

BUILDING CONSENSUS:
History and Lessons from the Mesa de
Diálogo y Consenso CAO-Cajamarca, Peru

2

MONOGRAPH 2.
THE INDEPENDENT WATER STUDY
(2002–2004)



CAO

THE OFFICE OF THE COMPLIANCE/ADVISOR OMBUDSMAN



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MONOGRAPH 2.

THE INDEPENDENT WATER STUDY (2002–2004)

Monograph 1.

The Formation and First Steps of the Mesa (2000–2003)

Monograph 3.

Independent Water Monitoring and the Transition of the Mesa (2004–2006)

About the CAO

The CAO (Office of the Compliance Advisor/Ombudsman) is an independent post that reports directly to the President of the World Bank Group. The CAO reviews complaints from communities affected by development projects undertaken by the two private sector financing arms of the World Bank Group, the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Fund (MIGA). The CAO works to respond quickly and effectively to complaints through mediated settlements headed by the CAO Ombudsman, or through compliance audits that ensure adherence with relevant policies. The CAO also offers advice and guidance to IFC and MIGA, and to the World Bank Group President, about improving the social and environmental outcomes of IFC and MIGA projects.

The CAO's mission is to serve as a fair, trusted, and effective independent recourse mechanism and to improve the environmental and social accountability of IFC and MIGA.

For more information about the CAO, please visit www.cao-ombudsman.org

About the Mesa de Diálogo y Consenso CAO-Cajamarca

Mesa, from the Spanish word for “table,” is a dialogue roundtable: a multistakeholder system for addressing issues of common concern, and collaborating on solutions.

The Mesa de Diálogo y Consenso CAO-Cajamarca was convened to address and resolve conflicts between Yanacocha, the largest gold mine in Peru, and the surrounding communities affected by its operations. The Mesa sought consensus-based solutions under a framework of good faith, cooperation, and tolerance.

“Dialogue means: We are all different, we all have part of the answer, and together we have the solution.”

—The motto of the Mesa de Diálogo y Consenso CAO-Cajamarca

CAO Material about the Mesa de Diálogo y Consenso CAO-Cajamarca

More detailed information about the Mesa can be found in the following documents:

- Independent Commission Investigation of the Mercury Spill, July 2000
- Minutes of Mesa meetings
 - 2001 (August, September, October, November)
 - 2002 (January, February–March, April, July–August, September–October)
 - 2003 (February, August)
- Independent Water Study, November 2003
- Independent Evaluation of Mesa Effectiveness, May 2005
- Mesa Annual Water Monitoring Report, December 2005
- CAO Exit Report, March 2006

All these documents and the three-monograph series are available at http://www.cao-ombudsman.org/html-english/complaint_yanacocha.htm. There is also a 20-minute video on the water study entitled “Divided Waters: Currents of Change,” available upon request from cao-compliance@ifc.org

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FOREWORD

This series of three monographs presents more than four and a half years of work by the Mesa de Diálogo y Consenso CAO-Cajamarca in Peru. The Mesa's efforts to foster productive dialogue between the community of Cajamarca and representatives of the Yanacocha gold mine have signified many things to its diverse participants and observers. As a forum for debating environmental and social concerns, conducting participatory water monitoring, and training participants in mediation, the Mesa has at once inspired, disappointed, and perplexed. Indeed, the distinct experiences in and around the Mesa have created a rich and complex story that we hope these pages capture.

It is not easy or sufficient to say which parts of the process succeeded or failed. In a community as multifaceted as Cajamarca, solutions are difficult to obtain. Still, the process persevered while some critics hoped and worked to destabilize it. Despite the many challenges and complexities, the CAO succeeded in bringing parties together, facilitating dialogue, and introducing tools for addressing and resolving community concerns productively.

Although these monographs are not a complete catalog of all stakeholder voices, they convey a wide range of critical perspectives. Many of the quotes, collected through frank and confidential interviews, speak for themselves. It is my hope that the critiques and reflections offered here help carry forward the necessary dialogue that the Mesa has encouraged.

The CAO is proud of the Mesa's achievements and humbled by the challenges encountered. Along the way, the CAO has evolved with the Mesa, deepening our understanding of complex community-mine relationships, participatory studies, and multistakeholder dialogue. Our office carries with it many of the lessons learned from the Mesa's journey and hopes that others will consider and critique them in future dialogue efforts like the Mesa.

As we look to the future, it is evident that the challenges facing Cajamarca and other mining areas will continue to evolve. According to the Mesa's motto, "*Dialogue means: We are all different, we all have part of the answer, and together we have the solution.*" In this spirit, let this story be one guidepost on the demanding road that lies ahead for all of us who seek to promote conflict resolution, accountability, and improvements in the lives of project-affected people.

Meg Taylor

Compliance Advisor/Ombudsman, The CAO

June 2007

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The CAO also acknowledges the hard work and commitment of the Mesa’s board of directors (Comité Directivo, known as the Comité) and the Mesa Technical Commission, whose perseverance and dedication enhanced public knowledge of water quality issues in Cajamarca. We gratefully recognize the important and tireless work of the Mesa mediation team, the Mesa staff, and the water study team, whose contributions were essential to the Mesa’s progress.

Finally, we thank Nina Robertson for authoring the monograph series.

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Note: Affiliations are as of the time of publication.

a. With the CAO at the time of participation in the Mesa.

b. With Stratus Consulting, Inc. at the time of participation in the water study.

c. The first delegate was the main and only delegate to the Comité for his/her organization until the second replaced him/her to be the only delegate.

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STAKEHOLDERS

The term “stakeholder” is broadly defined as those who are affected by company activities such as mining operations, as well as those who are able to influence company activities. Stakeholders can include companies, local communities, nongovernmental organizations (NGOs), government agents, international financial institutions, and opposition groups.

Some of the main stakeholders involved in the Yanacocha gold mine operations in Peru are listed below. A list of abbreviations and acronyms for various stakeholders appears at the end of this monograph.

Yanacocha shareholders:

- Newmont Mining Corporation, a U.S.-based international mining company that holds 51.35 percent of the shares in the mine
- Compañía de Minas Buenaventura S.A., a Peruvian mining company that holds 43.65 percent of the shares
- International Finance Corporation (IFC), a member of the World Bank Group that holds the remaining 5 percent of the shares.

A branch of Newmont’s Peruvian subsidiary, Newmont Peru Limited, is the contracted managing entity of Yanacocha.

Local and Peruvian-based civil society and community groups:

- Federation of Female *Rondas Campesinas* of Northern Peru (FEROCAFENOP), which filed a complaint with the CAO
- The Defense Front of Choropampa (Frente de Defensa de Choropampa, the Frente), which filed a complaint with the CAO
- Ecovida, an environmental NGO
- The Cajamarca Chamber of Commerce
- The Autonomous Authority of the Jequetepeque Basin

International NGOs:

- Project Underground, a U.S.-based NGO that partnered with FEROCAFENOP

Government entities and agencies:

- Local mine-affected communities
- The provincial municipality
- COMOCA (Comité Técnico y Científico de Monitoreo del Agua, Scientific and Technical Committee for Monitoring)
- The National Institute for Agrarian Research and Extension (INIA)
- The Sanitation System Provider of Cajamarca (SEDACAJ)
- The Peruvian Ministry of Energy and Mines (MEM)
- INRENA (Instituto Nacional de Recursos Naturales, National Natural Resources Institute)

The CAO:

The Office of Compliance Advisor/Ombudsman, the independent recourse and accountability mechanism for two members of the World Bank Group, the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA). The CAO served as the convener and facilitator of the Mesa.

OVERVIEW

“Woman reports mercury appeared in the kitchen sink”

“Levels of chemicals in Cajamarca’s water exceed safe drinking limits by 1,000 times”

“Canal owners claim no water for crops”

“Sediments kill fish in Porcon”

Headlines like these appeared on the front pages of local newspapers in the city of Cajamarca, Peru, with increasing frequency in 2000. The articles implicated the Yanacocha gold mine, located less than 20 km north of the city, as the source of the public health and environmental risks. The articles cited various studies and the testimonies of local farmers. In response, Minera Yanacocha (hereafter Yanacocha), the company that owns and operates the mine, maintained that it complied with all applicable laws and that no risks to local people and the environment existed. These company assurances did not allay the fears of many Cajamarcans, who were certain that some level of risk existed. They feared that the water they were drinking was unsafe and that the water supply was diminishing as a result of the mine. If anything, the company’s insistence that it operated safely fueled the public mistrust and resentment that had been escalating since the mine began operating in 1993. Protests ensued in which marchers held banners proclaiming *“Life, yes. Gold, no!”* and *“Clean water is a right that we demand.”* Over time, these protests escalated.

In the first meetings of the Mesa de Diálogo y Consenso (the Mesa) in September 2001, many participants brought forth these concerns about the mine’s impacts on society in general and on local water quality and quantity in particular. The Mesa’s goal was to prevent and resolve community-mine conflicts through dialogue. The Office of the Compliance Advisor/Ombudsman (CAO) had convened the meeting in response to two complaints received by local groups affected by the mines.

During these first meetings, it quickly became clear that more comprehensive, accessible, and trusted information about mine impacts was needed on which to base a path forward toward resolution of the intensifying conflicts. As one Mesa participant recalled, *“We didn’t want just another study. We wanted someone independent from Yanacocha and competent to do these types of assessments.”*

With guidance from the CAO, in January 2002 the Mesa selected Stratus Consulting, Inc. (Stratus), to undertake an independent and participatory study of water quality and quantity in the mine’s area of influence. The main objective of the water study was to create new, trusted knowledge about the state of water sources in the region and the Yanacocha mine’s impacts on them, thereby ultimately contributing to the process of conflict resolution between the community and Yanacocha.

During the execution of the water study, the CAO, Stratus, and Mesa participants faced considerable challenges that spanned a wide range of themes from the technical to the social and political. In confronting these challenges, they experienced both successes and disappointments, and these generated a series of important lessons for Mesa members, the CAO, and outside observers. This monograph relates these experiences and these lessons.

This monograph is divided into two main chapters. The first provides the context and background information on the mine and community concerns about water issues. The second analyzes the major challenges that the Mesa, the water study team, and the CAO confronted during the water study process, the actions taken to overcome these challenges, and lessons learned during the process.

The information and stakeholders' perspectives that inform this monograph and the two other monographs in the series were gathered from project documentation and more than 60 interviews with stakeholders, project staff, and consultants in Peru and the United States, conducted between October 2004 and March 2006 (see appendix A).¹ The perspectives are not intended to be fully comprehensive; rather, they are a representative sample of the spectrum of stakeholder opinions regarding the Mesa. Without a doubt, there are more voices to be heard and understood.

This monograph is the second in a series of monographs on the CAO's involvement in Cajamarca, Peru. The series is complemented by a 20-minute video about the water study described here, "Divided Waters: Currents of Change," which includes interviews with the CAO and the Stratus scientists.²

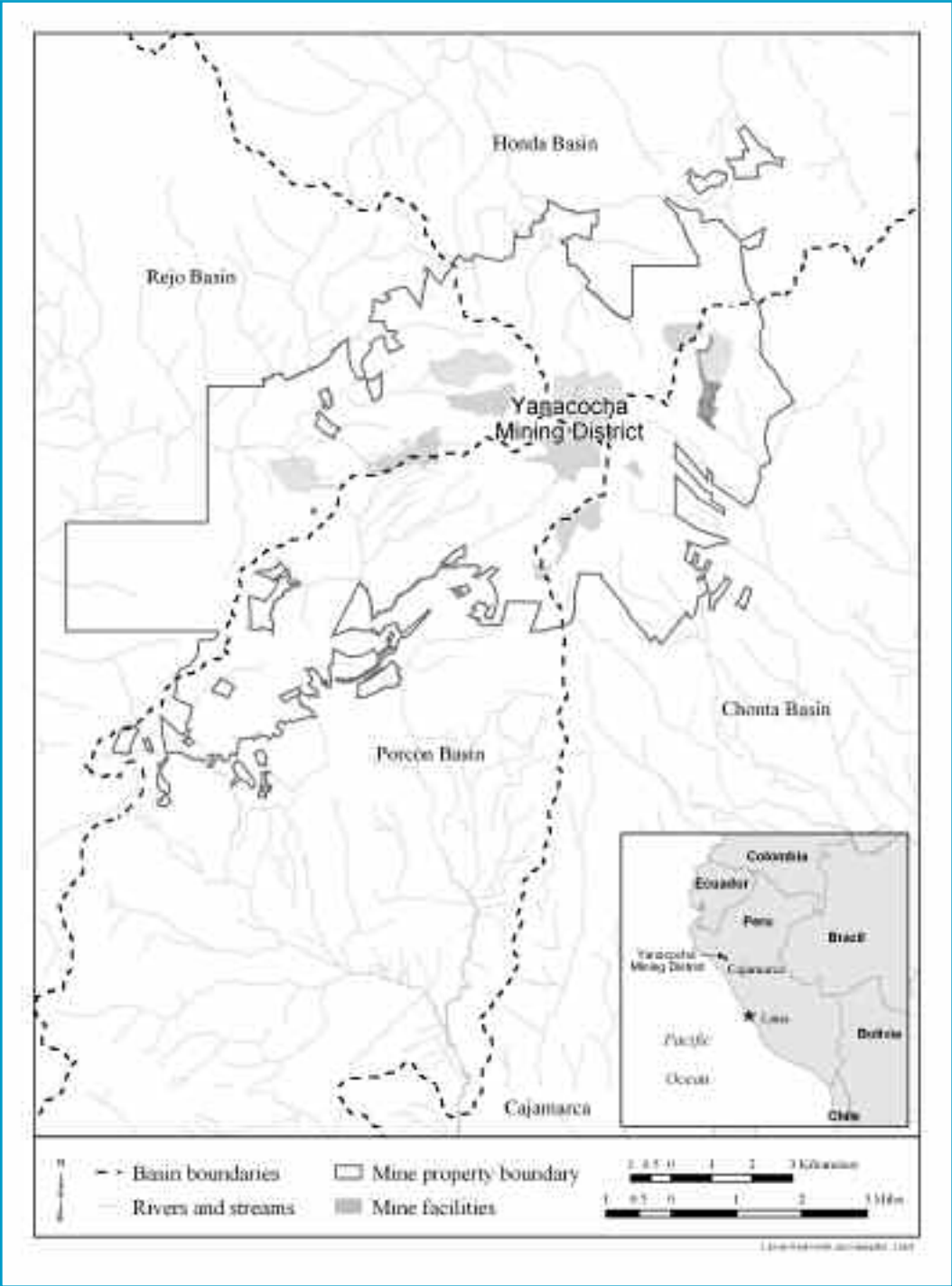
TIMELINE

Important events during the water study^a

2002 January	Stratus team contracted by the Mesa
January–March	Preliminary field visits to gather qualitative information; negotiations over data-sharing begin
April	Water study questions determined and <i>veedores</i> selected
August	Field office established in Cajamarca
September	Quantitative field data collection begins
2003 April	Quantitative field data collection ends
September	Draft report completed and submitted for review
October	Final report completed and distributed First presentation of the water study in Cajamarca
October–December	Press conferences and additional presentations of results in Lima and United States
December	Stratus sends recommendations to the Mesa board of directors (the Comité)
2004 April	Yanacocha sends written response to recommendations

^a For events in 2000-2002 and 2004-2006, see monographs 1 and 3.

Map 1. The Yanacocha Mining District and Regional Watersheds





CHAPTER 1. BACKGROUND

The largest gold mine in Latin America, the Yanacocha mine began operating in northern Peru, in the department of Cajamarca, in 1993. The mining company, Minera Yanacocha, is a consortium of three shareholders: Newmont Mining Corporation of Denver, Colorado, which holds 51.35 percent of the shares; Compania de Mina Buenaventura, S.A of Peru, which holds 43.65 percent of the shares; and the International Finance Corporation (IFC), which holds the remaining 5 percent of shares. A branch of Newmont's Peruvian subsidiary, Newmont Peru Limited, is the mine's contracted managing entity.

Yanacocha was conceived as a relatively short-life mine, projected to operate for 10 years. Because of tremendous exploration successes, however, the company's output has increased substantially, from 81,000 ounces in 1993 to more than 3.3 million ounces in 2005.

The Yanacocha mining complex comprises six open pit mines, four leach pads, and three processing facilities. The mine property covers a total land area of approximately 1,600 square kilometers (160,000 hectares, or 600 square miles). The mine property lies on the continental divide at an altitude ranging from 3,700 to 4,100 meters and spans four major watersheds (the Chonta, Honda, Porcon, and Rejo) (see map 1). The southern mine boundary is located 15 km north of the city of Cajamarca, the capital city of the Department of Cajamarca and the Municipality of Cajamarca.³

For Peru, Yanacocha was a landmark mining investment that paved the way for foreign direct investment in the country's mining sector after nationalization of the industry in the 1970s and nearly 15 years of armed internal conflict. Peru's gold exports totalled \$2 billion in 2003—35 percent more than in 2002—and Yanacocha alone accounts for about half that production. Yanacocha's gold exports represent between 8 and 11 percent of total Peruvian export earnings, and the company is one of Peru's most significant taxpayers.

Since the mine's inception, inhabitants of the villages in the vicinity of the mine, as well as residents of the city of Cajamarca, have voiced with increasing intensity their concerns about its adverse impacts. In addition to health and environmental concerns, complaints have centered on the mine's land purchases, procurement and hiring practices, and adverse social and cultural impacts.

Conflicting reports and lack of information disclosure exacerbated local concerns. In December 1999, a U.S.-based nongovernmental organization (NGO), Project Underground, published a report alleging water contamination in several areas affected by Yanacocha, along with various other negative environmental and social impacts. A university study later alleged mine contamination of the city's potable water. In response, Yanacocha denied the charges and pointed to an extensive network of water monitoring stations. For its part, IFC hired a hydrologist

An independent water study became the first priority on the Mesa's agenda.

to review the mine's nonpublic water quality data and found that Yanacocha was in compliance with both Peruvian law and IFC's mining guidelines on water quality. However, the general sense was that, as one observer stated, "The mine and IFC just told us what they wanted us to hear and paid scientists off.... Why would we trust them as interested parties?" When the municipal government requested the monitoring data, Yanacocha refused to release it, claiming the public would misinterpret the data. This refusal to disclose information led many to believe that the company was hiding serious problems and deceiving the public.

In early 2001, two local groups—the Frente de Defensa de Choropampa (the Defense Front of Choropampa, known as the Frente) and the Federation of Female *Rondas Campesinas* of Northern Peru (FEROCAFENOP)—filed complaints with the CAO.⁴ The Frente alleged that Yanacocha had violated its commitments to victims of a mercury spill for which the company was responsible (see monograph 1). The FEROCAFENOP complaint alleged broader adverse impacts and violations of IFC environmental and social policies.

After undertaking an assessment of the conflict and the disposition of parties to enter into mediated dialogue, the CAO convened the Mesa de Diálogo y Consenso (the Mesa). Although the complaints against the mine were diverse, most Mesa participants agreed that Yanacocha's impacts on water quality and quantity were a source of intense debate and division, and thus warranted immediate attention. An investigation by an independent, unbiased scientific source could potentially move the water discussion forward and propose solutions substantiated by facts. Such a study became the first priority on the Mesa's agenda, and the CAO undertook a search for a team of scientists. In late 2001, the CAO contacted Stratus Consulting, Inc., and in January 2002, the Stratus team visited the Mesa. After being questioned and approved by the Mesa, Stratus was contracted to complete the study.

Around the same time, a separate Mesa was formed by the national government to introduce the Regional Transition Administration Council (or CTAR, in its Spanish abbreviation; henceforth the CTAR Mesa). CTAR Mesas were formed throughout Peru in 2001 to facilitate Peru's transition to a new phase of decentralization. Like the CAO-sponsored Mesa, the CTAR Mesa recognized the need for an independent study of Yanacocha's environmental and social impacts. Under the auspices of Peru's Ministry of Energy and Mines (Ministerio de Energía y Minas, or MEM), the CTAR Mesa contracted a Colombian consulting firm, Engineering Consultants (Ingenieros Consultores, or INGETEC, in its Spanish abbreviation) to conduct an environmental audit, which would focus more on compliance and review air quality and social issues in addition to water quality. The INGETEC audit relied primarily on data provided by Yanacocha and some supplemental information it gathered from field work and interviews. Even though the INGETEC audit's scope and data were different from the Mesa water study, much of the public understood the studies to be similar and sometimes competing.

This monograph describes the main challenges of the Mesa water study. The challenges are presented in the approximate chronological order that they surfaced, as shown in the timeline in the front of this monograph. From these challenges, insights and lessons learned are derived and discussed.



CHAPTER 2. CHALLENGES, ACTIONS, AND LESSONS LEARNED

During the Mesa water study, stakeholders faced numerous obstacles that can be grouped into six overarching challenges:

1. Creating an effective and trusted operational framework for independent studies
2. Defining the study scope and standards to address local concerns
3. Building knowledge and trust in the data collection and draft review processes
4. Presenting the results in a balanced and accessible format
5. Maintaining a productive debate
6. Ensuring effective follow-up to study recommendations

The sections below explain these challenges, the actions taken to overcome them, and the lessons learned, as perceived by Mesa participants, staff, consultants and observers, as well as the CAO.

CHALLENGE 1.

Creating an Effective and Trusted Operational Framework for Independent Studies

Although the demand for a water study was widespread throughout Cajamarca, many were skeptical that objective results and analyses could be obtained. Initial discussions in the Mesa hinged on how to structure a study that would gain the trust of a skeptical audience. Specifically, this called for finding an independent team of researchers, establishing a trusted funding mechanism, and gaining access to information and cooperation from Yanacocha.

Finding an independent team

The CAO based its search for a consulting firm on the following criteria established by the Mesa:

- Technical capacity in the various study components
- No history of being contracted directly by the mining industry
- No direct connections with environmental NGOs
- No prior professional relationships within Peru.

The collaborative process that established criteria for ensuring the independence of the study and adequate sharing of information created a solid foundation that most Mesa members trusted and supported.



In October 2001, the CAO contacted Stratus Consulting, Inc., an environmental consulting firm based in the United States. The bulk of Stratus's work had been for the public sector, and Stratus also had a team of scientists with expertise in the impacts of mining on water quality and quantity. The Stratus team attended the Mesa assembly in January 2002, where it encountered extensive questioning about the team members' background, expertise, and potential ties to the mining industry. As one Mesa participant stated, "We thought since they were *gringos* and from Colorado, where Newmont's offices were, they must be friends of the mine." The team and the CAO addressed the participants' questions, focusing the discussion on Stratus's technical capacity, past work for the public sector, and mechanisms to ensure the study's independence. A general consensus emerged that the team should proceed. As a representative of the municipal government stated, "We opted for a wait-and-see strategy."

An equal if not greater challenge to the selection of Stratus came from Yanacocha, which suspected the team had an environmentalist bias. Specifically, the company pointed to a Stratus project for the State of Colorado in which Newmont was a responsible party. One member of the Stratus team had also testified against a mine in Washington State whose corporate proponent was later purchased by Newmont. These examples, Yanacocha maintained, suggested that Stratus would not produce an impartial study. After a period of negotiations, the mine reluctantly agreed to the selection of Stratus.

Recognizing the need for a local field coordinator, Stratus and the CAO contracted a native of Cajamarca who had earned a degree in municipal water management from a college in the United States. Over the course of the study, he proved instrumental in collecting water samples, coordinating the community participation component, and translating for the Stratus team in the field.

Establishing a trusted funding mechanism

Beyond the question of who should conduct the study, the question of how it should be funded was of equal importance to local stakeholders. The CAO explored various funding options, which included IFC, foundations, and Yanacocha. Many Mesa participants wanted the funding source to be as far removed from Yanacocha as possible. As one participant stated,

“We thought the public would see Stratus as ‘sold out’ if they were paid by the mine. That would mean the mine could pay them to produce the results they wanted...It is a very difficult thing to convince people of impartiality. That is just how our country works.”

Given such concerns, the lack of foundation interest, and the CAO’s funding constraints, the CAO proposed a mechanism to the Mesa in which Yanacocha would deposit all the funds for the study into an account administered by the CAO. This account would be separate from that of the Mesa, although in principle the system was similar: Yanacocha assumed the cost of the study but had no financial leverage over Stratus. Although Mesa participants believed this mechanism could be sufficiently independent with proper vigilance, whether the wider public would perceive it as such remained to be seen.

Gaining access to information and cooperation from the mine

To proceed with the study, Stratus needed access to maps, existing studies and reports, and pre-mining (baseline) and operational water data, as well as access to the property to collect field data. Its requests for such access were meticulously vetted, questioned, and at times denied by Newmont’s legal team in Denver and Yanacocha managers in Lima and Cajamarca. Concerned that Stratus would report its findings with an “anti-mine” slant and without proper review, Yanacocha remained guarded.

Negotiations over maps, reports, data, and access to Yanacocha’s property were slow, and on several occasions the CAO threatened to abandon the study altogether if key information was not provided. Yanacocha eventually provided the information. It refused to grant access to its property for sampling purposes, but provided data from discharge compliance points on mine property that are part of Yanacocha’s required monitoring and reporting. Although Stratus and the Mesa found this restriction to be unsatisfactory because the region’s waterways were legally public property, they accepted that these data, along with sampling at boundary points outside the mine property, would suffice. In addition, because the study was not an audit of the mine facility, but rather focused on potential impacts outside the mine boundary, the inability to sample within the boundary did not affect the technical merit of the study. By July 2002, after several months of negotiation, the team had enough information to prepare a sampling and analysis plan for the field data collection program.

Many Mesa participants wanted the funding source to be as far removed from Yanacocha as possible.

Overall, the collaborative process that established criteria for ensuring study independence and adequate information sharing created a solid foundation that most Mesa members trusted and supported.

CHALLENGE 1.

Creating an Effective and Trusted Operational Framework for Independent Studies

LESSONS LEARNED

- **While scientifically rigorous analysis is essential, the social process through which data are gathered and analyzed is equally crucial to any independent study's ultimate success.** To build trust and ensure stakeholder confidence, a study design should include:
 - a system of community oversight of sampling or data collection
 - consensus on the independence of a scientist or study team and, if applicable, the laboratory to be used for analysis
 - interpretation and communication of activities and findings of technical experts, and
 - third party oversight of study funding.
- **Selection criteria for an independent scientist should be transparently and collaboratively developed by process participants.** Participation in these phases of a process can help ensure local trust in the independence of the team or scientists and confidence in their capacity to address local concerns.
- **The finances, mission, and institutional history of an independent scientist should be publicly disclosed and periodically explained.** Such proactive and constant communication efforts can help assuage doubts and counter misperceptions about the study's integrity.
- **A local coordinator is important for establishing a consistent field presence, maintaining contact between the independent scientists local stakeholders, and overcoming linguistic and cultural barriers.** This role is important in a dynamic and complex social context where open channels of communication are essential.

CHALLENGE 2.

Defining the Study Scope and Standards to Address Local Concerns

Because the purpose of the study was to address specific concerns regarding water resources outside the mine boundary rather than auditing the mine, Mesa members insisted that the study focus on answering the questions they identified during discussion sessions and that they knew were of primary concern to Cajamarcans. The Mesa provided the forum for discussing local concerns, gathering stakeholder input, and discussing water quality guidelines. Refining the scope and the guidelines against which to measure water quality proved to be a significant challenge, especially given the diversity of concerns and resource constraints.

Ascertaining local concerns and questions

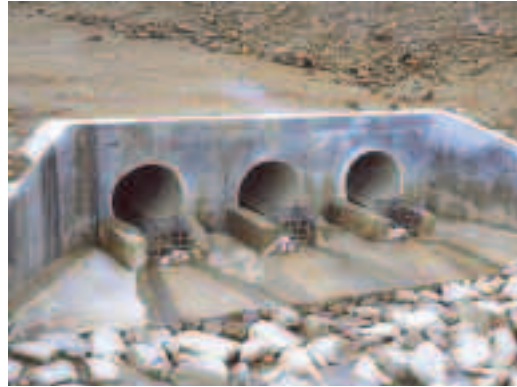
During the first quarter of 2002, the team conducted more than 20 interviews with local residents in the area around the mine. As word spread that a study was commencing, many people arrived at the Mesa to communicate their observations of the causes and consequences of mine impacts on the region's waterways. The observations and health concerns that were expressed fell into the following categories, which the CAO team recorded:

Decreased *water quality* in streams, canals, groundwater, and city tap water, resulting in:

- Human sicknesses
- Deformed livestock
- Stunted crops
- Fish kills due to sedimentation
- Fewer fish and frogs.

Decreased *water quantity* in streams, canals, and water systems, resulting from:

- Consumption of water during mineral processing
- Diversion of waterways that supply irrigation canals
- Diversion of waterways that supply urban water



- Removal of the soil “sponge”
- Destruction of springs
- Destruction of canals.

After substantial deliberation and meetings among Stratus, the Mesa, the CAO, and Yanacocha, specific questions were agreed upon as a framework for the study’s scope.

Question 1. Have the current mining operations produced changes in the flow of surface water that have adversely affected or that could adversely affect the:

- Quantity of water available for the treatment plants that provide potable water to the city of Cajamarca?
- Frequency or magnitude of droughts or floods?
- Quantity of water available for irrigation or agricultural use?
- Quantity of potable water available for rural use?

Question 2. Have the current mining operations produced changes in the quality of surface water that have made or could make the water unsuitable for:

- Human consumption?
- Contact with skin or clothes washing?
- Cattle?
- Irrigation or agricultural use?
- Plants, invertebrates, fish, toads, and other aquatic life?
- Human consumption of organisms that live in the water?

These questions captured many community concerns about quality and quantity. At the same time, concerns regarding groundwater quality and future expansion impacts were not fully included because of limitations on access, time, and resources. The only groundwater wells in the area were maintained by Yanacocha to monitor on-site conditions. Because Yanacocha initially did not grant Stratus permission to enter mine property, the team could not sample groundwater directly. As an alternative, Stratus proposed the indirect method of analyzing dry

Many Mesa participants wanted the study to examine the potential impacts of future mine expansions. The Mesa decided that the study’s strength would come from its foundation in current data, and so it should avoid speculation.

season flows in the streams because they were fed almost entirely by groundwater sources and would thus give an indication of the groundwater quality. Many Mesa participants, although disappointed that no direct measurements of groundwater could occur, accepted this method as an alternative.

Regarding the projection of future impacts from the mine, the study assessed future water quantity impacts of current mining operations. Many Mesa participants wanted the study to also examine the potential impacts of future mine expansions. The Mesa collectively decided that the study's strength would come from its foundation in current data, and so it should avoid speculation. This decision squared with the Mesa's decision not to focus on the controversy over the proposed expansion of mining on a hill near the city of Cajamarca, Cerro Quilish, which was widely opposed by the public, and enabled the water study to proceed without addressing additional controversies. However, it also opened the Mesa to harsh criticism when the Cerro Quilish issue became the center of conflict between the community and Yanacocha, as described in monograph 3.

Determining water quality standards and guidelines

Another issue addressed in the preliminary stages of the study was the application of water quality standards and guidelines. Because the study was intended to answer specific questions regarding the suitability of water for different uses—rather than assess compliance with a set of legal standards, as would occur in an audit—the question of what standards and guidelines to apply was critical.⁵ Several sets of national and international standards and guidelines existed that Stratus could have applied to the mine water discharge points and to streams affected by mine operations. Through consultation with Mesa members, including Yanacocha, Stratus determined which standards and guidelines it would apply.

The mismatch between actual water use and legally required standards quickly became apparent. For example, it was known that rural inhabitants at least occasionally drank water directly from streams and irrigation canals and that many streams support aquatic life. However, the standards with which the mine was required to comply were not intended to be protective of these uses. The applicable Peruvian standards are not designed to be protective of aquatic life or human health without treatment.⁶ For the IFC, the applicable guidelines for its projects—World Bank Environment, Health, and Safety Guidelines for open pit mining—state that, for liquid effluent with concentrations below specified levels, “there is expected to be no risk for significant adverse impact on aquatic biota or human use.” This guidance, however, is generally less protective than water quality guidance values specified in other countries and by international agencies such as the United States Environmental Protection Agency (US EPA).

At the same time, Newmont's environmental policy stated that if the local and/or national law is incomplete or inadequate for a specific water quality parameter, the company would apply US EPA standards. In the context of Peru, the policy suggested that Yanacocha would apply US EPA drinking water standards, as the applicable Peruvian classification did not specify standards for human consumption for untreated water in streams.

Based on this information, Stratus concluded that because the applicable Peruvian classification was generally not designed to be protective of the various uses that stakeholders were concerned about (for example, for drinking water, livestock watering, irrigation, and aquatic life), the water study should use standards and guidelines developed by international agencies as well as the Peruvian government.

The suite of standards and guidelines thus included:

- Peruvian Class III standards as the legal standards with which the mine must comply and that are applicable for waterways used for irrigation and livestock watering
- World Health Organization (WHO) and US EPA guidelines to determine suitability for human consumption, assuming the water resource being evaluated is the primary drinking water source for the users
- State of Nevada (the location of most of Newmont's North American operations) and Environment Canada standards for livestock and irrigation
- US EPA criteria for aquatic life.

The Mesa emphasized that a robust, independent data collection process was essential to building local trust.

Because the international standards were not binding, they were termed “guidelines” in the study. Stratus emphasized that it would not judge whether Newmont was in legal compliance with various regulations, but rather it would answer the broader quality and quantity questions posed by the Mesa. The Stratus team's use of international standards and guidelines did not imply that the streams had been reclassified for the uses protected by such standards.

Most Mesa members were satisfied with the suite of standards and guidelines selected, and understood the difference between international guidelines and national standards. As one rural resident emphasized, “It would not have worked any other way. We drink the water, so we insisted the study use international drinking water standards, not the less strict ones of Peru. Otherwise we wouldn't be learning much, and our preoccupations would continue.” According to a Yanacocha representative, “We were okay with the standards and guidelines. The key was how they would be applied and communicated.”

As discussed further in monograph 3, the issue of international standards and guidelines was a continual source of debate. According to one member of the Stratus team, “Many mines want to say they are conforming to international standards. Rhetoric and practice are still not matched, and there needs to be discussion about how to develop a transparent program. The question becomes which international standard and how will it be applied and enforced?”

The process of defining water study questions, standards and guidelines required substantial deliberation that took into account a wide range of local concerns. Ultimately, the agreements reached on these issues, as well as the participatory process through which they were attained, enhanced the study's legitimacy and relevance to Mesa members and local communities.

CHALLENGE 2.

Defining the Study Scope and Standards to Address Local Concerns

LESSONS LEARNED

- **Local knowledge, questions, and concerns should form the basis of study design and scope.** Failing to address the concerns and questions of local stakeholders—regardless of expert opinion or technical merit—can undermine a study's legitimacy.
- **A single study cannot usually address and resolve all issues of concern to a community.** To avoid creating unrealistic expectations, studies should clarify from the outset their data limitations. In these cases, final reports should outline clearly what steps can be taken to address them in the future.



CHALLENGE 3.

Building Knowledge and Trust in the Data Collection and Draft Review Processes

After several preliminary visits, the Stratus team began collecting samples in September 2003. Samples were taken from 6 sites on a weekly basis (for a period of 22 weeks) and from 48 sites on 3 different occasions in the dry, transition, and wet seasons.

From the outset, the Mesa emphasized that a robust, independent data collection process was essential to building local trust. The study's findings would be largely irrelevant if data were perceived to be manipulated. Various trust-building measures were needed in order to build credibility. They included incorporating a community oversight body (*veedores*), unannounced sampling, including nights and weekends, and participatory selection of a laboratory.

Establishing a community oversight body: the *veedores*

Although there was general agreement that the Stratus team was credible, many Mesa participants still had some doubt whether the team could be trusted and called for additional measures to ensure that the study results were legitimate. FEROCAFENOP introduced the idea of *veedores*, observers from the community who would participate in the study to ensure its independence. As one *veedor* explained, "There were still many uncertainties about Stratus. Would they take the water from the right places? Would they add something? Would they change the bottles? No one knew what to expect... Since no one fully trusted them, the *veedores* could watch over how they took the samples from the streams and make sure they did not alter them." Indeed, the *veedores* were soon seen as an essential part of the study and incorporated into its structure. As one member of the Mesa Comité stated, "It was the only way the study would have legitimacy in the eyes of the town."



Stratus was receptive to local participation. As one Stratus team scientist said, “Of course, we wanted local people with us. We wanted to build trust in our work. We wanted to show them how the study was done.” The mine was also supportive of the *veedor* idea.

The *veedores* were nominated at the Mesa by institutions and town representatives. Initially, there were about 20 *veedores* from 8 groups:

- FEROCAFENOP
- The Sanitation System Provider of Cajamarca (SEDACAJ, in its Spanish abbreviation)
- The Scientific and Technical Committee for Monitoring Water (COMOCA, in its Spanish abbreviation)⁷
- The National University of Cajamarca
- The Peruvian Ministry of Energy and Mines (MEM)
- Minera Yanacocha
- The Municipal Government of Cajamarca
- The Autonomous Authority of the Jequetepeque Valley (a local group that monitored water in the Chonta basin).

The *veedores* expressed various reasons for participating in the study:

- “I became a *veedora* because I wanted to report back to my base what the mine was really doing. I wanted to say: I went and saw this and that; this was good, that was bad. And I wanted to tell the hydrologists when I didn’t think they were doing something right.”
- “I became a *veedor* to make sure that the consultants didn’t deceive us.”
- “My institution was already monitoring irrigation canals in the region. It made sense for us to see what Stratus was doing because it was similar to our work. We initially wanted them to give us their data and were disappointed when we found out they couldn’t. But we continued anyway.”

Various trust-building measures were needed in order to build credibility. They included incorporating a community oversight body (*veedores*), unannounced sampling, and participatory selection of a laboratory.

Defining the role of the veedores

Through discussions, the Mesa agreed on the *veedores*' terms of reference: to observe, ask questions, check that the sampling and shipping methods followed the agreed-upon protocols, and inform their communities and the Mesa about the process and progress of the water study. Their function was not, as some Mesa participants initially suggested, to *guarantee* the integrity of the study. "Because we are not technical experts, we cannot claim to guarantee anything, nor can we have that responsibility," explained one *veedor*. Stratus taught the *veedores* the correct protocols for taking and storing samples and what to look for to ensure that sampling techniques followed protocols. Because the Stratus team wanted to keep the sampling methods consistent, the *veedores* did not physically collect the water samples. In total, there were more than 30 sampling missions, and at least one *veedor* was present at all of them.

During the Mesa meetings, participants questioned the *veedores* about their capacity and roles. Questions included:

- "How do we know the bottles aren't being changed after you let them go?"
- "Can't they add something to the samples when you aren't looking?"
- "If there really was a problem, how would the *veedores* really know?"

To the extent possible, the *veedores* answered these questions, emphasizing their training and vigilance during sampling as well as the integrity of the Stratus team.

After significant discussion, the Mesa decided that the *veedores* would not be paid, as any payment might give the impression that the *veedor* system was not fully independent. Although this decision was important for building trust in the *veedores*, it also made participation difficult for some.

Ensuring consistent and comprehensive participation

As the *veedor* system evolved, the potential costs and risks of being a *veedor* became evident and influenced the level of participation of *veedores*. Because *veedores* were not paid, those not participating on behalf of an institution lost a day of income. Moreover, the field conditions were at times difficult. As one active *veedor* explained, "We sometimes suffered in the rain and in the hail and had to walk for hours. It was hard work!"

For many *veedores*, reputational risks were also significant. The belief that people and institutions who worked with Yanacocha were "contaminated" persisted among many stakeholders and was transferred to some degree to the *veedores*. Some *veedores* and their institutions were accused of being co-opted. As one *veedor* recalled, "Many people told me, 'You will become a puppet of the mine. They will pay you to say everything is fine.' And now, some people think this happened." According to another *veedor*, "People have attacked us. They have said we are sellouts. They have said many things about us that are not true."

In some cases, the combined costs outweighed the benefits and led to unreliable attendance. Only about 20 percent of the time did *veedores* follow through with the scheduled plans and accompany Stratus when they said they would. In almost every Mesa meeting, the problem of low attendance rates was discussed, and institutions were encouraged to prioritize participation in the water study by consistently sending *veedores*. To address the lack of monetary compensation paid to *veedores*, the Mesa continually acknowledged and praised the *veedores* and emphasized the technical integrity of the process. These efforts had some positive effects on attendance rates, and ensured consistent participation from a small number of dedicated *veedores*.

Another issue raised by observers was the need for more site-specific, local knowledge of and participation in the study. People from regions directly affected by the mine did not participate as *veedores*. Many local people did not know about the study, and some thought Stratus worked for Yanacocha. On at least three occasions, local residents blocked the road to the sampling site and would not allow the team to pass. In all three cases, the team's explanations of its affiliation and objectives assuaged the blockaders enough to allow passage. In some cases, local residents accompanied the team. These interactions revealed both the sensitivity of local people toward water issues and outsiders, and the lack of awareness of the study in the affected areas.

There were more than thirty sampling missions, and at least one *veedor* was present at all of them.

One Mesa participant observed, "The strategy of the *veedor* system was good. The problem was that people from the actual area were not there. How could someone be okay with another entering into their territory to look around? Often the locals were not told what was going on."

After significant deliberation, the Mesa decided that local people, when they chose to, could accompany the team on any sampling missions in their region but that they would not become official *veedores* because of the difficult logistical coordination. As an additional measure, Stratus notified the mayors of each village when the team arrived to sample and invited them to accompany the team. In this way, local residents and leaders were invited to participate and were aware of where and when the team had collected water samples.

Without a rigorous reporting system, the extent to which the *veedor* system helped to inform a wider audience about the water study varied widely across institutions. Some *veedores* informed their respective institutions and groups periodically about what they had observed during the sampling trips and about the study's process and objectives. However, the thoroughness of these *veedor* reports to constituents varied according to group or institution. One *veedora*, for example, recounted that she regularly informed her constituents about the water study and her participation. In meetings, she explained how the study was progressing and answered questions and concerns. Other *veedores* merely included the sampling trips in their monthly reports and did not inform their respective institutions about the progress of the water study.

Incorporating unannounced sampling

To prevent the possibility that water quality could be altered (by some purposeful contamination of the sampled stream or by Yanacocha's changing its normal discharge patterns), the Mesa decided the exact sampling location should be kept confidential until the day of the sampling. *Veedores* were notified only a day before that a sampling would occur, and the *veedor* from the mining company was not notified about the sampling until the evening of the day before. Although the last-minute notice added credibility to the study, it also meant that *veedores* did not have much advance notice to plan for the sampling trip, and this contributed to a higher absentee rate.

To address concerns that the mine could be discharging contaminants at night or on weekends, some samples were collected unannounced at night and on weekends; and six were collected at one location over a 24-hour period.

Selecting a trusted laboratory

The integrity of the lab was as important as the integrity of the study team and sampling methods. As one *veedor* said, "We feared that the mine could pay the lab to give us the results [Yanacocha] wanted." To select a credible lab, Stratus and the Mesa agreed to a list of criteria that, in addition to technical capacity, included well-documented quality control procedures and independence from the mining industry. The Stratus team suggested a U.S. lab, Columbia Analytical Services. After extensive discussion, the Mesa determined that the lab met the selection criteria.

Several Mesa participants suggested the *veedores* visit and review the lab for adequacy. As one *veedor* explained, "We wanted to look at it in the same way that we observed the sampling." However, the team decided that the logistics of such a visit would make the process too complicated to justify. Instead, the laboratory made a video of the process of water sample analysis, which Stratus showed at the Mesa. Stratus explained in detail the procedures that were used in the analysis to ensure the lab's independence (for example, the use of a unique numbering system for sample bottles, blank samples, and duplicate samples). With these quality control procedures in place, Stratus emphasized, the laboratory could not fabricate data without the technical team knowing about it.

Despite these measures, many participants still had doubts and maintained a wait-and-see approach. According to one participant, "We thought for the most part that the lab was legitimate and trustworthy. Still, a degree of faith was required. Really, people just waited for the results, as they would indicate if the mine had paid them."

Keeping the public informed about the study's progress

As the study progressed through 2002 and 2003, the Mesa and the Stratus team realized that continuous briefing of key stakeholders during the data collection period would help build knowledge of and trust in the results. During its visits to Cajamarca, the Stratus team met with various groups interested in the water study both to explain how the study was progressing and to address questions and concerns.

Many parties conveyed their interest in accessing the water data as soon as the lab released it. Water users, they believed, could be at risk of being poisoned and deserved to know immediately if this was the case. However, water quality data had been misconstrued in the past, and the CAO and Stratus team sought to ensure the data were presented accurately and completely. After intensive discussions, the Mesa reached a compromise solution with Stratus in which the team would notify the Mesa immediately if the data suggested that water users were at risk. Otherwise, the team would not release the data until the study was completed.

To build basic technical understanding of water issues, the consultant team conducted a series of presentations to the Mesa.

Building capacity to understand the study results

Recognizing the need for basic technical understanding of various water issues, Stratus conducted a series of demonstrations at the Mesa. To address some common misunderstandings about pH and acidity, Stratus showed that Coca-Cola, with a pH of 3, was acidic; and mineral water, with a normal pH of 7, could change to a pH level of 3 when a small amount of lemon juice was added. Stratus explained that, contrary to some claims that low pH was always dangerous, whether low pH is harmful depends on the use or if the pH changes the levels of other contaminants in the water.

Stratus used analogies that were simple to understand, anticipating future confusion over the interpretation of short-term spikes in contaminant concentrations above standards versus persistent exceedances, and the risk from occasional versus regular exposure to a contaminant. For example, the team used body temperature to illustrate the concept of the difference in risk between a short-duration spike in concentration versus a persistent exceedance; a fever for one day is not likely to cause harm, whereas a fever for a week could be life-threatening. To illustrate the concept of risk from occasional versus regular consumption of water with moderate concentrations of a contaminant, the team used alcohol consumption as an example: excessive alcohol consumption on one occasion is not usually harmful, while regular excessive drinking can lead to serious health problems. On another occasion, the team used a sponge and scrubber to demonstrate how soil in the highland region near the mine stored water that contributed to canal flows, while other more common soils retained little moisture. When sprayed with the same amount of water, the sponge retained the water while the scrubber did not.

According to one Mesa participant, “Those demonstrations were important for everyone, even the people who called themselves technicians. Stratus had a lot to teach us about the water. Many people understood, but it was still very difficult.”

Although it was not possible to cover all issues and reach all interested observers, these explanations helped prepare the Mesa to interpret the study’s findings and implications.

The draft review process

Stratus finalized the draft report in August 2003. Reviewers of the draft included Yanacocha, the Ministry of Energy and Mines (MEM), and the CAO’s own internal compliance auditor. Reviewers were instructed to correct factual inaccuracies only, and not to take issue with interpretations or conclusions as long as they were based on accurate information. The CAO also reviewed the draft, focusing on its format and accessibility to the public.

Many Mesa members were concerned that Yanacocha or MEM could alter or influence the findings and conclusions during their review. They called for additional safeguards for the review process. After some discussion, the CAO agreed to provide the Comité president with a copy of the draft report. Participants agreed that if doubts about the integrity of the review process arose, comparing the draft with the final version could reveal any changes that might impact the report’s integrity. This additional trust-building measure gave the review process more legitimacy and credibility.

The participatory data collection and lab selection processes, in addition to the draft review arrangement, were largely successful in addressing key community concerns about the integrity of the data. Although some concerns remained unresolved because of logistical constraints, Mesa participants and observers were generally satisfied with the overall level of participation and the credibility of the data.

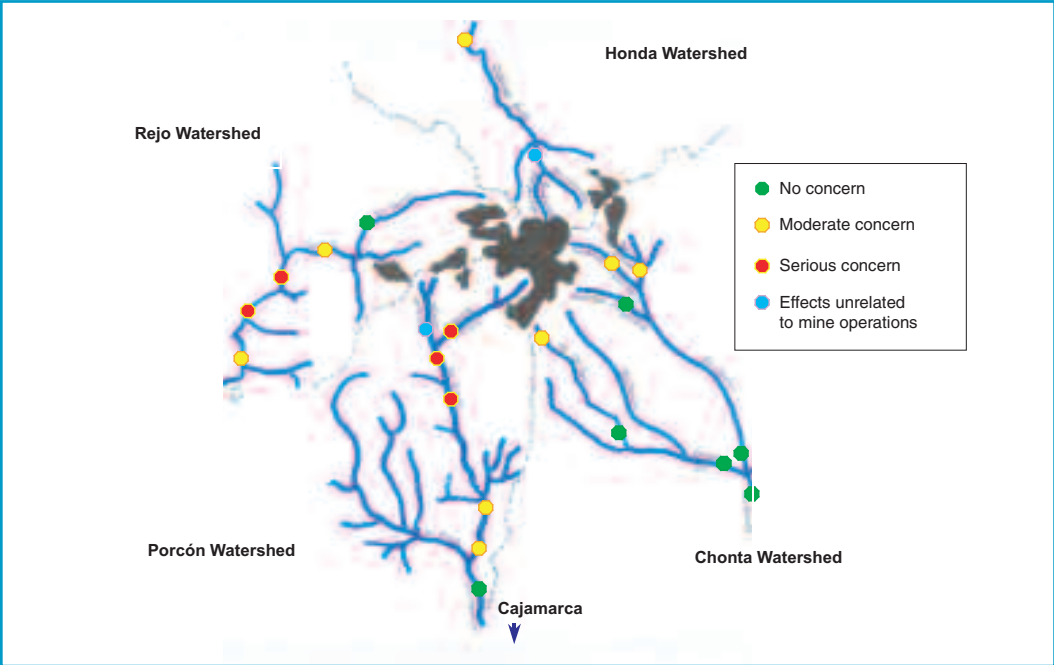
CHALLENGE 3.

Building Knowledge and Trust in the Data Collection and Draft Review Processes

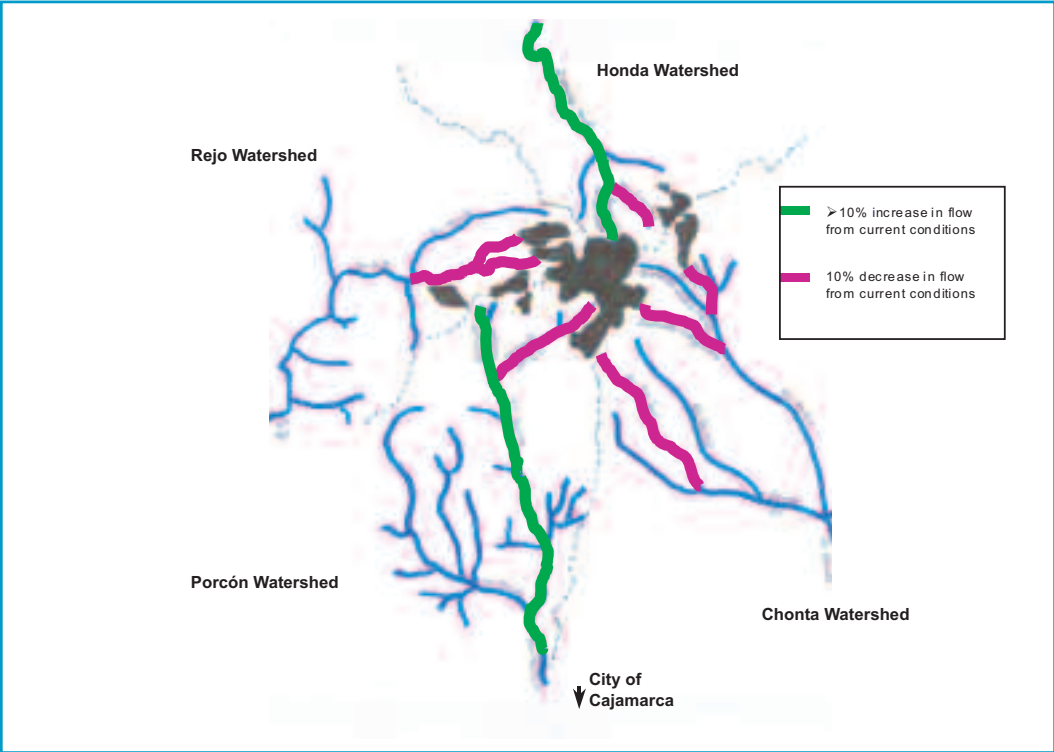
LESSONS LEARNED

- **Achieving meaningful local participation in a study requires considerable time and resources.** Consistent outreach and education to diverse and dispersed local stakeholders, and investing in qualified communications and technical staff, are keys to securing full participation in independent technical studies. The resource and time requirements often exceed those of standard, nonparticipatory studies.
- **To the extent possible, lay participants in the oversight of data collection should be local to the region and also local to specific sampling sites,** especially in areas where monitoring suggests that concerns may exist. Although more logistically demanding, such a site-specific participatory system can ensure that local residents are informed about and incorporated into the study. If local residents choose not to participate, study leaders should periodically brief them on the program's activities and respond to critical feedback.
- **A basic technical orientation can enable stakeholders to better understand a study's results and prevent misunderstandings before results are released.** Information outreach and skills-building can be an iterative learning process for local stakeholders, as well as for the study team.
- **The role of local participants in data collection supervision should be clearly defined.** While such participants can affirm the integrity of a process and inform the public of study progress, they typically are not certifiers of data quality, nor should they be responsible for interpreting study findings.
- **Mechanisms to benefit volunteers in lieu of paying them should be established, such as public recognition and certification of capacity building.** Given the general suspicion that monetary payment can result in bias, this arrangement can encourage continued participation, without creating distrust in volunteer integrity.
- **Clear mechanisms should exist for local participants in technical studies to report to their institutions or constituencies.** Without such a system, dissemination of information about the study process may remain limited to the small group of participants directly involved in the study.

Map 2. Water Quality: Areas of Concern and Threat Levels for Aquatic Life



Map 3. Water Quantity: Estimated Changes in Stream Flow





CHALLENGE 4.

Presenting the Results in a Balanced and Accessible Format

The Stratus team completed its analysis in October 2003 and presented the study to the Mesa during a two-day workshop. Approximately 100 people attended, representing about 40 institutions. Subsequently, the Mesa sent the written report and annexes (totaling more than 600 pages) to all of the major public institutions in Cajamarca and to the relevant national ministries.

Over the following week, the CAO and Stratus conducted a press conference, appeared on several radio and television shows, and were interviewed by numerous newspapers. More than a dozen local newspaper articles were written about the study. During the last months of 2003, the Stratus team presented its findings at the World Bank, to the Peruvian Congress, Yanacocha staff and contractors, and at an industry conference in Lima.

A major challenge was interpreting and presenting the findings so that they were accurate, understandable, and responsive to the wide range of local questions. The team sought to balance the demands of various groups and highlight areas where local concerns were validated, while at the same time maintaining scientific rigor.

Balancing thoroughness and simplicity

At a basic organizational level, the team had to balance the local demand for site-specific data with the general public's interest in broader and concise conclusions. Although the local residents wanted to know as much as possible about their waterways, other Cajamarcan residents were more focused on the state of the urban water supply.

The written report presented the original stakeholder questions about water quality and quantity that framed the study. The study findings were divided according to watershed. This format made the data more accessible to local residents who sought information specifically about their region.

Stakeholders seeking an impartial and understandable presentation of the study results were satisfied with the Stratus team's communication of the complex findings. For those who sought a simple "yes or no" judgment as to whether the mine was contaminating, the presentation of the findings was frustrating.

At the same time, excessive written detail ran the risk of being too complicated for some readers. The team recognized that the main results of the study should be displayed visually as much as possible to make them accessible to the public. To illustrate the results of the water quality assessment, Stratus placed colored dots on a map of the sampled waterways, indicating sampling locations according to degree of risk or concern for each use evaluated. The dots followed the colors of a stoplight, with green indicating no concern, yellow indicating a moderate concern, and red indicating a serious concern (see map 2). For water quantity, lines on the map ran parallel to the streams, and their colors indicated by what percentage the water levels had increased or decreased as a result of the mine's operations (see map 3).

Walking the middle path as the independent team

In many ways, the form and tone of the presentation of the results and their implications were even more important than the study's accessibility. In a highly charged local context, the team analyzed the results and deliberated about how to convey them to the public. A wide range of groups in Cajamarca wanted the interpretation and communication of the results to reflect their respective interests. At one end were groups that sought confirmation of their accusations of extreme pollution. At the other end, Yanacocha sought confirmation that its operations had resulted in very limited impacts and posed minimal risk. The team found that the reality lay in between these extremes, requiring Stratus to "walk a middle path," as one Stratus team member said. Such a course required internal deliberations about how to summarize the report in a way that was accurate and also responsive to local stakeholder questions and concerns.

Before presenting the study, the team drafted a summary document to convey the key findings. The team realized the importance of assuaging local fears that water consumption in rural and urban areas posed an immediate risk to human health. At the same time, it was important to point out areas where exceedances of various standards and guidelines were found, and to qualify the degree of threat those exceedances posed to human health, livestock, irrigation, and aquatic life. Quantity issues were also important to highlight for rural canal users and urban consumers of potable water.

The summary document, presented to all workshop participants and local media, included nine major conclusions (see appendix B). The first sentence of each major point was intended to respond succinctly to local concerns (see box 1). Areas with detected exceedances were described under points 6 and 8. As will be discussed in Challenge 5, different groups chose to highlight different parts of the findings.

Some important judgment calls on conveying exceedances were required in finalizing the report and drafting the summary document. For example, Stratus had to decide whether to report the risk presented by high fecal coliform levels in water from human and animal waste. This type of contamination was not related to the mine, and Stratus did not want to convey the message that they were minimizing or hiding mine-related impacts. However, in light of the gravity of this threat to human health, the team decided to include this finding and recommend measures to address the problem.

For the written report, two possibilities were available for visually representing threat levels that would be highlighted in red: severe danger from exposure to the water a single time, or a longer-term risk from persistent exposure. The first definition would encompass only the areas where standards and guidelines were exceeded to a high and immediately dangerous level, while the second would encompass even slight standard exceedances. Stratus knew it was important to convey that one exceedance of US EPA and WHO guidelines was not necessarily a serious threat to public health; the permissible level for some substances is below the level that has a one in one million chance of causing cancer over 30 years of consumption. Thus to highlight areas of concern for the public without causing alarm, the Stratus team applied the first definition, with red signaling a significant, short-term threat and yellow indicating exceedances of less immediate concern.

BOX 1. Summary of the Findings of the Mesa Water Study^a

The water study was organized around nine major conclusions:

1. The mine has altered water quantity and quality in some locations and at some times.
 2. Changes in water quantity and quality are greatest close to the mine boundary and diminish with distance downstream of the mine.
 3. The quantity of water available for the City of Cajamarca has not been reduced by the mine.
 4. The quality of drinking water in the City of Cajamarca has not been affected by the mine. Although the quality of water at one of the three water intakes for the city was affected by the mine on several occasions, the kind of treatment used at El Milagro [water treatment plant] will remove these substances.
 5. The water quality changes caused by the mine are not serious enough to pose imminent short-term danger of illness or death to people, livestock, or crops, including to people who drink the water in the City of Cajamarca.
 6. Even though water quality changes do not pose imminent danger to people, international water quality standards for drinking, livestock, and crops were exceeded in some locations. This is a concern for the long term. Continuous monitoring to ensure that people and their needs are not harmed, and water quality improvements by the mine, may be needed. The concerns are greatest at locations close to the mine property.
 7. The greatest concern for human health is bacteria in water...Bacterial contamination is caused by animal and human waste, not by mining operations.
 8. Water quality effects caused by the mine may be sufficient to kill fish and other life in streams at some locations.
 9. Mining operations have not reduced the amount of water available for people at the present time. Some streams have decreased flows because mine facilities capture water that would go to the streams. Some streams have increased flows due to discharges of treated water from the mine.
- a. Appendix B contains the full summary handout, which includes further explanation of the findings and site-specific information.



Validating some local concerns

The water study confirmed some of the local community's specific observations of water quality and quantity impacts. These linkages between local knowledge and study findings were important for gaining the attention and trust of the public.

Monitoring data collected from the location in Quebrada Honda where the mine discharges treated leach pad water showed that changes in flow and chemistry could be detrimental to aquatic life. Local people had a perception that these discharges had an impact on the stream, but did not have the data to confirm this perception. Highlighting this impact in the report confirmed this suspicion and generated credibility for the water study with the community.

Another notable finding related to the unique soil properties of the highland region. Many canal users had expressed concern that the mine's removal of topsoil around the mine had decreased water levels in canals. Although such an allegation had initially appeared dubious to the Stratus team, its analysis of soil characteristics supported these claims while also revealing one of the most notable scientific surprises to the Stratus team: the soil's ability to store and release water to a degree that far exceeded what the scientists had expected or seen in other environments. As many of the farmers had stated, the soil in the region near the mine was like a sponge, storing water and releasing it during the dry season. Because rural people rely on water in canals for most of their needs, the sponge effect was critical for the water supply of some canals, especially during the dry season. Indeed, the Stratus team soon realized that the irrigation canals had been originally built (some as long as 500 years ago) to take advantage of the "sponge" effect. Indeed, as a hydrologist on the Stratus team remembered, "I had never observed a soil with these properties before. It was really amazing."

For local people, the finding was less remarkable but important as recognition of their knowledge. "It was frustrating that it took so long for the scientists to tell us what we already knew from our ancestors," one canal owner reflected. "But I guess scientists are like that."

Several concerns of residents in the Honda basin also were confirmed by the study's findings. Because the Honda basin was the site of the mine's main discharge point, some elevated levels of contaminants were found on occasion. A resident of one town in the Honda basin stated, "This study shows us that there *is* contamination where we live, in Quebrada Honda. It confirms to us that the worries we had were true. Many people feel vindicated by the study. They are looking at the findings closely and want to know what the mine is going to do about it."

CHALLENGE 4.

Presenting the Results in a Balanced and Accessible Format

LESSONS LEARNED

- **Adapting communications to different audiences is essential for developing a solid foundation of public knowledge.** Parties interested in technical results have different levels of education and technical knowledge. Presenters should seek to understand and adapt to such differences. Specific guidelines include the following elements:
 - Provide a technical orientation for local stakeholders before reporting findings to ensure they understand key technical terms, results, and their implications
 - Tailor technical presentations to the capacity and expertise of each audience
 - Directly respond to key questions of local concern in order to establish local relevance and understanding
 - Involve local staff with expertise in communications who can convey complex findings in a format understandable to the local audience
 - Report results to the public over time to ensure widespread understanding.
- **Direct outreach to local communities is key to ensuring that affected groups receive and understand technical findings and recommendations.** Regular dialogue with affected people ensures that their concerns are addressed fully and promptly. Communication with local representatives is necessary—but not sufficient—because representatives do not always convey information to their constituents.
- **Communication strategies and capacity should be integrated into a study's initial design and budget.** As with participation, capacity building and communication require considerable time and resources and require specific expertise for successful execution. Study organizers should invest adequate resources in expertise to develop and implement a comprehensive communications strategy.

On the whole, stakeholders seeking an impartial and understandable presentation of the study results were satisfied with the Stratus team's communication of the complex findings. For those who sought a simple "yes or no" judgment as to whether the mine was contaminating, presentation of the findings was frustrating; some of these participants discarded the study's findings as inconclusive or influenced by the mine.

CHALLENGE 5.

Maintaining a Productive Debate

Not surprisingly, the water study's findings sparked a heated debate about their validity and implications. In the face of much public distrust and competing agendas, the Mesa, the CAO, and the Stratus team struggled to keep the debate focused on the facts, respond to spin, and directly and persistently address the doubts and misinterpretations of the wide range of interested parties.

Addressing public questions and doubts

During question-and-answer sessions, the CAO and the Stratus team aimed to assuage local fears of life-threatening harm from contamination and focus on the specific areas that warranted concern and remediation. The issues that sparked the most debate are described below, along with a summary of the discussion that surrounded them.

Yes or no to contamination?

The ambiguous meaning of the word "alteration," which the study used to describe the mine's effects on some waterways, frustrated some participants who sought a definitive statement of "yes" or "no" to the question of whether or not the mine contaminated water. In several instances they demanded that the CAO, Stratus, and the *veedores* issue such a statement.

In response to these requests, Stratus and the CAO attempted to widen the space for discussion about the reality on the ground, which was not one extreme or the other. "Contamination is a very loaded term," one Stratus team scientist explained to the workshop. "When we say there is alteration, we mean change at some level. Whether or not this change is serious enough to be considered dangerous contamination depends on the site and on the use at that site." The CAO added that the word "contamination" means different things to different people and emphasized the differences in the mine's effects on water quality across watersheds. "There are many different effects felt throughout the region, and if people want to know what is happening in their region they should refer to the report."

A lively debate over the study built public knowledge about water issues in the region and helped to address misperceptions and mischaracterizations of the study findings.

These explanations were enriching for some observers, who began to understand the complexities of the mine's effects and focus on the areas where mine impacts were significant. For others, however, such responses were not satisfactory for the very reason that they were complex and difficult for the public to understand and act upon. After pressing the CAO and Stratus about contamination, one interviewer stated, "If you aren't going to clarify this basic fact [of whether or not there is contamination], we'll just leave the water question in the ambiguous zone that it has been for years."

Another stakeholder conveyed this concern: "If there is any gray area about contamination, the mine will twist it in their favor; and they did because the critical environmental NGOs didn't take up the study and point out the problem areas as much as they could have."

Nevertheless, the team's focus on the specific water quality issues on the ground, rather than a summary statement, provided the space for a more accurate and productive discussion at the Mesa. Such an atmosphere would later enable the Mesa to call for acceptable technical solutions to the complex impacts found in the mine's area of influence.

True Mesa independence?

Some observers who were disappointed that the study did not confirm imminent danger to health attacked the Mesa, the CAO, and the study's independence. They alleged that the mine's influence over the Mesa and the lack of CAO independence had led to a softening of the study's critical findings of adverse mine impacts on waterways. The CAO, Mesa leaders, and Stratus urged these critics to focus on the substance of the study and to carefully review the water quality and quantity data. They emphasized that such a focused review, rather than allegations, would help to inform local stakeholders about the state of the region's waterways and facilitate productive discussions about next steps.

Potential manipulation of samples?

Another set of concerns centered on the rigor of the sampling process relative to the mine's power to manipulate findings. One government official asked the Stratus team, "Couldn't the mine have changed its operations during the study to ensure that the results were favorable?"

In response, Stratus explained the measures it had taken to avoid such a possibility, such as unannounced sampling, sampling on nights and weekends, and a 24-hour sampling cycle, to ensure that neither the mine nor people against the mine influenced the water quality. Stratus explained that it had found no difference in the nighttime, unannounced, and Yanacocha monitoring data, which suggested that no manipulation had occurred. For some participants, this explanation was reassuring. However, doubt remained among those who believed the mine could have changed its discharge levels for the entire life of the study.

Long-term versus short-term human health risks?

The complexity of assessing risks to human health were another source of questions for the Stratus team. A local farmer asked the team, “When you say that there is no risk of short-term danger to people, do you mean that there is long-term danger? What about the people living in the upper watershed? There are areas where people are exposed to water that does not comply with protective standards. The mine needs to recognize this and do something about it. These are human lives we are talking about!”

Stratus responded that, although no immediate risks to human health were found, characterization of the longer-term implications for public health in the region would require additional data on local water use patterns, such as the frequency with which people drank water from streams. Because the terms of reference of the study did not include the collection of these data, Stratus could not determine the extent to which local residents were at risk for the long term. This frustrated some people concerned about the well-being of people living and drinking water near the mine. Recognizing the need to address these concerns, Stratus recommended a series of actions, including collection and analysis of water use data, installation of potable water systems in rural areas, and mitigation measures where water quality concerns were identified.

Continually building public knowledge and managing mischaracterizations

Interpretation of the Stratus findings continued in the public realm. In addition to both praise and criticism of the study’s integrity, slanted characterizations of the study results abounded. The misinformation required constant attention from the Mesa, the CAO, and Stratus, which responded to attacks and mischaracterizations of the study by emphasizing its independence and the entire set of study findings. Stratus also sought to distinguish the study from an audit conducted at the request of the CTAR Mesa by another consulting firm, INGETEC (see box 2).

Understanding of the results and their implications varied widely, as demonstrated by these varying statements from a wide range of Mesa participants and observers:

- “Yanacocha is not contaminating, and these two reports [Stratus and INGETEC] confirm this fact.”
- “It shows the mine is in compliance with IFC policy requirements....”
- “There is contamination that is manageable. The mine needs to implement improvements, and we need to monitor.”
- “There is no contamination, which cannot be true. We know there is contamination.”
- “There is contamination in my region, as we always knew. The mine needs to fix it now.”
- “There is basically less pollution than we thought, which is a relief.”

BOX 2. Distinguishing the Water Study from the INGETEC Audit

The public perception of the Mesa water study's legitimacy and the environmental impacts of Yanacocha were colored by an environmental audit of Yanacocha conducted by INGETEC, a Colombian consulting firm. INGETEC was selected by the regional government's CTAR Mesa and contracted by the Ministry of Energy and Mines to audit various aspects of Yanacocha's environmental management. The overlapping objectives, findings, and recommendations of the two initiatives required that the Stratus team and the Mesa communicate with the INGETEC team and clarify similarities and differences to the public.

The INGETEC audit concluded in mid-2003, but the results were not released until early 2004 (after the Stratus report was made public) because of some complications with the controversial publication of the audit's draft. The INGETEC audit based at least some of its conclusions and recommendations on the Mesa water study data and incorporated Stratus's recommendations (discussed in the section on Challenge 6). Yanacocha accepted both initiatives, although it expressed more confidence in the scientific rigor of the Stratus study and the validity of its recommendations. Nevertheless, the two initiatives presented distinct challenges because both required thorough responses. Table A contrasts the two initiatives.

Political context had significant influence over public perceptions of the two initiatives. Because the water study was overseen by the Mesa, which was not officially part of the regional or local governments, critics characterized it as less legitimate. In addition, because the INGETEC audit was part of the governmental CTAR Mesa and endorsed by some of the groups that staunchly criticized Yanacocha and refused to participate in the Mesa, the INGETEC audit was perceived by many to have more independence from Yanacocha.

Table A. Similarities and Differences between the Mesa Water Study and the INGETEC Audit

Parameter	Mesa Water Study	INGETEC
Funding	Both paid for by Yanacocha but managed through a third party	
Purpose	Both present "independent" evaluations of Yanacocha's impact on water quality and quantity	
Findings	Both arrive at similar conclusions about water impacts and similar recommendations to mitigate these impacts	
Origins	Mesa	CTAR Mesa and MEM
Scope	Water	Various environmental and social issues
Data	Primary (collected) with <i>veedores</i>	Reviewed existing data; limited primary data collection; some social surveys
Recommendations	10 in total, based on broad findings	309 in total, mostly site-specific and at times duplicative
Follow-up	Implementation of some recommendations in 2004-05	Follow-up commission in 2006

- “We knew that there was pollution in the area where we had already been working. The study confirmed that and expanded the knowledge base.”
- “There are problem areas with major contamination, and the mine knew and still hasn’t done anything.”

For its part, Yanacocha sought to present the case findings in a positive light for the mine. In its 2003 Social Balance Report, for example, Yanacocha highlighted six of the summary findings listed in box 1, and excluded the three stating that guidance values for water quality were exceeded in some areas. On various occasions, Yanacocha reiterated publicly the findings about fecal coliform and lack of mine-related contamination in the city of Cajamarca’s water. When the issue of Cerro Quilish intensified, Yanacocha stated that the Stratus study suggested that mining Quilish would not result in contamination. In response, Stratus, the CAO, and the Mesa had to emphasize that the water study did not include any predictions about the impact of the Quilish expansion.

In an interview with a Peruvian newspaper, the mine’s general manager stated that, like any human construction, “the Yanacocha mine alters the environment, but it does not contaminate.” These messages frustrated some Cajamarcans who expected the company to acknowledge contamination in some areas. As one Mesa participant stated, “The general message from Yanacocha was ‘the study shows we are good, we comply.’ But really, that’s not fully true.”

Although the Mesa remained attentive to addressing potential mischaracterizations of the study, over time there was a lull in Mesa presentations about the study and a decline in exposure to its findings. The Mesa did not conduct additional comprehensive outreach about the study, as members chose to focus on follow-up to Stratus’s recommendations. As a result, because few people actually read the report, knowledge of the study remained limited to the presentations and sound-bite news coverage. Indeed, many Mesa participants expressed concerns over a lack of widespread public comprehension of the findings and their implications, especially in rural areas:

- “The written study is so dense. No one will read it, not even technically trained people like myself.”
- “We cannot interpret the report as *campesinos*, even the places where they say they monitored. We don’t understand a GPS point, we understand: ‘by the bend in the stream we took a sample that said xyz.’”
- “Field workshops are needed, as are meetings with local mayors in the affected area.”
- “The findings and their presentation need to be adapted to local ways of understanding, and they need to be repeated many times for them to be comprehended”
- “The challenge is always to get the word out in the rural areas. The Mesa did a better job than us at this, but more needs to be done.”

Given the wide range of interpretation of the findings and the need for additional communication efforts, the Mesa made a comprehensive communications plan a priority for future work in late 2004, as described in monograph 3.

In general, public communication of the water study findings was initially robust and comprehensive. A lively debate over the study built public knowledge about water issues in the region and helped to address misperceptions and mischaracterizations of the results. However, without a longer-term communications strategy, the Mesa was unable to thoroughly convey the results, implications, and recommendations, especially in rural areas where the potential impacts of mine operations are generally greatest.

CHALLENGE 5.

Maintaining a Productive Debate

LESSONS LEARNED

- **Periodic and comprehensive reporting of a scientific study's results is key to widespread understanding.** A few presentations, however thorough and well attended, have little chance of being successfully assimilated into local common knowledge. Because travel to urban areas is often difficult or impossible for rural stakeholders, study leaders should travel and present directly to rural communities. To ensure broad coverage and productive discussions, such presentations should occur over a period of several months after a study's initial release
- **Because political climate and media coverage can influence discussion of a study's processes, results, and implications, study leaders should develop a long-term communications strategy.** The strategy should include plans for proactive and frequent engagement with local representatives and the media on issues of particular concern and guidelines for responding in a timely manner to misinformation that may surface following the study's release.

CHALLENGE 6.

Ensuring Effective Follow-Up to Study Recommendations

Moving from findings to tangible improvements was a major hurdle for all Mesa participants.

With the findings made public, many stakeholders focused on the question of implementing the recommendations. One participant at the water study presentations asked the audience and the Stratus team: “We see that there are places where we need to be concerned. Now the question is, what do we do with the information?” Significantly, the Yanacocha representative to the Mesa stated: “We, Yanacocha, see this as an opportunity, a point in common from which we can work together transparently. We will work with you to repair the impacts.” Moving from findings to tangible improvements was a major hurdle for all Mesa participants. The Mesa sought to craft recommendations and create a mechanism for tracking their implementation.

Issuing recommendations

The Mesa Board of Directors (Comité) requested recommendations from the Stratus team about how to address current and future water issues. Although recommendations were not part of its original terms of reference, Stratus had made some suggestions for improvements during the question-and-answer periods in the October 2003 workshops and was prepared to provide guidance for the Mesa on request.

In December 2003, the Stratus team sent the following recommendations in a letter of response to the Mesa’s Comité (see appendix C for the complete letter):

1. Continued participatory monitoring of surface water
2. Verification and communication of monitoring results
3. Groundwater assessment and monitoring
4. Assessment of the actual use of water at locations identified in our report as being of potential concern
5. Further assessment of aquatic life in streams
6. Erosion control and sediment management
7. Protection of canals that cross the mine property
8. Treatment or replacement of rural drinking water sources that could be affected by bacterial contamination
9. Evaluations of mine closure plans
10. Evaluation of specific water quality and quantity issues in each basin.

To many Mesa participants, these recommendations were key to ensuring that the study would succeed in its ultimate goal of contributing to conflict mediation. As one member said, “We trusted the results of the study, so we naturally wanted to know what they thought should be improved and changed by the mine. We thought their recommendations should be a starting point for our future work.”

Yanacocha had committed to addressing significant problems identified by the study. In a radio interview, the environmental manager of Yanacocha stated, “It is the policy and interest of Yanacocha to work to solve these problems because we want to have a good environmental control and because we want the community to participate in it.... We must continue to work with transparency under a scheme that involves the participation of the community to guarantee that mining operations use controls that will prevent things from occurring in the long term.”

In April 2004, Yanacocha sent the Mesa a written response to the Stratus recommendations. The response addressed each of the ten recommendations and provided explanations of three concrete areas of action that Yanacocha was undertaking at the time to mitigate its environmental impacts, including two sediment control dams, a reverse osmosis treatment system at the main discharge point to the Quebrada Honda, and various additional studies, with the aquatic life study first on the list.

Yanacocha had presented a similar response to the CTAR Mesa in February 2004. The company's responses to other areas of concern, such as potable water for rural areas and protection of canals, were more vague.

Creating a system for follow-up

Even before receiving Yanacocha's response, the Mesa began to prioritize implementation of the recommendations. The top priority was to continue water monitoring. Many people, especially those in rural areas, saw great value in independent water monitoring. In addition, aquatic life remained a central concern. Although it focused on these specific issues, the Mesa did not establish a formal system for tracking the implementation of all ten recommendations. This later became a major challenge for the Mesa, as discussed in monograph 3.

The Mesa and the Stratus team successfully moved the discussion about water concerns forward, from debate over the study's findings to deliberation over its recommendations. Although a series of next steps were agreed upon by a wide range of Mesa stakeholders, creating a system for their implementation and follow-up proved to be a significant challenge for the Mesa. The challenge continued to surface during the Mesa's transition phase, as described in monograph 3.



CHALLENGE 6.

Ensuring Effective Follow-Up to Study Recommendations

LESSONS LEARNED

- **An initial commitment by the parties to adapt operations or actions if studies suggest such adjustments are appropriate can help ensure that independent findings will have consequences.** It will also boost local confidence in a study's potential utility and independence.
- **Process participants should agree on a mechanism for addressing problem areas identified by an independent study.** The mechanism should include protocols for:
 - Directly addressing study recommendations through mitigation measures and/or additional analysis
 - Establishing verifiable benchmarks
 - Supervising recommendation implementation
 - Reporting regularly to the public.
- **Independent studies should not attempt to replace the regulatory responsibility of government.** To prevent the creation of parallel and competing monitoring programs, participatory processes should define with relevant regulatory bodies the legal “status” of study findings and recommendations, as well as the mechanism through which the government will (or will not) take them into account.

CONCLUSION

As a central focus of the Mesa, the water study contributed significantly to the conflict mediation process by directly addressing community concerns about Yanacocha's impact on local waterways and enabling local stakeholders to participate at many levels in the study. This participatory approach and the numerous efforts to ensure procedural credibility were essential to building trust in the study. In addition, the technical capacity building that accompanied the water study helped many local stakeholders understand the results and their implications. As a result, local stakeholders could work collaboratively to educate the public and address identified areas of potential concern in the mine's area of influence. At the same time, more rigorous communication efforts could have built a broader base of public understanding, especially in rural communities where awareness of the water study and its recommendations was more limited.

The efforts made to overcome challenges that emerged during the water study thus resulted in both successes and shortcomings. Collectively, they provide a series of key lessons learned for similar future endeavors.

APPENDIX

APPENDIX A. PEOPLE INTERVIEWED FOR THIS MONOGRAPH SERIES

Each person was interviewed at least once: in late 2004 (October–December), in 2006 (March), or in both years. Affiliations are as are of the time of the first interviews, which for some individuals is different from their affiliation during their involvement with the Mesa. Individuals are listed alphabetically by organization.

U.S.-based organizations	
World Bank Group	
CAO (Office of Compliance Advisor/Ombudsman)	Meg Taylor
	Ana María Aguilar
	Rachel Kyte ^a
IFC (International Finance Corporation)	Mauricio Athie
	Doug Lister
	Shawn Miller ^b
Yanachocha	
Newmont Corporation	Chris Anderson
Consultants	
CDR Associates	Susan Wildau
DPK Consulting	Bill Davis
Stratus Consulting, Inc.	David Atkins ^c
	Kate LeJeune
	Josh Lipton
	Ann Maest
	Connie Travers
NGOs	
Project Underground	Erica Etelson
	John Gilber
External reviewers	
CAO 2003 External Review Team	Ben Dysart, Dysart & Associates
	Tim Murphy, Independent consultant

Continued on next page

Peruvian-based organizations

Mesa

Mesa staff	Laura Alarcón
	Carlo Calderón
	Elizabeth Morales
	Luis Ara Valera
Mesa Comité (board of directors) ^d	José Marchena Araujo, SEDACAJ
	César Briones, Mesa Technical Commission
	Segunda Catrejon, FEROCAFENOP
	Marieta Cervantes, INIA
	José Delgado, Private University of Cajamarca
	Carlos Díez, Solidaridad International
	Ramón Huapaya, Minera Yanacocha (second delegate)
	Ismael Linares, Town of Combayo
	Julio Marín, CORECAMIC
	Gil Paisic, Town of Yanacancha Grande
	Segundo Sandoval, Cajamarca Chamber of Commerce
	César Torres, COMOCA

Yanachocha

	Nick Cotts
	Alejandro de Bary
	Brant Hinze
	Michael Myers
	Carlos Sanchez

Government groups

Regional Fisheries Directorship	Rebecca Iglesias
Ministry of Energy and Mines (MEM)	Maria Chappuis
	Ricardo Giesecke
MEM Regional Office	Elmer Portilla
Municipality of Cajamarca	Rodolfa Orejuela

Catholic Church

Vicaria de Solidaridad	Padre Efraín Castillo
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Community groups and NGOs

ALAC	Violeta Vigo
ASPADERUC	Pablo Sánchez
Cajamarca Chamber of Commerce	Horacio Gálvez
	Víctor Gutiérrez
CONAM	Eduardo Dios
Ecovida	Nilton Deza
Frente de Defensa de Cajamarca	Reinard Scheiffer
Futuro Sostenible	Antonio Bernales

Canal users

Manuel Carrasco
Rafael Castrejon
Luís Gilberto
Daniel Heras Flores
José Enemesio Ilman
Leonides Taica Valdivia

Veedores (independent oversight observers)

Alfredo Chávez, SEDACAJ
Gilberto Cruzado, IUDER
Ulises Pajares Gallardo, ADEFOR
Zenaida Mirez Gallardo, FEROCAFENOP
Humberto Marín, CORECAMIC
Fanny Rimarachín, Municipality of Cajamarca
Cesar Torres, COMOCA
Cleotilde Villanueva, FEROCAFENOP

Conflict resolution students

Anita Araujo
Ronnie Ruben

- With the CAO at the time of participation in the Mesa.
- With the IFC until 2004.
- With Stratus Consulting, Inc. until 2005.
- The first delegate was the main and only delegate for his/her organization until the second replaced him/her to be the only delegate

APPENDIX B. WATER STUDY FINDINGS: SUMMARY HANDOUT

Introduction

This summary presents the objectives, methods, results, and conclusions of an independent investigation of the potential effects of mining operations on water quantity and quality in the vicinity of the Yanacocha mine in northern Peru. The Yanacocha mine is operated by Minera Yanacocha and is owned jointly by Newmont Peru Limited (51%), Compañía de Minas Buenaventura (44%), and the International Finance Corporation of the World Bank, or IFC (5%). This independent investigation was conducted by Stratus Consulting Inc., an environment and energy research and consulting firm with headquarters in Boulder, Colorado, USA. Stratus Consulting was retained by the Office of the Compliance Advisor/Ombudsman (CAO) of the IFC, the private sector lending arm of the World Bank, to conduct this independent study on behalf of la Mesa de Diálogo y Consenso CAO-Cajamarca (the Mesa) in response to a formal complaint that had been filed with the CAO regarding potential environmental harm caused by the mine. The study was conducted for the sole purpose of answering the questions identified by the Mesa.

Study Objectives

Have current mine operations resulted in changes in surface water flow that have adversely affected or could adversely affect:

- the quantity of water available for potable water treatment for the City of Cajamarca?
- the frequency or magnitude of droughts or floods?
- the quantity of water available for irrigation and agricultural use?
- the quantity of potable water available for rural use?

Have current mine operations resulted in changes in surface water quality that have made or could make the water unsafe for:

- human consumption?
- skin contact or clothes washing?
- livestock?
- irrigation and agricultural uses?
- plants, invertebrates, fish, frogs, or other aquatic life?
- human consumption of organisms that live in or consume the water?

Study Design

To answer these questions, Stratus Consulting conducted a data and information review followed by a field investigation to evaluate current surface water quantity and quality conditions in the streams, canals, and other waters downstream of the Yanacocha Mining District. The geographic scope of the investigation included the Porcón, Chonta, Honda, and Rejo basins. To determine how water in streams downstream of the mine compares to water in streams not influenced by the mine, water quantity and quality in streams originating on the mine site were compared to conditions in streams in areas that are outside the potential influence of the mine.

This investigation was conducted between January 2002 and October 2003; field sampling activities took place between September 2002 and April 2003. Over 300 water quality samples and stream flow measurements were collected for this assessment. As part of the field study, representatives of the Mesa (veedores) accompanied Stratus Consulting on field sampling trips. The veedores witnessed the study and served as a link between their institutions and communities, the Mesa, and Stratus Consulting.

Conclusions

Our study and our sampling have enabled us to reach scientific conclusions regarding the effects of the Yanacocha mine operations on water quality and quantity.

Conclusion 1: The mine has altered water quality and water quantity in some locations and at some times.

To explain this conclusion, the following sections describe:

- a. The types of operations at the Yanacocha Mine that alter water quantity and quality.
- b. Sites where significant changes are occurring.
- c. When the significant changes in water quality occur.
 - a. Mining facilities and associated operations that affect water quality and quantity include open pits, leach pads, and waste rock dumps. Mine operations increase erosion of soils and sediment loading in streams.

Minera Yanacocha currently mines ore from four open pits. Rainfall and groundwater that collect in the open pits are pumped from the pits, treated to reduce the acidity and metals, and discharged to streams. Minera Yanacocha discharges the treated water to Quebrada Honda and Quebrada Callejón. The treated water that they discharge changes the quality of the water in Quebrada Honda and Quebrada Callejón. The discharges can raise or lower the acidity and change the concentrations of metals, sulfate, and calcium. The quality of the discharge water varies, and the changes that it causes in the receiving streams also vary. Sometimes it improves the existing water quality, and some times it degrades the water quality. The discharge of water pumped from pits increases the water quantity in Quebrada Honda and Quebrada Callejón.

Leach pads, where ore containing gold is leached with a cyanide solution, reduce the quantity of water available for streams downstream of leach pads. Leach pads are underlain with impermeable barriers designed to contain the gold-bearing solution that leaches from the ore. When rain falls on a leach pad, it is intercepted by the barrier, routed through Minera Yanacocha's gold extraction procedure, and returned to the leach pad. None of the rain that falls on a leach pad flows over the ground surface to streams or soaks into the ground to become groundwater. During the rainy season, when too much water falls on the leach pads, Minera Yanacocha treats the excess water to remove cyanide and metals and discharges the excess water to Quebrada Honda. The excess water increases the flow in Quebrada Honda during the rainy season, and it changes the quality of water in Quebrada Honda. The quality of the discharge water varies day to day, but it frequently has elevated levels of calcium, chloride, zinc, dissolved solids, and sulfate, and occasionally has elevated levels of cyanide, copper, selenium, and other metals. Quebrada Honda is the only stream that receives treated water from leach pads.

Mined rock that does not contain gold is disposed of in waste rock dumps. These dumps reduce the quantity of water in streams downgradient, and can adversely affect water quality in streams downgradient. Waste rock dumps intercept rainfall and delay the flow of water to streams. Minera Yanacocha's waste rock dumps are large, and it will take many years for the dumps to become fully saturated with water from rain. Until the dumps are saturated, water will not infiltrate in to the groundwater beneath them, and it will not flow over the dump surfaces to streams. Therefore, for many years, the dumps will impede the flow of water to streams and reduce streamflow. Minera Yanacocha's waste rock contains minerals that create acid and metals. When rain falls on the waste rock dumps, the rainwater leaches metals and acid from the rock. Minera Yanacocha treats the seepage from waste rock dumps before it leaves the mine property. However, acid seepage and the lime used to treat the acid seepage can change the quality of water downstream. Quebrada Encajón and Río San José have both been affected by acid seepage from waste rock dumps.

Removal of vegetation and soils for mining, road building, and other mine-related construction affects water quality and quantity. Water from rainfall flows more rapidly across bare ground than across vegetated ground, so removal of vegetation and topsoil increases the amount of water that reaches streams as runoff, and reduces the amount of rainfall that soaks into the ground to replenish the groundwater. Groundwater is the main source of streamflow during the dry season. Removal of vegetation also causes increased erosion and transport of sediment (mud) to streams. The mine captures most of the runoff and sediments in settling structures that reduce the turbidity of the water before it flows off the mine site, but not all of the sediments are removed. Operations at the mine have increased the sediment in the Río Grande, Río Tinte, and other smaller streams in the Chonta basin.

b. Locations of significant changes in water quantity and quality

Mining operations have caused a greater than 10% increase in the quantity of water in the Río Grande and in Quebrada Honda during the dry season, when availability of water is most critical. Mining operations have caused a greater than 10% decrease in the quantity of water in Quebrada Encajón, Río San José, Quebrada Chaquicocha, Quebrada Arnacocha, Río Colorado, and the upper tributaries to Río Tinte.

Mining operations have caused significant changes in water quality in Canal Tual (in the Rejo Basin reach downgradient of the Yanacocha facilities), Canal Quishuar Corral (on the mine property, but not near the centro poblado of Quishuar Corral), Quebrada Encajón, Río Grande, Quebrada Arnacocha, Quebrada Ochucha Machay, Quebrada Chaquicocha, Río San José, Quebrada Honda as far downstream as El Campanario, and Río Tinte and the upper Río Rejo near Granja Porcón.

Streams and canals where water quality has not been affected by mine operations include Quebradas Quilish, Corral Blanco (or Chinalinda Coremayo), and Viscachayoc, and the Ríos Chilincaga and Porcón in the Porcón Basin; Quebrada de la Sacsha and Ríos Azufre and Paccha in the Chonta Basin; the Río Colorado in the Honda Basin; and Quebradas Pampa de Cerro Negro, Crestón de Cerro Negro, Cerro Negro, Chacacoma, and Tranca in the Rejo Basin.

c. Timing of changes in water quality

In baseline streams, and in most assessment streams, concentrations of metals were highest during the transition to the rainy season and in the early part of the rainy season (October, November, and December), when flows were beginning to increase. Levels of sediment in baseline streams and in assessment streams increased during this period as well. Concentrations diminished substantially by January in baseline and most assessment streams, and remained low through the rest of the rainy season.

When water quality standards were exceeded, they were typically in samples collected during the transition to rainy season and in the early part of the rainy season. Concentrations of metals in most streams were low through the majority of the sampling period.

Exceptions to this include Quebrada Chaquicocha, where we measured the highest concentrations of metals in September, with very low concentrations thereafter, and in Quebrada Honda. In Quebrada Honda, the water quality is affected by the discharge of treated water from the leach pads. The mine discharges more treated water during the rainy season than during other times of the year.

[Conclusion 2: Changes in water quantity and quality are greatest close to the mine boundary and diminish with distance downstream from the mine.](#)

The mine is located at the top of several mountains, and at the headwaters of several streams. Streams receive water from rain that runs over the ground surface and from groundwater stored in soils. During the dry season, most of the water in streams comes from groundwater. At the top of the mountain, the area of soils that contributes groundwater to streams is small. Where mine facilities cover much of the ground near the headwaters of a stream, they significantly reduce the amount of water that flows to the stream (as groundwater and flow over the ground). With distance downstream, the area that contributes flow to the streams increases. The effects of the mine facilities are reduced as the area of the basin and the number of tributaries increase. Farther downstream, such as in Río Chonta and Río Tinte, the “footprint” of the mine facilities is so small relative to the area of the drainage basin that the effects of the mine on water quantity are too small to detect.

The effects on water quality are diminished with distance downstream for the same reason. As more tributaries contribute water to streams that flow from the mine, concentrations of metals are diluted. Therefore, even though we occasionally measured elevated concentrations of metals in certain streams near the mine boundary, concentrations were typically much lower downstream.

Conclusion 3: The quantity of water available for the City of Cajamarca has not been reduced by the mine.

The city of Cajamarca gets water from the Río Grande, Río Porcón, and Río Ronquillo. Intakes on these rivers supply water to the El Milagro and Santa Apolonia treatment plants. The Río Porcón and Río Ronquillo are not affected by current mining operations. The Río Grande is affected by mining operations, but the discharge of treated water increases the quantity of water in the stream. Water pumped from the La Quinoa pit is treated and discharged to Quebrada Callejón, which flows to the Río Grande. Mine operations significantly decrease flow in Quebrada Encajón, also a tributary of the Río Grande. However, the increased flow in Quebrada Callejón is greater than the decreased flow in Quebrada Encajón, so the net effect is a greater than 10% increase in flow in the Río Grande. Therefore, mine operations have not decreased, but rather have increased the quantity of water available for the City of Cajamarca.

Conclusion 4: The quality of drinking water in the City of Cajamarca has not been affected by the mine. Although the quality of water at one of the three water intakes for the city was affected by the mine on several occasions, the kind of treatment used at El Milagro will remove these substances.

We collected samples from the Río Grande each week from September 2002 until the end of April 2003 at a site near the intake for El Milagro water treatment plant. We collected 25 samples during the eight month sampling period. Each time that we collected a sample, we analyzed for substances in unfiltered water (water pumped directly from the stream to a sample bottle) and in filtered water (water pumped through a clean 0.45 micron filter, and then to a sample bottle).

Concentrations of lead and arsenic in unfiltered water samples that we collected near El Milagro intake on the Río Grande exceeded World Health Organization guidelines for drinking water, and United States Environmental Protection Agency standards for drinking water, on two occasions (two of the 25 times we sampled). This is why we say in Conclusion 4 that “the quality of water at one of the three water intakes for the city was affected by the mine on several occasions.” In the remaining 23 samples that we collected, concentrations of arsenic and lead, and of all the other substances that we measured, were well below the drinking water standards. Concentrations of dissolved lead and dissolved arsenic (and all other substances that we measured) were very low in our filtered water samples.

When the water from the Río Grande reaches El Milagro treatment plant, sediment is allowed to settle and the water is treated with a flocculent (alum) that removes the remaining sediment and small suspended particles from the water. The lead and arsenic that we measured in the two samples that exceeded the drinking water standards were present as particles carried in the water. We know that because we measured high lead and arsenic concentrations only in unfiltered

samples. Lead and arsenic concentrations in the filtered samples were low, so that means that the particles were too big to go through the filter. The flocculent that El Milagro uses is designed to stick to particles in the water and cause them to settle to the bottom of settling tanks before the water is sent to homes and businesses in Cajamarca. Therefore, we conclude that the changes from mine operations in the quality of water in the Río Grande do not affect the drinking water for Cajamarca. The El Milagro treatment plant removes particles that contain lead and arsenic before the water reaches any consumers, so there is no remaining effect on the water.

We did not detect mercury in any of the samples that we collected from the Río Grande. We used an analysis that would allow us to detect very low concentrations of mercury in water. Since we never detected mercury in water from the Río Grande, we conclude that mine operations are not causing mercury to appear in the drinking water in the city of Cajamarca.

Conclusion 5: The water quality changes caused by the mine are not serious enough to pose imminent short-term danger of illness or death to people, livestock, or crops, including to people who drink the water in the City of Cajamarca.

We compared levels of metals, cyanide, nitrate, and other substances in the more than 300 water samples that we collected to levels that are known to cause immediate, severe sickness or death. We used information from the United States Agency for Toxic Substances and Disease Registry, the United States National Library of Medicine-Hazardous Substances Data Bank, and the United States Environmental Protection Agency-Integrated Risk Information System to determine concentrations known to cause severe sickness or death within hours or a few days (less than one week).

None of the levels of substances that we measured in water near the mine, or far downstream of the mine, was high enough to cause sickness or death, in the short term, of humans, livestock, or crops. The concentrations that we measured were thousands of times lower than levels that would cause severe reactions. Using the water will not cause sickness or death within hours or days of use, and it will not cause a delayed severe reaction. For example, drinking the water today will not cause a severe reaction two weeks, two months, or two years from now.

People living around and downstream of the mine do not need to be concerned that the mine operations have made the water dangerous to use for everyday purposes.

When we began this sampling project, we promised the Mesa that we would not discuss the results until we had all the data and had completed our analysis and scientific interpretation. However, we promised the Mesa that if we detected concentrations of substances that were immediately dangerous to humans, we would notify the Mesa immediately. During our study, we found no instances that represented an imminent danger and that hence would have needed a rapid response from the mine or from people living downstream from the mine.

Conclusion 6: Even though water quality changes do not pose imminent danger to people, international water quality standards for drinking, livestock, and crops were exceeded in some locations. This is a concern for the long term. Continued monitoring to ensure that people and their

needs are not harmed, and water quality improvements by the mine, may be needed. The concerns are greatest at locations close to the mine property.

After we determined that there were no immediate, short-term concerns for the use of the water for humans, livestock, and irrigation, we considered the safety of the water for long-term use. Some of the substances that occur naturally in water, and that can be increased as a result of mine operations, can have a cumulative effect on humans, livestock, or soils and crops.

Many organizations worldwide have established levels of substances in water that are safe for humans, livestock, and crops. For evaluation of the quality of water for drinking, we used standards established by the World Health Organization (WHO), and the United States Environmental Protection Agency (U.S. EPA). These standards are not legally enforceable in Peru.

The WHO guidelines were established as advisory information for national and regional authorities as a basis for the development of drinking water standards appropriate to their own socioeconomic and exposure situation. For inorganic chemicals (such as metals and cyanide), a WHO guideline value is a concentration of a constituent that does not result in any significant risk to the health of the consumer over a lifetime of consumption. The WHO guidance says that “short-term deviations above the guideline values do not necessarily mean that the water is unsuitable for consumption.”

U.S. EPA drinking water standards that we used are legally enforceable standards (in the U.S.) that apply to public water systems (not streams or source waters) which provide water for human consumption. The standards are established at levels that maximize health risk reduction benefits at a cost that is justified by the benefits. The U.S. EPA standards for most inorganic substances (such as metals and cyanide) are based on lifetime exposure, so for most substances, brief exceedences pose a small health risk. The exceptions are the standards for coliform bacteria and nitrate, for which exceedences can pose an immediate threat to health.

We compared levels of substances in over 300 water samples that we collected to the standards. If a concentration that we measured exceeded a U.S. EPA or WHO standard for drinking water, we identified the water as being of potential concern, and reviewed the data further to determine the amount by which the standard is exceeded, and the period for which the standard is exceeded. The health implications of the exceedence depend on the exposure.

Where we observed levels of metals higher than standards, we recommend continued monitoring and additional investigation of how the water is used. If consumption of water from streams is infrequent or does not occur when the streams are muddy, the concern for long-term effects from prolonged exposure to inorganic substances is diminished. Both the U.S. EPA and WHO guidance stipulate that short-term exceedences of standards for inorganic substances are unlikely to cause health risks. Since most of the exceedences that we measured in the Porcón, Chonta, and Rejo basins were during the rainy season when streams are muddy, we suspect that there is little need to worry about long-term effects in these basins. In the Honda Basin, consumption of the water by infants is a concern during the rainy season because of elevated levels of nitrate. Nitrate is unlikely to be a concern for children or adults.

Water in all streams and canals sampled is safe for skin contact, and for human consumption of aquatic organisms. None of the standards established to protect skin contact and humans that consume aquatic organisms were exceeded.

The U.S. government has not established national standards for livestock watering or irrigation, and WHO has not established livestock watering or irrigation standards. Therefore, we used standards established by the State of Nevada (United States), the Peru Water Law, and Environment Canada. The Nevada and Canada standards are designed to be protective of livestock, crop, and soil exposure over many years. If a concentration that we measured exceeded a Nevada or Canadian standard for livestock watering or irrigation, we identified the water as being of potential concern, and reviewed the data further to determine the amount by which the standard is exceeded and the period for which the standard is exceeded.

Again, the health implications of the exceedence depend on the exposure. Where we observed levels of metals higher than standards, we recommend continued monitoring and additional investigation of how the water is used. Once again, since most of the exceedences that we measured in the Río Porcón, Río Chonta, and Río Rejo basins were brief, we suspect that there is little need to worry about long-term effects of water on livestock or crops in these basins. In addition, we suspect there is little actual long-term concern in the Honda Basin.

Conclusion 7: The greatest concern for human health is bacteria in water. We know this because of the presence of fecal coliform in water samples that we collected. Bacterial contamination is caused by animal and human waste, not by mining operations.

Our sampling confirmed that fecal coliform contamination is pervasive in baseline and assessment streams, and its presence indicates the most immediate threat to human health of all the analytes that we measured. The standard for treated drinking water is zero. All locations that we sampled contained fecal coliform.

Fecal coliform itself is not a health hazard, but its presence indicates the potential presence of other, more virulent microorganisms. The most common effect of microbial contamination is gastrointestinal disease. Specific types and severity of disease depend on the type of contamination.

Operations at the mine do not contribute substantially to fecal coliform contamination. The low fecal coliform concentration at locations near the mine and the increasing coliform concentrations at locations far downstream of the mine indicate that the mine is not a substantial contributor. Fecal coliform concentration increased with the amount of fields and cultivated or irrigated pastures in the basin.

Since this type of contamination is unrelated to mine operations, technically, it is outside the scope of our investigation. However, we recommend treatment of these surface waters for pathogenic microorganisms. The SEDACAJ treatment plants and drinking water systems installed by Minera Yanacocha and others in the Centros Poblados most likely address this concern.

Conclusion 8: Water quality effects caused by the mine may be sufficient to kill fish and other life in the streams at some locations.

The results of our water quality evaluation suggest that releases of acid and some metals (mainly copper, cadmium, and zinc) from mining activities may make certain stream sections unsafe for aquatic life in the short term. We used aquatic life standards for short-term (acute) exposure established by the U.S. EPA. The aquatic life standards that we used were established to be protective of sensitive aquatic species.

By “unsafe in the short term,” we mean that concentrations of substances from mining activities are creating an imminent threat in hours or days for organisms that live in the streams. This does not mean (1) that all aquatic life is being killed, (2) that the surface waters cannot support any aquatic life such as fish, or (3) that the water is unsafe for human users of water. Fish are more sensitive to metals, and particularly cadmium, copper, and zinc, than are humans, livestock, and crops. Therefore, levels of metals that are toxic to fish are much lower than levels that cause a concern for other users of water. The sensitivity of fish and other aquatic life varies by species and by age. For example, young fish are more sensitive to metals than are adult fish, and certain species of insects that live in streams are more sensitive than other species.

Concentrations of cadmium, copper, and zinc, and, in some locations, acidity, that result from mine operations make the water unsafe for sensitive species and life stages at certain times of the year. During these times, sensitive species and life stages could be sickened or killed, or they may retreat to tributaries. At other times, the water is safe for sensitive species and lifestages. Locations where concentrations of metals make the water unsafe for sensitive aquatic life in the short term include the upper Río Grande and the Río Tinte.

Locations where concentrations of metals are high enough to cause aquatic life to avoid the stream or to sicken aquatic life over a longer term (many months) include Quebrada Arnacocha, Quebrada Ocuca Machay, and Río San José. However, baseline data indicate that these three streams and several other naturally mineralized streams near the mine boundary probably never fully support aquatic life because of naturally low pH and high metal concentrations.

Fish kills have been reported by others for two of these locations: the lower Río Grande near the Posada del Purhuay, and the Río Rejo near Granja Porcón. We did not see any fish kills during our sampling period. However, the elevated metal concentrations that we measured in Río Tinte around the time of the fish kill at Granja Porcón in October and November 2002 could have caused fish mortality.

Conclusion 9: Mining operations have not reduced the amount of water available for people at the present time. Some streams have decreased flows because mine facilities capture water that would go to the streams. Some streams have increased flows due to discharges of treated water from the mine.

We estimate that mining operations have caused a greater than 10% increase in the quantity of water in the Río Grande and in Quebrada Honda during the dry season, when availability of water is most critical. The discharge of water pumped from pits increases the water quantity in Quebrada

Honda and Quebrada Callejón. The discharge of treated water from the leach pads increases the flow in Quebrada Honda, particularly during the rainy season

We estimate that mining operations have caused a greater than 10% decrease in the quantity of water in Quebrada Encajón, Río San José, Quebrada Chaquicocha, Quebrada Arnacocha, Río Colorado, and the upper tributaries to Río Tinte. Waste rock dumps, leach pads, and bare ground in the headwaters of these streams change the way that water flows to the streams, and the net effect is a decrease in water flow in these streams. The effect decreases with distance downstream, because of the larger area that contributes to flow in the streams. Therefore, if flow in Río Asufre, Quinua Río, Río Chonta, Río Tinte, and Río Rejo is changed, it is changed by an amount that is too small to detect.

The human effect of a 10% or greater decrease in flow during the dry season depends on how many people need the water, how much water each person needs, when each person needs water, and how much rain has fallen in recent months. We think there could be adverse effects on users of water very near the mine, depending on how much water they need, but farther from the mine, any changes in flow are not great enough to affect the people that depend on the water.

Report on the Independent Assessment of Water Quantity and Quality near the Yanacocha Mining District, Cajamarca, Peru

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APPENDIX C. LETTER FROM STRATUS CONSULTING TO THE MESA COMITE REGARDING RECOMMENDATIONS FROM THE WATER STUDY



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December 12, 2003

Comité Directivo
Mesa de Diálogo y Consenso, CAO Cajamarca
Los Cerezos Nº 127, Urbanización El Ingenio
Cajamarca, Peru

Dear Esteemed Members of the Comité Directivo:

At the 20-21 October, 2003 meeting of the Mesa de Dialogo y Consenso CAO Cajamarca, Stratus Consulting presented the results of the CAO water study. At the conclusion of the presentation, the Mesa requested that we provide suggestions based on the results of our study and our extensive experience in water quality and quantity matters. This letter describes our general suggestions for monitoring and evaluation in the future, but of even greater importance are your ideas about the future. To this end, we hope these general thoughts and ideas will be studied, debated, rejected, revised, etc. and can serve as a catalyst for thinking about what you perceive the real issues to be, what you think is most important to do for the future, what we might have missed, and how you would like to establish priorities.

The mine will continue to operate and to grow. There are many uncertainties associated with future mine operations and how the mine will manage water quality and quantity. Because we do not have detailed knowledge of management actions the mine has implemented or will implement, and because the mine's management actions are critical to the long-term maintenance of water quality and quantity, our first suggestion is that the Mesa continue its efforts to foster dialogue, consensus, trust, and transparency between the mine and the community. The suggestions presented below depend on maintaining dialog and trust:

1. Continued participatory surface water monitoring
2. Verification and communication of monitoring results
3. Groundwater assessment and monitoring
4. Assessment of the actual use of water at locations identified in our report as being of potential concern
5. Further assessment of aquatic life in streams
6. Erosion control and sediment management
7. Protection of canals that cross the mine
8. Treatment or replacement of rural drinking water sources that could be affected by bacterial contamination

9. Evaluation of mine closure plans
10. Evaluation of specific water quality and quantity issues in each basin.

A discussion of each suggestion is presented below.

1. Continued participatory surface water monitoring

We evaluated water quality and quantity during an eight month period in 2002-2003. The mine will operate for many more years to come, and participatory monitoring of streams affected by the mine should continue. Any future monitoring that the Mesa may recommend could supplement the monitoring currently conducted by Minera Yanacocha but should be conducted in a transparent, publicly available, and inclusive manner. The *veedores* involved with the water study were key to the transparency and credibility of that study; a similar approach might be used for ongoing monitoring efforts.

The water study report provides useful information on the types of mine facilities in each basin and how they can affect water quality and quantity. This information, together with the water study results, can be used to help the Mesa design an appropriate participatory, cooperative monitoring plan, select locations and times to collect samples, and select methods for sampling and analysis and substances to evaluate. The study also provides a framework for analyzing and interpreting future data. The monitoring plan should be designed to change as the mine grows, closes old operations, and explores new areas.

Specific issues related to water quality monitoring

The laboratory and analytical methods used for any future monitoring should be carefully chosen to ensure that the resulting data can be used to continue to evaluate the questions the water study was designed to answer. Although we used a laboratory in the United States for the water study, with careful evaluation, it is possible that the Mesa can find the type of laboratory necessary in Peru. In addition, a rigorous quality control program should be included in the monitoring plan to ensure that the quality of the analytical data is acceptable.

Concentrations of metals should be evaluated on both unfiltered samples (to assess the safety of water for humans, livestock, and crops), and filtered samples (to assess the safety of water for aquatic life). Aquatic life is most sensitive to the very small particles of metals in water. Scientists conventionally measure the “dissolved” fraction of metals in water (metals that pass through a 0.45 micron filter) to describe the concentration that is relevant to fish and other aquatic life. However, for humans, livestock, and crops, all of the substances in water can be important. Although not all of the substances in water are necessarily “bioavailable” – or readily absorbed into the intestine, plant root, or food chain – processes in the intestine, and in and around plant roots, can alter the availability of metals and increase bioavailability. Therefore,

for routine monitoring, concentrations of metals and other substances in unfiltered samples should be used to assess the safety of the water for drinking, livestock watering, and irrigation.

At the laboratory, analytical detection limits for substances should be lower than the levels determined to be protective of humans, livestock, crops, and aquatic life. Analytical detection limits are the lowest concentration of a substance that can be detected using the specific method or instrumentation available at the laboratory. Different laboratories use different methods and instruments and can therefore achieve different detection limits. If the detection limits are higher than a water quality standard of interest, then it is impossible to determine whether the water is safe or not for a particular use.

Specific issues related to water quantity monitoring

Better hydrologic data would improve the understanding of effects of mining on water quantity. The climate data available from Minera Yanacocha and SENAHMI is quite good. However, the available stream flow data is limited. Consequently, we suggest that stream flow be measured frequently (at least once per month) in key locations potentially affected by mining operations. Key locations include the upper Río Grande, Río San José, Río Azufre, and Río Tinte. Other streams might be added as the mine continues to grow, particularly around the Cerro Negro and La Quinua project areas. We understand that a permanent gauging station is being installed at the SEDACAJ intake on the Río Grande. Having continuous flow data from this location is important for the evaluation of potential future mine impacts. We also recommend that a permanent gauging station be established at the intakes for the SEDACAJ treatment plant on the Río Porcón. Data from this location would provide flow information for a basin with very little mining activity (only exploration) as well as baseline flow information that would precede any large scale development.

The modeling that we described in the water study report is based in part on water treatment and discharge information provided to Stratus Consulting by Minera Yanacocha in 2002 and 2003. The results of the water quantity modeling are highly dependent on water management strategies used by Minera Yanacocha. As the mine develops in the future, Minera Yanacocha's water management plan will continue to be a critical determinant of the effects of the mine operations on flow in streams. We suggest that Minera Yanacocha maintain an accurate accounting of cross-basin water transfers, and communicate the water management and anticipated effects to the public.

2. Verification and communication of monitoring results

A monitoring plan could benefit from a formal, independent external verification program, perhaps through formation of a group of independent reviewers or advisors that would report to the public. This group should include people with technical training as well as people with knowledge of the landscape and communities in Cajamarca. Depending on what form any

future monitoring program would take (as described in the first suggestion), the verification process could be applied to data collected by Minera Yanacocha, SEDACAJ, or a community based monitoring program. After verification, water quality monitoring results should be communicated regularly to the public through a comprehensive communication plan. A web site that includes a detailed map of the area around the mine could be used as a basis for permanent display of data, including data collected as part of the monitoring, as well as historical data. The locations of sampling sites could be linked to data and graphs that illustrate water quality and quantity patterns with time, and concentrations relative to standards.

The monitoring and communication plan could also include a public warning contingency plan that could provide for rapid distribution of necessary information to the public.

3. Groundwater assessment and monitoring

Mine facilities such as waste rock dumps and heap leach pads can reduce the amount of groundwater recharge and degrade groundwater quality. Although there is very little groundwater use in the vicinity of the mine, groundwater does provide flow to streams during the dry season. In some instances, changes in groundwater quality and quantity can be observed before changes in stream water quality and quantity. Consequently, it would be useful to monitor groundwater levels and quality as an indicator of possible future conditions.

4. Assessment of the actual use of water at locations identified in our report as being of potential concern

Where levels of substances have exceeded water quality standards, we suggest that a more detailed investigation be conducted. This investigation would focus on quantifying the level of actual exposure of people, animals, and crops. Information from this investigation could be used to determine appropriate solutions for reducing or eliminating any potential concerns about long-term effects.

The additional investigation could include more intensive or directed water quality sampling, and gathering information about how people and livestock actually use the water in specific locations, how much water they use, and when they use the water.

If the investigation results show that there is a level of exposure to humans, livestock, or crops that could be a concern over the long-term, a formal site-specific assessment of health risks should be undertaken. Possible outcomes of this assessment could include mitigation of any sources of hazardous substances that could be attributed to the mine or identifying and providing alternative water sources (such as development of new potable water sources in the case of drinking water).

5. Further assessment of aquatic life in streams

An aquatic life assessment should be conducted to determine if locations identified in the water study as being a threat to aquatic life indeed represent a hazard. This assessment could include determining population data for fish, including information on species diversity and the age structure of the fish populations; collecting species diversity and density data for amphibians and invertebrates; and collecting data on the sensitivity of particular species to metals and acid in the proportions that occur in streams near the mine.

Management actions may be required to mitigate the adverse effects of metals and acid on aquatic life in some areas. Appropriate management actions would depend on the source of the metals and acid, the timing of release of metals to streams, and the concentrations. Management actions to benefit aquatic life could include adding calcium to streams to raise the pH and the hardness. The presence of calcium in the water protects fish from copper, cadmium, and zinc, so that higher levels of these metals can be present with no adverse effects on fish. As long as the pH is maintained below 8.5, adding calcium should not adversely affect human or agricultural uses of the water. Management actions could also include planting vegetation along stream banks to increase the amount of dissolved organic carbon in the water, which also can protect fish from metals. In addition, management actions already undertaken, or planned, by Minera Yanacocha, such as improved treatment of excess water from the leach pads, could also benefit aquatic life.

6. Erosion control and sediment management

Water quality standard exceedences identified in the water study were often related to erosion and sediment loading. We know this because we often observed that the metals were high in unfiltered samples, and low in the corresponding filtered samples, particularly in samples collected during the transition from the dry to the rainy season. This result suggests that erosion of sediments into streams is an important source of metals in streams.

Construction of roads, pits, leach pads, and processing facilities involves removing topsoil and subsoil, which are stockpiled for future use in reclamation. Disturbed areas and stockpiles at the mine are highly susceptible to erosion and are sources of runoff and sediment loading to surface waters. Much of the runoff from roads, stockpiles, pits, and other barren areas is captured and routed through serpentines and other holding ponds and settling structures. In addition, dams to collect sediment were completed on the Río Tinte and upper Río Grande during the course of the water study.

Monitoring should include documenting the effectiveness of sediment control structures in improving water quality. In particular, monitoring should focus on streams in the Rejo and Porcón Basins. With the increased density of roads that are not related to mine operations (such as the new road to Quishuar Corral), sediment loading in streams is likely to increase throughout the area around the mine. Monitoring should be designed to assess the effectiveness of management actions at the mine in controlling sediments, and should clearly separate

sediment contributions from non-mining sources. This could be accomplished by careful selection of sampling locations.

7. Protection of canals that cross the mine

Canals that cross the mine property should be protected from exchanging water with streams that have degraded water quality as a result of mining operations. Many canal crossings have already been improved by the mine, and we suggest that improvements continue. To determine appropriate actions, canals should be surveyed to identify those that are at risk and have not been improved.

8. Treatment or replacement of rural drinking water sources that could be affected by bacterial contamination

The mine is not a significant contributor to the pervasive bacterial contamination in waters in the four basins of the study area. Nevertheless, we suggest treatment or identification of an alternative drinking water supply for people whose only source of domestic water is surface water from streams or canals. The SEDACAJ treatment plants and drinking water systems installed by Minera Yanacocha and others in the Centros Poblados address this concern in some locations.

9. Evaluation of mine closure plans

The nature and quality of mine closure is critical to ensure that water quality and quantity are maintained in the future. Closure plans developed by Minera Yanacocha should define objectives, procedures, and possible long-term, post-mining measures necessary to maintain water quality and quantity. Some countries require that a monetary bond be posted as a contingency to fix problems that could occur after the mine has ceased to operate and is closed. These closure plans should be developed in consultation with the Ministry of Energy and Mines, International Finance Corporation (IFC), the Regional Government, and the City and Municipality of Cajamarca, and should involve public participation regarding issues of long-term land use in the area of the mine. Closure plans should also be reviewed by independent experts and be consistent with developing international standards.

Mine closure plans are increasingly viewed as essential to ensure that benefits related to the project are used to develop the region in a way that survives after closure. A mine closure plan should ensure that future public health and safety are not at risk; that the environment will not be degraded physically or chemically after mine closure; that the site can be used beneficially after mine closure; and that socioeconomic benefits are maximized. Specific to water quality, the mine closure plan should include provisions to address long-term impacts from waste rock dumps and open pits, including acidic lakes that form as abandoned pits fill with water. Mine closure plans not only specify an end result, but they help shape current pollution prevention

actions and management strategies. Therefore, mine closure plans should be developed and made public now, well in advance of the actual (planned or unplanned) closure of the mine.

10. Evaluation of specific water quality and quantity issues in each basin

Porcón Basin. While this study was being conducted, dams were built in the upper Río Grande to settle sediments and improve water quality. The effects of these dams on water quality in the Río Grande should be monitored and reported. In their comments on the water study report, Minera Yanacocha noted that they are either evaluating or implementing a more efficient lime neutralization of seepage from waste rock dumps in the Quebrada Encajón drainage of the Porcón Basin. The effect of this neutralization process should be evaluated through monitoring, and the results reported to inform people of the effects of acid seep management in Quebrada Encajón.

Chonta Basin. Water quality in Laguna San José and the upper Río San José has deteriorated since acid seepage began to drain from the San José waste rock dump. Minera Yanacocha adds lime to Laguna San José to neutralize the acidity and reduce the metal concentrations before the water flows to Río San José. Liming Laguna San José should not be the long-term solution to this problem because it renders Laguna San José unsuitable for uses such as livestock watering. Alternative mitigation solutions should be developed. Minera Yanacocha noted in their comments on the water study report that they are currently either evaluating or implementing closure of the San José East and South Waste Rock Dumps and investigating the viability of a passive treatment system for waste rock dump seepage in the Río San José drainage. The Mesa should continue communication efforts with the mine to understand and evaluate the closure and success of any treatment system installed. Water quality in the upper Río San José should continue to be monitored and the results reported to inform people of the effects of acid seep management on Río San José.

Honda Basin. The quality of treated water discharged to the upper Quebrada Honda should be improved. Since Quebrada Honda is the source for Canal Tual Negritos, and this canal crosses both the Rejo and Porcón basins, improved water quality in Quebrada Honda would potentially benefit users in three basins. In their comments on the water study report, Minera Yanacocha noted that they are either evaluating use of or installing a reverse osmosis water treatment for the Yanacocha excess water treatment plant, which discharges to Quebrada Pampa Larga in the Honda Basin. The Mesa should continue communication efforts with the mine to understand and evaluate any improvements in excess water treatment. A second excess water treatment plant, the Carachugo plant, also discharges to Quebrada Pampa Larga. The Mesa should inquire about whether there appears to be a need for improved treatment for the second plant as well.

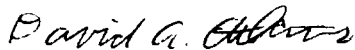
Rejo Basin. During our water quality study, a dam was built on Río Tinte at the mine boundary to settle sediments and improve water quality. The effects of the dam on water quality in the Río

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Tinte should be monitored and reported. As mining of Cerro Negro and La Quinoa progress, water quality and quantity in Río Tinte should be carefully monitored.

Thank you for the opportunity to provide these observations and suggestions. We hope that the efforts of the Mesa will continue to be successful. We care deeply about the people of Cajamarca – those we came to know well during the course of our study, and those we met at the many meetings of the Mesa and other groups in Cajamarca. We hope that our study provides a departure point for the people of Cajamarca, for a new era of openness, transparency, trust, and scientific objectivity in evaluating and if required, cooperatively addressing the effects of mining on the environment of Cajamarca.

Sincerely,



David Atkins
Project Manager
Stratus Consulting

cc: Minera Yanacocha
Ministry of Energy and Mines
International Finance Corporation

NOTES

1 Because of the sensitivity of some of the issues discussed, the CAO will not attribute quotations to individual interviewees.

2 The video is available on request by e-mail from the CAO, cao-compliance@ifc.org

3 Mine facilities expand and close on a regular basis. This description was accurate when the technical studies described in these monographs were conducted but may be different now.

4 The network of *Rondas Campesinas* is an important component of Cajamarcan society. Originally formed in the 1970s as local neighborhood watch groups to prevent cattle theft, the network's mission has since grown to encompass economic development and political advocacy for its constituencies. In Cajamarca, there are various subgroups of *Rondas*, one of which is FEROCAFENOP.

5 In general, for the purposes of this discussion, standards are legal requirements, enforceable in Peru or required by institutional arrangements (such as World Bank mining discharge standards), while guidelines are values used by other countries or institutions and are applied with discretion and usually not enforceable.

6 According to Peruvian law, all streams and canals around the mine must meet Peruvian "Class III" standards, as specified for livestock and irrigation water by the Ministry of Health's General Directorate of Environmental Health (DIGESA). In addition, streams in the Porcon Basin must meet Peruvian "Class II" standards (water acceptable for human consumption after disinfection and flocculation and settling of particulates) because these streams serve as raw water sources for the water treatment plants for the City of Cajamarca.

7 COMOCA was established in 1999 to address the concerns of canal owners about the mine's impacts. It comprises canal owner groups, government representatives, and Yanacocha and is discussed in further detail in monograph 3.

ABBREVIATIONS

ACEPAMY	Asociación de Centros Poblados Menores Afectados por Minera Yanacocha (Association of Smaller Population Centers Affected by Minera Yanacocha)
ADEFOR	Asociación Civil para la Investigación y Desarrollo Forestal (Civil Association for Forest Development Research)
ALAC	Asociación Los Andes de Cajamarca (Cajamarca Los Andes Association)
ASODEL	Asociación para el Desarrollo Local (Association for Rural Development)
ASPADERUC	Asociación para el Desarrollo Rural de Cajamarca (Association for the Rural Development of Cajamarca)
CAO	Office of the Compliance Advisor/Ombudsman
CAR	Comisión Ambiental Regional (Regional Environmental Commission)
CARE	Cooperative for Assistance and Relief Everywhere
CDR	CDR Associates
COMOCA	Comité Técnico y Científico de Monitoreo del Agua (Scientific and Technical Committee for Monitoring Water)
CONACAMI	Coordinadora Nacional de Comunidades Afectadas por la Minería (National Coordinator of Peruvian Communities Affected by Mining)
CONAM	Consejo Nacional del Medio Ambiente (National Environment Council)
CORECAMIC	Coordinadora Regional de Cuencas Afectadas por la Minería en Cajamarca (Regional Coordinator of Watersheds Affected by Mining in Cajamarca)
CTAR	Consejo Transitorio de Administración Regional (Regional Transition Administration Council)
DESA	Dirección Ejecutiva de Salud Ambiental (Executive Authority for Environmental Health)
DIGESA	Dirección General de Salud Ambiental (General Directorate of Environmental Health)

Further Information about the CAO

The CAO aims for maximum disclosure of reports and findings of the CAO process by reporting results on our Web site. Our Operational Guidelines and all other public publications are available in print and online. Most Web content is in English, French, and Spanish. The guidelines are available in these languages as well as Arabic, Chinese, Portuguese, and Russian. The guidelines and Web site include a model letter to the CAO's office to assist people in filing a complaint.

For more information about the CAO, please visit www.cao-ombudsman.org

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World Bank Group
Multilateral Investment
Guarantee Agency

MEMBERS OF THE WORLD BANK GROUP

DREM	Dirección Regional del Ministerio de Energía y Minas (Regional Authority for the Ministry of Energy and Mines)
EIA	Environmental Impact Assessment
FEROCAFENOP	Federación de Rondas Campesinas Femeninas del Norte del Perú (Federation of Female <i>Rondas Campesinas</i> of Northern Peru)
IFC	International Finance Corporation
INGETEC	Ingenieros Consultores (Engineering Consultants)
INIA	Instituto Nacional de Investigación y Extensión Agraria (National Institute for Agrarian Research and Extension)
INRENA	Instituto Nacional de Recursos Naturales (National Natural Resources Institute)
ITDG	Intermediate Technology Development Group
IUDER	Instituto Universitario de Desarrollo Regional de la Universidad Nacional de Cajamarca (University Institute for Regional Development of the National University of Cajamarca)
MEM	Ministry of Energy and Mines (Peru)
MIGA	Multilateral Investment Guarantee Agency
MY	Minera Yanacocha (Yanacocha Mining Company)
NGO	Nongovernmental organization
SEDACAJ	Empresa Prestadora de Servicios de Saneamiento de Cajamarca (Sanitation System Provider of Cajamarca)
SME	Small and medium enterprise
UNALM	Universidad Nacional Agraria–La Molina (National Agrarian University–La Molina)
UNC	National University of Cajamarca
US EPA	U.S. Environmental Protection Agency
WHO	World Health Organization