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INTERNATIONAL PRIVATIZATION GROUP

The Private Provision of
Solid Waste Management Services
in La Paz, Bolivia

Final Report

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Price Waterhouse



**PRIVATE PROVISION OF SOLID WASTE MANAGEMENT SERVICES
IN LA PAZ**

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I. EXECUTIVE SUMMARY

A. Background

In June 1991, USAID/Bolivia contracted a four-person team from the Price Waterhouse International Privatization Group through the APRE Privatization and Development Project to privatize the solid waste management services of La Paz. The PW-IPG team was asked to assess the quality and efficiency of the solid waste management services provided by the municipal government, analyze the existing legal framework for the private provision of this service, identify and define alternative scenarios for private provision, develop the solicitation documents necessary to contract private services, evaluate the proposals submitted, and assist the Municipality in drafting and negotiating the service contracts with the private companies. To date, the PW-IPG team has assisted the Municipality in all but the negotiation phase of this project, scheduled to begin in mid-November.

The objective of this report is to issue the findings of the team's assessment of the existing solid waste collection system in La Paz and offer recommendations for improving the system's efficiency and effectiveness through privatization.

B. Findings

The team's findings are listed below per category of analysis:

1. Legal Aspects

In light of the fact that the Municipality had decided to move forward with the privatization of solid waste management services, the PW-IPG team focused its legal study on several objectives: analyzing the general legal framework, identifying the constraints to the private provision of solid waste collection and disposal services, defining legal options to address these constraints, and developing a legal and transparent alternative which best promotes private provision of the solid waste collection and disposal services.

Given the legal framework and the time-frame involved, the PW-IPG team determined that the rental of municipal equipment to private contractors, and the establishment of a service contract with private companies offered the most appropriate legal path towards the private provision of solid waste management services.

2. Financial Aspects

The team defined the costs of the solid waste management operation in order to identify a baseline cost to which it could compare bidders' proposed costs. Based on the information available in La Paz, the team developed an annual cost breakdown as well as a cost per ton collected and disposed. Given an annual cost of over US\$ 3.6 million, the cost per ton in La Paz is US\$ 43.05.

3. Technical Aspects

Solid waste collection and disposal services in La Paz are provided by the Department of Urban Health (DSU - Dirección de Saneamiento Urbano). The DSU provides a range of solid waste management services to the community of La Paz, which we have divided into two categories: Collections Services and Disposal Services. Collection Services include fixed and mobile (roll-on/roll-off) containers, residential collection, hospital and clinic collection, special collection, street sweeping and park cleaning. Disposal services consist of the operation of a transfer station and a landfill. These services are provided at a minimal or no charge to approximately 78% of the city of La Paz.

There is a newly-established collection and disposal infrastructure consisting of recently donated equipment, a new landfill site and a new transfer station. In contrast to this new infrastructure, the DSU operates within a very centralized Municipality. Although the DSU manages its operations autonomously, it depends on other Municipality departments for administrative and management procedures which determine service efficiency and costs, such as equipment maintenance, fuel and lubricants, parts and service procurement, personnel policies and budgeting procedures.

Through analysis of data obtained from the DSU and other Municipality departments, team observations and time studies, and interviews, the PW-IPG team concluded that the average daily solid waste generation rate in La Paz is 300 tons/day. This daily tonnage is collected by the DSU with a crew and equipment utilization rate of 63% for the non-compaction equipment and 69 - 72% for compaction equipment. In other words, the present crews and equipment could be reduced by 31 to 37% if working conditions remained the same.

4. Public Perception of the Service

Through the analysis of a specially designed public opinion survey, the team was able to assess the public perception of the service provided by the Municipality. Generally, the public regarded the service as average, inconsistent and insufficient

for the city's needs. The public blamed the Municipality for the bad-quality service and felt that the private sector would provide a higher quality service to an expanded sector of the community.

C. Recommendations

1. Critical Steps Toward Private Provision

The team's findings revealed an inefficient service being provided to a dissatisfied community at a high cost to the Municipality. In view of the fact that the Municipality did not have the necessary number of qualified staff available to carry out the required systems and procedures improvements within a reasonable time, the decision was made to focus the team's efforts on the definition of an appropriate strategy which would lead towards the private provision of the solid waste management services. This strategy identified two steps which would give the process legal standing and public support: the establishment of an autonomous Municipal Waste Management Enterprise (Empresa Municipal de Aseo, EMA) and the design and development of an informational communications campaign.

a. EMA

Municipal norms identified EMA as the only municipal entity empowered to contract private companies to deliver solid waste collection and disposal services to the community. With this in mind, the PW-IPG team assisted the Municipality in developing EMA's company structure, budget, annual workplan and contracting policies. Once EMA was legally established, it would serve as the mechanism for private provision.

b. Communications Campaign

In order to inform the public about EMA, and its new contracting policies, the team worked closely with the DSU and a public relations firm to design and develop a communications campaign. This campaign consisted of several elements divided into a selective dissemination phase and a large-scale dissemination phase. As the public relations firm began producing the materials necessary to carry out the campaign, the team began to draft the solicitation documents for the private provision of solid waste management services.

2. The Scenarios for Private Provision of Solid Waste Management Services

With the establishment of EMA and the preparations for the communications campaign underway, the PW-IPG team began work on the development of alternative privatization scenarios.

The PW-IPG team developed three scenarios for private provision of solid waste management services which differ primarily in the number of companies participating in the management and operations of the solid waste collection and disposal services. The first scenario consists of one company performing all services for the entire city of La Paz, under the supervision of a second company. The second scenario suggests one company performing collection service and a second company in charge of disposal services, both being monitored by a third company on behalf of the Municipality. The third scenario presents two companies responsible for collection services, one company in charge of disposal services and a fourth company performing monitoring activities

The Municipality and the PW-IPG team viewed scenarios two and three as the two top choices. While there was no hesitation regarding the separation of functions; collection, disposal and supervision, no decision was reached regarding the choice of having one or two collection companies.

It was clear from the early stages of this project that while contracting the collection service to one company would offer opportunities for greater financial savings for the Municipality, it would not guarantee better quality service nor increased service coverage, and very importantly, it would not provide a backup plan for an interruption in service. In order to accurately weigh the opportunity costs (competition, quality, coverage and continuity of service) against potential cost savings, it was decided to postpone the final decision until after the bids submitted were reviewed.

Based on this strategy the team prepared three sets of Invitation For Bids documents: ~~one for waste collection, one for waste disposal and one for supervision services.~~

3. The Bidding Process

Although the PW-IPG team developed the solicitation documents, the only entities authorized by law to manage the procurement process were three pre-determined

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agencies. The agency chosen by the Municipality of La Paz to manage this procurement process was the Caisse de Depots et Developpement, C3D. C3D and the team worked closely with EMA in completing the documents in order to begin the bidding process on schedule.

Bidders were granted one month (August 19 - September 19) to submit proposals. Meanwhile, the PW-IPG team and EMA developed a set of selection criteria to be used during the evaluation phase of the project and answered questions from the bidders regarding the licitation documents.

The Invitations for Bids (IFBs) were structured for five-year contracts open to Bolivian, foreign or mixed companies, with the exception of the supervision contract which was limited to Bolivian companies. To ensure seriousness in bidding, bidders were required to submit a proposal bond as well as a performance bond. This financial requirement was offset however, by the opportunity to rent equipment from the Municipality. EMA would collect user fees through either the water or electricity bill. Payment of monthly invoices would be made by EMA through a special account set up specifically for this purpose.

4. The Evaluation

C3D evaluated the proposals submitted using the evaluation criteria defined by the team. The PW-IPG team also conducted an independent evaluation of these proposals. The evaluation criteria focussed on four main areas: experience, financial capabilities, technical proposal and cost proposal. Based on these criteria, three contracts were awarded, two to collection companies and one to a waste disposal company. Initially, EMA solicited bids for the supervision contract from only Bolivian collection companies. In light of the absence of Bolivian bidders, however, it was decided that the supervision contract would be re-bid to attract international bidders.

5. Recommendations for the Future

Following are a series of first steps which EMA should focus on to ensure the successful completion of this privatization project.

a. The Transition Period

EMA should request a Transition Implementation Plan from each of the private companies awarded a service contract which includes at a minimum: routing,

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schedules, takeover phasing, a plan for the incorporation of the microenterprises, a hiring plan, educational and informational campaigns and reporting formats.

b. Monitoring Practices during the Grace Period

In addition, adherence to the requirements stipulated in the contracts should be monitored not only by the Supervision contractor but also by EMA during the grace period granted in the contracts. Preparation of a check list would be useful for both the supervision company and EMA.

c. Legal Steps

It is essential to the success of this transition that EMA adhere to the legal requirements which will give this project transparency and solidity. It is essential that both the service and equipment rental contracts meet the legal requirements set forth not only by Municipal law but also other laws such as the Commercial Law and the Labor Law.

d. Special Account

EMA must take the necessary measures to establish the special account which will serve as the mechanism to guarantee payment to the private companies. This measure is important in order to prevent delays in payment which could easily jeopardize the success of private provision.

e. Service Fee Collection

The mechanism for collection of service fees must be defined prior to the transition phase. Service fees deposited into the special account will be the source of EMA's income. It is important that this matter be settled on time to prevent any delays in payment and consequential interruption in service. Depending on the level of service fees collected, EMA will either be self-sufficient or will receive transfers from HAM.

f. Future Cost Assessment

In view of the fact that EMA will not provide solid waste management services directly to the public, it will not be able to assess the real cost involved in such an operation. EMA must periodically seek professional services capable of determining the real costs of solid waste management. Given that the service contracts will cover a five year period, a cost assessment prior to the renewal date will be necessary.

II. BACKGROUND

A. Introduction

As part of an on-going municipal strengthening project, the Municipality of La Paz embarked on a program to improve the efficiency and quality of the services provided to the community. The Municipality's decision to increase efficiency and quality through privatization reflects a fundamental understanding of the recognized benefits from, and the international tendency toward, transferring the provision of public services to the private sector.

The private sector has consistently demonstrated that it is more capable of providing a higher quality service at a lower cost in the field of solid waste management, than the public sector. Several major research studies concerning the costs and benefits associated with privatization of solid waste collection services conclude that refuse collection by private contractors cost anywhere from 28 percent to 40 percent less than what public agencies spend for comparable services. In addition, it is generally recognized that privatization of solid waste collection services will result in greater efficiency, lower absenteeism, higher productivity, better employee morale, and less downtime.

In some industrialized countries, however, a very limited number of city governments have been able to maintain efficient solid waste management operations. In selected cities, such as Phoenix, Arizona public solid waste management entities compete against private companies for the provision of public services. This type of competition between private and public entities is the exception, however, since private companies as a rule operate more efficiently.

To improve the quality and efficiency of the solid waste collection and disposal services, the Municipality of La Paz requested technical assistance from USAID/Bolivia to: define options for private provision of solid waste management services; analyze existing solid waste services; and prepare the necessary baseline analysis and documentation to solicit bids from private enterprises. Through the privatization and development contract, USAID asked the International Privatization Group (IPG) of Price Waterhouse to assist the Municipality of La Paz in these technical areas. (See Appendix A: Scope of Work)

B. Methodology

The standard approach to the private provision of solid waste collection and disposal services involves the optimization of the service prior to privatization. Since 1986, HAM has been working to optimize the level of service in La Paz through projects such as the construction of the sanitary landfill and transfer station, the improvement of equipment by donation, and the creation of EMA. Given the work that the Municipality had already done, and its commitment to establishing a more efficient service in a short time-frame, HAM decided to move forward with the establishment of private provision of the waste collection and disposal services. In light of this decision, the PW-IPG team focused its work directly on the transition to privatization.

C. Solid Waste Collection and Disposal Services in La Paz: The Environment

1. La Paz

La Paz lies among the Andean mountains of Bolivia in rugged terrain commonly referred to as La Hoyada. At an altitude of 13,500 feet-above sea level, and with a population of 800,000 inhabitants spread throughout the mountainsides, La Paz is a challenging city to clean.

The steep, often unpaved streets render vehicle access to these hard-to-reach areas difficult. Vehicle operation in this type of setting often causes damage to waste collection equipment. In addition, many of the city streets and thoroughways are paved with a variety of materials including tar, cobblestone and stone tile. Each of these surfaces require different types of solid waste collection equipment.

Fortunately, the weather in La Paz is cool and dry, which keeps the solid waste in a relatively odorless and safe condition for a period longer than that allowed by a hot and/or humid climate.

2. The Municipal Government of La Paz

Prior to July 1991, the Municipality of La Paz (referred to as the Honorable Alcaldía Municipal de La Paz - HAM) provided solid waste collection and disposal services through the Dirección de Saneamiento Urbano (DSU), the equivalent of a Solid Waste/Public Works Department. In response to a Municipal Norm, the Municipality created the Empresa Municipal de Aseo (EMA) to replace the DSU in

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the performance of solid waste collection and disposal services. Although EMA was created in July 1989, DSU personnel continue to provide collection and disposal services under the EMA name. Once EMA transfers the provision of the service to private companies, it will only retain a limited number of staff.

While the DSU depended on other Municipal departments for funding, personnel management, equipment, materials, and general procurement, EMA functions autonomously and according to business guidelines.

Since 1986, HAM has worked to improve its waste management operation. HAM built a new landfill which meets international industry standards. This new landfill, funded by the World Bank, was built in Mallasa Park on the outskirts of La Paz and became operational in May 1991. It replaced the old city dump which had been the depository site for nearly fifty years. Early in 1991, the Government of Japan, through the Japanese International Cooperation Agency (JICA), donated new equipment for solid waste collection and disposal in La Paz. In July 1991, HAM also inaugurated a transfer station. These new components of the collection and disposal system (the Mallasa Landfill, the Kantutani Transfer Station and the Japanese equipment donation) are commonly referred to as the "new system". This "new system" offers significantly improved structural conditions for the provision of solid waste collection and disposal services.

D. The Operation of Solid Waste Collection and Disposal Services in La Paz

1. Solid Waste Collection Services

Services provided by the DSU at the time of the study include:

- o Residential Solid Waste Collection
- o Special Solid Waste Collection (commercial, open-air markets, and institutional waste)
- o Medical Waste Collection
- o Container Services
- o Non-mechanized Street Sweeping
- o Non-mechanized Park Cleaning

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The DSU provides these services to 78% of the population of La Paz. Most collection services are performed three times a week, with the exception of street sweeping, which is provided daily, and park cleaning, which is provided as needed. The container service is provided daily for high-volume areas and less frequently for areas with lower waste generation rates.

2. Solid Waste Disposal Services

Waste collected throughout the city of La Paz is disposed of at the Mallasa landfill, where it is spread into layers, compacted and covered daily. The Mallasa landfill, located approximately forty minutes from downtown La Paz, is expected to have a lifespan of 20-25 years.

3. Equipment and Servicing

The equipment used to perform collection services is a combination of old and new vehicles. The landfill equipment on the other hand is entirely new. While the DSU performs only preventive and small-scale maintenance for all the equipment, the Mechanized Services Department of the Municipality (SERMEC) conducts all heavy-duty maintenance.

Equipment is stored and cleaned at the two Service Centers, one of which is located in downtown La Paz and the other in Southern La Paz. Fueling of vehicles is usually carried out at SERMEC facilities.

III. PROJECT FINDINGS

This section describes the team's findings on the solid waste collection and disposal operation. The findings have been organized into five different categories: legal, technical, financial, general management, and public opinion.

A. Legal Framework

The PW-IPG team focused its legal study of the solid waste collection and disposal system on several objectives: analyzing the general legal framework; identifying the constraints to the private provision of solid waste collection and disposal services; defining legal options to address these constraints; and developing a legal and transparent alternative which best promotes private provision of the solid waste collection and disposal services.

1. The Existing Legal Framework

The analysis of the existing legal framework sought to define which Municipality department had the legal authority to "contract out" solid waste management services to a private entity.

The PW-IPG team reviewed the following principal norms:

- Constitutional Law
- Municipal Law
- Investment Law
- Decree 21660
- Decree 21060
- Civil Code
- Commercial/Mercantile Law
- Labor Law
- Municipal Norms 50 and 51
- 1976 Municipal Health Norm
- Contract Law

The initial analysis indicated that the DSU does not have the authority to contract a private entity to perform the solid waste collection and disposal services in La Paz. EMA exclusively has this authority. Through Municipal Norms 50 and 51,

EMA became a legal entity, empowered to act autonomously and independently, and inherited the responsibility for solid waste management from the DSU. The enactment of Norms 50 and 51 does not imply that the Municipality has relinquished its responsibility to provide solid waste services to the community. It has been merely transferred from one legal entity of the Municipality (the DSU) to another (EMA). Parallel to the transfer of responsibility, however, is the transfer of contracting authority.

The Municipality was no longer authorized to contract a private enterprise directly for the purposes of solid waste management. Had the Municipality decided to directly contract private companies, the legal basis for the contract would have been unsound and the contract could have been easily annulled due to the existence of Municipal Norms 50 and 51. If Norms 50 and 51 did not exist, Municipal Law dictates that to contract a private entity for the performance of any municipal service, the contract would be subject to City Council approval and the only mechanism available would be a concessionary contract. A concessionary contract would defeat the main objective of the project.

2. Concessionary Contract vs. Service Contract

a. Concessionary Contract

Through a concessionary contract, a government transfers absolute responsibility for the provision of a service to a private entity. The private entity provides the service independent of the government, and at its own risk, collecting a fee from the community. The government, in this case, relinquishes the right to monitor and supervise the service, as well as the right to influence any decisions that may affect service fees paid by the community. In return for the right to operate the service, the private company pays the government an agreed-upon sum of money.

b. Service Contract

In a service contract, the government contracts a private company to provide a service while retaining overall responsibility for that service. The government maintains control of the decision-making process and the orientation of the service, and is responsible for collecting service fees from the public. The income received from the service fees is used to pay the contractor, who receives payment based on the quality and quantity of the service performed.

Upon examination of the pros and cons of these two types of contracts, it became evident that the route to private provision of solid waste management services in La Paz was a service contract which required the establishment and

implementation of EMA. A more detailed analysis of Norms 50 and 51, however, revealed certain limitations to EMA's contracting authority.

3. Contracting Restrictions of Norms 50 and 51

Although Municipal Norms 50 and 51 grant EMA the right to sign contracts with the private sector, they limit that right to certain contracting mechanisms. After analyzing in detail the legal constraints contained in the norms, the PW-IPG team concluded that the most appropriate mechanisms available for private provision were the rental of the DSU equipment and the issuing service contract.

a. The Transfer of Assets

Norms 50 and 51 clearly prohibit the transfer of Municipal property to the private sector. In light of this restriction, two remaining alternatives for private provision of solid waste services existed: not to use the equipment recently donated by JICA, or rent the equipment to the private companies.

Of the two remaining options, the rental of existing equipment was the most attractive to the Municipality for two reasons. First, the rental of equipment would result in an efficient use of an available resource. Second, rental fees would be an additional source of income to EMA.

b. Contract Options

Norms 50 and 51 mention four types of contracts which EMA could use as mechanisms for private provision of solid waste management services. The four types of contract mechanisms are: concession contracts, contracts for the leasing of services, fiduciary management contracts, and any other contracts that involve DSU/EMA assets. There is an explicit requirement, however, which limits EMA's decision-making authority in granting these four types of contracts: approval by the City Council. This requirement does not apply to other types of contracts which Norms 50 and 51 do not prohibit EMA from granting: service contracts and joint ventures. In view of EMA's decision to maintain responsibility for the provision of the solid waste management services, the Municipality in conjunction with PW-IPG determined that the most appropriate contracting mechanism was the service contract, which does not require City Council approval.

The PW-IPG team consulted an independent legal firm to confirm its findings (See Appendix C: Independent Legal Opinion)

B. The Current Technical Capabilities and Performance of the Municipality's Solid Waste Collection and Disposal System

1. General Characteristics of a Solid Waste Management System

In general, solid waste management consists of a number of phases: collection, transfer (or intermediate disposal), and final disposal. In the collection phase, solid waste of different origins (residential, commercial, industrial, and hospital), is picked up by especially designed equipment from numerous locations at scheduled times. The waste is then transported by collection trucks to the transfer station where the second phase takes place.

At the transfer station, waste is weighed and loaded from collection trucks to large trailer trucks. Once a collection truck transfers its load to a trailer, the empty truck resumes its collection activities, or returns to the service center. As the trailer trucks are filled, they transport the waste to the landfill where the final disposal (third phase) occurs.

At the landfill, the waste is emptied from the trailer truck onto the especially-prepared terrain where the waste is layered, compacted and covered daily. Once a landfill is filled to capacity, it is sealed and landscaped for future use as park space.

If a community does not operate a transfer station, the collection trucks take the solid waste directly to the landfill. Under this system there is no intermediate disposal (transfer) phase. (See Appendix B: Glossary of Terms for details on terminology)

2. Team Methodology

This portion of the study addresses the current solid waste collection and disposal system in operation in La Paz. The PW-IPG team obtained the information presented below through site visits, route observations, time studies, interviews with DSU and Municipality personnel and analyses of reports and data. (See Appendix J: List of Interviews). The team conducted time studies during normal eight-hour work shifts on those collection and disposal activities that generate the highest total tonnage, on both heavy and light collection days. In addition, team members observed several solid waste collection and disposal crews in operation,

including an early Sunday morning special collection shift which gathers waste generated by marketplaces and other commercial or institutional establishments.

The following assessment includes technical data regarding the efficiency and performance levels of the existing solid waste collection systems in La Paz. The reasons for doing so are twofold. First, the Municipality has never possessed detailed or accurate information regarding the capability level of refuse collection services. The report's findings provide the Municipality with a sound indication of the efficiency and effectiveness of the various components that comprise the collection system. Second, the inclusion of the technical data supports the team's conclusion that privatization will enhance the efficiency and utilization of solid waste collection services throughout La Paz.

3. The Organization: DSU Structure and Personnel

a. Organizational Structure

The DSU is headed by a Director who in turn reports to the Technical Officer of the Municipality and the Mayor of La Paz. The Director works closely with the Assistant Director, and key staff in charge of the two main divisions, Administration and Operations to manage daily operations. The Operations Division covers both the collection and disposal phases of solid waste management. The Administrative Division is in charge of overall administrative, financial, and public relations procedures. Although operationally the DSU functions autonomously, the Municipality retains centralized control of payroll, budgeting, procurement and equipment maintenance functions.

The technical staff of the Operations Division oversees a number of employees: Supervisors, Drivers, Collectors, Sweepers, Maintenance Staff, Landfill Staff and other miscellaneous positions. In addition to these DSU employees, there are numerous employees from SERMEC who work for the DSU as drivers or collectors, or work on DSU equipment under the maintenance operation. Due to the centralized nature of the Municipality's structure, there are additional Municipality employees who devote part of their workday to DSU-related activities.

b. Personnel

The lack of information, and the existence of non-permanent workers at the DSU, render the definition of the DSU workforce a very difficult task. At this point, we can only approximate that the total number of workers at the time of the team's visit ranges from 500 to 600 workers. The greatest number of workers are

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concentrated in the street-sweeping operation. The street sweeping workforce is comprised of not only permanent DSU workers, but also temporary personnel contracted to meet specific demands.

Job descriptions of operational and administrative personnel were not available to the team. Personnel training takes place on the job and without any systematic methods. The need for the introduction of formal training is evident. Establishing training programs could improve supervisory, driving, maintenance and customer relations skills, and apply higher job safety standards. At the time of the team's visit, there were no personnel procedures with specific guidelines for management, operations, and staff development.

c. DSU Services

The DSU provides a range of solid waste management services to the community of La Paz, which we have divided into two categories: Collection Services and Disposal Services.

Collection Services include fixed and mobile (roll-on/roll-off) containers, residential collection, hospital and clinic collection, special collection, street sweeping and park cleaning.

Disposal services consist of the operation of a transfer station and a landfill.

4. The Collection and Disposal Service System

a. Residential Solid Waste Collection

At the time of our first visit, the residential solid waste collection in La Paz was divided into two geographic areas, the central and southern zones (Zona Central and Zona Sur). The bridge on Avenida Libertador over the Rio Orkojahuirra serves as the boundary between the two areas.

Drivers and helpers begin to enter the Service Center at 6:30 AM to prepare their vehicles for departure. Between 7:00 AM and 8:00 AM, non-compacting solid waste trucks and their crews leave the Service Center and travel to their designated routes. Upon arrival at the predetermined collection point, a crew member hits a metal bell or tube to inform the residents of the arrival of the solid waste collection truck.

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Shortly thereafter, residents bring their solid waste to the collection point in containers ranging in size from five to ten gallons. Due to the relatively high loading level of the non-compacting Prefectura trucks, workers are assisted by residents in unloading the solid waste containers. The need for resident participation in the collection process renders it disorganized and oftentimes causes delays.

After the solid waste is loaded into the trucks, the crew proceeds to the next pre-determined collection point. Once the truck is filled to capacity, or reaches the end of the route, the truck moves directly to the landfill. After weighing the truck and unloading the solid waste into the designated landfill cell, the truck returns to finish the route or goes directly to the Service Center.

Two types of trucks serve the Zona Central area: the 3.5-ton non-compacting solid waste collection truck and a rearloader with a 7-ton capacity. The non-compacting truck is mainly used in the low income level areas where steep and narrow roads are prevalent. Supervisors also claim that at certain locations, the road configuration causes the tail end of rearloaders to hit the pavement, resulting in damage to the truck. Also, the engine in the rearloaders is not powerful enough to pull a rearloader up the steep roads. For these reasons the rearloading compaction truck is mainly used in areas without steep inclines.

b. Roll-on/Roll-off Container Collection

In the mobile container collection system, six roll-on/roll-off trucks serve two shifts. These roll-on/roll-off trucks travel at 7:00 AM in the morning to pick up 18 containers. Upon arrival, the truck attaches the loaded container onto its frame. Once the container is fastened to the body of the truck, the truck proceeds to the landfill, where crew members empty the contents of the container into the designated landfill cell. The crew attaches the empty container to the truck, and returns the container to its original location. The truck then proceeds to the next container location, and the process is repeated until all the containers have been collected and emptied at the landfill.

The afternoon shift begins at 3:15 PM. After collecting eleven empty containers from the storage area, five of the six trucks (one remains at the Service Center on stand-by status) travel to high volume solid waste areas such as the cemetery and the market place. After the vendors and street sweepers load the solid waste into the containers, the crew members load the containers onto the truck and proceed to the landfill. From approximately 8:00 p.m. to 1:00 a.m., the crew members unload the solid waste into the designated landfill cells and return the containers to the storage area.

c. Special Solid Waste Collection

The scarcity of roll-on/roll-off containers requires the use of a Special Collection route in certain high-volume solid waste generation areas of La Paz. Such areas include market places and certain streets lined with vendors. In these areas, unlike all the others, collection services are performed by eighteen crews and their equipment, seven days a week.

Collection crews leave the assigned Service Center shortly after 4:00 AM. Upon arrival at the designated collection point, street sweepers shovel the solid waste into a piece of cloth and empty the contents into the truck's hopper. The crews proceed to the next designated collection point, and the process is repeated until all the solid waste from the high-volume areas is collected and deposited at the landfill.

d. Hospital and Clinic Service

A single rearloading compaction truck collects medical waste from eight hospitals, all located within a one-kilometer radius. Between 6:30 AM and 7:00 AM, the truck leaves the Service Center and travels to the hospitals. Upon arrival at the first hospital, the crew gathers the solid and medical waste, and loads it into the hopper. The crew proceeds to the next hospital, and the process is repeated until the solid and medical waste from the eight hospitals is collected and disposed of at the landfill.

Unlike hospitals, clinics in La Paz are scattered throughout the city. Due to the considerable time required to service the clinics, the hospital waste collection truck is unable to collect solid waste from the clinics. Presently, collection trucks servicing residential areas collect the medical waste from the clinics in their assigned routes. The collection and disposal process for clinics is similar to that used for hospital waste. Crews in charge of hospital and clinic waste collection have not been instructed to keep the medical waste separate.

e. Fixed Containers and Dumptrucks

Beginning at 7:00 AM, a dumptruck driver and one to four helpers travel to a fixed container location. As crew members open the container doors, the solid waste slides into the truck bed. The helpers then load any remaining solid waste from the container and the surrounding areas into the truck. The helpers also compile any solid waste that has been dumped by residents in front of the container, and load it into the truck. The truck proceeds to the landfill, where the solid waste is emptied into the designated landfill cell.

5. The Maintenance and Servicing Operation in La Paz

The two Service Centers for the collection operation in La Paz are the Posta Central and Posta 4. Both centers are cluttered with equipment in non-operating condition. This makes it extremely difficult to move the working equipment that is used in the collection operation in and out efficiently.

At Posta Central, there appeared to be little personnel supervision, which caused delays in the provision of the service. At Posta 4, however, some personnel control was evident. Workers were required to sign in and out on a daily logbook. Fueling of the trucks, however, was done manually by hauling fuel in cans to the equipment which is a time-consuming and unsafe practice.

a. The Maintenance System

The cost of providing effective waste collection and disposal services is directly related to the cost of maintaining equipment. Limited access to spare parts, insufficient staffing and inadequate information are examples of factors which increase the maintenance turnaround time and augment maintenance costs.

Currently, La Paz owns 68 collection vehicles to fulfill a requirement of 27 - 30 collection routes daily. Under proper maintenance practices, the number of fleet vehicles required to meet this service level would not exceed 40, assuming that sufficient workload exists to require this level of routing. The IPG-Team reached the 40-vehicle estimate by assigning one vehicle to each route, and incorporating a 20% spare ratio. This reserve requirement is generally applied by type of equipment (rearloader, roll-off, dumptruck, etc.), and is required to provide uninterrupted service (maintenance float). Industry standards indicate that reserve requirements range from 11 to 50% of the total equipment, depending on fleet size. The smaller the fleet the larger the reserve requirement.

A review of the current equipment maintenance practices at the DSU reveals three types of maintenance systems in place for collection and landfill equipment:

- Preventive and minor maintenance (performed by the DSU)
- Heavy maintenance (performed by SERMEC- Servicios Mecanizados) a separate department for mechanized services for the entire municipality.
- Warranty maintenance (performed by the vendor)

This menu of maintenance options is characteristic of industry practice and consistent with maintenance procedures in most large North American cities.

b. Deficiencies of the Maintenance System

Several factors hinder the efficiency of the maintenance program of solid waste collection and disposal equipment in La Paz: fleet diversity, lack of available and affordable spare parts, theft, inadequate staffing and an absence of a maintenance record-keeping system.

(1) Fleet Diversity

A key issue in maintaining the fleet is the diverse nature of the equipment (For reasons beyond their control such as equipment donations and the purchase of low-cost equipment, the Municipality owns a diverse fleet of Toyota, GMC, Hino, Kobota and Caterpillar equipment). A diverse fleet not only requires additional financing and stocking of spare parts but also an adequately trained staff capable of applying several maintenance techniques to different types and ages of equipment. If these elements are present, maintenance turnaround time could be 24 - 36 hours, decreasing the total amount of equipment needed. Fleet diversity within the Municipality of La Paz has resulted in a lengthy turnaround time and higher maintenance costs

(2) Spare Parts

The ready availability of appropriate spare parts and the resources to keep these parts in stock are essential to an expedient maintenance turnaround. Conversations with DSU and SERMEC staff indicate that existing approval procedures to order spare parts are burdensome, time-consuming and based on a demonstrated need for the part. This approval process can add weeks to the requisition process and severely undermine efforts to quickly repair and field the equipment.

(3) Theft

It is not uncommon for tools, fuel, equipment manuals, parts and other work material to disappear from the workplace. This practice hinders the ability of the DSU and SERMEC to provide basic maintenance service.

(4) Staffing

Appropriate staffing is essential in a well-managed maintenance program. Staffing at the DSU appears to be inadequate and insufficient, given the number of vehicles assigned. Although staffing was projected at seven employees, only four handle the workload of 89 vehicles. This is an insufficient level.

(5) Maintenance Records

No apparent exchange of maintenance information exists between DSU and SERMEC. The breakdown history of equipment would allow a manager to make informed decisions regarding driver abuse of equipment; mismatch of a vehicle and its assigned route; or duplicate repairs caused by poor diagnostics. Despite the decision to transfer the collection and disposal service to the private sector, the heavy maintenance unit at SERMEC will remain in operation to service other Municipality equipment.

6. The Performance of the Solid Waste Collection and Disposal System

After obtaining information through time studies, route observations, interviews and data analysis, the PW-IPG team organized and analyzed the data to arrive at certain performance indicators.

a. Annual Solid Waste Generation

Exhibit 1 shows the annual solid waste tonnage collected in La Paz by the Municipality, for 1991 year. The absence of any recorded information prior to May 1991 forced the team to use waste generation data for the months of May, June and July. In addition, the team used the Supervisor's Estimate Method to project the seasonal fluctuations in the annual solid waste tonnage for La Paz in lieu of any recorded data available.

EXHIBIT 1

CITY OF LA PAZ
DEPARTAMENTO DE SANEAMIENTO URBANO
ESTIMATED ANNUAL SOLID WASTE TONNAGE
1991

Month	Residential	Comm.	Hospital	Spec. Coll.	Urban Clean.	Container	Total	(2) Seas. Diff. %
Jan	5139	386	55	189	394	1408	7671	117
Feb	5392	418	60	205	426	1526	8027	122
Mar	5112	370	53	181	377	1350	7443	113
Apr	4578	325	46	159	331	1186	6625	101
May (1)	5008	357	51	175	364	1306	7280	111
Jun	4945	353	50	173	361	1292	7174	109
Jul	4532	321	46	157	328	1175	6559	100
Aug	4442	315	45	154	321	1151	6428	98
Sep	4487	318	45	156	325	1162	6493	99
Oct	4603	328	47	161	334	1197	6670	102
Nov	4840	350	50	171	357	1281	7049	107
Dec	5293	382	55	187	390	1398	7705	117
TtIs	58371	4223	603	2068	4308	15432	85005	--
%(3)	69.1	4.9	.7	2.4	5.0	17.9	100.0	--

(1) Actual weight for the month of May, 1991.

(2) Seasonal differences estimated by the Field Operations and Planning Directors.

(3) Percentages calculated on the basis of information received from the Planning Director.

b. Time Standards

During each time study, the team broke down the solid waste collection activities into various work elements, and developed a corresponding time standard. Exhibit 2 displays time standards corresponding to each work element and four types of equipment.

EXHIBIT 2

CITY OF LA PAZ
 DEPARTAMENTO DE SANEAMIENTO URBANO
 SOLID WASTE COLLECTION TIME STANDARDS
 (in minutes)

Work Element	Parada Prefectura	Parada Rearload	Semi Curb Rearload	Roll-on Roll-off
Get ready/Put away	15.000	15.000	15.000	15.000
Non-route travel to route/transfer station per/kilometer	2.500	2.500	2.500	2.500
Non-route travel to landfill per/kilometer	3.400	3.400	3.400	3.400
Non-route travel from landfill per/kilometer	1.800	1.800	1.800	1.800
Route travel per/meter	.011	.011	.008	--
Returnable container per/container	.142	.140	.139	--
Non-returnable container per/container	.115	.113	.099	--
Compaction time per/occurrence	--	.981	.981	--
Collection Stop per/stop	3.147	3.729	--	--
Roll-on/off per container	--	--	--	6.500
Landfill per/occurrence	13.500	13.500	13.500	13.500
Transfer station per/occurrence	7.000	7.000	7.000	7.000

For comparative purposes Exhibit 3 shows time standard data for the City of Phoenix, Arizona.

EXHIBIT 3

CITY OF PHOENIX
SOLID WASTE MANAGEMENT DIVISION
SOLID WASTE COLLECTION TIME STANDARDS
(in minutes)

Work Element	Curbside Rearloader	Mechanized Sideloader
Get ready/Put away	15.000	15.000
Non-route travel to route per/km	1.306	1.306
Non-route travel to landfill per/km	1.306	1.306
Non-route travel from landfill per/km	1.306	1.306
Route travel per/meter	.004	.004
Returnable container per/container	.173	--
Non-returnable container per/container	.098	--
90-Gallon container per/container	--	.167
300-Gallon container per/container	--	.158
Landfill per/occurrence	9.200	9.200

Note: The Phoenix curbside rearloader system has been replaced by the mechanized collection system.

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The Phoenix and La Paz time standards are used to project the total time required to collect a refuse volume of 900 gallons with different types of equipment. Exhibit 4 illustrates that collecting 900 gallons in La Paz takes considerably more time than collecting it in Phoenix. While it takes 28.56 minutes in La Paz with a rearloading truck, it takes almost one fourth of that time (7.13 minutes) in Phoenix, with similar equipment (curb rearloader).

EXHIBIT 4

CITY OF LA PAZ
SOLID WASTE COLLECTION SYSTEMS
COLLECTION TIME COMPARISON

Containers	Size Gall.	Units	Use. Vol.	Para-da Pref.	Para-da Rear1	Semi Curb Rear2	Roll/on
Returnable	7.5	120	900	17.04	16.80	16.68	--
Non-returnable	7.5	120	900	13.80	13.56	11.88	--
Roll-on	900	1	900	--	--	--	.65
Time in Minutes	--	--	--	30.84	30.36	28.56	.65

CITY OF PHOENIX
SOLID WASTE COLLECTION SYSTEMS
COLLECTION TIME COMPARISON

Containers	Size Gal.	Units	Use. Vol.	Curb Rearl.	Mech. Curb Sidel.	Mech. Alley Sidel.
*Returnable	30	30	900	5.19	--	--
*Non-Returnable	30	30	900	2.94	--	--
Mech. Curb.	90	10	900	--	1.67	--
Mech. Alley	300	3	900	--	--	.50
Time in Min.	--	--	--	7.13	1.67	.50

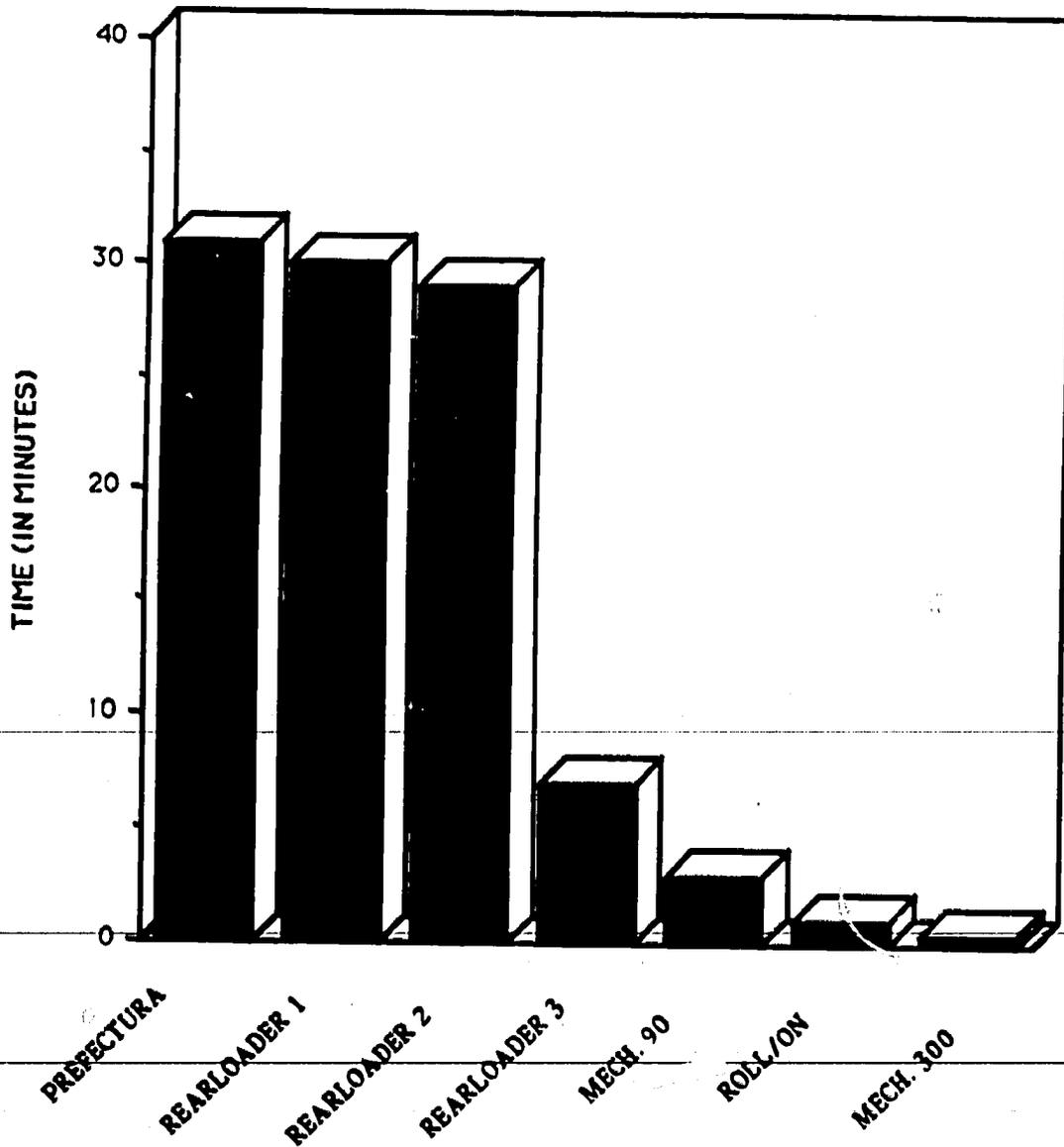
* Discontinued system

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Exhibit 5 is a graphic representation of the time required for each system when collecting a volume of 900 gallons of solid waste. It illustrates dramatically the impact of a mechanized solid waste collection system and presents a very convincing argument for the expansion of roll-on/roll-off container services in La Paz. (Please, refer to the next page)

EXHIBIT 5

TIME REQUIREMENTS FOR WASTE COLLECTION USING DIFFERENT TYPES OF EQUIPMENT



c. Crew and Equipment Utilization Levels

Time studies indicate that the crews and non-compaction solid waste collection equipment are being utilized at a level of approximately 63%. The crews and compaction solid waste collection equipment show a 69 - 72% utilization level.

These utilization levels are calculated by dividing the actual time worked (adjusted by the crew performance rating) by the time available per shift. Exhibits 6-9 show the actual minutes worked.

To test the conclusions from the time studies, three routes were expanded to ensure a minimum of an 8-hour workload. These routes included a non-compaction Prefectura truck and a compaction rearloading truck for the Zona Central area and a compaction rearloading truck for the Zona Sur area.

The % utilization figure is determined by dividing the actual elapsed time (adjusted for by subtracting get ready/put away time: $370.5 - 41 = 329.5$) by the available time (adjusted for by subtracting the standard get-ready/put-away time: $480 - 15 = 465$). The equipment utilization rate for the Prefectura non-compacting truck in solid waste collection in La Paz is 71%.

At the time the PW-IPG team conducted its time studies, the new transfer station was not in operation. To simulate the operational advantages of the transfer station, empty trucks were parked at the transfer station. When a test truck was loaded, the trucks were swapped at the transfer station. The empty truck went back to the route and the loaded truck went to the landfill in Mallasa.

EXHIBIT 6

ROUTE PERFORMANCE
Prefectura Non-Compacting Truck

Work Element	Standard Time (Min.)
Get ready/put away	41.0
Non-route travel : 2 km	5.0
Route travel : 5 km	56.2
Collection time:	
Returnable containers: 986	140.1
Non-returnable containers: 232	26.7
Non-route travel to landfill: 17km	58.0
Landfill time (scale to scale)	13.5
Non-route travel to Service Center	30.0
Total elapsed time	370.5

Crew performance rating : 88%
Number of stops : 53
Weight collected : 3.640 tons

EXHIBIT 7

ROUTE PERFORMANCE
Rearloading Compacting Truck Parada System

Work Element	Standard Time (Min.)
Get ready/put away	35.0
Non-route travel : 3 km	9.0
Route travel : 6 km	61.0
Collection time :	
Returnable containers : 819	116.0
Non-returnable cont. : 547	63.0
Non-route travel to landfill	57.0
Landfill time (scale to scale)	13.5
Non-route travel to Service Center	32.0
Total elapsed time	386.5

Crew performance rating : 90%
 Number of stops : 61
 Weight collected : 5.900 tons

EXHIBIT 8

ROUTE PERFORMANCE

Rearloading Compacting Truck Semi-Curb Collection System

Work Element	Standard Time (Min.)
Get ready/put away	15.0
Non-route travel : 2 km	7.0
Route travel : 7 km	102.1
Collection time:	
Returnable containers : 418	59.0
Non return. containers : 599	68.9
Non-route travel to landfill	55.0
Landfill time (scale to scale)	13.5
Non-route travel to Service Center	25.0
Total elapsed time	345.5

Crew performance rating : 100%
 Number of stops : 27
 Weight collected : 5.300 tons

EXHIBIT 9

ROUTE PERFORMANCE

Roll-on/Roll-off Container Collection Truck

Work Element	Standard Time (Min.)
Get ready/put away	10
Travel to/from Service Center, Landfill and Roll-on/Roll-off containers 102 km	362.0
Number of containers : 3	19.5
Landfill time	40.5
Total elapsed time	432.0

Crew performance rating : 100%
 Weight collected : 5.400 tons

d. Division of the City

Due to the city's uneven topography and time constraints, it was difficult to divide the city into two zones with fairly equal workloads given the time restraints. The team finally decided to make the dividing line the Choqueyapu River up to where it meets the Orkojahuirra River. Exhibits 10 through 16 show the workload per zone.

EXHIBIT 10

Zone B : Zona Central Routes

Rt. No	LOCATION	WEIGHT (Kg)
1	Munaypata-Portada	3.016
2	Munaypata-Bajo	3.001
3	Mariscal Sta. Cruz	2.560
4	Chamoco Chico	3.936
5+6	Tejar	4.553
7+8	Callampaya	4.256
9+10	Villa Victoria	4.286
11	14 de Septiembre	3.486
12	Los Andes	4.815
13	Ave. 9 de Abril	3.418
14	B. Aires 8 de Diciembre	3.056
15+16	V. Nueva Potosí	4.335
17	Pura	2.382
18	Ciudadela Ferroviario	1.967
22	San Sebastián	3.395
23	Rosario Manco Kapac	4.486
24	Gran Poder	3.418
25	Belén	4.580
26	San Pedro Alto	6.302
27	San Pedro Central	5.361
28	San Pedro Bajo	3.713
29	Sopocachi Alto	4.863
30	Sopocachi Pza. Andreu	6.148

(Continued on next page)

EXHIBIT 10 (Continued)

31	Sopocachi Avenida Ecuador	3.876
32	Sopocachi Plaza Adela Zamudio	3.361
33	Sopocachi Plaza Abaroa	2.791
34	San Jorge-Kantutani	2.293
37	Central Bajo	2.501
57	Tacagua	2.819
Total		108.974

EXHIBIT 11

Zone B : Roll-on/Roll-off Containers

R.O. No.	LOCATION	Weight (kg)
1	Mercado Strongest	2.420
2	Av. Buenos Aires-Calle 3 de Mayo	2.148
3	Av. Buenos Aires-Calle 3 de Mayo	2.155
4	Av. Buenos Aires-Calle Chorolque	2.411
5	Av. Buenos Aires-Calle Chorolque	1.998
6	Av. Entre Ríos-Calle Los Andes	2.023
7	Cementerio-Av. Baptista	2.158
8	Cementerio-Av. Baptista	2.158
9	Av. Apumalla-Calle Calatayud	2.661
10	Av. Tumusla-Calle Ortega	2.065
11	Av. Montes-Calle Boso	1.745
22	Puente Av. del Ejército	1.739
23	C. Final Chaco-Cancha América	1.747
24	C. Boquerón-Calle Batallón Sucre	2.393
25	C. Luis Lara-Calle Benancio Burgoa	2.330
26	Mercado Rodríguez y Belén	2.355
27	Mercado Rodríguez y Belén	2.355
28	San Francisco	2.838
29	San Francisco	2.838
Total		42.537

EXHIBIT 12

Zone B : Fixed Containers

Cont. No.	LOCATION	Weight (kg)
1	Mercado Strongest	.318
2	Río Cotahuma	.674
3	Tacagua	.296
4	Tacagua	.296
5	Tacagua frente a Nino Kolla	.296
6	Final Bustamante	.249
7	Final Bustamante	.249
8	Puente Topater	.435
9	Puente Topater	.435
10	Escuela Leones	.275
11	Escuela Leones	.275
12	Av. Collasuyo (Curva Micro I)	.249
13	Av. Final San José	.103
14	Av. Final Florida (Parada Micro X)	.103
15	Cancha Munaypata	.103
16	Calle Santa Ana	.103
17	Ciudadela Ferroviaria	.102
41	Final Buenos Aires	.249
42	Final Alcoreza y Av. 9 de Abril	.050

(Continued on next page)

EXHIBIT 12 (Continued)

43	Av. 9 de Abril	.050
44	C. Juancito Pinto	.078
45	Av. NN. UU. (Parada Micro 136)	.408
46	C. Calasasaya	.103
47	Av. NN. UU. (Ex-Puente V. Victoria)	.162
48	Pura Fábrica Said	.302
Total		5.963

EXHIBIT 13

Zone A : Zona Central Routes

Route No.	LOCATION	Weight (kg)
19	Achichacala	2.729
20	Vino Pinto Periférica	2.660
21	Norte Challampa	2.492
35	Sta. Bárbara	2.290
36	Villa Pabón	2.865
38	Central Alto	4.457
39	Miraflores S. Oeste	5.986
40	Miraflores S. Este	4.389
41	Miraflores Central	4.263
42	Miraflores Nor Este	4.023
43	Miraflores Nor Oeste	4.249
44	Miraflores Nor Oeste T. Zorsano	2.160
45	Miraflores Alto	2.811

(Continued on next page)

EXHIBIT 13 (Continued)

46	V. Fátima Bajo	2.617
47	V. Fátima La Merced	2.204
48	V. Fátima Alto	2.528
49	Barrio Petrolero	4.373
50	V. Copacabana	4.702
51	V.S. Antonio Centro y Bajo	3.963
52	V. Armonía	2.890
53	V. El Carmen	2.691
54	Periférica Norte	2.312
55	Pampahasi Norte	1.770
56	Pampahasi Sud	2.242
58	San Antonio Alto	2.764
Total		80.430

EXHIBIT 14

Zone A : Roll-on/Roll-off Containers

R.O. No.	LOCATION	Weight (kg)
12	Av. Chacaltaya-Mercado Antofagasta	2.380
13	C. Alto de la Alianza-C. Ingavi	1.756
14	C. Loayza-Plaza Periodista	2.424
15	Av. Tejada Sorzano-C. Jerónimo de Soria	1.811
16	Av. Illimani-Calle Jemio	1.989
17	Av. Simón Bolívar-Calle Nanawa	1.290
18	Plaza Villarroel-Av. Tejada Sorzano	1.952
19	Puente Pasos Kanki	2.169
20	C. Final Gutiérrez Guerra	1.547
21	C. Final Díaz Romero	.980
30	Av. Kantutani	1.352
31	Zona Sur-Calle 10 Calacoto	1.554
32	Zona Sur-Calle 15 Calacoto	1.578
33	Zona Sur-Los Pinos	1.589
34	Zona Sur-Los Pinos	1.589
35	Zona Sur-Ferias	1.166
Total		27.126

EXHIBIT 15

Zone A : Fixed Containers

Cont. No.	Location	Weight (kg)
18	Plan Autopista	.224
19	Final Ramos Gavilán	.224
20	Curva Micro "L"	.224
21	Av. Periférico Río Zarzuela	.214
22	Av. Baltazar de las Salas	.371
23	Av. Periférico Río Pokeni	.214
24	Av. Periférico Río Infiernillo	.214
25	C. Chirca lado Puente	.249
26	Río Huancarani	.243
27	Río Chanpuma Av. Las Delicias	.243
28	Final Cil. Junín (Río Mejahuira)	.249

(Continued on next page)

EXHIBIT 15 (Continued)

29	C. Modesta Sanjinés	.249
30	C. Guilarte Monje	.249
31	Final Vicente Burgaleta	.558
32	Mutual La Paz	.131
33	Río Luquichapi	.076
34	Av. Esteban Arce	.076
35	San Isidro	.249
36	Puente Zenobio López	.249
37	Hospital de Clínicas	.450
38	Parque Zoológico	.649
39	Final 20 de Octubre	.249
40	Plaza de los Héroes (Limpieza)	.249
49	Av. Periférico Soligno	.214
50	Av. Periférico lado Mercado	.214

(Continued on the next page)

EXHIBIT 15

Zone A : Fixed Containers

Cont. No.	LOCATION	Weight (kg)
51	Alto Lazareto cerca Av. Periférica	.214
52	Río Minaza lado Mercado	.573
53	Río Pokeni Final Cnl. Pariente	.249
54	Río Guitarrani Final Cnl. Monje	.249
55	Río Zoquero II	.249
56	Río Venecia Parada Micro 138	.249
57	Lado Río Hualpajhuira	.249
58	Final Josefa Mujía	.076
Total		8.639

EXHIBIT 16

ZONE WEIGHT DISTRIBUTION

	Zone B	Zone A
Zona Central	108.974	80.430
Roll-on/Roll-off	42.537	27.126
Fixed Containers	5.963	8.639
Zona Sur	--	35.050
Totals	157.474	151.245
Percentage	51%	49%

Annual weight Zone B = 51% x 86,184 tons = 43,954 tons

Annual weight Zone A = 49% x 86,184 tons = 42,230 tons

The zone boundary is the Choqueyapu River up to the point where it meets the Orkojahuirra River. Zone B contains all solid waste collection services west of the Choqueyapu River, except Zona Sur. Zone A contains all solid waste collection services east of the Choqueyapu River, including all of Zona Sur.

e. Waste Stream Composition

To determine the possible impact of a recycling program on the collection and landfill activities, it was necessary to obtain data on the composition of solid waste deposited at the Mallasa Landfill. The waste loads were dumped and spread out at the landfill where the composition of each load was estimated in percentages of the total load, which was all that was possible given the limited timeframe. This method provided the team with a rough idea of the composition of the waste for the day of the study. Exhibit 17 gives a percentage breakdown of the solid waste composition by category.

EXHIBIT 17

CITY OF LA PAZ
DEPARTAMENTO SANEAMIENTO URBANO
SOLID WASTE COMPOSITION

Category	La Paz %	USA %
Food waste	15	7
Yard waste	34	18
Newspaper	20	26
Paper	8	10
Cardboard	2	4
Plastic	6	8
Glass	3	7
Metals	3	9
Wood, Rubber, Leather, Textiles	9	11
Total	100	100

Note: The percentage of yard waste may be less in the period of November-January, due to rains.

C. The Financial Constraints and Costs of the System

One of the primary objectives of any privatization project is to maximize financial cost savings to the government. This was one of the stated objectives of this project from its inception. To maximize financial savings, however, certain conditions are necessary: the existence of a clearly-defined service level that has been in place for some time, and available, reliable budgetary and accounting systems which clearly track all relevant costs associated with providing the service. Once these conditions exist, it is possible to determine the cost to the city of providing the required service. These costs are used as a baseline to compare contractor's bids and to project savings.

The Municipality of La Paz decided that there would be greater benefits to the community derived from accelerating the private provision of collection and disposal services than from pursuing additional measures to optimize the existing services.

Based on the information received, the team developed the following analysis:

The following budget is based on the DSU 1991 operating budget with the basic categories of expenses as follows:

- Category 100: Personnel Costs
- Category 200: Non-Personal Services
- Category 300: Materials and Supplies
- Category 400: Real Property

At the time the team received the budget, there existed approximately three months of expenditure history for the line items of each major category of expense.

A new automated, financial system had recently been put on line and prior history in a usable form was unavailable within the required time frame. The team projected costs based on the budget allowed for the current fiscal operating year without the benefit of having actual expenditures history from the prior years to identify trends and expenditures cycles. At best, the data used for actual expenditures can be considered a reasonable estimate.

Given that the contract documents would specify payment based on a calculation of the cost per ton collected and disposed, it was imperative that a current municipal cost per ton be generated for comparison purposes. For the purpose

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of this analysis, direct costs included any cost incurred for the delivery of the service and any cost incurred by the DSU. Also included as a direct cost were those costs in SERMEC's budget directly attributable to solid waste operations and an estimated cost of amortized capital related to the operations.

The following is a description of how the city's cost per ton, as depicted on the following chart, was generated. The costs related to the transfer station operations, the impact of the microenterprises on the operation costs and expanded service levels are identified in the Invitation to Bid document. All values are in Bolivianos (Bs), unless otherwise noted.

1. Direct Personnel Costs

The Bs 5,318,256 figure was extracted from the existing personnel salary line items. In addition we have included personnel for the Transfer Station which was not originally budgeted, and the percentage of SERMEC's personnel budget that corresponds to SERMEC employees who work for the DSU. The estimated total for this item is Bs. 6,109,349.00.

2. Non-Personnel Services

A total of Bs 657,912 were extracted as base allocation from the existing documentation. We made adjustments for this category in SERMEC's budget. The estimated total for Non-Personnel Services is Bs. 721,793.00.

3. Materials and Supplies

A figure of Bs 1,294,278 was obtained from existing documentation as a base allocation. Materials and supplies were also added for the transfer station and SERMEC's maintenance operation. The estimated total for this category amounts to Bs.2,316,872.00

4. Real Property

This section includes the amortized equipment cost, on a yearly basis, for the equipment projected for lease. The information was derived from the insurance carriers' estimates of replacement value. Also included in this figure is a Bs 108,900 per year amortization charge for the landfill and transfer station. Equipment was amortized over 10 years and real estate over 20 years. The total estimated amount for Real Property is Bs.1,049,687.00.

5. Indirect Overhead

Although item 500 is not listed as indirect overhead costs in the city's chart of accounts, the team has used this item to reflect that component of the citywide administrative overhead that reflects that work related to the DSU, and that portion of SERMEC that is directly related to supporting the DSU. The estimated total for this category is Bs. 2,827,105.00.

6. Educational and Informational Campaign

Although item 600 is not included in the city's chart of accounts, the team has used the item to reflect the cost savings attributed to an education/information campaign. Public Education was identified as a new service required of contractors in the Invitation For Bid. It is required that a contractor spend an amount equal to 2% of the annual budget in performing this activity. Meeting this requirement would add approximately Bs 260,496.00 to the future DSU budgets.

7. Summary Estimated Total and the Cost per Ton

A summary estimated total of all the expenses yields an estimated total cost of Bs 13,285,297. Based on a current annual tonnage of 85,008 tons generated, the cost per ton collected and disposed by the Municipality is Bs 156.28. At the exchange rate of bs 3.63 per US\$1.00, the cost per ton equals US\$43.05 per ton. The cost per ton serves as a benchmark against which bidders' cost per ton where compared in order to ensure a level playing field between the private and public sectors. The cost of managing EMA was added to the private sector scenario. This cost was expressed on a per ton basis at US\$3.53 per ton, and extracted from the 1991-92 EMA operating budget. It is important to note that the team, in conjunction with city staff, estimated EMA's budget at US\$ 300,000 or US\$3.53 per ton.

D. The Labor Environment

DSU personnel belong to one of two Municipality unions: The Union of Municipal Employees or the Union of Municipality Workers. The Union of Municipality Employees is restricted to employees directly involved in management, legal, financial or administrative tasks. The Municipality Workers' Union consists of all other personnel, mostly those involved in the operational and non-administrative activities of the Municipality.

Resistance to the transfer of the solid waste management operation to the private sector would most likely originate in the Municipal Workers Union, since most workers would be concerned about the potential effects of labor displacement. Collective contracts between the DSU and the Municipal Workers' Union cover most seasonal workers, particularly sweepers, collectors and drivers. The majority of SERMEC's employees working for the DSU participate actively in the Municipality Workers Union.

The DSU has experienced minimal conflict with the Union of Municipality Employees. The Union of Municipality Workers, on the other hand, is traditionally more active and expressive of its views regarding issues such as compensation, holidays and contract terms. Nonetheless, there was no precedent of violent or heated conflict between the DSU and the two labor unions mentioned above. Our conversations with an AFL-CIO representative in La Paz indicate that Bolivia has been characterized in the recent past by relatively passive labor movements. Strike activity has emerged mostly as a response to massive lay-offs and oftentimes it is limited to non-violent demonstrations.

E. Microenterprise Participation and Development

The Municipality has been working closely with the GTZ - Germany's Development Agency, to incorporate microenterprises into the waste collection and disposal system. These microenterprises, consisting of two to twelve individuals, are funded and trained by a separate department of the Municipality, the Municipal Development Fund.

The role of these microenterprises is to collect solid waste from the hard-to-reach areas in La Paz, mainly slopes, where truck access is either limited or harmful to equipment. The microenterprises bring the solid waste to a previously-defined collection point where a collection truck will pick it up and transport it to the transfer station. At the time of this report six microenterprises were in operation.

It was anticipated that by the end of the year 18 microenterprises would be integrated into the solid waste collection system.

F. Public Perception of Solid Waste Collection and Disposal Services

From June 21-26, 1991 the Municipality of La Paz conducted a public opinion survey to measure its public opinion of public perception its performance to date. Part of this survey was designed by the PW-IPG team to measure public opinion regarding the current solid waste collection service. The survey also included questions to gauge the initial public perception regarding the private provision of these services. (See Appendix D: Public Opinion Survey)

1. The Results of the Survey: Public Perception of the Municipality's Service

In general, public opinion of the service is negative; people feel that La Paz is not a clean city, and that the solid waste collection service is not reliable and it is insufficient. The public holds the Municipality responsible for delivering a mediocre service and feels the DSU is unorganized. In addition, and very relevant to the project, the public felt responsible for generating large amounts of waste. This is indicative of a sense of obligation towards the community which could be harnessed towards efforts to make La Paz a cleaner city.

The following survey indicators reflect public perception of the service:

- 49 % of those interviewed found DSU services to be of average quality and 38% found it poor.
- The service is seen as average for three main reasons: it is simply poor quality, it is not offered to the entire community and it is delivered inconsistently and intermittently.
- 76% of those interviewed hold the DSU, its employees and the Mayor accountable for the poor quality of the service. 20% view the citizens as responsible.
- ~~26% of those surveyed do not receive the solid waste collection service at all. They feel that the DSU does not offer the services to the entire community because the city is too big, the DSU is unorganized and/or the DSU needs additional equipment.~~

2. Public Perception of Private Provision of the Service

In general the public favors private provision of the solid waste collection and disposal service. They feel the service would improve and it would come more expensive. Specifically, reactions reflect the following:

- 57% of individuals surveyed feel the idea of private provision is good.
- 64% of those interviewed think a private company would provide more efficient services.
- 73% are convinced the service would be more expensive.
- 33% of those surveyed believed they should not have to pay for the service, while 32% feel they should pay a fair price.

The public opinion survey demonstrates that the community of La Paz is not satisfied with the service currently provided. It also reflects an open attitude towards the private provision of solid waste collection services as long as the service improves.

3. The Need for A Communications Campaign

Despite the positive outcome of the public opinion survey, the team felt there was a need to carry out an educational, public information campaign. This public information campaign was aimed at informing the public about solid waste management in general, the "new system", the option of private provision, and very importantly, to promote a sense of awareness and responsibility within the community.

IV. CRITICAL STEPS IN SUPPORT OF PRIVATIZATION

The team's comprehensive analysis of the environment within which the privatization decision was taken, lead the team to identify a series of steps to be taken.

Two areas clearly required immediate attention: the legal framework for private provision and the public perception of the Municipality's service.

A. Legal Framework: The Establishment of The Empresa Municipal de Aseo - EMA

As discussed earlier, norms 50 and 51 order the formation and implementation of EMA. EMA would function as an autonomous, efficiently-managed and technically-oriented institution, responsible for the collection and disposal of waste, street-sweeping, park cleaning and other services performed previously by the DSU.

EMA's mandate required the establishment of a Board of Directors, and the selection of a General Manager. Norms 50 and 51 presented in detail the requirements to be met by these two executive bodies. Once these two requirements were met, PW-IPG assisted the Municipality in the drafting of EMA's contracting policies, the preparation of an annual budget and workplan, and the design of its personnel and company structure. The law in Bolivia required all these elements to be defined before EMA could exercise its right to begin the contracting process.

Although these institution-building activities were not originally contemplated in the PW-IPG project design, it was clear that the process toward private provision would not go forward without EMA legally established and entitled to perform its duties.

B. The Communications Campaign

In addition to the institution-building activities, preparation for the communications campaign required immediate attention. The PW-IPG team approached USAID/Bolivia to obtain additional funding for the new elements of the scope of work. Upon review of the specific activities of the communications campaign which the team identified, USAID/Bolivia recognized the essential nature of the request. As soon as additional funds were made available the PW-IPG team, in

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cooperation with the Bolivian public relations firm and the Director of the DSU designed a comprehensive campaign which included the following:

- design, production and dissemination of EMA literature, specifically a company pamphlet/folder
- design, production and dissemination of a twenty-minute documentary video on EMA and its private enterprises
- organization and execution of a press conference to launch the private provision program
- development of the EMA logo, motto and jingle
- public dissemination through T.V., radio spots and newspaper advertisements
- newspaper articles and participation in TV talk shows
- neighborhood and interest group discussion meetings
- EMA's participation in a conference/show on urban health
- design and production of an EMA bumper sticker

The elements listed above constitute a two-tier campaign. The first phase is characterized by selective campaigning, followed by the second phase focussing on a more broad-scale dissemination.

The design and production of the dissemination materials were finished by the time the contracts were awarded. This allowed the broad-scale dissemination phase to be ready to begin as the contracts are negotiated, and conclude when the private companies had taken over the service. By then the companies would be in a position to prepare their own public relations campaign.

V. ALTERNATIVE PRIVATIZATION SCENARIOS

With the establishment of EMA and the preparations for the communications campaign underway, the PW-IPG team began work on the development of alternative privatization scenarios.

In light of the Municipality's decision to transfer the delivery of solid waste management services to the private sector, the PW-IPG team developed three possible privatization scenarios.

The three scenarios differ primarily in the number of companies participating in the management and operations of the solid waste collection and disposal services. The first scenario consists of one company performing all services to the entire city of La Paz, under the supervision of a second company. The second scenario suggests one company performing collection service and a second company in charge of disposal services, both being monitored by a third company on behalf of the Municipality. The third scenario presents two companies responsible for collection services, one company in charge of disposal services and a fourth company performing monitoring activities. The next section describes each of those scenarios in detail.

A. The First Scenario

1. Characteristics

The **first scenario** would transfer the operation and development of all DSU Services, solid waste collection and disposal, urban sweeping and management of the landfill and transfer station, to one contractor. This contractor would be either supervised by the Municipality itself or the Municipality would contract out the supervision and administration of the service contract.

2. Advantages and Disadvantages

The main advantage of this scenario is that by contracting one company to perform the entire range of services in all of La Paz in an integrated manner. This type of contract appeals to the larger, more experienced companies. In addition the contract administration would be simple and require fewer resources.

However, public opinion could easily claim that what was once a public monopoly has simply become a private monopoly. In addition, the chances of dishonest behavior increase when the same entity which collects waste is responsible for weighing it.

Under this scenario the risk of an interruption in service is extremely high. If the company providing the service is unable or unwilling to continue delivering the service, there would be no other entity in a position to provide the service temporarily without interruption.

B. The Second Scenario

1. Characteristics

The **second scenario** would assign the solid waste collection, urban sweeping and park cleaning services to one company. A second company would operate and manage the landfill and the transfer station. The contract supervision in this case would be done by either the Municipality or a supervision contractor.

2. Advantages and Disadvantages

This scenario does not change the public perception of a private monopoly because the public has minimal knowledge of and contact, if any, with the transfer station and the landfill operations. Therefore, the same disadvantages as in the first scenario apply here.

Although in this scenario two companies would perform all the services in lieu of one, the absence of competition in the collection service is still evident because the two companies would perform a distinct operation with different objectives. However, the benefits of an integrated service between the transfer station and the landfill still apply.

C. The Third Scenario

1. Characteristics

The **third alternative** assigns the responsibility for solid waste collection and urban sweeping to two different companies (each assigned a different zone in La Paz). The landfill and transfer station management and operation would be performed

by a third company, and a fourth company would supervise the other three and administer the contract on behalf of the Municipality.

2. Advantages and Disadvantages

Two collection and sweeping companies would provide for a competitive environment and promote better quality service to the community. Competition would also encourage innovative solutions and drive down cost.

This scenario minimizes the chance of a service interruption, an important consideration with regard to public health. Since the Municipality would no longer provide the collection service, the presence of two waste collection and urban cleaning companies would allow it to request one company to expand its service if the other private collector is not able, or willing, to continue providing the service.

Utilizing a single company to manage and operate the Transfer Station and the Landfill would allow for an integrated waste disposal operation where schedules and maintenance programs (for both equipment, facilities and access roads) are performed in a coordinated manner. This will minimize any potential conflict that might occur if two separate companies worked in the same facilities and used the same access roads.

The company managing and operating the Transfer Station and the Sanitary Landfill will provide the Municipality information on the waste input into the Landfill and check it against the weight information obtained at the Transfer Station. If one of the collection companies also managed the transfer station and/or the landfill there would be more opportunities for dishonest reporting on tonnage weighed at the scales. This was important since payment to the companies providing this service would be done on the basis of tons of waste collected per month.

The supervision contractor will provide for efficient and objective contract monitoring and management on behalf of the Municipality, including the weighing of waste. Setting up a contract management department at the Municipality would add to its bureaucracy and would allow for the possibility of political influences to come into play regarding contract decisions. It would also be likely to involve higher costs than those resulting from contracting out this service.

D. Other Advantages Present in all Three Scenarios

An advantage present in La Paz which will prove to be attractive to any bidder under any of the three scenarios described is that the companies will not have to incur significant upfront capital equipment costs. The equipment recently donated by the Government of Japan, through JICA, will be available for rental by the private contractors. This is attractive to investors because the contractors will not have to purchase and transport a large amount equipment to La Paz (investors will, however, be making considerable investments to improve service levels). This will allow the Municipality to maximize the efficient use of this equipment.

1. Payment Method

Companies would be paid on the basis of tons of waste collected, or disposed of per month. This payment mechanism offers the contractors an incentive to collect additional waste, and keep a cleaner city.

To ensure payment, EMA will open a special account in the Banco Central in which it shall deposit monthly, the amounts collected from service users. User fees will be collected through either the electricity or the water bill, at this point the Municipality has not decided which one. If the amount collected from service fees is not sufficient, HAM shall make up the difference. This account shall be established exclusively for payment of services covering garbage collection, street sweeping and cleaning, landfill and transfer station operation and contract supervision.

2. Integration of Microenterprises into the Project

The Department of Urban Health recently implemented a microenterprise project whereby microenterprises collect and transport solid waste from the hard-to-reach peripheral areas of La Paz to collection points accessible to the Municipality's equipment. In order to give the microenterprise project continuity, the microenterprises will continue to transport the garbage to mutually agreed points of collection.

The collection contractors will pay the microenterprises directly for the waste collected and then transport it to either the transfer station or the landfill at their expense. Microenterprise training would be conducted jointly by the collection companies and the Urban Improvement Department.

VI. THE PREPARATION OF BIDS

A. The Strategy: Allowing for Flexibility

The Municipality and the PW-IPG team viewed scenarios two and three as the two top choices. While there was no hesitation regarding the separation of functions; collection, disposal and supervision, no decision was reached regarding the choice of one or two collection companies.

It was clear from the early stages of this project that while contracting the collection service to one company would offer opportunities for greater financial savings for the Municipality, it would not guarantee better quality service nor increased service coverage, and very importantly, it would not provide a backup plan for an interruption in service. In order to accurately weigh the opportunity costs (competition, quality, coverage and continuity of service) against potential cost savings it was decided to postpone the final decision until after the bids submitted were reviewed.

Based on this strategy the team prepared three sets of Invitation For Bids documents: one for collection, one for disposal and one for supervision.

B. Terms of the Invitations For Bid

The collection and disposal IFB's were open to both Bolivian and international bidders, and joint ventures were encouraged. Although the contracts were specified for a five-year period, they were renewable to ten years. To ensure seriousness in bidding, bidders were required to submit a proposal bond as well as a performance bond. This financial requirement was offset however, by the opportunity to rent equipment from the Municipality, a real cost savings considering the cost involved in purchasing and transporting heavy equipment to Bolivia.

The method of payment defined in the bids consists of a dollar amount per ton of ~~waste collected and/or disposed.~~

To allow for flexibility of choice, bidders to the collection service were requested to submit proposals for two scenarios: one in which they would be in charge of collection in the entire city (zone C) and one in which they would only collect solid waste from one section of the city (zones A and B), each with its corresponding costs. Having evaluated opportunity costs, the decision regarding which

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alternative to choose could be more easily made. (See Appendices F,G and H for Invitation for Bid documents).

VII. THE BIDDING PROCESS: BIDDER QUESTIONS AND EVALUATION CRITERIA

A. The Bidding Period

Decree 26060 requires that the procurement process for all government contracts for \$100,000 or more be managed by one of three predetermined procurement agents legally entitled to do so. The procurement agent chosen by the Municipality for this purpose was C3D, Caisse de Dépôts et Développement. Prospective contractors were granted one month to prepare bids the first two weeks of which were also reserved to submit any questions. In anticipation of questions which would be posed by potential bidders, two members of the PW-IPG team were made available to answer any inquiries. The PW-IPG team worked closely with EMA and C3D over a four-day period to answer questions submitted by bidders. The list of questions and answers was faxed to each bidder. Questions revolved around issues of form as well as content.

Examples of questions are: Can the performance bond be issued by a non-Bolivian bank?; If a bidder submits proposals for two bids, is it necessary to submit the required documentation twice in original form?; How far in the legal process does a Joint Venture have to be in order to be eligible for consideration? and how much time will elapse between the submission of proposal and the award of the contract?. Some questions such as the following dealt with issues of content rather than form: Should the contractor's employees exercise their right to strike what is the extent of the company's responsibility? Could you please provide us with a list and location of all the open-air markets in La Paz?; What restrictions exist regarding the acceptance of solid waste?

B. Evaluation Criteria

Once all questions were answered, and in view of the approaching deadline to submit proposals, the PW-IPG team began work on the development of the specific evaluation criteria to be used for the upcoming evaluation process.

The PW-IPG team, EMA and C3D agreed to jointly develop detailed evaluation criteria corresponding to each category identified in the solicitation documents. Although C3D would have its own evaluation team to review the bids prior to the IPG review, by jointly developing a set of evaluating standards, both teams would be able to conduct the evaluations within a consistent framework.

The PW-IPG team identified the following categories in evaluating the three contracts:

1. Collection Contract

- Technical Proposal (30%)
- Financial Capabilities (15%)
- Cost Proposal (35%)
- Experience (20%)

2. Transfer Station & Landfill Contract

- Technical Proposal (20%)
- Financial Capabilities (10%)
- Cost Proposal (50%)
- Experience (20%)

3. Contract Supervision

- Technical Proposal (15%)
- Technical Capabilities (70%)
- Operating Capabilities (15%)

For a detailed explanation of each category, please refer to Appendix I: Evaluation Criteria.

VIII. THE EVALUATION

The role of the PW-IPG team during the evaluation phase was to review the evaluation conducted by C3D, in accordance with the defined evaluation criteria. C3D, however, as the contracting agent chosen by the Municipality was responsible for issuing a recommendation to the Municipality once the evaluation is conducted.

EMA and the Municipality chose C3D because they agreed to complete the bidding and evaluation process within the time frame presented. C3D allowed the PW-IPG team to participate in the evaluation acknowledging that it was useful to have the team who prepared the documents available to answer questions and provide views during the evaluation, notwithstanding that C3D would make the final decision.

The Municipality asked C3D to submit, in its evaluation report, a series of options, with the corresponding costs and benefits. The flexibility was necessary in light of the fact that the Municipality preferred to make the decision, whether to contract one or two companies to collect solid waste in all of La Paz, until it could weigh opportunity costs. This decision would be based on the qualifications and opportunity costs of the proposals submitted.

As agreed, the C3D team of evaluators presented their analysis to the PW-IPG team on September 25th. The PW-IPG met with C3D to discuss the team's observations and incorporate a number of them in their final report.

In their final document C3D presented the Mayor with a series of options, among which was the scenario that the PW-IPG team felt comfortable with, in terms of technical and financial capabilities, to fulfill the contract.

~~The Municipality ultimately decided on this scenario which consisted of two collection companies each collecting solid waste from approximately half of the city, and one disposal company operating the transfer station and the landfill. The supervision contract has been re-opened for bid, in light of the fact that it was declared deserted due to an absence of bidders. This supervision contract was made accessible to international companies since initially it was restricted to Bolivian companies.~~

The principal reasons for this choice were that this scenario would:

- ~~Promote a competitive environment;~~
- Involve a lower risk of an interruption in service enhancing service continuity;

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- **Integrate the solid waste disposal services;**
- **Minimize the opportunities for dishonest activity;**

IX. ADDITIONAL RECOMMENDATIONS

This section presents a series of measures which, if implemented, could aid the Municipality not only in its efforts to transfer the provision of the solid waste management services to private sector, but also in establishing a more efficient maintenance and equipment support system for the Municipality. The measures identified below are in not in order of priority.

A. Maintenance Recommendations

In support of efficiency improvements, cost controls and increased productivity, the team recommends the following:

1. Expenditure Authority and Budget Reviews

The maintenance unit at SERMEC be given adequate expenditure authority to cover a minimum of three months of anticipated costs. Budget management training should also be provided for SERMEC staff responsible for this function, and appropriate personnel action be considered for mismanagement of funds. Quarterly budget reviews should also be considered in order to assist management in monitoring expenditures and making projections.

2. Tool Control

Mechanics be required to purchase their own tools. The Municipality could advance the amount and deduct the cost, over a period of time, from the mechanic's pay. Special tools should be retained in a tool room and signed out when needed. Appropriate action should be taken in the case of loss or theft of special tools.

3. Parts Inventories

Quarterly parts inventories be conducted to promote honesty at the workplace and assess future needs. This would make parts personnel more accountable for the stock, and may decrease incidence of theft.

4. Maintenance Reports

Requiring drivers to submit pre-trip and post-trip maintenance reports may enhance first echelon equipment maintenance and maintenance accountability. (see Appendix K: Sample Maintenance form)

Equipment managers should be provided maintenance data on a regular basis, which would allow them to make informed management decisions regarding current equipment use and future purchases.

5. Standardization of Equipment

Efforts be made to standardize Municipality equipment to minimize the variety and costs of parts inventory. Specifications for municipal solid waste equipment should be prepared after service level decisions have been made and not before.

B. Equipment Recommendations

Prior or during the transition to a private provision of solid waste management services, the following steps will be useful regarding the management of equipment.

- Auction off 24 rearloading compaction trucks that are more than 12 years old. Smaller municipalities may be interested in purchasing them.
- Purchase 3 roll-on/roll-off containers from the auction revenues and place them in areas which require them. This action could be requested of the private companies.

C. Service-Related Recommendations

1. Hospital Waste

In view of its potentially infectious nature, medical waste should never be knowingly mixed with regular residential solid waste. EMA should request that all medical waste be placed in distinctly colored bags labelled "Medical Waste". These bags should be kept separate from the regular residential solid waste and buried at a special site at the Mallasa landfill, specifically designed to receive medical waste.

All collection employees handling medical solid waste should be given instructions on how to properly handle this material.

2. Container and Dumptruck System

The fixed container and dumptruck system is an outdated system that needs to be phased out because it presents a real danger to the public and the workers of the solid waste collection crews. If the doors of the container are not opened carefully, a resident or worker could get a heavy load of solid waste dumped on him or her. At several locations, the residents have simply removed the metal doors and the solid waste overflows, creating a public health hazard.

3. Clean Up Program

Scattered throughout the city are illegal dumping areas such as empty lots and ravines. If these illegal dump sites continue to exist, they will soon become a serious health hazard to the residents of La Paz. To prevent this from occurring, it is imperative to put into place a city-wide clean-up program as soon as possible. This program could be a Bolivian version of the "Keep America Beautiful".

4. Recycling

The preliminary estimate of the solid waste composition indicates that the life of the landfill could be extended by at least 22% if newspaper and cardboard were recycled. (see Exhibit 17). This potential reduction could also have a significant impact on the collection operations if residents were required to deposit newspapers at centrally located collection points, to be picked up by recycled paper-processors. Once the system of private provision is in place, EMA should consider the establishment of a recycling pilot project to gauge the feasibility and sustainability of a recycling program in La Paz.

D. Transition Recommendations

EMA should request from each of the private companies awarded a service contract, a Transition Implementation Plan. This plan should include at a minimum: routing, schedules, takeover phasing, a plan for the incorporation the microenterprises, a hiring plan, educational and informational campaigns and reporting formats. In addition, adherence to the requirements stipulated in the

contracts should be monitored not only by the Supervision contractor but also by EMA during the grace period granted in the contracts. Preparation of a check list would be useful for both the supervision company and EMA.

E. Legal Steps

It is essential to the success of this transition, that EMA adhere to the legal requirements which will give this project transparency and solidity. Two types of contracts will be negotiated with the private companies, the service contracts and the equipment rental contracts. It is important that both of these contracts meet the legal requirements set forth not only by Municipal law, but also all the other laws listed in the legal section of this report.

EMA must take the necessary measures to establish the special account, described earlier, which will serve as the mechanism to guarantee payment to the private companies. This measure is important in order to prevent delays in payment which could easily jeopardize the success of private provision. Directly related to this issue is the need to define the situation regarding service fees to be collected by the EMA. These service fees would be deposited into the special account and are the source of EMA's income. At the time of the team's last visit the Municipality decided that the service fees to the public would be charged through the electricity bill. It is important that this matter be settled on time to prevent any delays in payment.