

# An Alternative Look at a Proposed Mine In Tambogrande, Peru



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Editorial Note: This report refers to the town of Tambogrande in Peru. However, the name of the mining project, which is derived from the name of the town, uses a different spelling, Tambo Grande. In this report “Tambogrande” is used to refer to the town, and “Tambo Grande” to refer to the mining project.

Cover photo: Ernesto Cabellos, Guarango Cine y Video.

## FOREWORD

The proposed Tambo Grande mining project in northern Peru offers a stark illustration of the problems associated with large-scale mining operations in an era of deregulation and globalization. The town of Tambogrande is poor, isolated and in the heart of Peru's "El Niño" zone. It sits directly atop a major gold, zinc and copper deposit that Manhattan Minerals, a small Canadian mining multinational, is seeking to develop into an open-pit mine. Projected impacts of the mine could be severe. Construction of the mine would require the relocation of an estimated 8,000 inhabitants of a total population of between 14,000 and 16,000 people and the diversion of a local river. The project could also have significant impacts on agricultural production in the area. Tambogrande farmers are Peru's principal mango exporters and the area has become one of Peru's leading agricultural centers thanks to major investment in irrigation systems, some of it provided by the World Bank.

Concerned by the proposed relocation and by threats to their agriculturally based livelihoods, local populations have mounted significant resistance to the project. On February 27 and 28, 2001, an estimated 10,000 people participated in blocking road access to the exploration site. A recent initiative collected approximately 28,000 notarized signatures of individuals in the Tambogrande district, of approximately 37,000 eligible voters, who are opposed to the mine. Tambogrande's Mayor and local Archbishop have called for the project not to go forward, citing not only the potential environmental impacts, but the mine's disruptive social impacts, already evident in the exploration phase due to the tense environment of distrust and conflict that exists in the area. The archbishop has called the project "socially unviable." These actions represent significant opposition to the proposed mine by affected citizens and community leaders.

Manhattan Minerals, a mining "junior" with no previous experience operating a mine of this size, and no other current projects, rode into Peru on the wave of the country's recent mining boom. With the privatization of Peru's mining sector in the early 1990s, foreign investment in the sector has exploded over the past decade. From 1992 to 1997, the volume of mining operations in Peru tripled from 30,000 to 100,000 metric tons of minerals per day. Land area devoted to exploration and extraction increased from 4 million to 18 million hectares between 1992 and 1998. According to the *Financial Times*, Peru has had South America's highest rate of exploration success in recent years, driving Latin America's emergence as the most popular continent for new mining projects. The Tambo Grande project is located in the department of Piura, a department that up until now has not been known for mining, but rather agriculture. Manhattan's operation may open the door to the exploitation of hundreds of thousands of hectares currently under concession in Piura. The impact on traditional agricultural livelihoods, from which the vast majority of Piurans draw sustenance and income, could be significant.

Peruvian legislation adopted in December of 1998 specifically forbids mineral exploration or production in urban areas, such as the town of Tambogrande. Under that legislation, current mining lease holders tenure holders had a two-year window in which to apply for an exemption, providing that they could demonstrate surface rights and had submitted an environmental impact study to the satisfaction of the Peruvian Ministry of Energy and Mines. Manhattan received an extension to that timeline as part of a Supreme Decree from the government of then-President Alberto Fujimori. Since that time, however, Manhattan has repeatedly pushed back the date for completing the environmental impact study.

While rich in detailed knowledge about their environment, local communities sometimes lack access to the scientific expertise needed to effectively evaluate and respond to technical studies and claims put forward by mining project proponents. This is particularly true in Tambogrande, where there is no prior history of mining.

To support the ability of local communities to gauge potential impacts of the Tambo Grande mine on their water, land and livelihoods, Oxfam America, Mineral Policy Center and the Environmental Mining Council of British Columbia supported a visit to the area by Dr. Robert Moran, a hydrologist and internationally-recognized expert on the environmental impacts of mining. The objective of Dr. Moran's work was to provide an independent assessment of the project's potential impacts on water quality and quantity in the region, an issue of particular concern given the importance of agriculture production to the regional economy.

The results of Dr. Moran's investigation are presented in the following report. Among Dr. Moran's conclusions is that there are fundamental inadequacies in the environmental assessment work presented to date by Manhattan Minerals. This information is essential for designing adequate impact prevention and remediation measures. Additionally, Dr. Moran concludes that given the geography and geology of the proposed mine site and given past history with open-pit mining, negative environmental impacts are inevitable in the Tambogrande region, despite claims to the contrary by Manhattan and Peruvian government officials. Because of the potential for water, soil and crop contamination from mine wastes, Dr. Moran also raises doubts that mining and agricultural production can indeed co-exist without long-term environmental impacts, as the company has claimed.

The Peruvian government and Manhattan Minerals have both said publicly that they will not proceed with the project if local populations are opposed. We agree that the project should not go forward without informed community consent. Such consent and a rigorous environmental review are essential preconditions for any mining project, whether in North America or Peru. Dr. Moran's study, taken together with demonstrated opposition to the project by thousands of local

citizens and their elected representatives and religious authorities, indicates that in Tambogrande there is reason to doubt that either of these criteria can be met.

Oxfam America  
Mineral Policy Center  
Environmental Mining Council of British Columbia

## EXECUTIVE SUMMARY

The findings of this report demonstrate that the proposed Tambo Grande open-pit gold mine, if approved, is likely to have negative, long-term impacts on water quality and quantity, the general environment, and possibly agriculture. Further, claims that Manhattan Minerals and the Peruvian government have made regarding the lack of impacts cannot be substantiated by the analysis and information that the company has provided, to date.

Consider these primary findings:

- The TamboGrande Baseline Study is completely inadequate, if judged by the criteria of the British Columbia Environmental Assessment Office; criteria that Manhattan Minerals would have to meet if it was proposing such a mine in its home country (Canada) and province (British Columbia). Nor would it be acceptable in the United States.
- The evidence provided by the company does not support the company's assertion that there will not be any detrimental environmental impacts. Manhattan has not released any study describing potential environmental impacts, such as an Environmental Impact Assessment (EIA). However it is clear that residents have been led to believe that no such impacts will occur, based upon public presentations by company representatives and government officials.
- Water pollution at the site is likely. Whether highly acidic or highly alkaline, the waters leaching from the tailings are likely to contain high concentrations of many toxic constituents such as: metals (aluminum, antimony, arsenic, barium, cadmium, copper, chrome, cobalt, iron, mercury, molybdenum, manganese, nickel, lead, selenium, silver, thallium, vanadium, zinc); non-metals (sulfate, nitrate, ammonia); cyanide and related breakdown compounds (metal-cyanide complexes, cyanate, thiocyanate); possibly radioactivity (uranium, radium, gross alpha and beta); and organic compounds.
- There is significant potential for soil and crop contamination in an area of highly valuable agricultural production. As noted above, solid wastes from the mine will contain numerous chemical contaminants, and many will exist as forms mobile in water, capable of contaminating local surface and ground waters. In addition, these huge accumulations of waste rock and tailings will be exposed to local winds, which will carry contaminant-laden dust particles into nearby domestic areas, schools, surface waters, and agricultural fields. These particles are potentially toxic to humans, animals, fish, and crops—especially when released over many years.

- The Peruvian government, with a 25 percent ownership stake in the project, has an inherent conflict of interest. It is both the regulator and will benefit from mine production, thus it might be tempted to avoid enforcing environmental requirements that prove too costly. Such arrangements have resulted in similar problems at other mines such as the Kumtor Mine in Kyrgyzstan and the Aurul Mine in Romania.
- Discussions with local community leaders revealed strong opposition to the project on the grounds of its likely environmental impacts. Local communities are deeply concerned about the threat that potential contamination from the project could pose to their livelihoods, based primarily upon agricultural cultivation and production. They are cognizant of environmental and social problems that have occurred in recent years at other large mining projects in Peru and worry the same could occur at the Tambo Grande mine.

Clearly, the proposed Tambo Grande mine will also have substantial impacts on the social fabric of those living at, and near, the site of the proposed mine. Mine operation would require relocation of numerous families because portions of the mine would be excavated under the existing town. Some of the short-term impacts could be viewed as positive, such as immediate improvements to local infrastructure—assuming they were constructed as planned. However, it is the long-term impacts to the community and environment that will be most significant. It is imperative that all of the potential risks and impacts are fully considered and weighed, by those living in and near the mine site, before any decision is made to proceed.

Manhattan Minerals should not proceed without the prior informed consent of the affected community. As a first step, Manhattan Minerals must provide a full impact assessment, including a comprehensive and final baseline study, and should provide community leaders with resources to conduct their own, independent assessment of Manhattan's conclusions. It is only on this basis that those affected can make an informed decision about whether or not they wish to accept the likely impacts of this mine on their environment, livelihoods and community, in exchange for the potential economic benefits of a large-scale mining operation.

## INTRODUCTION

Have you visited many active metal mining sites? If the answer is yes, you know that most are located at a distance from large population centers, often in mountainous areas. The reasons generally have to do with the way natural mineral-forming and mountain-building processes work, and the settlement history of the area. The citizens of most densely populated portions of the developed world simply will not tolerate the noise, truck traffic, and potential contamination that come with large, active metal mines. There are exceptions, of course, but they are just that, exceptions. Even more unusual is to find a modern and active metal mine located in a populated area, which derives its income largely from agriculture. Once again, there are exceptions---but we shall discuss those later.

Tambogrande is located in an agricultural area of Peru, about 100km inland from the Pacific coast and about 50 km south of the border with Ecuador (see map).



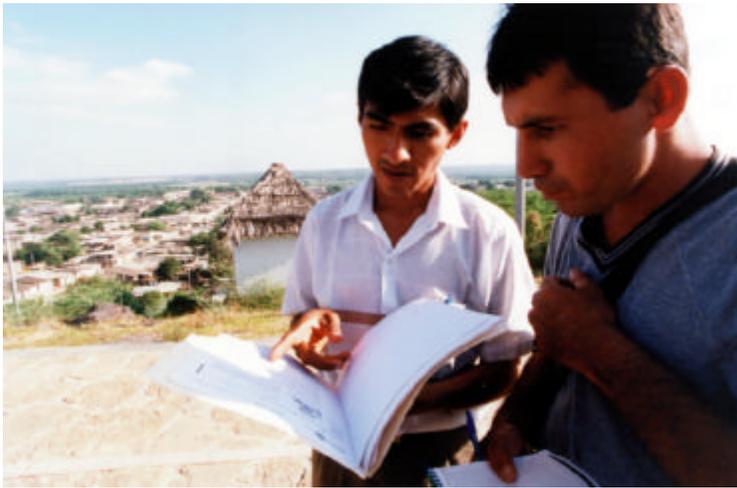
Approximately 50 years ago, this area contained only a few farms and ranches that obtained very limited amounts of water from the local rivers, which flowed intermittently. Beginning about 1949, a multistage water diversion and irrigation program began, which diverted water from the Quiroz River into the Piura River basin, supplying the Tambogrande area. Funding for the initial stage came from the Peruvian government, with later stages funded by the World Bank, the governments of the U.S.A. and Peru, the U.S. Agency for International Development, and the Peruvian Banco de Fomento Agropecuario (*Details on the irrigation project history come from Aste Daffos, 2001.*) Thus, a significant amount of international aid and development funding was invested in this area to convert the land into irrigated farms, with results that are visible 50 years later.

These diversion and irrigation improvements have caused the Tambogrande area to become one of the most successful and profitable agricultural areas in Peru, producing significant amounts of mangos, lemons, rice, cotton, marigold, and corn. Juan Aste Daffos, an economist with the NGO Grupo de Investigaciones Economicas, ECO, estimates that the average annual lemon and mango production alone contribute about \$12.5 million and \$ 83.5 million, respectively to the local farmers, and about \$41.0 million and 106.5 million, respectively, to the national economy, largely in the form of exports (*Written communication, May, 2001*).

While essentially a near-coastal desert (average precipitation about 60 mm per year) located at about 5 degrees south of the equator, much of the Tambogrande area contains “dry forests” composed of unusual accumulations of algarrobo trees. These deep-rooted trees are able to tap ground water recharged by the irrigation waters and rainfall from El Nino events. The algarrobo tree is a central part of the local ecosystem in that it provides essential shade and moderates the strong local winds thereby limiting the process of desertification. It also provides wood (for construction and cooking/ heating), and the seedpods are a source of “honey” (*Torres G., 2001*).

In the last few years, the Canadian multi-national mining company, Manhattan Minerals, has discovered ore deposits containing significant amounts of gold, silver, copper, and zinc, much of which lie beneath the village of Tambogrande. Yet, as the history and geography of the area demonstrates, the Tambogrande area is quite an unusual choice for the location of a potential metal mine site for many reasons. A considerable amount of international money was used to convert the land into irrigated farms; now agricultural exports from this region contribute significantly to the national economy. Manhattan Minerals is now proposing that much of the village be relocated to make way for mine facilities, which would operate for at least 20 to 30 years immediately adjacent to the homes of about 14,000 to 16,000 people and some of the most productive agricultural lands in Peru.

Manhattan Minerals is proposing to exploit the ore by constructing several open pit excavations, one of which (referred to by the company as TG-1) would be at the present location of the village. TG-1 would be approximately 250 meters deep, and would require the relocation of an estimated 8,000 inhabitants out of a total population of between 14,000 and 16,000. It should be noted that the Manhattan website states about 1600 households will be relocated.



*(Photo: Ernesto Cabellos, Guarango Cine y Video. Local youth activists working on strategies to resist the establishment of the mine. The entire area behind them would be in the proposed pit, TG-1.)*

Any proposal to develop large scale mining in a predominantly agricultural area is guaranteed to cause controversy, especially when the local citizens are unfamiliar with the expected impacts, question whether they will benefit from such development and dislocation, and where they feel they are not being adequately informed about the issues and potential consequences.

Local citizens are extremely concerned about the potential impacts to the local water resources if such development occurs. Specifically, they fear that mining activities will negatively impact the sources and volumes of waters used to irrigate agricultural crops (mangos, cotton, limes, papayas, rice) which are the lifeblood of the present economy. They worry that such mining development would lower the local water table, causing domestic wells to dry up, and possibly killing the algarrobo trees. Furthermore, the citizens are reasonably concerned that mine development may contaminate their surface and ground waters, soils and crops, via the development of acid, metal-laden wastes and the release of potentially-toxic process chemicals such as cyanide. Such impacts have resulted, in fact, in areas surrounding numerous mining sites, in Peru and throughout the world.

There are hundreds of sites throughout the developing countries of the world where international mining companies are operating or propose to operate such huge projects. Almost all of the technical and environmental information and data relating to these projects is paid for and prepared by representatives of the



*(Photo: Ernesto Cabellos,  
Guarango Cine y Video.  
Mango trees outside  
Tambogrande.)*

mining companies. These environmental documents prepared by the consultants to the mining companies and lending institutions normally fail to consider potential impacts from the viewpoints of those most likely to be impacted---the local citizens.

Mining consultant's reports frequently fail to realistically discuss the unpleasant impacts; it is not good for their future employment prospects, and it is easier for the politicians to approve projects when no negative impacts are "foreseen." Less-than-candid consultant's reports are often produced in both developed and less-developed countries (Moran, 2000). This leads to a great deal of mistrust on the part of the public, and frequently results in unforeseen environmental costs which must later be paid for, often not by the companies, but by the taxpayers (Moran, 2001). Such concerns have developed regarding the Tambo Grande project.

The purpose of this report is to raise and begin to discuss critical environmental and water-related issues from the perspective of those potentially affected, the community. It is intended to provide an independent outside review of the quality of the current publicly available environmental information for the Tambo Grande mining project prepared by Manhattan or its consultants.

Various Peruvian government officials have stated that the Tambo Grande mining project will have no negative environmental impacts. This report will also comment on these assertions.

This report is not intended to instruct the local citizens and regulators as to what to do. It is intended to provide independent technical support to the local citizens and NGOs, and to assist them in determining their own choices regarding their environment and its development.

## FINDINGS

My opinions and observations result from:

- Visits to the Tambogrande area, discussions with many local citizens, one well driller, university laboratory personnel, and representatives of numerous local and national non-governmental organizations (NGOs);
- A review of all publicly-available environmental technical information; and,
- A meeting with senior representatives of Manhattan Minerals in Lima.

All activities occurred between May 1 and May 14, 2001.

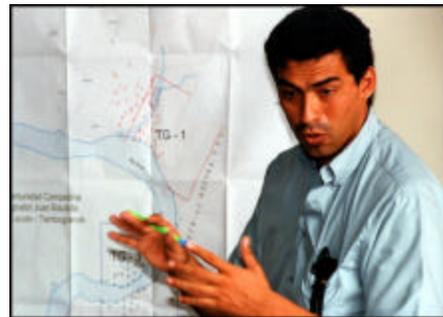
A discussion of the water-related and environmental aspects of the Tambo Grande project is more meaningful if we first review some of the proposed mining activities. Unfortunately, Manhattan Minerals has not released any studies (i.e., the EIA or any feasibility studies) that describe the specific locations of the proposed facilities or which discuss the proposed process details.

The company website ([www.manhattan-min.com/](http://www.manhattan-min.com/)), supplemented by conversations with the Manhattan project manager, indicate that the company proposes to excavate several open pits, the first designated as TG-1, which is likely to be about 1000 meters long by 650 meters wide by 250 meters deep. Another deposit, TG-3, is located about 500 meters to the south of TG-1, and the open pit is expected to be about 1400 meters long by 1000 meters wide by 350 meters deep. All anticipated pit dimensions are based on existing exploration drilling information and metals prices; such information could change in the future, as could the pit dimensions.

Construction of any deep open pit creates a huge, low elevation area, which becomes a “sink” that collects local ground water, if it exists. Likewise, this sink will potentially receive nearby surface waters, such as the Piura River, and other tributaries. Hence, such pits have the potential to deplete existing river flows, and to lower local and regional ground water levels if they are not very carefully engineered and maintained. Pumping of pit-inflow water is often one of the most costly and important aspects of mine operation. Thus, for TG-1 construction,

*(Photo: Ernesto Cabellos, Guarango Cine y Video.*

*Activist Ulisses Garcia reviewing the proposal for the mine with a map showing the pit locations. TG-1 would destroy part of the town; TG-3 would require a river diversion. Ulisses' father was an outspoken opponent of the proposed mine, and was murdered last March.)*



Manhattan anticipates needing to divert one of the tributaries to the Piura River, Carneros Creek, and creating a constructed channel for portions of the Piura River. Manhattan expects that construction of the TG-3 pit would necessitate diverting a significant length of the Piura River (*Telephone conversation, June 12, 2001, Richard Allan, project manager*).

The rocks to be mined are mineralized, and contain high concentrations of many metals and non-metals. Once the pits are excavated the rocks will be exposed to contact with air and water, which will initiate chemical reactions that form acid and dissolve metals and other chemicals from the rock. These acidic, contaminated waters (leachates), if not contained, can pollute local surface and ground waters, and soils.

Clearly it is imperative for a company to thoroughly understand the details of the chemical quality, presence, amounts, flow directions, and interactions of local surface and ground waters before beginning a project. It is also imperative that the local citizens understand these details before they can reasonably be asked to analyze the options, or to support such a mining project.

#### **Findings on Baseline Study conducted by Manhattan Minerals**

From May 1999, when recent exploration drilling began, until May 2001 when my project review took place, Manhattan had made public only one “substantive” environmental document concerning Tambogrande--the Environmental Baseline Study, released in July 2000. The title of this document called it a “preliminary report”; unfortunately it has never been finalized. It is common practice for mining environmental reports to be designated “preliminary”, and, unfortunately, for no final report to be released. Nevertheless, the language of the report implies that it was intended to provide an indication of the “baseline” conditions of the project area.

What is a baseline study in the context of mining? With respect to water resources, it is a study intended to define, characterize, and quantify the water resources of an area prior to commencement of actual mining and mineral processing activities. Such studies normally define, in considerable detail, the amounts and quality (chemical and biological) of all surface and ground waters present in a study area. Because both water quantity and quality often vary markedly from month to month (and often from day to day), such studies must be quite detailed, and usually involve sampling throughout at least one entire calendar year. Water quantity and quality (both surface and ground waters) can also vary markedly from place to place. Thus, baseline sampling must also be conducted at a significant number of locations, especially those likely to be impacted by future mining activities. In order to be usable, such sampling must yield *statistically valid* results.

Baseline water resource studies at mining sites routinely include sampling of aquatic life, such as fish and bottom-dwelling organisms. In addition, these studies are usually integrated with sampling of the geologic materials that will be mined. In this way it may be possible to foresee impacts to water quality, such as the development of acid conditions, or for example, the likely contamination due to elevated arsenic concentrations.

When adequately conducted, a baseline study allows users to perform the following tasks:

- to estimate how much water is available for various uses prior to project initiation;
- to compare the pre-mining water quality (and quantity) with future water quality (and quantity), so that one can understand the causes for future changes, and to determine whether changes have been significant;
- to anticipate the development of many future impacts to water resources;
- to determine who, or what group was responsible for the changes.

Decision-makers and regulators must have such information in order to truly enforce regulations and to quantify penalties or financial assurance bonds.

Without an adequate baseline study, it is frequently impossible to demonstrate technically or legally which party is responsible for any future impacts.

### **Baseline Study Details**

The Baseline Study describes several possible aquifers, or water-bearing units, but details about the actual presence of ground water are largely lacking, especially for the deeper zones. Most of the discussion is speculative and theoretical. Because the open pits are anticipated to be at least 250 to 350 meters deep, it is imperative that deep test wells be constructed and tested. There is no evidence in the report that such detailed testing has been conducted, and no actual well data are cited to explain the ground water conclusions. It appears that no long-term aquifer tests were performed in any wells. No maps depicting water levels or ground water flow directions (based on actual measurements) are shown in the Study.

Map 3.9 in the Baseline Study shows the positions of all the ground water monitoring locations in the Study. While the map is difficult to read, it appears there were only 7 total wells for all water-bearing units in the entire study area. All were located south of the Piura River and all appear to be relatively shallow. Most of the discussion suggests that these wells had low yields. However, these conclusions are open to question because no details are presented on the drilling methods, fluids employed, or completion and well development techniques used. In fact, a discussion with a driller for one of the Piura-based NGOs (*Hector Otero Aviles, of CIPCA---Centro de Investigacion y Promocion del*

*Campesinado*) who was present when several Manhattan wells were drilled suggests that there may have been little or no development of these wells. That is, it appears the drilling contractors never conducted activities necessary to remove fine-grained sediments from the wells prior to testing them. Thus, it is unlikely that we can learn much about the water-yielding characteristics of these rocks from the existing well data.

Discussions with Mr. Otero and local citizens indicate that the wells Manhattan drilled to augment the water supplies in some outlying villages also were not developed. Hence, it seems unreasonable to assume that reported low well yields are representative.

Table IV. 4, in Annex IV of the Baseline Study, shows the ground water quality analyses. Only five actual samples were analyzed, and only one included metals. In fact, the list of metals and non-metals that were determined is very incomplete when compared to the Canadian criteria documents (see website [http://www.eao.gov.bc.ca/PUBLICAT/PRO\\_guide2001/appendices/a\\_4/2.0.htm#3.0](http://www.eao.gov.bc.ca/PUBLICAT/PRO_guide2001/appendices/a_4/2.0.htm#3.0)). Some of the few metals reported were from unfiltered samples, while others were from filtered samples. No analyses are from the deeper geologic zones that will actually yield the majority of the ore.

Table IV.7 of the Baseline Study presents a comparison between water quality samples analyzed at the ASL lab in Canada versus those analyzed at the IHHIS lab at the Univ. of Piura (all collected February, 2000). Most of the samples are from surface water sites. Unfortunately, the analytical agreement between the determinations for many of the duplicate samples is extremely poor. Also, the list of constituents is extremely incomplete. Lastly, there is no indication that holding times were adhered to, for either lab. No total cyanide was determined. It is obvious that these water quality data, together with the other water quality data Manhattan has made public, are totally inadequate to provide a reasonable baseline data set.

Pages 127-128 state that bedrock water quality samples from nine sites were airlifted, and that samples were then taken to the laboratory (University of Piura) for analysis. Only measurements for pH, EC, and temperature were made on these samples—back at the lab. However, since airlifting would alter the water chemistry of these samples, these measurements would be largely useless.

The Baseline Study fails to report any studies that would indicate that Manhattan has evaluated the potential impacts of dramatically increased rainfall that occurs during El Nino events. While average local rainfall may be about 60 mm per year, about 4,000 mm of rainfall is reported to have fallen during the 1998 El Nino event. Will roads and bridges, and the various mine waste facilities be able to withstand the next El Nino event? Such facilities could easily fail leading to release of highly contaminated wastes into the rivers, ground water, agricultural fields, and into the village. Such events could generate massive

contamination, health and economic problems, together with possible deaths. Clearly, all facilities and operations decisions must take El Nino rainfall into account.

Between May 1999 and the end of May 2000 alone, Manhattan had drilled more than 400 exploration and feasibility holes (*verbal communication, G. Clow, May 14, 2001*). Nevertheless, the Baseline Study contains no environmental data from the roughly 400 holes drilled before the end of May 2000. Samples from these holes were obviously analyzed for sulfide content, otherwise the various cross sections showing the oxide – sulfide ore boundaries could not have been constructed.

While the Baseline Study contains little actual environmental data related to water resources, the sections describing the Peruvian environmental legislation, regulatory agencies, guidelines, and various environmental enforcement processes covers about 40 pages!

At the most basic level, Manhattan has failed to adequately investigate and describe the following:

- the availability of shallow and deep ground waters;
- the quality of surface and ground waters; and
- the chemical composition of the rocks to be mined and impacted (this would include the soils / overburden, ores, waste rock, future tailings).

In short, there is no basis for compiling a statistically valid baseline data set for ground water or surface water quality. Also, there is little useful information on the presence of ground water. As a result, it would not be possible to distinguish when water levels had declined, or whether pump yields had been reduced. Information presented in this Baseline Study is inadequate to allow the public to detect future impacts and to assign responsibility for these impacts, if they were to occur.

The Environmental Baseline Study (July 2000), is an extremely poor quality study, and would not be acceptable as the baseline portion of an Environmental Assessment (EA) in Manhattan's home country, Canada, in the U.S.A., or in western Europe.

Manhattan Minerals argues that the Baseline Study was preliminary, and thus does not represent their final product. However, Manhattan has released no revisions to this report, nor have they released any other environmental studies during the almost two years since their drilling program was initiated. Furthermore, Manhattan representatives have stated that numerous other studies are ongoing, but that none will be released until finalized (*G. Clow, former CEO, May 14, 2001 meeting; subsequent telephone conversations with project*

*manager, R. Allan*). This position is reasonable, but the same policy clearly was not followed for the Baseline Study.

Representatives of international mining companies are fond of saying that they operate in developing countries using the same environmental practices and criteria they use in their home countries. Because Manhattan Minerals is based in British Columbia, it is informative to refer to the B.C. environmental guidance documents to learn what information would be required when submitting a comparable study there. The major information requirements for the “environmental setting” are presented on the website of the B.C. Environmental Assessment Office (<http://www.eao.gov.bc.ca>)

As part of the Environmental Assessment (EA) process, the same B.C. agency also prepares **project-specific** reports that list data and information requirements, and makes them public on the internet. For example, the environmental information requirements for the Prosperity Gold Mine in British Columbia are presented at:

<http://www.eao.gov.bc.ca/PROJECT/MINING/Prosprty/finalreport/secB6.htm>

Clearly there are many differences in the environmental details between the proposed Prosperity Mine and Tambo Grande. Some of the proposed monitoring activities in the much wetter B.C. setting would not be applicable, however a comparison is very instructive in demonstrating deficiencies of the Manhattan baseline program.

For example, the table below compares a few of the environmental requirements for the Prosperity Gold Mine from the B.C. Environmental Assessment Office with what was done for the Tambo Grande project.

**Table: Comparison Between Publicly-Available Tambo Grande Information and Selected B.C. Environmental Assessment Office Requirements for the Prosperity Gold Mine, British Columbia**

Prosperity Gold, British Columbia	Tambogrande, Peru
Comparison 1	
Provide results of a hydrogeological study which determines seepage rates and direction into or from the pit, waste rock dump and tailings impoundment areas, and any impacts on surface stream flows and surface water quality. Groundwater data is required to assess the extent and likelihood that the pit will flood at abandonment, and that groundwater will contribute to the tailings impoundment and waste rock dump water balance	No studies of facilities seepage rates or flow direction are presented.

Prosperity Gold, British Columbia	Tambogrande, Peru
<b>Comparison 2</b>	
<p>Taseko Mines is required to provide a detailed water balance for the mill, pit, tailings impoundment and any other associated infrastructure, during pre-operational, operational, closure and post-operational phases of the project, for each of the wet case, dry case, and expected case scenarios.</p>	<p>No water balance studies are presented.</p>
<b>Comparison 3</b>	
<p>Existing monitoring wells as shown in Figure 8 must be sampled. While not required for the Project Report, Taseko should note that prior to site development, groundwater wells should be established to sample aquifers in both surficial deposits and bedrock below at the following locations:</p> <p>Downgradient from the pit</p> <ul style="list-style-type: none"> <li>• Downgradient from the waste rock piles</li> <li>• Downgradient from the tailings impoundment</li> <li>• Upgradient from the pit</li> <li>• In Groundhog Creek, downgradient from the tailings impoundment.</li> </ul> <p>The locations of these monitoring wells must be selected so that they are not disturbed by future development. One year of sampling must be completed prior to site disturbance (section 6.3.1.2).</p>	<p>No facilities locations have been sampled by designated monitoring wells. Analyses from other ground water sites are not representative of a complete hydrologic year.</p>
<b>Comparison 4</b>	
<p>The following are minimum requirements for frequency and duration of monitoring. Streams--minimum of monthly for one full year, plus:</p> <ul style="list-style-type: none"> <li>• Weekly for five consecutive weeks starting with early spring freshet on the rising limb of the hydrograph for each stream as indicated by stream hydrology monitoring;</li> <li>• Weekly for five consecutive weeks during low flows identified from stream hydrology monitoring. The lowest flows accessible for each stream should be monitored to represent base flow conditions most closely.</li> </ul> <p>Ground water—all wells must be sampled quarterly for one year as a minimum (section 6.3.1.3).</p>	<p>None of the frequency and duration criteria have been met for either surface or ground water quality samples.</p>

Prosperity Gold, British Columbia	Tambogrande, Peru
<b>Comparison 5</b>	
<p>Surface and ground water samples must contain the following variables: temperature (field), dissolved oxygen (surface samples only), pH (field and lab), specific conductance (field and lab), total suspended solids, turbidity (field and lab), alkalinity (total), sodium (ground water only), sulphate, fluoride, dissolved organic carbon, ammonia, nitrite, nitrate, total nitrogen (lakes only), ortho phosphorus (D), total phosphorus (D), chloride, hardness, aluminum (D), antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, titanium, uranium, vanadium, zinc –all D and T(section 6.3.1.4). (D=dissolved; T=total)</p>	<p>None of the analyses presented in the baseline study contained all, or even most of the constituents listed above. In many cases the detection limits used did not meet those mentioned in the B.C. criteria (see section 6.3.1.4, table 3).</p>
<b>Comparison 6</b>	
<p>Predict the ARD/ML (acid rock drainage / metal load) potential of all materials (bedrock and surficial) to be disturbed or created (i.e. tailings) during all phases (construction, operational, post-closure) of the proposed project, and reduce the level of uncertainty to one at which the potential risk can be identified, and effective impact prevention strategies can be selected (section 6.4.3.1).</p>	<p>No data from whole rock geochemical analyses, static tests or kinetic tests have been presented in the baseline report or any other publicly available reports.</p>

(Reference:

<http://www.eao.gov.bc.ca/PROJECT/MINING/Prosprty/finalreport/secB6.htm>).

The entire Environmental Issues section for the Prosperity Gold Mine is 43 pages long, and defines all EA information requirements, in addition to specific baseline requirements. However, after only a few minutes reading through this guidance document, the average reader would realize that the Tambo Grande Baseline Study is totally inadequate, if judged by these standards.

## RELATED OBSERVATIONS

The following observations draw lessons from the authors experience at other mine sites relevant the Tambo Grande project.

### **“Zero Discharge Facilities”**

The mining industry often says that there will be no leakage from modern tailings facilities because they will be lined with synthetic liners. Thus, they are often called “zero discharge facilities”—implying to the average citizen that there will be no leakage. Unfortunately, this is an obvious exaggeration; all liners leak to some extent. This leakage can be very significant if the liners were not installed correctly. Even when correctly installed, small amounts of leakage can produce significant impacts if they occur over long periods of time, such as the decades proposed for the operation of this mine. The management of potential leakage becomes even more difficult once the mine closes. It may require that some form of water management activities continue *in perpetuity* after mine closure.

Manhattan has made the same claims about “zero discharge” at the Tambo Grande project, implying that there will be no release of waste contaminants to the environment.

### **Water Quantity**

Most mining operations require massive quantities of water for processing and other uses. Hence, the competition for local water resources almost always increases where open-pit mining occurs. There will be an obvious increase in competition for surface and ground waters between Manhattan and the various present water users if the Tambo Grande project is developed.

### **Processing Chemicals**

Modern mining is a chemical process, not simply a physical one. Metals are extracted from the rock using numerous potentially toxic chemicals, such as: sodium cyanide, lime, soda ash, kerosene, various inorganic and organic acids, sodium sulfite, copper sulfate, sodium metabisulfite, sulfur dioxide, sodium silicate, numerous flocculants, thickeners and collector compounds of undefined chemical composition, etc. These chemicals are disposed of in the tailings along with the other metal residues. Most or all of the chemicals mentioned above will be used by Manhattan if the project becomes operational.

### **Solid Waste**

Mining produces tremendous amounts of solid waste (waste rock, tailings) which contain process chemicals, waste metals, and other toxic components. The U.S.

EPA states in its Toxics Release Inventory (TRI) for 2001 that the mining industry is the largest source of toxic pollutants in the USA (U.S. EPA, 2001). In 1999, it released approximately 3.98 billion pounds of toxic materials, more than half of all the toxic pollution (7.8 billion pounds) released in the United States that year.

Previously, Manhattan has refused to make public detailed geochemical analyses of the rock to be mined, but it is obvious from the information that has been released that the sulfide and metal concentrations are extremely high; these deposits are referred to as massive sulfide deposits for a reason. (Tegert, et. al., 2000, page 324, states: “The TG1 and TG3 massive sulphide deposits consist of 85 to 99 percent pyrite,....”) Thus, the waste rock will likely form acidic (pH probably between 2.5 and 3.5), high TDS, high sulfate, metal-rich leachates after weathering. Such leach waters would be toxic to most plants, aquatic life, and many organisms.

Based on the preliminary information presented in the AGRA Simons (2000) report, it seems likely the tailings will initially be alkaline (initial pH may be greater than 9.5) due to the high concentrations of process chemicals added to the ore. Eventually, however, the tailings would likely become acidic as the high alkalinity declines and the sulfide oxidizes. Whether highly acidic or highly alkaline, the waters leaching from such tailings are likely to contain high concentrations of many toxic constituents such as: metals (aluminum, antimony, arsenic, barium, cadmium, copper, chrome, cobalt, iron, mercury, molybdenum, manganese, nickel, lead, selenium, silver, thallium, vanadium, zinc); non-metals (sulfate, nitrate, ammonia); cyanide and related breakdown compounds (metal-cyanide complexes, cyanate, thiocyanate); possibly radioactivity (uranium, radium, gross alpha and beta); and organic compounds.

### **Chemical Spills and Process Waste**

Mining sites typically have spills of chemicals and of the process wastes. Such spills can have serious impacts given the massive volumes of wastes and reagents involved. There is little reason to believe that Manhattan can operate without experiencing unforeseen spills that are normal practice in the mining industry. However, in this case, they could occur in proximity to productive agricultural fields.

### **Potential Contamination of Waters, Soils and Crops**

As noted above, the Tambo Grande solid wastes will contain numerous chemical contaminants, and many will exist as forms mobile in water, capable of contaminating local surface and ground waters. In addition, these huge accumulations of waste rock and tailings will be exposed to local winds, which will carry contaminant-laden dust particles into nearby domestic areas, schools, surface waters, and agricultural fields. These particles are potentially toxic to humans, animals, fish, and crops—especially when released over many years.

### **Long Term Impacts**

Some mining impacts do not become visible for many years. For example, acid discharges from mining wastes may not produce obvious negative impacts for many years, or even decades. As a result, some modern mining situations may appear to be without impacts, when in fact it may simply be too early to judge. Once such impacts do develop, however, they may continue for centuries if not adequately and continuously managed.

One of the greatest shortcomings in most mining studies, and in the existing Manhattan work, is to underestimate the length of time the public should consider when attempting to evaluate future impacts. For example, acid drainage has continued for hundreds and even thousands of years at sites originally mined in ancient Scandinavia, Spain, and Greece. Also, it is an unproven assumption that buried wastes will remain “contained” even a hundred years in the future. As evidence of these concerns, the State of New Mexico (USA) recently recommended that mining companies provide financial bonds adequate to pay for treatment of contaminated waters for a period of 100 years following mine closure (*Moran, R.E. and McLaughlin Engineers, 2001*).

### **Agricultural Resources**

There are very few examples where large metal mining and agriculture operate next to each other. Manhattan has repeatedly mentioned the example of the Martha Mine in New Zealand as one example. It is true that this gold and silver mine, operated by Waihi Gold (a subsidiary of the Australian company, Normandy Mining) is situated within an agricultural and dairy area. However, the comparison is interesting. The open pit operations were not begun until 1987. Thus, the history of these activities co-existing is quite short-lived. Also, the mine is located in an area that receives about 2,300 mm of rainfall per year—quite different than the Tambogrande setting.

The area in New Zealand had much earlier metal mining, beginning at the end of the 19<sup>th</sup> century, which was done by underground methods, and was conducted on a much smaller scale. These activities had contaminated local waters such that many of the “baseline” pH measurements were less than 4.0, prior to the open-pit operations. As early as late 1993, incidents of contaminated (low pH, metals, sulfate) runoff from mine wastes were reported at the site. Since that time, the company has been required to construct encapsulated waste rock cells and ground water cut-off drains, and to operate a full time water treatment plant. All surplus water is treated prior to discharge in the river. At present, the Martha Mine operates on 400 hectares of prime agricultural land, and is negotiating for more.

The Marta mine is anticipated to operate until 2007. After mine closure, the site will have to be remediated, and it is possible that the treatment plant may need to continue operating for an indefinite period of time. I was unable to locate information on the amount of any financial assurance that the company was required to present to the government. The above information comes from website locations sponsored by Waihi Gold and one of their consultants: [www.ameef.com.au/publicat/groundwk/grnd998/gc3case3.htm](http://www.ameef.com.au/publicat/groundwk/grnd998/gc3case3.htm) and [www.waihigold.co.nz/com](http://www.waihigold.co.nz/com)

It is interesting to note that an extensive internet search revealed numerous sources of information on the Martha Mine, but all were, either directly or indirectly from company sources. No company-independent sources of information or data could be located on the internet.

Manhattan has also taken Tambogrande residents on at least one trip to visit mining sites near Copiapo, Chile. These sites operate near vineyards. While I did not review specific data on these sites, it is clear that these locations are also quite recent, and the long-term impacts are not likely to be visible.

### **Impacts of Modern Mining**

It is not true that there will be no environmental impacts. Manhattan has not released any study describing potential environmental impacts, such as an EIA. However, it is clear that their representatives have been implying, in public presentations, that no impacts will occur.

In addition, the Ministry of Energy and Mines (MEM) is encouraging this opinion. In a statement released on May 2, 2001 (see [www.mem.gob.pe](http://www.mem.gob.pe) for original in Spanish), the Minister of MEM said that: "...modern mining applies up-to-date-technology and complies with present laws, co-existing perfectly with agriculture and other economic activities, and it is completely respectful of the environment; there being no reason to generate concern and worry among the people."

Unfortunately, this is simply not true. Modern mining practices are much improved over older methods, but nevertheless, there are usually some negative impacts to water resources (both surface and ground waters), often resulting in degradation of water quality and/or some reduction in water quantity. In addition, there is almost always some contamination of nearby soils, and some negative impacts to local aquatic life. In roughly 30 years of experience in water and environmental chemistry issues, much of it associated with mining, I have never seen a site that did not have some negative environmental impacts (see Moran, 2001, and <http://www.cipma.cl/hyperforum/index.htm>).

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 10 years 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.

It is possible that the reclaimed McLaughlin Mine in northern California may now comply with the criteria of the 1997 study. Nevertheless, the basic conclusion of the study remains the same: that very few sulfide-rich sites have been closed without generating acid drainage problems.

### **The Cost of Monitoring**

Chemical monitoring and analysis are very costly. Citizens cannot normally afford to conduct such activities. Thus, it is often not done. As a result, only company technical information, data, and viewpoints are available to the public.

During my Tambogrande visit in May 2001, we provided some basic training in water quality sampling techniques to representatives of one Piura-based NGO, and a few samples were collected and analyzed. However, because the basic analytical costs are more than \$200 per sample, it is not possible for this or most local groups to provide their own data. As a result, conclusions about baseline concentrations and existing or future impacts are routinely made using only the data provided by the mining company. Such company data often provides a very limited and biased picture of the most important issues facing the local communities.

### **Community Role in Decision-Making**

The desires of the local citizens are important in the decision-making process, in addition to the studies prepared by the mining company or their paid consultants. While the Ministry of Energy and Mines (MEM) has said that the mine will not be developed without the support of the local people, it is clear from some of their written announcements that this is doubtful. A careful reading of MEM's announcement of May 2001 (see [www.mem.gob.pe](http://www.mem.gob.pe)) shows that they have all but decided that the project should be approved, despite the obvious negative opinions of thousands of the local citizens. Alejandro Silva Reina, an attorney with an NGO supported by the Catholic Church in Piura, reports that about 28,000 notarized signatures were collected from voters within the Tambogrande

district (out of about 37,000 eligible voters) protesting continued development of the mine.

Frequently the desires of the citizens are dismissed as simply the wishes of *poorly informed* folk, and it is posited they should instead be guided by technical studies. Unfortunately consultants who receive most of their income from mining and related industries normally conduct these studies. Also, their studies are often far less objective than is claimed. It is common for these studies to revolve around water-related predictions involving the use of computer models that appear quite sophisticated. Frequently they are not. The results are often found to be very inaccurate and overly optimistic when compared to actual events. Unfortunately, such comparisons are seldom made. Reasonable decision-making requires actual data, collected by independent parties, rather than simply relying on computer simulations.

### **Financial Guarantees for Closure**

Adequate financial assurance measures are imperative to prevent the public sector from having to fund long-term environmental cleanups. Such measures often include financial bonds held by the State or possibly environmental liability insurance. Several international mining companies have now been required to provide bonds greater than \$100 million for mine remediation and operation of water treatment facilities. Manhattan has claimed that they are willing to provide financial assurance, but no details regarding financial assurance have been publicly discussed. While such issues need to be made public early in the decision-making process, the presently available Manhattan environmental data are far too inadequate to make reasonable evaluations of either environmental impact assessments or reasonable estimates of bond calculations for environmental liability.

### **Government Conflict of Interest**

The Peruvian government has an inherent conflict of interest in regulating the Tambo Grande project. Because the government stands to receive 25 percent ownership in the project if it goes forward, it is conflicted in enforcing environmental laws and criteria. Adequate enforcement of environmental regulations may be viewed as detrimental to the collection of revenues. This form of shared government ownership has resulted in numerous examples of lax regulatory oversight and severe environmental damage, as can be seen from recent events at the Kumtor Mine in Kyrgyzstan, the Aurul Mine in Romania, and the Ok Tedi Mine in Papua New Guinea.

## RECOMMENDATIONS

All ongoing studies (baseline, feasibility, etc.) intended to culminate in the Tambo Grande EIA should continue. However, independent consultants should participate in and review all such studies and environmental issues. The citizens, or the regulators should make no judgments or decisions concerning project approval, until such complete, detailed, and independent studies are made publicly available

At the present date, Manhattan Minerals has not released any studies (i.e., the EIA or any feasibility studies) that describe future impacts, the specific locations of the proposed facilities or which discuss the proposed process details. Also, the present baseline study is inadequate and should be revised in such a way that it would be able to comply with the general data and information requirements set out in the B.C. Environmental Assessment Office guidelines (see section 2.0). At present, concerned citizens have no technical or scientific basis on which to judge the claims Manhattan has made about future environmental impacts.

Local citizens would be much more likely to trust statements about future impacts if an “independent” study of the Tambo Grande data and information was performed. Thus, it is recommended that Manhattan provide community leaders with resources to conduct their own, independent assessment, of Manhattan’s conclusions.

Such activities would be generally guided by the B.C. criteria presented in section 2.0, and would be conducted by expert consultants selected by representatives of the citizen’s groups involved. These consultants would be allowed to oversee the Manhattan environmental activities intended to define the baseline information and describe potential impacts. These independent activities would also include the ability to accompany Manhattan representatives during all environmental field activities, and to receive and analyze split environmental samples.

These activities would be directed by the consultants themselves, and would be independent of influence from all outside sources, including Manhattan, the Peruvian Ministry of Energy and Mines, and citizen’s groups and NGOs.

Data collected by this independent group and by Manhattan’s representatives would be openly shared in a timely fashion, and could be interpreted as each side saw fit in their respective reports.

The Ministry of Mines should be required to consider the technical findings of both sides, as well as the wishes of the affected public, in making their rulings about whether the Tambo Grande project would proceed.

Manhattan should not go forward with the Tambo Grande project without the free, prior and informed consent of the potentially affected populations. The current level of opposition to the project suggests that this consent does not exist at present. Such informed citizen consent is now considered fundamental to project approval by the World Commission on Dams (2000). The entire report by this Commission can be found at [www.dams.org](http://www.dams.org). However, the most relevant portion is Chapter 7: Enhancing Human Development: Rights, Risks and Negotiated Outcomes, which can be found at: <http://www.damsreport.org/docs/report/wcdch7.pdf>.

The EIA should discuss possible long-term impacts to agriculture. Such a discussion should include collection of specific baseline data for soils and crops.

Manhattan should be required to present detailed information and data on a population of sites from around the world where comparable mining and agriculture have successfully coexisted. Such information should be presented in the EIA, or in some other document made public prior to the release of the EIA.

(Photo: Ernesto Cabellos, Guarango Cine y Video.)



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