

NWT Division
P.O. Bag 3000
Yellowknife, NWT
X1A 2M2

Tel: (403) 873-6301
Fax: (604) 873-2980 (Management)
(403) 873-8983 (Purchasing)
(403) 873-2914 (Administration)
(403) 920-2133 (Colomac)

July 21, 1994

Revised July 26, 1994 due
to typographical error.

Mr. Emery Paquin
Director
Environmental Protection Division
Renewable Resources
Government of the NWT
600-5102 50th Avenue
Yellowknife, NT
X1A 3S8

HAND DELIVERED

Dear Mr. Paquin:

Re: 1994 Snow Core Sampling Program

Further to our meeting of July 14, 1994 in this regard. Thank you for the opportunity to review and comment upon this study. Please find listed our concerns with respect to the Draft Report, dated June 24, 1994.

Comparison with Continuous Air Monitoring:

A High Volume Air Sampler has been installed and operated at the Post Office since 1973. This equipment has performed reliably and the protocol for sample collection and analysis has been accepted as representative of the conditions which exist. It is therefore essential to observe that the ambient concentrations of arsenic in 1993/1994 were significantly lower than the levels observed in 1985, 1986, 1987 and 1988. This being a fact, we expect a comparative study should demonstrate the snow core sampling would predict arsenic deposition rates which were lower than the 1975 and 1986 studies.

Are the Results of Snow Core Studies Correct?

The 1975 air sampling program showed the geometric average for total airborne arsenic was 0.04 ug/m^3 . This correlated with arsenic deposition of $1.90 \text{ kg/km}^2\text{.mo}$, predicted by snow core sampling.

In 1986, the airborne arsenic levels were 0.016 ug/m^3 . This was a 60% reduction from 1975. The snow core sampling program suggested arsenic deposition of $0.40 \text{ kg/km}^2\text{.mo}$, which was a 79%

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reduction from 1975. If we were to predict arsenic deposition in 1986 from the results of the measured airborne arsenic levels and the 1975 snow core study, we would expect to observe arsenic deposition of $0.76 \text{ kg/km}^2\text{.mo.}$

In 1994 the airborne arsenic levels were 0.011 ug/m^3 . This is a 73% reduction from 1975 and 31% from 1986. If we were to predict arsenic deposition from the results of the measured airborne arsenic levels and the 1975 snow core study, we would expect to observe arsenic deposition of $0.51 \text{ kg/m}^2\text{.mo.}$

YEAR	TOTAL AIRBORNE ARSENIC ug/m^3 MEASURED	ARSENIC DEPOSITION $\text{kg/km}^2\text{.mo}$ SNOW CORE PREDICTION	ARSENIC DEPOSITION $\text{kg/km}^2\text{.mo}$ PREDICTION USING MEASURED AIRBORNE ARSENIC
1975	0.04	1.90	1.90
1986	0.016	0.40	0.76
1994	0.011	1.37	0.51

Clearly, there is some conflict between measured values for total airborne arsenic and predicted values for arsenic deposition, based upon snow core sampling.

Are the Results Compared Correctly?

The 1994 study utilizes 55 sample points. The 1986 study utilizes 36 sample points. The 1975 study apparently utilizes 35 sample points. Where comparative data does not exist, data is inserted from other locations, so that in fact we compare apples with oranges and bananas.

It may be possible to compare some of the 1994 data with 1986 and 1975 data, however, the current work is not completed in a manner which will produce a representative comparison.

Protocol for Sample Collection and Preparation:

The sample handling protocol for previous work has been questioned by the author and GNWT. We agree with this assessment. This being the case, can a comparison of the 1994 work with previous work be held as factual? Should it be published and reported as such, in light of other conflicting comparisons? We share your concern in this regard.

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Are the Sample Points the Same?

Were the sample points located with sign posts, to ensure relative duplication, or have we taken snow from the windward side of a tree one year, a hollow or a hilltop the next? Are these samples points within a defined radius or as interpreted by different field technicians on a small scale map?

Conclusions, Recommendations:

- Continuous air monitoring conducted over the past 21 years shows conclusively that emissions from Giant have, for the most part, progressively decreased.
- We are concerned by the apparent increase in arsenic deposition from 1986 to 1994, however, we also note that the results are much lower than 1975. This is consistent with lower levels of airborne arsenic recorded in 1994 as compared with 1975 and 1986.
- Several areas of conflict with respect to data comparison and test work protocol have been identified by the Department of Renewable Resources and Royal Oak Mines. These items should be addressed by Ferguson, Simek and Clark, prior to their final publication.
- A follow up study should be completed in the winter of 1995. Careful consideration should be given to protocol development prior to undertaking this study so that a representative comparison can be made with previous work.

Once again, thankyou for the opportunity to review and comment upon this draft report, prior to final publication.

Yours truly,

ROYAL OAK MINES INC.

David Anthony, P.Eng.
Manager
Environmental Services