680984

SUMMARY OF METALLURGICAL TESTING OF SIWASH NORTH GOLD DEPOSIT

Prepared for:

CORDILLERAN ENGINEERING LTD.

1980 Guinness Tower

1055 West Hastings Street

Vancouver B.C.

R.M. Samuels Consulting, Inc.

1516 Baybrook Drive
Comox, B.C. V9N 6A5

Bus. & Fax: (604) 339-3306

April 16, 1992

John W. Stollery, P.Eng.
Fairfield Minerals Ltd.
Suite 1980
1055 W. Hastings St.
Vancouver, B.C.
V6E 2E9

Dear John:

The following technical report covers metallurgical investigations performed on the Siwash North Gold Deposit. The testwork was conducted on a bulk sample taken from surface trenching and a composite vein sample diluted to a true mining width.

In summary, test results to date have been excellent. The ore is "free milling" and the gold is readily ammenable to recovery by the gravity/flotation or gravity/cyanidation processes. Recoveries in excess of 95% are predicted, and most notable is the result that primary recoveries by gravity technology alone exceed 50%.

Environmentally, the ore is clean (low concentrations of deleterious minerals) and waste rock products are non-acid generating. To further enhance the environmental mitigation, an on-site mill not using cyanidation technology is recommended.

The following observations, recommendations and attachments support the findings.

Yours truly,

R.M. SAMUELS CONSULTING INC.

R. M. Samuels

Rod Samuels

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1.0 Observations

The writer has perused results from preliminary metallurgical testing of the Siwash North Gold Deposit performed by the Placer Dome Inc. Metallurgical Research Centre in February 1990, along with additional testwork carried out by Bacon, Donaldson & Associates Ltd. in March 1992. The following are notable observations stemming from the testwork.

1.1 The ore can be classified as free milling, that is, the fine free gold particles and gold associated with the sulfides is readily liberated from the gangue in the grinding stage and recoverable by common unit processes. Excellent recoveries were achieved at a grind of 54% minus 200 mesh.

1.2 The ore is of medium hardness; the ballmill Work Index was determined at 10.9 kwh/ton. Abrassion tests were not conducted, but due to the high silica content abrassion should be considered during plant design.

1.3 Mineralogical investigation and analyses revealed a "clean ore" with low concentrations of undesireable constituents. The ore is generally described as coarse crystalline quartz vein material with granite wall rock dilution. Sulfide concentration is less than 10% (predominantly pyrite), with trace concentrations of galena, arsenopyrite, chalcopyrite, sphalerite, and pyrrhotite. Free gold occurs as particles from 1 to 50 microns in diameter.

1.4 The ore has a classic "nugget effect", particularly when sampling larger volumes prior to the laboratory portion. This problem is evident in the drill core composite. The anticipated grade derived from drill core assays was 74.4 gm/t. Back calculated assays from the 14 kg of metallurgical test sample averaged 132.6 gm/t, almost double. This is likely due to the clustered gold occurrance in the vein system. Laboratory splits in both the Placer Dome & Bacon Donaldson testwork showed a good correlation, likely due to the fine gold grain size (<50 microns) and the mixing during comminution.

1.5 Excellent recoveries were achieved using gravity separation as a primary recovery process. A split composite sample tested by gravity/flotation and gravity/cyanidation yielded recoveries of 62.7% and 63.2% respectively. It should be noted that head asssays for the testwork were much higher than the average Mother Shoot grade and a lower head grade would result in lower gravity recoveries. Experience with similar ores prompts the writer to estimate gravity recoveries in a production circuit would exceed 50%. Grade of the gravity concentrate, 0.05% of the head weight, makes it a direct smelting product.

1.6 The indicated milling process is gravity/flotation. An overall recovery of 99.5% was achieved from the composite sample using this process. Again, the test sample was higher than an average mining grade, and a typical grade/recovery relationship would likely lower recoveries to the 95% range from run-of-mine ore. A simple suite of flotation reagents with low dosage and low environmental impact is required.

1.7 Gold in the Siwash North deposit is also ammenable to recovery by gravity/cyanidation. Overall recovery of 98.3% was achieved from the Bacon Donaldson testwork, while recoveries with lower head grades and different parameters ranged from 90.2% to 97.8% in the Placer Dome testwork. Recoveries of 95% are predicted in actual practice.

1.8 Silver recoveries were 98.8% and 91.6% from gravity/flotation and gravity cyanidation circuits respectively. Gold to silver ratio in the ore is approximately 1:1 and therefore, silver must be considered as a viable by-product with a contribution to revenues.

1.9 Limited testwork on tailings showed poor settling rates. This perameter is important to tailings disposal, and in the preliminary testwork insufficient investigation was done. It should be noted that settling tests were conducted on cyanidation tailings only, and the presence of residual sodium hydroxide (a dispersant), would be deleterious to settling testwork.

1.10 ICP analysis on both solution and solid fractions show the waste products are very clean and would not cause environmental problems if disposed in the manner currently accepted in the B.C. mining industry. Preliminary acid-base accounting results show the waste rock and tailings are non-acid generating.

2.0 Recommendations

2.1 Testwork conducted to date shows Siwash North ore is readily ammenable to processing by either gravity/flotation or gravity cyanidation. The writer does not feel that pilot testing of a large bulk sample can add significantly to further defining and optimizing a process. Testwork to confirm design criteria and environmental parameters should be conducted at a laboratory bench scale.

2.2 During the up-comming field season when "Mineability Tests" will be conducted on the Mother Shoot vein, a fresh bulk sample should be taken for metallurgical testing. A portion of the sample will be forwarded to potential custom milling companies to test recoveries of Siwash North ore in their circuit configurations. Testwork for an onsite mill should be confined to further defining environmental criteria. There parameters should include:

a) settling and flocculant tests

b) locked cycle testwork using gravity/flotation to produce tails

c) low level testing of tailings for trace elements

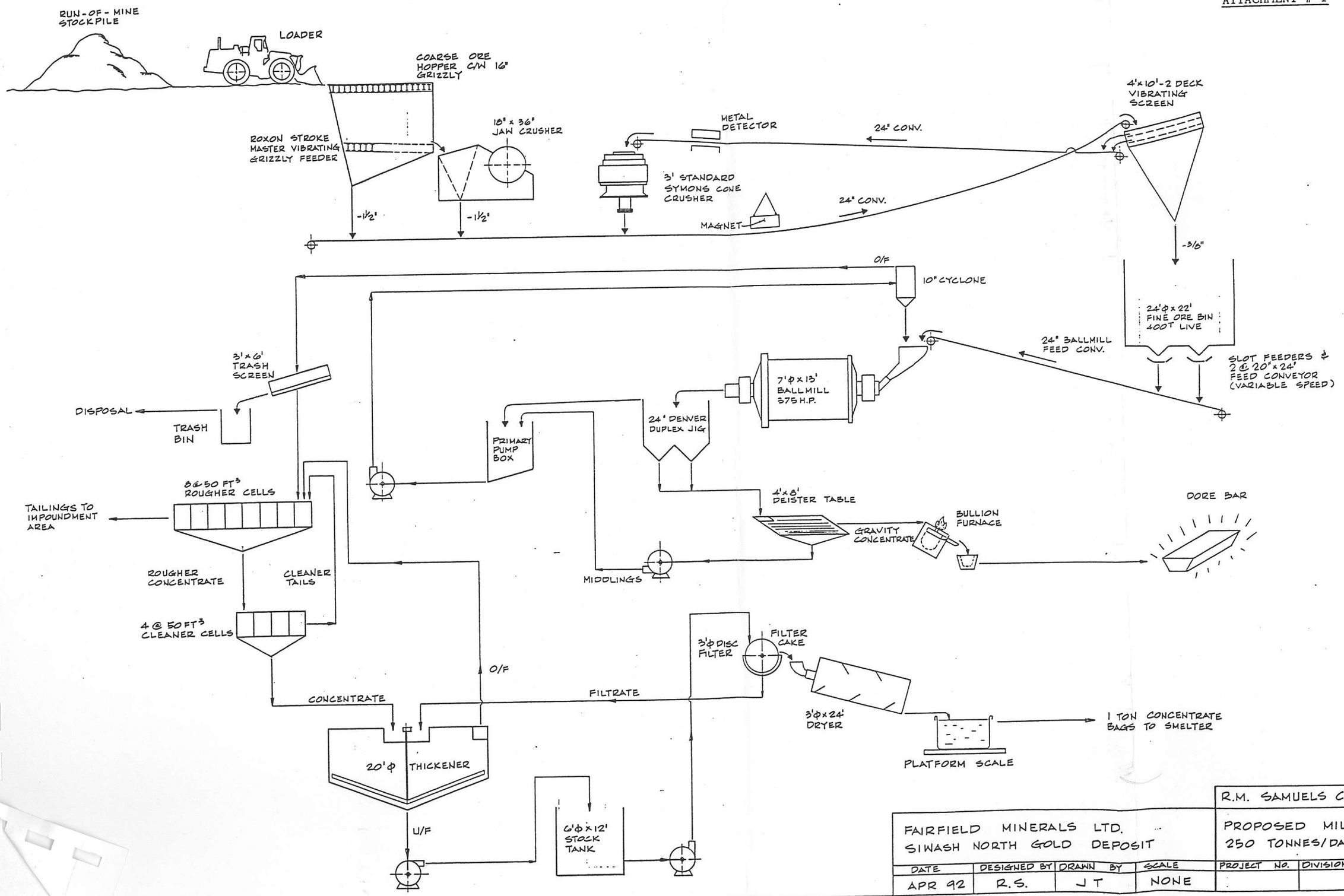
d) acid-base accounting and humidity cell testing on tails

2.3 No further cyanidation testwork should take place unless the option to send the ore to a custom mill already permitted for cyanidation is chosen.

2.4 Sampling of this material must adhere to theoretical sizing and reduction procedures. It is also recommended that all critical assays such as metallurgical and accounting samples are fire assayed using the "pulp/metallic" method. Grade control samples could be assayed with the typical method.

2.5 Based on current testwork and operating experience a conceptual flowsheet for a 250 t/day mill circuit is proposed in Attachment #1.

ATTACHMENT # 1



R.M. SAMUELS CONSULTING INC.

FAIRFIELD MINERALS LTD.
SIWASH NORTH GOLD DEPOSIT

PROPOSED MILL FLOWSHEET
250 TONNES/DAY

DATE	DESIGNED BY	DRAWN BY	SCALE	PROJECT NO.	DIVISION NO.	DRAWING NO.
APR 92	R.S.	J T	NONE			001

ATTACHMENT # 2

Drill Core Composite

Metallurgical Test Sample

In February, 1992 a composite sample consisting of 2-metre diluted vein intercepts from three drill holes was prepared for metallurgical testing. Intersections of the "Mother Shoot" vein in holes 97, 107 and 108 were used. These were located 230 to 300 metres downdip on the vein from the surface. True width of vein sample for each of these holes was 0.88 m, 0.41 m and 0.39 m respectively. Each was diluted to represent a 2.0 m true width by adding the appropriate quantities of material from adjacent samples in the vein hangingwall and footwall. The enclosed table shows the calculated amounts of sample rejects combined to produce each 2.0 m intercept which were, in turn, combined to give the composite sample weighing approximately 14 kg.

Based on geological descriptions of the drill core the composite sample is estimated to consist of 18% vein quartz, 77% altered granitic wallrock, 4% pyrite, and <1/2% combined chalcopyrite, sphalerite and galena.

The calculated average grade of the composite based on metallics fire assays of the drill core samples is 74.39 gm/tonne Au (2.17 oz/ton) and 70.29 gm/tonne Ag (2.05 oz/ton).

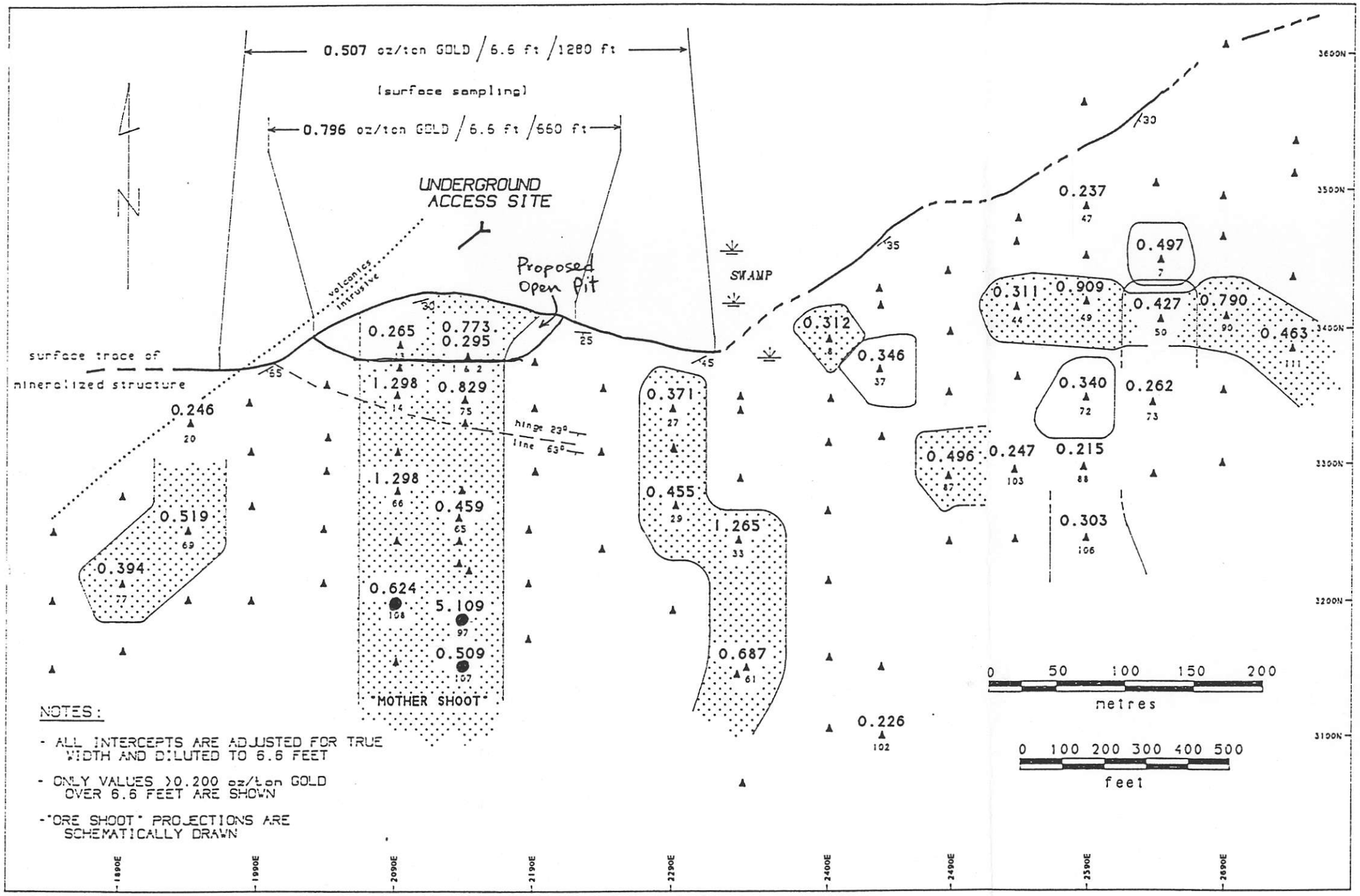
Location of the drill intercepts in the "Mother Shoot" portion of the vein and a detailed make-up of the composite sample can be seen in the attached graphics.

MILL TEST FROM DRILL CORE REJECTS

March 1992

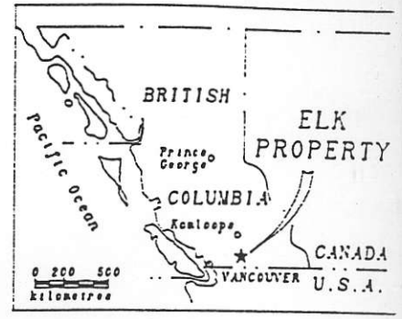
Sample #	True Width (m)	Sample Weight gm	Metallics Fire Analysis Assay Au gm/t	Ag gm/t	% Qtz Vein	% Altered Wallrock	% Unaltered Wallrock	% Pyrite	% Chalcopy	% Galena	% Sphal
SND9197-17	.35	876	.03	.03		71	29				
SND9197-18	.50	1,230	3.87	7.20	60	34		6	Trace		
SND9197-19	.38	951	916.74	686.60	50	38		12	Trace		
SND9197-20	.97	1,927	.03	.03		37	63	Trace			
SND91107-16	.78	1,494	.03	.03			100				
SND91107-17	.41	785	85.03	61.70	54	26	12	8	Trace	Trace	.50
SND91107-18	.81	1,520	.03	.03			100				
SND91108-12	.39	1,068	12.89	27.00	36	27	30	6	Trace	Trace	1
SND91108-13	.62	1,698	.89	3.70		93		7			
SND91108-14	.39	1,068	3.22	16.10	12	83		5	Trace		
SND91108-15	.39	1,070	91.54	224.10	45	46		9	Trace		
SND91108-16	.21	575	1.23	.03		99		1			
BULK TOTAL:					18	43	34	4			0

Total Weight(gm): 14,262
l Avg Au Grade (gm/t): 74.39
cal Avg Ag Grade (gm/t): 70.29



NOTES:

- ALL INTERCEPTS ARE ADJUSTED FOR TRUE WIDTH AND DILUTED TO 6.6 FEET
- ONLY VALUES >0.200 oz/ton GOLD OVER 6.6 FEET ARE SHOWN
- "ORE SHOOT" PROJECTIONS ARE SCHEMATICALLY DRAWN



▲ diamond drill hole location -most holes drilled at -65°N

Total of 107 diamond drill holes 1989 to 1991

oz/ton Gold / 6.6 feet

▲ Hole Number

— average vein dip

B vein "ore shoots"

C, D, & E vein "ore shoots"

FAIRFIELD MINERALS LTD.

ELK PROPERTY

OKANAGAN AREA, SOUTHERN BRITISH COLUMBIA
NTS 82M 15W

SIWASH NORTH GOLD DEPOSIT

DRILL HOLE PLAN & PROJECTED "ORE SHOOTS"

CORDILLERAN ENGINEERING LTD.
1980 - 1055 W. HASTINGS STREET
VANCOUVER, B.C. V6E 2E9

NOVEMBER 19, 1991

ATTACHMENT # 3

BACON
DONALDSON
& ASSOCIATES LTD.

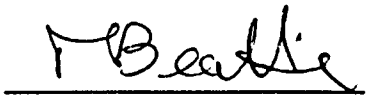
12271 HORSESHOE WAY
RICHMOND, B.C.
CANADA V7A 4Z1
TELEPHONE: (604) 277-2322
FACSIMILE : (604) 274-7235

PRELIMINARY METALLURGICAL TESTING OF SIWASH NORTH GOLD DEPOSIT

Prepared for:

CORDILLERAN ENGINEERING LTD.
1980 Guinness Tower
1055 West Hastings Street
Vancouver, B.C.
V6E 2E9

File Number: MN2-041
April 6, 1992
WP\MN\MN2041R1.MB



Dr. M.J.V. Beattie, P.Eng.

1.0 SUMMARY

Preliminary metallurgical test work has been conducted on a composite sample of Siwash North ore containing 130 g/t Au.

Gold recovery to a gravity concentrate was 63%, producing a very high grade concentrate.

Combined gravity/flotation resulted in 99% gold recovery, while combined gravity/cyanidation resulted in 98% gold recovery. The ore is readily amenable to processing by either process.

The work index of the sample was determined to be 10.9 (kwh/ton).

2.0 INTRODUCTION

Preliminary metallurgical test work has been conducted on a composite sample of drill core rejects from the Siwash North gold deposit. The test program was conducted at the request of Mr. Jeffrey Rowe of Cordilleran Engineering. The scope of the program was to test both a gravity/flotation and a gravity/cyanidation circuit for gold recovery. Various of the test products were to be analyzed for environmental purposes. The results of these environmental analyses are included in a separate report.

Subsequent to the initial instructions for the program, modified procedures were provided by Mr. Rod Samuels of R.M. Samuels Consulting Inc. The progress of the program was discussed with Mr. Samuels as the test work proceeded.

3.0 DISCUSSION

3.1 Sample Description

The sample provided by Cordilleran for the test program consisted of approximately 15 kg of crushed drill core rejects. The sample was described as a composite sample of quartz vein and granite host rock.

The crushed rejects were blended and then split into individual test samples. The total sample was utilized for the test work. The sample was assayed to contain 130 g/t Au and 99 g/t Ag. In addition, a whole rock analysis and multi-element ICP analysis were conducted on the sample. The results of these analyses are included in the Appendix of test details as "T1 Head".

3.2 Gravity/Flotation (Test F1)

One portion of the composite was ground to approximately 54% minus 200 mesh prior to being jigged. The jig concentrate was further concentrated by hand panning to simulate tabling of the jig concentrate in commercial operation. The pan tailings were combined with the jig tailings and subjected to a bulk flotation stage. The test details are appended and are summarized as follows:

Product	Weight %	Au g/t	Ag g/t	Distribution, %	
				Au	Ag
Gravity Conc.	0.05	155,000	48,000	62.7	25.3
Float Conc.	11.9	404	612	36.8	73.5

Multi-element analyses of the flotation concentrate and tailings are included with the test details.

A microscopic examination of the concentrate revealed it to be primarily composed of pyrite and gangue with trace concentrations (<1%) of galena, arsenopyrite, chalcopyrite, sphalerite, and pyrrhotite. Free gold was noted as particles from 1 to 50 microns in diameter. It appeared that a cleaner flotation stage could be beneficial in producing a higher grade concentrate. Similarly, a gold-selective collector should be investigated in future test work.

3.3 Gravity/Cyanidation (Test C1)

One portion of the composite was ground to 55% minus 200 mesh prior to being jigged. The jig concentrate was hand panned with the concentrate being assayed and the pan tails combined with the jig tails for cyanidation. The overall results can be summarized as follows:

Stage	% Extraction	
	Au	Ag
Gravity Concentration	63.2	30.0
Cyanidation	35.1	61.6

The above extraction was achieved after 48 hours cyanidation. Most of the gold leaching was achieved within the first 6 hours of leaching.

The cyanide consumption in this test was 1.07 kg/t with a final cyanide concentration of 0.51 g/L NaCN. A lower consumption could be achieved by allowing the concentration to drop to 100-200 ppm NaCN by the end of leaching. Confirmation will be required in subsequent test work that low residual cyanide will not result in gold or silver precipitation.

It should be noted that the high head grade of the sample resulted in a high grade pregnant solution suitable for Merritt Crowe precipitation.

The slurry had a very low (0.3 ppm) dissolved oxygen content and required one hour agitation before the oxygen content was high enough for cyanidation.

The final tailings from cyanidation would not settle to produce a clear supernatant. Lime was added to increase the pH from 10.5 to 11.5 and this resulted in a clear supernatant but negligibly slow settling rates.

3.4 Work Index

The ball mill work index of the sample has been determined by the comparative grinding method. Following are the test results for an ore of known work index and the Siwash North sample:

Known: Wi = 11.5 (kwh/ton)

F_{80} = 10 mesh (1651 microns)
P_{80} = 157 microns

Siwash North: F_{80} = 1651 microns
P_{80} = 146 microns

$$Wi = \frac{11.5\left(\frac{10}{\sqrt{157}} - \frac{10}{\sqrt{1651}}\right)}{\left(\frac{10}{\sqrt{146}} - \frac{10}{\sqrt{1651}}\right)}$$

= 10.9 (kwh/ton)

APPENDIX

Test Details

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: BACON, DONALDSON & ASSOCIATES LTD.,

12271 HORSESHOE WAY
RICHMOND, BC
V7A 4Z1

Project : MN2-041
Comments: ATTN: RON WILLIAMS

Page Number :1
Total Pages :1
Certificate Date: 13-MAR-92
Invoice No. :19211989
P.O. Number :MA 58793
Account :ID

CERTIFICATE OF ANALYSIS A9211989

SAMPLE	PREP CODE		Al2O3 %	BaO %	CaO %	Fe2O3 %	K2O %	MgO %	MnO %	Na2O %	P2O5 %	SiO2 %	TiO2 %	LOI %	TOTAL %	
MN2-041 T1 HEAD	225	200	12.97	0.11	1.18	7.73	3.80	0.66	0.10	1.80	0.22	66.36	0.40	4.64	99.97	

CERTIFICATION: Ithai D'Mar

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: BACON, DONALDSON & ASSOCIATES LTD.,
12271 HORSESHOE WAY
RICHMOND, BC
V7A 4Z1

Project : MN2-041
Comments: ATTN: RON WILLIAMS

Page Number :1-A
Total Pages :1
Certificate Date: 17-MAR-92
Invoice No. :19211991
P.O. Number :MA 58793
Account :ID

CERTIFICATE OF ANALYSIS A9211991

SAMPLE	PREP CODE		Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %	La ppm	Mg %	Mn ppm	Mo ppm
MN2-041 T1 HEAD	299	233	69.4	0.37	810	40	< 0.5	46	0.45	3.5	13	12	675	5.53	< 10	6	0.21	10	0.19	780	1

CERTIFICATION: Jhai D Ma

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: BACON, DONALDSON & ASSOCIATES LTD.,

12271 HORSESHOE WAY
RICHMOND, BC
V7A 4Z1

Project : MN2-041
Comments: ATTN: RON WILLIAMS

Page Number :1-B
Total Pages :1
Certificate Date: 17-MAR-92
Invoice No. :I9211991
P.O. Number :MA 58793
Account :ID

CERTIFICATE OF ANALYSIS A9211991

SAMPLE	PREP CODE		Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
MN2-041 T1 HEAD	299	233	0.01	1	570	230	5	3	13	0.02	< 10	10	16	< 10	232

CERTIFICATION: Thai D'Ma

TESTWORK PROCEDURE

Test No: MN2-041 **Date:** 3-Mar-92

Purpose: Initial bench scale flotation scoping test

STAGE	TIME (Minutes)	ADDITIONS		
		g/tonne	REAGENT	
Grind	11			
Gravity concentration			8 kg	
Jig				
Pan (Jig concentrate)				
Flotation				
Condition (Jig tails and pan tails)	2	50.0 25.0	A350 A208	
Rougher float	3			pH=7.4
Scavenger float	2	25.0 12.5	A350 A208	Final pH=8.0

TEST NUMBER: MN2-041 F1

PRODUCT	WEIGHT GMS	WEIGHT %	ASSAYS Au g/tonne	ASSAYS Ag g/tonne	% DIST Au	% DIST Ag
Jig pan conc	4.1	0.05	155168.2	47609.5	62.71	25.31
Ro conc	916.0	11.90	404.2	612.5	36.85	73.47
Final tails	6778.0	88.05	0.7	1.4	0.44	1.22
LC HEAD	7698.1	100.0	130.5	99.2	100.00	100.00
ASSAY HEAD						

SIZE DISTRIBUTION

SAMPLE NO:MN2-041 F1 Head

Size Fraction (mesh)		Individual Percentage Retained	Cumulative Percentage Passing
	+ 65	1.2	98.8
- 65	+100	8.3	90.5
-100	+150	19.5	71.0
-150	+200	17.1	53.9
- 200	+270	6.0	47.9
-270	+325	11.2	36.7
-325	+400	1.9	34.8
-400		34.8	

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: BACON, DONALDSON & ASSOCIATES LTD.,

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RICHMOND, BC
V7A 4Z1

Project : MN2-041
Comments:

Page Number :1-A
Total Pages :1
Certificate Date: 17-MAR-92
Invoice No. :I9212070
P.O. Number :MA 58797
Account :ID

CERTIFICATE OF ANALYSIS A9212070

SAMPLE	PREP CODE		Ag ppm	Al %	As ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %	La ppm	Mg %	Mn ppm	Mo ppm
MN2-041 B RO CON	225	233	>200	0.39	6140	40	< 0.5	402	0.28	25.5	45	25	5200	>15.00	< 10	< 1	0.26	< 10	0.13	580	13
MN2-041 C RO TL	225	233	1.8	0.55	55	60	< 0.5	8	0.47	< 0.5	2	22	45	2.54	< 10	8	0.28	10	0.21	845	1

CERTIFICATION: Thai D'Ma

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: BACON, DONALDSON & ASSOCIATES LTD.,

12271 HORSESHOE WAY
RICHMOND, BC
V7A 4Z1

Project : MN2-041
Comments:

Page Number : 1-B
Total Pages : 1
Certificate Date: 17-MAR-92
Invoice No. : 19212070
P.O. Number : MA 58797
Account : ID

CERTIFICATE OF ANALYSIS A9212070

SAMPLE	PREP CODE		Na %	Ni ppm	P ppm	Pb ppm	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm
MN2-041 B RO CON	225	233	< 0.01	2	460	1985	20	3	9	0.01	< 10	< 10	10	< 50	1380
MN2-041 C RO TL	225	233	0.01	3	710	70	< 5	3	14	0.02	< 10	< 10	19	< 10	92

CERTIFICATION: Thai D Ma

CYANIDATION REPORT

File No :MN2-041 Start Date :18 MAR 92
Test No :C1

Starting Conditions :

5500.0 dry g of feed Feed Description:ORE
8250.0 ml of water
40.0 % solids Grind Time (min) :11
1.0 g/l NaCN
10.5 target pH
0.0 g carbon added

Test Progress :

Time hr	NaCN Conc g/l	NaCN Add g	Ca(OH)2 Conc g/l	Ca(OH)2 Add g	Start pH	End pH	O2 ppm
-1.0				2.72	7.8	10.5	0.3
-0.5				0.68	10.1	10.6	2.3
0.0	0.00	8.25		0.54	10.2	10.7	3.6
1.0	0.80	0.00		0.00	10.6		6.0
6.0	0.67	0.00		0.00	10.5		8.6
26.0	0.32	1.49		0.00	10.5		8.8
48.0	0.51		0.00		10.4		9.0

Reagent Consumption : NaCN = 1.07 kg/t
Lime = 0.72 kg/t
Reducing Power : RP = 100 ml of N/10 KMnO4 per l solution

Assays and Extractions :

Time hr	Product	Solids Au g/t	Solids Ag g/t	Liquid Au ppm	Liquid Ag ppm	Extract Au %	Extract Ag %
0.0	JigConc	52595.03	19625.88			63.2%	30.0%
6.0	Soln			29.34	32.05	31.9%	44.4%
26.0	Soln			31.26	39.78	33.4%	54.0%
48.0	Soln			33.68	46.52	35.1%	61.6%
	Total Extracted					98.3%	91.6%
48.0	Solids	2.33	8.92			1.7%	8.4%
						100.0%	100.0%

	Au (g/t)	Ag (g/t)	Au (oz/ton)	Ag (oz/ton)
Calc Head	134.73	105.84	3.930	3.088
Assy Head	130.52	99.21	3.806	2.893

SIZE DISTRIBUTION

SAMPLE NO: MN2041-C1 (GRAV. TL.)

Size Fraction (Tyler mesh)	Screen Aperture (microns)	Individual Percentage Retained	Cumulative Percentage Passing
65	208	0.4	99.6
100	147	7.5	92.1
150	104	19.4	72.7
200	74	17.9	54.8
270	53	6.6	48.2
325	44	10.5	37.6
400	37	2.1	35.5
Undersize		35.5	

ATTACHMENT # 4

ASL

CHEMICAL ANALYSIS REPORT

Date: Apr. 06, 1992

ASL File No. 2217C

Report On: Water Analysis (MN2-041)

Report To: Cordilleran Engineering Ltd.
1980 Guinness Tower
1055 West Hastings Street
Vancouver, BC
V6E 2E9

Attention: Mr. J.D. Rowe
cc -Bacon, Donaldson & Associates
Att'n: Mr. Ron Williams

Date Received: Mar. 18, 1992

METHODOLOGY

Metals

These analyses are carried out in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater" 17th Edition published by the American Public Health Association, 1989. The procedures involve a variety of instrumental analyses including atomic emission spectrophotometry (ICP) and atomic absorption spectrophotometry (AA) to obtain the required detection limit for each element. Specific details are available on request.

ASL ANALYTICAL SERVICE LABORATORIES LTD.
per:

Brent A. Makelki B.Sc.
Project Chemist

Barbara Szczachor B.Sc.
Supervisor, Water Quality Lab

RESULTS OF ANALYSIS - Water

ASL

File No. 2217C
Page 2

Parameter		MN2-041 RO TLS Soln
Total Metals		
Aluminum	T-Al	0.085
Arsenic	T-As	0.0033
Beryllium	T-Be	<0.005
Cadmium	T-Cd	<0.0002
Chromium	T-Cr	0.011
Copper	T-Cu	0.010
Iron	T-Fe	0.112
Lead	T-Pb	<0.001
Manganese	T-Mn	0.116
Mercury	T-Hg	<0.00005
Phosphorus	T-P	0.58
Selenium	T-Se	<0.0005
Silver	T-Ag	<0.0001
Uranium	T-U	0.00033
Zinc	T-Zn	0.201

< = Less than the detection limit indicated.
Results are expressed as milligrams per litre.

End of Report

RESULTS OF ANALYSIS - Water

Parameter		MN2-049 CN Tail Solution
Total Metals		
Aluminum	T-Al	0.500
Arsenic	T-As	1.47
Beryllium	T-Be	<0.005
Cadmium	T-Cd	0.0523
Chromium	T-Cr	0.001
Copper	T-Cu	35.9
Iron	T-Fe	12.1
Lead	T-Pb	0.016
Manganese	T-Mn	0.009
Mercury	T-Hg	0.00240
Phosphorus	T-P	1.61
Selenium	T-Se	0.0031
Silver	T-Ag	51.0
Uranium	T-U	0.00100
Zinc	T-Zn	1.10

< = Less than the detection limit indicated.
Results are expressed as milligrams per litre.

End of Report

RESULTS OF ANALYSIS - Sediment/Soil

File No. 2291C
Page 3

Parameter		CM Tails	Grav Tails	Grav Tails Dup.
Total Metals				
Aluminum	T-Al	11000	13100	10900
Antimony	T-Sb	<25	<25	<25
Arsenic	T-As	808	1020	970
Barium	T-Ba	46.7	50.1	42.6
Beryllium	T-Be	<0.5	<0.5	<0.5
Bismuth	T-Bi	70	86	69
Cadmium	T-Cd	4.6	5.3	5.1
Calcium	T-Ca	5190	5100	4870
Chromium	T-Cr	20.7	22.3	20.0
Cobalt	T-Co	7.7	9.0	9.0
Copper	T-Cu	667	783	777
Iron	T-Fe	52000	61200	58700
Lead	T-Pb	329	378	373
Lithium	T-Li	4.4	4.6	4.1
Magnesium	T-Mg	2670	2950	2740
Manganese	T-Mn	895	978	940
Molybdenum	T-Mo	<5.0	<5.0	<5.0
Nickel	T-Ni	<2.0	<2.0	<2.0
Phosphorus	T-P	648	679	670
Potassium	T-K	3750	4200	3400
Selenium	T-Se	<1.0	<1.0	<1.0
Silver	T-Ag	9.3	8.9	25.8
Sodium	T-Na	465	<250	<250
Tin	T-Sn	<30	<30	<30
Vanadium	T-V	21.9	24.6	22.5
Zinc	T-Zn	241	278	261

< = Less than the detection limit indicated.
Sediment results expressed as milligrams per dry kilogram.

End of Report

BACON DONALDSON
& ASSOCIATES LTD.

12271 HORSESHOE WAY
RICHMOND, B.C.
CANADA V7A 4Z1
TELEPHONE: (604) 277-2322
FACSIMILE : (604) 274-7235

CORDILLERAN ENGINEERING LTD.
1980 Guiness Tower
1055 West Hastings Street
Vancouver, B.C. V6E 2E9

April 21, 1992

Attention: Mr R.M.Samuels

Dear Rod,

Further to our report of April 6, 1992 we have submitted several of the test product for environmental analysis. Samples of effluent from both the flotation test and cyanidation test as well as solids from the cyanidation test were submitted to ASL Analytical Service Laboratories Ltd. The results of those analyses were reported directly to Cordilleran Engineering. In addition, acid-base accounting was performed on tailings from both tests as follows:

SAMPLE	S,%	Paste pH	N.P.	M.P.A.	Net N.P.
			(tons CaCO3/1000tons waste)		
Float tail	0.10	5.8	13.5	3.12	10.4
CN tail	2.97	9.0	18.8	92.8	-74.0

The results indicate that while the flotation tailings would not be expected to be acid generating, the cyanidation tailings potentially are an acid producer. The high paste pH shown by the cyanidation tails are explained by the presence of lime from the cyanidation process.

Enclosed with this report is a polished section of the rougher flotation concentrate produced in the present testwork.

Yours Sincerely,
Bacon Donaldson & Associates Ltd.

Dr. M.J.V. Beattie, P.Eng.

Rob. Samuels.

ATTACHMENT # 5

PLACER DOME INC.

METALLURGICAL RESEARCH CENTRE

ELK CLAIMS PROJECT

BRITISH COLUMBIA

REPORT NO. 1

Gravity Concentration
and Cyanidation of
Bulk Samples
SN 89-7, SN 89-12
SN 89-13 and SN 89-14

PREPARED BY: David Hall
D.R. Hall
Research Metallurgist

REVIEWED AND
APPROVED BY: George Rodger
G.E. Rodger
Laboratory Superintendent

DATE: February, 1990

Metallurgical Testwork
Performed by:

P.P. Janssens
D.W. Akhurst

TABLE OF CONTENTS

DRH:ojt
1990-02-19

INTRODUCTION

Mr. E.T. Kimura of Placer Dome Inc., Exploration Department, (Vancouver, B.C. office) in a November 6, 1989 memo requested metallurgical testing. The objective of testwork was to determine preliminary gold recoveries. Another major objective was to ascertain head grades based on treatment of a large bulk sample thus reducing the "*nugget effect.*"

Four bulk samples from surface trenching were received on November 11, 1989.

SAMPLE DESCRIPTION AND LOCATION

Mr. E.T. Kimura's memo of November 6, 1989 in Appendix 4 outlines mineralization.

The samples were obtained from the Elk property near Peachland, B.C.

SUMMARY

Metallurgy

All four samples tested were high grade material showing signs of very fine grained free milling gold.

Direct cyanidation of the head samples show rapid dissolution of gold with high extraction of 90.2% to 97.8% after 24 hours.

Gravity concentration tests produced high grade Wilfley table concentrates and middlings, however overall extraction was low. A large percentage of gold reported to the spiral concentrator tails which was easily extracted by cyanidation.

Head Grade

Gold and silver assays were performed in triplicate on each head sample. A 25 g sample was subjected to fire assay preconcentration with Pt/Pd inquartation followed by AA finish.

Silver assays were also determined using Aqua Regia acid digestion and was found to be in very close agreement. Therefore, subsequent silver assays were performed by the Aqua Regia acid digestion method because it is a quicker and more cost effective method.

Assayed heads are summarized in Table No. 1 below. Table No. 2 summarizes assayed and metallurgical test calculated heads and Table No. 3 summarizes assayed and metallurgical test gold values in the gravity test products.

DRH:ojt
1990-02-08

SUMMARY

Head Grade (Continued)

Table No. 1 - Head Assays

Sample No.	Au g/t 1	2	3	Avrg	Ag g/t
SN 89-7	45.7	49.2	44.4	46.4	77.0
SN 89-12	46.8	45.8	-	46.3	152.0
SN 89-13	110.0	104.0	-	107.0	49.0
SN 89-14	15.8	17.9	12.1	15.3	13.0

Table No. 2

Comparative Head Assays Au g/t

Sample No.	Average Assay	Calculated Head Assay Cyandation Test	Gravity Test Assay Values	Gravity Test Leach Test Values	Average	Standard Deviation
SN 89-7	46.4	56.7	45.1	49.4	49.4	4.49
SN 89-12	46.3	40.0	30.8	33.8	37.7	5.96
SN 89-13	107.0	89.4	50.4	53.7	75.1	23.93
SN 89-14	15.3	15.9	6.5	6.3	11.0	4.61

Table No. 3

Test Product Comparative Assays (Au g/t)

Test Product	Sample No. SN 89-7 Assayed	Sample No. SN 89-7 Leach Test Calc Head	Sample No. SN 89-12 Assayed	Sample No. SN 89-12 Leach Test Calc Head
Wilfley Conc	27 230.0	-	2 400.0	-
Wilfley Middlings	3 260.0	2 981.0	500.0	417.0
Wilfley Tails	27.6	29.7	21.1	21.0
Spiral Tails	35.8	41.4	29.8	34.0

DRH:ojt
1990-02-08

SUMMARY

Head Grade (Continued)

Table No. 3

Test Product Comparative Assays (Au g/t)

Test Product	Sample No. SN 89-13		Sample No. SN 89-14	
	Assayed	Leach Test Calc Head	Assayed	Leach Test Calc Head
Wilfley Conc	6 933.0	-	2 500.0	-
Wilfley Middlings	1 540.0	1 414.1	320.0	308.0
Wilfley Tails	23.0	26.7	2.9	3.0
Spiral Tails	45.5	54.5	4.9	4.7

Metallurgical Tests

A flowchart in Appendix No. 1 outlines test procedures.

Gravity Concentration

Primary gravity separation was performed on crushed and ground bulk samples using a six turn wash waterless spiral concentrator. The spiral concentrator tails were sampled for cyanidation and assaying. The spiral middlings and concentrates were subjected to gravity concentration on a laboratory sized Wilfley Concentrating Table. The Wilfley tails were sampled for cyanidation and assaying as were the final Wilfley middlings. The Wilfley concentrate was assayed only.

Table No. 4 summarizes the gravity test final Wilfley concentrate distributions. It is provided to give an indication of the percentage of free gold that could be recovered in a gravity circuit, prior to cyanidation. For comparative purposes, the summary also displays results based on product assayed results and cyanidation test calculated assay results. There is good agreement between these two values. Refer to Appendix 2 for details.

Table No. 4

Gravity Concentration - Wilfley Concentrate Distribution Summary

Sample No.	% Weight	Assay (Au g/t)	% Distribution A	% Distribution B
SN 89-7	0.0242	27 230.00	14.62	13.35
SN 89-12	0.0474	2 400.00	3.69	3.36
SN 89-13	0.1362	6 933.00	17.59	15.38
SN 89-14	0.0533	2 500.00	20.59	21.09

A - Distribution calculated using individual product assayed results.
B - Distribution calculated using individual product cyanidation test calculated assay results.

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1990-02-08

SUMMARY

Cyanidation Tests

Initial feed and gravity test products were subjected to cyanidation at 45% solids by weight on the bottle roll unit.

Feed and Wilfley table middlings only were ground in the laboratory rod mill prior to cyanidation. The Wilfley and spiral tailings product were considered fine enough for cyanidation and were leached directly.

Table No. 5 summarizes the cyanidation tests.

Table No. 5

Cyanidation Tests Summary

Sample No.	Test Product	Assays Calc Head	Au g/t Residue	% Au Extr	Reagent Consumption (kg/t) Solution NaCN	Solution CaO	Dry Solids NaCN	Dry Solids CaO	Leach Time h
SN 89-7	Composite Head	56.73	5.40	90.5	0.48	1.13	0.59	1.38	24
	Wilfley Middling	2981.30	2820.00	5.4	0.90	1.63	1.10	1.99	24
	Wilfley Tails	29.70	2.82	90.5	0.50	0.57	0.61	0.70	24
	Spiral Tails	41.47	1.76	95.8	0.45	1.13	0.55	1.38	24
SN 89-12	Composite Head	39.99	0.88	97.8	0.45	2.08	0.55	2.54	24
	Wilfley Middling	417.00	131.00	68.6	0.90	1.61	1.10	1.97	24
	Wilfley Tails	21.00	2.67	87.3	0.55	1.36	0.67	1.66	24
	Spiral Tails	34.02	2.49	92.7	0.45	2.37	0.55	2.90	24
SN 89-13	Composite Head	89.37	4.43	95.0	0.45	1.16	0.55	1.42	24
	Wilfley Middling	1414.10	1177.00	16.8	0.90	1.49	1.10	1.82	24
	Wilfley Tails	26.72	1.06	96.0	0.45	0.78	0.55	0.95	24
	Spiral Tails	54.53	1.86	96.6	0.35	1.17	0.43	1.43	24
SN 89-14	Composite Head	15.89	1.56	90.2	0.30	1.34	0.37	1.67	24
	Wilfley Middling	308.00	110.00	64.3	0.90	1.07	1.10	1.31	24
	Wilfley Tails	3.04	0.42	86.2	0.35	0.49	0.43	0.53	24
	Spiral Tails	4.68	0.28	94.0	0.45	1.22	0.55	1.49	24

DISCUSSION

Head Grade

Excellent pulp assay and metallurgical test calculated assay agreement was achieved for samples SN 89-7 and SN 89-12. Samples SN 89-13 and SN 89-14 gravity test calculated head assays were approximately half the assayed and cyanidation test results. This variance is largely attributed to the difficulty in sampling and assaying concentrates containing free milling gold. Native gold was observed to be very fine. Assaying this type of product is strictly a hit and miss technique. Full sample fusion is recommended followed by gravimetric analysis.

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1990-02-08

DISCUSSION

Head Grade (Continued)

The feed cyanidation and pulp assay values agreed very well as did the gravity test products.

Appreciable silver values are also associated with the gold values.

Gravity Concentration

Very high grade final eoncentrates were produced by gravity separation. These concentrates all contained native gold. This was observed as attempts were made to upgrade the Wilfley concentrate on the superpanner.

The Wilfley concentrate produced could be considered as a direct smelt product.

Large losses were noted in the spiral tailings. This may have been caused by:

1. Finely disseminated grains.
2. Poor liberation (no particle size classification was performed).

This material may be more suited to jigging than spiral concentration techniques.

Cyanidation

Rapid dissolution was observed for all composite feed samples and gravity test tailing products. High extractions were achieved in all cases but samples SN 89-7 and SN 89-12 cyanidation residue assays were still significant. Sample SN 89-12 produced a respectable 0.88 g/t gold residue from the composite head leach tests but gravity test tails cyanidation residues were much higher. This is definitely particle size liberation related. No attempts were made during this phase of testing to optimize grinding or reagents. Testwork was performed as a limited, first pass scoping test to derive preliminary extractions and head grades.

Cyanidation of the ground Wilfley middling products resulted in poor extraction due to the high sulphide content and rapid depletion of reagents. This product would be reconcentrated in the gravity circuit for gold extraction.

After 24 hours of cyanidation reagent consumption for the head sample and gravity test tailing averaged:

NaCN 0.44 kg/t of solution
CaO 1.23 kg/t of solution

Silver extraction by cyanidation ranged from 36.8% to 70.3% from the head composites.

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1990-02-08

CONCLUSION

High gold extraction was achieved by both direct cyanidation and gravity concentration/cyanidation.

Fine free milling gold is present in each of the four samples tested.

RECOMMENDATION

It is recommended that a gravity/cyanidation test program be investigated to determine optimum:

1. Grind.
2. Reagent levels.
3. Cyanidation times.

SAMPLE PREPARATION

Four samples were received in 220 litre steel drums. The samples were air dried and grid sampled to obtain a head sample. Dry weights and sample designations are as follows:

Sample Designation	Weight (kg)
SN 89- 7	314.2
SN 89-12	300.0
SN 89-13	300.0
SN 89-14	322.8

Each sample was treated individually by jaw, cone and roll crushing. The samples were ground an a 16" x 32" rod mill prior to gravity separation on a mineral deposits six turn wash waterless spiral concentrator.

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1990-02-08

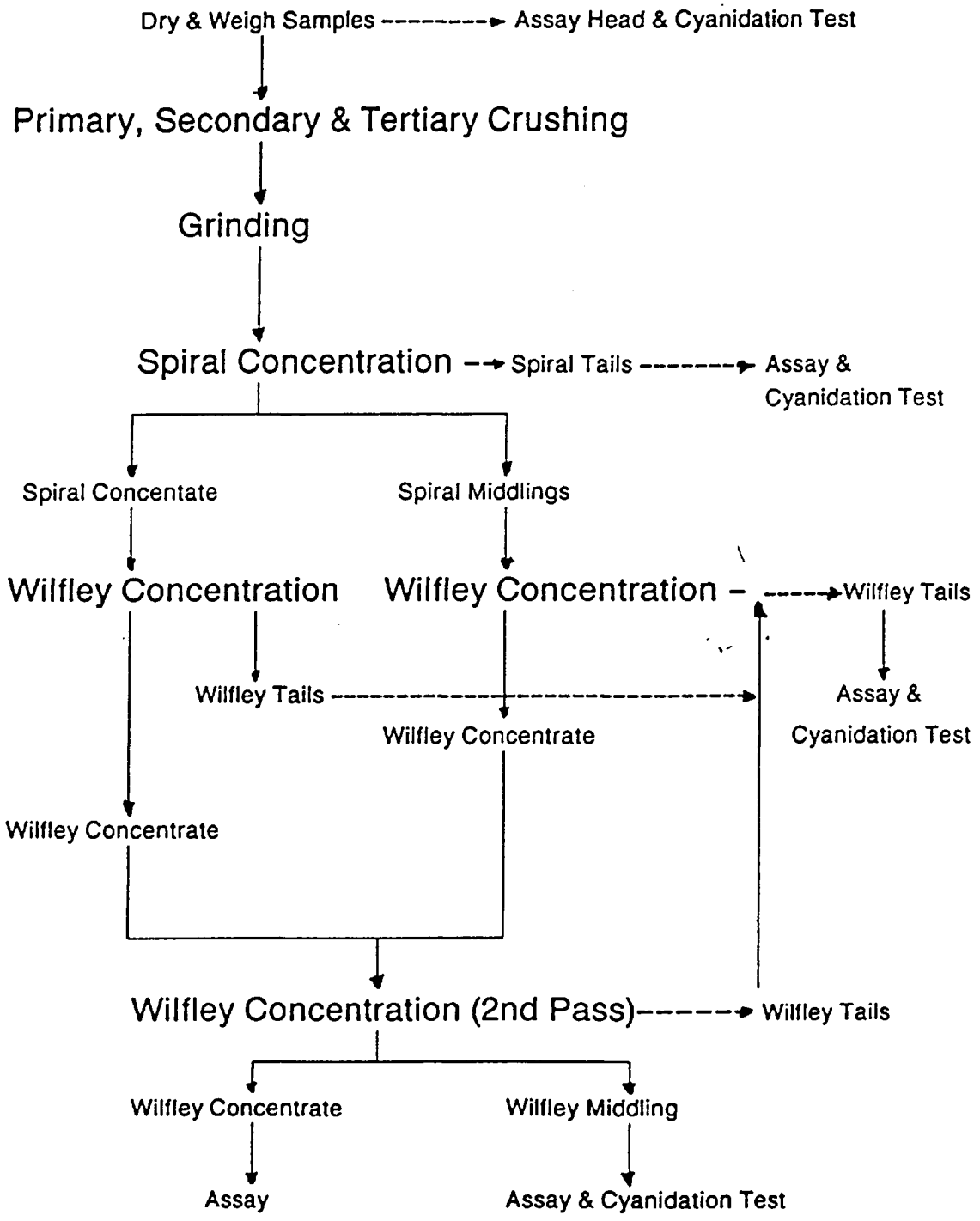
APPENDIX 1

Test Procedure

DRH:ojt
1990-02-12

ELK CLAIMS PROJECT

TEST PROCEDURE



APPENDIX 2

Gravity Concentration

DRH:ojt
1990-02-12

ELK CLAIMS - GRAVITY CONCENTRATION TESTS

(Product Assayed Results)

SAMPLE NO. S89-7

PRODUCT	Wt [Kg]	% Wt	ASSAY Au g/t	UNITS Au	% DIST. Au
WILFLEY CONC.	0.0761	0.0242	27230.00	659.52	14.62
WILFLEY MIDDLING	0.4695	0.1494	3260.00	487.13	10.80
WILFLEY TAILS	80.1000	25.4933	27.60	703.62	15.60
SPIRAL TAILS	233.5544	74.3330	35.80	2661.12	58.99
TOTAL	314.2000	100.0000	45.11	4511.39	100.00

SAMPLE NO. S89-12

PRODUCT	Wt [Kg]	% Wt	ASSAY Au g/t	UNITS Au	% DIST. Au
WILFLEY CONC.	0.1423	0.0474	2400.00	113.84	3.69
WILFLEY MIDDLING	1.0809	0.3603	500.00	180.15	5.84
WILFLEY TAILS	61.6000	20.5333	21.10	433.25	14.05
SPIRAL TAILS	237.1768	79.0589	29.80	2355.96	76.41
TOTAL	300.0000	100.0000	30.83	3083.20	100.00

SAMPLE NO. S89-13

PRODUCT	Wt [Kg]	% Wt	ASSAY Au g/t	UNITS Au	% DIST. Au
WILFLEY CONC.	0.4087	0.1362	6933.00	944.51	17.59
WILFLEY MIDDLING	0.6199	0.2066	1540.00	318.22	5.93
WILFLEY TAILS	57.0630	19.0210	23.00	437.48	8.15
SPIRAL TAILS	241.9084	80.6361	45.50	3668.94	68.33
TOTAL	300.0000	100.0000	53.69	5369.15	100.00

SAMPLE NO. S89-14

PRODUCT	Wt [Kg]	% Wt	ASSAY Au g/t	UNITS Au	% DIST. Au
WILFLEY CONC.	0.1711	0.0533	2500.00	133.34	20.59
WILFLEY MIDDLING	0.7935	0.2474	320.00	79.15	12.22
WILFLEY TAILS	86.7000	27.0262	2.92	78.92	12.19
SPIRAL TAILS	233.1354	72.6731	4.90	356.10	55.00
TOTAL	320.8000	100.0000	6.48	647.51	100.00

FN:ELKGRAV

APPENDIX 3

Cyanidation Test and Extraction Curves

DRH:ojt
1990-02-12

ELK CLAIMS PROJECT CYANIDE LEACH TESTS

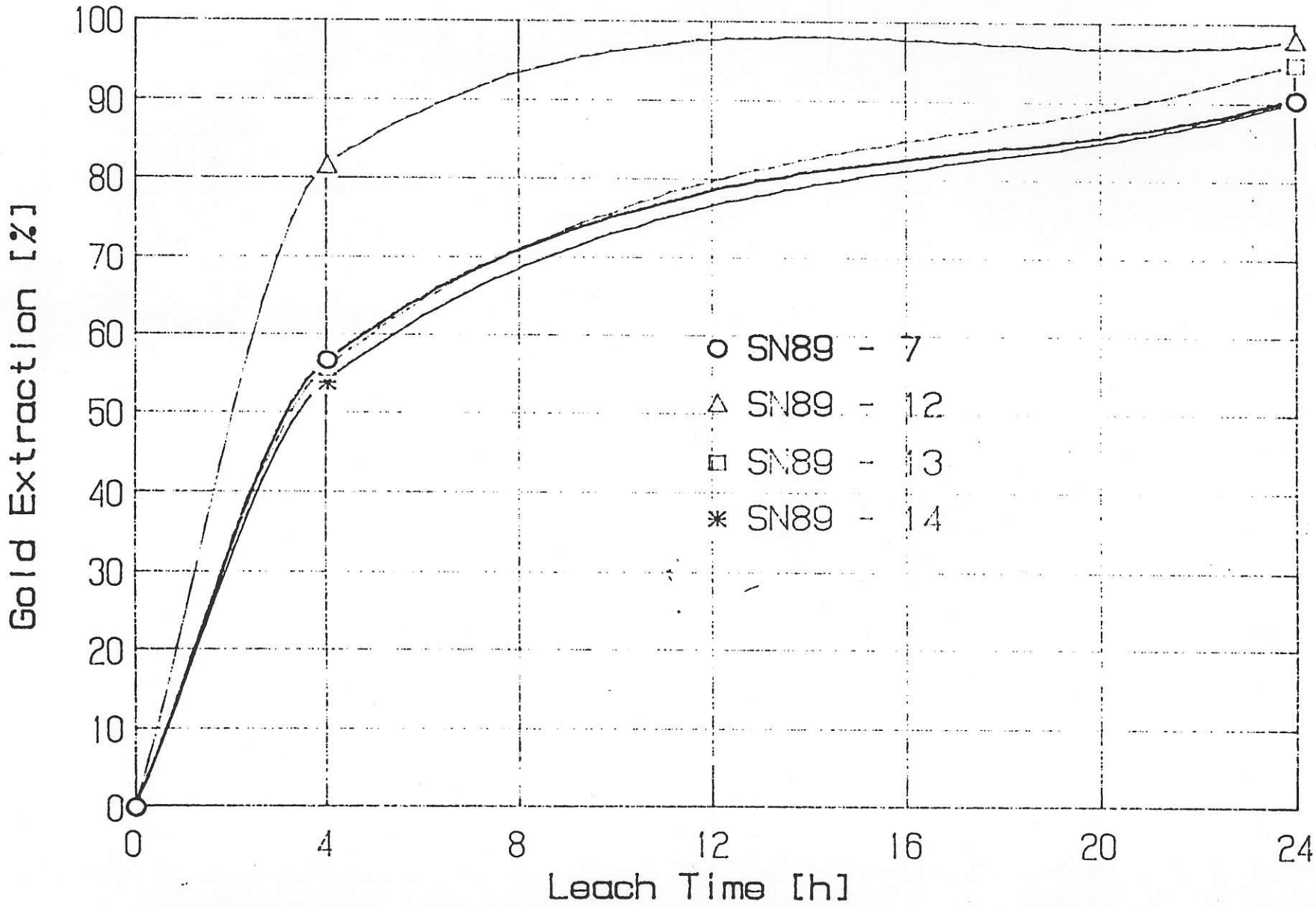
COMPOSITE HEAD SAMPLE

Test No.	Products	Test Variable	Grind P80 µm	Addn kg/t NaCN	Addn Sol'n CaO	Addn pH	Titration kg/t NaCN	Titration Sol'n CaO	Titration pH	Consumption kg/t NaCN	Consumption Sol'n CaO	Weights [g]	Weights [%]	Assays g/t Au	Assays g/t Ag	Extraction [%] Au	Extraction [%] Ag
	Initial Conditions			1.00	0.91	11.2											
Test	P. Soln. No.1 3 h	10 min			0.29		0.92	0.04	10.6			1228	55	26.30	20.40	56.66	32.77
S89-7	P. Soln. No.2 24 h	Grind					0.52	0.07	10.2	0.48	1.13	1228	55	42.00	28.70	90.48	46.11
							DO2 =		8.8								
	Residue						R.P. =		56			1004	45	5.40	41.00	9.52	53.89
	Calc Head			1.00	1.20		Natural pH =		5.8			2232	100	56.73	76.08	100.00	100.00
	Initial Conditions			1.00	1.75	11.1											
Test	P. Soln. No.1 3 h	10 min			0.38		0.90	0.04	10.5			1149	55	26.70	41.70	81.60	34.45
S89-12	P. Soln. No.2 24 h	Grind					0.55	0.05	10.2	0.45	2.08	1149	55	32.00	55.60	97.80	45.93
							DO2 =		9.5								
	Residue						R.P. =		44			940	45	0.88	80.00	2.20	54.07
	Calc Head			1.00	2.13		Natural pH =		6.3			2089	100	39.99	147.96	100.00	100.00
	Initial Conditions			1.00	0.90	11.1											
Test	P. Soln. No.1 3 h	10 min			0.31		0.92	0.04	10.5			1225	55	40.80	20.80	55.80	50.40
S89-13	P. Soln. No.2 24 h	Grind					0.55	0.05	10.1	0.45	1.16	1225	55	69.50	29.00	95.04	70.26
							DO2 =		9.4								
	Residue						R.P. =		24			1002	45	4.43	15.00	4.96	29.74
	Calc Head			1.00	1.21		Natural pH =		5.7			2227	100	89.37	50.44	100.00	100.00
	Initial Conditions			1.00	0.97	11.0											
Test	P. Soln. No.1 3 h	10 min			0.42		0.90	0.05	10.4			1528	55	7.00	2.47	53.94	27.27
S89-14	P. Soln. No.2 24 h	Grind					0.70	0.05	10.3	0.30	1.34	1528	55	11.70	3.33	90.16	36.77
							DO2 =		9.4								
	Residue						R.P. =		28			1250	45	1.56	7.00	9.84	63.23
	Calc Head			1.00	1.39		Natural pH =		6.1			2778	100	15.86	11.07	100.00	100.00

ELK CLAIMS PROJECT

COMPOSITE HEAD SAMPLE

Extraction versus Time Curves



ELK CLAIMS PROJECT CYANIDE LEACH TESTS

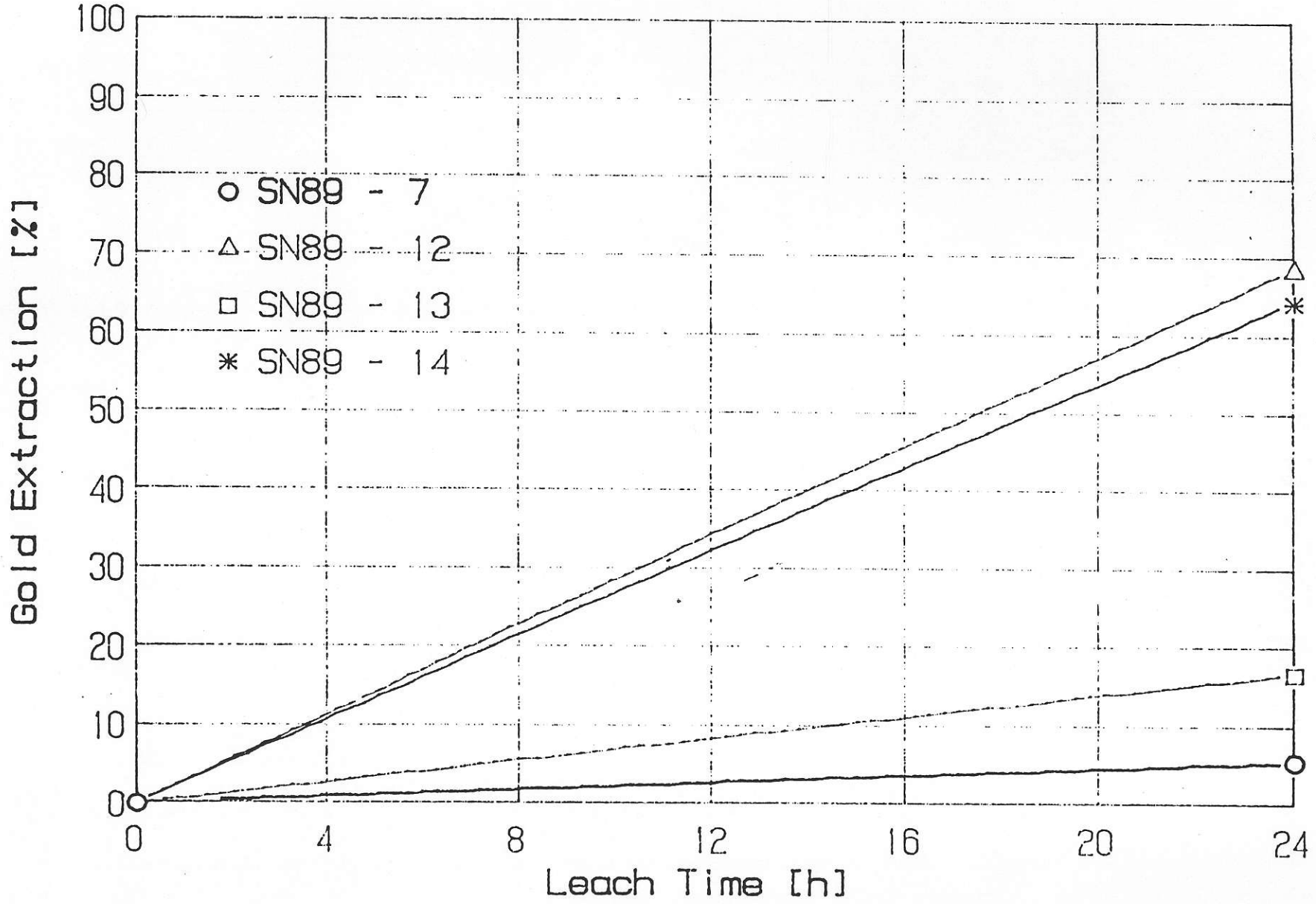
WILFLEY TABLE MIDDLINGS

Test No.	Products	Test Variable	Grind P80 µm	Addn kg/t NaCN	Addn Sol'n CaO	Addn pH	Titration kg/t NaCN	Titration Sol'n CaO	Titration pH	Consumption kg/t NaCN	Consumption Sol'n CaO	Weights [g]	Weights [%]	Assays g/t Au	Assays g/t Ag	Extraction [%] Au	Extraction [%] Ag
	Initial Conditions			1.00	1.47	11.0											
Test	P. Soln. No.1 4 h	5 min			0.20				10.5								
S89-7	P. Soln. No.2 24 h	Grind					0.10	0.04	10.5	0.90	1.63	467.6	55	132.0	0.0	5.41	0.00
							DO2 =		-								
	Residue						R.P. =		48			382.6	45	2820.0	1270.0	94.59	100.00
	Calc Head			1.00	1.67		Natural pH =		6.5			850.2	100	2981.3	1270.0	100.00	100.00
	Initial Conditions			1.00	1.21	11.0											
Test	P. Soln. No.1 4 h	7.5 min			0.42				10.1								
S89-12	P. Soln. No.2 24 h	Grind					0.10	0.02	9.5	0.90	1.61	1199.7	55	234.0	83.0	68.59	22.32
							DO2 =		8.9								
	Residue						R.P. =		80			981.6	45	131.0	353.0	31.41	77.68
	Calc Head			1.00	1.63		Natural pH =		5.2			2181.3	100	417.0	454.4	100.00	100.00
	Initial Conditions			1.00	1.42	11.0											
Test	P. Soln. No.1 4 h	7.5 min			0.10				10.6								
S89-13	P. Soln. No.2 24 h	Grind					0.10	0.03	10.6	0.90	1.49	665.8	55	194.0	0.0	16.77	0.01
							DO2 =		-								
	Residue						R.P. =		72			544.8	45	1177.0	400.0	83.23	99.99
	Calc Head			1.00	1.52		Natural pH =		6.1			1210.6	100	1414.1	400.0	100.00	100.00
	Initial Conditions			1.00	0.92	11.0											
Test	P. Soln. No.1 4 h	7.5 min			0.17				10.5								
S89-14	P. Soln. No.2 24 h	Grind					0.10	0.02	10.2	0.90	1.07	842.5	55	162.0	0.8	64.29	0.70
							DO2 =		8.1								
	Residue						R.P. =		304			689.3	45	110.0	133.0	35.71	99.30
	Calc Head			1.00	1.09		Natural pH =		5.8			1531.8	100	308.0	133.9	100.00	100.00

ELK CLAIMS PROJECT

WILFLEY TABLE MIDDLINGS

Extraction versus Time Curves



ELK CLAIMS PROJECT CYANIDE LEACH TESTS

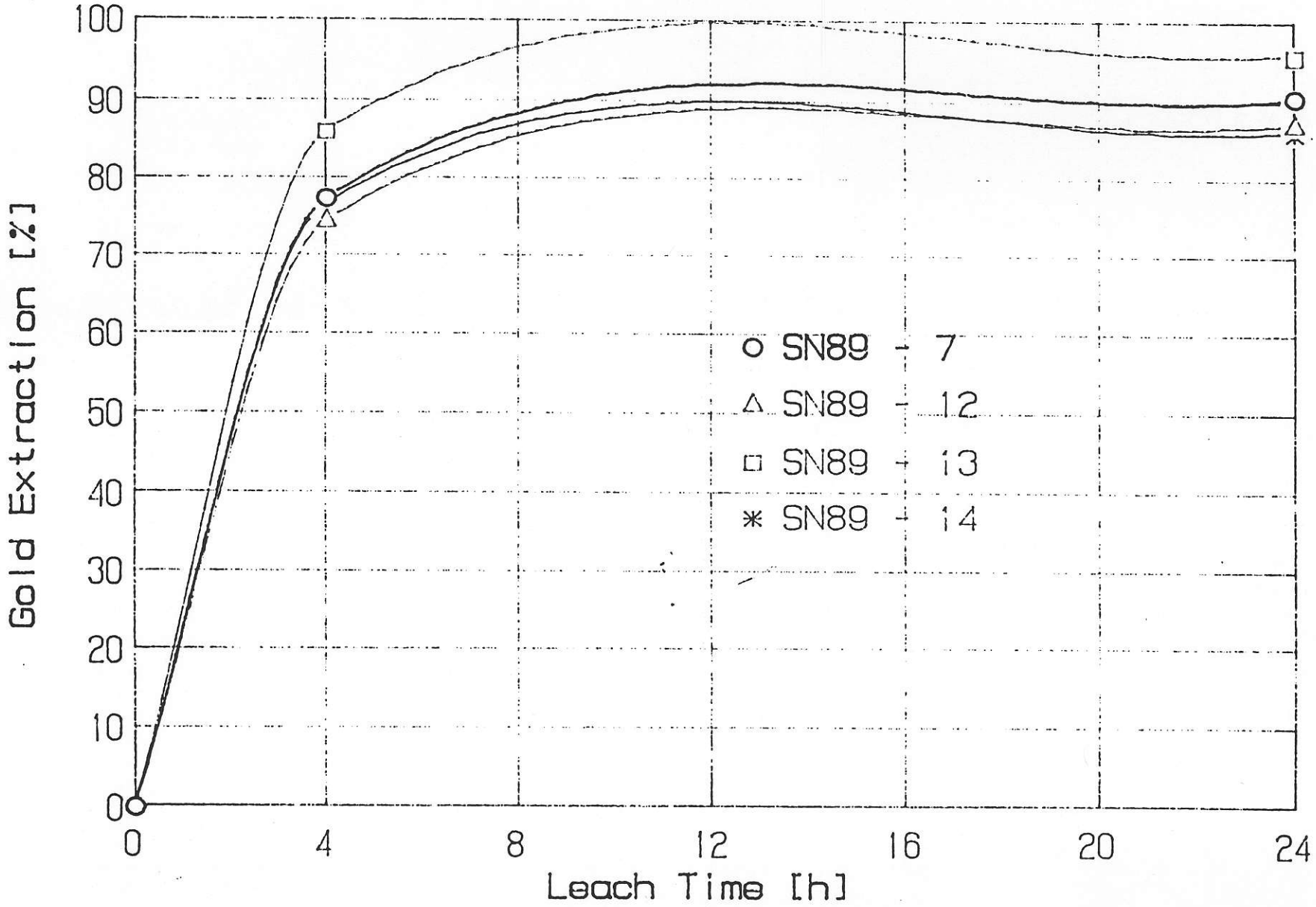
WILFLEY TABLE TAILS

Test No.	Products	Test Variable	Grind P80 µm	Addn kg/t NaCN	Addn Sol'n CaO	Addn pH	Titration kg/t NaCN	Titration Sol'n CaO	Titration pH	Consumption kg/t NaCN	Consumption Sol'n CaO	Weights [g]	Weights [%]	Assays g/t Au	Assays g/t Ag	Extraction [%] Au	Extraction [%] Ag
	Initial Conditions			1.00	0.40	11.0											
Test	P. Soln. No.1 6 h	No Grinding			0.23		0.80	0.02	10.4			2444	55	18.80	12.70	77.34	37.48
S89-7	P. Soln. No.2 24 h						0.50	0.06	10.0	0.50	0.57	2444	55	22.00	16.70	90.51	49.28
							DO2 =		10.9								
	Residue						R.P. =		16			2000	45	2.82	21.00	9.49	50.72
	Calc Head			1.00	0.63		Natural pH =		4.9			4444	100	29.70	41.41	100.00	100.00
	Initial Conditions			1.00	0.73	11.0											
Test	P. Soln. No.1 6 h	No Grinding			0.66		0.65	0.02	10.4			2444	55	12.80	21.10	74.48	36.39
S89-12	P. Soln. No.2 24 h						0.45	0.03	10.0	0.55	1.36	2444	55	15.00	27.70	87.29	47.78
							DO2 =		10.5								
	Residue						R.P. =		36			2000	45	2.67	37.00	12.71	52.22
	Calc Head			1.00	1.39		Natural pH =		4.8			4444	100	21.00	70.85	100.00	100.00
	Initial Conditions			1.00	0.53	11.0											
Test	P. Soln. No.1 6 h	No Grinding			0.29		0.75	0.04	10.4			2444	55	18.80	13.20	85.97	48.46
S89-13	P. Soln. No.2 24 h						0.55	0.04	10.0	0.45	0.78	2444	55	21.00	16.60	96.03	60.94
							DO2 =		10.4								
	Residue						R.P. =		20			2000	45	1.06	13.00	3.97	39.06
	Calc Head			1.00	0.82		Natural pH =		5.0			4444	100	26.72	33.29	100.00	100.00
	Initial Conditions			1.00	0.30	11.0											
Test	P. Soln. No.1 6 h	No Grinding			0.23		0.90	0.03	10.6			2444	55	1.90	1.40	76.50	28.15
S89-14	P. Soln. No.2 24 h						0.65	0.04	10.0	0.35	0.49	2444	55	2.14	1.70	86.16	34.18
							DO2 =		10.0								
	Residue						R.P. =		40			2000	45	0.42	4.00	13.84	65.82
	Calc Head			1.00	0.53		Natural pH =		6.3			4444	100	3.04	6.08	100.00	100.00

ELK CLAIMS PROJECT

WILFLEY TABLE TAILS

Extraction versus Time Curves



ELK CLAIMS PROJECT CYANIDE LEACH TESTS

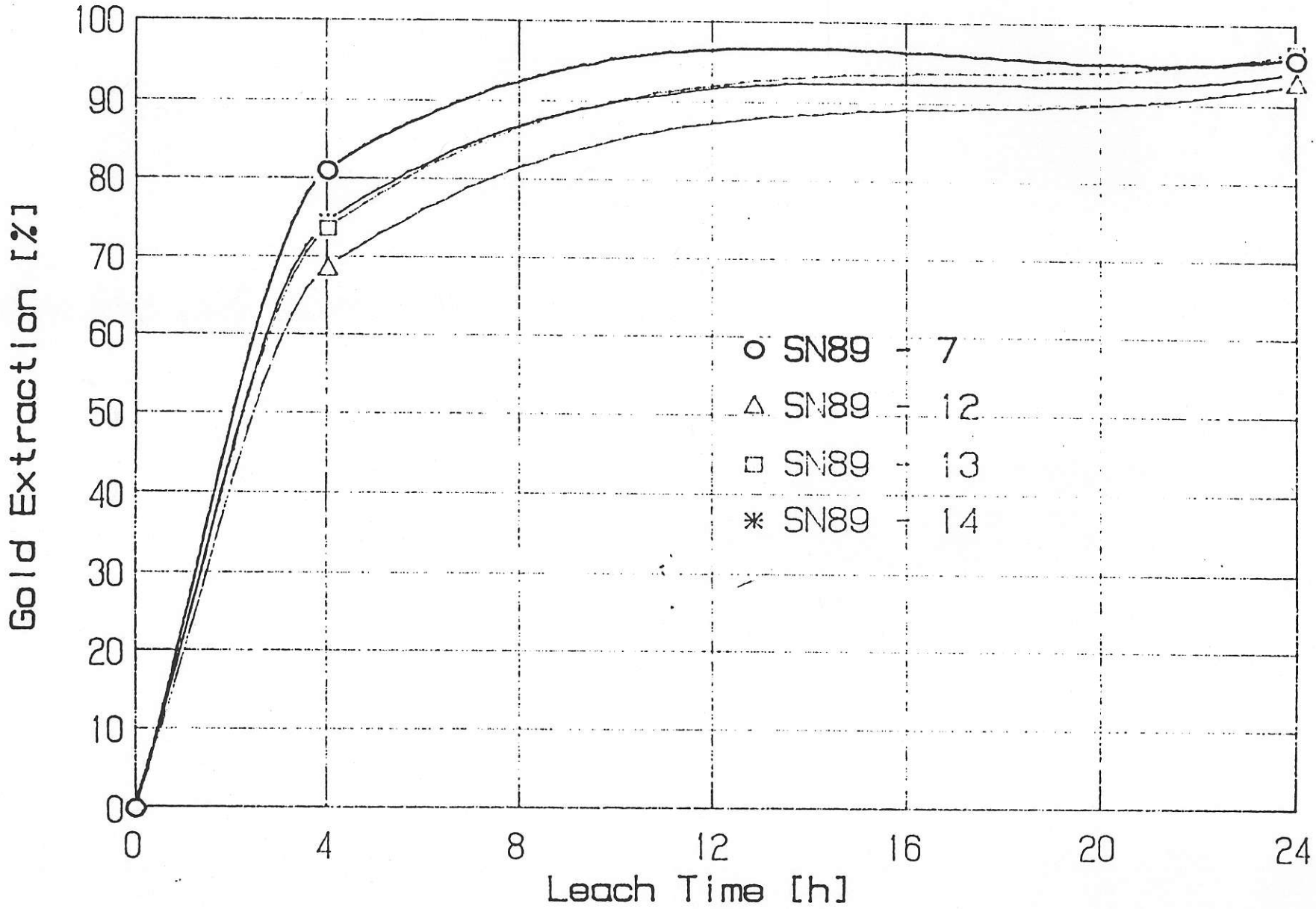
SPIRAL CONCENTRATOR TAILS

Test No.	Products	Test Variable	Grind P80 µm	Addn kg/t NaCN	Addn Sol'n CaO	Addn pH	Titration kg/t NaCN	Titration Sol'n CaO	Titration pH	Consumption kg/t NaCN	Consumption Sol'n CaO	Weights [g]	Weights [%]	Assays g/t Au	Assays g/t Ag	Extraction [%] Au	Extraction [%] Ag
	Initial Conditions			1.00	1.00	11.0											
Test	P. Soln. No.1 4 h	No Grinding			0.18		0.85	0.04	10.7			2444	55	27.50	29.30	81.02	35.86
S89-7	P. Soln. No.2 24 h						0.55	0.05	10.3	0.45	1.13	2444	55	32.50	36.70	95.76	44.92
							DO2 =		8.5								
	Residue						R.P. =		40			2000	45	1.76	55.00	4.24	55.08
	Calc Head			1.00	1.18		Natural pH =		4.8			4444	100	41.47	99.85	100.00	100.00
	Initial Conditions			1.00	2.04	11.0											
Test	P. Soln. No.1 4 h	No Grinding			0.37		0.70	0.00	10.4			2444	55	19.10	38.30	68.61	32.85
S89-12	P. Soln. No.2 24 h						0.55	0.04	10.2	0.45	2.37	2444	55	25.80	49.50	92.68	42.45
							DO2 =		8.5								
	Residue						R.P. =		72			2000	45	2.49	82.00	7.32	57.55
	Calc Head			1.00	2.41		Natural pH =		5.2			4444	100	34.02	142.49	100.00	100.00
	Initial Conditions			1.00	0.96	11.0											
Test	P. Soln. No.1 4 h	No Grinding			0.24		0.85	0.03	10.5			2444	55	32.90	23.80	73.73	52.12
S89-13	P. Soln. No.2 24 h						0.65	0.03	10.2	0.35	1.17	2444	55	43.10	29.30	96.59	64.16
							DO2 =		8.1								
	Residue						R.P. =		36			2000	45	1.86	20.00	3.41	35.84
	Calc Head			1.00	1.20		Natural pH =		6.2			4444	100	54.53	55.80	100.00	100.00
	Initial Conditions			1.00	1.04	11.0											
Test	P. Soln. No.1 4 h	No Grinding			0.21		0.80	0.03	10.5			2444	55	2.85	3.30	74.43	24.12
S89-14	P. Soln. No.2 24 h						0.55	0.03	10.2	0.45	1.22	2444	55	3.60	3.86	94.02	28.22
							DO2 =		8.3								
	Residue						R.P. =		60			2000	45	0.28	12.00	5.98	71.78
	Calc Head			1.00	1.25		Natural pH =		5.3			4444	100	4.68	16.72	100.00	100.00

ELK CLAIMS PROJECT

SPIRAL CONCENTRATOR TAILS

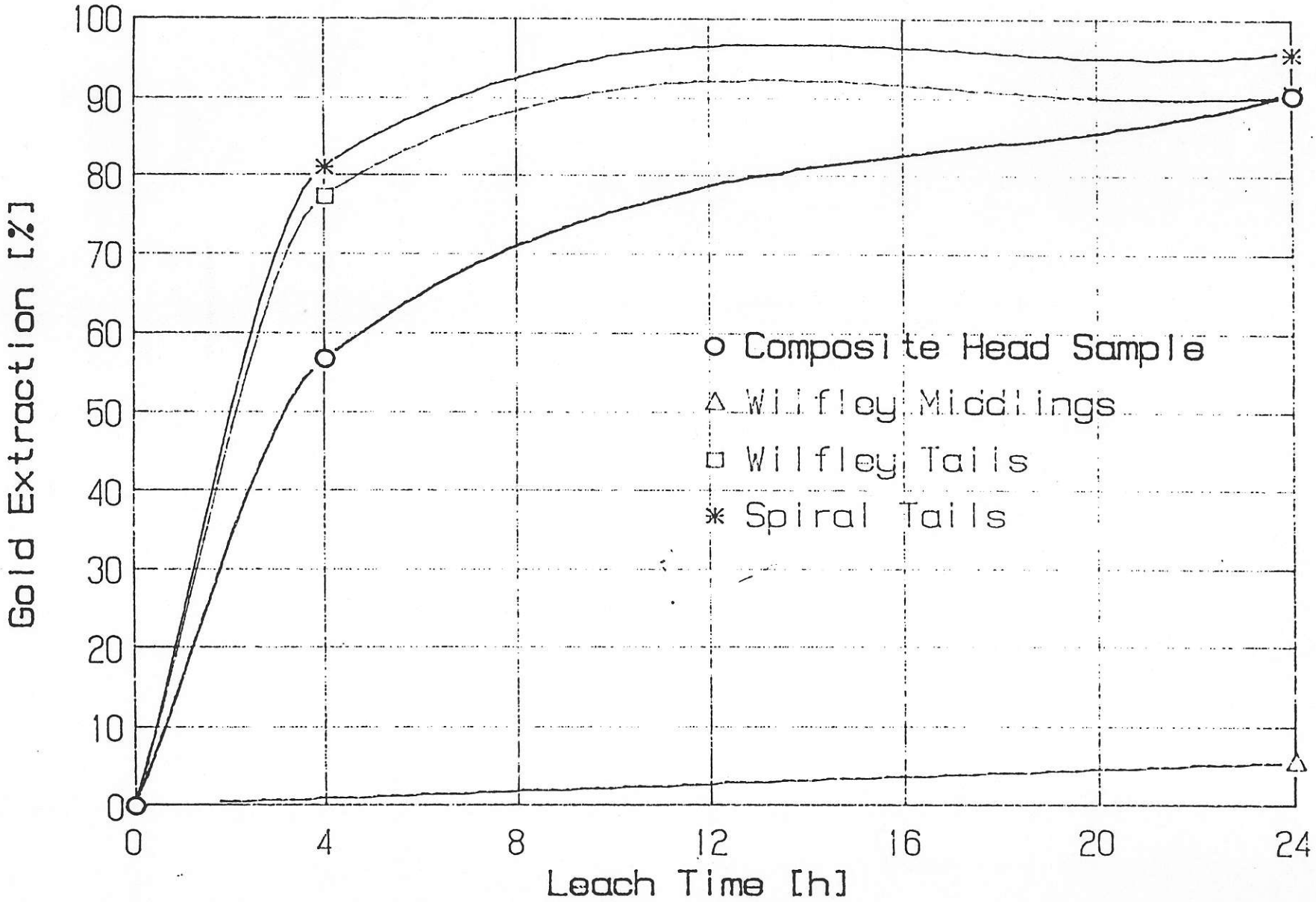
Extraction versus Time Curves



ELK CLAIMS PROJECT

SAMPLE SN89 - 7

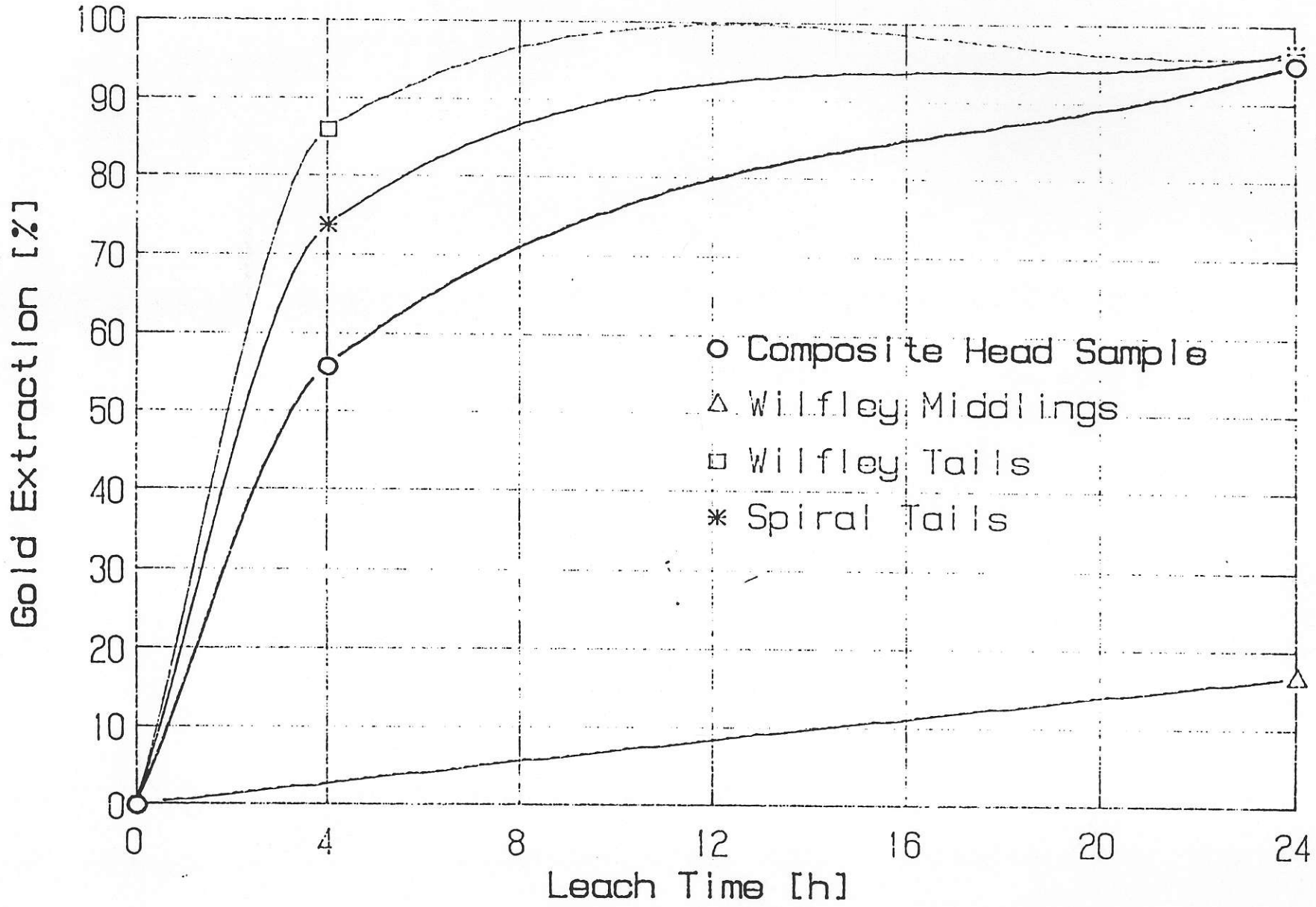
Extraction versus Time Curves



ELK CLAIMS PROJECT

SAMPLE SN89 - 13

Extraction versus Time Curves



APPENDIX 4

Metallurgical Test Request Memo
and
Sample Description

DRH:ojt
1990-02-12

PLACER DOME INC.
1600-1055 DUNSMUIR ST
VANCOUVER, B C
(604) 682-7082
TELEX 04-55181
FAX (604) 682-7092

MAILING ADDRESS
P O BOX 49330
BENTALL POSTAL STATION
VANCOUVER, B C
CANADA
V7X 1P1

Date: November 6, 1989

To: George Rodger

c.c.: L.C. Reinertson
B.W. Barde
P.R. Hodgson
D.A. Knight
File: V228 Elk

Re: Preliminary Metallurgical Test of Elk Property Bulk Sample

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A bulk sample of gold-bearing material from surface trenching on our Elk Property will be delivered to the Placer Met Lab by Cordilleran Engineering. It would be appreciated if a metallurgical test could be performed to ascertain preliminary gold recoveries. Account code for this research is 80152-71-V228 Elk.

For your information, mineralization on the Elk occurs as narrow quartz veins with associated pyrite and minor chalcopyrite in highly clay and sericite altered granite. On surface exposures much of the sulphide in quartz veins has been oxidized and the "highgrade" veins are characteristically vuggy with occasionally spectacular visible gold occurring as tiny grains and irregular scales as encrustations and loose wires in vuggy boxworks. The wallrock is usually very gossanous, suggesting that there are sulphide associations. Diamond drilling has shown that the wall rock and quartz-sulphide veins are competent at depth; this is in sharp contrast to the very soft, highly-fractured and incompetent nature of surface exposures in trenches. As the bulk samples are being collected from trenches, the oxidation factor may affect the representation of typical mineralization. Apparently the trench was dug as deep as possible with the exeavator to obtain the best possible sample.

E.T. Kimura

ETK/leb
11.06.89
cc. L.C. Reinertson
B.W. Barde
P.R. Hodgson
D.A. Knight
File: V228 Elk