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"Why repeat past mistakes when there are so many new ones to commit?"
Descartes

Review of the Rosia Montana Environmental Impact Assessment Report with a focus on water and water quality-related issues

[All references to specific Environmental Impact Statement (EIA) volume and page numbers presented in this report pertain to the numbers on the covers of the Printed Version of the Rosia Montana Project (RMP) EIA. These numbers are different from the CD version of the EIA.]

Executive Summary

This report focuses on water and water quality-related issues, those issues which normally cause the most serious and expensive, unforeseen, economic impacts and public liabilities at mining sites.

- The EIA is poorly organized, confusing and not comprehensive. In general, it is not possible to determine which specific individuals or companies authored which specific EIA sections and opinions, thereby avoiding any direct responsibility for authorship. It fails to meet many of the serious EIA-preparation criteria stated in Romanian Ministerial Order OM 863/2002, which describes the criteria of an acceptable EIA. In its present condition, the EIA is not suitable to allow the public or regulators to reasonably evaluate impacts. Much of this EIA has been written in the style of a public relations document, not a technical document. Despite repeated claims, the EIA was not prepared by independent consultants and compiled in an independent manner. Portions of the EIA appear to have been deliberately manipulated to minimize the exposure of unfavorable aspects and impacts.

- The Rosia Montana Project (RMP) site is seriously contaminated from recent, State-owned mining activities. Unfortunately, the EIA does not adequately define the extent of the specific chemical constituents causing the water quality contamination. It presents data for an overly-simplified list of chemical constituents [pH, arsenic, cadmium, nickel, lead, mercury, chromium, selenium, sulfate, and bicarbonate] , and neglects to present adequate data for numerous other environmentally-important metals and metal-like elements such as: aluminum, antimony, chromium +6, cobalt, copper, iron, lithium, manganese, molybdenum, strontium, thallium, vanadium, and zinc; numerous anions such as: nitrate, ammonia, chloride, fluoride; natural radioactive constituents such as: uranium, radium, strontium, thorium, potassium-40, gross alpha and beta; organic compounds relating to massive use of fuels, oils, chemical reagents, explosives, etc.; cyanide (WAD and Total) and related decomposition products, such as thiocyanate and cyanate. The RMGC data base contains data for many of these constituents, but their presence was not summarized or clearly revealed in the EIA.

- Information from past RMP site activities and contamination at similar gold mines and processing sites around the world indicates that cyanide was probably used to process the existing tailings and, in addition, that it is only reasonable to evaluate the presence of natural radioactivity at this site. Neither the presence of cyanide or radioactive elements in the water and soil baseline data has been revealed in the EIA. This appears to be an effort to: 1) minimize the environmental and health impacts resulting from past State-operated activities; and 2) avoid developing a quantitatively-defensible baseline water quality data base that could be used to reliably define future RMGC liabilities that might result from the proposed project.

- Do the terms of the RMP project agreements between the Romanian State and RMGC absolve RMGC from all responsibility for environmental and health liabilities, past and future?

- The EIA fails to adequately define the specific baseline conditions—especially for surface water, ground water, health and impacts from the existing tailings and existing processing plant. It fails to present recent baseline data. This leaves many important questions about responsibility and liability— past, present and most importantly future—unanswered.

- The Health Baseline studies failed to collect samples of fingernails, hair, blood or urine from citizens within the impacted area. Data from such data would allow development of a quantitative health baseline.

- The EIA assumes that, following closure and remediation, all pre-existing impacts will have disappeared, long-term. This is one more unsubstantiated promise—especially because existing facilities such as the Abrud and Saliste tailings are unlined and unremediated. They will continue to release contaminated leachates long-term. It appears that the RMP remediation will not involve the collection and treatment of contaminated leachates presently being released from the existing tailings.

- The EIA is not reliable for predicting or realistically evaluating environmental and related future impacts. Therefore, it is not suitable to define the realistic financial liabilities for investors.

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- Acid rock drainage and other contamination are likely long-term impacts that will occur at this site, post-closure. The EIA contains foolishly-optimistic, predictive statements regarding the likelihood of ARD. As a result of the activities proposed in the EIA, the RMP water quality, in general, will improve while the RMP is being actively operated and maintained. It is much less certain how effective the proposed measures will be for mitigating long-term, post-closure ARD and related contamination.

- Responsible financial assurance measures should be implemented and they should assume the need for operation and maintenance of perpetual, *active* water treatment facilities---if E.U. Guidelines are to be met. Without long-term collection of effluents (direct and indirect discharges) and active treatment, area streams and ground waters will likely fail to meet appropriate water quality criteria and be toxic to many aquatic organisms and most fishes. These impacts may not become obvious until many years following mine closure.

- The EIA neglects to evaluate the likely reasonable economic costs of environmental and health impacts, including price inflation, past and present.

- Despite the need to utilize massive quantities of water in RMP operations, the EIA makes no mention of the costs related to water use or water contamination. As usual, they are “externalized” in the EIA.

- The EIA public consultation and disclosure process is a charade. It does not reasonably inform the public of options or likely impacts, and fails to allow actual dialogue at the public consultations. This EIA and its related disclosure process fail to reveal much of the important environmental and health information, preventing a reasonable evaluation of the trade-offs to be made by the public.

- Romanian authorities at all levels have failed to adequately protect the public or to assist it in evaluating and understanding the actual environmental and health impacts resulting from the past mineral development-related impacts at Rosia Montana. Romanian mining and environmental agencies clearly lack the institutional capacity and will necessary to enforce the appropriate laws. Under these regulatory conditions where mines are essentially self-regulated, adequate remediation and long-term clean-up are unlikely to occur. The long-term costs will ultimately fall on the Romanian and E.U. taxpayers.

- This project, if proposed at a comparable site in the E.U., the U.S.A., or Canada, would not receive regulatory approval.

1. Introduction

Purpose and Scope

The following report is intended to provide a brief, technical review of the Environmental Impact Assessment (EIA) for the Rosia Montana Project [RMP], (Gabriel Resources, May 2006). This report does not discuss all aspects of the EIA, but focuses on water and water quality-related issues, those issues which normally cause the most serious and expensive, unforeseen, economic impacts and public liabilities at mining sites. It is intended to express viewpoints and perspectives that are not discussed, or are inadequately discussed by the mining company.

RMGC has spent many millions of dollars to hire consultants and prepare this EIA. My responses are an attempt to illuminate some of the issues and viewpoints that RMGC and their consultants have failed to make public.

My participation in these activities was requested by the Romanian non-governmental organization (NGO) Alburnus Maior (AM), supported by funds from the Staples Trust / U.K. and the Open Society Foundation / Romania**.** Alburnus Maior provided technical and logistical support for my efforts, but the opinions expressed here are my own, and they may differ from those held by Alburnus Maior, or other portions of Romanian and EU civil society.

I fully recognize that there is presently a broad spectrum of opinions concerning approval of this project in Romanian society. At one end of the opinion spectrum are citizens concerned predominantly about obtaining jobs, at the other end are those, landowners such as members of Alburnus Maior, who totally oppose approval of the project. Many of the others are somewhere in the middle. All require reasonable information in order to understand the broader consequences and to form intelligent decisions.

The opinions presented here are neither pro- nor anti-mining. I have often worked for clients with both orientations. **This report is not intended to tell the citizens and regulators what to do.** Rather, it is intended to provide technical assistance to the general public and the Romanian government so that better informed decisions can be made and to constructively influence the public review *process*. **The ultimate choices, however, must be made by the citizens and their elected representatives. They are the ones who will be personally impacted and held responsible.**

These opinions were developed after reviewing all relevant portions of the RMP EIA, in both electronic and paper versions. The electronic version was obtained in June 2006 from the official internet link provided by the Romanian government, and the printed volumes, in English, were provided to me by Alburnus Maior after receiving them from John Aston, Vice President of Rosia Montana Gold Corp. (RMGC) in Rosia Montana on August 1, 2006. I also reviewed a copy of the Technical Report of the RMP (Gabriel Resources, March 2006) provided by RMGC. In addition, my opinions were informed by my activities in Romania (July 31 through August 25, 2006), which included: several visits to the mine site and the general region, including Bucium; meetings with representatives of RMGC staff reviewing project details, details of the EIA, and numerous aspects of other RMGC water quality and geochemistry data files not included or summarized in the EIA; meetings with the Romanian Academy; conversations with local citizens, several former employees of the former State-owned mining company, and local and national NGOs; collection of tailings samples; and participation at public consultations in Cluj Napoca. Lastly, these opinions are informed by more than 34 years of applied hydrogeological and geochemical experience.

RMGC was cooperative in allowing me to review selected reports and data and in responding to technical questions. In addition, representatives of Alburnus Maior and myself were taken on a tour of the site by Mr. John Aston, Vice President of RMGC who answered numerous questions regarding the EIA documents, data, and proposed project.

2. Background

The Rosia Montana Project (RMP) is located near the village of Rosia Montana in west-central Romania approximately 50 km northwest of the regional capital, Alba Iulia in the Metaliferi Mountains which belong to a larger, regional mountain unit called the Apuseni Mountains of Transylvania.

RMP is owned and managed by Rosia Montana Gold Corp. S.A. (RMGC), which is a joint venture formed between Gabriel Resources Ltd. of Canada (80%), MINVEST (National Company for Copper, Gold and Iron Minvest S.A.) a company owned by the Romanian government (19.31%), and three Romanian minority shareholders: Cartel Bau, Foricon S.A., and Comat S.A. (each with 0.23%).

Gabriel Resources and its subsidiary, RMGC, are staffed by several senior members having significant relevant experience, but neither entity has previously operated a mine.

RMGC is proposing to operate an open pit gold and silver mine by redeveloping and expanding an existing mine that has been operated using both underground and open pit methods since before Roman times--- for roughly 2000 years. Much of the proposed project site is significantly contaminated by the previous mining activities, especially those of the Romanian-government owned operations. Contamination sources include, predominantly, tailings, waste rock, and draining underground workings. However, the proposed mine production is planned to be roughly 40 times larger than the state-owned operation.

The project is *presently* designed to have an operating life of about 19-20 years, with processing continuing for approximately 16 years, based on the presently-defined ore. The 24 hr. / 7 day-per–week operation will include a processing plant using conventional cyanide leaching techniques, combined with cyanide decomposition facilities. The EIA indicates that the plant operations will require about 238 to 251 liters / sec. of water (Water, Vol.11, pg. 36). However, on pg. 33 of the Water report it states that extraction from the Abrud River is likely to be 360 cu. meters per hour (100 L / sec.).

Some of the relevant operational and environmental details include:

- site elevation is between approximately 500 and 1200 m above sea level (ASL) -- site annual precipitation ranges between about 600 and 1000 mm.
- four open pits [total depths between about 220 to 260 m]
- total wastes generated: approximately 471,831,000 tons [EIA, Waste, V. 10, pg. 31].
- waste rock: approximately 256,900,000 tons [EIA, V.10, pg. 30-31].

overburden: approx. 590,000 cubic meters, or about 790,000 tons [EIA, V. 10, pg.31].

- tailings produced: between approx. 214,905,000 and 256,926,000 tons [numerous different quantities are cited in the EIA (i.e. EIA, V. 8, pg. 17-18; V. 8, pg. 57; Vol. 10, pg. 56, etc.]. Tailings dam maximum height: 185 m.

Based on the Gabriel Resources Technical Report (2006), the project will have an operating cost for gold production averaging $181 per ounce for the first five years, and $237 per ounce over the life of the mine. The EIA, V. 19, states that the presently defined gold and silver reserves are 10,100,000 ounces and 47,600,000 ounces, respectively, with an anticipated total production of about 8,000,000 ounces of gold and 28,800,000 ounces of silver. [Volume 8, pg. 77 of the EIA states that estimated total metal production will be the same as the reserves cited above: 10.1 M ounces of gold and 47.6 M ounces of silver]. The Technical Report (2006, pg. 12) states that it "….has confirmed the technical feasibility and economic viability of producing an estimated 7.9 million ounces of gold and an estimated 29 million ounces of silver from the property….".

The Non Technical Summary (Vol. 19, pg. 7) states that the RMP project will require the **resettlement of 974 households**. No further discussion on the impacts of such resettlement is included in the EIA. Instead it appears that this evaluation has been put into a separate report, the Resettlement and Relocation Action Plan (RRAP) available at: www.rmgc.ro, which is referred to several times in the EIA. However the RRAP is not included within the EIA. The NTS further states that all land decisions will be voluntary and will follow the World Bank's ***involuntary*** resettlement recommendations. This wording seems to imply that the RMP can be reconfigured to fit any potential land situation that might arise. This conclusion seems unrealistic.

Modern open pit mining relies predominantly on the use of mechanized equipment and massive quantities of explosives and chemicals to extract gold and silver from the rock. For example, below are the quantities of some of the fuels, processing chemicals and explosives expected to be used during the 17-year life of the RMP (Vol. 7, Chapt. 1, General Information, Tables 1-2, and 1-3, pg.15-16):

	Quantities	
Gasoline	13,948,500 L	
Diesel Fuel	279,786,000 L	
Lubricants	3,570,000 L	
Fuel Oil	290,394 tons	= 263,994,540 kg
Hydrochloric acid	39,100 tons	
Lime	918,000 tons	
Sodium cyanide	204,000 tons	= 185,454,540 kg
Sodium hydroxide	34,000 tons	= 31,000,000 kg
Sodium metabisulfite	221,000 tons	
Ammonium nitrate	79,220 tons	= 72,018,180 kg
Copper sulphate		1,563,636,000 kg

Most of the materials listed above are classified as hazardous substances, and significant quantities are routinely released into the environment at modern gold mining sites.

3. EIA General Comments

Characteristics of the Report

Despite being an enormous compilation of 33 volumes, at least 4500 pages in length, the EIA fails to truly provide the public or regulators with a technically-coherent basis on which to judge the adequacy of the proposed project. Most volumes are poorly organized with numerous sections repeated over and over in various volumes. Sections, figures and tables are often inconsistently arranged and numbered, so that it is difficult to follow the meaning.

There is no detailed Table of Contents for the entire EIA, and very strangely, the first attempt to present the reader any sort of overall summary is not to be found until Volume 19---the Non Technical Summary! In the RMP EIA, basic discussions of water resources are incoherently scattered throughout numerous volumes with little attempt to integrate the data and concepts. Hence it is unnecessarily difficult to interpret the validity of the conclusions.

Worst of all, the EIA fails to coherently and adequately summarize the most important data and information regarding *specific, quantitative* baseline conditions for water resource availability, water quality, geochemistry, health, etc. Instead of focusing on summaries of data and information in simple tables and figures, the EIA compilers have frequently substituted volumes of words, often in the form of predictions, promises or computer simulations-- rather than presenting the actual data. Such an approach is common at proposed mining sites, especially those of the smaller, “junior” companies, where there is no existing cash flow. Hence the proponents attempt to save money by not drilling and completing monitoring wells, for example. **More disturbing is the fact that crucial data have been withheld from this public document, or have been misleadingly edited, especially with respect to baseline water quality.**

A flagrant example is the chapter in Volume 1, entitled Sediment Contaminants Baseline Report, prepared by Fluvio, a technical group within the Institute of Geography and Earth Sciences at the University of Wales. Based on the directly-worded Executive Summary, this study involved, among several tasks, the detailed sampling and analysis of water quality and sediment samples from 421 sites during the years 2002 through 2004, from throughout the RMP and surrounding region. Despite this broad scope, the Fluvio report has been edited such that **most of the technical data and conclusions concerning the water quality findings are largely gone.** Hence the report in its present form is referred to as a “Sediment Contaminants Baseline Report”, which is extremely misleading. The original authors have clearly indicated these problems by stating that both edited and complete compilations of the Fluvio water quality and sediment data bases are included on an accompanying CD (see pg. 11, Vol. 1). **No such CD or summaries of the actual Fluvio data are included in or with the EIA.**

Additional issues related to the Fluvio report are discussed below in the Water Quality Baseline responses.

Returning to the overall RMP EIA, it fails to adequately define and describe some of the information most crucial for evaluating the existing physical status of the site and potential impacts of the proposed activities. Of particular concern are the following:

- inadequately defined the existing water quality, the baseline—especially for sources of water supply and ground water;
- a health baseline that is largely useless quantitatively;
- inadequately defines alluvial and bedrock ground water resources, both in terms of availability and water quality;
- fails to adequately discuss connections between the existing contamination and the elevated incidences of disease conditions in the local populations.

Responsible Authors

It is impossible for the reader to readily determine which companies or individuals actually prepared and authored most of the individual volumes, chapters, sections, and specific conclusions. Thus, there is no way to ascribe specific responsibility for the statements and conclusions. Also, there is no obvious way to determine whether the conclusions were made by firms and, most importantly, individuals with significant, relevant mining-related experience. It is clear in several sections that many of the authors, whoever they are, do not have the requisite specific experience.

Pages iii through vii of Volume 19 present listings of the various firms and contact individuals at these firms that participated in the preparation of the EIA. However, these lists fail to state who authored what! Volume 7, Chapt. 1, (General Information), pg. 7-9 again presents a similar list, and calls it: "Certified Author of EIA Study". Again it is impossible to determine which sections and opinions were authored by which groups and individuals. Comparable EIAs prepared in the EU, Canada or the U.S.A., often prepared by similar large teams, make clear which firms and usually which senior individuals were responsible for preparing specific sections and conclusions. They also normally summarize the technical backgrounds of the main contributors, specifying the numbers of years of mining-related or other relevant experience. No such information is provided in the RMP EIA.

Many of the water-related conclusions are based on work presented in detailed Engineering Reports which have not been included as Appendices to the EIA---which is normally done for comparable EIAs. As a result, there is no way that a technical reviewer can verify that the opinions presented in the EIA correspond to those presented by the original authors.

This confusing and imprecise manner of ascribing authorship of specific sections and opinions in the EIA is clearly prohibited by Romanian Ministerial Order, **OM 863 / 2002—"for approval of the methodological guidelines applicable to the stages of the environmental impact assessment framework procedure"**. This Order is discussed below.

“Independence” of the Contributors
Throughout the EIA, both in the text and on various tables and figures, the contributing consultants are repeatedly labeled as “independent”. This designation is, charitably speaking, misleading. As far as can be determined, all of the contributors were directly or indirectly selected, directed and compensated by the staff of RMGC / Gabriel. This is clearly not an “independent” team of experts.

Much of the wording style is that of a public relations document or advertisement, especially that of the Non Technical Summary (NTS), rather than that of a technical document. It minimizes most of the negative aspects--both present and future impacts--by providing verbal assurances and promises instead of technical data. It would have been much more useful to describe, **statistically**, how the impacts at Rosia Montana compare, and are likely to compare, to those at the hundreds of similar gold mines around the world. What have been the *long-term* impacts at such sites, statistically? In this way, one could make comparisons that are statistically-reasonable. Instead the EIA pretends to be able to quantitatively, deterministically, predict the future impacts, often using computer simulations. Such predictions, throughout the mining world, have been proven to be highly inaccurate and are generally overly optimistic.

Utility of the EIA
Apparently, by presenting such a massive EIA, filled with optimistic predictions and promises, it is hoped that the public and regulators will be confident and certain that the future impacts are known. **Unfortunately, this EIA is seriously flawed and does not allow the public or regulators to adequately evaluate the reasonably-expected impacts.**

In addition, by presenting such a massive, poorly-organized, and confusing EIA, a company can respond to difficult public questions by dismissively saying, in essence: Read the EIA; the answer is there. Or they can respond: Obviously you have not read the complete EIA, or you would understand that we have answered that question previously.

EIA Process Details: Romanian Guidance

Romanian Ministerial Order OM 863/2002 [subtitled: **“for approval of the methodological guidelines applicable to the stages of the environmental impact assessment framework procedure”**] contains two sections that provide specific and clear directions to the Romanian authorities on how to evaluate an EIA:
1-A list describing the specific contents that must be included in an EIA;
2-A checklist that must be used by Romanian authorities to evaluate the completeness and acceptability of any EIA. Review of this checklist must occur following the public consultations.

It is obvious that the RMGC EIA fails to comply with numerous aspects of Ministerial Order 863 / 2002, as will be demonstrated repeatedly below.

Role of Romanian Authorities: RMP EIA
RMGC has been working closely with the Romanian authorities for many years, since 1997. The Exploitation License allowing RMGC / Gabriel to mine and process gold and silver was awarded by the Romanian government in June 1999. It was officially transferred from MINVEST, the State mining company, to RMGC in October 2000. Despite this permit situation, mining at Rosia Montana has been conducted by MINVEST until June 2006, when active mining and processing ceased.

It is common knowledge that hundreds of severely-contaminated mining and mineral processing sites exist in Romania. Officially, it is the responsibility of the National Agency for Mineral Resources (NAMR) to coordinate the promotion and licensing of mining. However, it is the responsibility of the Ministry for the Environment and Water Management to evaluate the quality and adequacy of the RMP EIA. Despite the fact that open-pit mining has been conducted at Rosia Montana since the 1970's, no Romanian agency, national or regional, has taken the responsibility to actually oversee environmental activities at the mine. To add to the confusion, the regional Environmental Guard in Alba Iulia has the theoretical responsibility to investigate environmental matters at Rosia Montana, but only when requested, or when an accident occurs.

In 2006, it seems the mining industry is still largely *self-regulating.* Many of the negative aspects of the RMP EIA and the recent operations criticized in this report should have been detected and corrected previously by the appropriate regulatory agencies.

Volume 7, (General Information), pg. 6 states that all liability for previous mining and processing activities remain the responsibility of Minvest. **It is important for the Romanian and EU citizens to know whether the future liabilities that may develop from the RMP will also remain, technically, the responsibility of Minvest.**

4. EIA Process: Public Consultation
My participation at the RMP public consultation meeting in Cluj on August 7, 2006, showed me that hundreds of citizens attended the meeting and most stayed from the beginning to the end---from about 1630 on August 7, until about 0400 on August 8. Nevertheless it also became clear that the structure of the entire process was controlled by RMGC, **preventing any actual dialogue**. The majority of the first hour and a half was a public relations presentation on the RMP by RMGC. The public was then allowed to ask questions or make comments verbally from the floor, but rather than conducting an interactive response with the questioner, the company representative simply supplied a stock answer, or made a non-response reply. In all cases, RMGC had the final say, which allowed them to shape the final wording. This is not real public consultation; it is a charade. **It gives the impression that civil society has a significant role, but it really doesn't and hasn't.**

When this form of largely-meaningless Public Consultation is coupled with such an incomplete, disorganized and biased EIA, it should be obvious to any observer that the general public is not truly encouraged to provide substantive input into the project approval process.

5. EIA Report : Technical Comments

The following comments discuss some of the most important *technical* issues the general public and regulators need to understand in order to evaluate an EIA. They discuss only selected aspects of the EIA.

The RMP EIA presents baseline data that are incomplete and which do not allow a reader to adequately evaluate the **pre-mining water quantity conditions.** To a lesser extent the **baseline water quality data are also inadequate, especially with respect to ground water quality.** In addition these data are not organized and summarized in a fashion that makes it easy for the regulators or the general public to evaluate either the pre-mining conditions or the future impacts.

Hydrogeology Baseline / Ground Water Quantity

- **What quantities of ground water can be extracted from the water-bearing rocks and sediments at the RMP project site, prior to mining?**

Throughout numerous, uncoordinated volumes, the EIA repeatedly states that significant ground water does not exist within the RMP site. However, the EIA fails to present the detailed technical information to support this contention.

Acceptable EIAs prepared for comparable projects inevitably begin the Hydrogeology discussions by clearly stating who preformed the specific hydrogeologic work and on what dates. The RMP EIA **hydrogeologic information is, apparently, based on work performed during 2003 and *before*. Therefore it does not reflect present conditions.** It is unclear exactly which group performed which work; the maps and text have different names on them.

Secondly, acceptable EIAs present **tables that summarize** the technical details for all of the sources of ground water information (springs, hand-dug wells, boreholes, constructed monitoring wells, piezometers) used to generate the conclusions. Such tables identify, both by general category and by specific site the water-yielding zone (if known), the construction details of the wells, boreholes and piezometers (total depths, diameters of boreholes, casing and perforation information, details on methods to develop the wells or boreholes, the estimated or measured yields of springs, etc. In addition, they provide tabular summaries, by specific well, borehole, etc., the technical details that summarize any hydrogeologic testing that was performed. For example, such tables summarize the types of specific tests performed (slug or bail tests, packer tests, pumping tests) and the test details (test duration, pumping rates, etc.).

The RMP EIA fails to present such detailed summaries, and no testing details are provided. More importantly, it appears the hydrogeologic conclusions were developed without adequate drilling or adequate testing of either the alluvial or bedrock aquifers.

Table 4.1, Hydrogeology Baseline (Vol.2) indicates that the alluvial deposits have the capability to transmit significant quantities of water. It also indicates, qualitatively, that ground water is likely to be encountered in the weathered zones of the shallow bedrock and possibly in several other bedrock zones, largely due to movement along fractures and faults. **Despite stating that the presence of ground water is likely in these zones, RMGC did not direct their consultants to perform the testing necessary to quantify the hydrogeologic details.**

The EIA presents no evidence that long-term aquifer tests have been performed for either the alluvial or bedrock water-bearing units. Thus, it is not possible to reliably define the quantities of ground water present at the site. Apparently no deep ground water wells have been constructed within the project area.

The Hydrogeology Baseline Report [in Vol. 2] gives the appearance of having much subsurface hydrogeologic information, but in fact, it contains predominantly information on **alluvial ground water flow directions** (Figure 4.1) and some limited discussion of the subsurface engineering conditions near the proposed TMF. This information on alluvial water levels and flow directions is **based on old data and may not reflect present conditions.** No comparable data are presented for any of the bedrock zones.

Figure 4.1 shows the presence of only 4 locations designated "*monitoring wells"*. Other parts of the EIA [Water Baseline Report (Vol.1)] refer to these four locations as "monitoring boreholes". The actual construction details of these 4 monitoring locations are undefined, therefore it is unclear whether they were originally drilled as narrow diameter exploration or geotechnical boreholes, or if they were ever actually completed (gravel-packed, cased, developed, etc.) as true monitoring wells. These uncertainties suggest that the 4 sites were never completed as actual wells.

It is of greater significance to note that there are only 4 boreholes within the entire RMP site with which to sample ground water. *This conclusion is of most significance for defining the ground water baseline conditions*---see discussions below.

There are numerous other sources of information within the EIA that indicate the presence of ground water, which RMGC has failed to define. For example, underground mines normally maintain detailed records on the volumes of water pumped out of the workings. Where are these data? They are not mentioned in the EIA.

Given the scale of the proposed operations and the depths to which the pits will be excavated**, the public should be concerned about possible declines of water levels in hand-dug wells and possible reduction of flows at selected springs.** What might be the future interactions between ground and surface waters? These aspects are not defined in the EIA.

The Water EIA (Vol. 11, Chapt. 4.1), the Water Baseline Report (Vol. 1) and the Hydrogeology Baseline Report (Vol. 2) fail to provide any **integrated** discussion of ground water flow, availability, and ground water quality aspects. Similar studies usually conduct aquifer tests in which water quality samples are collected at various time intervals during the aquifer testing. In this way one is able to learn a great deal concerning the possible interconnection of various zones and the potential for the migration of contamination plumes.

Why was no ground water testing performed in the alluvial zones near the existing tailings impoundments? Such testing would have provided quantitative information on the hydraulic characteristics of the alluvium and information as to whether these zones are presently contaminated.

By failing to adequately define the shallow and bedrock ground water conditions, the public has no way of knowing the quantities of ground water actually available and are unable to realistically evaluate the extent of present ground water contamination. Thus the public and regulators will be unable to confirm or deny that the proposed activities have, for example, depleted existing ground waters or whether future ground water quality has gotten worse or better [see Water Quality discussions below].

Additional Technical Support for the opinions above is presented in the Appendices.

Baseline Water Quality

- What is the *baseline* (existing, pre-RMP) water quality of the surface and ground waters within the project area and areas likely to be impacted? What areas have already been impacted?

If an EIA fails to present reliable baseline water quality data [statistically-representative of all sources and seasonal variability], prior to the beginning of a project, there is no way for regulators or the public to quantitatively determine whether new impacts have been subsequently caused by the new activities. For the RMP, this is especially important due to the extensive past activities of Minvest. An inadequate baseline data set prevents the public and regulators from evaluating the actual water quality impacts that have already occurred due to past activities, and their possible relationships to human health conditions, etc. Without adequate baseline data, there is no reliable mechanism for holding any party responsible for the consequences of their actions.

Mining baseline monitoring programs need to collect data that reveal possible contamination from a wide range of construction, mining and mineral processing activities. These activities use tremendous quantities of processing chemicals, fuels and oils, explosives, etc.- all of which can generate contamination.

Baseline chemical samples should be collected and analyzed for a broad range of inorganic and organic compounds---much broader than the few parameters reported in either the EIA or the RMGC data files which I observed. Such analyses should include, as a minimum: field and lab pH, specific conductance, water temperature, together with total determinations (and in some cases dissolved determinations) of: aluminum, antimony, arsenic, barium, cadmium, copper, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, zinc, calcium, magnesium, sodium and potassium, sulfate, nitrate, ammonia, boron, phosphorus, fluoride, chloride, and natural radioactive constituents (uranium, thorium, strontium, potassium-40, gross alpha and beta, in general), cyanide and related breakdown compounds (metal-cyanide complexes, cyanate, thiocyanate), organic carbon, oils and greases, together with a comprehensive scan for organic compounds, especially determinations that indicate the presence of fuels. Baseline data sets also need to include representative data on volumes of sediment and quality assurance / quality control parameters [i.e. total suspended sediments, turbidity, total dissolved solids, ion balances, etc.]

RMGC states that they have collected more complete water quality data than the constituents listed above, as is demonstrated by Table 3-8, Vol. 1, pg. 18. The full extent of RMGC's water quality monitoring is unclear with respect to exact calendar dates and locations. RMGC showed me examples of the more complete water quality data files in their offices in Rosia Montana. *However, it should be noted that these more complete data were not summarized in the EIA, which could easily have been done.* ***Most importantly, many of these constituents that were not presented in the EIA are often the constituents that are most useful for making interpretations concerning the sources of contamination and their possible migration pathways [hydrogeologic and geochemical interpretations].***

The EIA argues that a total compilation was too onerous and difficult for their database capabilities. However, such complete summaries are presented in most comparable EIAs all over the world.

Volume 1, State of the Aquatic Environment, contains a strangely-abridged report entitled: "Sediment Contaminants Baseline Report", prepared by Fluvio, a technical group within the Institute of Geography and Earth Sciences at the University of Wales. As discussed above, the original objective of this report was: "The collation of all published and unpublished geochemical (water and sediment) data sets for the Abrud / Aries catchment and integration within a GIS database." In addition Fluvio performed detailed sampling and analysis of water quality and sediment samples from 421 sites during the years 2002 through 2004, from throughout the RMP and surrounding region. Despite this broad scope, the Fluvio report has been edited such that **most of the technical data and conclusions concerning the water quality findings are largely gone.**

The Fluvio authors have clearly stated that both edited and complete compilations of the Fluvio water quality and sediment data bases are included on an accompanying CD (see Sediment Contaminants Baseline Report, pg. 11, Vol. 1). No such CD or summaries of the actual Fluvio data are included in or with the EIA. Why was this water quality information not included and integrated into the RMGC Water Baseline Report?

Again, the reader is made suspicious by the "Statement of Liability" on pg. 30. It states: "Whilst the University will use all reasonable endeavors to ensure the accuracy of the work performed and any information given, the University makes no warranty, express or implied, as to accuracy and will not be held responsible for any consequences arising out of any inaccuracies or omissions unless such inaccuracies or omissions are the result of negligence on the part of the university or its agents." Such a Statement is an extremely unusual addition to any EIA document.

Based on information in the Fluvio report (pg. 39--44, and Figs. 9-1 thru 9-5), the original study included, among all the data, analytical results (2002-2004) for both water and sediment samples collected down gradient of the old tailings piles.

Additional Technical Support for these Baseline Conclusions are included in the Appendices.

<u>Baseline Surface Water Quality</u>

The EIA states that several programs of baseline surface water quality monitoring have been conducted sporadically over many years (since at least 1998). A summary of surface water quality data is presented in Appendix A., but the tables fail to show the sampling dates, and baseline data for many important chemical constituents are lacking or are inadequate at numerous locations, as is discussed below**.**

The Water Baseline document (Vol. 1, pg. 9-10) describes field activities during only one month in 2000, and it is unclear what sampling occurred during 2001. RMGC provided me examples of the historic data on water draining from the 714 Adit, Site R085 *[An adit is the entrance to an underground tunnel that is roughly horizontal.]*, from their more extensive computer data base. These data indicate that the Adit was sampled once in 2000 (late November); twice in 2001 (May and October); twice in 2002 (April and November); three times in 2003, 2004, 2005. RMGC stated that surface water monitoring was continuing, but that the later data had not been entered into the database. Hence, it appears that the baseline surface water quality data (Water Baseline, vol. 1 and Appendix A), represent very few samples from only 2000-2001, and most of the hydrogeologically-important constituents are missing (see discussion below).

EIA Volume 1, Water Baseline Report, presents only selected water quality data. Appendix A reports data for: pH, total (T) and dissolved (D) arsenic (As), T/ D cadmium (Cd), T/D Nickel (Ni), T/D Lead (Pb), mercury (Hg---assumed to be T, but it has no specific designation), T Chromium (Cr), selenium (Se---assumed to be T), sulfate (SO4, or using the British spelling, sulphate; usually reported as T), bicarbonate (HCO3, usually reported as T).

For both surface water and ground water quality baseline data, the EIA fails to compile a summary of the complete water quality data collected at all water monitoring locations from all dates. Additional surface water quality data collected during 1998 (March, April, May) are presented in the Biological and Bacteriological Baseline Report (Vol. 1). For some unexplained reason, RMGC has chosen not to integrate these1998 data [V.1, pg.

11-14] into the baseline data base, even though these analyses report many more constituents than the analyses in the Water Baseline Report. Clearly, part of the difficulty is that, between 1998 and the present, different parties have collected samples, different sampling and handling methods may have been used, different laboratories and analytical procedures were likely employed. None of these specific parties or details are clearly identified in the EIA. For all of the above reasons, comparable EIAs around the world compile their baseline water quality data sets over a period of one to two years of intensive sampling---prior to the initiation of the operational phase.

The water quality data for Adit 714 (from 2000-2005) in the RMGC database indicate that extremely elevated concentrations of the following constituents, as a minimum, are capable of being released from the Rosia Montana ores and wastes under low pH conditions: arsenic, cadmium, copper, iron, nickel, lead, zinc, antimony, chromium, manganese, mercury, molybdenum, and selenium. These data indicate that "complete" baseline data set should be compiled for selected crucial surface water (and ground water) monitoring locations. Such a "complete" suite of constituents would include all or most of the constituents described at the beginning of the Baseline Water Quality section above. It is especially important that a revised / expanded baseline monitoring database be compiled which also includes nitrate, ammonia, uranium, common organic compounds and fuels, and cyanide [WAD and Total], together with cyanate and thiocyanate and radioactivity determinations.

Clearly, the list of baseline water quality constituents actually reported in the EIA is truncated in an attempt to avoid revealing the full extent of the existing contamination. Given the presence of large accumulations of processed tailings, it is imperative that cyanide concentrations be included in a revised compilation of baseline. The Adit 714 data in the RMGC computer database shows only one determination for cyanide (Apr.19, 2002), with all the other dates reporting cyanide concentrations as "0". It would be much more informative if one knew the actual detection limit for this cyanide determination. RMGC stated that the CN results were for Total CN, but the exact CN form was not specified on the table. **It is of concern that no *recent* water quality data---representing either surface or ground waters--- are presented in the EIA from areas down gradient of any existing tailings piles.**

Missing constituents: The surface water baseline in the EIA [V.1, Water Baseline] fails to include or discuss the following important constituents, as a minimum: cyanide (any form), nitrate, ammonia, chloride, fluoride, numerous metals and metal-like elements, organic compounds (petrol, kerosene, etc.), and radioactive constituents.

Because of the confused nature of the EIA, it is not possible to determine the detailed surface water baseline conditions of the RMP. In order to quantitatively define baseline surface water quality for the RMP, "complete" water quality data need to be collected monthly for at least a year from at least one monitoring station near the mouth of both the Rosia and Corna Valleys. Discussions with RMGC indicated that surface water site S010, near the mouth of Rosia Stream might be a suitable site for intensive monitoring. However, this has not been done. The baseline data presented in the EIA for S010 are totally inadequate in terms of the months sampled and the completeness of constituents analyzed and reported. Similar detailed baseline data should be compiled for the sites near the mouth of Corna Stream and the Saliste Valley downgradient of the existing tailings, near its confluence with the Abrud River.

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Useful baseline data should also include the **calculation of constituent loads** [concentration x flow] for all environmentally important constituents. With such data, one can determine changes in the actual mass of chemical constituents, such as cadmium, moving through the system. Because RMGC maintains a weir at station S010, such calculations can be made and should be included in a revised baseline database.

Baseline Ground Water Quality

[Note: See discussion in Baseline Hydrogeology section for more details on the inadequacies of the ground water program.]

The EIA presents no recent, baseline ground water quality data. No sampling dates are shown on any tables in Appendix A. Also, the text fails to describe the actual dates ground water samples were collected. **The ground water quality baseline does not contain any data from actual constructed monitoring wells of known depths.** These data come from a combination of springs, hand-dug wells, and, apparently, uncased boreholes. The geologic water-bearing zones that yield these waters are not identified. Ground water quality baseline data are not interpreted with respect to the site hydrogeology. Several of the wells in both Corna and Rosia Valleys appear to be contaminated by mining waste sources. Unfortunately, because the list of chemical constituents presented in the EIA lacks some of the most informative constituents, such as nitrates, cyanide, etc.- it is not possible to verify these conclusions.

In acceptable mining EIAs, ground water quality samples are usually collected monthly or at least quarterly prior to compilation and release of the EIA. **Acceptable EIAs routinely include baseline ground water monitoring wells constructed in areas near and down-gradient from the proposed mining and processing facilities, including proposed smelters, waste rock and tailings locations.** Most reliable ground water studies require monitoring a minimum of three wells down-gradient of a possible contamination source. In such informative EIAs, baseline ground water quality and hydrogeology information are **integrated** to allow interpretation of contamination sources, flow mechanisms, and ground water-surface water interactions. **The RMP EIA ground water baseline contains few if any of these attributes.**

Figure 4.1 of the Hydrogeology Baseline shows **only one down gradient monitoring borehole in each of the important RMP ground water flow paths**: the Rosia Valley (R087), the Corna Valley (C165), and the Saliste Valley (D029).

Only one other monitoring borehole is shown on Figure 4.1, C166, the only other Corna Valley monitoring borehole that has been sampled. Unfortunately, that borehole would be covered by the proposed TMF, thus it is not a useful location for long-term monitoring and comparison to baseline conditions.

None of the specific completion details of these wells are presented (such as diameter, casing details, total depth), nor is the reader told, most importantly, the details describing how the samples were collected and handled. No **collection dates** are provided for any of the ground water baseline data in Appendix A, Volume 1.

Two ground water monitoring sites are located downgradient from the recently-active tailings impoundment in the Saliste drainage. These are hand-dug well D002, and monitoring borehole D029. **No recent data for these two sites are presented in the EIA.** The older data reported in Tables 13 and 14 indicated that, at that time, these ground waters still contained adequate alkalinity to prevent pHs from dropping below about 6.0. **Recent, "complete" analyses are needed at these locations to verify that the tailings alkalinity has not been depleted.**

The Hydrogeology Baseline Report states (pg. 6) that the Saliste Valley contains the existing Saliste tailings impoundment and is planned to contain the southwest portion of the plant site. Nevertheless, RMGC has failed to construct adequate monitoring wells / piezometers with which to evaluate the potential impacts to ground water quality, or to define baseline conditions in these two areas.

No *recent* ground water monitoring data are presented in the EIA for any locations down gradient of the old tailings in the Abrud drainage. Given the age of these tailings, it is likely that alkalinity and pH concentrations have dropped. Samples are needed in these areas to define the extent of ground water contamination.

The EIA contains little usable data with which to define the local ground water quality. Clearly, the EIA provides inadequate, quantitative information to allow the public to determine baseline water quality concentrations at the RMP. These data also raise concerns that numerous drinking water sources within both the Corna and Rosia Valleys may have been contaminated for some time.

International WQ Guidelines

Appendix 1 is a summary of the international water quality Standards and Guidelines most relevant to the RMP. It compares the Standards and Guidelines from the World Bank, the United States, Canada and Romania. This table does not include Standards and Guidelines for most organic compounds. Note that many of the constituents listed in this table, for which international Standards exist, are not included in any of the RMP baseline water quality data reported in the EIA.

Health Baseline

Volume 5, Health Baseline, states that residents of Rosia Montana and other nearby villages exhibit elevated incidences of numerous disease conditions when compared to other populations. The results were obtained through the use of a medical questionnaire answered by citizens in and near the RMP, and comparisons to other national health statistics. **This study, however, does not provide a quantitatively useful health baseline.**

Given that local environmental conditions have been seriously degraded for many years, it would have been extremely informative if the study had involved the collection of blood, urine, hair, fingernails, etc. from a large number of these citizens---especially those that had worked at Rosia Montana and those that live near the existing tailings and other facilities. In this way, the potential relationships between the past environmental degradation and the reported health anomalies could have been evaluated. In addition, a quantitative health data base could have been compiled which would allow comparison to future, comparable samples. Apparently, no such samples have been collected. Their existence is not reported in the EIA.

Section 6, Risk Assessment, describes supposed statistical relationships between health and environmental data. Unfortunately, the simple one to one correlations, such as the relation between soil mercury concentrations and hypertension, are far too simplistic to be of much value. Most toxicologists would argue that, in such environments, health impacts, such as hypertension, are likely to be produced by the synergistic effects of several toxic substances working together.

ARD / Post-Closure Water Quality

Acid rock drainage (ARD) is one of the most common and certainly the most expensive environmental impacts encountered at metal mine sites having significant quantities of sulfide-rich ores and wastes. Rosia Montana ores frequently have between 2 and 5 percent total sulfur, which indicates the presence of pyrite in significant concentrations. Many of the waste rock types clearly have acid-generating tendencies. One need only review the existing RMGC water quality data or travel through the site to observe the strong tendency of numerous local rock types to generate ARD. Some RMP site wastes presently generate effluents having field pHs less than 2.9**. If one considers a wide range of metal mine sites throughout the world, field pHs below 3.0 are not common.** Such values indicate a strong tendency to generate ARD in the rocks.

The EIA states that: “The project is unusual as a mining operation in that, because of the existing contamination from historical mining activities, most of its impacts on the aquatic environment, particularly on water quality, will be beneficial.”[Vol. 11, Chapt. 4.1, Water, pg. 8].

This project is not actually so unusual. At least three similar sites at which I have had involvement come to mind--- all in the U.S.A.: the Summitville Mine in Colorado, the Red Dog Mine in Alaska, and the Zortman-Landusky Mine in Montana. All had previous, significant contamination, two from historic mining and one (Red Dog) from natural erosion of the ore body. In all three situations the parent corporations were Canadian companies, and the operators received their permits partly on the basis that the new activities would clean up the existing contamination. All three of these sites currently require operation of a full time water treatment facility, with no end in sight. Treatment at two of the sites, Zortman and Summitville is being paid by the U.S. taxpayers because both operations went into bankruptcy after severe, unpredicted water quality problems became obvious.

The RMP EIA authors make varying and conflicting statements and predictions throughout numerous EIA volumes about the tendency of the site wastes and facilities to ultimately generate ARD [i.e.: Vol. 8, Chapt. 2, Technological Processes, pg. 129; Vol 10, Chapt. 3 [Waste], pg. 18, 20, 34, 36; Vol. 13, Chapt. 4.5, Subsoil Geology, pg. 21-31; Vol. 22, [Waste Management Plan, pg. 25; Vol. 11 [Potential Impacts], Chapt. 4.1, Water, pg.51, 55, 60, 65, etc.]. Despite many of these naïve and misleading statements, it appears obvious that **regulators should take a conservative approach and assume that, in the long-term, ARD will be generated from several Rosia Montana sources, post-closure.**

As a result of the activities proposed in the EIA, the RMP water quality, in general, will improve while the project is being actively operated and maintained. It is much less certain how effective the proposed measures will be for mitigating long-term, post-closure ARD and related contamination. Acid rock drainage and other contamination are likely long-term impacts that will occur at this site, post-closure.

In addition, the RMP geochemical data indicate that the public should be concerned with general long-term water quality degradation that will likely result from the release of contaminants, **even without the formation of acid conditions**. Such contamination is likely to result from the mobilization of numerous anions like nitrate, sulfate, ammonia, together with increased sediment loads, and total dissolved solids (TDS), and mobilization of fuels, greases, and numerous metals and metalloids that are mobile at both acid and alkaline pHs, such as arsenic, aluminum, antimony, iron, manganese, mercury, lead, nickel, chrome, selenium, molybdenum, uranium, etc.

Sulfide Rock

Much of the RMP rock will be sulfide-rich material. Additional evidence of the pervasive impacts associated with mining sulfide ores can be found by reading Todd and Struhsacker (1997). This study was commissioned by the mining industry in an attempt to favorably influence mining legislation in the State of Wisconsin (U.S.A.). It was intended to show "…that a mining operation has operated in a sulfide ore body in the United States and Canada for at least 10 years without polluting groundwater or surface water from acid drainage at the tailings site or at the mine site or from release of heavy metals." It was also intended to show "….that a mining operation that operated in a sulfide ore body in the United States or Canada has been closed for at least 10years without polluting groundwater or surface water from acid drainage at the tailings site or at the mine site or from the release of heavy metals."

Data from hundreds of mine sites from the U.S. and Canada were investigated. **A careful reading of the details in this paper shows that the authors were unable to locate any sites that totally complied with the criteria at the time the paper was published.**

Additional technical support for these opinions is included in the Appendices.

Semi-PassiveTreatment.
In numerous volumes (i.e. Vol. 11, Chapter 4.1, Water, pg. 74-75) the EIA gives the impression that post-closure water quality will be maintained within the appropriate guidelines by employing semi-passive treatment cells, which will replace the previously-employed active treatment plant. Furthermore, it is claimed that no negative impacts to water quality will result from the long-term use of such semi-passive treatment.

Unfortunately, the technical literature and real world experience demonstrate that, given the type and degree of contamination present at the RMP, **semi-passive** treatment solutions will not allow sufficient improvement in water quality to meet international discharge standards and the waters would likely be toxic to sensitive plants and aquatic organisms. These semi-passive treatment methods have been especially unsuccessful when employed in areas that have severe winter conditions.

I know of no examples, anywhere, that can demonstrate the long-term, applied success of semi-passive treatment methods in cleaning such waters to meet the desired standards / criteria. It is likely that, long-term, the effluents released down gradient from the Secondary Containment Dam will be unsuitable for many agricultural and domestic uses, if only semi-passive treatment is employed.

Cyanide Environmental Concerns
Cyanide is one component of environmental concern in the chemically-complicated “soup” that makes up the RMP process wastes (tailings) and those from typical cyanide-leach gold wastes (Moran, 1998, 2000a, 2000b). It can be present in mining wastes and the surrounding environment in numerous chemical forms that result from the reaction and decomposition of cyanide, such as free cyanides, metal-cyanide complexes, cyanates, thiocyanates, ammonia, possibly organic-cyanide compounds, cyanogen, cyanogen chloride, and chloramines. All of these chemical forms have some degree of toxicity when released into the environment (Moran, 2001, 2002).

The RMP EIA fails to include any form of cyanide data in its discussion of the site baseline water quality for either surface or ground waters (see Water Baseline Report, Volume 1). Furthermore, the EIA is exceedingly unclear with respect to the existing cyanide contamination of the waters and soils at the RMP site and surrounding areas containing the existing tailings. On page 8 of Chapter 4.1, Water [EIA, volume 11], it states: **“**Cyanide will be introduced to the area during the proposed Project for the processing of the precious metal ore; however, **it should be noted that cyanide has occasionally been detected during routine sampling of the baseline condition**, albeit below the level prescribed by TN001 (see Table 4.1-17).**” Does this mean that cyanide was used by Minvest in the earlier processing and that it is a contaminant in the existing tailings? RMGC has publicly denied that cyanide was previously used at the site.**

The present RMP water quality baseline monitoring [ground water and surface water] should have included data for WAD-CN, Total-CN, thiocyanate, and cyanate. Future water quality monitoring should also include these cyanide forms in all analyses.

Wastes such as those for the proposed RMP---and likely in the fresh tailings present on site---are quite complicated chemically, containing fluids with high concentrations of suspended sediments; cyanide and breakdown compounds (such as free cyanides, metal-cyanide complexes, cyanates, thiocyanates, ammonia, possibly organic-cyanide compounds, cyanogen, cyanogen chloride, and chloramines); numerous metals (for example, arsenic, cadmium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, mercury, molybdenum, vanadium, zinc); non-metals (sulfates, chlorides, fluorides, nitrates, and carbonates may all be elevated); radioactive constituents (such as uranium, radium, gross alpha and beta); organic compounds; and high pH.

The high pH environment in cyanide leach wastes makes many metals and metal-like elements more mobile, hence it is common for such wastes to have elevated radioactivity and metal concentrations. Commonly, neither regulators nor the public are aware of the actual chemical components or concentrations of such wastes.

The Rosia Montana ores and wastes release usually high concentrations of total cobalt---up to 2483 micrograms per liter---from the waters draining the underground workings (see RMGC data base, Site 085, the 714 Adit). These data suggest that cobalt-cyanide complexes will form in the processed wastes, together with numerous other metal-cyanide complexes. Research conducted by the U.S. Geological Survey (Johnson, *et. al*., 2001, 2002, 2005) has found that such complexes, and many other complexes, can release significant quantities of free cyanide, creating conditions that are extremely toxic to aquatic organisms when released into the environment.

Cyanide Detoxification

The EIA states that the waste solutions from the process plant, the tailings solutions, will be treated using the INCO cyanide decontamination process. This process is frequently employed to treat ores containing iron sulfides, or where iron cyanide complexes are present in the effluents in significant concentrations. It involves the addition of SO_2, air, and a copper catalyst to break down cyanide. **While this process does greatly reduce free cyanide concentrations, it results in the formation of several other byproducts that may be toxic to aquatic organisms, such as: cyanate, thiocyanate, sulfate, ammonia, nitrate, some free cyanide, and elevated copper concentrations. Such treated effluents may also contain elevated concentrations of other metals.**

Most Canadian gold sites that use the INCO process are able to generate effluents that meet the official discharge standards in relation to cyanide concentrations. However, many of these effluents are **still toxic to organisms** in bioassay tests (Dr. George Dixon, toxicologist, U. of Waterloo, personal communication, 1999). Thus, these complex solutions produce toxicity effects we do not understand, probably as a result of synergistic effects, or they contain toxic constituents that are not being detected or regulated (Moran 2001, 2002a).

Interestingly, the concentrations of many metals and other chemical constituents [i.e. aluminum, antimony, arsenic, copper, cobalt, lead, mercury, manganese, molybdenum, iron, selenium, strontium, thallium, sulfate, chloride, alkalinity, cyanate, thiocyanate, ammonia, nitrate, some free cyanide, etc.] in the tailings liquid can actually **increase following INCO treatment**.

Based on lab testing, RMP tailings waters/ effluents will have significantly reduced cyanide concentrations, BUT they **will contain Total CN concentrations that significantly exceed the Romanian TN001 Standard** following the INCO treatment. [Table 4.1-18, p. 60, Vol. 11, Chapt. 4.1, Water].
Table 4.1-18 data show that, following INCO treatment, the RMP tailings effluent concentrations will **increase to above TN001 Standards for Total cyanide, ammonia, arsenic, calcium, molybdenum, and sulfate.** These test results represent the expected effluent composition **after only a few days of contact time** between the tailings liquids and solids. In practice, the liquids and solids will be in contact for many years, theoretically forever. Thus the actual chemical compositions of such tailings effluents usually have much higher concentrations of many additional components when determined after months or years of contact time.

Note that the Pre-Treatment and Post-Treatment cyanide concentrations reported in the **Technological Processes Report** (Vol. 8, Chapt. 2, pg.89) are totally different and much higher than those reported in Vol. 11, table 4.1-18 (see above). Such test results, obviously, provide only a very general approximation of the actual chemical composition of the future tailings.

A more comprehensive version of the INCO-Treated tailings effluent analyses is presented in the Waste Report, Vol. 10, pg. 19-20, Table 3-6, and contains an informative footnote**: "The data results from laboratory tests. Under large scale operating conditions, the Cyanide concentrations are expected to be in the range of CN Tot = 12—15 mg/L and CN WAD = 5—10 mg/L."**

These anticipated cyanide concentrations greatly exceed the TN001 Standard for total cyanide. This implies that such lab tests are largely useless for making precise, quantitative predictions of effluent concentrations.

Cyanide Management / Code

Following the Baia Mare spill and several other environmental incidents involving cyanide, a mining industry-funded research association, together with the United Nations Environment Programme (UNEP) organized a series of meetings in an effort to prepare a cyanide "code", with the objective of describing "best use" practices. Unfortunately, this process was funded primarily by the industry, and was largely controlled by it. Even the participants from the UNEP staff came largely from industry-sponsored positions. Therefore, the Code reflects, predominantly, what is best for industry, not the interest of the environment or the public.

While it contains many positive aspects, one should note that the Cyanide Code is a *voluntary* program, involving self-monitoring by the industry, not by regulatory authorities.

Unfortunately, the CN Code states that direct or indirect discharges to surface waters can contain up to 0.50mg/L WAD CN. Then, the Code states that a Free CN concentration less than 0.022 mg/L downstream of any established mixing zone is acceptable. Most objective experts would agree that there is no reliable analytical method to analyze Free CN at low concentrations (C. Johnson, US Geological Survey; G.Miller, U. of Nevada). **More importantly, many fresh water aquatic organisms would be killed by prolonged exposure to a WAD cyanide concentration of 0.50 mg/L, or a free CN concentration of 0.022 mg/L.**

If read closely, one will note that the Cyanide Code contains no actual remediation measures for a spill of cyanide into a river or lake---because all of the options have significant environmental impacts (Moran 2002a). Nevertheless, the tone of the EIA implies that the public should have no concerns regarding a cyanide spill into water! This is simply untrue.

The Cyanide Management Plan (vol. 26, pg. 29) states that WAD cyanide in the tailings will be kept at or below the 10 mg/L EU regulatory limit. Firstly, **WAD cyanide determinations fail to detect numerous other toxic forms of cyanide. More importantly, ingestion of a solution containing 10 mg / L WAD CN would be rapidly toxic to numerous species of wildlife.**

Cyanide Monitoring

As noted previously, cyanide is not included in the Water Baseline Report Vol. 1] summaries of routine water quality [Appendix A Data Tables]. It is clear that RMGC has water quality data on cyanide in their databases, but these have not been made public in the EIA, and these databases fail to define the specific form of cyanide that was determined.

The EIA "Monitoring" volume [Volume 17, Chapter 6] is **totally unclear what forms of cyanide will be determined during routine water quality monitoring at the RMP, both during operation and post-closure.** Table 6-2 lists only Total Cyanide, while Table 6-3 lists Total CN, Free CN, and WAD CN. **However, it is clear from the wording on pg. 16-17 that the actual CN forms to be monitored have not yet been determined. Both Total and WAD should be included in future monitoring and should have been reported in all past monitoring and determination of baseline.**

Radioactive Components

Past uranium mining in the Apuseni Mountains is well known (Steblez 1995). In addition, the presence of uranium and other naturally-radioactive constituents (such as uranium, radium, potassium-40, strontium, thorium, gross alpha and beta, etc.) in precious-metal ores and wastes is commonly reported throughout the world. **Many such constituents accumulate in the tailings due to the elevated pH environments of the process**

fluids, which can mobilize these and other oxyanionic forms. The Waste Report (Vol. 10, Table 3-6 pg. 19) shows that the TMF decant water had a uranium concentration of less than 0.010 mg/L. Nevertheless, this was one sample, and it failed to look at the broader population of naturally-radioactive constituents. Also, the EIA apparently does not report the uranium concentration in the tailings solids themselves (Table 3-4, vol. 10 (Waste), pg. 17, where uranium is not reported.). In such metallurgical tests, the contact time between the water and sediments is short---only a few days. Thus, the results often greatly underestimate the actual concentrations of numerous metals and metalloids in the actual produced tailings.

Despite the repeated statements throughout the EIA that: "Radiological characteristics: no geological and technical indications." (i.e. Vol. 10, Chapt. 3, pg. 16)---it seems only prudent that uranium and gross alpha and beta determinations should have been included in the RMGC water quality baseline. Note that**, in Gabriel's home country, Canada, public drinking waters are required to contain no more than 20 micrograms per liter (20 parts per billion) of elemental uranium.**

Toxicity Testing

Regulatory agencies often require that the potential toxicity of mining effluents be evaluated by conducting Whole Effluent Toxicity (WET) tests, where organisms, such as freshwater shrimp (*Ceriodaphnia)* are exposed to varying concentrations of the *actual waste mixture*. Actual WET tests should be conducted using treated RMP tailings solutions, rather than relying on promises or theoretical predictions. **Such testing demonstrates the total toxic effect of all the chemical components within the wastes "acting" together on the test organisms.**

Water Costs

This EIA contains no discussion of the costs the company will pay for water as a commodity. Frequently in less developed countries, industries, including mining operations, are not required to pay for the water they use. Sometimes they will be charged a *nominal* and artificially-low price for the use of surface waters---prices much lower than are usually paid by agricultural users. However, often the mining companies will simply avoid even these modest water costs by constructing wells near rivers or lakes, which then extract the surface waters **indirectly,** because the nearby ground waters are usually interconnected with the surface waters (Moran, 2002b).

Both the EIA and the Technical Report (Gabriel Resources 2006) state that fresh water for project use will be taken from the Aries River and transported to the site via a 12.7 km long, buried pipeline (Technical Report, pg. 20). Will RMGC be required to pay an actual market price for the water they use? Will RMGC pay for construction of the pipeline?

The EIA provides no specific hydrogeologic details to evaluate either the interactions of the surface and ground waters or to evaluate the actual costs the company will pay for water. As a result, any attempts to describe **cost-benefit analyses** would seem to be unrealistically biased.

Cumulative Impacts
RMGC is currently conducting additional exploration near Bucium, to the southeast of Rosia Montana. It is possible that these ore bodies may also be developed in the foreseeable future. Thus, as with most similar gold mine EIAs, the document fails to realistically discuss **the total impacts** the local population is likely to experience. If other ore bodies are developed, additional natural resources will be impacted. In fact, many of the technical details presented in the EIA will obviously change.

Companies normally argue that they cannot evaluate a scenario that does not actually exist. Obviously that sort of comment is foolish as that is precisely what EIAs were originally intended to do. This EIA should have been required to evaluate the *cumulative impacts* to all populations and resources within the region, **and required to evaluate and discuss "what if" scenarios which would consider the possible impacts to regional water resources, etc. if several of the additional metal deposits were also permitted and operated.**

Financial Assurance
i. Environmental Remediation
If unexpected environmental impacts occur after mine closure, who will pay for them and with what funds? There are literally thousands of mining and mineral processing sites throughout the world that have been abandoned without adequate, sometimes any environmental remediation. Despite industry claims, many of these are modern mines operated in the last ten to twenty years.

The most significant and costly problems of abandoned mine sites almost always involve water contamination, where operation of a long-term water treatment plant should have been required. **However, often these contamination problems do not become obvious to the public until after the projects have been closed and the responsible corporation is dissolved or gone.** In the U.S.A. and Canada, there are numerous examples where environmental problems have become obvious, often after the mines have closed, and the costs to remediate these problems have often been from a few millions of dollars up to hundreds of millions of dollars (U.S.). Under these conditions, the cleanup costs must be paid with *public funds.*

In both Canada and the U.S.A., it is now routine procedure for the State and Federal regulatory agencies to require the mining companies to provide some form of adequate financial assurance, often a financial bond. The bond is normally provided by a reputable insurance company and held for the government by an independent trustee. Canada, the home base for RMGC's corporate parent, Gabriel Resources, has defined detailed provisions describing all aspects of the calculation, collection, holding and release of such financial assurance bonds.

As with all other aspects of the EIA and environmental approval process, the most crucial requirement is that **truly, financially-independent** experts be employed to calculate the financial amounts of the reclamation bonds. The weakest aspects of most comparable bonding / financial assurance plans often are:

- reclamation bond amounts are far too low because they have been calculated by “interested” experts who assume that long-term, *active*, water treatment will not be required---and then it is!
- *tranches* of the bond are often released to the corporation (or insurance company) sequentially as post-closure reclamation occurs, so that no remaining bond is available to the government. **Frequently, water contamination does not become clearly evident until years or even decades after mine closure, often when all, or most of the bond has been released.**
- the State authorities require the company to provide only relatively small percentages of the total anticipated bond during the early years of operation. If a company were to go bankrupt during these initial years, inadequate funds would be available to operate an active water treatment plant.

Given the existing ARD conditions at the RMP [severely depressed pH conditions, often below pH 3.0, together with very high dissolved metals and other chemical constituents] Romanian and EU authorities should assume that funds will be required to operate an *active* water treatment plant, long-term, and possibly in perpetuity, post-closure. This represents the reasonable, financially-conservative assumption that is often avoided at many comparable sites.

Volume 29 [Mine Rehabilitation and Closure Management Plan], pages 128 through 130, entitled RMP’s Environmental Finance Guarantee (EFG), discusses some legal and theoretical aspects for ensuring that funds will be available for closure and rehabilitation of the site. Table 1, pg. 130 summarizes RMP Closure Estimate Costs. **It estimates that $70,789,884 (USD) will be needed to cover environmental closure costs.**

Note that the cost estimates calculated by RMGC’s experts assume that most of the anticipated clean-up costs will not be provided to the Romanian authorities until after year 16. If RMGC were to develop financial problems before then, the State would have inadequate funds to cover long-term remediation costs.

It should also be noted that the EIA fails to provide funds necessary to collect and treat waters contaminated by the existing tailings piles located in the Abrud and Saliste drainages.

Discussions regarding financial assurance should be made publicly available. The public would have increased confidence in the EIA process, if the details of financial assurance issues had been included in the original EIA.

The actual legal and contractual details of the EFG have not yet been determined, but they need to be finalized and made public in the EIA. **When negotiating the terms financial assurance, it seems likely that RMGC would require some financial credit for the improvements in water quality they claim will occur.**

ii. Institutional / Infrastructure Costs---Development Foundation
RMGC has stated that numerous new facilities, infrastructure and programs will be initiated or upgraded as part of the project. Examples include improved water supply and treatment systems, schools, roads, health clinics, re-training of citizens, etc. **Once the mine closes, however, cash flow ceases and funds are no longer available to operate and maintain such activities.**

RMGC has proposed that such long-term needs will be financed via operation of the Rosia Montana Development Foundation [see Volume 31, pages 103 through 115. Similar foundations have been initiated in the last few years at other mining sites in Chile and other locations. **Most have been set up with relatively small amounts of capital. Because these are recent developments, it is far too early to draw conclusions regarding their long-term success.**

Despite all of the benefits promised in the Community Sustainable Development Management Plan (section 9 of volume 31), **none of the specific details concerning the operation of this Foundation are presented.** The Foundation might operate as described, but it might not. There appear to be no Romanian or EU laws that require the Foundation to operate as promised. In order to actually develop the activities mentioned above, long-term, such a Foundation would require large **amounts of capital**. The EIA provides no specific details on the amounts of capital that would be provided to operate the Foundation.

Also, the public should know that it is not possible to point to any examples of *sustainable* gold mines with long-term records of operation. Such operations don't exist. They may in the future, but at present, the term sustainable mining is presently an undemonstrated desire, a wish.

6. Miscellaneous EIA Comments

Biodiversity Report, Vol.13, Chapter. 4.6, provides **no quantitative analysis of benthic invertebrates to allow use as actual baseline**.

The Soil Pollution section of Vol.13, **Soils**, p. 25, states that the current Cetate and Carnic Pits are "***stationary potential sources of pollution."*** This section then concludes: ***"In effect, the area currently contains no mobile source of soil pollution."***

The pits themselves are obviously stationary, if one neglects the movement of the pit sediments via mass wasting. However, this discussion naively neglects to consider that numerous chemical constituents contained within and on the pit walls and floor are mobile---including blasting residues, mobile metals and metalloids, non-metals, etc. **Exposure of these soils or rock to weathering allows the chemical constituents to be mobilized into the environment, especially via ground water pathways.**

Most importantly, the Soil study fails to provide an adequate, quantitative data base of the baseline chemical components [especially metals / metal-like elements, selected anions and organic compounds] in the soils, especially in areas where future facilities will be constructed.

Monitoring Report, Vol. 17:
This report provides no defined goals for water uses following closure of the RMP. It states that environmental and social performance criteria *will be established,* but none have. Such criteria should have been established and presented within the EIA.

Table, figure and section numbers do not correlate. The sections are numbered 1.0—5.0, but the Tables are numbered 6.1—6.11! This report presents similar confusions for Figure and Exhibit numbering.

-Page 5 states: “A detailed discussion of the existing (monitoring) programme is presented in Section 6.1.2.” However, **no such section exists. For clarity, this report should have been combined with baseline volumes.**

Page 16 states: “Parameter suites will be defined in the appropriate monitoring plans, and a provisional schedule is shown in Table 6.2.”
Nevertheless, nothing is actually defined.

Social and Economical Environment Report**,** Vol. 14:
On pg.12 it states: “There is no precedent in Romania for a major extractive project implemented in conformance with Romanian regulations and transposed EU legislation and standards; there is no precedent in Romania for a major extractive project implemented in conformance with International Finance Institutions’ and the Equator Principles’ requirements.”

Such an initial statement should raise great concerns on the part of outside investors and regulators about the ability of the Romanian regulatory agencies to successfully oversee such a project.

In general, the wording of this volume shows obvious bias towards mining without recognizing or quantifying any of the past / present environmental costs that are routinely associated with mining. Apparently these costs have all been externalized.

On pg. 27-28, the authors make several reasonable observations about the existing, less-developed economic conditions, BUT they then **argue, circularly, for replacing mining with MINING**, and again externalize the associated environmental and health costs!

Page 27, sect. 4.5 states: “Environmentally the area is of low conservation value---water resources (streams, etc.) are, by and large, polluted, habitats fragmented, landscape scarred, and on-going anthropogenic impacts occur.”

On page 28 it notes that Campeni has a more diverse and higher income base than Rosia Montana. **Correct, but this situation does not result from having mining.**

Page 29- 32, reports that the Health Status is much reduced compared to the general Romanian status. It states that there are several causes, but concludes it results partly from risks related to mining.

Who will pay to redress these degraded and depressed conditions? The implication is that new mining will pay to redress these issues. What will be the sources of funds for remediating the environmental and health issues, and for maintaining the local infrastructure after the RMP project closes?
This report proposes substituting one short-term solution for another.

Most importantly, this report provides no balanced, quantitative cost-benefit analysis to support its conclusions.

Risk Cases Report **Vol. 18, Chapt. 7: Long-term versus Short-term Impacts.**
This report focuses on describing the risks that various acute or catastrophic events will occur during the life of the RMP. **Unfortunately, it neglects discussing the slow, chronic, almost invisible processes, such as long-term ground water contamination that almost always occurs at mine sites.**
Such chronic processes are much harder to evaluate and predict, thus they are often disregarded---as they are here. However, they frequently represent the much greater long-term financial risk for the public.

As evidence of this, one should know that insurance providers have, for several decades, refused to provide insurance covering such long-term, chronic releases to the environment, while they do provide insurance for acute, catastrophic, unforeseen events---such as a tailings dam failure. The insurance industry argument has been that if an environmental release was long-term and chronic, it was therefore not unforeseen, and the causes should have been rectified by the company. Thus, they have generally not paid claims to mining companies relating to such chronic releases.

Page 17, vol. 18, Ch. 7: implies that the main mining risks are related to cyanide. Worldwide experience would suggest that this is untrue. The financial risks associated with the development of chronic ARD and water competition are probably more significant risks.

Contrary to what is stated here, some research suggests that cyanide ingestion may have chronic impacts in some aquatic species (see references cited by Heming and others, 1985, 1989). Most of the recent, readily available cyanide research is funded by industry, thus such studies have not received much support. The wording here shows a poor understanding of the associated chemistry and research, and demonstrates a pro-project bias.

Pages 20-23: Provides descriptions of accidents that are totally simplistic and dismissive. What would the Romanian and Hungarian authorities have done if they HAD been notified promptly to remediate the Baia Mare spill? As stated above, there is no treatment of such a spill into water which does not entail significant environmental impacts (i.e. the addition of hypochlorite to cyanide spills).

Ch. 8 reiterates that cost-benefit analyses of the various options were never performed. Furthermore, it describes sustainable mining, for which no long-term examples can be shown!

World Bank Relationships / Extractive Industries Review

In 2002 the IFC withdrew from financial support to for Gabriel's Rosia Montana proposal. According to Bloomberg News, the IFC was concerned about the lack of planned pollution controls, revenue management, and the relocation of hundreds of residents. IFC Spokesperson Corrie Shanahan explained that "there were significant environmental and social issues connected with the project" (Bloomberg News, 2002).

In 2001, civil society represented by a consortium of international non-governmental organizations (NGOs) pressed the World Bank Group (WBG) president, James Wolfensohn for a review of the Bank's involvement in the Extractive Industries sector, which includes mining. Civil society had become critical of the WBG's role in lending to and oversight of these industries, and they "wanted to be consulted and recognized as equal partners in development, especially in extractive industries that deplete nonrenewable extractive resources and have negative impacts on affected communities and resettled indigenous people."
[Quote from Extractive Industries Review Final Report, vol. 1, Dr. Emil Salim; http://www.worldbank.org/ogmc/files/eirreport/volume1english.pdf]

As a consequence, the WBG set up the Extractive Industries Review (EIR), a two-year, interactive process to evaluate the Bank's involvement in this sector, which evaluated past successes and failures, and made recommendations for future Bank practices. In the fall of 2003, I was appointed to the Advisory Board of the EIR, which assisted Dr. Emil Salim in preparing the Final EIR report. The Final EIR report was submitted to the WBG at the beginning of 2004. Amongst the recommendations accepted by the WBG are as follows:

1. "The sequencing of our activities in EI (Extractive Industries) will be **based upon governance capacity and risks**. **Where we make judgments in favor of involvement we will disclose our rationale. For significant projects we will require risks to be mitigated."**
2. "The Bank Group will **require revenue transparency as a condition for new investments in EI."**
3. "We will establish **independent monitoring mechanisms for our largest projects."**
4. "The Bank Group will **only support extractive industry projects that have the broad support of affected communities."**

The entire EIR Management Response report [World Bank Group Management Response to the Final Report of the Extractive Industries Review; September 17, 2004] can found at the link above.

Conclusions

It is important to note firstly, that mining companies are not predominantly *development companies*. Their main expertise is in extracting gold and silver from rock; not primarily at preventing environmental degradation, and certainly not at developing communities. Secondly, one needs to recall that simply because a company *states or predicts* that no negative impacts will occur (for example, that water supplies will not be impacted), even when stated repeatedly for 4500+ pages, this does not mean that significant impacts will not, in fact, develop.

Many of the most crucial, misleading and potentially-costly aspects presented in this EIA relate to the last words of the Introduction to Chapter 4.1, volume 11, Water, pg.8:

"In closure, most of the existing and Project-related sources of these pollutants will be permanently removed or closed, and the project will commit to the longer-term management of any potential residual post-closure sources of acid rock drainage, even though these will be below the levels that occur in the current baseline condition.

Other impacts associated with the Project are related to water resources and surface water and groundwater quality that could become affected by new potential sources of contaminants. The principal example is the use of cyanide in ore processing. There are potential impacts associated with these contaminants that will require the implementation of mitigation measures and management plans. Cyanide merits particular attention due to concerns related to past environmental incidents in Romania (Baia Mare) and elsewhere, and public perceptions about the chemical. Although cyanide has a significant intrinsic acute hazard potential, the chronic toxicity of cyanide in the environment is less than some metals that currently exceed standards in the Project area. At hazardous concentrations, cyanide is managed entirely within the closed process circuit.

The following section presents the baseline information and provides a summary quantification of the existing water quality issues.**"**

Let's examine these words more carefully. Referring to the words from page 9 above, the EIA is unclear and misleading when describing *precisely* what is meant by:

1- **"…..most of the existing and Project-related sources of these pollutants will be permanently removed or closed, ………"** One is forced to ask: Which specific sources will not be removed or closed? How does this relate to the existing tailings?

2- "….and the project will commit to the longer-term management of any potential residual post-closure sources of acid rock drainage……" Specifically, what is RMGC committing to when they say *longer-term management*? Does this mean they agree to fund **perpetual collection and**

active water quality treatment of contaminated waters ---if this is required following closure?

3- **"….even though these will be below the levels that occur in the current baseline condition."** This phrase raises two issues that require clarification. Firstly, we do not presently know what the future water contaminant concentrations will be---despite the simplistic predictions presented in the EIA. Secondly: What are the **specific baseline concentrations** that RMGC is committing to for surface and ground waters? **Which specific data from which specific monitoring sites are considered to represent the specific baseline concentrations?** Unfortunately, the EIA is totally unclear concerning this issue. Does the EIA refer to the very limited baseline concentrations included in the Water Baseline Report, Volume 1, or to the data and information presented in this volume, vol. 11, chapter 4.1, beginning on pg. 10, confusingly entitled Baseline Information? **This distinction is crucial for successful regulation of the RMP site.**

4- **"Other impacts associated with the Project are related to water resources and surface water and groundwater quality that could become affected by new potential sources of contaminants."** Note that this states, reasonably, that ground quality could become affected. However, throughout the EIA it has been implied that ground waters will not be impacted, and that almost no ground water exists at the site. **Conveniently, the EIA has failed to adequately define either the presence or quality of alluvial and bedrock water-bearing zones.** Thus, if releases of contaminants to the site ground waters do occur, the present baseline information will be inadequate to reliably define these releases or ascribe responsibility.

5- **"Cyanide merits particular attention due to concerns related to past environmental incidents in Romania (Baia Mare) and elsewhere, and public perceptions about the chemical."** True, but then why was cyanide **not** included in the baseline data set presented in the Water Baseline Report, Vol. 1? **Because of this omission, the reader is unable to readily determine whether the RMP environment is presently contaminated with cyanide. Neither will this inadequate baseline data base allow one to evaluate potential future contamination with any forms of cyanide.** Should one relate aspects of the Baia Mare spill to the present RMP project? Clearly yes. However, RMGC has argued in the public consultations that the Baia Mare event has no relevance to the proposed project and comparisons should not even be discussed.

6- **"Although cyanide has a significant intrinsic acute hazard potential, the chronic toxicity of cyanide in the environment is less than some metals that currently exceed standards in the Project area."** This statement is at least *partially* correct. Even some non-metals such as free ammonia, which is commonly released at mining sites and results partly from the use of blasting compounds, is roughly as toxic to fish as is free cyanide (Moran 2001). **Why was ammonia not included within the RMP water quality baseline data reported in volume 1?** There are literally dozens of potentially-toxic chemical constituents in the RMP effluents that can be chronically toxic to aquatic organisms. Hence a much broader list of constituents must be *specifically* defined in the RMP baseline.

7- **"At hazardous concentrations, cyanide is managed entirely within the closed process circuit."** Most modern gold operations attempt to operate a *closed process circuit.* **Essentially all of these systems leak to some extent, long-term.** Inadequate definition of the ground water baseline conditions prevents the public and regulators from detecting such leakage.

"The following section presents the <u>baseline</u> (emphasis added) information and provides a summary quantification of the existing water quality issues." This wording is extremely misleading and confusing. Which are the specific data to be considered baseline water quality data? Those included here in Vol. 11, Chapter 4.1, or those presented in the Water Baseline Report of Volume 1?

The EIA makes clear that RMGC has presented an overall message that, not surprisingly, focuses predominantly on the positive aspects of the project, and minimizes the negative or potentially negative issues.

<u>Recommendations</u>
1-The EIA needs to be rewritten by a team of experts that are professionally and financially independent of RMGC or their representatives. Independent sources of funding should be raised to support this process.

2 –Representatives of the general public should be allowed total access to all historical environmental and health monitoring data relevant to the RMP and surrounding areas, including the Bucium area.

3-The general public should be allowed access to contract agreements between RMGC and the Romanian government, including: details on indemnification, insurance, and financial assurance issues. Public access to these documents should be facilitated whether the project is approved or not.

4-Financial Assurance measures that are truly robust, enforceable and available to the public must be negotiated prior to project approval. These assurances must stipulate that most of the assurance vehicle / bond be delivered to an independent trustee at the beginning of the project. Conditions must meet those that would be required by an international, commercial lending institution, as a minimum.

5-As has been recommended in the Extractive Industries Review Report (see above), the World Bank Group has been encouraged not to lend to projects in countries where institutional capacities are lax. Thus, it seems reasonable that Equator Banks would follow the same guidelines. Hence the RMP should not be accepted until the Romanian government can demonstrate they have the regulatory capacity and will to enforce the appropriate regulations.

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APPENDICES

Appendix 1. International Water Quality Standards and Guidelines.

Parameter	**Units**	**IFC Precious Minerals[1]**	**World Bank Guidelines[2]**	**US EPA**	**US EPA Aquatic Life[3]**		**Canada Agricultural[4]**		**Canada[5]**	**Canada[6]**	**Romania[7] [8]**	
		Mine Effluents	**Open Pit Mining**	**Drinking Water[9]**	**Acute**	**Chronic**	**Irrig.**	**Livest**	**Drinking Water**	**Freshwater Aquatic Life**	**Drink. Water**	**Industrial waters[10]**
pH	Units	6.0-9.0	6.0-9.0	6.5-8.5	6.5	9			6.5-8.5	6.5-9.0	[11]6.5-9.5[12]	6.5-8.5
TSD	mg/l			500			500-3500	3000	500			2000
Tot Susp Solids	mg/l	50	50								33	35(60)
Turbidity	NTU										<=5	
COD	mg/l	250	250									125
Bioch Ox Dem	mg/l	50	50								25	25
Oil+Grease	mg/l	10										
Total N	mg/l	10	10								15	10 (15)
Total Phos	mg/l	2	2								2	5
Sodium	mg/l								200		200	
Chloride	mg/l			250			100-700		250		250	500
Cl, tot res	mg/l				0.019	0.011						0.2
Sulfate	mg/l			250				1000			250	600
Sulfide	mg/l	1	1			0.002					100µg/l	1
Nitrate	mg/l			10 (as N)				100	10(N)	13	50 [13]	25
Nitrite	mg/l								1		0.50[14]	1
Ammonia (as N)	mg/l				0.002 to 0.325	0.032 to 0.049				0.019	0.50	2
Flouride	mg/l	20	20	4.0 (2.0)			1.0	1.0-2.0	1.5	0.12	1.2	5
Aluminium	mg/l			0.05-0.2	0.75	0.087	5.0	5.0	0.1	0.005-0.1	200µg/l	5.0
Antimony	mg/l			0.006					0.006			
Arsenic	mg/l	0.1	0.1	0.05(0.01)	0.34	0.15	0.10	0.025	0.005	0.005	10µg/l	0.1

Parameter	Units	IFC Precious Minerals[1]	World Bank Guidelines[2]	US EPA	US EPA Aquatic Life[3]		Canada Agricultural[4]		Canada[5]	Canada[6]	Romania[7 8]	
		Mine Effluents	**Open Pit Mining**	**Drinking Water[9]**	**Acute**	**Chronic**	**Irrig.**	**Livest**	**Drinking Water**	**Freshwater Aquatic Life**	**Drink. Water**	**Industrial waters[10]**
Boron	mg/l								5		1.0	
Cadmium	mg/l	0.1	0.1	0.005	0.002	0.00025	0.0051	0.08	0.005	0.000017	5.0µg/l	0.2
Chromium,hex	mg/l	0.1	0.1		0.016	0.011	0.008	0.050		0.001		0.1
Chromium (tot)	mg/l			0.1					0.05		50µg/l	1.0
Copper	mg/l	0.5	0.5	1.3(1.0)	0.013	0.009	0.2-1.0	0.5-5.0	1	0.002-0.004	0.1	0.1
Iron(tot)	mg/l	3.5	3.5	0.3		1	5		<0.3	0.3	200µg/l	5
Lead	mg/l	0.1	0.1	0.015	0.065 0.025	0.0025	0.20	0.10	0.01	0.001-0.007	10µg/l	0.2
Manganese	mg/l			0.05				0.2	<0.05		50µg/l	1
Mercury	mg/l	0.01	0.01	0.002	0.0014	0.00077		0.003	0.001	0.000026	1.0µg/l	0.05
Molybdenum	µg/l						10-50	500		73		0.1
Nickel	mg/l	0.5	0.5		0.47	0.052	0.2	1.0		0.025-0.15	20µg/l	0.5
Selenium	mg/l	0.1	0.1	0.05		0.005	0.02-0.5	0.05	0.01	0.001	10µg/l	0.1
Silver	mg/l	0.5	0.5	0.1	0.0032	0.0019				0.0001		0.1
Thallium	mg/l			0.002						0.0008		
Uranium	µg/l			30			0.01	0.2	20			
Zinc	mg/l	2	2	5	0.12 0.12	0.12	1.0-5.0	50.0	5	0.03	5000µg/l	5
Alpha, Gross	picoCi/L			15							0,1 Bq/l	
Radium	picoCi/L			5								
Cyanide (total)	mg/l	2(0.20)	1		0.022	0.0052			0.2	0.0005	50 µg/l	0.1
Cyanide(free)	mg/l		0.1	0.2							10µg/l	
Cyanide WAD	mg/l	0.5 (0.05)	0.5									
Chlor,tot resid	mg/l	0.2	0.2								0.50	0.2
Phenols	mg/l	0.5	0.5							0.004		0.3
Fecal Coliform	MPN/100ml	400	400						<5	100	0	
Tot. Colif.									<5	1000		

Parameter	Units	IFC Precious Minerals[1]	World Bank Guidelines[2]	US EPA	US EPA Aquatic Life[3]		Canada Agricultural[4]		Canada[5]	Canada[6]	Romania[7 8]	
		Mine Effluents	Open Pit Mining	Drinking Water[9]	Acute	Chronic	Irrig.	Livest	Drinking Water	Freshwater Aquatic Life	Drink. Water	Industrial waters[10]
Temp (increase)		<3°C	<3 C									35 C[15]
Salinity (change)		<20%	<20%									

[1] IFC Environmental Health and Safety Guidelines for Precious Metals Mining (Draft) July 2004

[2] World Bank General Env.-Proc. Wastewater discharges to surface waters: Pollution Prevention and Abatement Handbook, July 1998: [http://wbln0018.worldbank.org/essd/PMExt.nsf/d798dd11401b4e068525668000766b9d/cb6c29e967664f658525666e00705a4e?OpenDocument]

[3] US EPA Water Quality Criteria for Aquatic Life—acute(Ac)and chronic(Chr): http://www.epa.gov/OST/standards/index.html#criteria
Due to space limitations, A=acute, and C=chronic.

[4] Canadian Guidelines for the Protection of Agricultural Water Uses(1999)—Irrigation (Irrig.) and Livestock (Livest.): http://www2.ec.gc.ca/ceqg-rcqe/agrtbl_e.doc
Due to space limitations, I=irrigation, and L= livestock.

[5] Canadian Environmental Quality Guidelines, Dec. 2004, Summary Table: http://www.ccme.ca/assets/pdf/e1_062.pdf

[6] Canadian Council of Ministers of the Environment, 2003, Canadian Water Quality Guidelines for the Protection of Aquatic Life.
MERCURY: Inorganic mercury and methylmercury. http://www.ccme.ca/assets/pdf/ceqg_hg_wqg_fctsht_aug2003_e.pdf

[7] Substance for which there are no maximum admissible limits in the applicable legislation, these limits will be set up based on studies carried out by specialized institutes, accredited according to the law, subcontracted by the water user. The studies will comprise the quantitative and qualitative methods for analysis of the respective substances, as well as adequate treatment technologies. The maximum admissible limits will than be approved by the competent central authority for water and environmental protection. In the case of the used waters containing polluting substances with values over the present limitations, it i mandatory to treat them or to take appropriate technological measures for these waters to reach the admissible values. In extraordinary circumstances, the central public authority for waters and environmental protection can proceed to a derogation from the present law.

[8] For polluting substances, other than those stipulated in table 1, the maximum admissible values are established in the water permits, based on the characteristics of the natural receptor, on its self-cleaning capacity, on the characteristics of other used substances discharged in the same natural receptor, on the needs of other water users and on the necessity for environmental protection.

[9] U.S. Environmental Protection Agency (US EPA) Drinking Water Standards: http://www.epa.gov/safewater/mcl.html#inorganic
Arsenic standard in ( ) becomes effective January 2006.; US EPA, 2002, National Recommended Water Quality Criteria: 2002. EPA-822-R-02-047 http://www.epa.gov/waterscience/pc/revcom.pdf

[10] Maximum admissible values

[11] Romanian law on drinking water quality stipulates as a parameter pH (S.U.)

[12] Water doesn’t have to be aggressive

[13] Following formula shall be applied: ([nitrate] / 50) + ([nitrite] / 3) <= 1

[14] Following formula shall be applied: ([nitrate] / 50) + ([nitrite] / 3) <= 1

[15] Temperature of the natural receiving waters shall not be higher than 4C

Appendix 2

Hydrogeology Technical Support.

The Hydrology Baseline (Vol. 2), sect. 3.1, pg. 11, states that the **unconsolidated deposits**, are **up to 12 m thick in valley bottoms; 3 to 10 m thick on valley slopes.**

Fig. 3.3, Hydrogeologic Cross-sections: are actually engineering cross sections intended to define the geologic materials and their engineering properties near the proposed tailings dam. They reveal no quantitative hydrogeologic information.

Vol. 2, pg.19-20; Table 4-1: Hydrogeologic Setting. This section describes hydrogeologic data sources. However, few useful details are provided on the quantitative aspects of the tests performed. Normally such hydrogeologic discussions summarize details on well construction, pump test duration, etc. Slug and packer tests mentioned here were conducted in boreholes, which usually have small diameters. Such tests are generally useful only to define the hydraulic characteristics within a short radius around a borehole. They are not reliable for developing estimates of ground water availability throughout an extensive water-bearing unit. This section also mentions that some pump tests were conducted, but it fails to say how many, for how long, pumping well diameter, etc. There is no indication in this baseline volume that long-term pump tests were performed on any alluvial or bedrock wells or boreholes.

Vol. 2, Fig. 4.1: Shows potentiometric surface of unconfined aquifer based on piezometer data. **It is totally unclear from the text on pg. 20, which data from what dates were used to construct Fig. 4.1.** Nevertheless, such a project needs piezometric data from many dates and seasons to construct several such maps in order to note seasonal and long-term trends.

Table 4.1, p.20, General Hydrogeologic Units: Such a Table normally provides information on the actual wells / boreholes / piezometers used to develop these interpretations [note, depths, completion intervals, etc.]. No such specific information is summarized in this document.

The Table describes several bedrock units that have lower permeability, often via fractures, but does not provide subsurface data to support these statements. Many similar shales at other sites can conduct significant volumes of water long-term via fracture permeability.

Vol. 2, pg.23, Black Shale: States that the shale contains conglomerate layers that are laterally and vertically discontinuous, which are **not considered significant water-bearing units, except in the upper weathered zones.** Why doesn't the Baseline Report provide any quantitative data to demonstrate this?

Vol. 2, pg.23: States that bedrock near the Cetate and Carnic Pits is drained (to an elevation of 714m) because of existing underground workings. No piezometers were installed. The discussion here regarding water in the underground workings implies that these geologic units store and transmit water. However, RMGC has not presented any quantitative information on these units. Normally, any company operating underground workings will maintain detailed records on the volumes of water pumped. No such information has been mentioned in the EIA.

Vol.11, Ch 4.1, p.64: States that they expect to encounter ground water at an elevation of 714 m ASL. Such a statement assumes that RMGC has detailed hydrologic drilling information from these areas and depths. Was testing performed? What volumes of water are anticipated? The technical details supporting such a statement should have been summarized.

Vol. 2, pg. 24: States that the underground workings all interconnected, but provides no technical support for this statement. Also, the conclusion seems to contradict statements made in the Archeological ---------. It further states that the workings will hydraulically interconnect all pits, with the possible exception of the Jig Pit. Why didn't consultants perform any testing from underground?

Vol. 2, pg. 24: "…high yield water supply wells are not present at the mine site or in the immediate vicinity." True, but there are low-yield wells and they are likely to be impacted by the proposed activities.

Pg. 25., etc.: States that the project valleys contain gaining streams, which implies they are receiving ground water inflow. It further states: piezometer responses to rainfall events "indicate that the stream and alluvial ground water are generally in direct connection with each other."

Pg. 27: Summary of Hydrogeologic Model. This section discusses theoretical possibilities, but provides almost no actual data on much of the system.

Pg. 27: States: "Because of this extensive underground network, extensive pit dewatering is not likely to be needed until mine levels extend below 720 to 715 m-ASL." This obviously implies the presence of bedrock ground water. Why was this not adequately evaluated?

Do underground workings interconnect valleys hydraulically?
Is ground water (alluvial, bedrock) presently contaminated?

Underground mining studies: [v.14, pg. 23-29 demonstrate clearly ancient capabilities to de-water workings (70 km): elevating / hydraulic wheels, wooden drainage channels / systems, drainage rooms, etc.---shows presence of some bedrock ground water; probably from structural pathways. Presently recognized vols. seem low.

v. 14, Exhibits 4.9.6a and 4.9.6b: Show sites of underground workings investigated for archeological aspects. All are significantly above the elevations of the proposed pit floors.
Old workings elevations investigated for archeological purposes: about 1020m—930m.
Underground workings (more modern) elves.: down to about 660 m ASL.
Proposed Pit bottoms: 760m (Carnic); about 680m ASL –Cetate.
[proposed pit depths about 220—260m below land surface.]

The relationships above emphasize concerns for impacts to ground waters / surface waters from pit dewatering.

On p.64, of the Water Report [Vol. 11, Chapt. 4.1, Section 5.2.3] it states: "During mining groundwater is expected to be encountered at an elevation of around 714 m ASL (714 adit). When the pit bottoms are excavated below this level, groundwater is expected to start draining into the pits, including possibly some reverse drainage from the current mine adits. Prolonged pit dewatering operations may result in groundwater drawdown leading to reduced groundwater contributions to surface water flows in the Rosia Valley where the pits are located."

Appendix 3
Baseline Water Quality Technical Support.
--Include in the EIA a simple description of the sample collection and handling methods employed, including which parties performed the activities, and the specific dates of these activities. The present document simply states that samples were collected according to standard methods. **Incorrect sampling and sample handling procedures are generally the main causes of unreliable water quality data. Generally, the greatest errors result from holding samples too long prior to filtration, adding preservative, chilling, and analysis.**
--Designate chemical constituents as Total or Dissolved, so that the reader can determine whether they result from analysis of unfiltered or filtered samples.
--Summarize the baseline data so that one can determine the actual pre-mining, baseline concentration, by monitoring location, for any chemical constituent that has a relevant standard or criterion. A format that has been used in other studies includes:

Station Designation / number
Constituent (i.e. Dissolved Aluminum)
n (number of determinations)
Range (minimum—maximum)
Mean (average, calculated by including all determinations, including < values)
Median
Confidence Intervals

Appendix A, Vol. 1, presents a statistical summary for *selected* chemical constituents, which includes some of the categories above, but is presented in an unclear manner. For example, neither the sampling dates represented are shown, nor are the names of the parties that collected the samples.

It is important to the public that specific baseline water quality be designated, by sampling location. Otherwise it will be largely impossible to "prove" that future contamination has occurred (or not) at a specific location. This requires that statistically-reliable baseline data on the mean or median concentrations of all constituents having relevant regulatory standards or criteria be determined and summarized. This should have been completed for the present EIA. The RMP EIA presents no designated baseline concentrations (means) for numerous constituents, for example arsenic, antimony, cadmium, chrome, cobalt, mercury, selenium, cyanide, nitrate, sulfate, etc.

Note: It is not statistically-meaningful to make conclusions about data where there are less than about five or six data points in the "population". That is, if one wishes to describe, for example, the mean or median baseline mercury concentration in a certain spring or well, the data set needs to include *at least* 5 or 6 reliable determinations of mercury, preferably collected within one year. For surface water sites, baseline statistics should be computed from monthly data, preferably collected during twelve consecutive months. Statistics derived from smaller populations can be highly unreliable.

Appendix 4
Technical Support: Geochemistry / ARD / Post-closure Water Quality

1-Vol. 10, Waste, pg. 33, shows the percent of various rock types that may be generating. It fails to present a summary of the numbers of samples by rock type or to summarize the actual, detailed ABA data. Nevertheless, it demonstrates clearly that significant percentages of the various rock types are likely to generate ARD. Unfortunately, nowhere in the EIA are the actual ABA data presented to allow independent evaluation.

On the following page, pg. 34, it states: "Based on weighted averages of the waste rock geochemical tests, the overall waste rock mass will generate near-neutral pH water." This assumes that the neutralizing potential of some rock types will buffer and prevent ARD from forming. Such statements are totally contradicted by real world experience.

Unfortunately, I have had experience at metal mine sites where waste rock with as little as 0.2 % total S, and below, have lead to massive ARD problems. In addition, simple **average** data on the waste rock neutralizing potential (NP) versus the **average** acid-producing potential (AP) [the NP / AP], often fails to accurately predict real world ARD problems. This is partly because the migrating water must actually come in contact with and chemically-react with these AP and

NP-producing mineral grains. Often they do so selectively, in a manner that does not reflect the average geochemical composition. More importantly, there is an inherent time-related bias in this type of geochemical testing, and static tests do not consider the effects of TIME (Morin & Hutt, 1994). The NP-producing minerals react more rapidly than do the AP-producing minerals, so that over the long-term, the NP will be depleted, and, if sufficient AP minerals are present, the waters will become acid.

These general conclusions about static geochemical tests are corroborated by many other researchers, including Kim Lapakko of the Minnesota (U.S.A.) Department of Natural Resources, one of the foremost experts on geochemical testing of mine ores and wastes (see, for example, Lapakko 2003).

Thus, the overall RMP *geochemical test* data indicate that there is a significant chance that ARD will develop in some undefined percentage of the local waste rock.

2- Vo. 10, Waste, pg. 18: describe *kinetic test data* to argue that ARD problems will probably not develop. These were three tests of 26 weeks duration where selected samples of the tailings were reacted with air and water and leachate samples were collected weekly and analyzed.

Vol. 13, Chapt. 4.5, Subsoil Geology, pg. 21 through 31 and associated Exhibits also present results for several sorts of kinetic tests. Here the EIA states that at some tests were conducted for 52 weeks. **Strangely, these discussions were never coordinated and summarized with the other geochemical test results presented in the Waste volume.**

Such tests are an attempt to simulate accelerated weathering or chemical reactions that would occur in the tailings samples. Such tests are subject to NUMEROUS sources of significant error, but if conducted scrupulously, they can be useful for predicting whether ARD will develop--- at least qualitatively.

One of the largest sources of kinetic testing error results from running the tests for an inadequate period of time. **Twenty-six weeks is generally far too short a time period to be useful for predicting whether ARD will develop in the long-term.** It is true that 20 weeks is the time duration mentioned in one testing method (ASTM 2000), however, essentially all geochemists experienced in such testing agree that *much longer* time periods are required to adequately predict whether ARD will develop. A few examples of quotes from internationally-recognized experts should make this point obvious:

- Lapakko (2003): “One major concern regarding the ASTM D5744-96 method is that it recommends a minimum test duration of 20 weeks. However, the method also states in Note 12 (ASTM 2000, pg. 265) that additional testing may be required to demonstrate the complete weathering characteristics of mine-waste samples (e.g., as much as 60 to 120 weeks were required for some samples). If only a 20-week test duration is used, this is clearly too short to allow for potential drainage acidification from mine-waste samples in general." *That is a polite way of saying that the official guidance on test duration is ridiculous. In fact, Lapakko's laboratory has conducted numerous kinetic tests having durations of many years where the chemistry has continued to change.*

- Morin and Hutt (1977): "The duration of humidity cell test(s) is usually at least 40 weeks, or until the rates of sulphate generation and metal leaching have stabilized at relatively constant rates for at least five weeks. Experience has shown that stabilization can take over 60 weeks, and significant changes may take place even after several years."

- Price (1997) states that stabilization of kinetic / humidity cell tests often requires at least 40 weeks, can sometimes take over 60 weeks, and may even require several years (pg. 100).

- Robertson and Ferguson (1995), on the research staff of Canadian mining company Placer Dome stated the following: "Kinetic testing methodology prescribes that tests should last a minimum of 20 weeks, although Placer believes that this time frame is inadequate for reliable results unless the samples are extremely high in sulphur content, low in buffering capacity, and/or potentially highly reactive. On sites which warrant this type of testing **the company typically runs samples for two to three years**, allowing for a more complete assessment of slower or marginally reactive materials."

RMP has not demonstrated that the waste rock, the pit wall rock, or any of the other wastes, including the tailings will not generate water quality problems. In fact, the available data indicate exactly the opposite. A simple, review of the environmental history of numerous similar gold mining operations throughout the world would support the view that the majority have degraded local water quality---and this includes both older and modern mines.

It seems technically unreasonable for RMGC to have made predictions about future water quality at this *specific* RMP Mine site, without also taking into account the actual water quality results at hundreds of mines throughout the world. The latter approach would have allowed a more reliable, statistical overview of a *population* of gold mines, which would yield meaningful conclusions about future water quality. The present approach does not.

Clearly the available data do **not** disprove that ARD will develop in the long-term. Furthermore, it is likely that many of the sources of mine activities and wastes **will generate contaminants that are mobile even without the formation of ARD conditions.** These include, nitrate and ammonia from blasting compounds and cyanide decomposition, increased suspended sediment loads from erosion,

increased concentrations and loads of metal and metal-like compounds, many of which are mobile under both low and high pH conditions. These include constituents such as arsenic, aluminum, selenium, mercury, molybdenum, uranium, antimony, etc. In addition, almost all similar mine sites release significant concentrations of organic contaminants into the environment, many resulting from the use of massive quantities of fuels and organic reagents.
Based on data patterns from similar mines throughout the world, many of the contaminants noted above are likely to be released into the environment and will degrade water quality relative to baseline conditions within the RMP drainages.

The TMF will be unlined and constructed in part [in deeper sections of dam] with potentially-acid-generating (PAG) waste rock. Post-closure it will clearly yield contaminated leachates, despite revegetation. Successful segregation of PAG rock at comparable sites is often only partially successful. [v.13, CH. 4.5 Subsoil Geology, p. 22.]

Report needs a simple, statistical summary table of actual ABA data by lithology. Exhibit 4.5.3 plots distribution, but not actual ABA values. Weighted mean averages of ABA data underestimate ARD risk---doesn't consider actual chemical reactivity.
-Column testing, Vol. 13, Ch. 4.5, p. 25-26: incorrect interpretations.
-field barrel tests, p. 26-27, indicate waste rock will go acid.

Pg.27-28: Basic Conclusion: "…..**large-scale ARD generation is not likely." "The most probable water quality for seepage and runoff from the waste rock is therefore that of neutralized ARD." Incorrect! This should concern potential investors**. **Who are specific authors?**

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