FREEPORT-McMoRan
COPPER & GOLD

Copper Queen Branch/Freeport-McMoRan Corporation
36 West Highway 92
Bisbee, Arizona 85603

October 1, 2008

Cynthia S. Campbell
Manager, Water Quality Compliance Section
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

RE: Mitigation Order, Docket No. P-121-07
Results of Monthly Sulfate Monitoring and Trend Analysis

Dear Ms. Campbell:

In accordance with Mitigation Order on Consent, Docket No. P-121-07 Freeport-McMoRan Corporation, Copper Queen Branch (CQB) has conducted five rounds of monthly water quality sampling at six drinking water supply wells that had sulfate concentrations between 135 mg/L (milligrams per liter) and 250 mg/L in their initial samples. The enclosed letter from Hydro Geo Chem, Inc. evaluates the results of the water quality sampling and provides recommendations for ongoing monitoring based on the results of the monthly sampling. CQB plans to implement the proposed monitoring schedules in November 2008 unless we hear otherwise from Arizona Department of Environmental Quality by October 27, 2008. The monitoring recommendations for drinking water supplies will be re-evaluated for development of the Mitigation Plan.

If you have any questions or require anything additional please contact me at 520-432-6206.

Sincerely,

Rebecca A. Sawyer
Senior Environmental Engineer
Copper Queen Branch

Enclosure

HYDRO GEO CHEM, INC.

September 29, 2008

Rebecca A. Sawyer
Senior Environmental Engineer
Freeport-McMoRan Corporation
Copper Queen Branch
36 West Highway 92
Bisbee, Arizona 85603

RE: Mitigation Order, Docket No. P-121-07
Results of Monthly Sulfate Monitoring and Trend Analysis

Dear Ms. Sawyer:

This letter describes and evaluates the results of monthly water sampling and analysis of sulfate in six drinking water supply wells conducted pursuant to Section 4 of the Work Plan[1]. As outlined in Section 4 of the Work Plan *"a water supply having a discrete sulfate concentration between 135 milligrams per liter (mg/l) and 250 mg/l will be monitored monthly for four months to determine whether concentrations are increasing and to identify any trend in sulfate concentration over time. Based on the apparent trend in sulfate concentrations, a monitoring schedule will be developed for the supply. If the trend indicates increasing concentrations, an interim action will be selected and an implementation plan will be developed."*

In February 2008 water quality sampling for the well inventory[2] identified six wells (BIMA, BLOMMER, FULTZ, RAY, ROGERS 803, and SCHWARTZ) verified as drinking water supply wells that had a discrete sulfate concentration between 135 mg/l and 250 mg/l. These six wells were sampled for sulfate monthly from April to August 2008. The following table provides the results of the sampling. Analytical reports for February through June 2008 are included as Appendix D in the First and Second Quarters Groundwater Report[3]. Analytical reports for the July and August 2008 sampling will be included in the third quarter monitoring report.

DATE	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
Feb-08	210	206	152	159	138	158
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Results presented as sulfate in mg/l

[1] Hydro Geo Chem, Inc. (HGC) 2008. Revision 1, Work Plan to Characterize and Mitigate Sulfate with Respect to Drinking Water Supplies in the Vicinity of the Concentrator Tailing Storage Area, Cochise County, Arizona. July 3, 2008.
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Mann-Kendall Analysis

A Mann-Kendall statistical trend analysis was conducted to determine if concentrations of sulfate are increasing or decreasing over time in samples collected from the six drinking water supply wells. The Mann-Kendall test is a non-parametric test for identifying trends in time series data. The test compares the relative magnitudes of sample data rather than the data values themselves. One particular benefit of this test is that the data need not conform to any particular distribution. Moreover, the test can be used with a minimum of four rounds of sampling results. An Excel based macro[4] was used to process the input time series data, perform the trend analysis, and report the results (Attachment).

Mann-Kendall Trend Results

Based on guidance in Gilbert[5], a trend was considered significant if the *"confidence in trend"* metric, (1-p) x 100%, was ≥ 80% which represents a significance level of $\alpha = 0.2$. Statistically significant (86% confidence level) increasing and decreasing trends were observed in wells BIMA and BLOMMER, respectively. The four remaining wells did not have a trend that was statistically significant. The results are shown in the following table and the best fit trend lines for the sulfate time concentration plots are shown in Figure 1.

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	Mann-Kendall Statistic (S)	7	-7	-3	-5	-4	3
	Probability [6] (p)	0.136	0.136	0.360	0.235	0.235	0.360
	Confidence in Trend (1-p)	86%	86%	64%	77%	77%	64%
	Number of Rounds (n)	6	6	6	6	6	6
	Average	213.3	202.0	136.7	131.0	133.0	152.5
	Standard Deviation	24.229	9.077	15.24	14.213	5.586	46.984
	Coefficient of Variation (COV)	0.114	0.045	0.112	0.108	0.042	0.308

Trend ≥ 80% Confidence Level	INCREASING	DECREASING	No	No	No Trend	No Trend
Trend ≥ 90% Confidence Level	No Trend	No Trend	No	No	No Trend	No Trend

Stability Test; If No Trend Exists at 80% Confidence Level	NA	NA	CV <= 1 STABLE	CV <= 1 STABLE	CV <= 1 STABLE	CV <= 1 STABLE

Based on available data, drinking water supply wells FULTZ, RAY, ROGERS 803, and SCHWARTZ show no significant trend, suggesting that the sulfate concentrations are stable. However; even though the trend at SCHWARTZ was not significant, a positive Mann-Kendall statistic indicates that the sulfate concentration may be increasing and it is recommended that it

[4] State of Wisconsin, 2001. Department of Natural Resources, Chapter NR 700 Appendix A, Mann-Kendall Statistical Test, Form 4400-215.
[5] Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York.
[6] U.S. Environmental Protection Agency, 1998. Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G-9, Table A-11: Probabilities for the Small Sample Mann-Kendall Test for Trend. January.

remain on a monthly monitoring schedule an additional quarter at which time another trend analysis will be conducted. Wells FULTZ, RAY, and ROGERS 803 have a negative Mann-Kendall statistic indicating that the sulfate concentration at these wells may be decreasing. BLOMMER also has a negative Mann-Kendall statistic and a statistically significant decreasing trend. Quarterly monitoring is recommended for BLOMMER, FULTZ, RAY, and ROGERS 803.

As an interim action for BIMA, having a statistically significant increasing trend and a discrete sulfate concentration > 250 mg/l in August 2008, Freeport-McMoRan Copper Queen Branch (CQB) has offered to provide bottled water. Quarterly monitoring also is recommended for this well.

Please do not hesitate to call us if you have any questions about the data analysis or the monitoring recommendations described in this letter.

Sincerely,

Daniel R. Simpson
Senior Hydrogeologist

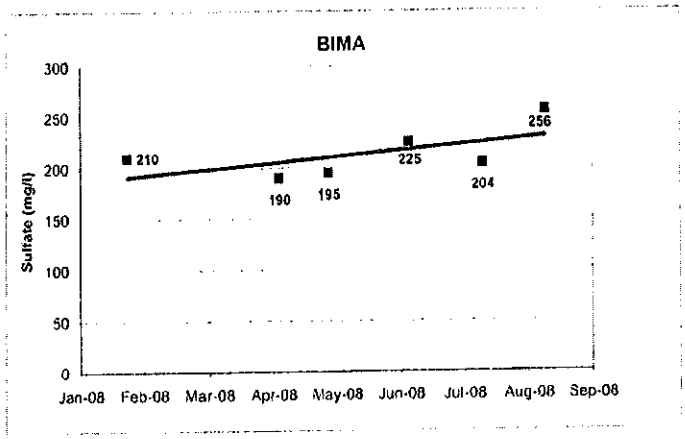
James R. Norris
Arizona Registered Geologist No. 30842

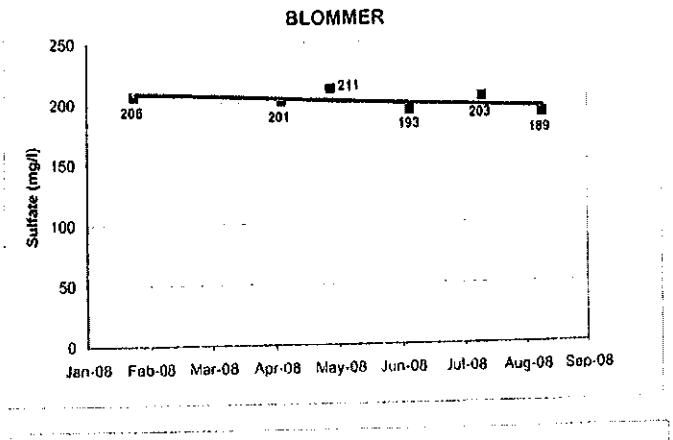
REGISTERED GEOLOGIST
CERTIFICATE NO.
30842
JAMES R.
NORRIS
9/24/08
ARIZONA U.S.A.
Expires 12/31/08

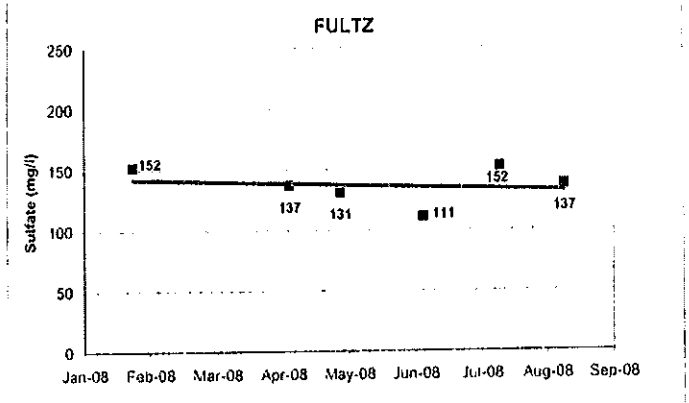
Attachment

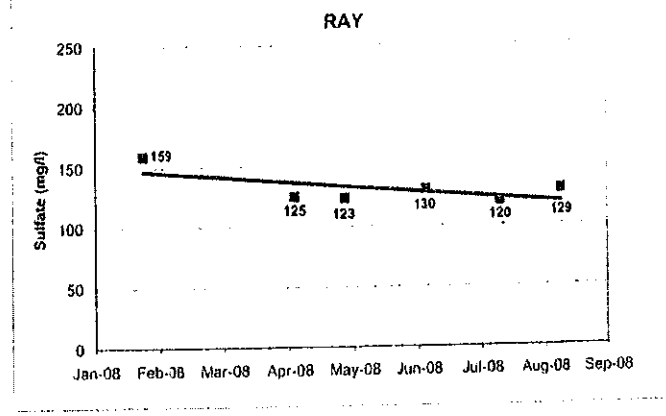
cc: Michael Jaworski, Freeport-McMoRan Copper Queen Branch
Sheila Deely, Freeport-McMoRan Copper & Gold, Inc.
Dalva Moellenberg, Gallagher & Kennedy
Stuart Brown, Bridgewater Group, Inc.

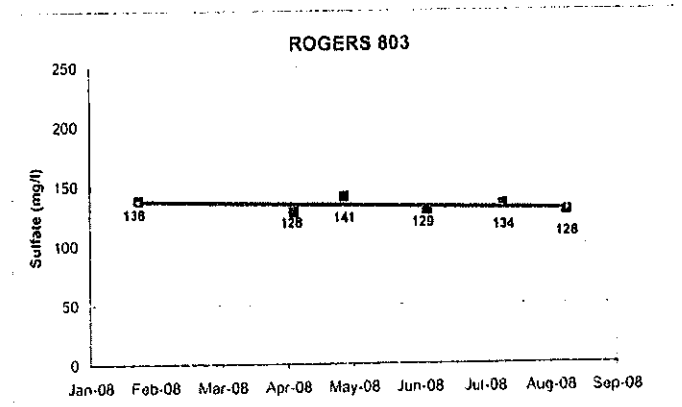
FIGURE 1. TIME SERIES GRAPHS OF SULFATE CONCENTRATION OVER TIME

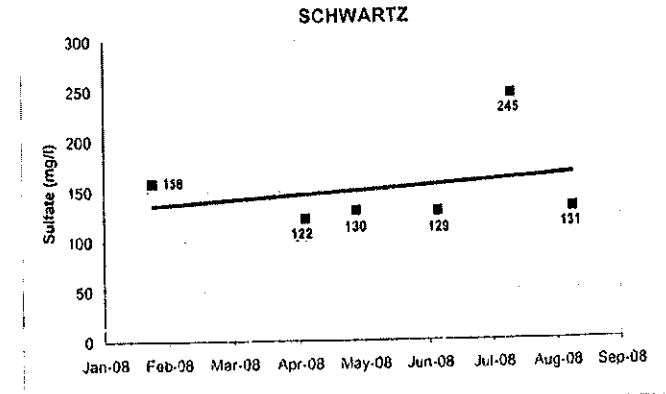












ATTACHMENT
MANN-KENDALL TREND ANALYSIS

Bisbee Mitigation Order - Sulfate Trend Analysis

Event	Sample Date	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
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6	Aug-08	256	189	137	129	128	131
7							
8							
9							
10							
	Mann-Kendall Statistic (S)	7	-7	-3	-5	-4	3
	Number of Rounds (n)	6	6	6	6	6	6
	Average	213.3	202.0	136.7	131.0	133.0	152.5
	Standard Deviation	24.229	9.077	15.240	14.213	5.586	46.984
	Coefficient of Variation (COV)	0.114	0.045	0.112	0.108	0.042	0.308

Error Check, If No Errors - Blank	

Trend ≥ 80% Confidence Level	INCREASING	DECREASING	No Trend	No Trend	No Trend	No Trend
Trend ≥ 90% Confidence Level	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend

Stability Test; If No Trend Exists at 80% Confidence Level	NA	NA	CV <= 1 STABLE	CV <= 1 STABLE	CV <= 1 STABLE	CV <= 1 STABLE

THIS BLOCK OF CELLS IS USED TO SEARCH FOR DATA ENTRY ERRORS

DATA ERROR CHECKS	Event	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
	1	-1	-1	-1	-1	-1	-1
	2	-1	-1	-1	-1	-1	-1
Checks for data	3	-1	-1	-1	-1	-1	-1
with values less	4	-1	-1	-1	-1	-1	-1
than zero or text	5	-1	-1	-1	-1	-1	-1
(a space is seen	6	-1	-1	-1	-1	-1	-1
as text in Excel).	7	-1	-1	-1	-1	-1	-1
	8	-1	-1	-1	-1	-1	-1
Minus one (-1)	9	-1	-1	-1	-1	-1	-1
shown if no	10	-1	-1	-1	-1	-1	-1
error.	Data Error?	no error	no error	no error	no error	no error	no error

THIS BLOCK OF CELLS USED TO FIND ERRORS IN DATES

DATE ERROR CHECKS	Date	Text in Date?	Consecutive?	Data w no date?
	Feb-08	-1	-1	-1
	Apr-08	-1	-1	-1
Checks include	May-08	-1	-1	-1
a test for	Jun-08	-1	-1	-1
consecutive	Jul-08	-1	-1	-1
dates and text.	Aug-08	-1	-1	-1
	BLANK	-1	-1	-1
Minus one (-1)	BLANK	-1	-1	-1
shown if no	BLANK	-1	-1	-1
error.	BLANK	-1	-1	-1
	Date Error?	no error	no error	no error

Mann Kendall S Values [1]		
Values of n	Smax@0.2	Smax@0.1
4	-4	-6
5	-5	-7
6	-6	-8
7	-7	-10
8	-8	-11
9	-10	-14
10	-11	-16

TEST FOR	Number of Rounds	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
INCREASING	4						
OR	5						
DECREASING	6	1	-1	0	0	0	0
TREND @ 80%	7						
	8						
If +1, increasing	9						
If -1, decreasing	10						
If 0, neither.		Increasing	Decreasing	Neither	Neither	Neither	Neither

TEST FOR	Number of Rounds	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
INCREASING	4						
OR	5						
DECREASING	6	0	0	0	0	0	0
TREND @ 90%	7						
	8						
If +1, increasing	9						
If -1, decreasing	10						
If 0, neither.		Neither	Neither	Neither	Neither	Neither	Neither

ATTACHMENT
MANN-KENDALL TREND ANALYSIS

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: BIMA

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
210	190	195	225	204	256					
	-1	-1	1	-1	1					-1
		1	1	1	1					4
			1	1	1					3
				-1	1					0
					1					1
										0
										0
										0
										0

Mann Kendall Statistic (S) = 7

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: BLOMMER

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
206	210	211	193	203	189					
	1	1	-1	-1	-1					-1
		1	-1	-1	-1					-2
			-1	-1	-1					-3
				1	-1					0
					-1					-1
										0
										0
										0
										0

Mann Kendall Statistic (S) = -7

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: FULTZ

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
152	137	131	111	152	137					
	-1	-1	-1	0	-1					-4
		-1	-1	1	0					-1
			-1	1	1					1
				1	1					2
					-1					-1
										0
										0
										0
										0

Mann Kendall Statistic (S) = -3

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: RAY

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
159	125	123	130	120	129					
	-1	-1	-1	-1	-1					-5
		-1	1	-1	1					0
			1	-1	1					1
				-1	-1					-2
					1					1
										0
										0
										0
										0

Mann Kendall Statistic (S) = -5

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: ROGERS 803

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
138	128	141	129	134	128					
	-1	1	-1	-1	-1					-3
		1	1	1	0					3
			-1	-1	-1					-3
				1	-1					0
					-1					-1
										0
										0
										0
										0

Mann Kendall Statistic (S) = -4

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: SCHWARTZ

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
158	122	130	129	245	131					
	-1	-1	-1	1	-1					-3
		1	1	1	1					4
			-1	1	1					1
				1	1					2
					-1					-1
										0
										0
										0
										0

Mann Kendall Statistic (S) = 3

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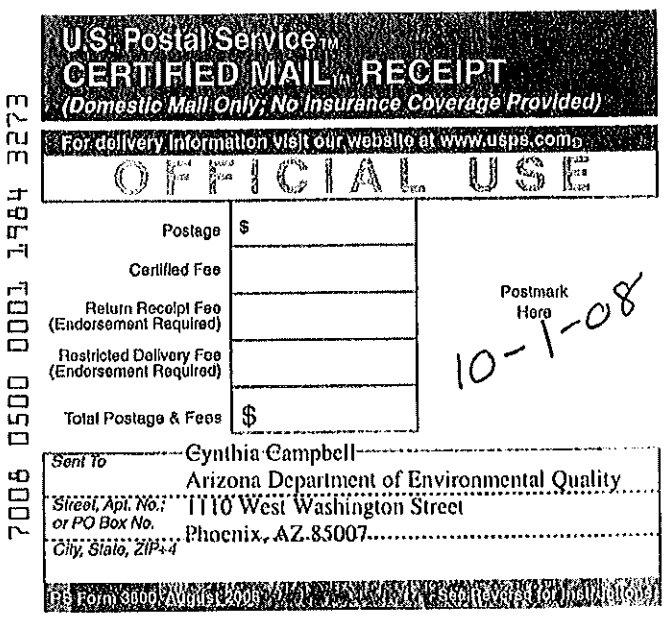

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HYDRO GEO CHEM, INC.
Environmental Science & Technology

September 29, 2008

Rebecca A. Sawyer
Senior Environmental Engineer
Freeport-McMoRan Corporation
Copper Queen Branch
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51 West Wetmore Rd, Ste. 101, Tucson, AZ 85705-1678 520.293.1500 520.293.1550-Fax 800.727.5547-Toll Free

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Sincerely,

Daniel R. Simpson
Senior Hydrogeologist

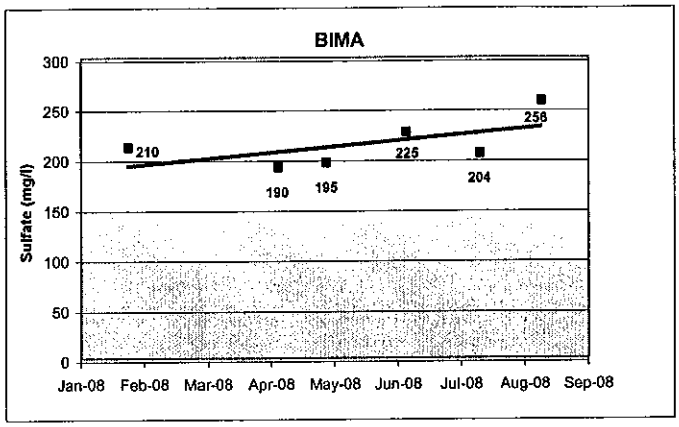
REGISTERED GEOLOGIST
CERTIFICATE NO.
30842
JAMES R.
NORRIS
Date Signed 9/29/08
ARIZONA U.S.A.
Expires 12/31/08

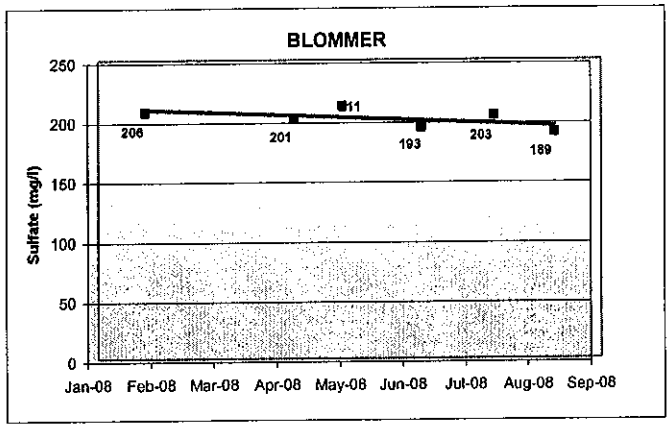
James R. Norris
Arizona Registered Geologist No. 30842

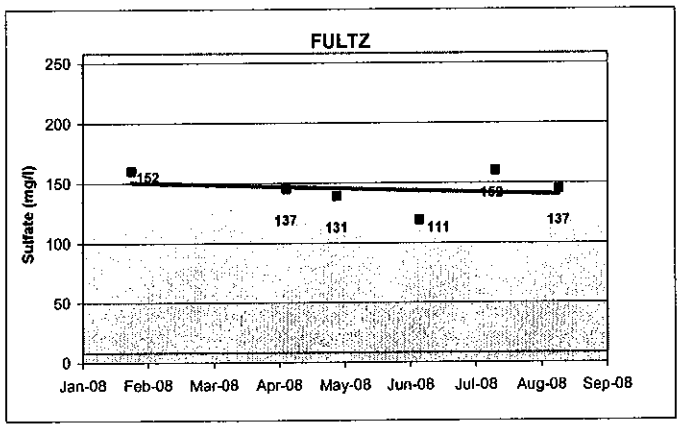
Attachment

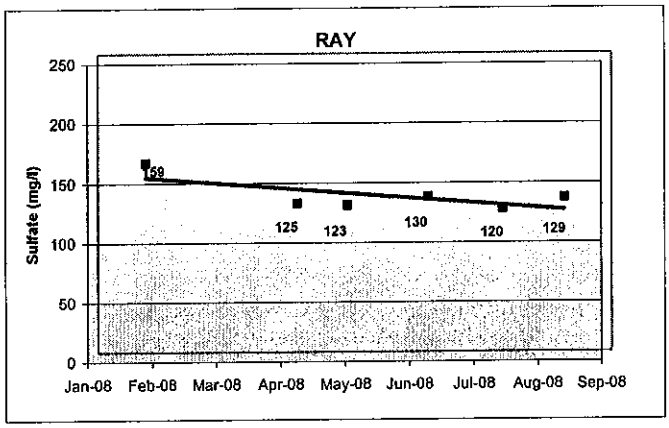
cc: Michael Jaworski, Freeport-McMoRan Copper Queen Branch
Sheila Deely, Freeport-McMoRan Copper & Gold, Inc.
Dalva Moellenberg, Gallagher & Kennedy
Stuart Brown, Bridgewater Group, Inc.

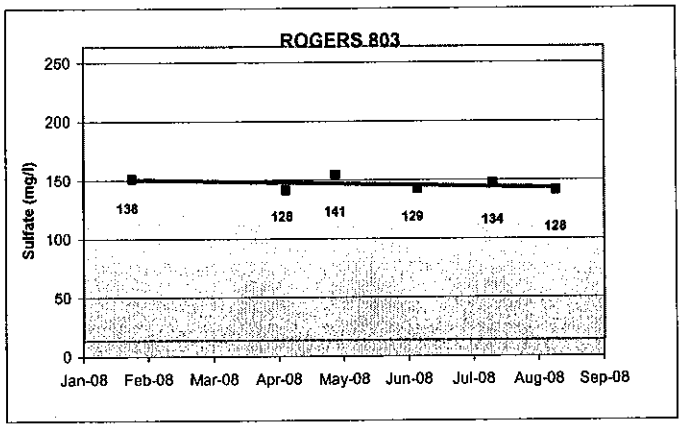
FIGURE 1. TIME SERIES GRAPHS OF SULFATE CONCENTRATION OVER TIME

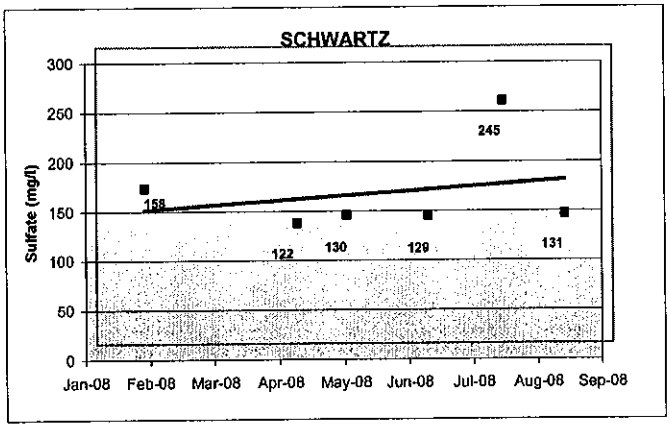












ATTACHMENT
MANN-KENDALL TREND ANALYSIS

Bisbee Mitigation Order - Sulfate Trend Analysis

Event	Sample Date	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
1	Feb-08	210	206	152	159	138	158
2	Apr-08	190	210	137	125	128	122
3	May-08	195	211	131	123	141	130
4	Jun-08	225	193	111	130	129	129
5	Jul-08	204	203	152	120	134	245
6	Aug-08	256	189	137	129	128	131
7							
8							
9							
10							
	Mann-Kendall Statistic (S)	7	-7	-3	-5	-4	3
	Number of Rounds (n)	6	6	6	6	6	6
	Average	213.3	202.0	136.7	131.0	133.0	152.5
	Standard Deviation	24.229	9.077	15.240	14.213	5.586	46.984
	Coefficient of Variation (COV)	0.114	0.045	0.112	0.108	0.042	0.308

Error Check, If No Errors - Blank	

Trend = 80% Confidence Level	INCREASING	DECREASING	No Trend	No Trend	No Trend	No Trend
Trend = 90% Confidence Level	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend

Stability Test; If No Trend Exists at 80% Confidence Level	NA	NA	CV <= 1 STABLE	CV <= 1 STABLE	CV <= 1 STABLE	CV <= 1 STABLE

THIS BLOCK OF CELLS IS USED TO SEARCH FOR DATA ENTRY ERRORS

DATA ERROR CHECKS	Event	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
	1	-1	-1	-1	-1	-1	-1
	2	-1	-1	-1	-1	-1	-1
Checks for data	3	-1	-1	-1	-1	-1	-1
with values less	4	-1	-1	-1	-1	-1	-1
than zero or text	5	-1	-1	-1	-1	-1	-1
(a space is seen	6	-1	-1	-1	-1	-1	-1
as text in Excel).	7	-1	-1	-1	-1	-1	-1
	8	-1	-1	-1	-1	-1	-1
Minus one (-1)	9	-1	-1	-1	-1	-1	-1
shown if no	10	-1	-1	-1	-1	-1	-1
error.	Data Error?	no error	no error	no error	no error	no error	no error

THIS BLOCK OF CELLS USED TO FIND ERRORS IN DATES

DATE ERROR CHECKS	Date	Text in Date?	Consecutive?	Data w no date?
	Feb-08	-1	-1	-1
	Apr-08	-1	-1	-1
Checks include	May-08	-1	-1	-1
a test for	Jun-08	-1	-1	-1
consecutive	Jul-08	-1	-1	-1
dates and text.	Aug-08	-1	-1	-1
	BLANK	-1	-1	-1
Minus one (-1)	BLANK	-1	-1	-1
shown if no	BLANK	-1	-1	-1
error.	BLANK	-1	-1	-1
	Date Error?	no error	no error	no error

Mann Kendall S Values [1]		
Values of n	Smax@0.2	Smax@0.1
4	-4	-6
5	-5	-7
6	-6	-8
7	-7	-10
8	-8	-11
9	-10	-14
10	-11	-16

TEST FOR	Number of Rounds	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
INCREASING	4						
OR	5						
DECREASING	6	1	-1	0	0	0	0
TREND @ 80%	7						
	8						
If +1, increasing	9						
If -1, decreasing	10						
If 0, neither.		Increasing	Decreasing	Neither	Neither	Neither	Neither

TEST FOR	Number of Rounds	BIMA	BLOMMER	FULTZ	RAY	ROGERS 803	SCHWARTZ
INCREASING	4						
OR	5						
DECREASING	6	0	0	0	0	0	0
TREND @ 90%	7						
	8						
If +1, increasing	9						
If -1, decreasing	10						
If 0, neither.		Neither	Neither	Neither	Neither	Neither	Neither

ATTACHMENT
MANN-KENDALL TREND ANALYSIS

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: BIMA

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
210	190	195	225	204	258					
	-1	-1	1	-1	1					-1
		1	1	1	1					4
			1	1	1					3
				-1	1					0
					1					1
										0
										0
										0
										0
Mann Kendall Statistic (S) =										7

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: BLOMMER

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
206	210	211	193	203	189					
	1	1	-1	-1	-1					-1
		1	-1	-1	-1					-2
			-1	-1	-1					-3
				1	-1					0
					-1					-1
										0
										0
										0
										0
Mann Kendall Statistic (S) =										-7

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: FULTZ

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
152	137	131	111	152	137					
	-1	-1	-1	0	-1					-4
		-1	-1	1	0					-1
			-1	1	1					1
				1	1					2
					-1					-1
										0
										0
										0
										0
Mann Kendall Statistic (S) =										-3

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: RAY

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
159	125	123	130	120	129					
	-1	-1	-1	-1	-1					-5
		-1	1	-1	1					0
			1	-1	1					1
				-1	-1					-2
					1					1
										0
										0
										0
										0
Mann Kendall Statistic (S) =										-5

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: ROGERS 803

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
138	128	141	129	134	128					
	-1	1	-1	-1	-1					-3
		1	1	1	0					3
			-1	-1	-1					-3
				1	-1					0
					-1					-1
										0
										0
										0
										0
Mann Kendall Statistic (S) =										-4

Bisbee Mitigation Order - Sulfate Trend Analysis — Well: SCHWARTZ

Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Sum Rows
158	122	130	129	245	131					
	-1	-1	-1	1	-1					-3
		1	1	1	1					4
			-1	1	1					1
				1	1					2
					-1					-1
										0
										0
										0
										0
Mann Kendall Statistic (S) =										3