060,380	0.21	0.21	7,159	7,159
TOTAL	4,940,070	2.01	1.72	319,242	273,182

Total Block Edge Dilution = 27%

Total Pit Tonnage = 17,474,220
Total Diluted Ore = <u>4,940,070</u>
Total Waste 12,534,150

Stripping Ratio = <u>2.54</u>

NOTE: This estimate includes several small low grade blocks.

	Oxide								
	Ore Blocks			Block Edge Dilution			Total Diluted Oxide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
9900E	9,240	1.83	1.83	3,240	0.09	35	12,480	1.38	1.38
9950E	14,520	1.15	1.15	5,760	0.28	40	20,280	0.90	0.90
10,000E	16,800	2.07	2.07	5,040	0.36	30	21,840	1.68	1.68
10,050E	163,920	2.96	2.71	41,400	0.27	25	205,320	2.42	2.22
10,100E	176,130	2.33	2.18	36,170	0.22	21	212,300	1.97	1.85
10,150E	132,960	2.09	2.09	37,080	0.14	28	170,040	1.67	1.67
10,200E	106,920	3.45	2.73	45,960	0.22	43	152,880	2.48	1.98
10,250E	39,000	1.26	1.26	32,400	0.23	83	71,400	0.79	0.79
10,300E	82,200	1.68	1.68	28,680	0.18	35	110,880	1.29	1.29
10,350E	97,440	1.66	1.66	50,640	0.18	52	148,080	1.15	1.15
10,400E	90,360	1.45	1.45	22,920	0.22	25	113,280	1.20	1.20
10,450E	70,320	1.17	1.17	32,880	0.17	47	103,200	0.85	0.85
10,500E	70,920	1.38	1.38	28,680	0.23	38	99,600	1.05	1.05
10,550E	173,040	2.32	1.85	40,440	0.23	23	213,480	1.92	1.54
10,600E	136,800	1.42	1.42	30,840	0.15	23	167,640	1.19	1.19
10,650E	37,320	2.93	2.07	19,920	0.22	53	57,240	1.99	1.43
10,700E	8,650	1.91	1.91	3,440	0.36	40	12,090	1.47	1.47
TOTAL	1,426,540	2.10	1.92	465,490	0.21	33	1,892,030	1.64	1.50

	Sulfide								
	Ore Blocks			Block Edge Dilution			Total Diluted Sulfide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
9900E	------	------	------	------	------	------	------	------	------
9950E	------	------	------	------	------	------	------	------	------
10,000E	------	------	------	------	------	------	------	------	------
10,050E	144,560	3.13	1.76	24,960	0.24	17	169,520	2.71	1.54
10,100E	147,030	2.87	2.15	35,230	0.27	24	182,260	2.37	1.79
10,150E	216,320	6.30	4.07	45,370	0.16	21	261,690	5.24	3.39
10,200E	274,040	3.24	3.03	56,680	0.23	21	330,720	2.72	2.55
10,250E	281,580	3.20	2.85	27,170	0.19	10	308,750	2.94	2.62
10,300E	301,340	3.18	2.35	58,760	0.23	20	360,100	2.70	2.00
10,350E	251,160	1.53	1.53	59,410	0.16	24	310,570	1.27	1.27
10,400E	20,020	2.80	2.80	22,230	0.23	111	42,250	1.45	1.45
10,450E	124,150	1.45	1.45	43,160	0.19	35	167,310	1.13	1.13
10,500E	124,150	2.23	2.23	29,380	0.23	24	153,530	1.85	1.85
10,550E	39,520	2.77	2.77	14,820	0.19	38	54,340	2.07	2.07
10,600E	195,520	1.72	1.72	21,970	0.21	11	217,490	1.57	1.57
10,650E	105,220	2.18	2.18	14,790	0.17	14	120,010	1.93	1.93
10,700E	4,370	3.31	3.31	1,640	0.33	38	6,010	2.50	2.50
TOTAL	2,228,980	2.95	2.41	455,570	0.21	20	2,684,550	2.49	2.04

Summary	Tonnes	Uncut Grade	Cut Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces
Oxide Ore	1,426,540	2.10	1.92	96,315	88,059
Sulfide Ore	2,228,980	2.95	2.41	211,407	172,708
Subtotal	3,655,520	2.62	2.22	307,922	260,911
Oxide Dilution	465,490	0.21	0.21	3,143	3,143
Sulfide Dilution	455,570	0.21	0.21	3,076	3,076
Subtotal	921,060	0.21	0.21	6,219	6,219
TOTAL	4,576,580	2.14	1.82	314,880	267,795

Total Block Edge Dilution = 25%

Total Pit Tonnage = 17,474,220
Total Diluted Ore = 4,576,580
Total Waste 12,897,640

Stripping Ratio = 2.82

Note: Second estimate excludes small low grade blocks.

	Oxide								
	Ore Blocks			Block Edge Dilution			Total Diluted Oxide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
10,100E	9,480	2.05	2.05	8,280	0.25		17,760	1.21	1.21
10,400E	18,360	1.51	1.51	4,440	0.27		22,800	1.27	1.27
10,450E	4,800	1.99	1.99	2,640	0.24		7,440	1.37	1.37
10,500E	17,280	1.16	1.16	3,840	0.23		21,120	0.99	0.99
10,550E	18,480	3.25	2.08	2,040	0.18		20,520	2.95	1.89
10,650E	16,680	0.99	0.99	7,320	0.21		24,000	0.75	0.75
TOTAL	85,080	1.80	1.55	28,560	0.23		113,640	1.41	1.22

	Sulfide								
	Ore Blocks			Block Edge Dilution			Total Diluted Sulfide		
Section	Tonnes	Uncut Grade	Cut Grade	Tonnes	Grade	% Tonnes Dilution	Tonnes	Uncut Grade	Cut Grade
		gm/tonne	gm/tonne		gm/tonne	%		gm/tonne	gm/tonne
10,100E	------	------	------	------	------	------	------	------	------
10,400E	23,660	1.73	1.73	23,530	0.17		47,190	0.95	0.95
10,450E	3,900	1.12	1.12	2,600	0.14		6,500	0.73	0.73
10,500E	4,550	1.90	1.90	5,200	0.04		9,750	0.91	0.91
10,550E	10,140	1.62	1.62	5,070	0.34		15,210	1.19	1.19
10,650E	------	------	------	------	------	------	------	------	------
TOTAL	42,250	1.67	1.67	36,400	0.17		78,650	0.98	0.98

<u>Summary</u>	Tonnes	Uncut Grade	Cut Grade	Total Contained Uncut Ounces	Total Contained Cut Ounces
Oxide Ore	85,080	1.80	1.55	4,923	4,240
Sulfide Ore	42,250	1.67	1.67	2,268	2,268
Subtotal	127,330	1.76	1.59	7,205	6,509
Oxide Dilution	28,560	0.23	0.23	211	211
Sulfide Dilution	36,400	0.17	0.17	199	199
Subtotal	64,960	0.20	0.20	418	418
TOTAL	192,290	1.23	1.12	7,604	6,914

Total block edge dilution = 51%