HOMESTAKE MINING COMPANY
PO Box 875
LEAD, SOUTH DAKOTA 57754

September 24, 1976

Charles E. Bartlett
1361 Singinwood Ct. #5
Walnut Creek, California 94595

Dear Mr. Bartlett:

Your recollection of the proper clay tube used in the Miller Process is correct. We still use the Battersea tube from England. The address of their distributor is:

This is for Miller Process (chlorine) gold bullion refining

    Morganite Incorporated
    P.O.Box 347
    Dunn, North Carolina 28334
    Telephone 919-892-3127

We order the tubes as: Chlorine Tubes #T-537.

We have no prints on a carbon reactivator kiln as ours was bought used. The one we have has a 16" diameter stainless steel tube 12 feet long. This handles 2,000 lbs. in 24-hours.

Sincerely yours,
HOMESTAKE MINING COMPANY

Harold L. Hinds
Production Metallurgist

HLH/e

Suggested Improvements
CARBON ADSORPTION-DESORBTION

REACTIVATION - SIZE REQUIREMENTS
Summa Corporation Feb. 1976

Cycle

Adsorption -- Manhattan $\pm$ 1600 oz. Au/month

$\pm$ 50 oz. Au/day

Loaded carbon 1 ton/4 days/200 oz. Au load

Transport Manhattan to Tonopah

2000 lb. Carbon wet (45 lb./cu.ft.)
(Dry: 30 lb./cu.ft.)

100 cu. ft. tank approx. needed
+ weight of tank @ 1000 lb.

2 ton capacity trailer --- cone bottom
with brakes.

Desorbtion Tonopah --- 2000 lb. batch
cycle from transport through stripper
to reactivation with Ag-Au to bullion
form -- complete less than 8 hours.

Reactivation Tonopah: 3 hour preheat

200 lb./hr. furnace limit

2000 lb.: 13 hours, sized and weighed carbon
and assayed; returned in barrels
to Manhattan.

Mine and leach pads at Manhattan - Carbon stripping and reactivation is in Tonopah. (50 miles)

Transport:

The carbon transport tank if placed on a trailer will save
a truck from permanent assignment:

One ton of (dry) carbon plus adsorbed water and the tank
itself will weigh about two tons. The transport trailer
must have brakes coupled to the tow vehicles. The pickups
may be used.

Transport tank should be rigged for easy cleandown and
fast unloading. Capacity should be about 100 cubic feet.

Desorbtion:

Operational experience of the past year has shown the
basic fundamentals of methanol-caustic stripping to
be valid but in poor application.

Recent testwork by myself in your Tonopah lab shows
that much of the published data on time to desorb gold
and silver from carbon is false. With proper agitation,
temperature and solution makeup, gold-silver desorbtion
is practically instantaneous.

Agitation is the key to fast desorbtion. Fluid
agitation is recommended to hold down carbon disinte-
gration; however, a mechanical agitator option is
provided in the desorbtion unit plans.

Solution Makeup depends on pressure and temperature
limits of the desorbtion vessel; low pressure (-15 lb.
psi) and low temperature (-210°F.) require approximately
10% methanol to react well. Operating temperature of
250°F. and pressure of +60 psi would probably not
require any alcohol. The requirement of 2% NaOH
(caustic soda) is to provide a solvent for the gold
and silver cyanide complex and an electrolite for the
electroplating unit. If electrowinning is not used, the
NaOH level may be lowered.

Precipitation:

In place of the current practice of electrowinning the
gold-silver from solution, I recommend a direct
precipitation of the gold-silver from solution by the
addition of aluminum granular metal to the pregnant
solution taken from the reaction vessel. Plus 99% of
the Ag-Au is precipitated from an agitated 150° F.,
pregnant solution as metallic gold and silver. Retention
time in precipitation of twenty minutes.

Option/Electrolytic Cell:

In the event the aluminum precipitation reaction causes
unforeseen problems, the electrolytic unit cell of the
current type may be used.

Data/Present Plant Cell:

15 amps/sq.ft/one basket of steel wool

3 volts DC
3½ gpm flow
200 amp rectifier
cells 13" x 13"/.3 cu.ft./cell/2.2 gal.
Retention time one cell = 30 seconds
                 10 cells = 3 minutes

Problems: Amperage draw per cell package is not even.
           Cells with lower grade solution draw more
           amps (less resistance).

           Amperage used is excessive to that needed.

           Acid treatment of steel wool is sloppy and
           time consuming.

The following cell can be used for 50 gpm. flow.
       See plate #3.

           Amperage of 7-8 amps/sq.ft. on this type of
           vertical steel wool package is ample to
           electroplate Au-Ag.

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Agitated Carbon Desorbtion:

Test #1:   100 grams carbon

                  loading   141 oz. Au
                             47 oz. Ag

          Solution   10% methanol
                     2% NaOH
                     water

Temperature raised to 180°F.
Open beaker agitated by prop.
Tests could not be run to completion.
Methanol evaporation drops, Ag-Au back
into carbon.

See plate #1.

Test #2-5:   Same pattern as #1.


          Ag-Au desorbtion reaction is extremely rapid.

          Conclusion: In a pressure vessel, a properly
                       agitated carbon in a caustic
                       methanol solution at +180°F.
                       can be stripped to -5 oz./ton
                       loadings of Ag-Au in less than
                       1 hour.

Gold Desorption

Experiment 100 grams of Carbon Assay 131 oz Au   47 oz Ag.

     2000 ml Water
     200 ml Methanol
     40 grams NaOH

    Agitated by prop. in beaker on hot plate

100 grams = 3.4T Assay tons
$$\frac{\times\ 131\ mg/AT}{443.02\ mg\ of\ Au\ contained}$$

100% = $\frac{443.02\ mg}{2200\ ml}$ = 203 ppm
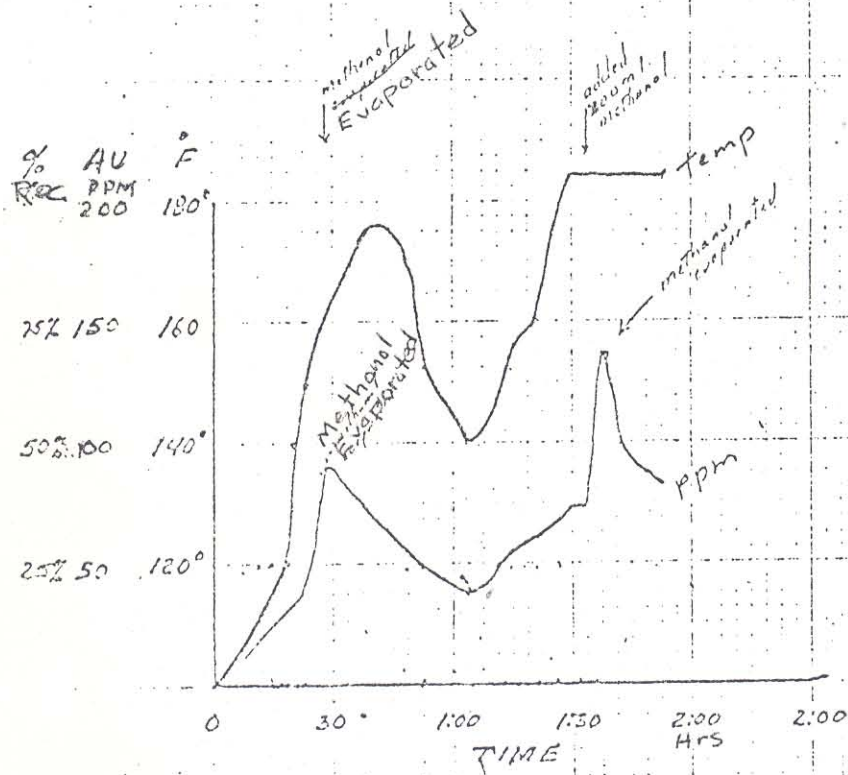
Data Result: Carbon strip is not a time critical and dependent system as assumed by USBM. and our prior work.

Gold dissolution is almost instantaneous with the right temp and methanol

Agitated Stripping may be 100% (or close) complete in less than 2 hours.

         Dave Pruett
         25 Jan 76.

Plate # 1.

HEAT CALCULATIONS

Present Desorbtion Unit:

30" diameter x 10' long x 5/16" walls

6" heat exchanger x 10' long

Burner 1.65 gal./hr. @ 135,000 btu./gal.	=	222,000 btu./hr.
Electrical strip heat 30 kw.	=	102,000 btu./hr.
Total	=	324,000 btu./hr.

Temperature raise $60°F$ to $200°F$ ($140°F/3$ hrs.)

Radiant surface area   13 sq.ft./pipe
                             5 sq.ft./elec.   A = 18 sq.ft.

Input heat   324,000 btu./hr.
Radiation loss   140,000 btu./hr.   (calculated)

     Btu -- applied   18,000 btu./sq.ft.   exchange area
           -- exchanged   10,000 btu./sq.ft.

Overall coefficient heat transfer = .57

550 gal. of solution + carbon/975,000 btu/1 hr./$140°F$ (rise)
                 or 1772 btu./gal.

Planned Unit:

Using the heat transfer figures from the present stripper,
1,950,000 btu./$140°F$ (rise)/hr. would be required for a
unit with 1150 gal. of solution + 2000 lb. carbon.

The efficiency of this unit will be much greater.
1,950,000 btu. = 14.4 gal. of fuel oil.
3 2.5 gal./hr. burners = 7.5 gal./hr.
2 hours would be required for preheat.
Improved heat exchange and insulation should cut this to
        estimated 1 hour 20 minutes.

HEAT CALCULATION CONVERSIONS

1 hp. = 0.745 kw. = 42.4 btu./min. = 2544 btu./hr.

1 boiler hp. (bhp.) = 33.475 btu./hr.

1 kw. = 1.34 hp. = 56.88 btu./min. = 3413 btu./hr.

1 btu. = .029 kw./hr.

1 cu.ft. water = 62.4 lb. @ 60°F.
1 gal. = 8.34 lb. water @ 60°F.
1 cu. ft. = 7.48 U. S. gal.

fuel oil = 135,000 btu./gal.

propane = 87,000 btu./gal. liquid

Reactivation of Carbon:

The present trommel dewatering of educted carbon from
the desorbtion tower to the reactivator furnace storage
bin is inadequate. Discussions with Sweco Inc., indicate
the 48" unit presently on the furnace discharge would be
ideal for the dewatering. A small 18" Sweco would handle
the 200 lb./hour/day sizing of furnace discharge.

The reactivator storage tank increase to 2500 lb. capacity
may be done with a cone above the leg stands.

Option: If the auger feed unit were replaced with a
         longer screw section. The storage tank shape
and size could be made to approximate the Cortez
reactivation unit feeder and storage.   See plate 2.

Layout:

The following work pages include recommended tank, filtering,
precipitation units for a plant based on this new data and
the operating experience of the present desorbtion system.

COST ESTIMATE

Reactor Vessel complete with exhaust manifold and catwalk, condensers (all code)	$ 9,900
Viking positive displacement pump variable speed	575
Agitator -- Precipitation tank	860
Filter Adaption & Pump	450
Dual 670B AES Screen, 6 valves	1,580
Valving	1,040
Piping	300
Wiring	350
Guages: Temperature	300
Pressure	290
Ladder Access	150
Burners	320
Transportation	500
Installation	1,500
TOTAL:	$18,115

Option: Agitator add	$1,950

Reactivation furnace modification:	Bin	$1,590
	Auger	240
	Inst.	300
	TOTAL:	$2,130