INTER-AMERICAN DEVELOPMENT BANK

BOLIVIA

AGUAS DEL ILLIMANI WATER AND SANITATION PROJECT
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ENVIRONMENTAL AND SOCIAL IMPACT REPORT

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I. INTRODUCTION

1.1 In June 1997, the Government of Bolivia ("GOB") awarded a concession for the operation, maintenance, and improvement of the potable water and sewerage systems in the cities of La Paz and El Alto (the "Concession"). The Concession was granted through a public tender process to Aguas del Illimani S.A. ("AGIL" or the "Company") for a 30-year period. Prior to privatization, and since 1971, water and sewerage services were provided by SAMAPA (Servicio Autónomo Municipal de Agua Potable y Alcantarillado), a state owned company created in 1966. Upon privatization, SAMAPA's assets, including the existing network and treatment plants, were taken over by AGIL against payment of an annual canon throughout the life of the Concession. AGIL took over the Concession on August 1, 1997. All existing and new infrastructure will remain the property of SAMAPA.

1.2 The Concession area is located in western Bolivia in the heart of the Bolivian "*altiplano*", at an altitude of 3,400 meters above sea level. The area of influence includes the metropolitan area of La Paz and the different areas of El Alto, with a total estimated population of 1.3 million inhabitants.

1.3 On average, when AGIL took over the operation of the Concession, approximately 84% of La Paz' population was connected to the potable water system (71% in El Alto area), and 66% was connected to the sewerage system (30% in El Alto). Per the Concession, the Company is committed to supply 100% of potable water coverage in La Paz, and 82% of coverage in El Alto before December 31, 2001. The Company is also obligated to provide sewerage services with an estimated coverage of 82% by 2001 in La Paz, and 41% in El Alto. By the end of 2001, a new set of expansion goals will be agreed upon between the Company and the Water Superintendency.

1.4 Aguas de Illimani was formed as a full service water and wastewater sanitation concession agreement with Suez Lyonnaise des Eaux (LDE), a large French water and wastewater full service utility organization, in order to provide a 30-year concession program. Under this contract AGIL is the concessionaire to perform system improvements and expansions via LDE's financing, design, construction, commissioning, operation, and management services. AGIL consists of Suez Lyonnaise des Eaux, the concessionaire with a 35% share; local Bolivian partners BICSA, with a 20% share; the engineering corporation CONNAL, with a 5% share; the Argentinean Sociedad Comercial del Plata, with an 18% share; Meller, with a 12% share; and the affiliate of the Banco de Galicia, an Argentinean bank, through its affiliate, Arousa, with a 10% share.

1.5 An estimated investment plan of US$362 million is envisioned throughout the whole period of the Concession. The total investment is divided into six five-year investment plans. The first of the six five-year investment plans constitutes the project under consideration (the "Project"). The total cost of the Project is estimated to be approximately US$72.0 million with US$40 million in debt. The Bank has been requested to provide US$15 million to partially finance AGIL's first five-year investment program. The remaining US$25 million will be provided under a parallel financing with the Bank, by the IFC and CAF.

II. PROJECT DESCRIPTION

2.1 This section provides an overview of the existing water and wastewater infrastructure in the Cities of La Paz and El Alto and planned infrastructure improvements within the Initial Improvements Plan in Years 1 through 5 of the concession contract. Section 2A contains descriptions of existing water and wastewater infrastructure. Descriptions are separated into water supply (reservoirs, groundwater wells), water treatment plants, water distribution piping networks, wastewater collection piping networks and wastewater treatment plants. Section 2B contains descriptions of planned improvements to water and wastewater infrastructure. Section 2C outlines the project costs for the Initial 5-Year Improvements Plan.

A. Existing Facilities

A1. Water Supply and Treatment

2.2 Potable water is supplied to the City of El Alto by the El Alto and Tilata water supply and treatment systems. Potable water is supplied to La Paz by the Achachicala and Pampahasi water supply and treatment systems. Total capacity within the AGIL service area is approximately 2,671 LPS. These treatment facilities are fed by raw water systems located at the following sources: Tuni Dam, Milluni Dam, Estrellani Dam, Incachaca Dam, Kinquillosa Dam, Hampaturi Dam, Choqueyapu Intake, and a well-field comprised of thirty (30) wells. A map of the existing water supply and treatment systems for the Cities of La Paz and El Alto is attached as Figure 1. A more detailed description of the service areas for each water system is included in the subsections below.

El Alto Water Supply and Treatment System

2.3 The El Alto water system was placed into service in 1979 and provides water services to the majority of the El Alto area and certain suburbs of the city of La Paz located above elevation 3,750 meters (above sea level), and along the western and northern mountain sides of the City of La Paz. Raw surface water is obtained from the Condoriri, Tuni and Huayna Potosi Basins, having a combined flow of 1,087 LPS; and, later retained in the Tuni Reservoir System, with a capacity of 24,700,000 m^3. The raw water is then transmitted a distance of 34.5 Km, via an 800 mm diameter steel pipeline system having a capacity of 1,100 LPS, to the El Alto Water Treatment Facility.

2.4 The El Alto Water Treatment Facility is rated at 618 LPS and is comprised of Influent Energy Disipitation, Aeration/Mixing, Filtration, Clearwater Storage, Disinfection (by chlorination) and Storage Systems. The quality of raw water from the Tuni Reservoir is generally good. The El Alto treatment plant is currently able to meet local and concession contract treated water quality standards.

Achachicala Water Supply and Treatment System

2.5 The Achachicala system was placed into operation in 1935 and provides water service to the central areas of the City of La Paz, located within a valley at elevation 3,750 m (above sea level), adjacent to the Choqueyapu River. Raw water is obtained primarily from the Milluni Reservoir, which has a capacity of 9,500,000 m^3. Under normal operating conditions, raw water is conveyed via gravity from the Milluni Reservoir via an open channel- system that is 13.5 Km in length and has a capacity of 1,200 LPS, to the COBEE Reservoir. From the COBEE Reservoir, raw water continues via a 800 mm steel-gravity pipeline system to the Achachicala Water Treatment Facility. Raw water flow in the transmission system from the Milluni Reservoir can be supplemented by the transmission pipeline from the Tuni reservoir (described above in the El Alto system – see Figure 1). In cases of operational emergency conditions, raw water is available from the Choqueyapu River via an open channel system with a capacity of 2,000 LPS at a yearly demand/allocation rate of 4,000,000 m^3/year.

2.6 The Achachicala Water Treatment Facility consists of Pre-Settling, Energy Dissipitation, Mixing/Flocculation, Settling, Filtration, Clearwater Storage, Disinfection (by chlorination), and Storage Systems. Raw water enters the facility via an 800 mm steel transmission pipeline, with a rated maximum flow capacity of 1,000 LPS; and is transmitted to the 17,000 m^3 Pre-Settling Basin. Based on data collected, the raw water supply has relatively high levels of turbidity, suspended and total solids, color, total hardness, iron, manganese, and zinc. When water is supplied from the Milluni Reservoir, higher levels of iron, manganese and zinc and color can be attributed to runoff from abandoned mining sites in the Milluni Basin. When water is supplied from the Choqueyapu River, higher levels of turbidity, color, suspended solids and organics can be attributed to direct discharges of raw domestic and industrial wastewater into the river upstream of intake structure. While measures could be taken to improve the raw water quality, the Achachicala Water Treatment Plant is currently producing potable water that meets local standards and concession requirements.

Pampahasi Water Supply and Treatment System

2.7 The Pampahasi system was placed in service in 1971, and provides water services to the southern and eastern portions of the mountain sides east of the city of La Paz, up to elevation 3,800 meters (above sea level). Raw water is obtained from the Incachaca Reservoir, whose design volume is 4,500,000 m^3; and Hampaturi Reservoir, which has a design volume of 3,170,000 m^3. The Hampaturi and Incachaca basins have a combined flow capacity of 880 LPS. Raw water is transmitted from the Hampaturi Reservoir and Incachaca Reservoir via open channel concrete systems to a Grit Chamber. The Hampaturi and Incachaca channels have lengths of 13.2 Km and 8.5 Km, respectively, and a capacities of 280 LPS and 300 LPS, respectively.

2.8 From the Grit Chamber, flow is transmitted 4.5 km through a 350 mm diameter asbestos-cement pipeline (capacity of 300 LPS) to the Pampahasi Wastewater Treatment Facility.

An additional 800 mm diameter steel pipeline is currently being installed from the Hampaturi Reservoir to the Pampahasi Water Treatment Facility.

2.9 The Pampahasi Water Treatment Facility is rated at 705 LPS and consists of Energy Dissipitation, Mixing, Screening, Flocculation, Sedimentation, Filtration, Clearwell Storage, Disinfection (by chlorination), Storage, and Sludge Retention Systems. Raw water enters the facility via two (2) influent pipelines: Hampaturi's 250 mm diameter pipeline and Incachaca's 150 mm diameter pipeline, having a combined capacity of 416 LPS. The Pampahasi system's raw water quality is acceptable and allows the treatment facility to meet local standards and concession requirements for treated water quality.

Tilata Water Supply and Treatment System

2.10 The Tilata System provides water service to the area south of the city of El Alto. The system obtains raw water via a well field system consisting of thirty (30) subterranean 250 mm diameter wells with depths of 90 to 105 m having a production capacity of 347 LPS. Raw water flow is conveyed via a 500 mm pipeline to the Tilata Water Treatment Facility where it is disinfected (by chlorination) and conveyed via another 500 mm pipeline to the Pacajes Reservoir, with a capacity of 4,000 m^3. Since the Tilata system's water supply is not exposed to surface contamination, the quality of raw water has been good to date. As discussed later in this report, the direct discharge of wastewater in El Alto to the ground surface or to septic tanks has resulted in contamination of the groundwater to depths of approximately 60 meters, presenting the potential for future contamination of the Tilata raw water supply. Expansion of El Alto's wastewater collection and treatment systems should slowly remedy this situation and improve groundwater quality. Groundwater quality in the vicinity of the well intakes is monitored on a regular basis. The start-up of Puchucollo Waste Water Treatment Plant was initiated in November (1998).

A2. Water Distribution

La Paz Water Distribution Network

2.11 Water is supplied to La Paz through the Achachicala and Pamaphasi water distribution networks. A summary of each water distribution network is presented in the table below.

Table 2-1
La Paz Water Distribution System

Description	Achachicala	Pampahasi
Capacity, LPS	1,000	705
Actual Production, LPS	705	462
Service Area, ha	1,209	2,400
Population in Service Area	255,500	220,000
Percent Coverage	99.5	96.0
No. of Connections	23,010	25,500

2.12 The Achachicala distribution system is generally in good condition. There are no notable problems associated with storage volume or distribution system pressure. The Pampahasi system has experienced problems in maintaining adequate system pressure, reportedly due to undersized distribution piping.

El Alto Water Distribution

2.13 Water is supplied to El Alto through the El Alto and Tilata water distribution networks. A summary of each water distribution network is presented in the table below.

Table 2-2
El Alto Water Distribution System

Description	El Alto	Tilata
Capacity, LPS	1,000	347
Actual Production, LPS	1,000	49
Population in Service Area	590,852	73,693
Percent Coverage	80.0	86.0

2.14 Although there are no major deficiencies in the El Alto and Tilata water distribution systems, the existing pipeline sizes and storage tank capacities are reaching their design capacities. Significant expansions of the distribution system are included in the concession contract to provide adequate potable water supply through the Year 2026.

A3. Wastewater Collection

La Paz Wastewater Collection

2.15 Approximately 72 percent of the population of La Paz is connected to the city's sewer system. The oldest sewers were installed in 1920 and were considered at that time to have a useful design life of 30 years. Given the poor condition of these sewers, which are in need of renovation, the effective percent coverage of the sewer system in La Paz is

somewhat less than 72 percent. Major deficiencies of the existing sewer system are as follows:

- Large number of defective, leaking pipe joints;
- Many of the main sewer collectors were not sized adequately for the actual growth that has since taken place and as a result, velocities in these sewers are excessive and reduce the sewers' useful life; and
- Many of the sewers were installed at very shallow depths; therefore, in many cases, new constructions cannot connect to the existing system without installing their own sewer lift stations.

El Alto Wastewater Collection

2.16 A sewer system was not previously planned and installed as part of the initial development of El Alto. Due to that lack of planning, coupled with rapid and uncontrolled urban growth, only the central part of El Alto and a few isolated areas are served by sanitary sewers. The majority of the inhabitants discharge their wastewater directly to the streets, latrines or to unmaintained septic tanks. A number of residents have sewered their households by making clandestine cross-connections to the storm sewer system. The sanitary sewers that exist are in fair condition. One common problem is plugging of the sewer pipes caused by the disposal of solid waste into the system at the household connection. These obstructions have caused periodic sewer overflows through inspection manholes. A large interceptor was constructed in 1990-1991 to transport wastewater from the sewer collection system to treatment lagoons in the zone of Puchucollo. These treatment lagoons will soon be taken out of service and replaced by the new Puchucollo Bajo Wastewater Treatment Plant, scheduled to be operating by the end of 1998. During 1998 administration, the main sewers (or collectors), outlets, and distribution networks were completed in many areas of El Alto city.

La Paz Wastewater Treatment

2.17 In the city of La Paz, wastewater treatment has historically been limited to a handful of septic tanks. In recent years, SAMAPA has investigated economical methods of wastewater treatment for La Paz. As a result, 12 small treatment plants, consisting of sedimentation tanks and anaerobic biological filters, were constructed in the following areas along the southern outskirts of downtown La Paz: Bolognia, Koani, Aranjuez, Achumani, Aquisamana, Cota Cota, Clacoto, Seguencoma Bajo, Escobar Uria, Pampahasi Bajo, Chasquipampa and Alto Irpavi.. The number of inhabitants served collectively by these plants is 7,800, or approximately 1 percent of the total population of La Paz. The plants at Bolognia and Koani have been taken out of service and abandoned. The remaining plants in operation are not controlled or maintained. Treatment efficiencies at these plants are unknown, since influent and effluent wastewater characteristics are not monitored. As these plants treat such a small percentage of the total wastewater generated in La Paz, virtually all of domestic and industrial wastewater in La Paz is discharged without treatment to the Choqueyapu River or its tributaries.

El Alto Wastewater Treatment

2.18 There are three wastewater treatment plants in El Alto: the Pilot Plant of El Kenko; Rio Seco Plant; and the existing Puchucollo plant.

2.19 The Pilot Plant of El Kenko was constructed in 1988 and consists of five treatment lagoons in series. The plant was designed for a capacity of 0.4 LPS and a retention time of 28 days. This pilot plant was constructed and operated to establish treatment design criteria for a full-scale treatment plant at Puchucollo Bajo. Although the plant is in service, it receives no operator attention or maintenance. In addition it is operating at flows and organic loads higher than those for which it was originally designed. Plant effluent is discharged into the ground through a "filtration well". The well is overloaded and a portion of the effluent overflows onto the ground surface. Once the new Puchucollo Bajo Wastewater Treatment Plant is in service at the end of 1998, it is anticipated that the Pilot Plant at El Kenko will be taken out of service and demolished.

2.20 The Plant of Rio Seco contains three small Imhoff tanks and a sludge drying bed. Currently, the Treatment Plant is abandoned and all wastewater is bypassed around the plant and discharged directly into the Rio Seco.

2.21 The existing Puchucollo Plant consists of two lagoons that actually work as presedimentation basins. The basins were to have been incorporated into the new Puchucollo Bajo plant. However, due to a recent collapse of one of the basin dikes, and due to observed failures in the basin liners, it was decided to take the basins out of operation. Currently, wastewater is bypassed around the plant and discharged directly into the Rio Seco. The pumping of sludge into the new treatment plant is scheduled for the end of November 1998, and the demolition of existing lagoons will be carried out later.

B. Improvements to Facilities

2.22 The description presented herein pertains only to those projects scheduled to take place within Years 1 through 5 of the concession contract (i.e. - Years 1996 through 2001), or those projects under-consideration for financing. The potential projects beyond Year 5 of the concession contract, such as the incorporation of additional reservoirs for the El Alto water system, expansion of the El Alto**,** Achachicala and Pampahasi Water Treatment plants, and the construction of wastewater treatment facilities for La Paz, are not presented. However, during 1998 administration, the Company initiated quality studies to redesign the Treatment Plant in La Paz city.

B1. Water supply and treatment

El Alto Water Supply and Treatment System

2.23 El Alto system improvements are as follows:

- Construction of the Condoriri dam and water intake structure in the Year 1997. Included in the project is the installation of a 700 mm pipeline to transfer raw water approximately 2 kilometers from the new Condoriri reservoir to the existing Tuni reservoir. The Condoriri dam is designed for a volume of 230,000 cubic meters, with a maximum depth of 6.90 meters.
- Construction of the Huayna Potosi Dam in the Year 2001. Included in that project will be another 900 mm pipeline to transfer raw water from the future Huayna Potosi reservoir to the existing Tuni reservoir. Detailed design information for this reservoir project has not yet been developed.

2.24 Raw water from the Condoriri and Huayna Potosi reservoirs will be discharged directly to the Tuni Reservoir. Raw water from the Tuni reservoir is discharged to the El Alto Water Treatment Plant.

B2. Water Distribution Networks

2.25 Currently, potable water is supplied to about 84 percent of the combined populations of La Paz, El Alto and Tilata. Approximately 48 percent of the population in La Paz and 79 percent of the population in El Alto/Tilata are either poor or extremely poor. A primary objective of Aguas del Illimani's contract is 100% water coverage for the residents of the Achachicala and Pampahasi areas, and almost 100% coverage of the residents of the El Alto area. To this end, 78,252 new potable water services connections to be installed or rehabilitated by the end of the Year 2001. Of these connections, 71,752 will be new connections provided to the poor and extremely poor households in El Alto/Tilata. The remaining 6,500 connections will be provided to poor households in La Paz. To date, AGIL has performed new 21,909 water connections, which is 10% above the number of connections required during this period (19,973).

2.26 In order to comply with the Concession, the Company shall meet the following goals during the Concession period:

POTABLE WATER COVERAGE

	Historical 97	2001	2011	2026
La Paz	84%	100.0%	100.0%	100.0%
El Alto	71%	82.0%	90.0%	90.0%

2.27 A listing of the projected water distribution system improvements/expansions is summarized in the following table based on.

Table 2-3
Water Distribution System Improvements/Expansion
1998/2001

System	New Customer Connections	Distribution Pipelines [1] (Km)	Transmission Pipelines [2] (Km)
El Alto/Tilata	71,752	850	60
Achachicala	1,500	3	--
Pampahasi	5,000	35	10
Totals	78,252	888	70

[1] *Pipelines from transmission system to household connections*

[2] *Pipelines from treatment plants/storage tanks to distribution network*

B3. Wastewater Collection Systems

2.28 A listing of required year-end sewer customer connections for the Achachicala (La Paz), Pampahasi (La Paz) and El Alto areas is summarized in the following table.

Table 2-4
Sewer Customer Connections
1998/2001

Area/Year	1998	1999	2000	2001
Achachicala	1,000	1,000	1,100	1,000
Pampahasi	1,300	1,800	1,800	1,800
El Alto	10,700	3,000	3,100	10,400
Totals	13,000	5,800	6,000	13,200

2.29 By the end of the Year 2001, sewer system coverage in El Alto will have increased from 35 percent (present) to 41 percent and sewer system coverage for La Paz will have increased from 72 percent (present) to 85 percent. In locations where the sewer network is already in place, installation of a sewer connection includes the only piping from the existing sewer main to the individual household. In many areas where new household connections will be made, there is no sewer network in place. To install these connections, AGIL will also install new sewer mains and connect them to the existing sewer network. According to Annex 6 of the concession contract, expansion of the sewer main network will be required for approximately 10, 80 and 50 percent of the new household connections in Achachicala, Pampahasi and El Alto, respectively.

2.30 The Company has established a financing mechanism to encourage lower income customers to connect to the sewerage system. In cases where the construction is done

with the collaboration of customers connection charges can be considerably lower only charging the material costs. Otherwise, the Company is proposing a 3 to 5-year financing at an 8 percent interest rate to pay for the connection charge. AGIL is proposing the regulatory agent to require obligatory connection to sewerage system, once the network exist, when connected to the water system in order to avoid environmental problems.

B4. Wastewater Treatment

El Alto Wastewater Treatment

2.31 As part of the 1981 Master Plan for wastewater collection and treatment, a need was determined for the construction of three wastewater treatment plants to serve El Alto. The plants are Puchucollo Bajo, Puchucollo Alto, and Viliroco by the year 2020.

2.32 The Puchucollo Bajo WWTP, which is the initial phase of a master planned improvement project to provide treatment for the El Alto area's wastewater, is currently under construction and is expected to be operating by the end of 1998.

2.33 The first phase of the Puchucollo Bajo wastewater treatment facility is designed for a flow rate of 600 LPS, an influent BOD concentration of 300 mg/l, and shall serve the city of El Alto to Rio Seco– Pallina – Catari with tertiary quality treated discharges into the Rio Seco, which eventually discharges into Lake Titicaca approximately 60 kilometers downstream. The initial design retention time is between 24 to 28 days for the maximum flow conditions. The ultimate configuration will consist of four (4) process trains, each with six (6) lagoons. The initial phase consists of two of the four process trains. The treatment plant will contain the following process units: Degritting system; Anaerobic-facultative lagoon; Facultative Lagoon No. 1; Facultative Lagoon No. 2; Maturation Lagoon No.1; Maturation Lagoon No. 2; and a Final Polishing Lagoon.

2.34 The system's final effluent quality should meet the requirements of local standards and the concession contract requirements. Final effluent will be utilized for irrigation, agricultural, or discharged to the Rio Seco. The stabilized sludge settled within the anaerobic lagoon will be extracted every five to ten years via a floating desludging system and transferred to three small sludge stabilization lagoons for thickening and drying operations. The thickened/dried sludge is anticipated to have a solids content of 35%. Additionally, further treatment will be provided via composting. AGIL proposes to utilize the final sludge as an agricultural soil amendment.

2.35 According to population projections, the ultimate capacity of the Puchucollo Bajo Wastewater Treatment Plant will be adequate to serve 100 percent of El Alto's sewer connections through the Year 2020. Future phases of the Puchucollo Bajo plant will be constructed as required based on monitoring the projections of population growth and new sewer connections.

2.36 Future treatment plants at Puchucollo Alto or Viliroca would be constructed for one of two reasons:

- To provide additional capacity to that of the Puchucollo Bajo plant.
- Should the rate of urban development increase slower than expected in the area of Puchucollo Bajo and faster than expected in Puchucollo Alto or Viliroca, it may become more practical to construct the Puchucollo Alto and/or Viliroca plants before constructing later phases of the Puchucollo Bajo plant. The El Alto sewer system is being configured with the flexibility to proceed with either scenario.

La Paz Wastewater Treatment

2.37 There are no provisions in the concession contract to construct wastewater treatment facilities in La Paz during the Initial 5-Year Improvements Plan. According to the concession contract, the concession company must fulfill the following obligations:

- Within 12 months after the concession start date, AGIL shall initiate a plan to provide wastewater treatment for the City of La Paz. AGIL shall prepare the study in coordination with the applicable government agencies. The study shall be completed and approved by the end of the Year 2001.
- Immediately following its approval, AGIL shall begin implementation (construction) of the approved wastewater treatment plan. Once the Company obtains the Superintendency's approval, the Company and the Superintendency will have to reach an agreement on the tariff according to investments and operative costs of the sewage treatment plant and the sewage system.
- Within 18 months after the concession start date, AGIL shall prepare and complete a Register of Industrial Wastewater Dischargers. For each Industrial Wastewater Discharger, the Register shall include general information on discharger, the source (process) of the wastewater, the characteristics and quantity of the wastewater, and the applicable requirements of the Reglamento en Materia de Contaminacion Hidrica (part of Bolivian environmental law).

C. Project Costs

2.38 The following table, obtained from Aguas del Illimani summarizes yearly costs by investment area for the water and wastewater systems.

Table 2-5
Aguas del Illimani Investment Plan
(Updated April 28, 1998)
(US Thousands)

Description/Cost	1997	1998	1999	2000	2001	Totals
Water Treatment Facilities and Expansion Projects						
Sources	200	530	0	828	828	2,387
Treatment Plants and Reservoirs	620	330	1,070	1,070	0	3,090
Network and Connections	2,607	8,858	5,383	5,396	5,837	28,081
Total Water	3,427	9,718	6,453	7,295	6,666	33,558
Wastewater Treatment Facilities and Expansion Projects						
Treatment	609	1,256	500	0	0	2,365
Network and Connections	687	3,109	2,857	2,963	6,048	15,664
Total Wastewater	1,296	4,365	3,357	2,963	6,048	18,029
Rehabilitation and Upgrading Projects	505	1,842	3,319	2,130	1,811	9,606
Facilities	2,349	2,752	838	530	530	6,998
Total (US Thousands)	7,577	18,677	13,966	12,917	15,055	68,191

III. LEGAL AND INSTITUTIONAL ASPECTS

A. Institutional

3.1 In 1966, SAMAPA (Servicio Autonomo Municipal de Agua Potable y Alcantarillado), a decentralized, autonomous enterprise, was appointed by the Mayor's Office of La Paz to be responsible for planning, execution and administration of water and wastewater services for the city of La Paz. SAMAPA was directed by an Administrative Council, led by the Mayor's Office. Due to a lack of continuity within the Administrative Council and a lack of financial resources to expand infrastructure as required by the area's rapid growth, the decision was made to award a concession for water and wastewater services.

On July 25, 1997, a 30-year concession for the expansion and operation/maintenance of SAMAPA's water and wastewater services was awarded to Aguas del Illimani.

3.2 The Regulation System Law of October 28, 1994 established the creation of SIRESE with the objective to regulate, monitor, and supervise the activities of various sector including water supply and sewerage, with the ultimate goal to protect consumer's interest. The Law established a General Superintendency attached to the Ministry of Finance. The General Board's function include approving and publishing prices and rates, granting and renewing concessions, promoting efficient service delivery, and, in general, complying with and enforcing legal requirements and sector regulations.

3.3 The current Water Superintendent was appointed following the privatization of SAMAPA on an interim basis. By the end of this year the appointment of a new Water Superintendent, who will hold the position for a full 5-year term, will end the interim arrangement.

3.4 The number of employees working at the Superintendency is rather low, but this number is expected to increase in the near future. To monitor AGIL's operations and its compliance with the Concession, the Superintendency uses the information periodically provided by the Company and by independent consultants that the Company has to hire. Through funds provided by the Multilateral Investment Fund under a technical cooperation administrated by the IDB, efforts are being carried out to strengthen the institutional capacity of the Water Superintendency.

B. Legal

3.5 In 1992 the Bolivian government passed Law 1333, which established both environmental laws and regulations along with the country's current environmental institutional structure. The Ministry of Sustainable Development was created to be responsible for national environmental policy, regulations, planning and research. In each of Bolivia's nine (9) departments, a "Prefectura" was established to implement the Ministry's environmental policy. The principal roles of each Prefectura are to review applications for environmental licenses and monitor the mitigation of important environmental mitigation measures by environmental license holders.

3.6 The environmental licensing process for any construction project consists of four basic steps, as follows:

1. The applicant submits a checklist called a "ficha" to the Prefectura.
2. Based on criteria defined in Article 25 of Law 1333, the Prefectura rates the project on a scale of 1 to 4, according to the degree of environmental impacts (a rating of "1" represents the highest degree of impacts and a rating of "4" represents the lowest degree of impacts).
3. Once a project rating is established, the applicant submits further documentation to the Prefectura, as follows:

Rating	Document Required by Prefectura
1	Complete Environmental Impact Study
2	Limited Environmental Impact Study
3	List of Mitigation Measures
4	No further documentation required (i.e. - no significant impacts)

4. After the environmental document has been reviewed and approved by the Prefectura, an environmental license is granted. The Environmental License is called "Decalaratoria de Impacto Ambiental o Certificado de Dispensación de EEIA".

3.7 During the project, the holder of the Decalaratoria de Impacto Ambiental submits periodic environmental monitoring reports to the Prefectura. The Prefectura also conducts periodic inspections of the project's construction activities.

3.8 Although Law 1333 was passed in 1992, the Prefecturas were not in place for enforcement of the new environmental laws until 1996. As such, a number of the individual projects in AGIL's concession had been started before the Prefectura's environmental license processing procedure was in place. For projects already underway without an environmental license, the Prefectura may require an environmental manifest ("manifiesto ambiental"). The manifest process consists of the following steps:

1. The applicant submits the Environmental Manifest to the Prefectura.
2. Following any necessary revisions or elaboration to the Manifest, the Prefectura issues a Declaration of Environmental Measures ("Declaratorio de Adecuación Ambiental") required by the applicant.
3. The applicant then must submit to the Prefectura for approval a Plan of Environmental Measures ("Plan de Adecuación Ambiental") and a Plan for Environmental Mitigation and Monitoring ("Plan de Aplicación y Seguimiento Ambiental").
4. The Prefectura performs inspections to confirm that the applicant is conforming to the Plan for Environmental Mitigation and Monitoring. Should the applicant not be in compliance with the approved plan, the Prefectura will perform a complete environmental inspection of the project.

C. Concession Contract

3.9 Clause 18 of the concession contract contains the following environmental/social obligations to be met by the concession company:

- Compliance with all Environmental Laws (Bolivian).
- The concession company shall notify the appropriate authorities if they become aware of the existence or emission of a hazardous substance in violation of Bolivian Environmental Laws.

- The concession company must perform all projects and acts necessary to remove hazardous substances from raw and treated water supplies in accordance with the Bolivian Environmental Laws. It is stipulated that if the source of hazardous substance is beyond the control of the concession company, tariffs will be adjusted to cover additional operational costs.

D. Project Compliance

3.10 The Prefectura La Paz has indicated that Aguas del Illimani has complied with the application, mitigation and monitoring requirements for all current projects within the concession contract through either the standard licensing procedure or through the manifest procedure.

3.11 Aguas de Illimani hired a local environmental consulting firm, PCA Ingenieros Consultores, S.A., to prepare an Environmental Audit of the concession. The Environmental Audit ("Diagnostico y Evaluacion Ambiental de los Sistemas de Agua Potable y Alcantarillado de La Paz y El Alto") addresses operating and maintenance of existing facilities, current construction projects, and future expansion/improvement projects. The Environmental Audit, which was completed in July 1998 and consists of five volumes (documents), provides a very detailed description of the following: existing facilties and operations, analysis of environmental conditions, identification and evaluation of impacts, prevention and control measures, monitoring and supervision measures, analysis of risks and contigencies, and conclusions and recommendations.

3.12 Aguas de Illimani has developed an Environmental Action Plan, based upon the results from the Environmental Audit, which will be implemented in order to prevent and/or minimize potential environmental and social impacts associated with the AGIL present and future operations (refer to section 6 for details).

3.13 In order to provide the public and interested partities specific information on the environmental and social aspects of the five-year investment program, Aguas de Illimani prepared an Environmental and Social Assessment (ESA). The ESA includes specific sections on project description, legal and institutional aspects, environmental and social impacts, and environmental and social mitigation measures and monitoring measures. The ESA was made available to the public in August 1998.

IV. ENVIRONMENTAL AND SOCIAL CONDITIONS

A. La Paz (General)

4.1 The City of La Paz (population of 786,729) was founded in 1548 and is located in the Choqueyapu valley of the Andes mountains at an elevation that ranges from approximately 3,300 to 3.750 meters above sea level. The average annual temperature is 10 degrees C. The average annual rainfall is 600 mm, with the rainy season lasting from November

through March. Flowing through the middle of La Paz at the base of the valley is the Choqueyapu River. Upstream of La Paz, the quality of the water in the Choqueyapu River is generally good. As it flows through the La Paz valley, it receives domestic and industrial wastewater discharges from the city. During the dry season (April to November), the river within La Paz and downstream (south) of La Paz has contaminant levels equivalent to that of a sewer. Although the downtown area is host to heavy vehicular traffic, the air quality is actually better than that of similar-sized Latin American cities.

4.2 Based on its topography and demographics, La Paz can be broken down into three distinct sectors which are described below.

1. Mountain Slopes. The mountain slopes leading down into the valley of La Paz have two types of populations. Along the western slope, the inhabitants are made up primarily of rural farmers and ranchers who have migrated from areas outside of La Paz. These rural immigrants are principally descendents of the Aymaran indians. The inhabitants are poor and the area lacks many basic services. Given their rural customs, disposal of trash and sewage directly into the valley is common. The eastern, northern and southern slopes are populated by office workers and government employees. Basic services and overall living conditions are much better than those on the western slope.
2. The head of the Choqueyapu River. The area at the head of the Choqueyapu River (north of downtown La Paz) contains more manufacturing and industry. The majority of the inhabitants in this area work at these factories. Living conditions are moderate.
3. The central downtown area. The central area of La Paz contains the commercial center (El Centro). El Centro includes many high-rise office buildings, hotels and apartment buildings. In addition, the majority of the storage and distribution of agricultural products is located in this sector. The residential areas are considered middle to upper class. The inhabitants are typically office workers, professionals, etc. Along the southern edge of the downtown area are some poorer neighborhoods, some of which lack basic services.

4.3 In socioeconomic terms, approximately one half (48 percent) of the population of La Paz is considered “poor” and approximately one fifth (21 percent) is considered “extremely poor”.

B. El Alto (General)

4.4 El Alto (population of 604,088) was recently formed in the 1960’s and is located west of La Paz at an elevation of approximately 4,000 meters above sea level. Whereas La Paz is located in a valley and has widely varying topography, El Alto is located on a high flat plain. The majority of the city’s inhabitants are ranchers and farmers who have migrated from rural areas outside of La Paz. These rural immigrants are mostly indigenous descendents of the Aymara indians. Bordering the west side of El Alto is the Seco River, which eventually flows into Lake Titicaca approximately 60 kilometers from El Alto.

4.5 El Alto has experienced rapid urban growth. There has been a lack of planning for public works infrastructure such as water supply, sanitary sewage and stormwater collection and sewage treatment. As a result environmental conditions throughout El Alto are poor.

4.6 Due to their rural customs, inhabitants typically dispose of sewage and trash directly into the streets or open areas. Houses are rudimentary and are typically built with no gardens or ornamental areas. Many houses are built in the rural style, with adobe walls and thatched roofs. There are virtually no parks or green spaces in the city. Those areas designated as parks or recreation centers are typically polluted by trash and sewage and therefore are never used for their intended purpose.

4.7 In general, the socioeconomic conditions in El Alto are much worse than those in La Paz. The majority of inhabitants are poor or extremely poor.

C. Water Sources

4.8 All the water sources for La Paz and El Alto are located in the high plains of the eastern range of the Andes. Environmental and social aspects for each water source are very similar. The areas are typically located above the tree line at elevations of 4,100 to 4,700 meters. Vegetation consists of grasslands and small brush. The median temperature is between 3 and 5 degrees Celsius. The wet season lasts from November to March and brings intense rains that have caused significant erosion of natural slopes. Soils typically consist of hard, dry clayey gravel and sand. Fauna consists of sheep, llamas, alpacas, cows and lizards.

4.9 The inhabitants of these rural areas are principally indigenous descendents of the Aymaran Indians. The population has formed small, dispersed, and isolated communities made up of modest adobe houses. The principal land use is grazing of livestock; a small amount of land is used for farming potatoes and other roots (due to the cold temperatures, no other crops are grown).

D. Water Treatment Plants

4.10 The Achachicala WTP is located in a mountainous zone in the central sector of the Achachicala plateau. The climate is cold and windy. The surrounding area is urban with commercial and industrial activity, but also contains a significant amount of mature eucalyptus trees and grassy areas. The population near the plant is comprised mainly of medium-income office and government workers. Fauna consists solely of domestic animals and small birds.

4.11 The Pampahasi WTP is located in a mountainous zone in the middle of the Pampahasi plateau. The climate is milder than in Achachicala. The surrounding area is urban and contains little vegetation. Socioeconomic conditions and fauna are similar to those of Achachicala.

4.12 The El Alto WTP is located in a flat area of the City of El Alto. There is no significant development within the immediate vicinity of the plant. The surrounding area is made up of small stores and residences. The climate is cold and windy. Vegetation is limited to a type of sagebrush called "pajabrava". Inhabitants in the area are largely poor immigrants from rural areas. Fauna consists of domestic animals, sheep and cows.

4.13 Environmental and social conditions at the Tilata WTP are similar to those described above for the El Alto WTP, except there is a greater presence of commercial business and small industry.

E. Wastewater Treatment Plants

4.14 The Puchucollo Wastewater Treatment Plant is located on an isolated site in the southern part of El Alto along the Seco River. The physical and geographical aspects are similar to that of El Alto.

V. ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 This section highlights the significant environmental and social impacts as identified in the Environmental Audit (July 1998) performed on the entire Aguas de Illimani operations. The Environmental Audit included an assessment of environmental and social impacts related to operation of all existing facilities and the construction/operation of proposed facilities. Section 5.A presents impacts caused by the operation of the existing water and wastewater facilities and Section 5.B presents impacts related to the construction and operation of future facilities. Environmental and social impacts are categorized according to the type of facility, including water sources, water treatment plants, water distribution networks, wastewater collection networks and wastewater treatment plants. Section 5.C summarizes the principal project benefits (positive impacts).

A. Existing Operations

A1. Water Sources

5.2 As the design and operation of all reservoirs serving La Paz and El Alto are similar, their impacts will be considered collectively, unless otherwise noted.

5.3 In general, impacts to the air, land, water and flora/fauna are negligible.

5.4 The reservoirs created a change in land use. The land was formally made up of grasses and brush used for grazing. However, there is an immense amount of similar land remaining and available for grazing of sheep, llamas and alpacas.

5.5 In the Achachicala system, an open transmission canal conveys raw water from the Milluni Reservoir to the El Alto treatment facility. Crossing of the canal by ranchers and their animals, as well as over-grazing near the canal, have resulted in erosion of the canal dikes in certain locations. The erosion has caused leaks in the canal dikes that, in turn, has resulted in the loss of raw water to the Achachicala Water Treatment Plant.

5.6 Two water sources that supply the Achachicala Water Treatment Plant are exposed to contamination that degrade the quality of raw water entering the plant. Raw water in the Milluni Reservoir contains elevated levels of iron, manganese and zinc. The source of these contaminants is from old mining operations in the upstream basin. The Choqueyapu River, used as an emergency raw water supply to the Achachicala Water Treatment Plant, has been polluted by untreated domestic and industrial wastewater discharges.

5.7 The Tilata system water source is made up of 30 groundwater wells. The operation of the wells themselves have created no notable impacts. It should be noted that there exists the risk of contamination of the groundwater supply due to the current widespread practice in El Alto of discharging raw domestic sewage directly onto the ground surface and into latrines and unmaintained septic tanks. To date, contamination has been observed from ground level to depths of 20 to 60 meters below ground. The wells are taking in water at a depth of 90 to 105 meters below ground. Therefore, groundwater contamination has not yet reached the intakes of the Tilata wells. The levels of contamination of groundwater contamination were not available for this report. Should groundwater contamination reach the well intakes in the future, and if the levels of contaminants are high, this would have a severe impact on Tilata's raw water quality and on the Tilata system's ability to meet potable water quality standards.

5.8 The only significant social impact associated with existing water sources occurred at the Condoriri reservoir. By changing the natural flow of the Condoriri River, the reservoir has reduced the amount of water previously available to certain rural communities.

A2. Water Treatment Plants

General

5.9 At all the water treatment plants, lime and alum (chemicals used to enhance water treatment) are stored in a dry form in chemical storage rooms. The storage facilities do not have dust collectors. As a result, plant workers within the rooms are subject to inhalation of the dust, which could have an adverse impact on worker health and safety.

5.10 At all the water treatment plants, chlorine gas is stored in 150 pound steel containers. Chlorine gas from a container is drawn through piping to an injector, where it is mixed with water to form a chlorine solution. The chlorine solution is then used to disinfect the treated water before it is discharged into the potable water distribution system. When a chlorine gas container is spent, the empty container is disconnected from the gas piping, removed and a full container is installed and connected in its place. There exists the risk

of fugitive emissions of chlorine gas from the piping and/or container during the switchover. As chlorine gas is toxic, the potential for accidental inhalation by workers would present a significant health and safety hazard.

El Alto WTP

5.11 On-site sanitary wastes and residual solids from cleaning of the flocculation tanks and filter backwashing are discharged into a common channel that flows into the Seco River. This operation causes the impacts due to: the organic content of the raw water, discharged residuals generate offensive odors; and the residual discharge also causes contamination of soils (both in the canal bed and the downstream river bed) and the quality of receiving waters.

5.12 Areas along the banks of the Seco River are used to farm food crops. The Seco River is the source of irrigation water for the farmland. Contamination of the soil and water by residuals discharged into the Seco River from the El Alto WTP could cause both health risks to the farmers and to those that consume the food crops.

5.13 Noise from the cascade aeration process and filter backwashing is disturbing to the neighboring community for Aguas del Illimani staff.

Achachicala WTP

5.14 There are several locations downstream of the WTP where raw domestic and industrial sewage is discharged directly into the Choqueyapu River. When the Choqueyapu River intake is used as an emergency source of raw water, the volume of river flow downstream of the WTP is significantly reduced. This, in turn, decreases the amount by which the sewage is diluted. As a result, odors and contamination of both the river and adjacent soils are increased.

5.15 Residual solids from the pre-settling basin contain significant levels of organic material and possibly heavy metals. These solids are periodically removed from the basin and discharged into the Choqueyapu River. Resulting impacts include generation of odors, and contamination of both the river water and soils adjacent to the river.

5.16 Residuals from the cleaning of the flocculation tanks, backwashing of the filters, and discharge of on-site sewer and laboratory wastes are also discharged into the Choqueyapu River. Resulting impacts include generation of odors, and contamination of both the river water and soils adjacent to the river.

5.17 Media from the filters is periodically replaced. Old filter media is stockpiled on site old sedimentation tanks allows it to dry prior to its disposal offsite. The leaching of pollutants previously captured by the media during treatment causes contamination of the soil and potentially the groundwater below.

5.18 Downstream of the WTP, certain areas along the Choqueyapu River are used for crop farming. River water is used for crop irrigation. Contamination of the soil and water by residuals discharged into the river from the Achachicala WTP could cause both health risks to the farmers and those that consume the food crops.

Pampahasi WTP

5.19 Residual solids from the flocculation tanks, sedimentation tanks, and filter backwash are discharged to a sludge holding tank. The contents of the sludge holding tank are in turn discharged to a ravine/stream that flows into the Orkujahuira River. This sludge discharge results in the following environmental impacts:

- Since the sedimentation tanks do not have mechanical sludge collectors, sludge is removed every two months. Therefore, due to the organic content in the raw water supply, the sludge becomes anaerobic. When discharged into the stream from the sludge holding tank, significant odors are released.
- The sludge discharge also causes contamination of soils (both in the stream bed and the downstream river bed) and the quality of receiving waters.
- The periodic discharges of relatively high volumes from the sludge holding tanks cause erosion of the slopes of the canyon stream. "Unplanned" homes that have been constructed along the stream could be damaged by excessive erosion. The anaerobic sludge discharges also expose these inhabitants to offensive odors.
- Since crop farming also takes place along the banks of the Orkojahuira River, the contamination of soil and river water by the sludge tank discharges presents the same health concerns discussed for the El Alto and Achachicala WTP's.

5.20 Noise from the backwashing of the filters is disturbing to the neighboring community for Aguas del Illimani staff.

Tilata WTP

5.21 Settled solids have never been cleaned from the raw water tank. Potential environmental impacts could result from improper handling and disposal of these solids when the tank is eventually cleaned.

A3. Water Distribution Networks

5.22 There are no significant project-specific environmental impacts related to the operation and maintenance of the existing water distribution network.

A4. Wastewater Collection Networks

La Paz

5.23 In La Paz, there are cross-connections between sewage piping and stormwater drains. During heavy rains sewers become surcharged and overflow to the ground/street surface through manholes. As a result, the public is exposed to unpleasant odors and adverse health risks.

5.24 A common problem in La Paz, especially in sewers running down mountain slopes, is the failure of pipe joints. This exposes the soil and groundwater to sewage contamination. This also leads to the potential for infiltration of contaminated groundwater into buried potable water piping.

5.25 Leaking sewers also cause soil erosion and soil instability, especially along mountainside slopes.

5.26 There is no wastewater treatment in La Paz. All raw domestic and industrial sewage is eventually discharged into the Choqueyapu River or its tributaries. This leads to the contamination of the river by organic material and heavy metals. Except during the rainy season between November and March, the Choqueyapu River has BOD levels of 100 mg/l to 300 mg/l. This, coupled with contamination from solid refuse, has eliminated most of the aquatic plants and wildlife.

5.27 A significant amount of farmland has been developed along the banks of the Choqueyapu River downstream of central La Paz. Farming consists largely of cultivating food crops such as potatoes, onions, etc that supplies a significant amount of the city. This location was chosen because the pluvial soil is easy to handle. However, the farmland is irrigated from the river, whose water is contaminated from domestic and industrial sewage. Exposure through direct contact, food contamination or vector attraction (mosquitoes, flies) with pathogens and heavy metals from the sewage can cause adverse health impacts.

El Alto

5.28 In El Alto, the current coverage of wastewater collection is approximately 35 percent. The remaining population discharges sewage into latrines, septic tanks or directly into nearby ground. In either case, these discharges are causing contamination of El Alto's soil and groundwater table.

5.29 In El Alto, sewer piping has repeatedly become plugged, causing sewage to overflow through inspection manholes onto the ground or streets. As a result, the public is exposed to unpleasant odors and adverse health risks. Sewer plugging is due to the low slopes of sewer piping and deposition of trash into the sewer system at the household connections. The sewers are designed to transport wastewater by gravity. To allow flow by gravity, the sewers must be installed on a slope. The topography in El Alto is relatively flat. The low sewer slopes result in low wastewater velocities, which allow solids in the wastewater to settle to the bottom of the pipe.

5.30 The majority of El Alto is inhabited by rural immigrants who lack education about acceptable sanitary practices. They are not accustomed to living in such densely populated areas. Even in areas where sewers are available, some households have not connected to the network.

A5. Wastewater Treatment Plants

El Alto Wastewater Treatment Plants

5.31 At the El Kenko plant, effluent (treated wastewater) is injected into the ground through a shallow filtration well. Since plant flow exceeds the well capacity, effluent sometimes overflows the well and flows out onto the ground surface. Since the plant receives no operator attention, the quality of the effluent is poor. Due to the proximity of the plant to the surrounding population of El Kenko, the result is contamination of soils, which are used by the surrounding community for livestock grazing and farming. The plant is currently closed since the main sewage pipe is directed to the Puchocollo Plant.

5.32 At the Rio Seco and Puchucollo plants, influent flow is bypassed around the plants and discharged directly into the Rio Seco. As the wastewater is untreated, the result is contamination of the Rio Seco. Since November 13, Puchucollo sewage treatment plant started to operate and all sewage water from El Alto will soon be disposed into it.

5.33 At the Puchucollo plant, filtration has been observed from the abandoned presedimentation basins. As a result, untreated, anaerobic wastewater has leached through the bottoms and dikes of the basins and polluted the adjacent soil and groundwater. A portion of the contaminated groundwater flows through natural open canals that are the source of water for livestock in the surrounding communities

5.34 Contamination of the air and ground/surface water from all three treatment plants has reportedly resulted in respiratory and gastrointestinal illnesses in the surrounding communities.

5.35 Strong, objectionable odors have been detected in the communities surrounding each of the treatment plants.

La Paz Wastewater Treatment Plants

5.36 Of the 12 small wastewater treatment plants built on the southern outskirts of downtown La Paz, the wastewater treatment plants at Bolognia and Koani have been taken out of service and abandoned. Accumulated anaerobic sludge in the sedimentation and biological filter structures generates strong, objectionable odors.

5.37 The original construction of the 12 small wastewater treatment plants resulted in a loss of land and the destruction of vegetation.

5.38 Some of the 12 small wastewater treatment plants discharge effluent directly into ravines that eventually discharge into the tributaries of the Choqueyapu River. The discharge into the ravines causes soil erosion and, depending on level of treatment attained, soil contamination.

B. Future Expansion/Operations

B1. Water Sources

5.39 The following is a summary of potential significant environmental impacts from a typical water source serving La Paz/El Alto. A typical water source consists of a reservoir with earthen dam, an intake structure, and raw water transmission piping. The impacts are categorized separately for construction and operation. These impacts would apply to the proposed Huayna Potosi Reservoir, to be constructed in 2001.

During Construction

- Noise from heavy construction equipment (earth moving, etc).
- Pollution from equipment and truck emissions and dust generation.
- Loss of land displaced by new reservoirs.t
- Erosion of slopes during the construction of earthen dams
- Destruction of vegetation, habitat during construction of earthen dams.
- Degradation of water quality due to contamination from work encampment or deposition of excavated soils.
- Effects of increased movement of construction personnel around rural communities near work sites.

During Operation/Maintenance

- Modifying the hydraulics of the natural waterway by the addition of a reservoir will affect the availability of water available to farmers and ranchers downstream of the reservoir.

B2. Water Distribution Networks

5.40 The following is a summary of potential significant environmental impacts from construction and operation of a typical water distribution network in La Paz/El Alto.

- Noise from heavy equipment during pavement removal, trench excavation, installation of piping, and backfilling/compaction of soil.
- Generation of dust during trench excavation and backfill/compaction.
- Improper disposal of construction trash, debris onto open land, into canyons/gulches, or into streams or rivers.

- During connections to existing distribution piping, some customers will experience temporary cuts in water service.
- While spans of new piping are being installed under streets, the traffic in that area must be routed around the work site. This is likely to cause traffic delays and inconvenience to the affected population.
- Improper sequencing of repair/expansion projects could impact water service to customers more than necessary.

B3. Wastewater Collection Networks

5.41 The following is a summary of potential significant environmental impacts from construction and operation of a typical water collection network in La Paz/El Alto:

- Noise from heavy equipment during pavement removal, trench excavation, installation of piping, and backfilling/compaction of soil.
- Generation of dust during trench excavation and backfill/compaction.
- During connections to existing sewers for expansion of the network or during renovation of existing sewers, it will be necessary to drain the existing piping of its sewage contents. If draining and bypassing/disposal operations are not conducted properly, potential spillage would generate odors.

B4. Puchucollo Wastewater Treatment Plant

5.42 The following is a summary of potential significant environmental impacts from construction and operation of the Puchucollo Wastewater Treatment Plan:

- The construction of the treatment lagoons results in a loss of vegetation and significant change in land use. The land was previously available for grazing or agricultural use.
- Trenches have been constructed around the perimeter of the plant site to divert groundwater. To construct and operate the lagoons, the groundwater level must be maintained below the bottom of the lagoon. This diversion of groundwater has lowered the groundwater table "downstream" of the plant, resulting in further loss of vegetation. The loss of that land for farming or grazing has impacted the livelihood of these land owners. As long as the plant is in operation, the permeability will be higher due to the biosolid sedimentation on the bottom.
- Odors from both normal operation of the treatment plant and during the removal of settled sludge from the anaerobic lagoons will be a nuisance for adjacent inhabitants.
- The bottoms of the treatment lagoons are lined with clay and compacted to provide an impermeable surface. Should the lagoon bottom permeabilities be too high, wastewater could leach into the groundwater table.
- AGIL proposes to utilize the composted biosolids (residuals) removed from the anaerobic lagoons, stabilized and dried in downstream lagoons, as an agricultural soil amendment. If the biosolids contain elevated levels of contaminants, it will contaminate the soil to which it is applied.

- During land stripping to grade lagoons, "pajabrava" (sagebrush) was given to neighboring rural residents for roof construction, etc. (positive impact).

C. Project Benefits

Direct Benefits

5.43 This project will provide new water connections to the poor and extremely poor in La Paz and El Alto, as detailed in the table below.

Table 5-1
Summary of Potable Water Service Coverage by Area
With and Without the Project by the Year 2001

Area	Percent of Population Poor or Extremely Poor	Number of Potable Water Service Connections		Percent Coverage	
		Without Project[1], 1996	With Project[2], 2001	Without Project	With Project
La Paz	48%	48,510	55,010	93.7%	100%
El Alto/ Tilata	79%	89,530	161,282	79.7%	100%
Both Areas		138,040	216,292		

[1] *Includes connections that need rehabilitation.*

[2] *Includes both new connections and rehabilitated connections. Information not yet available to separate the number of new connections from the number of rehabilitated connections.*

5.44 The improved quality and quantity of potable water improves hygiene and lessens the risk of illness from waterborne diseases. Due to the reliable delivery of potable water to each household, time that individuals would otherwise spend on collecting water from a remote source can be spent on earning income and other productive activities.

5.45 The project provides for 10,800 new sewer connections in La Paz and 27,200 new sewer connections in El Alto by the Year 2001. These new connections will increase sewer coverage in La Paz from 72 percent to 85 percent and in El Alto from 35 percent to 52 percent.

5.46 The new Puchucollo Bajo Wastewater Treatment Plant will provide secondary treatment for all sewered wastewater in El Alto through the Year 2020.

5.47 Increased wastewater collection and treatment in El Alto improves the environmental health of the Seco River, which up to now have been subjected to raw sewage discharges. This in turn reduces the exposure of the public to health risks associated with fishing, swimming and washing clothes in the river.

5.48 Expanded water supply and wastewater collection/treatment generally fosters increased economic development of the subject community, which in turn results in increased opportunities for employment and a higher standard of living.

5.49 The construction, operation and maintenance of the proposed water and wastewater facilities provides employment opportunities for the local residents, therefore improving their standard of life and infusing additional money into their local economy through the increased purchase of goods and services.

VI. ENVIRONMENTAL AND SOCIAL MITIGATION/MONITORING

6.1 The basis for the environmental and social mitigation and monitoring measures to be implemented for the project are those presented in the following project related documents:

- Environmental measures and actions identified in the Aguas de Illimani Environmental Action Plan,
- Regulatory documents (e.g., complete or limited environmental impact assessment, list of mitigation measures) prepared for the environmental governmental authority (prefectura) for new project works,
- Regulatory documents (e.g., plan of environmental measures or plan for mitigation and monitoring) prepared for the environmental governmental authorities, if requested, for existing operations or facilities, and
- Various procedures and measures listed in the Environmental Audit.

6.2 This section highlights the principal planned environmental and social mitigation and monitoring measures related to the operation of the existing water and wastewater facilities (section 6.A) and the construction and operation of future expansion projects (section 6.B), based upon the Environmental Action Plan (see appendix 1) and results from the Environmental Audit. Environmental and social mitigation measures are categorized according to the type of facility, including water sources, water treatment plants, water distribution networks, wastewater collection networks and wastewater treatment plants. Section 6.C reviews the organizational structure and procedures for implementation of the mitigation and monitoring measures, section 6.D presents costs to implement mitigation and monitoring measures, and section 6.E outlines the AGIL's risk management/ and contingency plan.

A. Existing Operations

A1. Water Sources

6.3 The recent construction of the Condoriri Reservoir has altered the natural flow of the Condoriri River. Downstream of the new reservoir, the water supply to rural ranchers and farmers has been reduced. To mitigate this problem, Aguas del Illimani has reached an agreement with the affected ranchers/farmers in which, during the dry season, AGIL provides water to the ranchers/farmers through a chamber derivation located in the pipeline Condoriri - Tuni.

6.4 The uncontrolled discharge to the ground of approximately 65 percent of the sewage in El Alto and Tilata has contaminated the groundwater to depths of 60 meters below grade. The Tilata water system's supply wells take in groundwater at 90 to 105 meters below grade. The expansion of El Alto's sewer collection system and the ability to treat sewered wastewater at the new Puchucollo Bajo Wastewater Treatment Plant will reduce the amount of untreated sewage that is disposed to the ground; this in turn should reduce the level of contamination of the groundwater. The sewer system expansion to provide full coverage to El Alto/Tilata is a long-term process. The groundwater around the Tilata Water System supply wells shall continue to be sampled and tested for signs of contamination to ensure that the quality of potable water produced by the Tilata water system is not compromised. The punping radio shall be controlled specially from those wells near Puchucollo Plant.

6.5 In an effort to improve raw water quality to the Achachicala Water Treatment Plant, AGIL and COBEE and COMSUR will coordinate to evaluate methods to reduce levels of iron, manganese and zinc entering the Milluni Reservoir from old, abandoned mining sites.

6.6 AGIL will consider relocating the raw water intake from the Choqueyapu River further upstream to avoid the majority of domestic and industrial wastewater discharges.

A2. Water Treatment Plants

General

6.7 In order to eliminate the contamination of soil and water courses caused by the discharge of residual solids from the El Alto, Achachicala, Pampahasi and Tilata Water Treatment Plants, facilities will be developed to dewater the residuals in sludge drying beds and transport the dried sludge to a sanitary landfill.

6.8 In order to improve occupational safety and health for those workers handling dry lime and alum at the various water treatment plants, dust collectors shall be installed at each storage/feed facility; the storage room shall be cleaned of residual dust on a regular basis; workers shall be mandated to wear protective face masks; and workers shall be regularly trained on related occupational health and safety.

6.9 In order to mitigate the exposure of workers to fugitive chlorine gas leaks, workers shall be mandated to wear approved air/oxygen masks; containers and piping shall be regularly inspected to detect potential leaks; and workers shall be regularly trained on related occupational health and safety.

6.10 In order to mitigate the irrigation of food crops with river water contaminated by the discharge of water treatment plant residuals; both the farmers and consumers must be educated as to the potential adverse health impacts.

El Alto WTP

6.11 In order to prevent sanitary sewer discharges from the WTP into the Seco River, the plant sewer(s) shall be connected into the El Alto wastewater collection network (as part of the concession project to expand the sewer system) and treated at the Puchucollo Wastewater Treatment Plant.

6.12 Filter backwashing is a daily intermittent activity during the 24 hours. A study on the associated noise disturbance with respect to the filter backwash equipment will be carried out with the purpose of establishing the noise emission levels. As per the Regulation on Atmospheric Pollution of the Environmental Law No. 1333, if noise level exceeds the 65dB limit during the night, mitigation measures shall be implemented accordingly.

Achachicala WTP

6.13 The contamination of soil and groundwater due to the leaching of pollutants from used filter media shall be mitigated by allowing the media to dry inside an abandoned tank at the plant, in lieu of allowing it to dry on bare ground. The dried material shall then be transferred directly to a sanitary landfill.

Pampahasi WTP

6.14 Until a sludge drying bed can be installed, the plant shall attempt to drain sludge from the sedimentation tanks more frequently than the current rate of once every two months. This will reduce erosion caused by periodic high volume discharges into the canyon stream. In addition, the shorter sludge retention time within the sedimentation tank will reduce odors by not allowing the sludge to become anaerobic.

6.15 Filter backwashing is a daily intermittent activity during the 24 hours. A study on the associated noise disturbance with respect to the filter backwash equipment will be carried out with the purpose of establishing the noise emission levels. As per the Regulation on Atmospheric Pollution of the Environmental Law No. 1333, if noise level exceeds the 65dB limit during the night, mitigation measures shall be implemented accordingly.

Tilata WTP

6.16 A plan shall be developed to properly dispose of settled solids removed from the cleaning of the raw water storage tank.

A3. Water Distribution Networks

6.17 No significant impacts were identified.

A4. Wastewater Collection Networks

La Paz

6.18 Subsiding and sliding soil along sloping terrain in the La Paz valley has caused sewer piping joints in these areas to fail. The failed piping joints have resulted in sewage leaks. Where leaking sewer joints are discovered, reparations will take place by replacing the existing rigid concrete pipes with more flexible PVC pipe joints or similar, more flexible material, depending on the case.

6.19 The leaking sewers discussed in the previous item causes additional land subsidence, sliding and erosion. These impacts will also be mitigated by replacing concrete piping with flexible PVC piping at locations where failed pipe joints are repaired. A major control shall be accomplished in vulnerable areas regarding geological and flooding risks.

6.20 Cross-connections between sanitary and storm sewers will be surveyed and eliminated to prevent flooding of the sanitary sewers during intense rains.

6.21 The public will be educated about the health risks from contact with raw sewage from irrigation of food crops, washing of cars, dust control, etc. The public, especially in El Alto, will be encouraged to connect their households to sewer networks when made available. The rural population should be educated as to the increased standard of living that can result from implementation of a complete sewer system, including increased economic development, improved health and hygiene, and a better sense of personal well-being and community pride.

6.22 The direct discharge of raw sewage to the ground will be mitigated by expansions of the sewer collection system and construction of wastewater treatment plants under the concession contract.

6.23 The plugging of sewers in El Alto by shallow slopes of sewer piping and disposal of refuse into the household sewer connections can only be partially mitigated. The slopes of sewer pipes (i.e. – the angle of vertical drop along the length of the sewer piping) is physically limited by the flat topography of El Alto. However, to mitigate the other cause, the population must be educated as to the consequences of putting trash into the sewer system to avoid pipeline plugging. AGIL must conduct periodic inspections of manholes and clean-outs to remove obstructions before they completely plug the sewer system.

A5. Wastewater Treatment Plants

El Alto Wastewater Treatment Plants

6.24 The sewer systems that discharge to the plants of El Kenko, Rio Seco and Puchucollo (existing) are currently being modified to discharge into the new Puchucollo Bajo treatment plant. Once these sewer modifications are complete and the new Puchucollo Bajo plant is in operation (end of 1998) the existing plants of will be demolished. Before demolition, sludge from the plants will be extracted, dewatered and disposed in a sanitary landfill.

6.25 Demolition of the existing treatment plants and adequate treatment of wastewater in the new Puchucollo Bajo treatment plant will mitigate current impacts of the existing plants with respect to odors and contamination of the surrounding soils, air and water. Contaminated soils in the surrounding area will also be removed and disposed of in a sanitary landfill.

6.26 Demolition of the existing plants will also improve the areas aesthetically. AGIL will restore each site to its original condition. In the process, the removal of the sludge from the tanks and the solid waste (trash) from the surrounding sites will mitigate the health risks associate with vectors (insects, rodents)

La Paz Wastewater Treatment Plants

6.27 In order to mitigate the emission of odors and toxic gases (hydrogen sulfide, methane) from the abandoned Bolgnia and Koani wastewater treatment plants, AGIL shall demolish the plants as follows:

- extract, dry and dispose of anaerobic sludge from the sedimentation and filter structures to a sanitary landfill;
- demolish the sedimentation and filter structures and dispose of debris as directed by the applicable municipality; and
- reforest the site to its original condition.

6.28 In order to mitigate the loss of land and the visual impacts caused by the construction of the treatment plants, AGIL shall reforest the areas directly surrounding each of the treatment plants.

6.29 In order to prevent soil erosion and contamination caused by the direct disposal of treatment plant effluent into ravines, AGIL shall install pipes to transport the effluent directly to the adjacent river (in all cases, the rivers are tributary to the Choqueyapu River).

6.30 None of the small wastewater treatment plants in service receive operator attention or regular maintenance. In addition, the quality of treated wastewater is currently not tested

or monitored. Therefore, the effect of treated wastewater disposal on the receiving waters (rivers) is unknown. AGIL shall actively operate and maintain the plants and implement a monitoring program to measure the characteristics of the effluent from each plant.

6.31 AGIL shall develop and implement a sludge management and disposal actions for each of the small wastewater treatment plants in operation. Excess sludge shall be periodically removed from the sedimentation and filter tanks, dewatered in sludge drying beds, and disposed of to a sanitary landfill.

6.32 Currently, virtually all domestic and industrial wastewater in La Paz is discharged without treatment to the Choqueyapu River or one of its tributaries. As part of a long-term solution to provide wastewater treatment to La Paz, the concession contract requires that AGIL prepare (1) a plan to provide for the management and treatment of La Paz wastewater and (2) a detailed database of all industrial wastewater Dischargers. Both documents are due by the end of the Year 2001. Implementation of the plan (e.g. – construction of sewer interceptors, treatment plant(s), industrial pretreatment programs, etc.) must commence immediately after approval by all appropriate governing agencies. Once the Company obtains the Superintendency's approval, the Company and the Superintendency will have to reach an agreement on the tariff according to investments and operative costs of the sewage treatment plant and the sewage system.

B. FUTURE EXPANSION/OPERATIONS

6.33 All future projects must satisfy applicable regulation requirements which includes the presentation of a checklist called a "ficha" to the Prefectura. The Prefectura would then have to rate the project according to the degree of environmental impacts and in order to get an environmental license, the Company shall submit either a complete EIA, a limited EIA or a list of the mitigation measures. Additionally, various mitigation and monitoring programs will also be implemented based upon the results that were identified as part of the environmental audit.

B1. Water Sources

6.34 The construction of the Huayna Potosi reservoir will include the principal mitigation measures listed below.

- In order to prevent disturbances to inhabitants from heavy equipment noise, equipment must be fitted with proper silencers and sound attenuation features and must not be operated during night/sleeping hours. Noise levels shall not be allowed to exceed 80 decibels at a distance of 15 meters from the source.
- In order to avoid excessive emissions of pollutants from equipment exhausts, equipment must be maintained in good working order. To avoid excessive inhalation of dust particles, work sites must be periodically wetted down. Trucks carrying excavated soil shall be covered to prevent spills, etc.

- In order to avoid instability and erosion of slopes, avoid creating steep slopes during construction; replace vegetation after a slope has been cut; and install rocks to stabilize slopes as required; consult with the project's geotechnical engineer.
- In order to avoid degradation of water quality, avoid locating work encampments directly upstream of a populated zone. In addition, utilize a septic tank or other means to properly dispose of sanitary wastes. Finally, take precautions not to allow excavated soils to be stockpiled in or directly adjacent to surface waters.

6.35 Construction noise during construction of the Huayna Potosi reservoir dam must be mitigated by installing silencers on earthmoving equipment and coordinating with the affected population for optimum hours of operation.

6.36 All data will be collected confirming that treatment lagoons are operating properly at high altitudes, and if problems are detected, there will be requirements for operating improvements and inputs for planning future facilities will be provided. Should the river flow be reduced downstream of the dam, AGIL must provide an alternate means of water supply to the affected rural population similar to the arrangement made for the Condoriri dam and the need and method for these means will take into account necessary minimum stream flows.

B2. Water Distribution Networks

6.37 To prevent disturbances to inhabitants from heavy equipment noise, equipment must be fitted with proper silencers and sound attenuation features and must not be operated during the day and 65 during night/sleeping hours. Noise levels shall not be allowed to exceed 68 decibels. Special coordination shall be undertaken with schools and hospitals, residential neighborhoods.

6.38 The generation of dust from trench excavations must be mitigated by periodically wetting the area and hauling away excess excavated soil instead of stockpiling it on-site. Trucks hauling excavated soil must be fitted with a trailer cover to prevent spillage and dust generation during transit.

6.39 Construction trash, debris shall be removed from the worksite immediately and disposed in a landfill or appropriate receiving site.

6.40 A traffic management plan will be implemented which address lane closures, detours, etc. made necessary by the installation of new water piping under streets. The plan must be reviewed and approved by the appropriate government agencies.

6.41 Work will be planned to limit the duration of interruptions in water service as a result of connections to or repairs to the existing network. The affected public must be notified in advance so that they can store water or make other provisions during the interruptions.

B3. Wastewater Collection Networks

6.42 Dust and noise generated during the expansion of the sewer collection network must be mitigated as described in item B2 above.

6.43 When draining/cleaning existing sewers during sewer expansion or renovation projects, the contents shall be pumped under controlled conditions directly to a manhole of an in-service sewer to prevent sewage spills.

6.44 Noise, dust and traffic during the expansion or repair to the sewer network must be mitigated as discussed above in item B2.

6.45 To avoid interruptions to service during connections to and repair of existing sewers, utilize temporary bypass piping/pumping.

6.46 To help lower income customers to pay for connection charges, The Company has established a 3 to 5-year financing at an 8 percent interest rate to encourage lower income customers to connect to the sewerage system. Additionally, if construction works are done in collaboration with a group of customers, only the materials are charged, lowering considerably the connection charges.

B4. Puchucollo Wastewater Treatment Plant

6.47 The treatment plant is designed to produce an effluent that meets irrigation quality standards. Loss of farm/grazing land due to the construction of the plant and its perimeter groundwater diversion canals will be mitigated by irrigating land near the plant to restore vegetation and create an equivalent or greater amount of new farm/grazing land.

6.48 The risk of wastewater leaching from the lagoons into the groundwater table will be mitigated by conducting permeability tests with raw water during construction before allowing them to be placed into service with sewage and continuously monitoring the groundwater quality around the plant and major control of pumping wells.

6.49 Excessive odors from the anaerobic lagoons can occur if the lagoons are overloaded hydraulically or organically. This will be mitigated by properly planning and implementation of future treatment plant expansions based on projections of population growth and wastewater flow/characteristics.

6.50 AGIL will monitor the quality of groundwater quality around the plant to ensure that there is no contamination from potential leaching of wastewater from the treatment lagoons.

6.51 In order to prevent contamination of soils from the land application of composted biosolids from the Puchucollo Bajo treatment plant, AGIL shall analyze the biosolids to verify that contaminants are below the allowable levels stated in the Concession Contract and applicable Bolivian regulations

C. ORGANIZATION AND SUPERVISION RESPONSIBILITIES

6.52 Aguas del Illimani has an Environmental Supervision Department, which consists of the following personnel:

- The Environmental Inspector,
- The Environmental Department Head, who is a specialist in environmental studies as they relate to water and wastewater projects, and
- An assessor for the management of natural resources (land and wildlife conservation, water bodies).

6.53 The responsibilities of the Environmental Supervision team include:

- Complete knowledge and understanding of the Environmental Audit, environmental license from the Prefectura, the PAA and the PASA, and applicable environmental laws;
- Guarantee implementation of mitigation measures through proper monitoring;
- Coordinate with applicable government institutions, including the Superintendent of Water, the Prefectura, and municipalities, as well as community groups; and
- Issue periodic reports of construction progress, any problems detected, solutions implemented, and the status of compliance with the PAA and the PASA.

6.54 As part of the Prefectura's environmental licensing process for specific projects, the Prefectura approves a plan for both the mitigation and monitoring measures and the supervision or implementation (e.g., Plan de Adecuación Ambiental (PAA), Plan de Aplicación y Seguimiento Ambiental (PASA)). The PASA or Environmental Supervision/Monitoring Plan is designed to:

- Monitor and verify the severity of the projected impacts,
- Guarantee the implementation of mitigation measures,
- Identify impacts not previously considered, and
- Modify proposed mitigation measures based on evaluation in the "field".

6.55 The Prefectura of La Paz plans on conducting regular inspections to verify that AGIL is in compliance with the environmental license.

6.56 The Company has a system to receive complaints and questions and respond them as a way to monitor service quality. The collected information including customers' complaints are available to the Superintendency at their request.

D. MITIGATION/MONITORING COSTS

6.57 The Project's total cost include some engineering and construction works which will directly improve and or protect the environmental conditions of the area. The total estimated cost for the various environmental protection, control and improvement actions

that will be implemented over the five year period associated with the Environmental Action Plan is approximately US$ 37.2 million dollars, comprised of the following main categories (see Appendix 1 for details):

- Water Sources: US$ 764,260
- Water Treatment Plants: US$ 1,423,300
- Water Distribution: US$ 716,000
- Waste Water Collection: US$ 15,181,470
- Waste Water Management: US$ 21,569,000

E. RISK MANAGEMENT/CONTINGENCY PLAN

6.58 Aguas del Illimani will prepare a Risk Management/Contingency Plan. The purpose of the plan will be to protect the safety and health of its workers, the affected public and the environment, and to secure the water supply to customers. Key potential risks identified in the Environmental Audit for existing facilities and projects to be constructed in Years 1-5 of the concession, and which will be the basis for the contingency actions, are as follows:

Water Sources

- Structural collapse of a dam
- Overflow of dam due to failure at intake structure
- Contamination of water supply at dam or in distribution canal
- Leaks in dam or in dikes of distribution canal

Water Treatment Plants

- Poor quality of treated effluent due to lack of treatment chemicals. This situation could be caused by a truckers strike, highway damage.
- Excessive biological contamination in the raw water supply
- Workplace accidents
- Chlorine gas leak

Water Distribution Networks

- General workplace accidents
- Ruptures of transmission or distribution piping
- Contamination of potable water by infiltration of contaminated groundwater

Wastewater Collection Networks

- Suffocation of laborers working inside sewer manholes due to a lack of oxygen and the presence of hydrogen sulfide and carbon monoxide.
- Potential ruptures of existing concrete sewer lines installed along mountainsides due to erosion and instability of slopes.

- Landslides along these same mountain slopes caused by soil erosion due to leaking/ruptured sewer pipes. As "unplanned" dwellings have been constructed on these slopes, landslides could cause property damage and injury or loss of life. In addition, such a landslide could obstruct a river below, causing flooding and subsequent further damage to life and property.
- Sewer overflows caused by piping obstructions from trash/refuse.

Wastewater Treatment Plants

- Overflow of treatment lagoons, causing contamination of soil and groundwater
- Excessive flows compromising treatment performance and resulting in non-conformance with treatment standards

VII. PUBLIC CONSULTATION

7.1 In order to provide the affected public and interested parties specific information on the environmental and social aspects related to the entire five-year investment program, Aguas de Illimani prepared an Environmental and Social Assessment (ESA). The ESA included specific sections on project description, legal and institutional aspects, environmental and social impacts, and environmental and social mitigation measures and monitoring measures. The ESA was made available to the public in August 1998.

7.2 For a given project with anticipated environmental or social impacts, the affected municipality is responsible for public consultation. According to the Prefectura La Paz, each municipality has a Development Plan that addresses infrastructure projects within their jurisdiction. The municipality typically makes the Development Plan available to the public and is also responsible for conducting workshops/meetings to review a given project and receive/address public comment.

7.3 Aguas de lllimani intends to coordinate with the affected municipalities to elaborate their Development Plans with respect to the concession projects.

7.4 Aguas de lllimani is developing various specific public information dissemination and education programs in order for the public to better understand the present and proposed operations and concerns and issues related to potable water, water quality and health.

VIII. RECOMMENDATIONS

8.1 The IDB will require, as part of the Loan Contract, that Aguas de Illimani comply with the following: (i) all applicable environmental, health and safety Bolivian regulatory requirements; (ii) all requirements associated with any environmental, health and safety related permits, authorizations or licenses that apply to Project; (iii) implementation of the

Environmental Action Plan; (iv) the applicable environmental and social IDB policies and guidelines.

8.2 Prior to first disbursement, Aguas del Illimani will submit a certification of compliance by with all environmental and social loan requirements.

8.3 The following conditions are required to be fulfilled by Aguas de Illimani prior to each disbursement:

1. Certification of compliance by with all environmental and social loan requirements.
2. Description of any non-compliance with any environmental and social loan requirement and an action plan to correct such non-compliance.
3. Description of any known environmental and social liability, including without limitation environmental claim, or material compliant, or unforeseen environmental, health or safety impact or risk.

8.4 During the term of the loan, Aguas de Illimani must prepare and submit an Annual Environmental and Social Compliance Report, which will be due 60 days after the close of each Fiscal Year. The report must include, at a minimum, the following:

1. Certification that the Company is complying with all environmental and social loan requirements;
2. Description of any material non-compliance with any environmental and social loan requirement which occurred and a description of measures taken to correct the non-compliance.
3. Description of any changes in the company's operations, including specifically the Environmental Action Plan, which may have a material environmental or social effect, the reasons for such changes and any actions taken to mitigate the impact of such change.
4. Description of any material environmental or social problem (such as accident, unplanned event, etc.) and a description of the actions taken to resolve the problem and the measures taken to prevent the event from occurring in the future.
5. Description of any contact by a third party (including governmental agency, public, non-governmental organization, company employee, etc.) regarding environmental, social or health and safety issue.
6. Description of planned environmental and social related activities, including but not limited to those in the Environmental Action Plan, to be performed during the next year, including estimated cost, schedule, and responsibility, including any environmental impact assessment to be developed.
7. Copy of any environmental and social document or report written to comply with any governmental regulatory requirements.

8.6 During the term of the loan, Aguas de Illimani must comply with the following requirements:

1. Consult with the Bank before implementing any action which will have a material

environmental or social impact.

2. Provide written notification, within 30 days after the Company becomes aware, of any material non-compliance with environmental and social loan requirements, environmental health or safety material affect, environmental claim, or material complaint related to environment health or safety related to the project or properties, including a description of the situation (extent, magnitude, impact, etc.), the cause, proposed corrective or remedial actions, actions taken, and proposed schedule for future actions.
3. Ensure compliance by construction contractors with the applicable environmental requirements.
4. Ensure continued implementation of public consultation activities.
5. If any resettlement or expropriation is required associated with the Project, the required actions will comply with the Bank's Policy on Involuntary Resettlement.

APPENDIX 1

ENVIRONMENTAL ACTION PLAN