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CHILE

**RURAL DRINKING WATER SUPPLY PROGRAM
FOURTH STAGE**

(CH-0115)

PROJECT REPORT

1985

CHILE

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Table of Contents

	<u>Page</u>
I. INTRODUCTION	1
A. Background	1
B. The Application	1
C. Priority	1
D. Missions	1
II. FRAME OF REFERENCE	2
A. Economic Aspects	2
B. Sanitation Sector	2
C. Execution of Earlier Operations	7
D. The Contribution of Other International Agencies to Development of the Chilean Sanitation Sector	15
III. THE PROGRAM	18
A. Objectives	18
B. Description	19
C. Total Cost of the Program	22
D. Financing Plan	28
IV. EXECUTION OF THE PROGRAM	30
A. Executing Agency	30
B. Modality of Execution	30
C. Supervision of the Program	31
D. Studies and Designs for the Program	32
E. Design Parameters	34
F. Water Sources	35
G. Execution of the Program	36
H. Acquisition of Goods and Contracting for Services	38
I. Lands and Rights of Way	39
J. Bidding Timetable	40
K. Timetable for Investments and Use of Funds	43
L. Household Connections	43
M. Installation of Meters	43
N. Installation of Hypochlorinators	44
O. Technology of the Program	44

	<u>Page</u>
P. Ecological and Environmental Considerations	45
Q. Verification of the Recommendations of the Operation Evaluation Office (OEO)	45
R. Operation and Maintenance	45
S. Advance of Funds	46
T. IDB Inspection and Supervision	46
V. THE BORROWER AND EXECUTING AGENCY	47
A. Institutional Analysis	47
B. Historical Financial Analysis	59
VI. JUSTIFICATION	73
A. Technical Feasibility	73
B. Financial Viability	73
C. Socioeconomic Analysis	79

APPENDICES

A P E N D I C E S:

- II - 1. Aspectos Económicos
- II - 2. Cuadro - Mortalidad Total y Por Enfermedades Infecciosas y Parasitarias en Chile 1978 - 1983
- II - 3. Cuadro - Morbilidad y Mortalidad por Tifoidea - Paratifoidea, Hepatitis y Disenterías en Chile 1978-1983
- II - 4. Situación Población Rural Chilena en Abastecimiento Agua Potable al 30.VI.85
- III - 1. Arranque Domiciliario
- III - 2. Esquema de Instalación de un Arranque Domiciliario
- III - 3. Relación Costo/Población - Muestra Representativa
- IV - 1. Descripción Técnica de los Proyectos de la Muestra
- IV - 2. Parámetros de Diseño
- IV - 3. Programa de Rehabilitación y Mejoramiento de Servicios de Agua Potable Rural - Cronograma de Actividades
- IV - 4. Programa de Rehabilitación y Mejoramiento de Servicios de Agua Potable Rural - Resumen

- IV - 5. Plan de Ejecución del Proyecto (PEP)
- IV - 6. Plan de Promoción Comunitaria
- IV - 7. Modelo - Convenio entre SENDOS y Comité de Agua Potable Rural
- IV - 8. Procedimiento de Licitaciones
- IV - 9. Programa Nacional de Agua Potable Rural - IV Etapa
Cronograma de Licitación y Ejecución de Estudios y Pozos
- IV - 10. Plan de Inversiones
- IV - 11. Reglamento para la Administración, Operación y
Mantenimiento de los Servicios Rurales de Agua Potable
- V - 1. Organigrama del Ministerio de Obras Públicas
- V - 2. Estructura Orgánica del nivel Central de SENDOS
- V - 3. Estructura Orgánica del nivel Regional de SENDOS
- V - 4. Estructura Orgánica del nivel Central de DEPRONA
- V - 5. Personal Nacional contratado para el Programa Nacional
de Agua Potable Rural
- VI - 1. SENDOS - Bases para las Proyecciones Presupuestarias
- VI - 3. SENDOS - Análisis Socioeconómico

I. INTRODUCTION

A. Background

- 1.01 Since 1961 the Bank has been supporting Chile's efforts for the execution of projects in the sector of urban and rural sanitation and drinking water supply in different regions of the country by making loans to public agencies in that sector. Dating from 1964, the Bank's support to rural drinking water supply programs has been confined to the financing of three stages for the expansion of collective water supply systems throughout the country, thereby contributing to reduce the incidence of diseases and improve the health conditions of beneficiary rural populations.
- 1.02 The operation presented in this Report, the "Rural Drinking Water Supply Program --Fourth Stage" would continue the program now in execution with the Bank's financial cooperation through loan 393/OC-CH, which in turn was preceded by the programs for the First and Second stages, financed respectively by loans 74/TF and 499/SF-CH. 1/

B. The Application

- 1.03 On March 4, 1985, the Minister of the Treasury of Chile presented the Bank with an application for a loan to finance the Rural Drinking Water Supply Program - Fourth Stage.

C. Priority

- 1.04 During the visit of a Programming Mission to Chile in late January and early February 1985, it was agreed with the country's high authorities that a sanitation project relating to the Rural Drinking Water Supply Program - Fourth Stage would be included in the Bank's programming for 1985. During that Mission's stay in the country both the Ministries of the Treasury and Economic Affairs and the National Planning Office (ODEPLAN) assigned the appropriate priority to financing for the Fourth Stage of the Rural Drinking Water Supply Program, which was ratified in the aforementioned application of March 4, 1985.

D. Missions

- 1.05 Among the measures to promote the Program, an Orientation Mission visited Chile in mid-March to review with the officers of the Servicio Nacional de Obras Sanitarias (SENDOS) -the present executing agency of loan 393/OC-CH for the Third Stage - the state

1/ See Execution of Earlier Operations, paragraph 2.16.

of preparation of the information that would be needed for a possible analysis of the proposed financing. A few months later, from June 17 to July 2, 1985 an Analysis Mission was in the country to examine the technical, financial, economic and institutional feasibility of the requested operation. The conclusions of that Mission, and the recommendations that issued from the study made of the possible operation, are reflected in the following chapters of this Report.

II. FRAME OF REFERENCE

A. Economic Aspects

- 2.01 Recent economic developments in Chile are set forth in Appendix II-1, and the salient aspects considered are: (i) developments in 1984; (ii) economic policy in 1984; and (iii) the short-term outlook.

B. Sanitation Sector

1. Situation in the sector

- 2.02 As can be seen in the table of Appendix II-2, mortality from infectious and parasitic diseases in Chile continues to decline, having dropped from 5.9 in 1979 to 3.6 in 1983, one of the lowest in Latin America. ^{1/} Among the ten leading causes of death in Chile in 1983, the infectious and parasitic diseases continue to rank seventh with 3.6% of the total. Diseases such as diarrhea and others generally associated with insufficient water supplies account for 28.3% of all deaths from the diseases in this group, while infectious and parasitic diseases accounted for 17.7% of all deaths in infants under one year of age.
- 2.03 The table of Appendix II-3 presents statistical data on numbers of cases recorded during the years from 1978-1983 throughout the country on morbidity and mortality from infectious and parasitic diseases and their respective rates. While mortality from typhoid and paratyphoid fever has decreased from 1.0 per 100,000 inhabitants in 1978 to 0.5 in 1983, morbidity from those diseases held at about 120 per 100,000 inhabitants, despite a decline to 95.5 in 1981. Mortality from hepatitis held at 0.5 per 100,000 inhabitants despite an increase in morbidity from 55.4 cases per 100,000 inhabitants in 1978 to 91.1 in 1983, also trending downward in 1980, when it dropped to 38.8. The morbidity rate from dysenteries decreased from 1.8 per 100,000 inhabitants in 1978 to 1.0 in 1983, while mortality rose from 0.2 deaths per 100,000 inhabitants in 1978 to 0.7 in 1983. It may be mentioned that in 1983 infectious and parasitic diseases accounted for 6.09% of total morbidity in the country. Meanwhile, diarrhea and other diseases associated with insufficient drinking water supplies accounted for 65.5% of the morbidity from those diseases. Moreover, 39.23% of the cases of those diseases were children under four years of age.

2. Coverage of drinking water supply and sewerage services

- 2.04 At the end of 1983, 92.7% of the urban population was served by drinking water house connections and 70.6% had household sewerage facilities.

^{1/} Argentina: 4.0 (1980); Brazil: 14.8 (1980); Colombia: 16.3 (1977); Costa Rica: 4.4 (1983); Venezuela: 8.2 (1983). Source: Annual Report for 1984 of the Pan American Health Organization.

Chile continues to have one of the highest coverages of urban drinking water supply services in South America but not in terms of sewerage services.

- 2.05 On December 31, 1984, the clustered rural sector ^{1/} comprised an estimated 571,990 inhabitants in 1,120 localities. Of this total, 66% or 379,826 inhabitants in 686 localities were provided with drinking water supply services (see the table in paragraph 2.20). The situation is not as good in respect of sewerage and excretal disposal services, which are available to only 15% of the clustered rural population, while another 5% have other sanitary facilities. This situation must be assessed in light of the fact that, according to the last census - that of 1982 - the rural population totaled about 2,142,158 inhabitants, of which only 26.7% lived in clustered rural localities and 73.3% (1,569,538 persons) constituted the disperse rural population.

3. Effect of drinking water on health

- 2.06 While it is clear that the foregoing information indicates that, on the whole, Chile has achieved lower levels of infectious and parasitic diseases and higher levels of drinking water supply coverage than other countries in Latin America, it remains important for the country to expand the coverage of drinking water supplies in rural communities despite the difficulty of evaluating the effects of the availability of drinking water on the health of the population.
- 2.07 Despite these difficulties in obtaining reliable statistics and personnel qualified to record them, the results of the three studies done by SENDOS in 1979, 1982 and 1984 to measure the impact of the drinking water supply program on the health of the clustered rural sector by quantifying the medical consultations for acute diarrhea among children younger than five and six years of age, ^{2/} make systematically clear that setting up a drinking water supply service in a rural locality reduces significantly - by half - the number of consultations for enteric diseases in the child population of beneficiary localities. SENDOS continues to study how to set up permanent data registry systems for the monitoring of other health indicators such as typhoid fever and infectious hepatitis, which would reinforce the methodology for

^{1/} In keeping up with SENDO's criteria of ruralness, a clustered rural locality is one with 20 or more housing units per kilometer of public thoroughfare. The coverage of the Chilean rural population by drinking water supply services on June 30, 1985, is illustrated in Appendix II-4.

^{2/} A summary of the first study is published in Foro Mundial de la Salud, Vol. 4, 1983, pp. 198-199. The three studies are presented in the document published by the XIX Inter-American Congress on Sanitary and Environmental Engineering (AIDIS), Evaluación Sanitaria del Programa de Agua Potable Rural Chileno, Santiago, Chile, November 1984, pp. 155-173.

quantifying the social and health impacts of its rural drinking water supply program.

4. Objectives and policies in the Drinking Water Supply and Sewerage subsector

- 2.08 Many of the basic objectives for the Drinking Water Supply and Sewerage subsector enunciated in 1978 under the Indicative National Development Plan 1979-1984 remain in effect, although they have had to adjust to the present situation in the subsector. These basic objectives are as follows: (a) to consolidate the institutional structure in the subsector by instituting the measures needed to make its various agencies fully operative; (b) to achieve full financial self-sufficiency at the regional level of all urban services, and the operational self-sufficiency of rural services; (c) to maintain a rate structure that can finance the operating, maintenance and administrative costs of urban services and their normal growth and expansion; (d) to promote the introduction of modern administrative practices so that the operational agencies will function at high levels of efficiency; (e) to seek and promote the organization of the community and its active participation in the solution of its own problems, and (f) to achieve and maintain adequate levels of quality and coverage of both urban and rural drinking water supply and sewerage services.
- 2.09 The National Drinking Water Supply and Sewerage Program was worked out to attain these objectives and it includes, in addition to a specific component for Rural Drinking Water Supplies, various programs for the attainment of permanent equilibrium between the supply of and demand for drinking water supply and sewerage services in both the urban and rural setting. The government's recent approval of the Triennial Program of 1985-1987 has resulted in determination of the Investments in Sanitary Works to be made during that triennium under the various programs comprised in the National Drinking Water Supply and Sewerage Plan. 1/
- 2.10 The coverage goals proposed in these programs are as follows: (a) in 1986 the coverage of household drinking water supplies must have reached 97% and that of sewerage services 70% of the urban sector, and that of drinking water supplies in the clustered rural sector 70%, and (b) for 1989 the aim is to attain a coverage of 100% for urban drinking water supplies, 100% for sewerage in the Santiago Metropolitan Region, and 90% for urban regional sewerage; and for the clustered rural population a coverage of 90% for drinking water supplies and 20% for sewerage services.

1/ The programs, some currently in execution, are as follows: Urban Drinking Water Supply and Sewerage Program (loan 115/IC-CH); Rural Drinking Water Supply Program - Third Stage (loan 393/OC-CH); Program for the Macro-Metering and Control of Water Losses; the Conservation and Replacement Works Program; the Drinking water Coverage Plan; the Sewerage Coverage Plan, and the Program for the Permanent Improvement of Drinking Water Supply and Sewerage Systems.

- 2.11 To execute the National Drinking Water Supply and Sewerage Program, the country has the Servicio Nacional de Obras Sanitarias (SENDOS), the national governing agency for both the urban and rural areas of the sector. 1/ The responsible agencies in the Santiago Metropolitan Region and in the Fifth Region (Valparaíso) are, respectively, the Empresa Metropolitana de Obras Sanitarias (EMOS) and the Empresa de Obras Sanitarias de Valparaíso (ESVAL), which operate as autonomous public agencies over which SENDOS exercises regulatory and supervisory powers.

5. Rate policy in the sector 2/

- 2.12 The purpose of the current urban rate policy is to provide drinking water and sewerage services at the lowest possible cost based on the principles of economic efficiency and the self-financing of all the costs of operating and maintaining the systems. At the same time, the policy establishes that the resources generated by its application shall be sufficient for the partial financing of expansion programs. The Ministry of Economic Affairs is the regulatory agency in matters of rates for the urban sector, based on the recommendations of the Ministry of Public Works.
- 2.13 Rates for drinking water supplies and sewerage services in the rural sector are set individually by each rural water supply committee, which operates and maintains a given system in keeping with the recommendations of SENDOS. It should be emphasized, therefore, that rural services, the works for which would be financed under the proposed operation would, as in the earlier stages, be administered by agencies independent of SENDOS. The rates to be applied in each system are set following a criterion of financial self-sufficiency similar to that stated for the urban sector, with the exception that these rates are not required to generate funds for the financing of expansion programs. It may also be noted that since the rates are set on the basis of the cost incurred by each system itself, each service has different rates.
- 2.14 It may be underscored here that the rate policy applicable to the Chilean rural sector and its operating mechanisms is consistent with the minimum requirement established by the Bank's operating policy, for the community agency operating each system must set rates that make the system financially self-sufficient, that is, which generate enough funds to cover its operating and maintenance costs. It is important to note that each system is administered by an agency (the water supply

1/ For the institutional analysis of this agency see Chapter V.

2/ For a fuller explanation of the criteria governing rate policy, see paragraph 5.31. An analysis of the effects of that policy on the economic and financial affairs of SENDOS, the operation of rural services and the fulfillment of the clauses in the current loan contracts is given in paragraphs 5.49 to 5.55.

committee) set up by the community itself and which functions efficiently from both the administrative and the financial standpoint, and provides a good example of a simple and functional institutional structure that fits the characteristics of the rural systems.

- 2.15 By Decree 183 of June 1984, the government changed SENDOS's urban rate structure, on the one hand increasing the general rate level by an average of 24% and, on the other hand, replacing from that date the existing flat-rate structure by another structure based on different rates for different levels of consumption, and setting lower rates for users earning lower incomes. In addition, by Decree 3 of January 1985 the rates were again raised an additional 24.2%. The Ministry of Economic Affairs is currently drafting a new Law on Drinking Water Supply and Sewerage Rates that will introduce an automatic and streamlined methodology for the determination of rates for water supply and sewerage enterprises and services. The passage of this law is expected to provide a mechanism that will keep rates at levels consistent with the financial requirements of each agency.

C. Execution of Earlier Operations

1. Loans made to the sector

- 2.16 Since 1961 the Bank has made eight loans for the country's sanitation sector: 31/OC, 12/TF, 74/TF, 63/OC, 72/SF, 251/SF, 499/SF and 393/OC-CH. Except for the last one, they are all fully disbursed. Loans 74/TF, 499/SF and 393/OC-CH have constituted Chile's leading source of external credit for the financing of rural drinking water supply programs, 1/ and constitute, therefore, the background to the new proposed program. Loan 499/SF-CH was evaluated in connection with the analysis of the Third Stage, 2/ and this report will therefore evaluate only operation 393/OC-CH, starting in paragraph 2.23.
- 2.17 It is also important to mention that, in addition to the aforementioned operations, the Bank is financing sanitation components through loans 115/IC and 141/IC-CH, approved in the last three years. 3/ Under loan 115/IC-CH the equivalent of US\$49.5 million is for the partial financing of a subprogram of drinking water supply works in 47, and sewerage works in 15 intermediate-sized cities, and for the rehabilitation of an additional 40 urban systems damaged by the earthquake of March 3, 1985. Of that amount, US\$22.0 million has been disbursed. SENDOS is the agency in charge of executing the subprogram, the physical works for which were 42% advanced on June 30, 1985.

1/ The First, Second and Third Stages, respectively, of the National Rural Drinking Water Supply Plan.

2/ See Document PR-1064-A of October 28, 1980.

3/ Loan 115/IC-CH (Urban Infrastructure Program) for US\$120.5 million approved December 20, 1982. Loan 141/IC-CH (Multiple Local Development Investment Program) for US\$125.0 million approved December 6, 1984.

- 2.18 This physical advancement means that 45 drinking water supply works have been completed in 26 cities and eight sewerage works in four urban centers, for the benefit of a population of 1,313,000 inhabitants. SENDOS has already begun the private bidding process toward the letting of contracts for the rehabilitation of several of the additional urban systems damaged by the aforementioned earthquake, particularly those for which studies and designs are not required, and the state of advancement of the physical works ranges between 5% and 70%. On the whole, the subprogram is being executed in a satisfactory manner.
- 2.19 The sanitation component in the equivalent of US\$20.7 million under loan 141/IC consists of two subprograms, one of drinking water supplies for US\$2.2 million and another of sewerage works for US\$18.5 million. The contract for this loan was signed on March 8, 1985, and on August 14, 1985 was declared eligible for disbursement, and the component is thus in the initial phase of execution.
- 2.20 The Bank's participation in the financing of the National Rural Drinking Water Supply Program through the three operations referred to in paragraph 2.16 has effectively assured the execution of the three stages of that program, the resources of the programs financially supported by the Bank having financed about 79.3% of the coverage achieved, as shown on the following table:

<u>Financing</u>	<u>Localities</u>		<u>Population</u>		<u>Connections</u>	
<u>IDB-SENDOS Program</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
IDB Loan 74/TF-CH(1)	194	28.3	114,450	30.1	20,184	29.5
IDB Loan 499/SF-CH(2)	146	21.3	73,763	19.4	13,605	20.0
IDB Loan 393/OC-CH(3)	204	29.7	112,795 1/	29.7	20,049	29.5
Subtotal	544	79.3	301,008	79.2	53,838	79.0
National Regional Development Fund	5	0.7	4,902	1.3	824	1.2
Social Funds	33	4.1	23,020	6.0	4,064	6.0
Other Local Sources	104	15.1	50,896	13.5	9,537	13.8
Subtotal	142	20.7	78,818	20.8	14,425	21.0
TOTAL	686	100.0	379,826	100.0	68,263	100.0
	===	=====	=====	=====	=====	=====

1/ When its execution is completed, this stage will benefit about 139,268 inhabitants.

2. Loan 393/OC-CH

a. Background

- 2.21 This loan was approved on November 20, 1980, and its contract was signed on January 15, 1981. The amount of the loan is the equivalent of US\$19.9 million (US\$14.9 million in foreign exchange and the equivalent of US\$5.0 million in local currency), and on July 31, 1985, US\$17.5 million - or 88% - had been disbursed. The program consists in the execution of the Third Stage of the aforementioned National Rural Drinking Water Supply Program, and its chief purpose is to bring water supplies to a rural population of about 101,000 inhabitants living in 220 localities all over the country. The goal of this stage is to attain, by the time it is completed, a coverage of 64% of the clustered rural sector.
- 2.22 The operation also includes investments for the determination of water sources (drillings) and the associated studies, which made possible the presentation of the operation considered in this report, that is, the Fourth Stage. It may also be mentioned that, to complement the systems built under the earlier programs financed by the Bank (74/TF and 499/SF-CH), provision was made for the acquisition and installation of house and production meters and hypochlorinators.

b. Present status

- 2.23 During the years 1982 and 1983 execution of the technical-physical plan fell behind schedule and the remaining activities were rescheduled, with the result that the Bank extended by 12 months, until January 15, 1985, and January 15, 1986, respectively, the terms for material commencement of the works and for the final disbursement.
- 2.24 On June 30, 1985, with 81% of the execution time elapsed, the weighted total advancement of the program was 92%. On that date 174 water supply systems had been completed and were in service and 38 were under construction. The 174 systems in operation serve 204 rural localities with a population of 112,795 inhabitants. The 38 systems under construction will serve an additional 38 localities. This state of advance of the program indicates that SENDOS has fulfilled on schedule the contractual clause requiring the material initiation of all the works by January 15, 1985. Based on that advancement, it is seen that the original goals established in the loan contract will be exceeded by about 10%, that is, not 220 rural localities will be serviced as provided, but 242.
- 2.25 The satisfactory progress being made in the execution of the Third Stage, also seen in the earlier stages, may be credited primarily to the excellent organization and capacity that SENDOS has demonstrated at both the central and regional levels. In addition to the efficiency of SENDOS's technical-operational procedures both in planning and in the

contracting for and supervision of works, the agency has given a remarkable performance in the promotion, mobilization and organization of rural communities for the establishment of rural water committees to administer their systems. In addition, in connection with the Third Stage, the substantial devaluation of the currency over the last two years at a time of only moderate domestic inflation made it possible to carry out additional works, so that, as previously indicated, the original targets should be exceeded by 10%.

- 2.26 It may be mentioned here that loan 393/OC-CH underwent modifications that were among the emergency measures that the Bank approved in May 1985 for the rehabilitation and reconstruction of physical infrastructures seriously damaged by the earthquake of March 3, 1985. The following changes were authorized: (i) use of the equivalent of US\$313,000 available in local currency for rehabilitation works; (ii) the setting of a new deadline - January 15, 1986 - solely for material initiation of those works; (iii) a deferment for six months - to July 15, 1986 - of the cutoff date for disbursements for completion of the rehabilitation works; (iv) the use of price bids for the contracts for those works; and (v) flexibilization of the criteria for the selection of beneficiary communities and determining the eligibility of projects. It was only in June that SENDOS began the process toward contracting for the rehabilitation works, and in July 1985, the Bank approved several contracts for rural localities in the Sixth Region.

c. Technical and operational aspects

- 2.27 In general terms, the Third Stage of the National Drinking Water Supply Program has been progressing without major problems. The salient technical, legal and operational aspects are considered in what follows. The analysis of compliance with the financial contractual clauses is given in Chapter V, which discusses rates (urban and rural), accounts receivable, financial statements and the like.

(i) Selection of localities under the program

- 2.28 As in the earlier stages, SENDOS has in all cases demonstrated that the given community had been selected in keeping with the technical and economic criteria established in the selection methodology, notably the requirements as to numbers of inhabitants, community interest, minimum number of housing units per kilometer of thoroughfare, capacity and quality of the water sources, design discharge rates and cost-effectiveness ratio. This selection work constitutes the first phase in implementation of the Rural Drinking Water Supply Program, which begins with a preliminary investigation of the communities in order to establish whether they meet those technical and economic criteria. The results of the study have been embodied in the report prepared by SENDOS's social workers at the regional level and sent to the central level for final selection of the beneficiary locality. A brief analysis of the activities carried on in the subsequent phases of

promotion of the program, that is, installation of the service and its administration and supervision, begins in paragraph 5.25.

(ii) Studies and designs

- 2.29 To prepare the designs for the service installations both under the Third Stage and for the representative sample under the Fourth, and the 36 additional studies contracted for in July 1985 to enlarge that sample, SENDOS employed 24 local engineering firms. Five local specialized firms participated in the performance of the hydrogeological studies. The work done was satisfactory, which enable SENDOS to meet the contractual requirement of having the designs and confirmation of the discharge volume and quality of the water source to be used on hand before sending out invitations to bids for the construction of each system.

(iii) Water disinfection

- 2.30 To disinfect the water, hypochlorinators are installed, and have been in all systems built and under construction in this Third Stage. They are also being installed in systems built under earlier stages which did not provide for them. It is interesting to note that the quality of the water is checked two to three times a week by the operator of the given system. Moreover, the rural offices of the Regional Agencies of SENDOS carry out quarterly bacteriological analysis of the water supplied and ongoing quality control procedures. Of the 618 services completed, and benefitting 686 localities, 560 are equipped with hypochlorinators, and SENDOS has planned to achieve about 100% by December 1985.

(iv) Water macrometering and micrometering

- 2.31 Macrometering (production) and micrometering (consumption) equipment has been installed in all systems of the Third Stage. It is also being installed in the systems of earlier stages, which are expected to be covered about 100% by the end of 1985. At mid-1985 the coverage had reached 88%. Since its launching in 1978 to rectify a deteriorating situation caused chiefly by indiscriminate water use, the program for the installation of house-connection meters has had a most salutary effect on the operation of these services, the equipment and installations of which suffer less wear because they operate for fewer hours, affording savings of electric energy and a substantial reduction in unjustified use of water, and providing an incentive to pay the water rates, which are based on the actual consumption of the individual user.

(v) Lands and rights of way

- 2.32 To obtain the lands and rights of way for the water sources (wells) and emplacement of the storage tank and its control shed, SENDOS, with the Bank's prior authority, instituted a mechanism by which it has obtained in commodatum for 20 years (the estimated service life of each system) of each of the plots of land on which the works of the program were

constructed, and has also secured a promise of cession of the given plot free of charge by its owner. To accomplish this SENDOS used a standard document which was signed by the owner and formalized by a notary.

- 2.33 It may be noted that, under Chilean legislation, the commodatum is a contract under which an owner lends the use of a thing, that is, there is no transfer of ownership or possession, but only of the holding of the thing. Moreover, the contract is precarious in that the owner may recover the holding of the thing given in commodatum when he needs it for his personal use. It is important to note, however, that, pursuant to article 16 of Decree Law 2050 of November 23, 1977, creating SENDOS, the goods and lands needed for execution of the drinking water supply and sewerage works and services entrusted to SENDOS are condemned in the public interest, and their expropriation is authorized on that basis.
- 2.34 According to SENDOS, while its charter law expressly authorizes it to expropriate lands on which it must execute its works, it has preferred to resort first to a voluntary arrangement under which the beneficiaries themselves provide of their own volition the lands needed for execution of the project without prejudice to its right to expropriate in the subsequent event that it is sought to rescind the commodatum for any reason. In this way the agency has been able to avoid the social and political problems that can be created by the compulsion involved in expropriation when resorted to from the outset.
- 2.35 As previously mentioned, in Chile as in the rest of Latin America, it is frequently difficult to show proof of the ownership of land, chiefly in rural areas, for which reason regularization of the titles to the lands on which the project works have been executed has been slow. Of the 212 water supply services comprised in the Third Stage, 21 have been totally regularized and 23 are in process of becoming so in the Land Registry Office.
- 2.36 SENDOS has drawn up a timetable of steps to take to regularize this situation, including the status of the lands that would be affected in the possible Fourth Stage. It is important to note that this problem is receiving the full attention of the National Programs and National Administrative Departments and the Office of the Legal Advisor at the central level, with the support of the Regional Rural Drinking Water Supply and Administrative Departments at the regional level.
- 2.37 In consequence the foregoing, and considering that: (i) in the past the Bank has accepted the formula of the 20-year commodatum in conjunction with a promise of a gift in compliance with clause 6.01 (b) (ii) of the contract for loan 393/OC-CH, a formula which has not yet given rise to any problem; (ii) the Office of Legal Counsel of SENDOS has been unable to find any legal arrangement that would improve substantially on the present one, under which it is able to fulfill completely the requirements of the aforementioned contractual provision; and (iii) SENDOS's Charter law authorizes it to expropriate for the public good any lands it needs for the accomplishment of its purposes, it is

considered that the formula of the commodatum for 20 years together with an unconditional promise of gift, plus the possibility of expropriating the lands needed by SENDOS, together provide the reasonable assurance that the Bank seeks through that contractual provision. Therefore, for purposes of administration of the proposed Fourth Stage of the program, it is recommended that the commodatum arrangement be again accepted for accomplishment of the stated purposes (see Recommendations).

(vi) Bids

- 2.38 In the course of the bidding operations for construction of services and provision of equipment, it has been established that those operations conform to the Bank's standards and procedures. It may be mentioned that no challenge or protest was ever made, and there was never any direct contracting, exception from the authorized bidding procedure, ^{1/} or execution of works on force account. A total of ten international bidding operations were conducted for the acquisition of equipment and vehicles aggregating the equivalent of US\$1.7 million, mostly goods of external origin from eligible countries. For the installation of services, it is important to note that, even though fewer bidding operations were conducted (18 compared with 44) and in larger amounts than those of the Second Stage (499/SF-CH) in order to make them more attractive to foreign firms, all bidders for the execution of this Third Stage were local. For the proposed operation it has been agreed to conduct an even smaller number of bidding operations for works, which will make the amounts larger than those on which bids were invited under loan 393/OC-CH, in order to achieve savings and make the program more attractive to international bidders. ^{2/}

(vii) Operation and maintenance

- 2.39 The operation and maintenance of all systems is entrusted to cooperatives (loan 74/TF-CH) and water supply committees (loans 499/SF and 393/OC-CH). SENDOS's National Programs Department supervises the management at each locality through periodic visits made by local technicians and assistants under the Regional Directorates. In addition to verifying how each service is being operated and maintained, they examine the financial control information carried by the community on its water supply system.
- 2.40 To carry out these operations, SENDOS has had the use of 57 vehicles acquired in 1983, which have a service life of four years. To maintain

^{1/} As indicated in paragraph 2.26, because of the earthquake of March 3, 1985, the Bank has authorized the use of private price quotations aggregating up to the equivalent of US\$313,000 for the rehabilitation of damaged rural drinking water systems.

^{2/} See paragraph 4.28.

appropriate levels of supervision and control in all phases, both of the earlier stages and of the possible Fourth Stage, it has been determined that an additional 40 vehicles are needed, and justification for their acquisition is presented in Chapter IV of this report. Normal maintenance of the systems in general is paid for out of rates received. Any unusual expenditures required for maintenance are generally covered by additional charges paid by users. Based on the experience of the first three stages so far, this activity is regarded as proceeding satisfactorily.

3. Rehabilitation and improvement of rural water supply systems

- 2.41 Based on the guidelines laid down in the Bank's policy on the maintenance and upkeep of physical works and equipment, the chief purpose of which is to preserve the service life and maximize the performance of the functions for which these physical installations have been designed, SENDOS has made an exhaustive study of the 618 water supply systems under its supervision on June 30, 1985. This study shows that more than 250 of those systems have been in operation for about 20 years, which is the usual average service life of the rural water supply system.
- 2.42 The factors that do the most to reduce the service life of a system are: (i) the use of sources with unreliable outputs, the blockage of wells that are not cleaned and maintained, and the use of slotted pipe instead of screen or sieve of a mesh and material suited to the characteristics of the well, and lowering of the water table owing to insufficient recharge of the aquifer or the abstraction of water in areas without proper sanitary protection; (ii) expiration of the service life of pumps, equipment for the measured release of chemicals, meters, steel water towers, etc.; (iii) destruction of conduits across rivers and creeks by unusually high floods; and (iv) inadequate organization of communities, particularly those under the First Stage of the National Rural Drinking Water Supply Program (74/TF-CH), which were organized into cooperatives under the supervision of the Office of Rural Sanitation in the Ministry of Health.
- 2.43 To rectify some of the aforementioned situations and avert further damage from many years of wear, and to restore satisfactory operating conditions and service at acceptable levels of quantity and quality, SENDOS, with the support of the 13 Regional Directorates, has identified 130 systems in which the following works are required: (i) the repair (reinforcement of structures) and painting of reservoirs to compensate for the wear caused by time and weathering. These repairs are described as periodic maintenance, and the cost of such maintenance cannot be charged to the system's rate receipts as routine maintenance work can be, and (ii) the rehabilitation and expansion of several systems that have come to the end of their service life, the tasks for which range from the construction of drainage chambers and valves to the reconditioning and construction of offtake works, sheds and reservoirs,

electrical installations, pumping equipment, the repair and extension of pipe networks and household connections and meters. The cost of these operations ranges between US\$700 and a maximum of US\$128,000. The total direct cost estimated for rehabilitation of the 130 systems is the equivalent of US\$2.8 million. 1/

- 2.44 Of these 130 systems, 108 were financed by loan 74/TF (execution period: 1964-1970) and 22 financed with local resources. On the basis of the foregoing, and in consideration of SENDOS's purpose in preserving and extending the service life of the physical plant of the aforementioned rural water supply systems, the proposed Fourth Stage includes partial financing for this subprogram, which, as previously mentioned, is in harmony with the Bank's policy on the subject. As a result of the analysis, several economic and financial criteria have been established for determining the eligibility of the systems to be rehabilitated. 2/

4. National Regional Development Fund and Social Funds

- 2.45 Some of the systems built in different parts of the country in the stages of the Rural Drinking Water Supply Program, partly financed by the Bank, have been financed from other sources, including the Social Funds (FS) and the National Regional Development Fund (FNDR). These funds are provided by the government to finance projects for which SENDOS is the executing agency (see the table in paragraph 2.20). It may be mentioned that, before SENDOS was established, services were provided to 104 localities (today harboring a total rural population of 51,000) by different national institutions such as the Irrigation Department, the Public Works Department, and the Rural Sanitation Office of the National Health Service independently.

D. The Contribution of Other International Agencies to Development of the Chilean Sanitation Sector

- 2.46 IBRD loan agreement 1832-CH between the Republic of Chile and the World Bank was signed on August 15, 1980. This agreement provided US\$38.0 million for the execution of a drinking water supply program consisting of two main projects: (i) the EMOS project for the equivalent of US\$27.0 million; and (ii) the SENDOS project for the equivalent of US\$11.0 million.
- 2.47 The first project, now in execution by the Empresa Metropolitana de Obras Sanitarias (Metropolitan Sanitary Works Enterprise), consists in an increase of the capacity and geographical coverage of the drinking

1/ The criteria on which determination of this cost was based are presented in paragraph 3.15.

2/ See paragraphs 4.14 and 6.32

water supply service in the Santiago Metropolitan Region at a total estimated cost of about US\$104.6 million. It also includes financing for studies and final designs for a sewerage master plan that will meet the needs of that region down to the year 2000. The term for execution of this project has been extended for one year until June 30, 1986, and is now in its final stage, for which the World Bank has programmed an additional loan in the equivalent of about US\$75.0 million. The purpose in this case would be the execution of works in connection with the aforementioned sewerage master plan, for US\$68.0 million, plus US\$7.0 million for the financing of sewerage works in the Fifth Region (Valparaíso) to be executed by the sanitation enterprise of that region (ESVAL).

2.48 The SENDOS project consists in a variety of programs for improving the quality of water, the metering of water production and consumption, and the detection of losses nationwide and in urban systems. The project includes a technical cooperation in the studies and in the implementation of a plan for the decentralization of SENDOS pursuant to the national policy laid down in 1980-1981. The purpose of that plan was to convert SENDOS's Regional Directorates into autonomous enterprises and to decentralize the management of the sector to the regional level. Later, owing to changes in economic policy, the authorities decided to revert to the original situation, and terminated the technical cooperation. At that time - that is, in 1984 - US\$4.5 million of the originally provided US\$11.0 million was cancelled at the borrower's request following a cutback of the goals for the water macrometering and micro-metering and loss detection programs. ^{1/} According to available information, on June 30, 1985, the programs of the SENDOS projects were being carried out fully, some activities remaining pending, for which the deadline for the last disbursement of financing has been extended for one year to June 30, 1986.

2.49 In the last five years the Pan American Health Organization (PAHO) has provided technical assistance to the Chilean sanitation sector for curative and not for preventive health programs as it did in the decade 1960-1970. In 1984, PAHO's cooperation consisted in the provision of advisory services, consultancies, fellowships, seminars and grants for a series of subjects, research projects and studies in the health field in general.

^{1/} To ensure a more balanced rationalization of water resource utilization, the loss detection program examined 1,510 km (39%) of the 3,905 km of pipes in the distribution networks of 20 cities in 10 regions, and arrived at the following average values: (i) 1.3 leaks per km of pipeline; (ii) 0.21 l/sec/km of discharge lost by leakage; and (iii) a total loss through leakage of 26.5% assuming the same loss rate for the rest of the pipelines that were not examined (61%). These figures compare favorably with those of some countries in Latin America.

- 2.50 When the country's authorities decided to reverse the process already in motion, of decentralizing SENDOS, as indicated in paragraph 2.46, above, the measures already taken by SENDOS has reduced the size of its staff, and in 1984 a consultant was hired through PAHO to determine the number of people who should be hired to improve the carrying out of the measures in the sector. A special review has been made of this matter, and the results are presented in this report starting with paragraph 5.09.

III. THE PROGRAM

A. Objectives

3.01 The principal objectives of the program are as follows:

- (i) To supply drinking water to a rural population of about 114,300 distributed in 240 localities throughout the country. Each locality would have a population estimated at between 100 and 3,000 inhabitants, and the population of those communities is expected to aggregate about 153,000 by the end of the design period (the year 2000). The goal of the program is to raise the present coverage of 66% in the clustered rural sector to 85% by the end of 1989;
- (ii) by an appropriate promotional effort, to make the inhabitants of the 240 localities active participants in all phases of the program through community organizations to be set up for the purpose so that they may afterwards properly handle the administrative, technical and financial aspects of operating and maintaining their drinking water supply systems;
- (iii) to rehabilitate, improve and increase the operating capacity of about 130 rural water supply systems in operation so as to lengthen their service life by 8 to 10 years and maximize the performance of the functions for which they were designed; and
- (iv) to perform studies that will enable SENDOS to keep in its active inventory enough projects for the continued execution, in due course, of the Rural Drinking Water Supply Program.

3.02 The general purposes of the program are:

- (i) To reduce the morbidity and mortality from water-borne diseases;
- (ii) to bring about an improvement in the habits and attitudes of the rural population in regard to the use of drinking water;
- (iii) to promote the economic and social development of the communities served by improving their sanitary conditions and reducing worker absenteeism from water-borne communicable diseases; and
- (iv) to make the inhabitants aware of their ability to solve common problems so that they may undertake new efforts for their own advancement.

B. Description

1. Main components

- 3.03 The program consists in the execution of the Fourth Stage of the Rural Drinking Water Supply Program, and calls for the planning, study and preparation of the engineering projects, community promotion and organization, and construction of the works needed for installation of the drinking water supply services with house connections and their respective meters in 240 rural localities with populations ranging between about 100 and 3,000 inhabitants throughout the country from Region I to Region XII and in the Metropolitan Region. It is estimated that about 190 systems will have to be built to provide this service to 240 localities. 1/ The map on the next page shows the regions into which the country is divided, the locations of the localities in the representative sample, and the tentative locations of the 240 localities under the program.
- 3.04 The operation also includes investments for the preparation of about 82 hydrogeological reports, 51 studies of water sources, the performance of 130 drillings, and 42 projects for the installation of services, which will make it possible to keep an active inventory of about 90 projects and to continue implementation of the Rural Drinking Water Supply Program in due course in a future Fifth Stage. In addition, to complete the systems built under earlier programs financed by the Bank, this operation provides for the acquisition and installation of 14,500 house meters and 300 production meters for the systems executed with loans 74/TF-CH and 499/SF-CH. 2/
- 3.05 In addition to the foregoing, provision is made for the acquisition of about six self-propelled cranes for assignment to about six regions in order to make more efficient the operation and maintenance of more than 400 pumping installations. The acquisition of about 40 vehicles for the work of supervising the rural systems is also provided for.
- 3.06 There is also a subprogram for the renovation and improvement of 130 water supply systems requiring work to lengthen their operating life, the great majority of these system having been built between 1965 and 1970. Of the 130 systems, 108 are financed with loan 74/TF, and 22 with local funds.

1/ In some cases two or more contiguous rural population clusters can be supplied with water by building just one system.

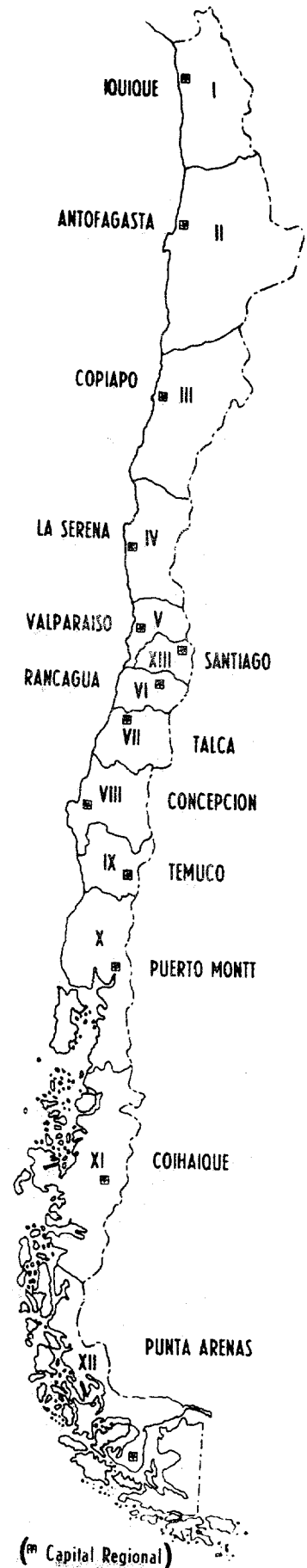
2/ Installation of meters. See paragraph 4.39.

PROGRAMA NACIONAL DE AGUA POTABLE RURAL
CUARTA ETAPA
(FINANCIADA PARCIALMENTE POR EL BID)

REG.	PROVINCIAS	MUESTRA REPRESENTATIVA		SELECCION BASICA	
		NUMERO DE LOCALIDADES	POBLACION (HABITANTES)	NUMERO DE LOCALIDADES	POBLACION (HABITANTES)
I.	ARICA				
	PARINACOTA				
	IQUIQUE			2	780
	Sub Total			2	780
II.	TOCOPILLA				
	EL LOA			3	1.970
	ANTOFAGASTA				
	Sub Total			3	1.970
III.	CHANARAL				
	COPIAPO				
	HUASCO			6	2.590
	Sub Total			6	2.590
IV.	ELQUI	2	654	3	950
	LIMARI	4	1.333	12	4.260
	CHOAPA	1	494	5	2.330
	Sub Total	7	2.481	20	7.540
V.	PETORCA	3	1.108	5	2.443
	LOS ANDES	1	1.345	2	1.917
	SAN FELIPE	5	2.642	7	3.110
	QUILLOTA	1	1.020	3	2.140
	VALPARAISO	1	894	5	1.920
	SAN ANTONIO			3	1.140
	ISLA DE PASCUA				
	Sub Total	11	7.009	25	12.670
VI.	CACHAPOAL	6	2.280	25	11.350
	COLCHAGUA	1	858	19	9.080
	CARDENAL CARO			2	1.090
	Sub Total	7	3.138	46	21.520
VII.	CURICO	2	1.742	23	10.190
	TALCA	2	402	12	4.960
	LINARES	2	805	14	5.600
	CAUQUENES			3	1.070
	Sub Total	6	2.949	52	21.820
VIII.	ÑUBLE	2	2.350	13	5.841
	BIO BIO	4	1.814	7	4.490
	CONCEPCION	3	2.538	3	2.538
	ARAUCO	4	2.261	4	2.261
	Sub Total	13	8.963	27	15.130
IX.	MALLECO	3	1.227	6	1.970
	CAUTIN	5	4.667	9	6.320
	Sub Total	8	5.894	15	8.290
X.	VALDIVIA	1	631	4	1.940
	OSORNO				
	LLANQUIHUE	3	1.709	6	2.234
	CHIOLOE	7	1.532	8	1.716
	PALENA	1	573	2	710
	Sub Total	12	4.445	20	6.600
XI.	AISEN	1	435	2	2.285
	COIHAIQUE			1	435
	GENERAL CARRERA				
	CAPITAN PRAT				
	Sub Total	1	435	3	2.720
XII.	MAGALLANES			1	100
	ULTIMA ESPERANZA			1	190
	TIERRA DEL FUEGO			1	140
	ANTARTICA CHILENA				
	Sub Total			3	430
XIII.	CHACABUCO	2	1.362	5	3.520
	CORDILLERA			1	1.076
	MAIPO	1	466	2	1.300
	TALAGANTE	2	1.084	2	1.084
	MELIPILLA	1	1.444	8	5.220
	Area Metropolitana de Santiago				
	Sub Total	6	4.356	18	12.220
TOTAL		71*	39.670	240**	114.280

*Corresponden a 64 acueductos.

**Corresponderan a 190 acueductos.



2. Technical aspects

- 3.07 The works to be executed in the Fourth Stage with the funds of the program would consist in the construction of integrated offtake, conduction, treatment (when surface waters are used), storage, disinfection and distribution works, with their respective house connections and meters. The supply sources will be aquifers and surface water bodies that must meet the country's standards as to quality and quantity relative to the calculated demand, which is an average supply of 60 to 100 liters per inhabitant/day. 1/ When surface water is used, the water will be treated in pressure filters and infiltration galleries.
- 3.08 A typical drinking water supply under this program 2/ would supply a current average population of 569 inhabitants and design population of 840 inhabitants, which for the aforementioned rate of supply would require 1.5 liters per second on the day of peak consumption, and would involve execution of the following works:
- (i) Offtake: When no alternative water source is available, groundwater will be tapped through deep tube wells with steel pipes of 8" dia. 3/; driven wells with concrete pipes of 2.00 m dia. 4/; cluster wells with steel pipes of 2" and 3" dia.; infiltration galleries with 10" concrete pipes; streams, springs, rivers and lakes. In each case a superstructure will be built to house the pumping equipment 5/ whenever needed and the sodium or calcium hypochloride disinfection system;
 - (ii) Conduit: Runs between the offtake installation and the reservoir, and would be laid down in pipes of polyvinyl chloride (PVC), galvanized iron, and/or asbestos cement. When the water is taken from wells this line is very short and is called a pressure pipe;
 - (iii) Reservoir: Depending on the topography, reservoirs may be perched on towers or resting on the ground. They will be built of steel³ or concrete and hold a maximum of 100 m³ and an average of 40 m³;

1/ The projects of the program in execution (393/OC-CH) and those of the representative sample of the Fourth Stage were designed for this rate of supply. See paragraph 4.04.

2/ A typical system is one that would supply a typical population under the program, that is, the arithmetical average population of 240 population clusters.

3/ To an average depth of 45 m.

4/ To a depth of not more than 15 m.

5/ Deep-well or submersible electric turbine pumps.

- (iv) Distribution networks: Networks will be of simple and inexpensive design so as to reduce the number of circuits. The pipe will be of polyvinyl chloride (PVC) and asbestos cement in diameters of 2", 3" 4" and 6", and the average network will be 4.150 m long;
 - (v) House connection on and off the property: The standard installation would consist of: (i) a line of 1/2" PVC pipe from the distribution main to the edge of the property; (ii) a brick box with a concrete lid to house a 1/2" shutoff valve and a velocity-type meter; and (iii) a pipe on the property one meter long and ending in a shutoff valve. 1/ About 13,000 connections of this description would be installed under the program.
- 3.09 The works to be executed in existing water supply systems under the Rehabilitation and Improvement Subprogram would comprise the reconditioning or construction of water offtakes, the repair and construction of sheds, reservoirs, electrical installations, control panels, pumps, equipment for the measured release of chemicals, the repair of fences around plots and enclosures of offtakes and of reservoirs and sheds, the repair and extension of distribution pipes, installation of new production and house meters, and of house connections and drainage chambers and valves.
- C. Total Cost of the Program
- 3.10 The total cost of the program is estimated at the equivalent of US\$30 million broken down by investment categories and sources of possible financing as follows:

1/ For the components of the typical house connection with its layout diagram, see Appendices III-1 and III-2, respectively.

ESTIMATED COST AND FINANCING PLAN
(Equivalents in US\$ thousands)

Category	Financing				Total	%
	Foreign Exchange (IC)	Local Currency (OC)	Sub- total IDB	Local Contri- bution		
1. <u>Engineering and Administration</u>	-	-	-	3,325	3,325	11,08
1.1 Studies and designs						
a) Fourth Stage	-	-	-	697	697	2,32
b) Services in operation	-	-	-	283	283	0,94
1.2 Supervision	-	-	-	895	895	2,98
1.3 Administration	-	-	-	1,450	1,450	4,84
2. <u>Direct Costs</u>	9,827	2,447	12,274	7,536	19,810	66,03
2.1 Supply of goods and execution of works	8,417	1,747	10,164	6,776	16,940	56,46
2.2 Rehabilitation and improvement	1,410	700	2,110	760	2,870	9,57
3. <u>Concurrent Costs</u>	718	680	1,398	1,647	3,045	10,15
3.1 Community promotion	-	-	-	413	413	1,38
3.2 Drilling and studies Fifth Stage	-	680	680	781	1,461	4,87
3.3 Expropriation/rights-of-way	-	-	-	310	310	1,03
3.4 Vehicles	718	-	718	143	861	2,87
4. <u>Finance Charges</u>	2,955	373	3,328	492	3,820	12,74
4.1 Interest	2,820	338	3,158	-	3,158	10,53
4.2 Credit commission	-	-	-	492	492	1,64
4.3 FIV	135	35	170	-	170	0,57
TOTAL	13,500	3,500	17,000	13,000	30,000	100
Percentages	45.0%	11.7%	56.7%	43.3%	100%	

- 3.11 To determine the total cost of the Program, adjustments have had to be made in the original budget presented by SENDOS based on more information available for determining updated costs for each of the 64 studies in the representative sample and on the experience acquired in the execution of the program of the Second Stage (loan 499/SF-CH) already completed and of the Third Stage (393/OC-CH) nearing completion. The Engineering costs have been calculated on the basis of the fees to be paid to the local firms for the projects additional to those of the representative sample. The costs for Administration and Supervision reflect current public administration salaries, including charges for social benefits and travel subsistence.
- 3.12 The direct construction costs have been estimated on the basis of the proposals for the 64 accepted projects of the sample ^{1/} worked out up to the level of final designs and using international prices for the imported materials and equipment. The estimates for the local materials and labor have been compared with similar budgets drawn up by SENDOS. The calculation was made on the basis of prices in June 1985 for the projects of the sample and in accordance with the pace of investment called for in the timetable for execution of the project, and the escalation was calculated on the basis of the rates given in Document LO-6-Rev. of June 12, 1985, which are considered appropriate for this case.
- 3.13 The per capita direct construction costs of the 64 systems in the representative sample are plotted relative to their respective present populations on the graph presented as Appendix III-3, on which a straight line has been drawn to show the cost trend. Grouping the localities in 17 classes with intervals of 100 inhabitants, the straight line for the trend yields the following results:

^{1/} See paragraph 4.08 for details on the representative sample. The socioeconomic analysis of this sample begins with paragraph 6.19.

<u>Class</u>	<u>Current Population (Interval)</u>	<u>Mid- Point</u>	<u>Frequency (No. of Systems)</u>	<u>Cost US\$ per Head of Pop.</u>
1	1- 200	100	7	214
2	201- 300	250	8	146
3	301- 400	350	14	126
4	401- 500	450	7	114
5	501- 600	550	6	105
6	601- 700	650	4	97
7	701- 800	750	2	92
8	801- 900	850	4	87
9	901- 1.000	950	2	83
10	1.001- 1.100	1.050	2	80
11	1.101- 1.200	1.150	-	77
12	1.201- 1.300	1.250	1	74
13	1.301- 1.400	1.350	2	72
14	1.401- 1.500	1.450	2	70
15	1.501- 1.600	1.550	1	68
16	1.601- 1.800	1.700	2	65
17	1.801- 2.000	1.900	-	65
			64	
			==	

3.14 The weighted arithmetic mean of the sample would be a population of 569 inhabitants, which in the foregoing table would give a per capita cost of US\$103. Applying the same trend to the total program of 190 systems and to the resulting population associated with a typical system, that is, 601 inhabitants, yields a cost of US\$101, which has been used to determine the construction cost of the program, which is compared with the one calculated by extrapolating from the same cost in the representative sample. The two procedures reach the same result for this category, which accounts for 56.5% of the total cost of the program.

3.15 The estimation of the costs for the projects in the Rehabilitation and Improvement Subprogram have been based on the unit costs of the contracts now in execution for the works of the Third Stage, both for the facilities of new services and the components for rehabilitation of the 29 water supply systems seriously damaged by the earthquake of March 3, 1985. The updated costs for execution of the rehabilitation works relate to the following components: wells, offtake works,

reservoirs of various standard capacities (between 15 and 100 m³), pumps (of less than 5 lps), laying of PVC pipe in each diameter (from 1" to 6"), house connections, and production and consumption meters. Based on the foregoing and given the quantities of physical works determined for each of the 130 supply systems requiring rehabilitation, improvement, expansion and periodic maintenance, it is considered that the estimated cost of the Subprogram as a whole has the reliability required for the restoration and extension over time of the operating capacity of those water systems.

- 3.16 Based on the foregoing, following is an analysis of the main investment categories under the Program.

1. Engineering and Administration (US\$3,325,000)

- 3.17 This figure, 11.1% of the total program cost, comprises the engineering, supervision and administration costs. The estimate is considered reasonable given the number of designs to be prepared and the geographic dispersal of the works in all of the regions of the country, and, moreover, is within the limits of similar projects financed by the Bank. 1/ This category comprises the following components:

- (i) US\$980,000 to pay the fees of the local engineering firms preparing the 118 remaining final designs and 88 designs for the rehabilitation and improvement of systems in operation;
- (ii) US\$895,000 to cover the fees, social benefits and travel expenses of the engineers and civil construction contractors to be assigned, who are required for the direct supervision of the studies and all the works. The supervision would account for less than 3% of the total cost of the program, and compares favorably with other projects for programs of the same kind in the sector; and
- (iii) US\$1,450,000 to cover the program's administrative costs, to be incurred in the central office of the Department of National Programs (DEPRONA) through the personnel assigned to the rural programs and technical assistance subdepartments and to the Accounting Section.

1/ These proportions were 20.1% under loan 446/SF-GU, 17.6% under 719/SF-GU, 25.7% under 587/SF-HO, and 14.7% under 609/SF-HA. In the operation considered the value of the studies for the sample has not been included.

2. Direct Construction Costs (US\$19,810,000)

3.18 This category accounts for 66% of the cost of the program and covers the provision of goods and execution of works and the rehabilitation and improvement of existing water supply systems, as follows:

- (i) US\$16,940,000 for the acquisition of pumping equipment, including replacement parts, hypochlorinators, well screens, production and consumption meters, equipment for surveying and construction, audiovisual materials for information campaigns, and implements for the execution of works contracted for in bidding operations. These works under contract comprise the drilling of wells, construction of pump sheds, installation of equipment, electrical connections, the construction of reservoirs and fences, the digging, filling and compacting of ditches for laying pipe of asbestos cement, polyvinyl chloride (PVC) and galvanized iron, and the installation of hypochlorinators and production and house meters. The stated amount includes the acquisition and installation of 14,500 house meters and 300 production meters for the systems built under programs 74/TF-CH and 499/SF-CH, and
- (ii) US\$2,870,000 for the rehabilitation and improvement of 130 rural water supply systems built chiefly between 1965 and 1970. The costs involved for the different systems ranged between US\$700 and a maximum of US\$128,000. The average cost per work would be the equivalent of US\$22,000, and some works would cost more and others less than US\$25,000. As noted before, the costs calculated for this Subprogram are considered reasonable for the purpose.

3. Concurrent Costs (US\$3,045,000)

3.19 These relate to the community promotion program (US\$413,000) to be carried out by 16 social workers plus the cost of the requisite publications and their distribution; the acquisition of lands and rights of ways (US\$310,000) needed for execution of the program and the determination of water sources (drillings) and the studies (US\$1,461,000) needed to repair the representative sample of projects for future stages of the Rural Drinking Water Supply Program. Also included is US\$861,000 for the acquisition of 20 single-cab and 20 double-cab pickup trucks which are considered necessary to provide SENDOS with the vehicles it needs and for its execution of the program.

4. Finance Charges (US\$3,820,000)

- 3.20 This category, which accounts for 12.7% of the total cost of the program, comprises the interest on the possible loans in foreign exchange (IC) and local currency (OC) that would accrue during the execution period, and, in addition, the amounts of the credit commission and inspection and supervision.

D. Financing Plan

1. IDB financing

- 3.21 The IDB's contribution to the financing of the proposed program would be the equivalent of US\$17 million, which is 56.7% of its total cost, divided into US\$13,500,000 in foreign exchange to cover 45.0%, and the equivalent of US\$3,500,000 in local currency (Chilean pesos) to cover 11.7% of the total cost (see table in paragraph 3.10).
- 3.22 The figure of US\$13,500,000 for the foreign exchange was determined in keeping with the current policy laid down in Document FP-33-1 for the sector of "Urban Development and Social Infrastructure" in Group B countries, that is, as up to 45% of the total cost of the program.
- 3.23 The funds of the two possible IDB loans would finance about 62% of the Direct Costs category (US\$12,274,000), part of the drillings and studies for future expansion of the services in the Concurrent Costs category (US\$680,000), and the vehicles (US\$718,000), the interest on the loans during the period of execution of the program (US\$3,158,000), 1/ and the costs for inspection and supervision (US\$170,000).
- 3.24 The Bank's possible loans in the different currencies would be on the following recommended terms and conditions:

- | | |
|--|--|
| (a) Source of funds: | Interregional Capital (IC)
and Ordinary Capital (OC) |
| (b) Amounts: | US\$13,500,000 in foreign exchange
(IC) and US\$3,500,000 in local
currency (OC) |
| (c) Material initiation of
the works: | 3 years |
| (d) Disbursement period: | 4 years |

1/ At the borrower's request.

- (e) Grace period: 4 years
- (f) Term of amortization: 25 years
- (g) First installment due: 4-1/2 years
- (h) Interest: Variable annual rate on portion in foreign exchange and 4% a year on portion in local currency
- (i) Credit Commission: 1.25% a year on undisbursed balances of the foreign-exchange portion of the loan
- (j) Inspec. and Supervision: 1% of total loan amount.

2. Local Contribution to the Program

- 3.25 The local contribution to the program is estimated at the equivalent of US\$13,000,000 (43.3% of the total cost) and would be made by the National Government in annual budgetary allocations in keeping with the investment requirements imposed by execution of the program. These funds will cover the costs for Engineering and Administration (US\$3,325,000); part of the direct construction costs (US\$7,536,000); the total cost of the community promotion work (US\$413,000); lands and rights of way (US\$310,000); part of the expenditures for preparation of the studies and performance of the drillings for future expansion of services (US\$781,000), and the credit fee on the possible foreign-exchange loan (US\$492,000).

IV. EXECUTION OF THE PROGRAM

A. Executing Agency

- 4.01 The fourth stage of the Rural Drinking Water Supply Program would be executed by the Servicio Nacional de Obras Sanitarias (SENDOS) through its Department of National Programs (DEPRONA), ^{1/} which is responsible for the third stage now in execution with financing from loan 393/OC-CH. It will also be responsible for execution of the component for the rehabilitation and improvement of rural water supply systems. The next chapter of this Report presents an institutional analysis of the executing agency which considers its operating capacity, internal organization, manpower and administrative-financial-accounting management.

B. Modality of Execution

- 4.02 The proposed fourth stage of the program would be executed in the same way as the two previous stages. The hydrogeological studies, the drilling of test wells, and the studies and final designs for service installations and the construction of works would be carried out by private engineering firms for groups of localities generally in the same and adjacent regions, and would be completed within the first two years following signature of the possible loan contract.
- 4.03 Winning contractors would supply all goods and services required for construction of the works with the sole exception of the goods that SENDOS would acquire in international public bidding operations, such as power pumps, well screens or sieves, hypochlorinators, and production meters, whose estimated prices are given in paragraph 4.32, below. In consequence, the house meters, pipes and accessories and other goods would be acquired and installed by those contractors.
- 4.04 SENDOS would hire specialized consulting firms to perform the more detailed studies and designs for the water supply systems requiring them under the Rehabilitation and Improvement Subprogram, and would have the simple designs required by the other supply systems prepared by the technical staff of its Regional Directorates. All the studies under this Subprogram would be completed within 24 months following the effective date of the possible loan. The works would be constructed under contracts to be let in international bidding operations.

^{1/} This Department was created at the end of 1983 to centralize in a single line unit the functions of the management and coordination of drinking water supply programs at the national level. It was previously known as the Department of Rural Drinking Water Supply (DAPRU), which had charge of the second stage and part of the third.

C. Supervision of the Program

4.05 At the national level the Department of National Programs (DEPRONA) includes the Subdepartment of Rural Programs, which with the support of the Subdepartments of Promotion and Technical Assistance and the Accounting Section, 1/ is in charge of the direction, the administrative, financial and accounting control, and the supervision of the Rural Drinking Water Supply Program. It is also supported by the other departments of SENDOS. 2/ The activities that the Subdepartment of Rural Programs would have to engage in for direct supervision of the proposed Program would be as follows:

- (i) Coordinating the work of the Technical Department in contracting for and supervising the hydrogeological studies, the designs for the projects additional to those of the representative sample, and the designs for the water supply systems to be rehabilitated;
- (ii) Ensuring that the bidding process carried out by the Construction Department for execution of the wells and installation of water supply facilities, and for the acquisition of domestic and imported goods, is carried out within the established execution deadlines; and
- (iii) With the support of the Subdepartments of Promotion and Technical Assistance at both the central and regional levels, selecting the localities for the program in keeping with the criteria established with the Bank; promoting and organizing their respective water supply committees; signing with each committee an agreement for execution and administration of the water supply system to be installed; obtaining the rights to water sources, lands and rights of ways; supervising the works during their execution; delivering the completed services to their committees, while implementing the Administrative, Operating and Maintenance Regulations; and supporting and supervising the committees in the correct operation and maintenance of the systems to be built and in the implementation of appropriate rates.

4.06 In light of the numerous supervisory and control operations currently involved in execution of the earlier stages and which would be required in the proposed Fourth Stage and the Rehabilitation Subprogram, the need has been identified to acquire 40 vehicles in international public bidding operations. The purpose of this acquisition would be, in addition to what has already been said, to renew part of SENDOS's current stock of 57 vehicles for the entire rural sector, which were acquired in 1983 with funds of loan 393/OC-CH. Since the service life of each vehicle averages 4 years, on June 30, 1985, these 57 vehicles had already completed half of their service life, and it has become necessary to acquire the 40

1/ See Appendix V-4.

2/ See Appendix V-2.

pick-up trucks within the first 2 years of execution of the proposed Fourth Stage. This acquisition represents SENDOS's minimum vehicle requirements for the next four years. The service life of these vehicles is substantially reduced by the fact that the current and prospective beneficiary rural communities are in places of rugged terrain, where the roads are not hard-topped, prone to drainage problems and, in some cases, lacking bridges across creeks and streams, which makes for constant wear on the vehicles.

- 4.07 Moreover, it is important to bear in mind that SENDOS is now responsible for the supervision of and technical and accounting assistance to 618 operating systems, which would become 808 by the end of 1989 or early 1990 with execution of this Fourth Stage. Without the 40 proposed vehicles it is felt that the execution of the proposed program and the activities under the Rehabilitation Subprogram could be prolonged, and the quality of SENDOS's hitherto satisfactory supervision of the operation and maintenance of those systems could be impaired. These vehicles would be apportioned an average 3 vehicles per region, with as few as 2 vehicles in Regions I, II, III and XII, and as many as 4 in Regions IV, V, VII y VIII.

D. Studies and Designs for the Program

1. The representative sample of the fourth stage

- 4.08 On June 30, 1985, SENDOS had 64 projects ready with their technical and economic feasibility verified in keeping with the established economic criteria; these 64 projects constitute the representative sample of the Program. ^{1/} These projects correspond to 71 rural localities and have their final designs at the construction level, their updated budgets, lists of materials and specifications, confirmed water sources, and the types of systems proposed, which would make it possible to initiate immediately the process of bidding for the construction of works and acquisition of equipment and materials.
- 4.09 The projects of the sample represent 34% of all the projects covered by the program, and 33% of the total population to be served. At the same time, they represent 27% of the direct costs of the 190 systems included, which percentage would rise to 50% by 1985 since 36 additional projects have been contracted and are being executed. These projects would ensure the first year and a half of execution of

^{1/} The salient characteristics of the projects and localities of the representative sample are presented in Appendix VI-1. The socioeconomic analysis of the sample begins in paragraph 6.19.

the program. 1/ Furthermore, it is important to bear in mind that the proposed program constitutes its Fourth Stage, which demonstrates the level of maturity achieved by SENDOS in developing sufficient projects to back up that stage. The project is well structured as to sizes and types of projects and is therefore considered suitably representative of the characteristics that may be expected of the additional 126 projects of the program. To ensure that the projects to be financed are correctly represented by the sample analyzed, they should be selected on the basis of the established criteria for size, population density, accessibility and economic profitability as set forth in paragraph 6.31, below.

- 4.10 All the projects of the representative sample have been designed on the basis of a demand of 60 to 100 liters/person/day, using the same parameters employed in operation 393/OC-CH and in correspondence with the annual average for the piped household water supply service. The variations in demand are as follows: peak day = 150% of the annual average; peak hour = from 150% to 200% of the peak day, depending on size of the population. These values are consistent with Chilean technical standards as are the other parameters established for the design of the projects under the program, which are regarded as adequate and are in keeping with the socioeconomic characteristics of the prospective beneficiary populations.
- 4.11 According to the experience of the previous program, 2/ the distribution of users by types of service would be as follows: households 94%, industrial 1%, and commercial 5%. The 118 final designs to complete the program would be prepared as the designs of the sample were, that is, under contract by local engineers and engineering firms experienced in the work. The designs would be completed within the first 2 years following the effective date of the loan contract, which would allow a reasonable period of time for conclusion of the entire bidding process, organization of the communities and commencement of the works, and make it so much easier to meet the schedule for their completion.
- 4.12 Moreover, since the inclusion of each system in the program will be subject to the Bank's approval, it is recommended that the possible loan contract contain provisions to ensure that, before any bidding is invited on each system, the borrower shall have presented to the Bank proof that that community was selected by the selection methodology agreed upon with the Bank, and on the basis of the general plans, specifications, budgets, and specific bidding documents (see Recommendations).

1/ Appendix IV-9 contains the execution schedule of the projects mentioned.

2/ Two hundred twelve systems financed with loan 393/OC-CH for 242 localities.

2. Rehabilitation and improvement subprogram 1/

- 4.13 In order to rehabilitate and improve a considerable number of rural water supply works built between 1965 and 1970 chiefly with funds of financing 74/TF, SENDOS, with the support of its 13 Regional Directorates, has identified among those 618 systems it had in operation on June 30, 1985, 130 systems requiring rehabilitation, improvement and extension in one way or another. For execution of the Subprogram, SENDOS has scheduled the contracting of 8 studies of water sources for the equivalent of US\$10,400 2/ and the 68 final designs for the improvement of service installations at a cost of US\$219,500. 3/ Moreover, 17 studies of water sources and 32 final designs for the rehabilitation of systems have been scheduled to be performed by the staff of the technical units of the Regional Directorates themselves. These studies and designs are uncomplicated, and no specialized firms would have to be hired to prepare them. All these studies and designs required for execution of the Subprogram would be completed within 24 months following the effective date of the possible loan contract.
- 4.14 Since the inclusion of each rehabilitation work in the program will be subject to the Bank's approval, it is recommended that the possible loan contract include provisions to ensure that, prior to initiation of any works, the borrower, through SENDOS, shall demonstrate that the Bank's requirement on the rates for the services of these rural drinking water supply systems has been complied with, and that, moreover, it has been complied with in at least 2 of the 3 preceding business years. Furthermore, the system or other facility to be rehabilitated must satisfy the minimum-cost criteria (see Appendix 4 of the Loan Proposal - The Program).

E. Design Parameters

- 4.15 Based on experience and practice not only in Chile but in other countries as well, the following rated service lives have been estimated for the components of a drinking water supply system: (i) powerpumps, a reservoir and electrical installations: 10 years, and (ii) pipes and sources of supply: 20 years. The stages in the execution of the adopted design would be carried out bearing in mind that each system would be built as an integral unit with a view to meeting the demand over 20 years. Therefore, the first element to be constructed would be the offtake, which could be from surface or

1/ See Appendix IV-3 for the Activities Timetable and Appendix IV-4 for a summary of the Program.

2/ Not counting contingencies and price escalation.

3/ Not counting contingencies and price escalation.

ground-water; then would follow the installation of the service, which consists essentially of the regulating and distribution facilities; and, finally, the pumping equipment, hypochlorinators, and some meters would be replaced in 10 years. Appendix IV-2 presents the salient design parameters and criteria used in preparing the representative sample.

F. Water Sources

- 4.16 Based on the analysis of the water sources in the sample, it is estimated that only 45% of the systems to be built would draw their water from surface sources, while 2% would be supplied from existing aqueducts, and 53% of the systems would be supplied from groundwater, which in much cases would be pumped out. The distribution of the water sources and offtake works in the representative sample is as follows:

<u>Stages</u>	<u>Deep Well</u>	<u>Driven Well (noria)</u>	<u>River</u>	<u>Cluster Well</u>	<u>Lake</u>	<u>Existing Networks</u>	<u>Small Water Courses</u>	<u>1/</u>	<u>Total</u>
With verified yield	28	3	2	3	0	1	27		64

- 4.17 In regard to the determination of water sources for the systems of the proposed Fourth Stage, it is important to mention that since 1983 SENDOS has been carrying out a variety of operations and investments for the execution of more than 77 hydrogeological studies, other technical studies, and a large number of drillings, which will enable it to establish the existence of 111 satisfactory sources (61 wells, 46 surface water bodies, and 4 connections to existing networks). These verified water sources will be in condition to be used for the projects to be selected for the program. In deciding on the tasks to be carried out for the determination of sources, SENDOS has based itself on the selection criteria of the program for operation 393/OC-CH, which have enabled it to develop a balanced package of projects for the Fourth Stage.
- 4.18 As under the program of the Third Stage, it is recommended for the operation considered that the possible loan contract include a clause ensuring that, before bids are invited for the construction of each system, the borrower, acting through the executing agency, present to the Bank studies showing that the available water supplies are of acceptable quantity and potability (see Recommendations).

1/ Rivulets, streams and brooks.

G. Execution of the Program

1. Preliminary plan for execution of the program (PEP)

- 4.19 The program would be executed over a period of four years running from the date of the contract. The Plan for Execution of the Project (Preliminary PEP), included as Appendix IV-5, shows the stages and operations required for construction of the different works under the project in the established time. It consists of four plans, one each for the legal, financial, institutional and technical-physical operations. The first operations on the critical path of project execution relate to the signing of the possible loan contract and to fulfillment of the conditions precedent for eligibility of the loan, which help determine the date for initiation of the work and of the disbursements. These operations would take 26 weeks following the date of the Bank's approval of the loan, which time is regarded as adequate and sufficient in light of the experience of the execution of the last project financed by the Bank (loan 393/OC-CH).
- 4.20 The next critical activities following fulfillment of the conditions precedent and the declaration of eligibility of the loan relate to the bidding and contracting for and construction of the last group of works, identified as bidding lot 03-88, which comprises 18 works to be bid for in the sixth six-month period after the date of signature of the contract. It has been estimated that the bidding for all works would take 20 weeks, which is regarded as reasonable and in compliance with the Bank's requirements.

2. Actual Start of the Work

- 4.21 Based on the experience of the programs for the Second and Third Stages, SENDOS has requested that a term of three years be allowed for the actual start of all works. The operations that must precede construction of the water supply systems ^{1/} take considerable time, which can run as long as 20 months, whereas the construction would take only six to eight months since what is involved are small engineering works of simple design with costs averaging the equivalent of US\$74,740. ^{2/} Of relevance here is the experience of the Third Stage, under which some of the 25 winning contractors executed works contracts for up to 8 systems with construction times always shorter than 12 months. In consequence, SENDOS has made a realistic schedule allowing a total contractual term of 4 years for complete execution of the water supply services for all 240 localities under the proposed program, for which up to the third year of execution of the program would have to be allowed as the deadline for the actual starting of the works, since it is expected that about 30%

^{1/} The hydrogeological studies, studies of water sources, drillings, preliminary and final project designs, processing for approval and the international bidding process, studies of proposals, awards, audits, decision of the Office of the Controller General of the Republic, and contracting

^{2/} Including contingencies and escalation.

of the systems would be awarded to bidders and started during the third year. The addition of one year to the term prescribed in IDB practice for the actual start of all works would not, therefore, be an impediment to the construction of all the systems within the 4-year execution period (see the Proposed Resolution).

3. Community promotion

a. Promotion plan 1/

- 4.22 Once a system has been selected in keeping with the established selection criteria, SENDOS, through the Department of National Programs, would work out a community promotion program which, among other activities, would include (i) building an awareness of the importance of water and acceptance of its supply to the home through the system; (ii) organization of the community to collaborate in the construction stage; (iii) negotiation for the rights to water, lands, and rights of way; (iv) organization of the water supply committees; (v) training of operation and maintenance personnel; (vi) health education of the beneficiary population, control of wasteful use, and protection of sources; (vii) advantages of household connections and meters, and of the use of hypochlorinators to disinfect the water; and (viii) acceptance of the rate system. Since SENDOS is well organized to carry out community promotion in programs of this kind, as has been demonstrated with execution of the Third Stage, and in view of the additional personnel the institution will have in the near future, 2/ no special recommendation is required in this regard. SENDOS would carry out its work in this area in accordance with the guidelines laid down in its plan of regular activities.

b. Constitution of water supply committees

- 4.23 Prior to the physical start of the works for each system, and in culmination of the community promotion work to be done, the water supply committees would be constituted and take charge of the administration, operation and maintenance of the installed services upon conclusion of the works. Prior to the bidding for a system two basic actions are taken, which are the formation of the committee and the signing of an agreement between that committee and SENDOS establishing (i) the obligations of SENDOS to the committee and its members in relation to construction of the system and provision of the administrative, legal and accounting advisory services, technical assistance, training and health education; and (ii) the obligations of the committee to cooperate with the program, provide any lands needed, make the payments of the contributions within up to 30 months; and

1/ Promotion Plan worked out by DEPRONA is presented in Appendix IV-6.

2/ The matter of SENDOS's personnel is considered beginning in paragraph 5.08, below.

oversee compliance with the standards and regulations governing the system's subsequent administration. Appendix IV-7 contains a model of the agreement currently in use for the program of the Third Stage, which would also be used in the proposed operation.

- 4.24 Owing to the importance of the foregoing aspects for full implementation of the program, it is recommended that a provision be written into the contract requiring that, before invitations to bid are issued for the construction of each system under the program, the Bank be presented with evidence that the water supply committee for the locality has been constituted and that the agreement between that committee and SENDOS has been signed (see Recommendations).

H. Acquisition of Goods and Contracting for Services

1. Execution of works on contract and acquisition of equipment

- 4.25 It has been provided that the works, including the Rehabilitation Subprogram, are to be carried out in the same manner as the Second and Third Stages, that is, under contracts awarded on the basis of bids. The works to be carried out are the drilling of wells and offtakes, construction of reservoirs, pumping sheds, pumping equipment installations and electrical connections, the laying of galvanized iron, asbestos cement and polyvinyl chloride (PVC) pipes, and the emplacement of hypochlorinators, production meters and 1/2" PVC household connections with their respective meters. As indicated in paragraph 4.03, above, contractors winning contracts for the construction of installations would acquire and install the house connection meters and the pipes and accessories.
- 4.26 In consequence, the program calls for bidding operations for two purposes, some for execution of the aforementioned works, and others for the acquisition of equipment and materials. Equipment would be acquired and work contracts awarded by the system of public bids in all cases in which the value of those acquisition and contracts exceeded the equivalent of US\$200,000 and was financed totally or in part with funds of the loan. Bidding operations for the acquisition of goods to be financed entirely with loan funds in local currency or funds of the local contribution could be confined to the local market. SENDOS has made no provision for the execution of works on force account. The bidding regulations for the awarding of contracts for works and supplies are similar to those used in the Third Stage, which were arrived at with the SENDOS management (see Appendix IV-8).

2. Contracting for services

- 4.27 Invitations to bid for preparation of the 118 remaining designs to complete the Fourth Stage of the program would be sent privately to at least three firms, and this work would be financed with local funds. For the program of the Third Stage and for the representative sample of the Fourth and the 36 additional studies contracted for in July 1985 to add to the stock of projects of the program, SENDOS has hired

five specialized firms to make hydrogeological studies and 24 consulting firms to do the studies of service installations. The cost of the 118 designs has been calculated at the equivalent of US\$697,000, as shown in the financing table given in paragraph 3.10 above. The cost of the final designs of the Rehabilitation Subprogram is estimated at the equivalent of US\$283,000.

3. Capacity of contractors and suppliers

- 4.28 Chile has enough contracting firms qualified to carry out works of the kind to be executed, so that no difficulties are anticipated on this score during execution of Fourth Stage. The 190 works distributed all over the country have been grouped into not more than 8 lots for international public bidding purposes in order to make them more attractive to private engineering firms in the other member countries and at the same time saving on costs. The works of the component for rehabilitation of the 130 systems have been grouped in not more than 12 lots. Nor are any problems expected to arise in delivery of the local goods to be supplied by the different winning contractors.
- 4.29 As previously mentioned, the goods to be imported, such as the pumping equipment, wellscreens, hypochlorinators, vehicles, equipment for hydrogeological studies, electromechanical equipment, audiovisual materials and other items, as well as the production meters, will be purchased by SENDOS in international public bidding operations for subsequent delivery to the contractors executing the works. Nor is any difficulty anticipated in their delivery on schedule. The household meters will also be acquired by the international public bidding process, and it is expected that, when the appropriate margin of preference is applied, they could be of local manufacture.

I. Lands and Rights of Way

- 4.30 The lands on which the wells would be drilled and the reservoirs built for the different systems are small, and, on the whole, of very low cost. Hence, it has been considered that the lands needed for this program would be obtained as contributions by their owners to the community or as contributions of the community following purchase from current owners. This was the experience with the systems built in the Second and Third Stages.
- 4.31 As indicated in Chapter II above (see paragraph 2.32), for cases in which the land is not voluntarily donated or sold, there is an appropriate legal procedure ^{1/} that allows SENDOS to summarily expropriate and take possession of the lands needed for execution of the works. This procedure had to be used in the Third Stage in only four cases, and at a cost in the equivalent of US\$17,000. The budget for the proposed stage provides an amount of US\$313,000 for the

^{1/} Article 16 in Decree Law 2050 of November 23, 1977, establishing SENDOS.

acquisition of lands and rights-of-way. As part of the advance promotional work, before proceeding to the construction of the works SENDOS must, in all cases, obtain documentary evidence, signed by the owner or owners in the presence of a notary, of their granting to SENDOS material tenancy of the lands and also the commitment to transfer ownership thereof, all without prejudice to the commitment to establish rights-of-way whenever necessary. As indicated in paragraph 2.37, it is recommended that the commodatum formula be accepted for purposes of compliance with the standard contractual clause to be established in the possible loan contract, by which SENDOS would be required, prior to issuing invitations to bid for the construction of each system, to present to the Bank satisfactory documentary proof that it enjoys legal possession of and the requisite rights to the land on which the works would be constructed (see Recommendations).

J. Bidding Timetable 1/

1. Procurement

- 4.32 SENDOS would carry out not more than nine international public bidding operations for procurement of the goods required for execution of the fourth stage. Following is a list of the scheduled bidding operations and the estimated value of each, which includes cost escalation.

(In US\$ thousands or equivalent)

	<u>Quantity</u> <u>Unit</u>	<u>Year 1</u>		<u>Year 2</u>		<u>Year 3</u>		<u>TOTAL</u>
		<u>Half-year</u>		<u>Half-year</u>		<u>Half-year</u>		
		1	2	1	2	1	2	
1. Power pumps	200	-	620	-	-	-	-	620
2. Well screens	450 m	-	150	-	-	-	-	150
3. Hypochlorinators	450	-	200	-	-	-	-	200
4. Household meters	14,500	-	270	-	-	-	-	270
5. Production meters	300	-	60	-	-	-	-	60
6. Electromechanical equipment	-	-	-	240	-	-	-	240
7. Self-propelled cranes	6	-	-	-	300	-	-	300
8. Vehicles	40	-	-	-	718	-	-	718
9. Gaging pumps	-	-	-	60	-	-	-	60
Subtotals		-	1,300	300	1,018	-	-	2,618

1/ The timetable for the bidding for and execution of the hydrogeological studies, water sources, construction of wells, and works for installation of the rural water supply systems are presented in Appendix IV-9.

2. Works

a. Wells

- 4.33 In keeping with the Preliminary Plan for Execution of the Program, SENDOS would carry out no more than 4 local bidding operations for the drilling of the remaining wells required to complete the program. These bidding operations would be carried out as follows:

<u>Bid No.</u>	<u>Scope</u>	<u>No. of works</u>	<u>Total cost US\$</u>	<u>Opening date for bids</u>	<u>Closing date for bids</u>	<u>Start of Works</u>	<u>Comple- tion of works</u>
1	Local	13	109,150	Apr/86	Jun/86	Aug/86	Dec/86
2	Local	13	109,150	Jun/86	Aug/86	Oct/86	Feb/87
3	Local	13	109,150	Aug/86	Oct/86	Dec/86	Apr/87
4	Local	<u>14</u>	<u>117,500</u>	Oct/86	Dec/86	Feb/87	Jun/87
Total		53	445,000 <u>1/</u>				

b. Installation of services

- 4.34 Construction of the 212 water supply systems in the Third stage required 18 international bidding operations to be carried out in four years (1981-84). All together, 118 works contracts were entered into with 32 construction firms, and 33 of those contracts were for amounts above the equivalent of US\$100,000. The works contracts ranged between US\$21,200 and US\$230,000. Owing to the dispersal of the 190 works under the proposed program, it has been thought best to divide them into larger groups than in the preceding stage, and the works for construction of the water supply systems would hence be carried out during the first three years in lots to be let in 8 international public bidding operations as follows:

1/ Including contingencies and escalation.

<u>bid No.</u>	<u>Scope</u>	<u>No. of works</u>	<u>Total cost US\$</u>	<u>Opening date for bids</u>	<u>Closing date for bids</u>	<u>Contract and Start of Works</u>	<u>Completion of works and entry into op- eration</u>
01-86	Internat.	50	3,735	06/86	08/86	09/86	12/87
02-86	Internat.	22	1,645	08/86	10/86	11/86	11/87
01-87	Internat.	20	1,495	05/87	07/87	08/87	08/88
02-87	Internat.	20	1,495	07/87	09/87	10/87	10/88
03-87	Internat.	20	1,500	09/87	11/87	12/87	12/88
01-88	Internat.	20	1,500	05/88	07/88	08/88	08/89
02-88	Internat.	20	1,495	07/88	09/88	10/88	10/89
03-88	Internat.	18	1,340	09/88	11/88	12/88	11/89
Total		190	14,200	(Unit Cost per Service: US\$74,740).			
		===	=====				

c. Rehabilitation and improvement works

4.35 The rehabilitation and improvement works would be executed over the first three years of the program in lots to be awarded in not more than 12 international public bidding operations with an average value of US\$240,000, as follows:

<u>Bid No.</u>	<u>Scope</u>	<u>Region</u>	<u>No. of works</u>	<u>Total cost US\$ thousands</u>	<u>Opening date for bids</u>	<u>Closing date for bids</u>	<u>Start of Works</u>	<u>Comple- tion of works</u>
01R-86	International	IV	10	340	05/86	07/86	09/86	07/87
01R-86	"	IV	11	380	08/86	10/86	12/86	10/87
03R-86	"	V	12	375	10/86	12/86	02/87	01/88
01R-87	"	VI	14	310	02/87	04/87	06/87	06/88
02R-87	"	VI	11	320	04/87	06/87	08/87	06/88
03R-87	"	VII	12	230	07/87	09/87	11/87	10/88
04R-87	"	VII	11	225	09/87	11/87	01/88	11/88
05R-87	"	VIII	12	125	11/87	01/88	03/88	02/89
01R-88	"	VIII	13	130	03/88	05/88	07/88	07/89
02R-88	"	IX and X	9	100	05/88	07/88	09/88	06/89
03R-88	"	X	9	105	07/88	09/88	11/88	08/89
04R-88	"	Metropol.	6	230	09/88	11/88	12/88	09/89
12 lots in 8 regions			130	2,870	1/			

1/ Including contingencies and price escalation.

- 4.36 The technical justification for the rehabilitation and improvement works is that they will preserve for a longer time the investments already made in beneficiary localities and enhance the efficiency of the service by increasing the water volume in some localities, extending the service to new areas, and improving the pressure and continuity of the supply. This subprogram satisfactorily implements the Bank's policy on operation and maintenance and on basic environmental sanitation. The documentation on the 130 works to be carried out under the rehabilitation and improvement subprogram is on file in the Bank's technical units.

K. Timetable for Investments and use of Funds

- 4.37 The Bank's funds would be disbursed over 4 years running from the date of signature of the loan contract. According to the Preliminary PEP, the investment timetable for the program would be as set forth in detail in the Appendix IV-10 and summarized as follows:

(Equivalents of US\$ thousands)

<u>IDB loans</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>	<u>Total</u>	<u>%</u>
- Foreign exchange (IC)	2,658	3,302	4,187	3,353	13,500	45
- Local currency (OC)	800	900	890	910	3,500	11
- Local contribution	<u>3,471</u>	<u>3,610</u>	<u>3,025</u>	<u>2,894</u>	<u>13,000</u>	<u>44</u>
Total	6,929	7,812	8,102	7,157	30,000	100
	=====	=====	=====	=====	=====	
Percentages	23.1	26.0	27.0	23.9	100.0	

L. Household Connections

- 4.38 The water supply system of each locality would have a capacity to supply 100% of the existing and design housing units through household connections. At the end of the construction period, 80% of the target population would be served through about 13,000 connections, as under the program of the Third Stage.

M. Installation of Meters

- 4.39 SENDOS proposes to purchase, with funds of the possible loan, 14,500 household consumption meters to complete the installation in progress of meters on existing connections of the rural water supplies built under the programs of loans 74/TF, 499/SF and 393/OC-CH. For the works of the proposed Fourth Stage, the contractors would obtain and install the aforementioned required 13,000 household meters. In addition, SENDOS would acquire 300 production meters for installation in the localities of the First, Second, Third and Fourth Stages.

- 4.40 In 1979, in response to requests of the water supply committees, SENDOS has been installing household meters, and has so far emplaced them in 52,000 of the 68,474 household connections installed on June 30, 1985, in all operating systems. It has also installed 500 production meters in as many systems.
- 4.41 In the preceding operation, household and production meters were purchased and installed in keeping with the policy adopted by SENDOS in 1979 of installing household meters in all rural water supply systems operated by pumps in order to make the most efficient possible use of the water. This equipment was financed with funds of loan 393/OC-CH. The criterion of the policy adopted is novel in the general context of rural water supply systems, in which it is unusual for meters to be installed.

N. Installation of Hypochlorinators

- 4.42 Based on the experience of program 393/OC-CH ^{1/} the hypochlorinators for disinfection of the water would be installed concurrently with construction of the works for each system. It is provided that, prior to the start of the works, SENDOS would purchase the 450 hypochlorinators envisaged for the program, the international bidding operation for which is scheduled to take place concurrently with that for the pumps, screens and meters, that is, during the first two years of execution of the program.

O. Technology of the Program

- 4.43 In their execution of the program works, the winning construction firms would make extensive use of unskilled labor, and what little construction equipment they used would be essentially for drilling the wells and building the reservoirs. The technology to be used in providing drinking water in the different supply systems is regarded as appropriate for the following reasons: (a) it is simple to build, upgrade and maintain; (b) it is highly reliable; (c) it makes extensive use of local resources, both human and material; (d) its cost is compatible with the existing monetary resources; and (e) it provides a continuous water supply of useful quantity and of a quantity sufficient for most of the users. The typical well for the systems will be 8" in diameter and be sunk to an average depth of 45 meters, and have a 2-lps pump, a 3-HP electric motor with an electric hypochlorinator; a metal water tower 15 meters high with a capacity of 40 m³; a distribution pipe network averaging 4,150 meters long, and 70 metered house connections. In the cases in which surface water is used, the water would be treated with special filters and infiltration galleries requiring no complicated or costly equipment.

^{1/} See paragraph 2.30, above.

P. Ecological and Environmental Considerations

- 4.44 In none of the localities in which water supply systems would be built or rehabilitated would any works be executed that could adversely affect the ecology or the environment. In the supply systems of the Fourth Stage, the pipe to be used would be mainly PVC, both for conduits and distribution mains. In the localities where water supply systems were built several years ago with asbestos-cement pipes, the chemical quality of the water will be strictly monitored so that corrective measures may be taken to prevent the cement in the pipes from being destroyed and so releasing the asbestos into the water flow, to the possible -if minimal- risk to users. This monitoring will be effected under the annual maintenance plan, and SENDOS will be required to present reports to the Bank on completion of the execution of the proposed program (see paragraph 4.49).

Q. Verification of the Recommendations of the Operation Evaluation Office (OEO)

- 4.45 The recommendations made by the OEO in document GN-1299 have been taken into account in the analysis of this operation.

R. Operation and Maintenance

- 4.46 The operation and maintenance of the systems to be built will be the responsibility of the water supply committees, which will receive technical and administrative advisory services from SENDOS through its regional directorates, as is now being done in a satisfactory manner for the systems financed by operations 74/TF, 499/SF and 393/OC-CH.
- 4.47 One activity for the maintenance of a system is monitoring the quality of the water (see paragraph 2.32). Thanks to the improvement of SENDOS's facilities for monitoring both urban and rural centers, for which it completed the outfitting of 14 regional laboratories throughout the country during 1984 with resources of IBRD loan 1832-CH, water quality is today monitored regularly in all localities with supply systems, which helps reduce morbidity and mortality from enteric diseases in urban centers and rural areas.
- 4.48 SENDOS has implemented the regulations for the administration, operation and maintenance of rural drinking water supply services, approved by Resolution D.O.S. 679 of February 1977, which has been revised and is considered satisfactory. The water supply committees are obliged to apply these regulations, which have been used in the programs of operations 393/OC, 499/SF and 74/TF-CH. With some modifications, they would be applied to the systems to be built through the proposed operation. These regulations are presented in Appendix IV-11. To ensure their application, it is recommended that a clause be written into the possible loan contract requiring that the systems under the program be administered, operated and maintained in keeping with generally accepted technical standards (see Recommendations).

- 4.49 To ensure the fulfillment of a plan for maintenance of the services and enable the Bank to be informed on and verify its execution, it is recommended that a contractual clause be required obligating SENDOS to present to the Bank within the first quarter of each year during the first 10 years following acceptance of all works (i) an annual plan for maintenance of the systems, and (ii) a report on the maintenance of the previous year, setting forth in detail the degree of operating efficiency and the state of repair of the systems, including the chemical quality of the water - in order to verify the ionic equilibrium of the water delivered - to the consumer by the appropriate index for systems using asbestos cement pipes (see Recommendations).

S. Advances of Funds

- 4.50 Owing to the nature of the program and the number of bidding operations for the purchase of goods and contracting of works to be carried out during the first three years of execution, it is recommended that advances of funds from the loans be authorized up to an amount equivalent to the actual payment requirements for a period of 120 days and up to an amount not greater than 10% of the total amount of the two possible loans, of: (i) US\$13.5 million from IC; and (ii) the equivalent of US\$3.5 in local currency from the OC.

T. IDB Inspection and Supervision

- 4.51 The Bank's inspection and supervision of the program would be carried out through its field office in Chile.

V. THE BORROWER AND EXECUTING AGENCY

A. Institutional Analysis

1. Background

5.01 The borrower of this loan to provide partial financing for the fourth stage of the Rural Drinking Water Supply Program would be the Republic of Chile. The executing agency would be the National Water Service (SENDOS). As in the earlier operations, 1/ SENDOS would be responsible for executing stage IV and supervising, at a later time, the operation of these systems. Prior to the start of these works, SENDOS and the Water Committees of the beneficiary communities would sign agreements on operation of the local services.

2. Legal system, purpose and organizational structure

5.02 Decree Law 2050 of November 23, 1977, which reorganized the water and sewerage sector 2/, established SENDOS as an independent state institution, operating under public law with its own legal personality and assets separate from those of the government. It has an undefined duration and a decentralized territorial structure and interacts with the government through the Ministry of Public Works. SENDOS is the legal successor of all water and sewer service agencies that existed as of the date of its establishment. These were:

- (i) The Directorate of Sanitary Works (D.O.S), which was responsible for planning, building, operating and maintaining the national sanitary infrastructure.
- (ii) The Directorate of Sanitary Services (D.S.S.), which was responsible for extending the water and sewer lines of existing systems.
- (iii) The Rural Sanitation Office, which was responsible for carrying out a rural drinking water program which ended in 1970, and was supported by the IDB.
- (iv) The Sanitary Engineering Sector of the Agrarian Reform Corporation (CORA), which is part of the Ministry of Agriculture.

1/ The executing agency of the first stage of the Rural Drinking Water Program was the Rural Sanitation Office of the Ministry of Health.

2/ Chile has defined the water sector as a national activity area. This sector in turn has several subsectors (irrigation, energy and others), sanitary works among them.

- 5.03 It is worth noting that SENDOS has still not become an independent enterprise, as called for in its establishing legislation. It now operates as a decentralized agency within the organic structure of the Ministry of Public Works. This organizational structure appears in Appendix V-1. The Institutional Development Committee was established to attend to aspects relating to implementation of the new institutional status of SENDOS. This committee, which reports to the National Director, has functions beyond those of general coordination and advisory assistance. 1/ The immediate goal of this unit is to finalize the draft statute and functional regulations for the service. That way, SENDOS will be able to start operating as a public autonomous institution in 1986. 2/
- 5.04 The purpose of this service, according to law 2050, is to plan, control, study, maintain, improve, operate, finance and administer all water and sewer works and services, and to supervise the treatment and elimination of liquid industrial wastes in urban and rural areas.
- 5.05 To achieve these broad objectives and others associated with institutional, financial, commercial and technical matters, SENDOS has adopted the organizational structure which appears in the Appendix V-2. As can be seen there, its basic institutional functions are performed by organizational units at the executive, advisory and line levels. Among the former is the National Directorate, which is responsible for highest level direction and administration of SENDOS. This office receives support from the National Subdirectorate and advisory assistance from the following national units: Industrial Development (institutional status of SENDOS and general coordination); Planning (the National Sanitary Works Plan, supervision of overall management, credit needs and arrangements, evaluation of projects); Legal Counsel (juridical and legal matters and preparation of opinions and contracts), Internal Audit (trustworthiness and adequacy of records system); Public Information and Relations. The line units, for their part, exercise supervision and control through the following departments: National Programs (development and coordination of national urban and rural sanitary works plans, technical assistance and supervision of operations of rural drinking water services); Construction (execution and control of national works programs and supervision of progress on regional works); Technical (technical control and evaluation of studies and designs of water and sewerage systems and water quality, supervision of the activities of regional directorates);

1/ Other responsibilities given to the Committee relate to strengthening its staff (See Section 3, Personnel, following), and "Developing a legal and regulatory system to unify and systematize present laws on rain water and others which set out the agencies responsible for financing, construction and operation."

2/ One of the Ministerial Tasks for 1985 is "To issue the organic statute of SENDOS, in accordance with D.L. 2050". The responsible organ is M.O.P.-SENDOS.

Finance (control of accounting, budget, commercial and financial activities of SENDOS at the central and regional levels); and Administrative (personnel, purchases, supplies, storage).

- 5.06 The remaining part of the SENDOS organizational structure consists of the Regional Directorates. A typical regional directorate structure appears in Appendix V.3. This is the organic structure and details of functions established for SENDOS at the regional level. This organization and the basic responsibilities assigned to it are considered adequate. The directorates are operational organs whose purpose is to administer, operate and maintain urban water and sewer services by executing plans and programs for the geographical area assigned to it. In carrying out this work, these offices prepare their projects, bid on, contract and inspect their own construction projects. The regional directorates are very autonomous although their activities have to conform to the national policy and programming set by the Ministry of Public Works through SENDOS. 1/

3. Personnel

- 5.07 The administrative department of SENDOS administers the organization's human resources through its Personnel Subdepartment. This unit coordinates its activities with counterpart units at the regional level. The extremely large staff of earlier years has been pared to the service's most basic needs. In 1984, the staff was only one quarter as large as it was in 1973, as can be seen below:

<u>Year</u>	<u>Total staff</u>	<u>Index</u> <u>(Base year 1973=100)</u>
1973	11.495	100
1977	5.683	49
1981	3.072	27
1984	2.898	24

- 5.08 Besides streamlining service activities, the staff reduction was helpful in containing the growth of public sector personnel expenditures and achieving the desire of authorities to convert the regional directorates into autonomous enterprises. This decision to convert, however, was later reversed and the original structure kept. The magnitude of these staff reductions 2/, at a time when the service infrastructure

1/ The water and sewer sector also encompasses the Regional Enterprises established in the Metropolitan Regions (EMOS) and the Fifth Region (ESVAL). These are autonomous state enterprises linked to the executive branch of government through SENDOS with which they maintain a merely regulatory relationship.

2/ Applicable law froze new hirings and allowed only one of every five vacancies to be filled. For 1985, the SENDOS budget law has released it from this restriction.

was expanding greatly, took a toll on normal development of SENDOS. To deal with this situation, in 1984 SENDOS decided to hire a Pan American Health Organization consultant to determine how many persons should be employed to ensure adequate operation of sector agencies, including EMOS and ESVAL, the autonomous enterprises. The Ministries of Public Works and Finance decided that for 1985 SENDOS should have 398 new employees. Based on a review of the consulting study and the service's needs, this number appears reasonable.

5.09 The SENDOS staff as of June 30, 1985, appears listed by speciality and regional distribution, in the table on the following page.

5.10 The following table has been prepared as a rough estimate of the overall productivity of SENDOS personnel:

Year	Average number of employees	Average number of connections	Billing, thousands m3	Connection/ Employee		Billing/ Employee	
				Number	Index	Number	Index
1981	3,190	650,477	175,356	204	100	54,970	100
1982	3,008	672,821	186,520	224	110	62,008	113
1983	2,921	697,170	192,927	239	117	66,049	120
1984	2,898	723,513	200,166	250	122	69,070	126

5.11 As the following table shows, the overall growth of the SENDOS staff during the analysis period is satisfactory, considering the changes in the number of connections and the billing of cubic meters consumed. Also, the values of the indicators compare well with those of similar Latin American enterprises.

4. Budget, accounting and financial management

5.12 The Finance Department is in charge of managing all SENDOS budget, accounting and financial systems. This department centralizes and consolidates information generated by the regional directorates. The budget cycle, for both MOP and SENDOS, starts with a draft of the proposed budget, following the rules and procedures of the State Financial Management Law (Decree Law 1263 of 1975) and policy guidelines handed down by the Ministry of Finance. It concludes when the Office of the Controller General of the Republic approves the final budget statement submitted to it. Throughout this process, MOP and SENDOS prepare monthly budget statements for distribution to the areas of responsibility and to outside parties, for control purposes.

SENDOS PERSONNEL, BY REGION 1/
As of June 30, 1985

Position	I		II		III		IV		V		VI		VII		VIII		IX		X		XI		XII		M.	
	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.	Pres.	Fut.
Regional Director																										1
Regional Subdirector																										1
Regional Depart. Chiefs																										7
Administrative	6		6		4		9		2		9		6		12		8		7		2		2			19
Professionals	20	2	32	7	13	3	23	3	2		30	7	36	2	66	5	38	1	33	6	9		11	2		78
Administrators	65	3	63	2	50	6	68	1	1		75	4	88	6	177	4	75	1	90	8	14	2	20	2		110
Services	104	34	134	40	53	14	116	29			124	22	137	28	378	58	136	33	163	49	28	4	57	2		80
	195	39	235	49	120	23	216	33	5		238	33	267	36	633	67	257	35	293	63	53	6	90	6		296
	==	==	==	==	==	==	==	==	=		==	==	==	==	==	==	==	==	==	==	==	=	==	=	==	==

Source: Personnel Subdepartment.

- 5.13 In 1983 SENDOS started an accrual-basis accounting system to improve its information system. It distributed an accounts plan and manual to all the regional directorates for their use. The accounting data from this system, processed mechanically in each region by outside data processing services, go to the central level for review and consolidation. Besides many budget reports, the system also prepares a general balance sheet and profit and loss statements from the accrual-basis accounting system. Private external auditors have denied opinion on these statements because they found deficient asset appraisals and currency indexation problems in them. Other problems were missing physical inventories of stock on hand and cases of omitted liabilities. All of this distorted the final representation of assets, liabilities, net worth and final operating figures. To eliminate these deficiencies, three principal work areas have been developed to review and correct the assigned appraisals of fixed assets ^{1/}, to design and implement the cost accounting system and to implement the accounting system and its support subsystems (billing and collections, supplies, treasury and payroll). The alternative currently being explored includes hiring of consulting services to execute all or part of this work. In connection with this situation, the recommendation is to have the prospective loan contract include a clause calling upon SENDOS to submit, no later than twelve months after the loan contract goes into effect, a plan and timetable for normalizing its assets accounting system. This plan should incorporate, at a minimum, the necessary measures to: (i) appraise adequately the fixed assets of the regional and central directorates, based on a physical inventory; (ii) reconcile the composite lists of user accounts receivable from the different services with the control accounts of general accounting; (iii) implement a reasonable cost accounting system; and (iv) improve support subsystems in billing and collections, supplies, treasury and payroll. Evidence will be required, no later than 36 months after the effective date of the eventual loan contract, that these measures have been implemented adequately (See Recommendations).
- 5.14 SENDOS limits its central financial functions to review and control of service billings and collections which are handled independently by each regional directorate and their accounting and finance departments. The main vouchers for disbursements also come from the regional levels and go, later on, to the regional directorates of accounting and finance of the Ministry of Public Works for final payment.

^{1/} The appraisals of fixed asset goods came from a technical reappraisal, later changed by SENDOS. Consequently, these figures are estimates and do not correspond to historical purchase costs, indexed for inflation, as generally accepted accounting principles require.

- 5.15 Financial planning, for its part, follows three-year investment and operating expenditure plans. These are updated annually in accordance with a budget framework issued by the Ministry of Finance and the priorities set by the Ministry of Public Works. The sources of financing for the three-year plan are also identified at this time. Typically, these include operating income from water bills, government contributions and debt.

5. Data processing

- 5.16 SENDOS has included the Sub-department of Statistics and Data Processing in its organization structure to identify and determine all data which require computer processing, and to analyze, design, establish and maintain data systems and subsystems. It has made this sub-department part of its national planning unit. Besides these principal functions, this sub-department gathers, processes, consolidates and distributes internally marketing information from the Regional Directorates. It also publishes this information periodically in statistics bulletins.
- 5.17 The processing applications currently used are the following: (a) billing and collections; (b) accounting; (c) inventory control; (d) fixed assets; (e) personnel; (f) investments; (g) commercial operations; and (h) special processes. Many of these systems are in the hands of outside companies which operate them under service contracts awarded by each Regional Directorate. The major reason for this method has been limited data processing hardware. At this time SENDOS has only one small computer to run all its data processing work. In an effort to correct this problem, SENDOS has drafted a document, now being revised, which sets out its different data requirements. These requirements include those stemming from supervision of the rural drinking water systems and the data processing structure required.

6. Insurance system

- 5.18 The present legal system ^{1/} authorizes the National Director to take out insurance policies against all types of risks. SENDOS policy, however, is to not cover any assets except automobiles, counted in its net worth against any types of risks. Considering these circumstances and the normal IDB practice of not requiring public water and sewer service enterprises to have insurance, it is not recommended that the possible loan contract include any such special condition.

7. Purchases and contracts system

- 5.19 The SENDOS Administrative Department coordinates all activities involving purchases of goods and services. Through its different sub-departments, this department prepares purchase documents or contracts,

^{1/} Law 15,840, article 9.

invites suppliers (a minimum of three) to submit price quotes and conducts private or public competitive biddings, in accordance with current law, opens price quote or bid procedures and, on the basis of internal committee opinions, proposes purchase or service contract awards to the director of SENDOS.

- 5.20 Decrees 61 and 62 of February, 1983, 1/ issued by the Ministry of Public Works, set the legal structures and amounts for authorizations of purchases, expressed in Tax Units, by level of authority and origin of goods. Purchases made with IDB and IBRD funds, is noted, must follow procedures arranged with those agencies. For the construction of works, supplies of goods and provision of services charged to funds of the loan in question, the bidding competition procedures agreed with the IDB 2/ shall apply.

8. Internal control

- 5.21 The SENDOS central control system includes an internal audit unit as part of its organizational structure. To this time, however, this unit has not had the staff it needs to perform this work effectively. Since 1982, four Regional Directorates have established visitation and control units to perform standard internal audit functions. For this year, the intention is to hire an auditor for each of the other six Regional Directorates. This will bring to ten the total number of such regional offices with this control structure. These additions are in line with the recommendation of the consultant who conducted the staff study mentioned in Section 3, Personnel, above.
- 5.22 The Regional Directorates are in charge the actual operating responsibilities of SENDOS and the central units are responsible for overall direction and coordination, in addition to supervision and control of other functions within their individual areas of competence. Nevertheless, it is believed prudent to recommend that an internal audit unit be established, as the Organic Structure and List of Functions of Central Level SENDOS provides. The present supervisory functions are not adequate substitutes for internal audit tasks which are responsible for documenting, testing and evaluating the rural records system to determine, independently, how reliable it is. This evaluation should apply to all levels: advisory, departmental and operational. In connection with the operation in question, it is recommended that the borrower submit, through the executing agency, and no later than one year after the effective date of the possible contract, a plan to the IDB containing an execution timetable for organization, operation and staffing of experienced professionals in the SENDOS Internal Audit

1/ Other applicable laws are M.O.P. Decree 130 (Contracting regulations for consulting services); the regulations to contract public works approved by M.O.P Decree 1340 of 1965 and later amendments, and law 15,840 (Organic Law of M.O.P.) and its article 50, which deals with contracts awarded following public bids.

2/ See Proposed Resolution.

Unit. In addition, it must show, no later than 36 months after the effective date of the eventual loan contract, that the agreed plan has been implemented and the internal audit is operating adequately (see Recommendations).

9. External control

5.23 External control of SENDOS management is the work of:

- (a) The Office of the Controller General of the Republic, which examines the budget execution of both SENDOS and the Ministry of Public Works. In addition, the Controller's delegations assigned to MOP and its regional delegations verify SENDOS disbursements and supplement these verifications by visits to the different Regional Directorates. It also conducts periodic reviews of administrative acts 1/ sanctioned by Resolutions of National Director and the Regional Directors. Finally, the Controller's Office is responsible for examining the financial statements of programs financed in part by IDB resources; 2/
- (b) A firm of certified public accountants 3/, which audits the assets and liabilities and profit and loss statements of SENDOS, in accordance with World Bank instructions; this firm has refused to give an opinion on the 1983 and 1984 statements, and
- (c) Inspection service by the Ministries of Public Works, Finance and Economy, based on regular reports prepared by SENDOS.

5.24 In connection with the operation in question here, it is recommended that the financial statements for the program be submitted with an audit report from the Office of the Controller General of the Republic, while the program is in execution and the statements of SENDOS 4/, for

1/ These reviews check the legality of those resolutions and whether they have been issued in exercise of delegated rights and powers.

2/ The Controller's Office issued opinions, with exceptions, on the statements for the project financed in part by loan 393/OC-CH. These exceptions related to the existence of overvaluations and undervaluations that affect the reasonableness of the figures they present. The Bank is following up this situation. The office's opinion on the financial statements for the operation financed in part out of loan 115/IC-CH contains no exceptions.

3/ According to the ruling issued by the Office of the Controller General of the Republic on April 15, 1983, no provision exists enabling state agencies subject to inspection by the Controller's Office to contract public accounting firms to audit their financial statements.

4/ The SENDOS financial statements are prepared from the accrual-basis accounting system. The purpose is to reflect the financial status and operating profit and losses in accordance with generally accepted accounting principles. The independent audit requirements of the IDB should be taken into adequate account when the statements are examined.

the life of the loan. The first financial statements will cover the 1986 fiscal year (See Recommendations).

10. Rural drinking water services

1. Management of rural services

- 5.25 The rural water systems which receive fundamental IDB funding and SENDOS assistance for organization in the rural communities are not SENDOS agencies. Therefore, neither their income nor expenses are entered recorded in the budget or accounting books of SENDOS. Each interested community organizes a Water Committee and nominates a Board of Directores which is later ratified by a municipal or office of government decree.
- 5.26 Before a water system is built, SENDOS and the individual Rural Water Committee sign an agreement under which SENDOS, with IDB approval, agrees to build a drinking water service and turn it over in operating condition to the committee. The committee, in turn, agrees to administer, operate and maintain the system. Through the agreement SENDOS also undertakes to provide advisory assistance to the committee in technical, administrative, legal and accounting matters, and to train its leaders. Furthermore, SENDOS sets the amount of contribution from each user, approves the rate schedule and sees to it that the operating regulations are enforced. The Water Committee, on the other hand, agrees to provide land, collect bills and see to it its members pay their contributions and abide by the operating regulations.
- 5.27 The operating regulations of the Rural Water Services, in effect at this time, were approved by Resolution D.O.S. 679 of February 1977. These are the same regulations, with minor changes, that have been in effect since 1965. After it was determined that the operating characteristics of the services necessitated changes in the regulations, a new draft ^{1/} was prepared. These new regulations went into effect on June 1984 for all services included in the third stage of the Rural Drinking Water Supply Program. Since these were temporary in nature, the regulations should need revision once again. The results of the temporary regulations are being evaluated with the Regional Directorate and the National Program Department (DEPRONA). A new document is expected during the second half of this year.

2. Supervision of rural service administration

- 5.28 The SENDOS organization includes, as noted before, a National Program Department (DEPRONA), to act as the executing unit of the fourth stage of this program. The structure shown in Appendix V-4 has been adopted for this purpose. The National Rural Drinking Water Program has 134 persons on its staff. Appendix V-5 shows their geographic distribution

^{1/} See Appendix IV-11.

and functions. Considering the requirements of this program, the size of this staff is considered reasonable.

- 5.29 The operations of the rural water services are supervised at both the central and regional levels. At the central level, the Promotion Subdepartment supervises the regional promotion teams of social workers by issuing and enforcing work guidelines for best operation of the rural systems. At the regional level, the social assistants perform direct supervision over service administration through the following activities: (a) regular assembly meetings with system users to encourage participation and payment of contributions and service bills, maintenance of installations and proper uses of drinking water; (b) training meetings for the boards of directors of the communities to discuss the functions of leaders, administrative and accounting aspects and setting of rates; (c) accounting and financial control of the service and half-yearly surveys of its financial figures; (d) control of delinquent service payments through educational activities for late payers and advice to community leaders; (e) sanitary education of the community through film and slide shows.
- 5.30 Finally, it should be mentioned that supervision and advisory assistance for the operation and maintenance of the rural systems are conducted satisfactorily from the central level through the Technical Assistance Subdepartment (DEPRONA) and at the regional level through the Rural Drinking Water Departments and their Execution and Technical Assistance and Promotion Subdepartments.

11. Rate system 1/

1. Urban systems

- 5.31 Decree law 2050 of November 1977 established the rate for this sector. This law states that SENDOS is responsible for "... submitting to the Ministry of Public Works proposals on the rates that users should pay for the services provided by the regional directorates and the enterprises, which must be approved by joint supreme decree from the Ministry of Public Works and the Ministry of Economy, Development and Reconstruction." In actual practice, the national director submits them to the Minister of Public Works for approval. The minister, in turn, proposes them to the Ministry of Economy. After this process is completed, only step remaining before these fees take full effect is the "Statement of Reason" issued by the Office of the Controller General of the Republic.

1/ The effect the rate policy has had on economic-financial management of SENDOS and on the operation of the rural systems, and the compliance with rate clauses in current loan contracts, are reviewed in the Historical Financial Analysis section.

- 5.32 The basic criteria governing the sector's rate policy are: (a) the rates should finance all operating and maintenance costs and the financial contribution for expansion of water and sewer systems; (b) resources must be allocated efficiently so that the cost of a cubic meter of water to the user is equal to the marginal cost paid by the enterprise to produce it; (c) the rates should consider the average long-term cost, so that the cost of expanding service can be included. It should be noted, however, that these criteria are only a frame of reference for computing the rates since the final figures are always affected by political and social factors.
- 5.33 A rate structure is developed after the aforementioned criteria are applied and weighed against other factors. The components of this structure are: (a) fixed charge, which is billed, according to diameter of connection, separately from any amount of water consumed; this helps to recover the fixed operating costs; and (b) a variable charge, which depends on the number of m³ of water consumed, for the purpose of repaying variable operating expenditures. It should be mentioned that until May 1984 a "flat rate" structure was in effect for each region. Under this system, prices were the same for all users and amounts of consumption. Later on, to mitigate the effect of rate increases on lower income users and to bring under control increases in amounts receivable from clients attributable to implementation (from August 1981) of the flat rate system, it was decided to use a differentiated rate system once again. The new rates ^{1/} do not distinguish between types of consumers but they do take into account the volume of consumption and connection diameter. Under the new structure, the present rates favor users with small-diameter connections (13mm) who consume small amounts of water (0 to 10m³). The system recognizes that such consumers are those with the least ability to pay. Users with connections larger than 13mm and consumption of more than 30m³ of water, and all other users, are charged the full rate for their entire consumption. This does not apply, however, to users with 13mm connections, who use less than 31m³. These persons pay the lower rate for their first 10m³ of water billed.
- 5.34 Finally, the sewer system rate also applies the aforementioned criteria. This rate, subdivided into a fixed charge and a variable charge, charges for the total cost of operation and maintenance of the sewer system, based on the connection diameter and cubic meters of water consumed by sewer system customers.

2. Rural services

- 5.35 The rates that rural water system users pay are set, as contractually arranged with the IDB, ^{2/} so that they cover all operating, maintenance and management expenses and, insofar as possible, depreciation. The Rural Water Committees set these rates, subject to SENDOS

^{1/} Decree 183 of June 1984.

^{2/} Loan 499/SF-CH.

approval. The central office of SENDOS supervises rate questions, as does each regional directorate of SENDOS, through its rural water department and technical assistance and promotion subdepartments.

5.36 It should be noted that the rate systems of approximately 82% of the rural systems are based on measurement and billing of actual consumption. The purpose of the water meter installation program started in 1978 was to correct the situation of deteriorating water service. The services were declining because of indiscriminate use of water, premature end of useful life of equipment and installations, delinquencies and desorganization caused by internal community conflicts. The individual house metering program has had very positive effects on service operations. It has led to less wear and tear on equipment and installations through fewer hours of operation, savings of electrical energy (85% of the services have electro-mechanical water pumping systems), a substantial decline in unexplained water use, incentives to pay rates based on actual consumption by each user, and building of community spirit.

5.37 Besides the monthly billings for actual consumption, users pay a contribution fee for the connection. The current amount of this fee is \$8,100 (US\$48.00). payable over a maximum term of 30 months. This amount is adjusted in accordance with the consumer price index, when public sector employees receive their salary adjustments. The water service installation projects include the financing of house connections for families connected during the service construction stage. Others connected to the system later on must finance the cost of materials included in the house connection, including the meter, and pay the connection fee as well.

B. Historical Financial Analysis 1/ 2/

1. Background

a. General

5.38 SENDOS is an autonomous state institution, operating under public law, with its own legal personality and assets.

b. Financial system

5.39 As Decree Law 2050 states, SENDOS has the following resources: (a) the proceeds from its water bills; (b) income from billing for items such as connection fees, cut-offs and service restorations, interest, fines and other fees; (c) funds appropriated to it by budget

1/ This analysis was drawn from SENDOS final budget statements.

2/ For the financial analysis, the historical figures have been expressed in constant currency for 1984 and converted to United States dollars at the rate of \$98.50 = US\$1.00.

laws in the form of fiscal contributions, as well as all other resources appropriated under other general or special laws; (d) the proceeds from any sales of assets; (e) resources from loans contracted which, according to Decree Law 1263, must be authorized in a decree from the Ministry of Finance.

c. Taxes

- 5.40 With the exception of income tax, SENDOS is liable for payment of taxes. Besides others, it must pay taxes on imported goods and the value added tax (IVA) on purchases of goods and services. In addition, as current rate systems stipulate, water bills must include IVA, at the general rate of 20%.

2. SENDOS budget execution statements

- 5.41 The income and expense budget execution statements for the period 1981-1984, shown on the following page, reflect movements of funds in accordance with government accounting rules and the budget and accounting practices established by the Ministry of Public Works and SENDOS. 1/

1/ As indicated above (paragraph 5.13), in 1983 SENDOS began to prepare financial statements, in addition to its budget execution statements, from the accrual-basis accounting system implemented at the start of that year. Their purpose was to present the financial situation of SENDOS and its annual profits and losses in accordance with generally accepted accounting principles. These statements were reviewed by a firm of certified public accountants which refrained from issuing an opinion on them in 1983 and 1984.

INCOME AND EXPENSES BUDGET EXECUTION

THOUSAND OF DOLLARS 1/

	1981 2/		1982 2/		1983 2/		1984 2/		TOTAL 1981/84	
	AMOUNT	%	AMOUNT	%	AMOUNT	%	AMOUNT	%	AMOUNT	%
INCOME										
OPERATING INCOME	37,860	78.1	33,852	65.9	33,415	69.7	32,515	43.1	137,642	61.6
SALE OF ASSETS	161	0.3	215	0.4	23	.0	109	0.1	508	0.2
TRANSFERS	0	0.0	0	0.0	0	0.0	76	0.1	76	.0
OTHER INCOME	775	1.6	732	1.4	659	1.4	925	1.2	3,092	1.4
DEBT	0	0.0	14,068	27.4	7,834	16.3	29,175	38.6	51,077	22.9
FISCAL CONTRIBUTIONS	9,664	19.9	2,516	4.9	6,003	12.5	12,688	16.6	30,871	13.8
TOTAL INCOME	48,461	100.0	51,384	100.0	47,933	100.0	75,488	100.0	223,266	100.0

EXPENSES

OPERATION AND MAINTENANCE

PERSONNEL	12,941	26.7	12,622	24.6	11,355	23.7	10,539	14.0	47,457	21.3
CHEMICAL PRODUCTS	1,305	2.7	1,365	2.7	1,569	3.3	1,628	2.2	5,867	2.6
ELECTRICITY	6,662	13.7	7,113	13.8	8,568	17.9	8,961	11.9	31,303	14.0
FUELS AND LUBRICANTS	744	1.5	726	1.4	796	1.7	718	1.0	2,984	1.3
REPAIRS	3,630	7.5	2,980	5.8	2,408	5.0	2,265	3.0	11,283	5.1
TOTAL OPERATION & MAINT.	25,281	52.2	24,806	48.3	24,696	51.5	24,111	31.9	98,894	44.3
COMMERCIAL EXPENDITURES	1,847	3.8	1,837	3.6	1,519	3.2	1,540	2.0	6,743	3.0
OVERHEAD	2,980	6.1	2,320	4.5	2,527	5.3	2,095	2.8	9,923	4.4
REAL INVESTMENT	22,012	45.4	21,819	42.5	15,568	32.5	35,022	46.4	94,421	42.3
DEBT SERVICE:			429	0.8	1,666	3.5	3,048	4.0	5,144	2.3
INTEREST	0	0.0	429	0.8	1,415	3.0	2,129	2.8	3,974	1.8
AMORTIZATION	0	0.0	0	0.0	251	0.5	919	1.2	1,170	0.5
MISCELLANEOUS	(3,659)	-7.6	173	0.3	1,957	4.1	9,671	12.8	8,141	3.6
TOTAL EXPENDITURES	48,461	100.0	51,384	100.0	47,933	100.0	75,488	100.0	223,266	100.0

a. Operating income

(1) General aspects

5.42 The review of operating income shows the following composition and amounts:

<u>Collection for Services</u>	<u>1981</u>	<u>1982</u> (Thousands	<u>1983</u> of US\$)	<u>1984</u>	<u>Total</u> <u>1981/1984</u>	
					<u>\$</u>	<u>%</u>
Drinking water	27,928	26,174	25,422	24,788	104,312	75.8
Sewer system	700	1,717	2,537	2,498	7,452	5.4
Other income	9,632	5,961	5,456	5,229	25,878	18.8
Totals	37,860	33,852	33,415	32,515	137,642	100.0
	=====	=====	=====	=====	=====	=====

5.43 As the table of paragraph 5.42 shows, collections from sales of drinking water constituted the largest income item over the analysis period. Drinking water represented approximately three quarters of total operating income while sewer service accounted for 5% and general operating income (cut-off and restoration fees, connection fees, interests and surcharges and similar items), approximately 19%.

5.44 From the standpoint of amounts and volumes billed, the analysis is as follows:

<u>Billing</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Amounts (US\$thousands)				
Water	30,389	28,953	28,028	26,540
Sewer	-- 1/	-- 1/	2,797	2,674
Volumes (thousands of m3)				
Water	175,356	186,520	192,927	200,166
Sewer	-- 1/	-- 1/	131,190 2/	140,166 2/
Connections (average No.)				
Water	639,143	661,649	683,166	708,512
Sewer	331,592	346,795	363,652	387,811
Average income (US\$/m3)				
Water	0,173	0,155	0,145	0,132
Sewer	--	--	--	0,019
US\$/connection				
Water	47.55	43.76	41.03	37.46
Sewer	--	--	--	6.90

1/ No information is available about volumes and amounts billed for sewer service in 1981 and 1982.

2/ Differences in amounts billed for water and for sewer service are explained by the different coverage of services provided by SENDOS. These coverages are approximately 92%, for water, and 54%, for sewerage, of the total population.

- 5.45 According to the foregoing statistical data, volumes of cubic meters of water billed grew by 4.5% per year while the average number of connections grew at an annual 3.5%. The available data on sewer service indicate only that the average number of connections rose during the period by 5.4% per year.
- 5.46 Despite the increases in the physical parameters and the earlier rate hikes, 1/ the monetary amounts of billings for water and sewer service, measured in constant 1984 currency, declined in real terms. This was because the currency devaluation eroded average income from water billings and reduced their purchasing power by approximately 24% or 21%, measured either by billed volume of water or average number of connections. In fact, the average income yield per sewer system connection declined by approximately 10% in real terms, from 1983 to 1984.
- 5.47 The following table describes water market structure served by SENDOS as of December 31, 1984:

<u>Type of user</u>	<u>Volume billed 2/</u>	<u>Connections 3/</u>
	(m3) %	(No.) %
Residential	74.5	91.9
Industrial	2.8	0.5
Commercial	10.1	6.4
Governmental	12.6	1.2
Total	100.0	100.0

- 5.48 As can be seen, residential users are the largest group, from the standpoint of volume billed and total number of installed connections. The governmental sector, however, whose consumption comes to approximately 13% of total billings, accounts for only 1% of the total number of connections. The commercial group, meanwhile, accounts for 10% and 6% of these two totals. Another point about this statistic is that, from the standpoint of diameter of connections, 89% have connections up to 16mm, 9%, 19mm connections, and the remaining 3%, connections larger than 25mm.

1/ These increases can be estimated at the following average figures: 1980, 21.7% and 9%; 1981, 8%; 1982, 24.4%; 1984, 24%; 1985, 24.3%. A rate adjustment of approximately 10%, as agreed with the Ministry of Economy, is pending at this time. This should be approved next year.

2/ The distribution by type of user in terms of volume billed and monetary value of billing is the same for all users since they all pay the same rate, without distinction of category.

3/ Includes only metered connections since users in both Regions XI and XII still do not have meters. Together, these represent approximately 4% of total SENDOS connections.

(2) Rate aspects

(a) Urban sector

- 5.49 The rate requirements set out in loan contracts 115/IC-CH and 141/IC-CH provided that the proceeds from SENDOS rates had to cover all operating expenses, not counting depreciation. It also required that once SENDOS serviced all obligations, any surplus had to finance no less than 35% of the works program. SENDOS was given, however, the option of securing additional resources from another source to achieve this same purpose. Under the frame of reference included in the present text on rates, even though SENDOS did not successfully cover 35% of the investment program out of its rate proceeds net of debt service, in 1983 and 1984 it did meet the rate requirements since it secured resources from other sources for this purpose.
- 5.50 Historically, SENDOS has generated internally only enough funds to provide 17% of its real investment, plus financial charges. Consequently, the national government has had to devote larger fiscal contributions to cover the additional resources needed to finance the operating and investment expenses of SENDOS. Therefore, SENDOS has complied with the legal formality but not with the ultimate intention of the rate clause established in this case. In consideration of this situation, the IDB has recently contacted national authorities to start an exchange of opinions about possible courses of action to reach the goals set out in the rate clause of loans 115/IC-CH and 141/IC-CH.

(b) Rural sector

- 5.51 As indicated above, 1/ the loan contracts for partial financing of the different stages of the rural drinking water program 2/ include a clause calling upon each system to generate sufficient resources to pay their operating and maintenance cost and, insofar as possible, depreciation. For the reasons discussed further on, it is recommended that this clause be maintained in the operation in question here. The same applies to the requirements of regular information to the Bank on compliance with the rate requirement by the rural services. The charges for rural water service are calculated by the Water Committees to cover the operating cost of each system. SENDOS checks this when it approves the rate. However, for different circumstances, most of these expenses could not reasonably be foreseen at the time the rates were established because they involved special maintenance and repairs, technical problems of varying natures and even cases of delinquency. Some services have not succeeded in bringing payments from rates and operating expenses into line and a financial deficit for the fiscal year in question has been produced. Since the services are self-financed and

1/ See paragraph 5.35 and following.

2/ Loans 499/SF-CH and 393/OC-CH.

receive no public subsidies, they finance these deficits out of surpluses built up by the services in previous years or, lacking these, payments of special assessments by the community. When it is determined that a system's present rates are inadequate, a rate updating is proposed. As may be seen, the possible deficits of the rural systems are, as explained, temporary and are normally offset in the following fiscal year. Because of the close supervision exercised by SENDOS there are very few cases of systems that repeatedly fail to fulfill the rate clause.

5.52 With respect to compliance with the above-mentioned rate requirement, the situation, by loan, for 1983 and 1984 is as summarized below:

	Loan											
	74/TF				499/SF				393/OC			
	1983		1984		1983		1984		1983		1984	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Services reported	141	100	148	100	125	100	125	100	68	100	105	100
Services covering												
operating expenses	86	61	96	65	91	73	85	68	61	90	86	82
Services with												
insufficient rates	55	39	52	36	34	27	40	32	7	10	19	18
	96	29	111	29								

5.53 As can be seen, approximately 71% of all services in operation comply with the IDB rate demand while 29% of them were not successful in covering their yearly operating expenses by normal rate collections for the reasons referred to above. From the standpoint of monetary amounts reflecting the financial movement of the services, the situation for 1984 turned out as indicated in the following table:

	<u>74/TF</u>		<u>499/SF</u>		<u>393/OC</u>		<u>Totals</u>	
	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>	<u>Amount</u>	<u>%</u>
Income from rates	<u>417</u>	<u>100</u>	<u>226</u>	<u>100</u>	<u>156</u>	<u>100</u>	<u>799</u>	<u>100</u>
Expenses paid out of rates								
Operations	<u>277</u>	<u>66</u>	<u>159</u>	<u>70</u>	<u>101</u>	<u>65</u>	<u>537</u>	<u>68</u>
Maintenance	<u>57</u>	<u>14</u>	<u>18</u>	<u>11</u>	<u>5</u>	<u>4</u>	<u>80</u>	<u>10</u>
Management	<u>52</u>	<u>13</u>	<u>24</u>	<u>8</u>	<u>15</u>	<u>9</u>	<u>91</u>	<u>11</u>
Total, Expenses	<u>386</u>	<u>93</u>	<u>201</u>	<u>89</u>	<u>121</u>	<u>78</u>	<u>708</u>	<u>89</u>
Yearly surplus	<u>31</u>	<u>7</u>	<u>25</u>	<u>11</u>	<u>35</u>	<u>22</u>	<u>91</u>	<u>11</u>
Cumulative balance of surpluses (1984 and earlier)	<u>257</u>	<u>-</u>	<u>155</u>	<u>-</u>	<u>84</u>	<u>-</u>	<u>496</u>	<u>-</u>
	<u>===</u>		<u>===</u>		<u>===</u>		<u>===</u>	

5.54 As the preceding table shows, operating, maintenance and administrative expenses actually disbursed absorbed an average of 68%, 10% and 11% of income received from operations. In 1984 the services had a financial surplus of approximately 11% of income to add to prior surpluses. These surpluses normally fund purchases of equipment replacements and modest expansions of service.

5.55 In the same area, the possibility of extending a further IDB rate requirement to the rural water system of the fourth stage of the program should be studied. This would call upon them to cover equipment and installation depreciation amounts, in addition to their other operating costs. Along this line, it should be taken into account that the fourth stage does not repeat work done in regions already benefited with drinking water service. Actually, this stage amounts to an extension of service to new localities which were less socially and economically attractive from the standpoint of using the stock of capital available in the earlier stages. In effect, the localities that make up the fourth stage of this program are communities whose major economic activity is farming and where trade and services account for only a small proportion of activity and income levels are relatively low. In addition, it should be remembered that the decision on the rates to be charged in any given community usually try to include amounts for contingencies which ultimately leave surpluses whose primary use is purchases of new equipment. These characteristics, considered with the experience of acceptable development of rural systems now in operation, lead to the recommendation that the rate requirement already applied in earlier stages be maintained, merely that once administration, operation and maintenance costs are covered, depreciation charges must be covered to the extent the possibilities of each system permit. As for the 130 rural water systems to be included in the rehabilitation and improvement sub-program, their eligibility will hinge on compliance with the following

minimum requirements: (i) they must comply with the IDB rate requirement for rural water services at the starting time of the works and shall, at the same time, that have complied with this requirement in at least two of the three preceding annual periods; and (ii) they must comply with the minimum cost economic criterion (see Appendix 4 of the Loan Proposal - The Program).

b. Operating expenses

- 5.56 Operating and maintenance expenses, the largest of which are personnel and electricity, and marketing expenses and overhead have accounted for more than half of all effective outlays of SENDOS during the period in question. Since the accrual-basis accounting system is still not in full and proper operation, a review of operating expenses should be based on budget execution data. This means considering only transactions out of cash funds, and not counting items drawn from cumulative surpluses, as for depreciation of fixed assets. It is important to note here that depreciation is not computed in studies to establish new rate levels chargeable to users where coverage is not required by the Bank. As a result of this, the operating budget figures reflect only the financial surplus, which is not representative of the real economic final figures from operations. In effect, a very preliminary estimate of depreciation ^{1/} for 1983 and 1984 shows that net adjusted operating profits and losses would be as follows:

	<u>1983</u>	<u>1984</u>
	(in thousand of US\$)	
<u>Operating income</u>	<u>33,415</u>	<u>32,515</u>
<u>Operating expenses</u>		
Operations and maintenance	24,696	24,111
Commercial expenses	1,519	1,540
Overhead	2,527	2,095
Total, operating expenses	<u>28,472</u>	<u>27,746</u>
Financial surplus	4,673	4,769
Depreciation (estimate)	(28,599)	(28,422)
Net operating los	<u>(23,926)</u>	<u>(23,653)</u>
	=====	=====

- 5.57 As can be seen in the adjusted profit and loss figures for 1983 and 1984, whose direction would presumably be the same if the analysis were taken back to previous years, the net operating losses are significant. If the calculation included all operating cost components, the loss would come to approximately 72% of operating income received. Obviously, this situation has affected the economic and financial development of SENDOS and heightened its dependence on National Treasury contributions to achieve financial equilibrium. For the period in question, these contributions came to approximately 14% of total resources actually received by SENDOS. It should be noted that the government's

^{1/} See footnote under paragraph 5.13.

policy for SENDOS was initially that the service had to finance its investments out of its rate proceeds. The government was to participate financially only in large scale works or other national projects. Thus, in 1981 and 1982, this income item helped to finance part of the Antofagasta and Iquique water pipe works and the rural drinking water program. Starting in 1983, the government contribution has also had to cover IDB debt service and a large portion of the local counterpart for external loans to execute investment projects which SENDOS has not been able to pay for out of its operating income.

c. Other income and expense items

- 5.58 The debt heading includes amounts equivalent to 23% of total resources attracted, that is, loan disbursements. Note that almost all the resources came from stage three of the rural water supply program (IDB Loan 393/SF-CH) and the urban infrastructure program (IDB Loan 115/IC-CH). Smaller amounts came from supplier credits and World Bank financing through Loan 1832/CH. The real investment, for its part, has gone mainly to the third stage of the rural water supply program, and the urban infrastructure program, both with IDB financing, the Iquique water pipeline and the small and large water metering program, with World Bank participation in the form of Loan 1832-CH.
- 5.59 One final comment about the SENDOS budget statements is that the income and expense budget execution statement for the period 1981-1984 showed a high effectiveness, averaging 91% of amounts actually authorized.

3. Accounts receivable

a. Urban sector

- 5.60 SENDOS has maintained a high collections rate, as shown by the ratio of amounts collected to billings ^{1/} for the period 1981-1984. In fact, during that time, the collections to billings rate for drinking water was 92%. As for the sewerage service, although available data allow a comparison only for 1983 and 1984, the rate is similar.
- 5.61 Loan 115/IC-CH, it should be noted, incorporates a clause which, if complied with, ensures attainment of satisfactory collections levels. The contract stated that proof had to be provided every year that the ratio of amounts collected to balances receivable from SENDOS users could not fall below 85%.
- 5.62 While this contractual requirement was not met in 1983, it was in 1984. The percentages of collection in those two years were 76.2% and 85.5%. These were lower than the indicators mentioned before. This discrepancy can be explained by the existence of old delinquent

^{1/} See paragraphs 5.42 and 5.44.

balances whose cumulative magnitude ^{1/} led to the passage in 1983 of Law 18242 which confers special powers to SENDOS to sign payment agreements and forgive readjustment and interest amounts owed by delinquent users in economic difficulty. A measure of similar scope and purpose went into effect in October 1984. This measure enabled debtors three or more billing periods in arrears to pay their debt with all fines, interests and readjustments forgiven. The agreements signed did not include interest amounts or readjustments except those of commercial and industrial users, which were charged a real annual interest rate of 7%. They were given payment periods of up to 60 months in monthly installments equal to 20% of the amount of future billings for water and sewerage. If an unsettled balance was still left after they paid 60 installments, this balance would be forgiven. At the close of the six-month period that the law allowed for signature of the payment agreements, the situation was as follows:

Total Debt as 10/24/84	Amount forgiven	Total Debt (3)=(1)-(2)	Debt Feasible for Arrangement		Debt Arranged		Ratio (8)=(7):(5)
			No. of Users	Amount	No. of Users	Amount	
(1)	(2)	(3)=(1)-(2)	(4)	(5)	(6)	(7)	(8)=(7):(5)
			(US\$ thousands)				

11,632	2,998	8,634	116,427	6,695	85,460	5,919	88%
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5.63 As the preceding summary shows, the amount forgiven came to 26% of the balance owed as of October 1984. Eligible debtors (those with three or more unpaid bills) who actually signed agreements accounted for 88% of the amount whose rescheduling was feasible and 73% of all users. The amount for which agreements were not arranged, which turned out to be equal to the remaining 12% or US\$776,000, represents an uncollectible amount that will have to be charged off soon. Finally, it should be noted that SENDOS now intends to take all applicable legal steps to ensure collection of amounts receivable, including cutting off water supply to delinquent users who are able to pay. The charges for notification and cut-off of service were adjusted recently and legal mechanisms for judicial collection will be used to the maximum.

5.64 As was observed, and in accordance with statements made by the external auditors of SENDOS, the balances of debtor accounts for sales given in the accounting system differ from the amounts in the computer files for these same debtors. This situation will be corrected when the plan to normalize the SENDOS accounting system, as recommended (see paragraph 5.13), moves into the implementation stage.

^{1/} As of December 31, 1983, balances five or more months in arrears accounted for 74% of total delinquencies. As of December 31, 1984, this proportion had declined to 56% of the delinquent total.

b. Rural sector

- 5.65 The delinquency situation, by loan, of the different services was as the table on the following page shows.
- 5.66 The statistical data covering all the drinking water systems revealed that delinquency, based on the small amounts of 6.4% in 1983 and 4.3% in 1984, does not present a significant problem for the operations of the rural services.

4. Conclusions of the historical financial analysis

- 5.67 During its initial stages of development, the sanitary works subsector was financed out of the budget appropriated for the Ministry of Public Works. In those years collections from sales of services went into the General Treasury of the Republic. This operating situation prevailed until the end of 1973. By that time, government contributions had gradually moved up to more than 90% of total income while outlays for operations and maintenance had fallen from 22% to 6% and payroll had risen from 22% to 39% of total expenses.
- 5.68 Institutional consolidation of the subsector began in 1977 with the issue of Decree Law 2050 which made SENDOS an autonomous institution with its own resources and assets and the legal authority to propose the rates its users should pay. The technical foundation underlying the present rate policy is adequate for self-financing of operations and maintenance of services and for a contribution to execution of the works program. However, since the needs this service satisfies are basic, economic and social considerations have prevented full application of these rate criteria. This has resulted a certain lag in updatings of rates and, in turn, to a drop in volume billed and collected, measured in real monetary terms. This circumstance and the growing scope of works executed, the most important of which have received partial support from the IDB, have made it necessary in recent years to increase public financial support through fiscal contributions. According to estimates made by the Ministry of Finance, this contribution will be a growing part of the agency's financing, as reflected in the Three Years Public Investment Plan 1986-1988. It will stabilize at a later time.
- 5.69 In connection with real services, one can see that they have been consolidated since 1978 when the small metering program was started. At this time, 82% of all services in operation are metered. This program has led to considerable savings in operation, maintenance and replacement of service equipment and even helped to reduce the backlog in billings.
- 5.70 The administration and application of rate guideline systems which require adequate coverage of operating expenses and, insofar as possible, amounts for depreciation of equipment and installations, has

Rural drinking water services
Delinquency Chart 1983-1984
(in thousand of US\$) 1/

	Loan 74/TF				Loan 499/SF				Loan 393/OC				Totals			
	1983		1984		1983		1984		1983		1984		1983		1984	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Total billed	438	100.0	434	100.0	253	100.0	236	100.0	85	100.0	166	100.0	776	100.0	835	100.0
Rate income	413	94.3	417	96.2	234	92.6	226	95.7	79	92.9	156	94.3	727	93.6	799	95.7
Total owed	25	5.7	16	3.8	19	7.4	10	4.3	6	7.1	9	5.7	50	6.4	36	4.3
60 days	7	1.5	5	1.2	4	1.7	3	1.1	2	2.0	2	1.5	13	1.6	10	1.2
90 days	4	0.9	3	0.7	3	1.1	2	0.8	1	1.0	2	1.0	8	0.9	7	0.8
More than 90 days	14	3.3	8	1.9	12	4.6	5	2.4	3	4.1	5	3.2	29	3.9	19	2.3

1/ Average exchange rates:
1983: \$77.94 = US\$1.00.
1984: \$98.50 = US\$1.00.

been carried out to date without significant problems. These circumstances, as well as the relatively low socio-economic level of the communities included in the fourth stage of the program in question, suggest that it would not be advisable to require the rate charges to cover amounts for depreciation of equipment and installation of the new rural services.

VI. JUSTIFICATION

A. Technical Feasibility

- 6.01 The studies, designs, blueprints and specifications for the 64 projects that make up the representative sampling submitted were prepared by the executing agency in accordance with current national standards for this area. This work followed generally accepted sanitary engineering principles. The technical solution for each system was the product of a feasibility study which also took into account other available sources of water. Hydrogeological studies were made before it was decided to use underground sources. In no case will a physical work be started until the well has been sunk and the flow of the source measured. The remaining engineering projects for both new water systems and those of the rehabilitation subprogram will be contracted with national engineers or engineering firms, of which Chile has many. The experience gained in preparing the 64 projects of the sampling makes it possible to assume that these will be completed during the first two years the loan contract is in effect. Also, all the works of the program will begin within the first three years.
- 6.02 The competitive biddings have been subdivided into two groups: supply of imported materials and execution of the works. The works would be executed by contractors in a manner similar to that used in Stage III (loan 393/OC). No difficulties are foreseen in supplying materials or labor. The execution timetable is realistic for the type of work involved. Purchases of materials and construction of groups of works were planned from the experience gained in the earlier programs.
- 6.03 The project budget has been computed not only from national prices but also comparisons with international rates. The escalation for construction was analyzed and computed in accordance with IDB instructions for this matter. In short, after all technical aspects were evaluated carefully the conclusion was that the project is technically feasible. Another factor considered was that SENDOS, and its National Programs Department, have the technical and administrative capacity to supervise execution of these projects. Also, it has its Community Promotion Subdepartment to motivate the beneficiary communities.

B. Financial Viability

1. Financial projections - Forecast of executing agency budget

- 6.04 According to the financial scheme developed for the Fourth Stage of the Rural Drinking Water Program, the Government of Chile would assume responsibility vis-à-vis the IDB for the local contribution commitments and repayment of the capital which the government receives in the loan.

This liability also applies to interest amounts cumulated during the construction period. Nevertheless, it is a good idea to examine how the executing agency of the proposed operation might grow, as projected by the expected behavior of its basic economic and financial variables. It should be noted that the aforementioned mechanism also provides for the financial involvement of future users. This growing participation, it is assumed, would come to the equivalent of 10% of the direct estimated constructions cost. These contributions, to be advanced by the National Treasury, would be repaid later out of the \$8,100 contribution fee (US\$48) paid by each user connecting to the system. ^{1/} Users will have 30 months from the start of the individual works in each community to pay this fee.

- 6.05 The forecast budget of SENDOS, prepared for 1985-1994, appears on the following page. This budget used the following general assumptions: ^{2/} (a) constant currency, for June 1985, expressed in United States dollars, at an exchange rate of \$169.00 = US\$1.00; (b) real growth of income and expense budget items, based on unchanging monetary unit values during the projected period; (c) price escalation only for the program under study, using the rates expected by the Project Analysis Department of the IDB. ^{3/}
- 6.06 If the assumptions of the budget forecast hold true, the economic and financial performance of SENDOS would be as discussed below. The volume of water consumption, measured in cubic meters, as well as the number of water connections, would both grow by 3.3% per year. This is considered reasonable. Furthermore, the magnitudes of growth of the sewer system are 7% and 9.6%, respectively. These rates appear desirable goals but, achieving them will require a considerable effort in physical and financial terms. If these results come about, the number of water and sewer connections in 1994 would total 990,300 and billing would be for 275,900 million cubic meters for each of these items.

^{1/} See paragraph 5.37.

^{2/} Detailed working assumptions appear in Appendix VI-1.

^{3/} PRA Management Memorandum LO 6 Rev. 12, dated May 14, 1985, and memoranda from the same office, dated December 27, 1984 and April 15, 1985.

CHILE - SENDD5
PROJECTED INCOME AND EXPENDITURE BUDGET
YEARS 1985-1994
(IN THOUSANDS OF US DOLLARS) 1/

ITEMS	ACTUAL				-PROJECTED-										TOTAL	2
	1984 US\$	1985 US\$	1986 US\$	1987 US\$	1988 US\$	1989 US\$	1990 US\$	1991 US\$	1992 US\$	1993 US\$	1994 US\$					
INCOME																
Operating income	25,610	24,849	28,218	29,347	30,494	31,560	32,686	33,563	34,557	35,430	36,905	317,609	49.52			
Payment agreements		596	596	596	596	596	592	592	592	592	592	5,940	0.92			
Sale of assets	86	116	116	116	116	116	116	116	116	116	116	1,160	0.22			
Transfers	59	80	76	73	69	66	62	59	55	52	47	639	0.11			
Other income	729	563	563	563	563	563	563	563	563	563	563	5,630	0.92			
Debt	22,980	16,377	17,743	11,219	9,243	12,263	8,000	12,050	12,050	13,050	13,050	125,045	19.52			
- IDB loans, IV Stage																
- Other loans	22,980	16,377	17,743	11,219	9,243	12,263	8,000	12,050	12,050	13,050	13,050	108,045	16.92			
Fiscal contribution	9,994	19,044	21,978	29,328	19,829	15,997	14,139	15,463	15,765	15,172	15,007	181,782	28.42			
- IDB contribution IV Stage																
- Debt service, IDB, IV Stage	9,994	19,044	21,978	29,328	19,829	15,997	14,139	15,463	15,765	15,172	15,007	168,782	26.42			
- Other contributions												13,000	2.02			
Miscellaneous	1,606	3,267	1	24	16,804	13,103	12,227	13,028	13,420	12,917	12,841	157,609	24.62			
					(1)						2	3,293	0.52			
TOTAL INCOME	61,064	64,892	69,291	71,266	60,910	61,161	56,217	62,406	63,698	64,975	66,282	641,098	100.02			
EXPENDITURES																
Personal	8,218	7,918	9,296	9,485	9,485	9,485	9,485	9,485	9,485	9,485	9,485	93,094	14.52			
Supply of goods & services	12,653	13,217	13,521	13,757	13,991	14,194	14,400	14,573	14,748	14,925	15,104	142,430	22.22			
Social benefits	2	2	2	2	2	2	2	2	2	2	2	20	.02			
Real investment	27,565	39,408	38,068	38,721	27,778	27,033	22,189	28,462	29,166	28,349	28,124	307,298	47.92			
- IDB program, IV Stage																
- Other investments	27,565	39,408	38,068	38,721	27,778	27,033	22,189	28,462	29,166	28,349	28,124	281,118	43.82			
Service of public debt	2,401	3,353	31,633	31,763	20,805	21,219	9,147	8,890	9,303	11,220	12,573	88,316	13.82			
IDB program : Interest																
IV Stage : Amortization																
Other loans : Interest	1,677	2,712	3,371	3,026	2,620	3,199	3,516	4,183	4,686	5,661	6,071	39,045	6.12			
Amortization	724	641	3,545	4,427	4,911	4,911	3,659	2,272	2,272	3,304	4,336	34,278	5.32			
Operations, previous years	78	106	106	106	106	106	106	106	106	106	106	1,060	0.22			
Other pending obligations	923	888	888	888	888	888	888	888	888	888	888	8,880	1.42			
Miscellaneous	9224															
TOTAL EXPENSES	61,064	64,892	69,291	71,266	60,910	61,161	56,217	62,406	63,698	64,975	66,282	641,098	100.02			

1/ Exchange rate: \$169 = US\$1.00

- 6.07 Average income from water and sewer service would maintain its purchasing power, according to statements made by national authorities to the mission. The resulting unit values, assuming a rate increase of approximately 10% in 1986, would be US\$0.101/m³ for water and US\$0.030/m³ for sewer service. These figures were kept constant for purposes of the budget projection. On a comparative basis, the average income would change as follows:

	<u>1984</u> Currency Dec. 84	<u>1985</u> Currency June 85 \$/m ³	<u>1986</u>
Water	13.06	15.45	17.01
Index	100.0	118.3	130.2
Sewer	1.88	4.52	4.97
Index	100.0	240.4	264.4
US\$/m ³			
Water	0.132 <u>1/</u>	0.091 <u>2/</u>	0.101 <u>2/</u>
Index	100.0	68.9	76.5
Sewer	0.019 <u>1/</u>	0.027 <u>2/</u>	0.030 <u>2/</u>
Index	100.0	142.1	157.9

- 6.08 As can be seen, between 1984 and 1985 currency parity with the United States dollar would move faster than changes in the consumer price index, thus depressing the average income from water expressed in terms of dollar equivalents. The average income from a sewer connection, for its part, was adjusted at a very high rate from 1985 on in consideration of large investments to be made in the near future for this service. This would still give it a large increase in equivalent dollars.
- 6.09 The operating income to be obtained during the period 1985-1994 would be as indicated in the table on the following page.

1/ Exchange rate: \$98.50 = US\$1.00.
2/ Exchange rate: \$169.00 = US\$1.00.

CHILE - SENDOS
OPERATING REVENUE
YEARS 1985-1994
(IN THOUSANDS OF US DOLLARS) 1/

BILLING		1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Total
Volume billed (thousands m3)												
Water		211,677	221,414	229,163	236,955	243,827	250,898	256,920	263,086	269,400	275,866	2,459,206
Sewerage		148,216	157,964	170,711	183,958	197,705	212,452	224,949	237,446	244,944	275,866	2,054,211
Average rate (US\$/m3)												
Water		0.0914	0.1007	0.1007	0.1007	0.1007	0.1007	0.1007	0.1007	0.1007	0.1007	
Sewerage		0.11367	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	
Amount billed (US\$ thousands)												
Water		19,762	22,286	23,065	23,850	24,541	25,253	25,859	26,480	27,115	27,766	245,567
Sewerage		3,364	4,645	5,020	5,410	5,814	6,248	6,615	6,983	7,203	8,113	60,016
Total billed		123,316	26,931	28,086	29,260	30,356	31,501	32,475	33,463	34,319	35,879	305,583
COLLECTIONS												
Water		17,416	20,057	20,759	21,465	22,087	22,728	23,273	23,832	24,404	24,990	221,011
Sewerage		3,188	4,181	4,518	4,869	5,233	5,623	5,954	6,285	6,483	7,301	54,015
Other revenue		3,184	3,980	4,070	4,160	4,240	4,335	4,336	4,441	4,543	4,614	42,583
Total Operating Revenue		24,919	28,218	29,347	30,494	31,560	32,686	33,563	34,557	35,430	36,905	317,608

1/ Exchange rate: \$169 = US\$1.00

- 6.10 Operating expenses, for their part, show a share (approximately 14%) similar to the current proportion of total income as a result of productivity gains. In effect, SENDOS would expand services considerably without further additions to its regular personnel after the staff increase planned for 1985 is completed. 1/ All other operating expenditures would also show savings since they decline relatively to the total amount of income, of which they would represent approximately 24%, compared with 36% for the most recent historical figures.
- 6.11 Capital from third parties received in the form of loans, for its part, includes funds from the IDB for partial financing of the Fourth Stage of the Rural Drinking Water Program. After estimating higher national contributions to the funding of the subsector, basically in the form of larger fiscal contributions, the participation of loans in real investment, including financial charges, would fall from the 52% reached during the period 1981-1984 to approximately 35% during the projection period.
- 6.12 The investment in works in execution and scheduled until 1988 is set in the MOP Three-Year Program. 2/ This program sets a budget framework for each year and identifies the annual investments in works, studies and specific programs (coverage, metering, rural water systems). Investment amounts after 1988, were estimated by adding to the already defined investment amount, other amounts for water and sewer lines, rural water systems and a proportion of plant-in-service that would have to be replaced, plus maintenance and improvement of services.
- 6.13 Even leaving out the effect of IDB loan debt service, for which the Chilean Government would be responsible, the total debt service payable by SENDOS would increase from approximately 2% of total income during the historical period to 11%. However, rate income, net of operating expenses, would be large enough to meet the financial obligations actually payable by SENDOS although the surplus it leaves could provide only a small percentage to the investment program. This would come to approximately 2.5% on the average for the period in question. Since that contribution to real investment, including financial charges, is small in comparison with the approximately 17% reached in the recent past, 3/ conversations have been started with national authorities to make sure SENDOS can achieve a level of economic operations sufficient to achieve the rate objective established.

1/ See paragraph 5.08.

2/ The original investment amounts were substantially greater than those finally approved for SENDOS, since they had to be reduced to conform to public funding capacity.

3/ See paragraph 5.49.

2. Feasibility of local contribution

- 6.14 As already stated, the local contribution to the IV Stage of the Rural Drinking Water Program would be the equivalent of US\$13 million from the Republic of Chile through appropriations to the income and expense budget of SENDOS. It should be noted that during and after the loan amortization period, the Government of Chile would also appropriate necessary amounts in its budget to service the IDB debt.
- 6.15 Working meetings with officials of the Budget and Public Credit Directorate examined the budget projections for SENDOS prepared in accordance criteria suggested by the IDB. 1/ They found that the size of the SENDOS investment program, on one hand, and the funding to be provided by the national government in the form of fiscal contributions, on the other, are in reasonable compliance with the expectations of the Ministries of Finance and Economy and Public Works contained in the Three-Year Program 1985-1987. 2/ Although the final figures for the MOP and SENDOS budgets have not been set for 1988, a preliminary review of the investment and contributions established for the budget projection for that year determined that those projected amounts were reasonable. Considering that the working hypothesis used in the budget forecast have proven acceptable to national financial authorities and that, for 1989 on, both the investment and fiscal contribution levels planned at this time are consistent with historical trends and recent projections, it can be concluded that there should be no problems of an economic or fiscal type that have an adverse impact on the financial viability of the program in question.

C. Socioeconomic Analysis

- 6.17 This section includes a minimum cost and cost-benefit analysis of a sampling of 64 representative projects out of the overall program of multiple works to be financed, and a study of their distributive impact. It also reaches a conclusion about the most appropriate selection criteria, from the socioeconomic standpoint, to ensure that the projects not included in the representative sampling or which are part of the rehabilitation and improvement program are likewise viable.

1/ See paragraph 6.04 and Appendix VI-1.

2/ "The Three-Year Program is an instrument indicative of the principles of a social market economy. The Three-Year Program 1985-1987 is a programming instrument and a tool for coordinating private and state initiatives aimed at reactivating the economy and increasing employment in the fastest and most efficient manner." (Three-Year Plan, 1985-1987, page 1).

1. Minimum cost analysis

- 6.18 The project design work included several studies into different ways of securing water (drilling versus surface sources), sketches of pipelines and physical location of water storage facilities. After this, the work compared the costs of the different design alternatives at present value and ended with the lowest economic cost alternative selected in each case. All system components such as filters, distribution lines, and house connections, meet minimum standards and follow existing streets. Accordingly, no significant deviations from the proposed designs are allowed.

2. Cost-benefit analysis

a. Results

- 6.19 The analysis showed that 64 projects had a rate of return higher than 12% in economic terms. This was high enough to be recommended as eligible for IDB financing. 1/ The economically feasible projects have a direct investment cost in the equivalent of US\$3.7 million. 2/ This is 27% of the total cost of the 190 projects to be built under the global program. The net present value of the eligible projects of the sampling is US\$2.3 million, while the internal rates of return range from 12% to 52%. The total beneficiary population from the sampling of projects to the year 2000 is 52,000 inhabitants.

b. Analysis methodology

- 6.20 The cost-benefit analysis of the sampling used the conventional method of measuring benefits to potential beneficiaries on the basis of willingness to pay (WTP) for the service they would receive from the project. In effect, having drinking water in the dwelling means a savings of time for the campesino and less bother in carrying a similar quality water from distant sources. Having a sufficient supply of good water is also a considerable improvement in their quality of life since it enables them to learn new hygienic habits and avoid water-borne diseases, which affect infant family members in particular.

1/ Table A20-6 of Appendix VI-3 contains the analysis results for the 64 projects.

2/ This cost includes direct cost of construction and IVA charges, but not direct rehabilitation and service improvement costs.

- 6.21 Most of these benefits, such as savings of time, elimination of bother and substantial improvement in standard of living, while evident to the consumer, have their reflection in the market in the form of the campesino's willingness to pay for water. Other benefits, such as lower incidence of illness among family members (sicknesses mean payments for medicines or medical treatment) and avoiding death (and lost productivity), apparently will not manifest themselves in willingness to pay since both are unforeseen future events and difficult therefore to perceive as a directly useful benefit to consumers.
- 6.22 The first type of benefit is computed by water demand curves estimated from information about localities already having water supply and a socioeconomic survey of localities that will be served by the project in question. ^{1/} This demand curves relate quantities consumed to prices paid in different situations of scarcity and show, therefore, the willingness of consumers to pay for water. The second type of benefit, which comes from the effects of the project on other markets (such as products and medical services and the future labor market), would also be quantifiable if information were available on the correlation between the existence of drinking water and the incidence of water-borne diseases. Such information, however, either does not exist or the data are unreliable since they use a direct causality relationship between the two variables without accounting for other factors such as education, income, climate and age. Health benefits, therefore, are viewed here qualitatively and have been left out of the estimates of socioeconomic profitability indicators.

c. Demand for water and measurement of benefits

- 6.23 The drinking water demand curve was estimated by econometric methods. A full explanation of these methods appears in Appendix VI-3. According to the findings, the curve that best explains the behavior of potential project beneficiaries is the hyperbolic or logarithmic curve in which the price elasticity is constant. The study found six demand curves that define consumption habits in different parts of the country where the beneficiary localities are located, and their socioeconomic level. The characteristics of these curves appear in Table 1.

^{1/} See details of the survey in Appendix VI-3.

Table 1

Demand Curve Used to Estimate Benefits

Region	Family Income (US\$ month)	Family Size (Persons)	Demand Function 1/ (Log Q =)	
1. North, Low Income	62.30	4.4	2.501	-0.31 Log P
2. North, Medium Income	73.31	3.8	2.549	-0.31 Log P
3. Central, Low Income	99.39	5.7	2.749	-0.31 Log P
4. Central, Medium Income	107.07	5.7	2.781	-0.31 Log P
5. South, Low Income	100.97	5.2	2.739	-0.31 Log P
6. South, Medium Income	217.55	4.4	3.042	-0.31 Log P

- 6.24 Consumption amounts for the different models depend inversely on amount charged and rise with family income and size. As Table 1 shows, the price elasticity of estimated demand is -0.31. Consumption amounts are always higher in segments having acceptable income, as is to be expected. The areas showing the highest consumption are in southern Chile 2/ where income levels are relatively higher.
- 6.25 The benefits of each project were computed by measuring the willingness to pay for project drinking water of each beneficiary family over the useful life of the project, estimated at 20 years. The consumption growth rate, estimated at 2%, corresponds to population growth plus higher per capita consumption expected over the life of the project. The initial coverage is assumed to be 80%, increasing to 100% in 1990.
- 6.26 The simulation model used estimates the benefits for each locality on a yearly basis and updates them to present value at a discount rate of 12% per year. The model and its operation are explained in detail in Appendix VI-3, in which a full example for a locality appears in Tables A20-1 to A20-5.

1/ Q = Quantity consumed by family per month.
P = Rate charged per m3 consumed, in pesos.

2/ Regions IX, X, XI and XII.

d. Costs

- 6.27 The benefits are compared against the project investment and the administration, operation and maintenance costs of the systems. Market financial costs are adjusted to reflect opportunity costs of resources in Chile. 1/

(i) Investment costs

- 6.28 Investment costs include the direct construction cost, all studies and designs, works supervision, community promotion, expropriations and vehicles. To this total is added an estimate of 12% of these costs for contingencies. As usual, the economic analysis does not include financial charges or cost escalation since it works with constant prices both to estimate benefits and to count costs. The transfers that occur in the economy without becoming costs in real resources do not enter the analysis. In this category are the value added tax on materials and equipment manufactured in Chile and customs fees on imported goods. The item for unskilled labor is adjusted to reflect the real cost of labor in the economy. This has been estimated by ODEPLAN. 2/

(ii) Administration, operation and maintenance costs

- 6.29 The administration and maintenance costs used estimates drawn from information about localities with operating water systems, financed by earlier stages of the SENDOS-IDB Rural Water Systems Projects. The operating cost calculated for them used annual average water system production figures. The administration cost corresponds basically to expenses incurred by the administrative committee in keeping the accounting books, measuring water used and collecting monthly water bills. The operating costs have two components: one is energy required to pump the water from underground sources and the other is the yearly cost for hypochlorite. The maintenance expenses are for regular cleaning and repairs to the system (catchment system, water storage tanks, pipelines, distribution lines and meters).

1/ A detailed analysis of the costs and conversion factors used appears in Appendix VI-3.

2/ A detailed analysis of the costs and conversion factors used also appears in Appendix VI-3.

6. Sensitivity analysis

- 6.30 Considering uncertainties about some of the parameters used in the cost-benefit analysis, the impact that variations in those parameters would have on the economic profitability indicators was studied. The variations analyzed represent reasonable ranges. As runs 3 and 5 in table 2 on the following page show, the variables having the greatest effect on the results are the price elasticity of demand and the limit price (that is, the maximum price allowed for the demand function). An elasticity increment from -0.310 to -0.366 or a drop in the limit price to an average of US\$3.06 reduces the net present value to US\$1.05 million or US\$1.95 million, respectively. These changes leave only 41 projects economically feasible. Nevertheless, the base case analyzed is believed to have sufficient foundation to ensure both the profitability of the projects in the sampling and those of the global program. Furthermore, neither a decline in consumption growth rate or a cost increase of up to 20% has a significant impact on project results.

3. Selection criteria and rehabilitation and expansion subprogram

- 6.31 The criteria SENDOS would use to select program beneficiary communities are the following:

- (i) Completely rural localities, having between 100 and 3,000 inhabitants;
- (ii) Minimum concentration of 15 housing units per kilometer of street, for which technical reports are available and favorable promotion work by the Regional Directorates of SENDOS;
- (iii) Easy access in adequate vehicles;
- (iv) Capacity and quality of water sources, with priority to sources operating on gravity;
- (v) Community interest in the service and payment for it, in the opinion of community promotion agents;
- (vi) Projects having an internal economic return in excess of 12%.

Table 2

Sensitivity Analysis

<u>Parameters</u>	<u>Value</u>	NPV	<u>Feasible</u>	<u>I.R.E.R</u>		<u>Run</u>
		(US\$ 000000)		<u>Projects</u>	<u>1/</u>	
A. Benefit Related						
1. Consumption growth rate						
- Minimum	1.0%	0.18	57	2.39	50.71	1
- Medium	2.0%	2.29	64	3.95	52.75	
- Maximum	3.0%	2.90	70	5.27	55.38	2
2. Demand elasticity						
- Minimum	-0.366	1.05	41	0.56	40.02	3
- Medium	-0.310	2.29	64	3.95	52.75	
- Maximum	-0.253	4.59	76	7.65	77.93	4
3. Limit price (US\$/M3)						
- Minimum	3.06	1.95	41	3.02	51.16	5
- Medium	3.41	2.29	64	3.95	52.75	
- Maximum	3.87	2.75	69	5.12	57.40	6
4. % of AQM cost as fixed charges						
- Minimum	65.0%	2.28	64	3.90	52.70	7
- Medium	75.0%	2.29	64	3.95	52.75	
- Maximum	85.0%	2.30	64	4.00	52.80	8
B. Cost Related						
- Minimum	+20%	1.89	53	2.50	47.00	9
- Medium	0%	2.29	64	3.95	52.75	
- Maximum	-20%	2.76	70	5.64	60.15	10
C. Total						
- Minimum	N.A.	0.54	22	1.29	31.51	11
- Medium	N.A.	2.29	64	3.95	52.75	
- Maximum	N.A.	6.88	79	12.35	97.15	12

1/ Those with I.R.E.R.s higher than 12% of the 79 subprojects that make up the representative sampling.

- 6.32 Besides the new water system construction program, the plans call for an investment in direct costs of US\$2.8 million to rehabilitate and expand 130 drinking water systems built with IDB support in the earlier stages. The projects have an average investment of US\$20,000, compared with an average investment for a global program of US\$90,000. The investments involved here will be for small works to take maximum advantage of existing installations. Therefore, these projects are high profitability items, from the socioeconomic standpoint. Nevertheless, to maximize the subprogram's benefits, it is recommended that the selected projects take minimum economic cost as the eligibility criterion (see Appendix 4, Section VI, Loan Proposal, The Program).

4. Ex post evaluation

- 6.33 SENDOS has set up a system for compiling and processing data already approved by the IDB for ex post evaluation of the Third Stage of the Rural Water Systems Programs, and a computer program to run a cost-benefit analysis of the systems. Considering these, it is recommended that the loan contract require only that an ex post evaluation report be submitted to the Bank in the third year after the date of the last disbursement and that this report deal with the results of the project on the basis of the methodology and guidelines agreed with the Bank.

5. Analysis of beneficiaries

- 6.34 The data used in this part of the study come primarily from the socioeconomic survey of 880 housing units which represent, statistically, the potential beneficiaries of the project.

a. Ability to pay of beneficiaries

- 6.35 The rates to be charged in each locality will depend basically on the operating and maintenance costs of each system. A preliminary estimate puts these charges within the range of US\$0.90 to 2.00 out of a family's monthly payments. ^{1/} These disbursements were compared against monthly monetary income to infer the ability to pay of potential program beneficiaries. The distribution of these amounts appears in the following table 3:

^{1/} This estimate, which assumes a five-member family with an average per capita consumption as shown in the demand curve, runs from 136 to 283 Chilean pesos per month.

Table 3

Income Distribution of Beneficiaries

<u>Income levels</u> <u>(pesos per month)</u>	<u>Number</u>	<u>Percentage</u>	
		<u>Absolute</u>	<u>Cumulative</u>
Less than 4,333	69	7.8	7.8
4,334 to 9,400	258	29.3	37.1
9,401 to 30,596	462	52.5	89.6
More than 30,596	91	10.3	100.0
Total	880	100.0	
	=====	=====	

6.36 This comparison shows that families in the lower income range (7.8% of the population), that is, those earning up to 4,333 pesos per month, will have to pay 3% or more of their income for water. Next, 29.3% will have to pay between 3% and 6.3% of their income for water, depending on locality and consumption. ^{1/} All other beneficiaries will pay less than 3% of his monthly income.

b. Analysis of distributive impact on low-income groups

6.37 This analysis, based on the subprojects of the representative sampling, unfolded in three stages. These included: (i) identification and description of principal groups affected; (ii) estimation of magnitude of distributive impact on identified groups; and (iii) computation of the distributive impact coefficient. The analysis showed that 76.6% of the net economic benefits generated by the sampling of subprojects would be taken by groups in the low-income category. Taking these results as representative and applying the distributive coefficient to the resources of the eventual IDB loan (US\$17 million), it is concluded that the equivalent of approximately US\$13,022,000 would benefit those low-income groups. An explanation of the methodology used to compute the coefficient of distributive impact appears below.

(i) Identification and description of principal groups affected

6.38 There were three groups directly affected by the income transfers induced by the projects analyzed. The first group is the executing agency of the project (SENDOS), which receives a flow of net positive transfers

^{1/} The minimum SENDOS charge of 136 pesos per month equals 3% of the average income of 4,333 pesos. Similarly, the maximum charge of 283 pesos is 3% of a 9,400 pesos income.

equivalent to the actualized value of rates charged in the localities included in the project. To this flow are imputed the investment and operating costs of the projects, all expressed at market prices.

- 6.39 The second group consists of unskilled workers hired for the projects. These workers receive a net positive transfer equivalent to the difference between the wage they actually receive and the supply price of their services. This group was one of the low-income groups affected by the project. The third group consists of drinking water consumers who will drink more water because of the greater availability of drinking water from the project and who value the water at more than the charge they have to pay to take that additional consumption. This group receives, then, a net positive transfer equal to the difference between their willingness to pay and their monthly water bill.
- 6.40 The group of consumers was subdivided into two, to determine the differences in income levels associated with different consumers. The first subgroup consisted of consumers whose incomes are below the income level defining the low-income group. The second subgroup consisted of consumers having income above that level. This distribution of consumers was based on data taken from the socioeconomic survey of potential program beneficiaries described in Appendix VI-3 and on the level agreed by the IDB and the Chilean Government to define low-income groups. ^{1/}

(ii) Distributive impact on affected groups

- 6.41 Table 4 on the next page summarizes the direct distributive impact produced by all the subprojects of the sampling analyzed. The last column of the table shows the actualized value of net added economic benefits (at economic prices, broken down into benefit and cost components). The first six columns represent the six groups selected for the distribution analysis. The first line, production, in turn, summarizes the transfers between groups arising from production and sale of drinking water by the sampling projects. Thus, the value of production, in economic terms, yields three positive income transfers. The first, income actually received from sales of drinking water, goes to SENDOS. The second and third transfers, with positive effects on water consumers, come from the fact that these consumers pay less for water than the amount they would be willing to pay, meaning that they do not forego that consumption. The estimate of these two latter transfers was based on the classification of consumers by income level. The lower lines show transfers of income from investment, operation, administration and maintenance cost items.

^{1/} This level is 68,500 per capita per year, or 30,596 pesos per family per month (figures of March 31, 1985).

Table 4

Project Impact on Directly Affected Groups

<u>Item</u>	<u>PUBLIC SECTOR</u>		<u>PRIVATE SECTOR</u>		<u>Users</u>		<u>Total</u>
	<u>SENDOS</u>	<u>Government</u>	<u>Labor</u>		<u>Low Income</u>	<u>Others</u>	
			<u>Unskilled</u>	<u>Other</u>			
Added Production	94929.8				506379.7	106670.8	707980.3
Investment Costs							
1. Imported materials	- 54204.2						- 54204.2
2. Natl. materials and equipment	-115308.5	26636.3					- 88672.2
3. IVA	-56012.3	56012.3					
4. Unskilled labor	-85276.5		50910.1				- 34366.4
5. Other labor	-192202.5			48736.7			-143465.8
Subtotal	-503004.0	82648.6	50910.1	48736.7			-320708.6
ACM Costs							
1. Administration	- 31639.6	375.4	238.6	13090.2			- 17935.4
2. Maintenance	- 17271.1	4248.3	347.6	952.2			- 11722.9
3. Energy	- 17057.0	5320.8	394.6	838.8			- 10502.8
4. Chemical products	- 2751.1	528.4	0.0	73.6			- 2149.1
Subtotal	- 68718.8	10472.9	980.8	14954.9			- 42310.2
Total	-476793.0	93121.5	51890.9	63691.6	506379.7	106670.8	344961.5

Coefficient of distributive impact - 0.7662

- 6.42 The economic costs in the last column are the result of the negative transfer absorbed by SENDOS less implicit taxes on national materials and the IVA, which are transferred positively to the government. In the case of hiring unskilled workers, the economic cost is the net result of a negative transfer absorbed by SENDOS (as a result of hiring those workers at prevailing wages) and a positive transfer taken by the unskilled workers since they do receive an effective wage higher than the average farm wage received in their alternative activity.
- 6.43 As can be deduced from table 4, water consumers in the low-income classification total 82.6% of all program users and receive a net benefit proportional to their consumption.

(iii) Coefficient of distributive impact on low-income groups

- 6.44 The coefficient of distributive impact (CDI) on low-income groups was estimated by dividing the net income transfers to the unskilled workers and low-income consumer groups by the total of net economic added benefits generated for the private sector. Thus, using the data of table 3, the coefficient of distributive impact turns out as follows:

Net transfers to unskilled workers
and low-income consumers

$$\text{CDI} = \frac{\text{Net economic benefits to the private sector}}{\text{Net economic benefits to the private sector}} = \frac{558270.6}{728632.2} = 0,7662$$

- 6.45 In other words, 76.6% of the net economic benefits generated by the sampling of projects for the Fourth Stage of the Rural Drinking Water Supply Program go to groups in the low-income category.

C H I L E. Marco de Referencia Socioeconómico

A. Evolución económica reciente

- 1.01 Después de la recesión de 1982-83, cuando el producto interno bruto (PIB) se redujo casi un 15 por ciento del nivel alcanzado en 1981, la economía chilena reinició su crecimiento a partir del tercer trimestre de 1983, pero su ritmo de expansión se contrajo en la segunda parte de 1984. El aumento de la competitividad de la producción exportable, resultante de la devaluación real que tuvo lugar desde junio de 1982 y la participación más activa del Estado, impulsaron la recuperación de la producción, determinando en 1984 un crecimiento real del PIB del 5,9 por ciento.
- 1.02 Sin embargo, en ese año se debilitó el proceso de ajuste interno que las autoridades venían realizando desde 1982. El dinamismo de la demanda agregada durante la primera parte del año, condujo a un crecimiento en el volumen de las importaciones que resultó incompatible con la disponibilidad de recursos externos. Este crecimiento de las importaciones se originó básicamente en el surgimiento de expectativas de aceleración del ritmo de devaluación del peso y de aumentos en los aranceles; y en menor medida, en la demanda de insumos intermedios para alimentar la reactivación industrial y satisfacer la necesidad del sector privado de reconstituir las existencias. Esto dio lugar a una recuperación inconstante de la inversión bruta, concentrada en la acumulación de existencias más que en la formación de capital fijo. La demanda externa, por su parte, continuó débil durante 1984 para la mayoría de los productos, con excepción de los no tradicionales, por lo que hubo solamente un modesto crecimiento en el volumen de las exportaciones. El consumo total creció a una tasa inferior a la de la población como consecuencia, principalmente, de la caída en las remuneraciones reales y de la existencia de un alto nivel de desocupación y subempleo.
- 1.03 Al acrecentarse las dificultades para aumentar la disponibilidad de divisas, a mediados de septiembre el Gobierno tomó medidas dirigidas a contraer el gasto interno, para lo cual devaluó el peso y redujo la liquidez monetaria (M_1). A pesar de que estas medidas disminuyeron la demanda de importaciones durante el último trimestre, el déficit de la cuenta corriente de la balanza de pagos llegó en 1984 a casi el doble del del año precedente, nivel bastante superior al programado inicialmente.
- 1.04 Las condiciones del sector externo que sirvieron de base para diseñar el Programa Económico de 1984 se deterioraron en forma notable. La tasa de interés de referencia (LIBOR) aumentó a un promedio de 11,2 por ciento durante 1984 frente al 9,9 por ciento del año anterior, y el precio del cobre se mantuvo por debajo del nivel promedio de \$0,75 la libra proyectado para el año. Por su parte, crecieron las expectativas de devaluación incrementando las presiones sobre el

peso. Estas últimas resultaron en la elevación del tipo de cambio en el mercado paralelo a un nivel superior en un 30 por ciento al de la cotización oficial a mediados de junio. Para contener el drenaje de las reservas internacionales y mantener controlado el crecimiento inflacionario, el Gobierno restringió la oferta nominal de dinero colocando pagarés en el mercado abierto. Esto aumentó transitoriamente la tasa de interés bancario de corto plazo (30 días), puesto que la restricción de la oferta monetaria no estuvo acompañada por una disminución de la demanda por liquidez del sector privado.

- 1.05 La agricultura, la pesca, la manufactura y la construcción, estuvieron a la cabeza de la expansión productiva del primer semestre. La mayor disponibilidad de crédito y la existencia de precios de garantía estimularon la expansión del cultivo de cereales, cuyo aumento de producción fue determinante para que el valor agregado agrícola creciera un 6,7 por ciento en 1984. La pesca se incrementó un 12 por ciento como resultado de una captura más abundante de especies para la elaboración de harina de pescado y aceites. Las manufacturas se expandieron un 10 por ciento, frente al 4 por ciento del año precedente, en respuesta a la mayor demanda de materiales de construcción y de insumos industriales nacionales provocada por la reactivación de las actividades favorecidas con el aumento de la protección arancelaria. Adicionalmente, una mejor situación en materia de endeudamiento interno de las empresas y las expectativas de cambios en las políticas comercial y cambiaria, estimularon a los empresarios a elevar sus existencias. La construcción, por su parte, continuó la recuperación iniciada en los últimos meses de 1983 y creció cerca de un 5 por ciento durante 1984.
- 1.06 La situación ocupacional mejoró durante 1984. A pesar de que la tasa de desempleo abierto continuó en un nivel alto, el Gobierno consiguió reducirla del 22,5 por ciento de la fuerza de trabajo en septiembre de 1983 a 18,5 por ciento en el mismo mes de 1984, como resultado de la recuperación económica y los programas de obras públicas. El número de ocupados en empleos productivos --excluyendo a los beneficiarios del Programa de Empleo Mínimo (PEM) y del Programa Ocupacional para Jefes de Hogar (POJH)-- aumentó un 6 por ciento en ese período, mientras que el número de participantes en esos programas especiales se redujo del 13,8 al 9 por ciento de la fuerza de trabajo.
- 1.07 La evolución financiera de 1984 se caracterizó por (a) un aumento del crédito interno neto del 7 por ciento en términos reales, frente a la disminución por un valor similar el año anterior. El sector público obtuvo un volumen de recursos tres veces superior al concedido al sector privado; (b) una disminución en la cantidad real de dinero del sector privado, seguida de fluctuaciones transitorias acentuadas en las tasas de interés, las que sin embargo mantuvieron la tendencia decreciente observada desde 1982; y (c) el aumento de la cartera vencida de las instituciones bancarias en relación al total de las colocaciones del sistema. Este deterioro resultó más agudo en los bancos intervenidos.

- 1.08 En 1984, el déficit global del sector público no financiero se elevó al 4,5 por ciento del PIB frente al 3 por ciento del año precedente. Las tres cuartas partes de dicho déficit correspondieron al gobierno general y el resto a las empresas públicas. El mayor déficit se debió al crecimiento de los gastos de capital llevados a cabo para reactivar la economía y reducir el desempleo. Las menores recaudaciones del impuesto sobre la renta y la reducción de los ingresos provenientes del cobre por la baja en el precio internacional de dicho mineral, fueron compensadas por el crecimiento en las recaudaciones de los impuestos a las importaciones. Los gastos corrientes, por su parte, se redujeron levemente en relación al PIB, a pesar de los mayores pagos por intereses de la deuda externa. Las dos terceras partes del déficit del sector público se financiaron con recursos externos contratados principalmente por las empresas públicas.
- 1.09 El índice de precios al consumidor creció un 20 por ciento en promedio en 1984 mientras que el de los precios mayoristas aumentó un 24,3 por ciento durante el mismo período, en comparación con cifras del 27,3 y el 45,5 por ciento, respectivamente, en 1983.
- 1.10 En 1984 aumentó el desequilibrio de las cuentas externas. La reducción del excedente comercial a \$282 millones, casi la cuarta parte del superávit proyectado inicialmente por las autoridades, y el incremento de los pagos por intereses de la deuda externa constituyeron las causas principales del aumento en el déficit de la cuenta corriente a un nivel equivalente al 10,6 por ciento del PIB, el doble del de 1983. Las importaciones de mercaderías aumentaron un 19 por ciento durante 1984. El mayor crecimiento se produjo en las de bienes intermedios y de capital. El valor de las exportaciones se redujo un 5 por ciento, como resultado de la drástica caída en los precios de los principales minerales, de la harina de pescado y de los productos de madera. A pesar de que en los últimos meses el Gobierno utilizó líneas de crédito de corto plazo por unos \$480 millones, los ingresos por inversión directa y otros capitales no alcanzaron a financiar el déficit corriente, y fue necesario utilizar reservas internacionales por \$82 millones --de acuerdo con la definición del Fondo Monetario Internacional (FMI). A fines de diciembre de 1984, las reservas alcanzaron un nivel equivalente a tres meses de importaciones de bienes y servicios no factoriales.
- 1.11 Debido a las dificultades para la contratación de nuevos recursos de los bancos comerciales, la deuda externa total de Chile aumentó un 8,6 por ciento en términos nominales durante 1984, llegando a \$19.000 millones. La relación entre el servicio de la deuda y las exportaciones se mantuvo a un nivel aproximadamente similar al del año anterior, del 58 por ciento.

B. Principales políticas económicas aplicadas en 1984

- 2.01 Los objetivos del Programa Económico de 1984, que contó con el apoyo crediticio del FMI, fueron: aumentar la producción exportable y de sustitución de importaciones; absorber parte del desempleo; y estabilizar el funcionamiento del sistema financiero. En vista de la reducida disponibilidad de recursos externos y de los propósitos de mantener bajo control la inflación y conservar el nivel de reservas internacionales alcanzado en diciembre de 1983, las autoridades programaron inicialmente llevar a cabo políticas conservadoras de demanda agregada. Tres meses después de iniciada la ejecución del Programa, el Gobierno reemplazó el equipo económico y modificó los instrumentos de la política económica para alcanzar los objetivos previstos.
- 2.02 Las nuevas autoridades se propusieron: acelerar la reactivación económica, dentro del marco del programa financiero acordado a principios del año con el FMI y con el Comité Asesor de los bancos acreedores; reducir más rápidamente el desempleo; y encontrar soluciones al endeudamiento interno de las empresas y las personas, incluyendo la situación de los bancos intervenidos y los grupos económicos de que forman parte.
- 2.03 Para alcanzar sus objetivos, el Gobierno aprobó el Programa Trienal para 1984-86, con el que se comenzaron a coordinar las actividades de los sectores privado y estatal dirigidas a recuperar las pérdidas de producción ocurridas durante la recesión de 1982-83. Además, inicialmente expandió el gasto público y la liquidez monetaria; estimuló la reprogramación de la totalidad de las deudas de amplios sectores de la población con los bancos, facilitando mayores plazos y reduciendo las tasas de interés; y se aprobó la ley según la cual se busca normalizar las operaciones de la banca intervenida en 1983 mediante su recapitalización.
- 2.04 En 1984 las autoridades continuaron los esfuerzos para mejorar la situación de liquidez del sector privado. Mantuvieron las líneas de crédito establecidas en 1983 para el pago del servicio de deudas en dólares, para repactar deudas en moneda nacional con los bancos y para adquirir viviendas. Adicionalmente, con el fin de promover el ahorro privado, se redujo la carga tributaria de empresas y de personas, a tiempo que se estimuló la reinversión de utilidades en las empresas. Las tasas de interés del mercado financiero se determinaron libremente con la excepción de la correspondiente a captaciones a 30 días, la que fue fijada por el Banco Central procurando mantenerla positiva en términos reales y compatible con las tasas internacionales.
- 2.05 El cumplimiento de la meta de absorber una parte importante del desempleo y de imprimir mayor austeridad en los gastos públicos, determinó que las autoridades decretaron, a partir de enero, un aumento del 15 por ciento en la remuneración de los servidores públicos sin realizarse ajustes posteriores. Los salarios del sector

privado siguieron siendo determinados mediante negociaciones colectivas o por acuerdos individuales, sin aplicarse ningún sistema de indización por inflación como en el pasado. Como resultado, entre diciembre de 1983 y diciembre de 1984 las remuneraciones reales se redujeron un 4 por ciento en adición a la disminución de también 4 por ciento ocurrida en el mismo lapso del año anterior.

- 2.06 Para mantener la competitividad de la producción exportable en el mediano plazo, el Gobierno programó ajustar mensualmente el valor del dólar en 1984 de acuerdo con las variaciones de los precios internos, descontada una estimación de la inflación internacional. A pesar de que durante algunos meses el ajuste cambiario resultó superior a ese diferencial de precios, hubo períodos en que dicho ajuste fue inferior al mismo, acrecentando las expectativas de devaluación del peso. Esto, unido a la evolución desfavorable del precio del cobre y de las tasas de interés externas, y a la apreciación del dólar, indujo al Gobierno a subir el arancel a las importaciones y a devaluar el peso a mediados de septiembre. Estas medidas, si bien redujeron la demanda de bienes importados en el último trimestre de 1984, aceleraron la inflación y produjeron como resultado una mejora en la competitividad de la producción exportable y una nueva caída en los salarios reales. Para reducir el impacto inflacionario de las medidas cambiarias, las autoridades: (a) modificaron en octubre el sistema de fijación mensual del tipo de cambio devaluando por una sola vez el peso en la mitad del crecimiento inflacionario del mes anterior; (b) dejaron de "sugerir" transitoriamente a los bancos la tasa de interés pasiva; y (c) contrajeron la oferta monetaria.

C. Perspectivas de corto plazo

- 3.01 La evolución del precio del cobre y de las tasas internacionales de interés, así como los nuevos préstamos de los bancos comerciales y otras fuentes, constituyen los factores externos que condicionarán la recuperación económica de Chile en los próximos años. La inestabilidad actual en los mercados de bienes y financieros y el alto nivel del endeudamiento externo ya contratado influirán adversamente en la disponibilidad de recursos para financiar el crecimiento económico futuro. Consecuentemente, el aumento del ahorro interno y de la capacidad para producir bienes exportables y substituir importaciones son los aspectos internos que requerirán la atención prioritaria de las autoridades.
- 3.02 En 1985, de acuerdo con el presupuesto aprobado para el sector público, podría alcanzarse una expansión moderada de las actividades económicas, con un crecimiento inflacionario similar al de 1984 y una disminución significativa de los déficit del sector público y de la cuenta corriente de la balanza de pagos. Como consecuencia de la reducida disponibilidad de crédito externo y de la incertidumbre sobre el posible ingreso de capitales de inversión directa, deberían realizarse nuevos esfuerzos para alcanzar un excedente comercial substancialmente superior al logrado en 1984, como medio de financiar los pagos de intereses de la deuda externa, que en este año

representarán más de la mitad de las exportaciones. En marzo de 1985 el Gobierno llegó a un acuerdo en principio con el FMI en relación con un crédito del Servicio Ampliado a tres años (1985-87) para apoyar un nuevo programa de estabilización económica. Esto le facilitará a Chile no solamente recurrir a los recursos de esa institución sino también reprogramar con los bancos comerciales los vencimientos de la deuda externa para ese período.

- 3.03 La estrategia de crecimiento económico para 1985-87 se basa en la expansión de las actividades de los sectores exportadores y substituidores de importaciones. Consecuentemente, se proyectó mantener una política cambiaria flexible y reducir uniformemente el arancel aduanero. Una política moderada de remuneraciones es otra de las condiciones importantes que mejorarán la competitividad de la producción nacional en el exterior. El programa prevé además la eliminación del déficit en las operaciones del sector público y una reducción significativa del desequilibrio de la cuenta corriente de la balanza de pagos para fines de 1987. Para estimular el ahorro del sector privado se tratará de evitar que haya aumentos significativos de la carga tributaria y las tasas de interés bancario se mantendrán a niveles reales positivos.

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Mortalidad Total y Por Enfermedades
Infecciosas y Parasitarias en Chile 1978 - 1983

MORTALIDAD TOTAL			MORTALIDAD POR ENFERMEDADES INFECCIOSAS Y PARASITARIAS			
Año	No. de Casos	Tasa por 1.000 Habi- tantes	No. de Casos	100.000 Habitan- tes	% del Total de Causas de Mortalidad	Población En Miles (*)
1978	72,321	6.7	-	-	-	10.732
1979	74.178	6.8	4.350	39.8	5.9	10.917
1980	73.710	6.6	3.544	31.9	4.8	11.104
1981	69.871	6.2	2.586	25.2	4.1	11.292
1982	70.041	6.1	2.678	23.3	3.8	11.487
1983	74.428	6.4	2.694	23.0	3.6	11.682

(*) Estimación del Instituto Nacional de Estadísticas (INE), al 30 de julio, basada en el Censo de 1970 con proyecciones al año 2.000.

Fuente: Servicio Nacional de Salud. Ministerio de Salud de Chile.

MORBILIDAD Y MORTALIDAD POR TIFOIDEA-PARATIFOIDEA,
HEPATITIS Y DISENTERIAS
1978 - 1983

Año	FIEBRE TIFOIDEA Y PARATIFOIDEA				HEPATITIS				DISENTERIAS			
	No. Casos Morbilid.	Tasa * Morbilid.	No. Casos Mortalid.	Tasa * Mortalid.	No. Casos Morbilid.	Tasa * Morbilid.	No. Casos Mortalid.	Tasa * Mortalid.	No. Casos Morbilid.	Tasa * Morbilid.	No. Casos Mortalid.	Tasa * Mortalid.
1978	13.114	120.8	106	1.0	6.014	55.4	50	0.5	192	1.8	27	0.3
1979	10.760	98.6	84	0.8	6.184	56.6	74	0.7	99	0.9	27	0.3
1980	10.872	97.9	74	0.7	4.312	38.8	63	0.6	101	0.9	60	0.6
1981	10.789	95.5	48	0.4	9.714	86.0	66	0.6	91	0.8	87	0.8
1982	12.795	111.7	59	0.5	8.124	70.7	59	0.5	88	0.8	75	0.7
1983	14.033	120.1	55	0.5	10.646	91.1	59	0.5	114	1.0	83	0.8

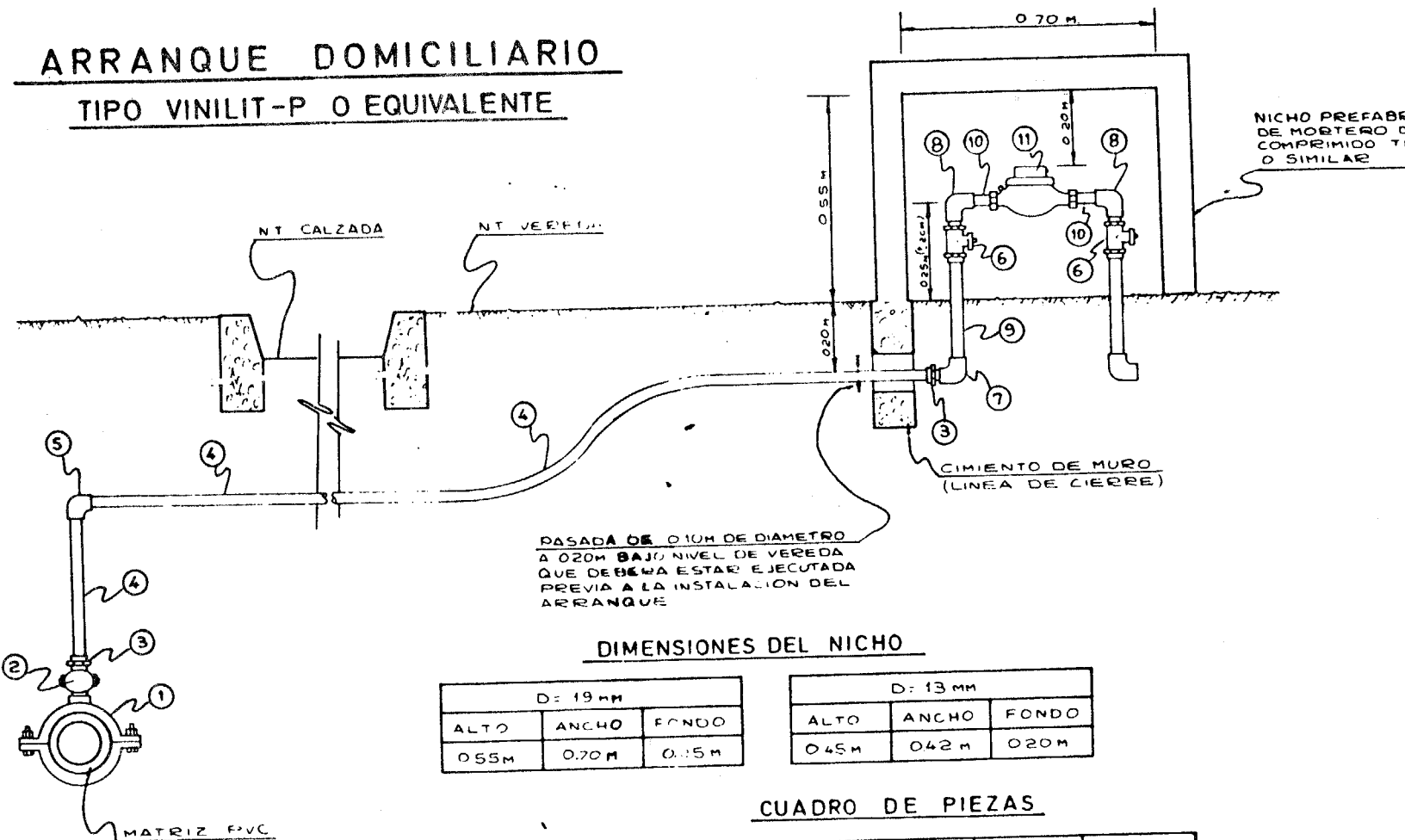
Tasas por 100.000 habitantes.
Fuente: Servicio Nacional de Salud. Ministerio de Salud de Chile.

SANEAMIENTO BASICO RURAL

Situación Población Rural Chilena en Abastecimiento de Agua Potable
Al 30-VI-85

	<u>Población</u>		<u>% sobre Poblac. Rural Total</u>	<u>Cobertura</u>
	<u>(en miles)</u>	<u>Total</u>		<u>% sobre Población Rural Concentrada</u>
a) Población total del país en 1984 (aproximadamente) *	11.700	-	-	-
b) Población rural total *	<u>2.142</u>	<u>18,3</u>	<u>100,0</u>	<u>-</u>
c) Población rural concentrada **	<u>572</u>	<u>4,9</u>	<u>26,7</u>	<u>100,0</u>
-Población rural concentrada con sistema de agua potable domiciliario	380	3,2	17,7	66,4
-Población rural concentrada sin servicios domiciliarios de agua potable	192	1,6	9,0	33,6
d) Población rural dispersa	<u>1.570</u>	<u>13,9</u>	<u>73,3</u>	<u>-</u>

ARRANQUE DOMICILIARIO **TIPO VINILIT-P O EQUIVALENTE**

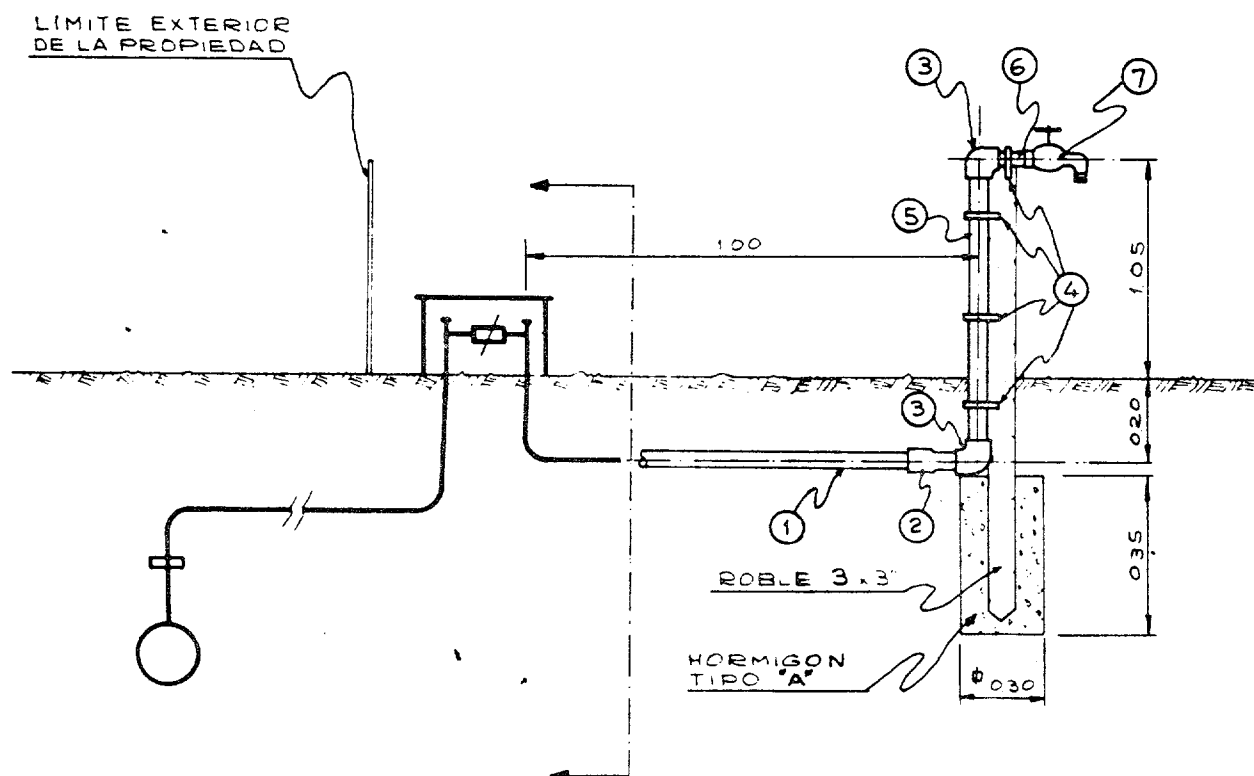


NOTA:

EL ARRANQUE DE AGUA POTABLE DEBERA QUEDAR ENTERRADO COMO MINIMO 75 CM DEL NIVEL SUPERIOR DEL TERRENO. SI HUBIERA SOLERA PODRA DISMINUIR A 50 CM PERO EN AMBOS CASOS SE SITUARAN COMO MINIMO 30 CM POR ENCIMA DE CUALQUIER TUBERIA DE ALCANTARILLADO

ESQUEMA DE INSTALACION

SIN ESCALA



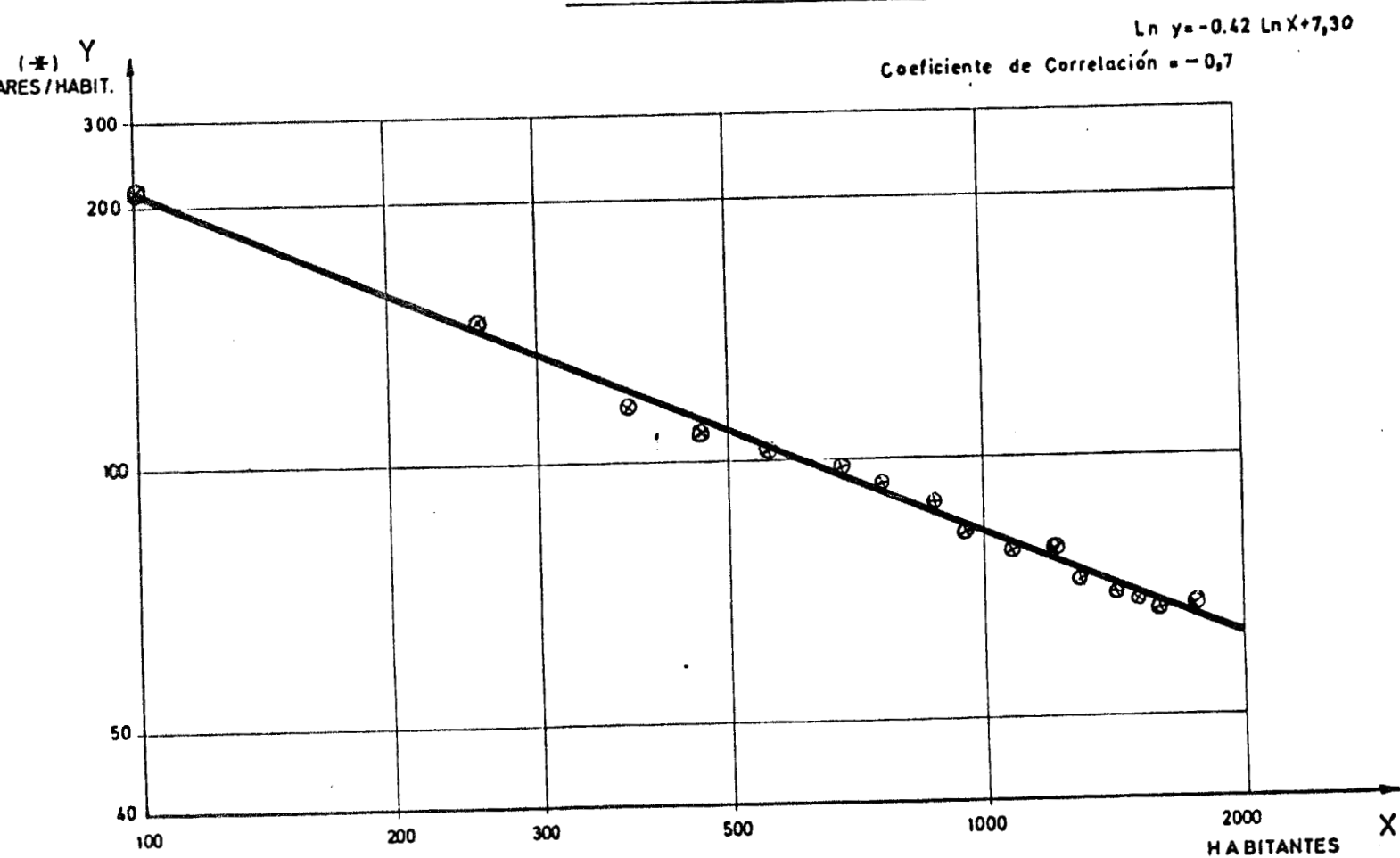
ARRANQUE DOMICILIARIO APROBADO
POR RESOLUCION Nº 1557 DEL 18-8-83
O EQUIVALENTE Y MODIFICACIONES
VIGENTES A LA FECHA DE CONSTRUCCION
DE LA OBRA

CUADRO DE PIEZAS

Nº	DESIGNACION	MATERIAL	D	CANT.
1	CAÑERIA L=1.00 m	VINILIT- P	20mm	—
2	TERMINAL HE	VINILIT- P	1/2"	1
3	CODO HI-HI	GALV	1/2"	2
4	ABRAZADERA	ACERO	1/2"	4
5	CAÑERIA L=1.20 m.	GALV	1/2"	—
6	NIPLE HE-HE L= 0.10 m.	BRONCE	1/2"	1
7	LLAVE DE SALIDA TIPO JARDIN	BRONCE	1/2"	1

PROYECTO DE OBRAS PÚBLICAS
FINANCIADOS
PROGRAMAS NACIONALES

MUESTRA REPRESENTATIVA DE SUBPROYECTOS
RELACION COSTO / POBLACION



DESCRIPCION TECNICA PROYECTOS DE MUESTRA

ION	SERVICIO	COMUNA	PROVINCIA	POBLACION		DOTACION (l/h/d)			FUENTE DE ABASTECIMIENTO ACTUAL	FUENTES DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO PER CAPITA CON RESPECTO A LA POBL. ABASTECIDA (US\$)
				ACTUAL (1985)	FUTURA A 20 AÑOS (2005)	MEDIA	FACTOR MAX. DIARIO	FACTOR MAX. HORARIO		Nº1	Nº2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION (m)		
IV	Algarrobo	Ovalle	Limarí	386	574	95	1,5	2,25	Canales de riego.	Sondaje existente.		Napa Subterránea. Se utilizará sonda N°1349 de SENDOS median te grupo moto bomba instalad o en el pozo.	Impulsión. Tubería plástica PVC y A.G. (Ac. Galv.) A.G. D=3" 328m. PVC D=75mm 204m. Ht(elev)=56,71m	Semienterrado de hormigón de 30m3.	Cañería PVC, clase 10 con unión Anger tipo ramificado. Long. = 1.004m. PVC D= 75mm. 901m. D= 63mm. 903m.	50.355	132
IV	El Maitén	Monte Patria	Limarí	244	363	100	1,5	2,25	Canales de riego.	Predefinido.		Vertientes Subterráneas. Elevación mediante grupo motobomba.	Impulsión. Tubería plástica PVC. A.G. D= 2" 21,5m. PVC (10) D=63mm 256m. Ht(elev)=75,61m	Semienterrado de hormigón de 30m3.	Cañerías de plástico PVC, clase 10, con uniones Anger D= 63mm con Long. = 1.146m.	29.415	121
IV	Las Morlacas	Monte Patria	Limarí	417	620	100	1,5	2,25	Canales de riego.	Noria existente.		Napa Subterránea Pozo. Se utilizará la noria N°1.293. Se hará mediante un grupo motobomba instalado en el pozo.	Impulsión. Tubería plástica PVC y acero galvanizado. A.G. D=3" 141m. PVC (10) D=75mm. 517m. Ht(elev)=73,8m.	Semienterrado de hormigón de 30m3.	Cañerías PVC, clase 10, con uniones Anger y A.G. con uniones hilo. Ramificada de long. de 1.598m. A.G. D= 75mm. 141m. PVC D= 63mm. 1.457m.	45.366	109
IV	Varillar	Paihuano	Elqui	354	526	90	1,5	2,25	Río Turbio y canales de riego.	Sondaje existente.		Napa Subterránea. Se utilizará sonda N°1.400 de SENDOS median te grupo moto bomba instalad o en el pozo.	Impulsión. Tubería plástica (PVC) y A.G. A.G. D=3" 57m. PVC D=75mm 309m. Alt.= 63,68m.	Semienterrado de hormigón de 30m3.	Cañerías de plástico PVC, clase 6 con uniones Anger y A.G. con unión hilo. Red de tipo ramificado, Long. total= 2.294m. A.G. D=3"mm. 18m. PVC D=75mm. 530m. PVC D=63mm. 1.746m.	43.481	123
IV	Samobajo	Ovalle	Limarí	286	425	80	1,5	2,25	Norias particulares y acequias de riego	Sondaje existente.		Napa Subterránea se utilizará sonda N°1.401 de SENDOS, median te equipo motobomba instalado en el pozo.	Impulsión. Tubería plástica (PVC) A.G. D=3" 56,00m. PVC D= 75mm. 635m. Ht(elev)=65,78m	Metálico Elevado de 15m3 y 15m de altura.	Cañerías de plástico PVC, clase 10. Con uniones Anger. Red de tipo ramificado. Long.= 2.038 m. D = 63mm.	42.063	147

CATEGORIA	SERVICIO	COMUNA	PROVINCIA	POBLACION		DOTACION (l/h/d)			FUENTE DE ABASTECIMIENTO ACTUAL	FUENTE DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO POR RESP. LA PO. ABAS.
				ACTUAL 1985	FUTURA A 20 AÑOS	MEDIA	FACTOR MAX. DIARIO	FACTOR MAX. HORARIO		Nº1	Nº2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION		
IV	La Calera	Vicuña	Elqui	300	446	100	1,5	2,25	Canal y norias.	Sondaje existente.	-	Sondaje existente, habilitado mediante grupo motobomba.	Impulsión en cañería PVC C-10 y A.G. Long. total 1.003 m. Ht= 73,96m.	Semienterrado de hormigón armado de 30 m3 de capacidad.	Matriz y red en cañería PVC C-10 y A.G. Long. total 2.376 m.	41.574	
IV	Tunga Sur	Salamanca	Choapa	494	734	100	1,5	2,25	Acarreo desde canal.	Sondaje existente.	-	Sondaje existente, habilitado mediante grupo motobomba.	Impulsión en cañería PVC C-10 y A.G. Long. total 193 m. Ht= 45,39m.	Semienterrado de hormigón armado de 30 m3 de capacidad.	Matriz y red en cañería PVC C-10 y A.G. Long. total 4.369 m.	54.175	
V	Río Blanco	Los Andes	Los Andes	1.345	1.999	100	1,5	2,25	Vertiente.	Predefinido.		Vertiente			Matriz A.G. 125mm. 236m. Red PVC 110mm. 1.252m. PVC 63mm. 573m. A.G. 3" (75mm.) 458m. A.G. 2" (50mm.) 979m. 3.262m.	142.418	106
V	La Polcura - La Chimba	Petorca	Petorca	251	373	100	1,5	2,25	Norias particulares y río Petorca.	Sondaje existente.		Napa Subterránea. Aprovechando sondeo existente (Nº1.416). Se hará mediante un grupo motobomba existente en el pozo.	Impulsión. Tubería Plástica (PVC) y A.G. A.G. D=3" 42m. PVC D= 63mm. 195m. Ht(elev) 34,60m.	Semienterrado de hormigón de 30m3	Cañerías de plástico PVC, clase 6, con uniones Anger y A.G. con uniones hilo. Red de tipo ramificado. Long.: 2.629m. A.G. D=3" 1mm. 27m. PVC D=63mm. 2.602m.	34.874	139
V	El Porvenir - Santa Rosa - El Roble	Llany-Llany	San Felipe	1.497	2.222	100	1,5	2,25	La localidad de El Porvenir cuenta con un preexistente servicio de A.P. (sondaje CORFO). El resto, mediante norias particulares y acequias de riego.	Sondaje existente.		Napa subterránea. Aprovechando sondeo N°COH de CORFO. Se hará mediante grupo motobomba instalado en el pozo.	Impulsión. Tubería plástica (PVC) y A.G. A.G. D=4" 72m. PVC D=110mm. 980m. Ht (elev)=50,51m.	Semienterrado de hormigón de 50m3	Cañerías de plástico PVC, clase 6 y A.G. con uniones hilo y Anger. Red de tipo ramificado. Long. total= 10.995m. A.G. D=4" 63m. PVC (C 6) D=110 1.617m. D=75 372m. D=63 8.943m.	105.725	71

N°	REGION	SERVICIO	COMUNA	PROVINCIA	POBLACION (1981)		FUENTE DE ABASTECIMIENTO ACTUAL	ANÁLISIS DE ABASTECIMIENTO EXISTENTE		N°1	N°2	CONDICION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION (m)	COSTO TOTAL (US\$)	COSTO POR CAPACIDAD CON RESPECTO A LA POBL. ABASTECIDA (US\$)	OBSERVACIONES		
					ACTUAL (1981)	FUTURA A 20 AÑOS (2001)		FACTOR DE CRECIMIENTO	FACTOR DE CRECIMIENTO										
16	V	Piguchen	Putaendo	San Felipe	371	551	Canales de Riego.	1,5	2,25	100	2,25	Tranque superficial en el centro del estudio. Pozo de sondaje en el pozo al este. Tanque existente.	Capitación superficial en el canal de la Compañía.	Impulsión. Tubo PVC, Cl. 10, longitud 57m. PVC (10) D=75mm. Ht (elev)=50,52m.	Recondicionamiento de tubería PVC, Cl. 10, longitud 57m. PVC (10) D=75mm. Ht (elev)=50,52m.	Utilización de tuberías instaladas de 100mm. (2.08m). Se complementará con 272 m. de cañería de plástico PVC, clase 6, con uniones Anger.	29.492	79	Oficina Consultora Alfonso Alva - Proyecto.
17	V	Cerri - Llos	Catemupe	San Felipe	774	1.150	Norrias particulares y acequias de riego.	1,5	2,25	100	2,25	Sondaje existente.	Utilización de tuberías PVC, clase 6, con uniones Anger y A.G. Red de tipo ranurado y Long. total red = 3.927m. A.G. D=3" 60m. PVC D=75mm. 605m. PVC D=63mm. 3.702m.	63.874	83	Oficina Consultora Alfonso Alva - Proyecto.			
18	V	El Arbolito	Petorca	Petorca	857	1.273	Norrias particulares y acequias de riego.	1,5	2,25	100	2,25	Extensión del servicio local. Nueva Impulsión en cañería tipo ranurado. Se abastecerá mediante una norria. (mejoramiento de este sistema).	Hierro Viejo. Semienterrado. Cerrado. Hierro Viejo (C.A.). Red de tipo ranurado. Long. total = 2.495m. (PVC y A.G.). A.G. D=4" 180m. PVC D=90 329m. Ht = 45,7m.	La matriz empalmará con la red existente. Hierro Viejo (C.A.). Red de tipo ranurado. Long. total = 2.495m. (PVC y A.G.). A.G. D=4" 180m. PVC D=90 329m. Ht = 45,7m.	Cañerías de plástico PVC, clase 6, con uniones Anger y A.G. Red de tipo ranurado y Long. total red = 3.927m. A.G. D=3" 60m. PVC D=75mm. 605m. PVC D=63mm. 3.702m.	51.902	61	Oficina Consultora Alfonso Alva - Proyecto.	
19	V	Caleta Quintay	Casablancas	Valparaiso	894	1.338	Hay dos fuentes, una desde el estero y la otra es una vertiente que abastece a la Caleta y que por el aumento de las construcciones ofrece peligro de contaminación orgánica.	1,5	2,25	100	2,25	Sondaje existente. Norria con pozo y estanque de 2m3, que actualmente abastece a 64 usuarios que cuentan con medidor. El resto se abastece de norrias y vertientes.	Impulsión en cañería PVC. Long. total = 1.319m. Ht = 82,98m.	Matriz y red de distribución en cañería PVC C-6 y A.G. con una Long. total 4.874 m.	105.298	118	Jorge Valenzuela C. Ings. Consultores. Anteproyecto.		
20	V	Quebrada Alvarado	Olnue	Quillota	1.020	1.516	Norria con pozo y estanque de 2m3, que actualmente abastece a 64 usuarios que cuentan con medidor. El resto se abastece de norrias y vertientes.	1,5	2,25	60	2,25	Sondaje existente. Norria con pozo y estanque de 2m3, que actualmente abastece a 64 usuarios que cuentan con medidor. El resto se abastece de norrias y vertientes.	Impulsión en cañería PVC. Long. total = 1.319m. Ht = 82,98m.	Matriz y red de distribución en cañería PVC C-10 y A.G. con una Long. total 9.243 m.	91.277	89	Jorge Valenzuela C. Ings. Consultores. Anteproyecto.		
21	VI	Idahuilto	Coltauco	Cachapoal	588	874	Norrias y pozos particulares.	1,5	2,25	100	2,25	Habilitación de sondaje existente. El estudio de alternativas queda limitado a la elección del tipo y ubicación del estanque.	Impulsión. Cañería de Fe. Galvanizado de 10m. Ht (elev)=22,9m.	Red formada fundamentalmente por 2 tramos de cañerías PVC, clase 6, y Fe. Galvan. Long. total de la matriz y red: 4.478m. PVC (6) D=63mm. 1.445m. PVC (6) D=90mm. 810m. PVC (6) D=110mm. 2.140m. A.G. D=75mm. 6m. A.G. D=50mm. 48m. A.G. D=100mm. 28m.	31.510	142	Consorcio Nacional de Ings. Consultores (CNI). Guillermo Ruiz T. Proyecto.		
22	VI	Pelequén Viejo - Portezuelo - San Luis.	Malloa	Cachapoal	653	970	Norrias particulares.	1,5	2,25	100	2,25	Sondaje existente. El estudio de alternativas queda limitado a la elección del tipo y ubicación del estanque.	Impulsión de Fe. Galvanizado de 10m. Ht (elev)=22,9m.	Red formada fundamentalmente por 2 tramos de cañerías PVC, clase 6, y Fe. Galvan. Long. total de la matriz y red: 4.478m. PVC (6) D=63mm. 1.445m. PVC (6) D=90mm. 810m. PVC (6) D=110mm. 2.140m. A.G. D=75mm. 6m. A.G. D=50mm. 48m. A.G. D=100mm. 28m.	89.282	137	Consorcio Nacional de Ings. Consultores (CNI). Guillermo Ruiz T. Proyecto.		
23	VI	Santa Inés	Las Cabras	Cachapoal	523	777	Norrias y pozos particulares.	1,5	2,25	100	2,25	Sondaje existente.	Impulsión de Fe. Galvanizado de 10m. Ht (elev)=22,9m.	Red formada fundamentalmente por 2 tramos de cañerías PVC, clase 6, y Fe. Galvan. Long. total de la matriz y red: 4.478m. PVC (6) D=63mm. 1.445m. PVC (6) D=90mm. 810m. PVC (6) D=110mm. 2.140m. A.G. D=75mm. 6m. A.G. D=50mm. 48m. A.G. D=100mm. 28m.	67.328	129	Consorcio Nacional de Ings. Consultores (CNI). Guillermo Ruiz T. Proyecto.		

N°	REGION	SERVICIO	COMUNA	PROVINCIA	POBLACION		ROTACION (1/10/d)		FUENTE DE ABASTECIMIENTO ACTUAL	FUENTES DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO PLR CAPITA CON RESPECTO A LA POBL. ABASTECIDA (US\$)	OBSERVACIONES	
					ACTUAL (1985)	FUTURA A 20 AÑOS (2005)	MEDIA	MAX. DIARIO/HORARIO		N°1	N°2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION (m)				
25	VI	San José de las Lagunas	San Vicente	Cachapoal	516	767	100	1,5	2,25	Norias. Algunos habitantes disponen de bombas.	Sondaje existente.	-	Habilitación del sondaje existente. Pozo N°1.590.	Impulsión. Tubería de Fe. galvanizado. D = 75mm. 45m. Ht (elev)=29,02m.	Metálico elevado de 25m3, sobre una torre de altura.	Long. red= 3.560 m. linales. Formada por dos tramos abiertos. PVC D=50mm. 745m. B=63mm. 2.750m. Fe. G. D=50mm. 65m.	64.805	126	Consorcio Nacional de Ings. Consultores (CNIC). Guillermo Ruiz T. Proyecto.
26	VI	Tunco Alto	San Vicente	Colchagua	858	1.275	60	1,5	2,25	Norias y pozos particulares. Algunas viviendas disponen de estanques propios para almacenar agua.	Se conectará a red existente, por lo que el estudio de alternativas queda limitado a la determinación del caudal max. que puede aportar la matriz entre el estanque y el punto de entrega a la red lince Abajo.	-	Red proyectada de 25m3, se termina a la red lince. Esta red es aluminio. Se toma desde un tanque y el punto de entrega a la red lince se cerrará de 75m3.	-	Formada por un tramo y algunos ramales cortos. Cahnria PVC, clase 6, y Fe. G. 3.010m. PVC (6) D=75mm. 3.460m. PVC (6) D=50mm. 37m. A.G. D=75mm. 8m. A.G. D=50mm. 8m. Long. Total 6.586m.	59.266	69	Consorcio Nacional de Ings. Consultores (CNIC). Guillermo Ruiz T. Proyecto.	
29	VII	La Odra	Curicó	Curicó	644	957	100	1,5	2,25	Norias y pozos particulares. El nivel de las norias está muy influenciado por las lluvias y los riegos).	Sondaje existente.	-	Habilitación de sondaje existente. N°1964.	Impulsión. Cahnria de Fe. galvanizado de D = 75mm. Ht (elev) 23,95m.	Metálico elevado de 25m3 instalado sobre una torre de 15m.	Red formada por dos tramos, Cahnria PVC, clase 6, y fierro galvanizado. Long. total red 3.462m. PVC (6) D=63mm. 1.845m. PVC (6) D=75mm. 1.545m. A.G. D=75mm. 47m. A.G. D=50mm. 25m.	61.670	96	Consorcio Nacional de Ings. Consultores (CNIC). Guillermo Ruiz T. Proyecto.

N°	REGION	SERVICIO	COMUNA	PROVINCIA	POBLACION (Hab.)		DOTACION			FUENTE DE ABASTECIMIENTO ACTUAL	FUENTES DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO PER CAPITA CON RESPECTO A LA POBL. ABASTECIDA (US\$)
					ACTUAL (1985)	FUTURA A 20 AÑOS (2005)	MEDIA	FACTOR MAX. DIARIO	FACTOR MAX. HORARIO		N°1	N°2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION (m)		
32	VII	Trapiche Loncomilla	Villa Alegre	Linares	805	1.196	100	1,5	2,25	Norías y vertientes.	Sondaje existente	-	Sondaje existente.	Impulsión en cañería PVC C-10 y A.G. Long. total 1.610 m. H _t = 40,00m.	Semienterrado de hormigón armado de 30 m3 de capacidad.	Long. total 5.404 m. PVC C-6 90mm. 85m. PVC C-6 75mm. 330m. PVC C-6 63mm. 4.855m. A.G. 75mm. 70m. A.G. 50mm. 64m.	84.875	105
33	VII	Rincón de Mellico	Sagrada Familia	Curicó	1.098	1.632	100	1,5	2,25	Norías	Pozo existente.	-	Pozo existente.	Impulsión en cañería PVC y A.G. con Long. total 327 m. H _t = 50m.	Semienterrado de hormigón armado de 50 m3 de capacidad.	Long. total 12.150 m. PVC C-6 90mm. 4.155m. PVC C-6 75mm. 1.150m. PVC C-6 63mm. 6.525m. A.G. 75mm. 200m. A.G. 50mm. 120m.	145.799	133
34	VII	Los Pozos - Los Garceses - Los Aromos	San Clemente	Talca	402	597	100	1,5	2,25	Norías particulares.	Sondaje existente	-	Sondaje existente.	Impulsión en cañería de acero. Long. total 435 m. H _t = 30,0 m.	Elevado metálico de 15 m3 sobre torre de 20 m. de altura.	Long. total 2.954 m. PVC C-6 75mm. 1.026m. PVC C-6 63mm. 1.102m. A.G. 75mm. 26m.	44.437	111
35	VIII	Chillancito de Cabrero	Cabrero	Bfo-Bfo	346	514	100	1,5	2,25	Norías.	Sondaje de SENDOS N°1619.	-	Sondaje impulsado con grupo motobomba.	Impulsión con equipo motobomba. H _t = 35,90m.	Elevado metálico de 15m3 y torre de 15m.	Cañería de PVC, C-6 y A.G. Long. de 1.070m.	32.992	95
36	VIII	Talcañavida	Hualqui	Concep.	1.629	2.421	100	1,5	2,25	Lagunas; sistema de bombeo entrega agua a un estanque; hay norías.	Halla de punteras.	-	Se usará equipo elevador. Halla de punteras.	Impulsión cañería en PVC clase 10. y A.G. Long. = 407m. H _t = 56,96m.	Hormigón armado semi-enterrado. V = 75m3.	Matriz y red en PVC y A.G. Long. total = 6.212m.	70.852	43
37	VIII	Charrúa	Cabrero	Bfo-Bfo	675	1.037	100	1,5	2,25	Norías.	Puntera.	-	Mediante equipo de vacío y bomba centrífuga a partir de puntera.	Impulsión con equipo elevador. H _t = 28,52m.	Metálico de 25m3 de capac. con torre de 20 m.	Matriz y red en cañería de PVC, C-6 y A.G. Long. = 4.222m.	49.501	73
38	VIII	Talquipén	Coihueco	Ruble	806	1.198	100	1,5	2,25	Norías y camiones aligibes.	Sondaje SENDOS N°1320	-	Sondaje existente con equipo elevado.	Impulsión con motobomba sumergida. H _t = 34,24m.	Elevado, metálico de 25m3 y torre 20m.	Cañería PVC, clase 6, y acero galvanizado Long. total = 6.869m.	68.294	85
39	VIII	Pichilo	Arauco	Arauco	472	701	100	1,5	2,25	Vertientes y ríos. Existe un estanque de 20m3.	Estero	-	Captación superficial en estero.	Impulsión en PVC, clase 10 D = 75mm. y acero galvanizado. Long. = 373m.	Hormigón armado semi-enterrado de V = 30 m3.	Cañerías en PVC C-6 y A.G. Long. total = 4.198m.	61.111	129
										Norías.	Conexión de red de Carampangue.	-	Ver Carampangue.	Ver Carampangue.	No contemplado (el de Carampangue es de V=500m3)	Ver Carampangue. Red en PVC, clase 6, Long. total = 7.222m.		
40	VIII	Lautaro	Contulmo	Arauco	608	903	100	1,5	2,25	Norías y estanque de la escuela.	Vertiente.	-	Superficial. Toma lateral a una vertiente.	Gravitacional Aducción con cañería PVC C-10.	De hormigón armado de tipo semi-enterrado. V = 30m3.	Matriz de 615m. en PVC, clase 10. D = 90mm. y acero Galv. D = 100mm. Red en cañería de PVC y acero galv. Longitud = 6.998m.	71.729	118

N°	REGION	SERVICIO	COMUNA	PROVINCIA	POBLACION		DOTACION (l/h/d)			FUENTE DE ABASTECIMIENTO ACTUAL	FUENTES DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO PER CAPITA RESPECTO A LA POBLACION ABASTECIDA	OBSERVACIONES
					ACTUAL 1985	FUTURA A 20 AÑOS	MEDIA	FACTOR MAX. DIARIO	FACTOR MAX. HORARIO		N°1	N°2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION			
41	VIII	Caleta Lengua	Talcahuano	Concepción	390	580	80	1,5	2,25	Vertiente. Sistema captación, estanco y cañ. plástica.	Estero Chorrillos.	-	Captación superficial en el estero Chorrillos.	Gravitacional. Aducción en cañería PVC C-6 de D=75mm. Long. total 671 m.	Sulente-rizado de hormigón armado de 30 m3 de capacidad.	Matriz y red de distribución en cañería PVC C-6 con una Long. total 1.596 m.	40.926	105	Isamu Ings. sultor Antep
42	VIII	Villa Sta. Rosa de Lebu.	Lebu	Arauco	585	869	90	1,5	2,25	Norias.	-	-	Captación superficial desde un estero formado por quebradas.	Impulsión en cañería PVC C-10 y A.G. Long. total 847 m. H _t elev. 58,1m.	Metálico elevado de 25 m3 de capacidad.	Matriz y red en cañería PVC C-6. Long. total 3.336 m.	71.936	123	Isamu Ings. sultor Antep
43	VIII	Ralco	Sta. Barbara	Bfo-Bfo	433	643	80	1,5	2,25	Arroyos, esteros y vertientes.	Canal alimentador del tranque existente.	-	Superficial, definida mediante una obra de toma lateral.	Aducción gravitacional en cañería PVC C-6, con Long. total 151 m.	Semienterrado de hormigón armado de 30 m3 de capacidad.	Matriz y red de distribución en cañería PVC C-10, con Long. total 2.541 m.	27.741	64	Isamu Ings. sultor Antep
44	VIII	Los Canelos	Antuco	Bfo-Bfo	360	535	100	1,5	2,25	Pozos y quebradas cercanas.	-	-	Superficial en el estero.	Gravitacional. Cañería de A.G. y PVC C-10 Long. total 362 m.	Semienterrado de hormigón armado de 30 m3 de capacidad.	Matriz y red de distribución en cañería PVC C-6 y A.G. Long. total 4.078 m.	35.470	99	Isamu Ings. sultor Antep
45	VIII	San José de Colico	Curanilahue	Arauco	596	886	60	1,2	1,8	123 de la población de vertientes y el resto de norias o pozos.	Wapa subterránea.	-	Batería de drenes.	Impulsión en cañería PVC C-10 y A.G. Long. total 551 m. H _t = 53,10m.	Metálico elevado de 15 m3 sobre torre de 15m.	Matriz y red en cañería PVC C-6. Long. total 1.869 m.	44.670	75	Isamu Ings. sultor Antep
46	VIII	Unihue	Hualqui	Concepción	519	833	100	1,5	2,25	Norias.	Sondaje existente	-	Sondaje existente.	Impulsión.	Metálico elevado de 25 m3 de capacidad y torre 15 m.	Matriz y red de distribución en cañería PVC C-6 y A.G. Long. total 4.193 m.	52.361	101	Isamu Ings. sultor Antep
47	VIII	Los Lleres	Pinto	Huile	1.544	2.530	100	1,5	2,25		Canal Villa Lobos	-	Superficial en el canal Villalobos.	Aducción cañería PVC C-10. Long. total 35 m.	Semienterrado de hormigón armado de 75 m3 de capacidad.	Matriz y red de distribución en cañería PVC C-10. Long. total 8.234 m.	64.191	42	Isamu Ings. sultor Antep
48	IX	Queule	Toltén	Chautín	1.235	1.835	100	1,5	2,25	Vertiente	Vertiente (Estanque V=50m3)	(Estanque V=50m3)	Superficial. Definida por una toma lateral a una vertiente.	Aducción. Cañería PVC C-10 (110mm.) 2.153m. Impulsión para sectores altos PVC C-10 y A.G. 298m. H _t 83,53m.	V=30m3. Hormigón armado semi-enterrado.	Matriz y red en PVC C-6 y A.G. Long. tot. = 3.987 m.	112.432	91	Ings. J. Val Project
49	IX	San Ramón	Freire	Chautín	248	456	100	1,5	2,25	Norias.	Sondaje SENDOS N°1615.	-	Sondaje.	Impulsión de 290 m. en grupo motobombas vergido. cañería en PVC, clase 6, D = 63mm. H _t = 36,73m.	V=15m3 con torre de 15m. alt.	Matriz y red en cañería de PVC; longitud total = 1.838m.	32.973	133	Ings. J. Val Project

N°	REGION	SERVICIO	COMUNA	PROVINCIA	POBLACION (hab.)		DOTACION		FUENTE DE ABASTECIMIENTO ACTUAL	FUENTES DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO POR CAPITA A LA POBL. ABASTECIDA (US\$)	OBSERVACIONES
					ACTUAL (1985)	FUTURA A 20 AÑOS (2025)	FACTOR MEDIO	FACTOR MAX.		N°1	N°2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION (m)			
65	X	Llao-Llao	Castro	Chiloé	369	548	100	1,5	2,25	Alimentadora desde la red de distrib. de Castro.	Alimentac. desde la red de Cas-Llao-Llao, mediante barrera mixta y extensión perpendicular al caudal que abastece a las redes de 300 mts.	Captación en estero Llao-Llao, con algunos mejoramientos. Sector alto = tre la planta tanque sect. al río PVC C-6 10mm. Long. = 41m. Alt. = 16,45	Gravitacional V=30x3 extensión de 70m de terrazo de hormigón armado. Longitud = 2,35m. La red es de PVC, clase 10 de D = 63mm. Long. = 577 mts.	Matriz de PVC, clase 6 D = 90mm, conectada a la red existente de abastecimiento D 75mm. Longitud = 2,35m. La red es de PVC, clasa 10 de D = 63mm. Long. = 577 mts.	35,071	95	ICI Ingenieros. Soc. Ingenieros Consultores Ltda. Proyecto.	
66	X	La Aguada	Corral	Valdivia	631	918	100	1,5	2,25	Acueducto en mal estado proveniente del estero La Aguada y sus vertientes.	Esterio La Aguada N°3 con vertientes.	Sector bajo = abastecido por el río, con algunos mejoramientos. Sector alto = tre la planta tanque sect. al río PVC C-6 10mm. Long. = 41m. Alt. = 16,45	Semi-enterrado de 30m3 (sector bajo) y 30m3 (sector alto).	Red y matriz en PVC C-6 D = 90mm. Long. red = 703m. (S. Matriz y red S. alto = 1.045m.	49,682	79	Consortio Nacional de Ingenieros Consultores. Guillermo Ruiz T. Proyecto.	
67	X	Rio Negro	Hualthue	Patena	573	851	100	1,5	2,25	Captación del río (con cañería a escuela y casas).	Rto Cuchillo.	-	Semi-enterrado de 30m3 (sector bajo) y 30m3 (sector alto).	Matriz y red en PVC C-6 y Fe. G. (diámetros variables). Long. Matriz = 732m. Long. red = 3,777m.	71,091	125	Consortio Nacional de Ingenieros Consultores. Guillermo Ruiz T. Proyecto.	
69	X	Quenuir	Mullín	Llanquihue	970	1,441	100	1,5	2,25	Morias propias y por acarreo.	Punteras existentes.	Punteras.	Hormigón concreto de 50 m3 de capacidad. D = 75 mm. Hc elev = 466,5m.	Matriz con can. de A.G. Red de dist., can. C.A. y PVC C-6. C.A. 125mm. 68m. C.A. 100mm. 445m. PVC C-6 75mm. 216m.	76,996	79	INCO Anteproyecto.	
70	X	Puerto	Cochamo	Llanquihue	281	418	100	1,5	2,25	Vertientes superficiales.	Vertiente	Rio División.	Hormigón armado de 30 m3.	El proyecto incorpora la red existente de PVC construido por SERVU y abastece la red de distribución con encasetadas. PVC C-6 D= 63mm. PVC C-6 D= 50mm.	41,646	148	INCO Anteproyecto.	
71	X	Unau	Quemchi	Chiloé	319	474	100	1,5	2,25	Vertiente de donde nace una red.	Esterio.	-	Semi-enterrado de 30m3 de capacidad.	El proyecto extiende a las zonas con déficit.	20,767	65	INCO Anteproyecto.	
72	XI	Lago Verde	Lago Verde	Aysén	435	646	100	1,5	2,25	Vertiente	Diseño de barrera frontal en el estero (costa de 155mts.)	Barrera frontal en el estero 20 m. arri-lo de barrera de hormigón arm. con cota de 155mts. Long. = 154,4m.	V = 30m3 Semi-enterrado de 30m3 de capacidad.	Matriz: tubería PVC C-6 y A.G. Long. 164m. Red: tubería PVC C-6 D= 63mm. Long. = 3,659 m.	36,989	85	ICI Ingenieros. Soc. Ingenieros Consultores Ltda. Proyecto.	
73	XIII	El Cuerno	Colina	Chacabuco	379	563	100	1,5	2,25	Acequias y canales.	Sondaje de 5MDS.	-	Capacidad de 30m3 (sector bajo) y 30m3 (sector alto).	Long. red = 3,330 m. Red: tubería PVC y Fe. Galvanizado PVC C-6 D= 63mm. 3,68m. Fe G. D= 50mm. 12m.	49,762	131	Consortio Nacional de Ingenieros Consultores. Guillermo Ruiz T. Proyecto.	

SERVICIO	COMUNA	PROVINCIA	POBLACION		DOTACION (l/h/d)			FUENTE DE ABASTECIMIENTO ACTUAL	FUENTES DE ABASTECIMIENTO ESTUDIADAS		SISTEMA PROPUESTO				COSTO TOTAL (US\$)	COSTO PER CAPITA RESPECTO A LA POBLACION ABASTECIDA	OBSERVACIONES
			ACTUAL 1985	FUTURA A 20 AÑOS	MEDIA	FACTOR MAX. DIARIO	FACTOR MAX. HORARIO		Nº1	Nº2	CAPTACION	CONDUCCION	ESTANQUE	MATRIZ Y RED DE DISTRIBUCION			
Pelvín	Peñaflor	Talagante	346	514	100	1,5	2,25	Norlas y pozos particulares aguas del río Mapocho.	Sondaje N°1613 de SENDOS.	Captación superficial de canales de riego provenientes del Mapocho.	Napa subterránea captada del sondaje a una cota del terreno de 98m alt. de elev. 21,48m.	Cañería de impulsión de fierro galv. de 75mm y longitud de 28m.	V = 15m³ torre de 10m. metálico elevado.	Long. red = 2.000 m. Cañería de PVC, clase 6, de 63mm.	39.727	115	Consorcio Nacional de Ingenierosultores. Guillermo Ruiz Proyecto.
Santa Inés de Patagui-lla.	Curacaví	Mellipilla	1.444	2.146	100	1,5	2,25	Norlas y pozos particulares.	Sondaje SENDOS N°1612.	-	Elevación electromecánica. Habilitación sondaje existente.	Impulsión en cañería de fierro galvanizado D = 75mm. Alt. total de elev. = 35,75m.	V = 50m³; en una torre de 20m metálico elevado.	Long. red = 15.320m. es en PVC, clase 6, con algunas partes en acero galv.	160.399	111	Consorcio Nacional de Ingenierosultores. Guillermo Ruiz Proyecto.
El Cristo Los Quilones de Chihue	El Monte	Talagante	738	1.097	100	1,5	2,25	Norlas y pozos particulares.	Sondaje existente.	-	Habilitación sondaje existente.	Impulsión en cañería de A.G. de D= 75mm.	Metálico elevado de 25m³ de capacidad y torre de 15 m.	Formada básicamente por dos tramos abiertos en cañería de PVC C-6. La matriz de 75 mm. y la red de 63mm. Long. total 5.699m. PVC C-6 63mm. 5.568m. A.G. 50mm. 131m.	82.347	112	Consorcio Nacional de Ingenierosultores. Consult. CNIC Guillermo Ruiz Anteproyecto.
Campusano	Buín	Maipo	466	692	100	1,5	2,25	Noria de la Escuela.	Sondaje existente.	-	Habilitación sondaje existente.	Impulsión de A.G. de D= 75mm. H _t elev. = 44m.	Metálico elevado de 25m³ de capacidad y torre de 15 m.	Red formada básicamente por dos tramos abiertos y algunos ramales en cañería PVC C-6 D= 63mm. La matriz desde el estanque hasta empalmar a la red será de A.G. D= 75mm. PVC C-6 D=63mm. 2.782m. A.G. D=50mm. 5m.	51.466	110	Consorcio Nacional de Ingenierosultores. Consult. CNIC Guillermo Ruiz Anteproyecto.
Los Hermanos Carre-rra.	Colina	Chacabuco	983	1.461	100	1,5	2,25	Norlas y pozos particulares.	Sondaje existente.	-	Habilitación sondaje existente.	Impulsión en cañería A.G. D= 75 mm. H _t = 39,05m.	Metálico elevado de 40 m³ de capacidad y torre de 20 m.	Formada básicamente por dos tramos abiertos. PVC C-6 110mm. 990m. PVC C-6 90mm. 440m. PVC C-6 75mm. 1.082m. PVC C-6 63mm. 1.827m. A.G. 50mm. 23m.	79.857	81	Consorcio Nacional de Ingenierosultores. Consult. CNIC Guillermo Ruiz Anteproyecto.

de la población considerada en la evaluación, debido a que en ambas localidades existe población flotante

	Pobl. Permanente (año 1985)	Pobl. Flotante (1985)	Pobl. Total (1985)
Chue	1.327	200	1.527
Los Molinos	931	2.088	3.019

PARAMETROS DE DISEÑO

1. Período de diseño - Año	2000
2. Tasa de crecimiento población futura	2.0%
3. Población actual	114.300
4. Población en 2000	153.000
5. Demanda litros/persona/día 2000 <u>1/</u>	
a) Promedio anual	entre 60 y 100
b) Coeficiente máximo diario	1.5 promedio
c) Coeficiente máximo horario	1.5 a 2.0 del día máximo
6. Capacidad mínima requerida para las fuentes de abastecimiento: 1.5 veces al caudal del día de máximo consumo	
7. Volumen de almacenamiento	
- Regulación en porcentaje del consumo máximo diario	20.0%
8. Presiones en la red en metros	
a) Máxima	40.00
b) Mínima	8.00
9. Coeficientes hidráulicos "C"	
a) Tubería cemento asbesto	140
b) Tubería de fierro fundido nueva	100
c) Tubería de plástico	130
10. Diámetro mínimo red	2"

1/ Por conexiones domiciliarias, incluyendo un 25% para pérdidas.

CRONOGRAMA DE ACTIVIDADES

PROGRAMA DE MEJORAMIENTO DE SERVICIOS DE A.P. RURAL

(ANEXO IV ETAPA)

ACTIVIDADES	CANT.	AÑO 1	AÑO 2	AÑO 3	AÑO 4
<u>Estudios y Diseños</u>					
<u>ESTUDIOS Y PROYECTOS DE POZOS</u>	<u>26</u> ✓				
FINANCIADOS	1	10.400			
CONTRATAR	8				
DISEÑO DIRECTO	17				
<u>ESTUDIOS DE MEJORAMIENTO DE INST.</u>	<u>143</u> ✓				
FINANCIADOS	8				
CONTRATAR	88	146.500	73.000		
DISEÑO DIRECTO	47				
<u>Construcción de Obras</u>					
	<u>26</u>	115.500	115.000		
<u>EDIFICIOS CIVILES Y OTRAS</u>	<u>190</u>				
CONTRATO C/ DISEÑOS	143	470.338	940.200	940.200	940.200
CONTRATO S/ DISEÑOS	38	39.447	39.400		
EJECUCION DIRECTA	9	16.188	16.200		
TOTAL ESTIMADO	US\$	798.373✓	1.183.800✓	940.200✓	940.200
	%	20.7	30.7	24.3	24.3

SERVICIO NACIONAL OBRAS SANITARIAS
DEPARTAMENTO PROGRAMAS NACIONALES

PROGRAMA DE REHABILITACION Y AMPLIACION (Subcategoría 2.2)

SERVICIOS DE A.P. RURAL

R E S U M E N

REGION	BID I - 74/TF-CH		BID II - 499/SF-CH		OTROS FONDOS		TOTAL REGIONAL	
	SERV N°	MONTO ESTIM US\$	SERV N°	MONTO ESTIM US\$	SERV N°	MONTO ESTIM US\$	SERV N°	MONTO ESTIM US\$
IV	8	311.196	2	55.657	21	562.505	31	929.358
V	18	482.434	-	-	-	-	18	482.434
VI	28	680.186	5	64.764	3	64.145	36	809.095
VII	26	578.005	7	10.403	-	-	33	588.408
VIII	19	258.220	18	73.444	-	-	37	331.664
IX	-	-	2	35.811	-	-	2	35.811
X	-	-	18	131.274	6	101.966	24	233.240
R.M.	9	287.163	-	-	-	-	9	287.163
TOTAL NACIONAL	108 ✓	2.597.204	52 ✓	371.353	30 ✓	728.616	190 ✓	3.697.173

TEMA SEGUIMIENTO DE PROYECTO PMS+-

WORK SCHEDULE SEND (CH0115) PROG.NAL.AGUA POTABLE IV ETAPA

WORK SCHEDULE REPORT BY WORK ITEM CODE

ORGANIZATION CODE

WORK SCHEDULE REPORT

PROJ BASE DATE 1 OCT 85 DATA DATE 1 OCT
 PROJ COMP DATE 5 NOV 89 PROP DATA DATE 30 JUN
 LOWR SPAN DATE 1 OCT 85 RUN DATE 6 AUG
 UPPR SPAN DATE 5 NOV 89 RUN SEQU 0
 PAGE

WORK ITEM CODE	WORK ITEM DESCRIPTION	REMAN DURAT	% COM	EARLY START	LATE START	MAX DELAY	EARLY FINISH	LATE FINISH	ALLOW DELAY
	APROBACION DEL PRESTAMO POR EL BID	0.	0	10CT85	10CT85	NONE	10CT85	10CT85	NONE
	NEGOCIAR Y FIRMAR CONTRATO	60.0	0	10CT85	10CT85	NONE	29NOV85	29NOV85	NONE
	PREPARAR INFORME JURIDICO	25.0	0	30NOV85	10JUL89	1318.	24DEC85	3AUG89	NONE
	OBT.APROB. BID INFORME JURIDICO	25.0	0	25DEC85	4AUG89	1318.	18JAN86	28AUG89	NONE
	NOMBRAR REPRESENTANTES LEGALES	10.0	0	30NOV85	19AUG89	1358.	9DEC85	28AUG89	39.
	ELEGIBILIDAD PARA DESEMBOLSOS	0.	0	18JAN86	28AUG89	1318.	18JAN86	28AUG89	NONE
	VIGENCIA DEL CONTRATO	0.	0	29NOV85	29NOV85	NONE	29NOV85	29NOV85	NONE
	INICIO MATERIAL DE OBRAS	0.	0	7JAN89	3NOV89	300.	7JAN89	3NOV89	299.
	TRAM.Y RECIBIR PRIMER DESEMBOLSO	7.0	0	19JAN86	29AUG89	1318.	25JAN86	4SEP89	1318.
	DEMOST.SUF.RECURSOS LOCALES AÑO 1	30.0	0	30NOV85	30JUL89	1338.	29DEC85	28AUG89	19.
	PRESENTAR EVIDENC. CONTRAL FUNC.AUDIT.	40.0	0	30NOV85	20JUL89	1328.	8JAN86	28AUG89	9.
	PRESENTAR CATALOGO CUENTAS	20.0	0	30NOV85	30JUL89	1338.	19DEC85	18AUG89	NONE
	OBT.APROB.BID CATALOGO CUENTAS	10.0	0	20DEC85	19AUG89	1338.	29DEC85	28AUG89	19.
	IMPUL GASTOS MUESTRE REPRESENT.ETAPA V	0.	0	7APR89	3NOV89	210.	7APR89	3NOV89	209.
	TRAM.Y RECIBIR ULTIMO DESEMBOLSO	60.0	0	5SEP89	5SEP89	NONE	3NOV89	3NOV89	NONE
	COND.PREV.1 DESEMB:PREPARAR PEP INICIAL	30.0	0	30NOV85	15JUL89	1323.	29DEC85	15AUG89	NONE
	COND.PREV.1 DESEMB:OBT.APROB.BID DEL PEP	15.0	0	30DEC85	14AUG89	1323.	13JAN86	28AUG89	4.
	ENTREGA COMUNIDAD SERVICIO 01/86	25.0	0	5JUN87	10OCT89	858.	29JUN87	3NOV89	857.
	ENTREGA COMUNIDAD SERVICIO 02/86	25.0	0	9AUG87	10OCT89	793.	2SEP87	3NOV89	792.
	ENTREGA COMUNIDAD SERVICIO 01/87	25.0	0	10MAY88	10OCT89	518.	3JUN88	3NOV89	517.
	ENTREGA COMUNIDAD SERVICIO 02/87	25.0	0	9JUL88	10OCT89	458.	2AUG88	3NOV89	457.
	ENTREGA COMUNIDAD SERVICIO 03/87	25.0	0	16AUG88	10OCT89	420.	9SEP88	3NOV89	419.
	ENTREGA COMUNIDAD SERVICIO 01/88	25.0	0	12JUN89	10OCT89	120.	6JUL89	3NOV89	119.
	ENTREGA COMUNIDAD SERVICIO 02/88	25.0	0	11AUG89	10OCT89	60.	4SEP89	3NOV89	59.
	ENTREGA COMUNIDAD SERVICIO 03/88	25.0	0	10OCT89	10OCT89	NONE	3NOV89	3NOV89	NONE
	FIN DEL PROYECTO	0.	0	3NOV89	3NOV89	NONE	3NOV89	3NOV89	NONE
	OBTENCION FUENTES DE AGUA GRUPO 1 (30)	0.	0	29NOV85	29NOV87	730.	29NOV85	29NOV87	NONE
	OBTENCION FUENTES DE AGUA GRUPO 2 (30)	250.0	0	30NOV85	25MAR87	480.	6AUG86	29NOV87	60.
	OBTENCION FUENTES DE AGUA GRUPO 3 (30)	250.0	0	29JAN86	25MAR87	420.	5OCT86	29NOV87	NONE
	OBTENCION FUENTES DE AGUA GRUPO 4 (28)	460.0	0	30MAR86	30MAR86	NONE	2JUL87	2JUL87	NONE
	ELAB. PROYECTOS GRUPO 1 (30)	0.	0	29NOV85	5AUG88	980.	29NOV85	5AUG88	NONE
	ELAB. PROYECTOS GRUPO 2 (30)	280.0	0	30NOV85	30NOV87	730.	5SEP86	4SEP88	NONE
	ELAB. PROYECTOS GRUPO 3 (30)	280.0	0	6OCT86	30NOV87	420.	12JUL87	4SEP88	NONE
	ELAB. PROYECTOS GRUPO 4 (28)	280.0	0	3JUL87	3JUL87	NONE	7APR88	7APR88	NONE
	OBT. APROB.BID PROJ.MUESTRA REPRESENT.	0.	0	29NOV85	15AUG88	990.	29NOV85	15AUG88	162.
	OBT. APROB.BID PROJ.GRUPO 1	10.0	0	30NOV85	6AUG88	980.	9DEC85	15AUG88	132.

TIME UNITS THIS REPORT ARE DAYS

() MEANS ACTUAL

TOTAL
FLOAT

() MEANS ACTUAL

FREE
FLOAT

SEGUIMIENTO DE PROYECTO PMS+-

SCHEDULE SEND (CHU115) PROG.NAL.AGUA POTABLE IV ETAPA

WORK SCHEDULE REPORT

WORK SCHEDULE REPORT BY WORK ITEM CODE

PROJ BASE DATE 1 OCT 85 DATA DATE 1 OCT 85
PROJ COMP DATE 3 NOV 89 PROP DATA DATE 30 JUN 86

ANIZATION CODE

LOWR SPAN DATE 1 OCT 85 RUN DATE 6 AUG 85
UPPR SPAN DATE 3 NOV 89 RUN SEQU 0

PAGE 2

CODE	WORK ITEM DESCRIPTION	REMAN DURAT	% COM	EARLY START	LATE START	MAX DELAY	EARLY FINISH	LATE FINISH	ALLOW DELAY	CAL
	OBT. APROB.BID PROY.GRUPO 2	10.0	0	6SEP86	5SEP88	730.	15SEP86	14SEP88	212.	71 00
	OBT. APROB.BID PROY.GRUPO 3	10.0	0	13JUL87	5SEP88	420.	22JUL87	14SEP88	NONE	71 00
	OBT. APROB.BID PROY.GRUPO 4	10.0	0	8APR88	8APR88	NONE	17APR88	17APR88	NONE	71 00
	PREPARAR BASES 1 PRECALIFICACION	0.	0	29NOV85	31JAN88	793.	29NOV85	31JAN88	NONE	71 00
	OBT.APROB.BID BASES 1 PRECALIF.	10.0	0	30NOV85	1FEB88	793.	9DEC85	10FEB88	NONE	71 00
	INVITAR FIRMAR 1 PRECALIF.	45.0	0	10DEC85	11FEB88	793.	23JAN86	26MAR88	NONE	71 00
	ANALIZAR OFERTAS 1 PRECALIF.	15.0	0	24JAN86	27MAR88	793.	7FEB86	10APR88	NONE	71 00
	OBT.APROBACION BID 1A PRECALIF.	10.0	0	8FEB86	11APR88	793.	17FEB86	20APR88	NONE	71 00
	COMUNICAR A INTERESADOS 1 PRECALIF.	7.0	0	18FEB86	21APR88	793.	24FEB86	27APR88	NONE	71 00
	PREPARAR BASES 2 PRECALIFICACION	90.0	0	6OCT86	7JAN88	458.	3JAN87	5APR88	NONE	71 00
	OBT.APROB.BID BASES 2 PRECALIF.	10.0	0	4JAN87	6APR88	458.	13JAN87	15APR88	NONE	71 00
	INVITAR FIRMAS 3 PRECALIF.	45.0	0	14JAN87	16APR88	458.	27FEB87	30MAY88	NONE	71 00
	ANALIZAR OFERTAS 2 PRECALIF.	15.0	0	28FEB87	31MAY88	458.	14MAR87	14JUN88	NONE	71 00
	OBT.APROB. BID 2 PRECALIF.	10.0	0	15MAR87	15JUN88	458.	24MAR87	24JUN88	NONE	71 00
	COMUNICAR A INTERESADOS 2 PRECALIF.	7.0	0	25MAR87	25JUN88	458.	31MAR87	1JUL88	NONE	71 00
	PREPARAR BASES 3 PRECALIFICACION	25.0	0	31OCT87	26APR88	178.	24NOV87	20MAY88	NONE	71 00
	OBT.APROB.BID BASES 3 PRECALIF.	10.0	0	25NOV87	21MAY88	178.	4DEC87	30MAY88	NONE	71 00
	INVITAR FIRMAS 3 PRECALIF.	45.0	0	5DEC87	31MAY88	178.	18JAN88	14JUL88	NONE	71 00
	ANALIZAR OFERTAS 3 PRECALIF.	15.0	0	19JAN88	15JUL88	178.	2FEB88	29JUL88	NONE	71 00
	OBT.APROB. BID 3 PRECALIF.	10.0	0	3FEB88	30JUL88	178.	12FEB88	8AUG88	NONE	71 00
	COMUNICAR A INTERESADOS 3 PRECALIF.	7.0	0	13FEB88	9AUG88	178.	19FEB88	15AUG88	58.	71 00
	PREPARAR ANTECEDENTES LIC. 01/86	20.0	0	11MAY86	15SEP88	858.	30MAY86	4OCT88	NONE	71 00
	OBT. APROB. BID CONVOC. LICIT.01/86	10.0	0	31MAY86	5OCT88	858.	9JUN86	14OCT88	NONE	71 00
	LLAMAR LICIT Y PROP. ADJUC. 01/86	60.0	0	10JUN86	15OCT88	858.	8AUG86	13DEC88	NONE	71 00
	OBT. APROB. BID PROP.ADJUN. 01/86	10.0	0	9AUG86	14DEC88	858.	18AUG86	23DEC88	NONE	71 00
	PREPARAR ANTECEDENTES LIC. 02/86	50.0	0	15JUN86	16AUG88	793.	3AUG86	4OCT88	NONE	71 00
	OBT. APROB. BID CONVOC. LICIT.02/86	10.0	0	4AUG86	5OCT88	793.	13AUG86	14OCT88	NONE	71 00
	LLAMAR LICIT Y PROP. ADJUC. 02/86	60.0	0	14AUG86	15OCT88	793.	12OCT86	13DEC88	NONE	71 00
	OBT. APROB. BID PROP.ADJUN. 02/86	10.0	0	13OCT86	14DEC88	793.	22OCT86	23DEC88	NONE	71 00
	PREPARAR ANTECEDENTES LIC. 01/87	20.0	0	16APR87	15SEP88	518.	5MAY87	4OCT88	NONE	71 00
	OBT. APROB. BID CONVOC. LICIT.01/87	10.0	0	6MAY87	5OCT88	518.	15MAY87	14OCT88	NONE	71 00
	LLAMAR LICIT Y PROP. ADJUC. 01/87	60.0	0	16MAY87	15OCT88	518.	14JUL87	13DEC88	NONE	71 00
	OBT. APROB. BID PROP.ADJUD. 01/87	10.0	0	15JUL87	14DEC88	518.	24JUL87	23DEC88	NONE	71 00
	PREPARAR ANTECEDENTES LIC. 02/87	20.0	0	15JUN87	15SEP88	458.	4JUL87	4OCT88	NONE	71 00
	OBT. APROB. BID CONVOC. LICIT.02/87	10.0	0	5JUL87	5OCT88	458.	14JUL87	14OCT88	NONE	71 00
	LLAMAR LICIT Y PROP. ADJUC. 02/87	60.0	0	15JUL87	15OCT88	458.	12SEP87	13DEC88	NONE	71 00

TIME UNITS THIS REPORT ARE DAYS

() MEANS ACTUAL

TOTAL
FLOAT

() MEANS ACTUAL

FREE
FLOAT

SISTEMA SEGUIMIENTO DE PROYECTO PMS-

NETWORK SCHEDULE SEND (CH0115) PROG.NAL.AGUA POTABLE IV ETAPA

WORK SCHEDULE REPORT BY WORK ITEM CODE

FOR ORGANIZATION CODE

WORK SCHEDULE REPORT

PROJ BASE DATE 1 OCT 85 DATA DATE 1 OCT 85
PROJ COMP DATE 3 NOV 89 PROP DATA DATE 30 JUN 86

LOWR SPAN DATE 1 OCT 85 RUN DATE 6 AUG 85
UPPR SPAN DATE 3 NOV 89 RUN SEQU 0

PAGE 3

WORK ITEM CODE	WORK ITEM DESCRIPTION	REMAN DURAT	% COM	EARLY START	LATE START	MAX DELAY	EARLY FINISH	LATE FINISH	ALLOW DELAY	CAL
4249	OBJ. 1º ROB. BID PROP. ADJUD. 02/87	10.0	0	13SEP87	14DEC88	458.	22SEP87	23DEC88	NONE	11 UU
4251	PREPARAR ANTECEDENTES LIC. 03/87	20.0	0	23JUL87	15SEP88	420.	11AUG87	40CT88	NONE	11 UU
4252	OBJ. 1º ROB. BID CONVOC. LICIT. 03/87	10.0	0	12AUG87	50CT88	420.	21AUG87	140CT88	NONE	11 UU
4253	LLAMAR LICIT Y PROP. ADJUD. 03/87	60.0	0	22AUG87	150CT88	420.	200CT87	13DEC88	NONE	11 UU
4254	OBJ. 1º ROB. BID PROP. ADJUD. 03/87	10.0	0	210CT87	14DEC88	420.	300CT87	23DEC88	NONE	11 UU
4261	PREPARAR ANTECEDENTES LIC. 01/88	20.0	0	18APR88	16AUG88	120.	7MAY88	4SEP88	NONE	11 UU
4262	OBJ. 1º ROB. BID CONVOC. LICIT. 01/88	10.0	0	8MAY88	5SEP88	120.	17MAY88	14SEP88	NONE	11 UU
4263	LLAMAR LICIT Y PROP. ADJUD. 01/88	60.0	0	18MAY88	15SEP88	120.	16JUL88	13NOV88	NONE	11 UU
4264	OBJ. 1º ROB. BID PROP. ADJUD. 01/88	10.0	0	17JUL88	14NOV88	120.	26JUL88	23NOV88	NONE	11 UU
4266	PREPARAR ANTECEDENTES LIC. 02/88	20.0	0	17JUN88	16AUG88	60.	6JUL88	4SEP88	NONE	11 UU
4267	OBJ. 1º ROB. BID CONVOC. LICIT. 02/88	10.0	0	7JUL88	5SEP88	60.	14SEP88	13NOV88	NONE	11 UU
4268	LLAMAR LICIT Y PROP. ADJUD. 02/88	60.0	0	17JUL88	15SEP88	60.	24SEP88	23NOV88	NONE	11 UU
4269	OBJ. 1º ROB. BID PROP. ADJUD. 02/88	10.0	0	15SEP88	16AUG88	NONE	4SEP88	4SEP88	NONE	11 UU
4271	PREPARAR ANTECEDENTES LIC. 03/88	20.0	0	5SEP88	5SEP88	NONE	14SEP88	14SEP88	NONE	11 UU
4272	OBJ. 1º ROB. BID CONVOC. LICIT. 03/88	10.0	0	15SEP88	15SEP88	NONE	13NOV88	13NOV88	NONE	11 UU
4273	LLAMAR LICIT Y PROP. ADJUD. 03/88	60.0	0	14NOV88	14NOV88	NONE	23NOV88	23NOV88	NONE	11 UU
4274	OBJ. 1º ROB. BID PROP. ADJUD. 03/88	10.0	0	19AUG86	24DEC88	858.	20CT86	6FEB89	NONE	11 UU
4311	CONTRATAR OBRAS 01/86	45.0	0	230CT86	24DEC88	793.	6DEC86	6FEB89	NONE	11 UU
4321	CONTRATAR OBRAS 02	45.0	0	25JUL87	24DEC88	518.	7SEP87	6FEB89	NONE	11 UU
4341	CONTRATAR OBRAS 01/87	45.0	0	23SEP87	24DEC88	458.	6NOV87	6FEB89	NONE	11 UU
4346	CONTRATAR OBRAS 02/87	45.0	0	310CT87	24DEC88	420.	14DEC87	6FEB89	NONE	11 UU
4351	CONTRATAR OBRAS 03/87	45.0	0	27JUL88	24NOV88	120.	9SEP88	7JAN89	NONE	11 UU
4361	CONTRATAR OBRAS 01/88	45.0	0	25SEP88	24NOV88	60.	8NOV88	7JAN89	NONE	11 UU
4366	CONTRATAR OBRAS 02/88	45.0	0	24NOV88	24NOV88	NONE	7JAN89	7JAN89	NONE	11 UU
4371	CONTRATAR OBRAS 03/88	45.0	0	30CT86	7FEB89	858.	30APR87	4SEP89	NONE	11 UU
4411	CONST. SERVICIOS LICIT. 01/86	210.0	0	7DEC86	7FEB89	793.	4JUL87	4SEP89	NONE	11 UU
4421	CONST. SERVICIOS LICIT. 02/86	210.0	0	8SEP87	7FEB89	518.	4APR88	4SEP89	NONE	11 UU
4441	CONST. SERVICIOS LICIT. 01/87	210.0	0	7NOV87	7FEB89	458.	3JUN88	4SEP89	NONE	11 UU
4446	CONST. SERVICIOS LICIT. 02/87	210.0	0	15DEC87	7FEB89	420.	11JUL88	4SEP89	NONE	11 UU
4451	CONST. SERVICIOS LICIT. 03/87	210.0	0	10SEP88	8JAN89	120.	7MAY89	4SEP89	NONE	11 UU
4461	CONST. SERVICIOS LICIT. 01/88	240.0	0	9NOV88	8JAN89	60.	6JUL89	4SEP89	NONE	11 UU
4466	CONST. SERVICIOS LICIT. 02/88	240.0	0	8JAN89	8JAN89	NONE	4SEP89	4SEP89	NONE	11 UU
4471	CONST. SERVICIOS LICIT. 03/88	30.0	0	30NOV85	25SEP88	1030.	29DEC85	240CT88	NONE	11 UU
4512	PREP. ANTECEDENTES MOTOBOOMBAS GR.1	365.0	0	30NOV85	260CT87	695.	29NOV86	240CT88	NONE	11 UU
4513	PREP. ANTECEDENTES MOTOBOOMBAS GR.2	10.0	0	30DEC85	250CT88	1030.	8JAN86	3NOV88	NONE	11 UU
4522	APROB. BID LLAM. LICIT. MOTOBOOMBAS GR.1									

TIME UNITS THIS REPORT ARE DAYS

TOTAL () MEANS ACTUAL
FLOAT

FREE
FLOAT

PROJ BASE DATE 1 OCT 85
UPPR SPAN DATE 1 OCT 85
LWR SPAN DATE 1 OCT 85
PROJ COMP DATE 5 NOV 85
PROP DATA DATE 30 JUN 86
DATA DATE 1 OCT 85
RUN DATE 6 AUG 85
RUN SEQU 0
PAGE 4

WORK ITEM DESCRIPTION	REMAN	%	COM	START	EARLY	LATE	MAX	FINISH	EARLY	LATE	ALLOW	CAL
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APPROB. BID LLAM.LICIT.MOTOBOMBAS GR.2	10.0	0	30NOV86	25OCT88	695.	9DEC86	3NOV88	NONE	11	00	NONE	71
LLAMAZ LIC.Y PROP.ADJUD.BOMBAS 1	90.0	0	9JAN85	4NOV88	1030.	8APR86	1FEB89	NONE	71	00	NONE	71
LLAMAZ LIC.Y PROP.ADJUD.BOMBAS 2	90.0	0	10DEC86	4NOV88	695.	9MAR87	1FEB89	NONE	71	00	NONE	71
081.APR03.BID PROP.ADJUD.BOMBAS 1	10.0	0	9APR86	2FEB89	1030.	18APR86	11FEB89	NONE	71	00	NONE	71
081.APR03.BID PROP.ADJUD.BOMBAS 2	10.0	0	10MAR87	2FEB89	695.	19MAR87	11FEB89	NONE	71	00	NONE	71
CONTRATAR SUMINISTRO MOTOBOMBAS 1	35.0	0	19APR86	12FEB89	1030.	23MAY86	18MAR89	NONE	71	00	NONE	71
CONTRATAR SUMINISTRO MOTOBOMBAS 2	35.0	0	20MAR87	12FEB89	695.	23APR87	18MAR89	NONE	71	00	NONE	71
081.GARANTIAS REEMB.MOTOBOMBAS 1	50.0	0	24MAY86	19MAR89	1030.	12JUL86	7MAY89	NONE	71	00	NONE	71
081.GARANTIAS REEMB.MOTOBOMBAS 2	50.0	0	24MAY86	19MAR89	1030.	12JUL86	7MAY89	NONE	71	00	NONE	71
STOCK EQUIPOS MOTOBOMBAS	120.0	0	30NOV85	8MAY89	1255.	29MAR86	4SEP89	597.	71	00	NONE	71
RECEP.MOTOBOMBAS GR. 1	120.0	0	13JUL86	8MAY89	1030.	9NOV86	4SEP89	512.	71	00	NONE	71
RECEP.MOTOBOMBAS GR. 2	120.0	0	13JUN87	8MAY89	695.	10OCT87	4SEP89	575.	71	00	NONE	71
PREP.MANTECEDENTES HIPOCLORADORES	30.0	0	30NOV85	25SEP88	1030.	29DEC85	24OCT88	NONE	71	00	NONE	71
APPROB. BID LLAM.LICIT.HIPOCLORAD.	10.0	0	30DEC85	25OCT88	1030.	8JAN86	3NOV88	NONE	71	00	NONE	71
LLAM.LICIT.Y PROP.ADJUD. HIPOCLORAD.	90.0	0	9JAN86	4NOV88	1030.	8APR86	1FEB89	NONE	71	00	NONE	71
081.APR03.BID PROP.ADJUD. HIPOCLORAD.	10.0	0	9APR86	2FEB89	1030.	18APR86	11FEB89	NONE	71	00	NONE	71
CONTRATAR SUMINISTRO HIPOCLORADORES	35.0	0	19APR86	12FEB89	1030.	23MAY86	18MAR89	NONE	71	00	NONE	71
081.GARANTIAS REEMBOLSO HIPOCLORAD.	50.0	0	24MAY86	19MAR89	1030.	12JUL86	7MAY89	NONE	71	00	NONE	71
STOCK EQUIPOS DOSIF.CLORO	120.0	0	30NOV85	8MAY89	1255.	29MAR86	4SEP89	597.	71	00	NONE	71
RECEP.HIPOCLORADORES	120.0	0	13JUL86	8MAY89	1030.	9NOV86	4SEP89	512.	71	00	NONE	71
PREP.MANTECEDENTES MEDIDORES CAUDAL	365.0	0	30NOV85	25DEC87	755.	29NOV86	23DEC88	NONE	71	00	NONE	71
APPROB. BID LLAM.LICIT.VEHICULOS	10.0	0	30NOV86	24DEC88	755.	9DEC86	2JAN89	NONE	71	00	NONE	71
APPROB. BID LLAM.LICIT.GRUA	10.0	0	30NOV86	24DEC88	755.	9DEC86	2JAN89	NONE	71	00	NONE	71
LLAM.LICIT.Y PROP.ADJUD.VEHICULOS	90.0	0	10DEC86	3JAN89	755.	9MAR87	2APR89	NONE	71	00	NONE	71
LLAM.LICIT.Y PROP.ADJUD.GRUA	90.0	0	10DEC86	3JAN89	755.	9MAR87	2APR89	NONE	71	00	NONE	71
081.APR03.BID PROP.ADJUD.VEHICULOS	10.0	0	10MAR87	3APR89	755.	19MAR87	12APR89	NONE	71	00	NONE	71
081.APR03.BID PROP.ADJUD.GRUA	10.0	0	10MAR87	3APR89	755.	19MAR87	12APR89	NONE	71	00	NONE	71

TIME UNITS THIS REPORT ARE DAYS

FLOAT
FREE
FLOAT

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() MEANS ACTUAL
() MEANS ACTUAL

TOTAL
FLOAT
FLOAT

NETWORK SCHEDULE SEND (CH0115) · PROG.NAL.AGUA POTABLE IV ETAPA

WORK SCHEDULE REPORT

PROJ	BASE DATE	1 OCT 85	DATA DATE	1 OCT 85
PROJ	COMP DATE	3 NOV 89	PROP DATA DATE	30 JUN 86

FOR ORGANIZATION CODE

LOWR SPAN DATE	1 OCT 85	RUN DATE	6 AUG 85
UPPR SPAN DATE	5 NOV 89	RUN SEQU	U

PAGE 5

WORK ITEM CODE	WORK ITEM DESCRIPTION	REMAN DURAT	Z COM	EARLY START	LATE START	MAX DELAY	EARLY FINISH	LATE FINISH	ALLOW DELAY	CAL
851	CONTRATAR SUMINISTRO VEHICULOS	35.0	0	20MAR87	13APR89	755.	23APR87	17MAY89	NONE	11 UU
852	CONTRATAR SUMINISTRO GRUAS	35.0	0	20MAR87	13APR89	755.	23APR87	17MAY89	NONE	11 UU
861	OBT.GARANTIAS REEMBOLSO VEHICULOS	50.0	0	24APR87	18MAY89	755.	12JUN87	6JUL89	NONE	11 UU
862	OBT.GARANTIAS REEMBOLSO GRUA	50.0	0	24APR87	18MAY89	755.	12JUN87	6JUL89	NONE	11 UU
871	RECEP.VEHICULOS	120.0	0	13JUN87	7JUL89	755.	10OCT87	3NOV89	754.	11 UU
872	RECEP.GRUAS	120.0	0	13JUN87	7JUL89	755.	10OCT87	3NOV89	754.	11 UU
910	PREP.ANTECEDENTES BIENES VARIOS 1	90.0	0	30NOV85	25SEP88	1030.	27FEB86	23DEC88	NONE	11 UU
911	INST.=UIPOS EN OBRAS LIC.01/86	35.0	0	1MAY87	5SEP89	858.	4JUN87	9OCT89	NONE	11 UU
912	PREP.ANTECEDENTES BIENES VARIOS 2	365.0	0	30NOV85	25DEC87	755.	29NOV86	23DEC88	NONE	11 UU
920	APROB. BID LLAM.LICIT.VARIOS 1	10.0	0	28FEB86	24DEC88	1030.	9MAR86	2JAN89	NONE	11 UU
921	INST.=UIPOS EN OBRAS LIC.02/86	35.0	0	5JUL87	5SEP89	793.	8AUG87	9OCT89	NONE	11 UU
922	APROB. BID LLAM.LICIT.VARIOS 2	10.0	0	30NOV86	24DEC88	755.	9DEC86	2JAN89	NONE	11 UU
931	LLAM.-ICIT.Y PROP.ADJUD.VARIOS 1	90.0	0	10MAR86	3JAN89	1030.	7JUN86	2APR89	NONE	11 UU
932	LLAM.-ICIT.Y PROP.ADJUD.VARIOS 2	90.0	0	10DEC86	3JAN89	755.	9MAR87	2APR89	NONE	11 UU
940	OBT.A=PO3.BID PROP.ADJUD.VARIOS 1	10.0	0	8JUN86	3APR89	1030.	17JUN86	12APR89	NONE	11 UU
941	INST.=UIPOS EN OBRAS LIC.01/87	35.0	0	5APR88	5SEP89	518.	9MAY88	9OCT89	NONE	11 UU
942	OBT.A=PO3.BID PROP.ADJUD.VARIOS 2	10.0	0	10MAR87	3APR89	755.	19MAR87	12APR89	NONE	11 UU
946	INST.=UIPOS EN OBRAS LIC.02/87	35.0	0	4JUN88	5SEP89	458.	8JUL88	9OCT89	NONE	11 UU
950	CONTRATAR SUMINISTRO VARIOS 1	35.0	0	18JUN86	13APR89	1030.	22JUL86	17MAY89	NONE	11 UU
951	INST.=UIPOS EN OBRAS LIC.03/87	35.0	0	12JUL88	5SEP89	420.	15AUG88	9OCT89	NONE	11 UU
952	CONTRATAR SUMINISTRO VARIOS 2	35.0	0	20MAR87	13APR89	755.	23APR87	17MAY89	NONE	11 UU
960	OBT.GARANTIAS REEMBOLSO VARIOS 1	50.0	0	23JUL86	18MAY89	1030.	10SEP86	6JUL89	NONE	11 UU
961	INST.=UIPOS EN OBRAS LIC.01/88	35.0	0	8MAY89	5SEP89	120.	11JUN89	9OCT89	NONE	11 UU
962	OBT.GARANTIAS REEMBOLSO VARIOS 2	50.0	0	24APR87	18MAY89	755.	12JUN87	6JUL89	NONE	11 UU
966	INST.=UIPOS EN OBRAS LIC.02/88	35.0	0	7JUL89	5SEP89	60.	10AUG89	9OCT89	NONE	11 UU
970	RECEP.VARIOS 1	120.0	0	11SEP86	7JUL89	1030.	8JAN87	3NOV89	1029.	11 UU
971	INST.=UIPOS EN OBRAS LIC.03/88	35.0	0	5SEP89	5SEP89	NONE	9OCT89	9OCT89	NONE	11 UU
972	RECEP.VARIOS 2	120.0	0	13JUN87	7JUL89	755.	10OCT87	3NOV89	754.	11 UU
0011	PREP.ANTECEDENTES CRIBAS	20.0	0	30NOV85	4DEC88	1100.	19DEC85	23DEC88	NONE	11 UU
0021	APROB. BID LLAM.LICIT.CRIBAS	10.0	0	20DEC85	24DEC88	1100.	29DEC85	2JAN89	NONE	11 UU
0031	LLAM.-ICIT.Y PROP.ADJUD. CRIBAS	90.0	0	30DEC85	3JAN89	1100.	29MAR86	2APR89	NONE	11 UU
0041	OBT.A=PO3.BID PROP.ADJUD. CRIBAS	10.0	0	30MAR86	5APR89	1100.	8APR86	12APR89	NONE	11 UU

A SEGUIMIENTO DE PROYECTO PMS+-

K SCHEDULE SEND (CH0115) PROG.NAL.AGUA POTABLE IV ETAPA

WORK SCHEDULE REPORT BY WORK ITEM CODE

GANIZATION CODE

WORK SCHEDULE REPORT

PROJ BASE DATE 1 OCT 85 DATA DATE 1 OCT 85

PROJ COMP DATE 3 NOV 89 PROP DATA DATE 30 JUN 86

LOWR SPAN DATE 1 OCT 85 RUN DATE 6 AUG 85

UPPR SPAN DATE 3 NOV 89 RUN SEQU U

PAGE 6

ODE	WORK ITEM DESCRIPTION	REMAN DURAT	% COM	EARLY START	LATE START	MAX DELAY	EARLY FINISH	LATE FINISH	ALLOW DELAY	CAL
	FIN DE LAS OBRAS	0.	0	3NOV89	3NOV89	NONE	3NOV89	3NOV89	NONE	7199

TIME UNITS THIS REPORT ARE DAYS	() MEANS ACTUAL	TOTAL FLOAT	() MEANS ACTUAL	FREE FLOAT
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END OF REPORT

PROJECT DURATION IS 1495.0 DAYS

PLAN DE PROMOCION COMUNITARIA

1.- Introducción y Fundamentos:

Basados en los propósitos generales del Programa Nacional de Agua Potable Rural, la Sección Promoción, a través del Plan de Promoción, se ha planteado dos propósitos específicos, que sirven de marco de referencia a toda su acción. Estos propósitos son:

- 1.1. Promover la participación de la comunidad, a través de su organización y educación, a fin de desarrollar el Programa de Agua Potable Rural, y capacitarla, para que explote sus servicios de agua potable.
- 1.2. Formar, para la explotación de los servicios, entidades comunitarias-funcionales, acordes con la realidad socio-económica del medio rural, y con los fines perseguidos por SENDOS.

De estos 2 propósitos específicos, se desprenden los siguientes fundamentos del Plan de Promoción:

- a) La necesidad de crear conciencia de la importancia del agua potable, entre la población rural que será beneficiada.
- b) La importancia de promover y hacer destacar valores de la comunidad, tales como la solidaridad y el esfuerzo común, para el logro de metas.
- c) La importancia de considerar los factores socio-culturales de la comunidad, que entran la participación de sus componentes, en el desarrollo del Plan.
- d) La necesidad de incorporar al total de la población rural que será beneficiada con el agua potable.
- e) La necesidad de establecer una estructura administrativa y funcional, encargada de operar, administrar y mantener los sistemas de agua potable.
- f) La ventaja de operar con grupos que ejerzan labores ejecutivas en el funcionamiento de los sistemas de agua potable, y a la vez, actúen como agentes multiplicadores del proceso administrativo.

2.- Objetivos generales de la Sección Promoción:

- 2.1. Diseñar los lineamientos generales, para el logro de los objetivos -

del Programa de Agua Potable Rural, en el aspecto de Promoción Comunitaria.

- 2.2. Proponer diseños alternativos de acción, para el mejor cumplimiento del Programa.
- 2.3. Elaborar programas de trabajo generales para los equipos regionales de Promoción.
- 2.4. Ejecutar estudios que permitan medir resultados socio-económicos, producto de la aplicación del Programa.
- 2.5. Participar en la selección de localidades beneficiarias del Programa.
- 2.6. Crear instrumentos de recolección de datos, de acuerdo a los programas y/o proyectos de trabajo que se implementen.
- 2.7. Efectuar evaluaciones permanentes y periódicas a nivel regional y nacional, respectivamente, en relación al desarrollo del Programa.
- 2.8. Realizar actividades de asesoría, supervisión y coordinación, a nivel de las regiones.
- 2.9. Confeccionar publicaciones, documentos y material audiovisual, afines con los objetivos del Programa.
- 2.10 Llevar un registro del desarrollo del Programa, en cada una de las localidades beneficiarias.
- 2.11 Efectuar cualquier tipo de labor que permita el mejor cumplimiento del Programa.

Cada uno de los objetivos enunciados, encontrará su materialización a nivel de las localidades del Programa, de acuerdo a los siguientes objetivos específicos que se persiguen:

3.- Objetivos específicos de la Sección Promoción:

- 3.1. Participar en la pre-selección y selección de las localidades en donde se aplicará el Programa.
- 3.2. Lograr un adecuado nivel de conocimiento de las características de cada una de las localidades seleccionadas.
- 3.3. Crear y/u organizar, según el caso, los mecanismos de participación de las localidades, en el Programa.
- 3.4. Capacitar y asesorar a las entidades organizadas, en materias administrativas, legales y contables, a fin de lograr su óptimo funcionamiento.
- 3.5. Proponer a las localidades beneficiarias, nuevas formas de pensar, de sentir y de actuar, con respecto al agua potable.
- 3.6. Coordinar las acciones de las localidades, SENDOS y/u otros organismos, en el desarrollo del Programa.

4.- Metas a nivel de las localidades.

Como resultado de la aplicación del Plan de Promoción, en cada una de las localidades beneficiarias del Programa Nacional de Agua Potable Rural, se pretende que estas asuman actitudes positivas hacia él, las cuales pueden ser evaluadas a través de la observación de conductas, como las siguientes:

- 4.1. Reconocimiento de la importancia del agua potable para la obtención de un mejor nivel de vida.
- 4.2. Reconocimiento de la incidencia del agua potable en el mejoramiento de la salud de los habitantes de la localidad.
- 4.3. Pago de los aportes en dinero que la ejecución del Programa exige.
- 4.4. Colaboración con el Comité de Agua Potable.
- 4.5. Forma en que la comunidad ha asumido la responsabilidad de administrar, operar y mantener el servicio de agua potable, una vez entregado a ella.
- 4.6. Grado de aplicación de las normas impartidas, para el uso del agua potable en la localidad.
- 4.7. Reconocimiento y uso de la asesoría y asistencia de SENDOS, en la operación del servicio.
- 4.8. Grado de cumplimiento, por parte de los usuarios del servicio, del pago de las tarifas por consumo.
- 4.9. Cooperación con los distintos estudios que realiza SENDOS.
- 4.10. Grado de solidaridad y valoración del concepto de cooperación, en la solución de problemas de la localidad.
- 4.11. Proposición, a través de la experiencia lograda en el Programa, de soluciones a otros problemas que afectan a la localidad.
- 4.12. Grado de participación en los proyectos de capacitación.

5.- Marco general del Programa de Agua Potable Rural.

El desarrollo del Programa Agua Potable Rural en una localidad, está claramente explicitado en la "Malla de secuencia de actividades para una instalación de servicio", la cual proporciona la secuencia de operaciones necesarias de realizar en cada localidad, para el cumplimiento del Programa. Con dicha base, y desde el punto de vista del trabajo de la Sección Promoción, a nivel de los equipos regionales, interesa destacar una serie de tareas, las que deberán insertarse en la ejecución de los proyectos específicos, que se definirán posteriormente. Se adjunta un ejemplar de dicha malla.

Estas tareas han sido definidas con anterioridad y dicen relación con: elaboración del informe de pre-selección, autorización del terreno para la construcción de la fuente de agua, información a autoridades comunales y a medios informativos, asamblea en la localidad y formación del Comité de Agua Potable, inscripción de socios, aplicación de la encuesta socio-económica y la ficha social, tabulación de datos y confección de la monografía, firma del convenio entre SENDOS y la comunidad, y entrega del servicio a la comunidad.

6.- Definición de Proyectos.

Para el cumplimiento de los objetivos específicos del Plan de Promoción, se propone diseñar a nivel de regiones, proyectos concretos de trabajo que aborden su consecución.

El proyecto diseñado, constituirá una unidad elemental dentro del Plan y proporcionará instrumentos para ordenar y racionalizar el trabajo, además de señalar una secuencia lógica en el cumplimiento de los objetivos del Programa.

Para la confección de los proyectos, deberán contemplarse una serie de consideraciones, entre las que se destacan:

- 6.1. El trabajo en equipo a nivel de regiones
- 6.2. Localidades incluídas en Programas BID 1ra. etapa, 2a. etapa y 3a. etapa.
- 6.3. Coordinación y compatibilidad de los proyectos diseñados.
- 6.4. Características de cada localidad
- 6.5. Participación de la localidad en el diseño y ejecución del proyecto.

Para la confección de cada proyecto, se propone la siguiente estructura:

- i)Definición de los objetivos
- ii)Enunciación de las actividades a desarrollar
- iii)Especificación de las técnicas a emplear
- iv)Asignación de recursos por actividad
- v)Definición de la secuencia y plazos
- vi)Definición de la población a la que se dirige el proyecto.
- vii)Distribución de responsabilidades
- viii)Determinación de los criterios de evaluación

Como proyectos concretos de trabajo, se proponen los siguientes:

- 1.- Proyecto de pre-selección de localidades
- 2.- Proyecto de asesoría y organización a entes comunitarios
- 3.- Proyecto de investigación de la comunidad
- 4.- Proyecto de capacitación y educación comunitaria
- 5.- Proyecto de estudios específicos

7.- Descripción de los proyectos.

A continuación se presenta una breve descripción de cada uno de los proyectos:

7.1. Proyecto de pre-selección de localidades

7.1.1. Objetivos

- 7.1.1.1. Conocer aspectos socio-económicos generales de las localidades propuestas.
- 7.1.1.2. Determinar localidades que cumplen requisitos desde el punto de vista de Promoción, para ser incluidas en futuras etapas.

7.1.2. Actividades

- 7.1.2.1. Visita a localidades propuestas por las Direcciones Regionales de SENDOS.
- 7.1.2.2. Contacto con organizaciones comunitarias, líderes y representantes de organizaciones institucionales.
- 7.1.2.3. Aplicación de la ficha "Informe de pre-selección de localidades".
- 7.1.2.4. Coordinación con otras unidades del Departamento para la ejecución, en conjunto, del proyecto.

7.1.3. Técnicas a utilizar

- 7.1.3.1. Entrevistas
- 7.1.3.2. Análisis de documentos
- 7.1.3.3. Reuniones
- 7.1.3.4. Pauta "Informe de pre-selección de localidades".

7.1.4. Recursos

7.1.4.1. Humanos

7.1.4.2. Materiales

Ambos, según la realidad de cada Región

7.1.5. Definición de plazos y secuencia

Máximo 2 días por localidad

7.1.6. Población hacia la que se dirige la actividad

Localidades propuestas por las regiones.

7.1.7. Responsables

7.1.7.1. Equipo de promoción regional

7.1.7.2. Sección Promoción - Depto. Nacional

7.1.8. Evaluación

Con respecto a cumplimiento de objetivos, técnicas utilizadas, recursos empleados, plazos, participación de responsables.

El resultado del trabajo en este proyecto, se consigna en un informe final, por cada localidad visitada, a fin de que contribuya a pre-seleccionar a las localidades a incluir en el Programa de Agua Potable Rural.

7.2. Proyecto de organización y asesoría a entidades comunitarias.

7.2.1. Objetivos

7.2.1.1. Creación de los Comités de Agua Potable

7.2.1.2. Fortalecimiento de la organización existente, para objetivos del Programa.

7.2.1.3. Motivar a los líderes para la ejecución del Programa.

7.2.1.4. Elaborar planes de trabajo, en conjunto con los Comités de Agua Potable Rural, para la implementación del Programa.

7.2.1.5. Identificar problemas de liderazgo o relaciones sociales, que entorpezcan el normal desarrollo del Programa.

7.2.1.6. Evaluar permanentemente la participación de la comunidad en el Programa

7.2.1.7. Estudiar con la organización, los aspectos reglamentarios del Programa.

7.2.1.8. Valorar la solidaridad y cooperación, como una de las formas de resolver los problemas de la localidad.

7.2.2. Actividades a realizar.

- 7.2.2.1. Asamblea para dar a conocer a la comunidad, el Programa.
- 7.2.2.2. Obtener de la asamblea, la nominación de ternas, a fin de formar el Comité de Agua Potable.
- 7.2.2.3. Tramitar ante las autoridades de Gobierno Interior, la oficialización del nombramiento del Comité.
- 7.2.2.4. Realizar reuniones periódicas con el Comité, de acuerdo a programa de trabajo elaborado con él.
- 7.2.2.5. Solucionar en conjunto con el Comité, los problemas que se presenten en la ejecución del Programa.
- 7.2.2.6. Entregar contenidos educativos, sobre roles, liderazgo, programación y organización del trabajo, aspectos reglamentarios del Programa, etc.

7.2.3. Técnicas a emplear

- 7.2.3.1. Entrevistas
- 7.2.3.2. Reuniones
- 7.2.3.3. Material audiovisual
- 7.2.3.4. Charla
- 7.2.3.5. Dinámica de grupos

7.2.4. Recursos

- 7.2.4.1. La comunidad
- 7.2.4.2. Autoridades de SENDOS y de Gobierno Interior
- 7.2.4.3. Equipo regional de Promoción
- 7.2.4.4. Materiales (vehículos, locales de reunión, folletos, etc.)

7.2.5. Secuencia y plazos

La organización del Comité se realiza luego de la 1ra. asamblea, una vez que está aprobado el proyecto de instalación de servicio, por el BID.

7.2.6. Población hacia la que se dirige la actividad.

Localidades seleccionadas, con informe positivo de fuente de agua y con proyecto aprobado por el BID.

7.2.7. Responsable

Equipos regionales de Promoción

7.2.8. Evaluación

Respecto a objetivos, técnicas, recursos, plazos, participación de responsables. Debe realizarse a nivel de regiones.

7.3. Proyecto de Investigación de la Comunidad

Este proyecto se realiza en dos fases secuenciales:

- i) Investigación preliminar
- ii) Monografía de la comunidad

7.3.1. Objetivos

- 7.3.1.1. Describir aspectos demográficos, histórico-culturales, socio-económicos y sanitarios, de las localidades en donde se construye la fuente de agua.
- 7.3.1.2. Motivar a la comunidad, para su incorporación activa al desarrollo del Programa.
- 7.3.1.3. Detectar los sistemas de liderazgo que operan en la comunidad.
- 7.3.1.4) Efectuar las evaluaciones socio-económicas periódicas que solicita el BID.
- 7.3.1.5. Analizar la dinámica de los grupos sociales que operan en la localidad.
- 7.3.1.6. Identificar los problemas que presenta la localidad.
- 7.3.1.7. Aportar la información recolectada, a los organismos de Gobierno Interior, a fin de que estos la utilicen para sus propios objetivos.
- 7.3.1.8. Decidir si la localidad reúne requisitos para ser considerada en el Programa.

7.3.2. Actividades a realizar

- 7.3.2.1. Visitas a las localidades u organismos que tengan información de la localidad.
- 7.3.2.2. Contacto con líderes formales e informales de la localidad.

- 7.3.2.3. Contacto con funcionarios institucionales de la localidad.
- 7.3.2.4. Aplicación de instrumentos
- 7.3.2.5. Reuniones y/o entrevistas, con fines de investigación y de motivación.
- 7.3.2.6. Contacto con cada jefe de hogar de la localidad

7.3.3. Técnicas.

- 7.3.3.1. Entrevistas estructurales
- 7.3.3.2. Observación estructurada
- 7.3.3.3. Reuniones
- 7.3.3.4. Análisis de documentos
- 7.3.3.5. Ficha social
- 7.3.3.6. Encuesta socio-económica

7.3.4. Recursos.

- 7.3.4.1. La localidad seleccionada
- 7.3.4.2. Equipos regionales de Promoción
- 7.3.4.3. Organismos e instituciones
- 7.3.4.4. Materiales (vehículos, instrumentos de investigación, etc.)

7.3.5. Secuencia y plazos.

La investigación preliminar comienza oficialmente, cuando se hace la solicitud para construir la fuente de agua, pero el trabajador social, desde el primer contacto con la localidad, ya empieza a recoger elementos que le servirán para ella. El informe debe estar confeccionado antes que se programe la instalación del servicio de agua potable.

Las encuestas para la confección de la monografía, se comienza a aplicar luego que se publica el llamado a propuesta para la construcción del servicio y después de haberse realizado la 1ra. asamblea. Sin embargo, existen en ese momento, una serie de antecedentes ya recolectados, que servirán de base para la Monografía.

7.3.6. Población hacia la que se dirigen las actividades

La investigación preliminar, se realiza en aquellas localidades en donde se está construyendo la fuente de agua.

La encuesta socio-económica y posterior Monografía, se aplica y confecciona, en las localidades donde se construye el servicio de agua potable.

7.3.7. Responsable

Equipos regionales de Promoción

7.3.8. Evaluación

Respecto a objetivos, técnicas, recursos, plazos, participación de la comunidad y responsables. Se realiza a nivel regional y nacional.

7.4. Proyecto de capacitación y educación comunitaria

Los proyectos de este tipo, abordan la necesidad de enfrentar con metodología, aquellas situaciones de limitación cultural y/o educativas, que presenta la localidad y que afectan el desarrollo del Programa.

Uno de los objetivos fundamentales del Programa es, lograr la participación activa y dinámica de la comunidad. Sin embargo algunas de ellas, adolecen de ciertas limitantes, que afectan la eficiencia de su participación. Estas limitantes derivan de las características socio-culturales que presenta la localidad y que, a modo de ejemplo, pueden señalarse las siguientes:

- i) Desconocimiento de la importancia del agua potable
- ii) Ausencia de hábitos de higiene
- iii) Desconocimiento de las formas de administración, operación y mantenimiento de los servicios de agua potable.
- iv) Poco conocimiento de las estructuras de participación.
(Cooperativas de agua potable, Juntas de Vecinos, Comités de agua potable).
- v) Desconocimiento de nociones generales de Salud Pública

Las limitaciones señaladas, determinan que la localidad presenta ciertas actitudes hacia el desarrollo del Programa, que se traducen concretamente en sus formas de pensar, de sentir y de actuar frente al equipo de agua potable rural, frente al Programa y frente a ella misma.

Una de las funciones inherentes al trabajo social, es la de educación, razón por la que esta tarea capacitadora debe impregnar todas las acciones que se realicen a nivel individual y de grupos

en la localidad. Cuando a esta función se le desea dar una sistematización, surge la necesidad de realizar un proyecto para tal efecto. El proyecto de capacitación, debe ser confeccionado, de acuerdo a la realidad de cada localidad y como en los otros proyectos, contemplar la participación de la comunidad en su diseño.

7.4.1. Objetivos

Resumiendo lo señalado en la fundamentación, se pretende:

- 7.4.1.1. Capacitar a la población en aspectos operacionales de los servicios.
- 7.4.1.2. Entregar contenidos educativos, sobre educación sanitaria y hábitos de higiene.
- 7.4.1.3. Reforzar e integrar la organización de la comunidad.

7.4.2. Actividades a realizar

- 7.4.2.1. Detectar junto a los líderes de la localidad, las necesidades de capacitación, de acuerdo al desarrollo del Programa.
- 7.4.2.2. De acuerdo a lo anterior, determinar los contenidos a abordar en las sesiones de capacitación.
- 7.4.2.3. Confeccionar los proyectos específicos de capacitación.
- 7.4.2.4. Coordinar los recursos que intervendrán en el proyecto.

7.4.3. Técnicas.

- 7.4.3.1. Entrevistas
- 7.4.3.2. Reuniones
- 7.4.3.3. Charlas
- 7.4.3.4. Técnicas audiovisuales
- 7.4.3.5. Técnicas de dinámica de grupos

7.4.4. Recursos

- 7.4.4.1. Equipo regional de Promoción
- 7.4.4.2. Organismos educacionales regionales
- 7.4.4.3. La localidad
- 7.4.4.4. Sección Promoción del Departamento
- 7.4.4.5. Materiales (vehículos, folletos, afiches, cartillas, proyectores de cine y de diapositivas, películas, etc.)

7.4.5. Secuencia y plazos

Como se ha señalado, la función de capacitación es permanente y de-

de ser realizada en todas las fases del Programa y proyectarse luego que se ha puesto en operación el servicio. Cada proyecto específico debe señalar el plazo de duración.

7.4.6. Población a la que se dirige

La localidad en donde está en marcha el Programa, incluyéndose a la totalidad de la población.

7.4.7. Responsables del proyecto

7.4.7.1. Equipo de Promoción del Depto.

7.4.7.2. Equipo regional de Promoción

7.4.8. Evaluación

Debe realizarse considerando los objetivos, técnicas usadas, participación de la comunidad, recursos, responsables. Se ejecuta a nivel regional y nacional.

7.5. Proyectos de estudios específicos

Estos tienen como finalidad, investigar determinados aspectos de las localidades, para permitir evaluar el impacto del Programa, en ellos.

Cada estudio deberá diseñarse concretamente, de acuerdo a las pautas existentes, para la confección de diseños o proyectos de investigación.

MFG/jsj.

CONVENIO ENTRE EL SERVICIO NACIONAL DE OBRAS SANITARIAS
Y EL COMITE DE AGUA POTABLE DE
PUNTA LAVAPIE
.....

EN..... PUNTA LAVAPIE....., COMUNA DE ARAUCO.....
PROVINCIA DE ARAUCO.....
A 14. DE DICIEMBRE..... DE 1983 , ENTRE EL SERVICIO NACIONAL DE OBRAS SA-
NITARIAS, REPRESENTADO EN ESTE ACTO POR DON LUIS ACUÑA ALMEIDA.....
....., POR UNA PARTE, Y POR LA OTRA, EL
COMITE DE AGUA POTABLE DE PUNTA LAVAPIE.....
REPRESENTADO EN ESTE ACTO POR SU PRESIDENTE, DON BALTAZAR MEZA SALAS.....
....., SE HA ACORDADO CELEBRAR EL SIGUIENTE CONVENIO:

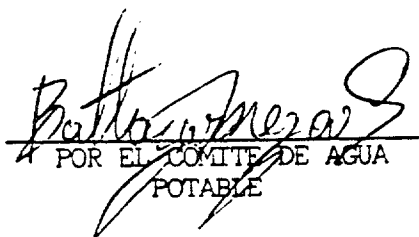
- 1.- POR EL PRESENTE ACTO, EL SERVICIO NACIONAL DE OBRAS SANITARIAS, PREVIA -
APROBACION DEL BANCO INTERAMERICANO DE DESARROLLO, SE COMPROMETE A CONS-
TRUIR UN SERVICIO DE AGUA POTABLE EN PUNTA LAVAPIE.....
..... Y, A ENTREGAR SU EXPLOTACION, AL COMITE DE -
AGUA POTABLE CONSTITUIDO EN ESTA(S) LOCALIDAD(ES). EL COMITE DE AGUA -
POTABLE, A SU VEZ, SE OBLIGA A ADMINISTRAR, OPERAR Y MANTENER EL SERVI -
CIO, UNA VEZ ENTREGADO A EL, PARA ESTOS FINES.
- 2.- CORRESPONDERA ADEMAS, AL SERVICIO NACIONAL DE OBRAS SANITARIAS:
 - a) PRESTAR ASESORIA Y ASISTENCIA AL COMITE DE AGUA POTABLE, EN LOS ASPEC-
TOS TECNICOS, ADMINISTRATIVOS, LEGALES Y CONTABLES QUE SE REQUIERAN ,
PARA EL BUEN FUNCIONAMIENTO DEL COMITE Y DEL SERVICIO DE AGUA POTA -
BLE.


- b) REALIZAR ACTIVIDADES DE CAPACITACION DE SUS DIRIGENTES Y DE EDUCACION SANITARIA, A LA COMUNIDAD BENEFICIARIA.
- c) FIJAR EL VALOR DEL APOORTE CON EL QUE DEBERA CONTRIBUIR CADA USUARIO, PARA LA INSTALACION DEL SERVICIO Y CONVENIR CON EL COMITE DE AGUA POTABLE, EL PLAZO DE CANCELACION.
- d) APROBAR LAS TARIFAS A COBRARSE, POR LOS CONSUMOS DE AGUA POTABLE, UNA VEZ QUE EL SERVICIO SE ENCUENTRE EN FUNCIONAMIENTO.
- e) VELAR POR EL CUMPLIMIENTO DEL REGLAMENTO DE EXPLOTACION Y DE LAS NORMAS QUE SE DICTEN, PARA EL ADECUADO FUNCIONAMIENTO DEL COMITE Y DEL SERVICIO DE AGUA POTABLE.

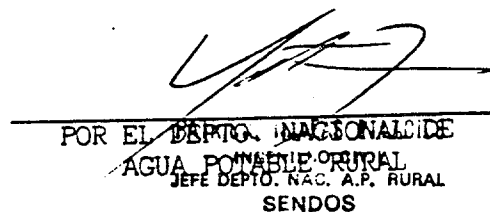
3.- CORRESPONDERA, AL COMITE DE AGUA POTABLE:

- a) COLABORAR CON LOS FUNCIONARIOS DEL SERVICIO NACIONAL DE OBRAS SANITARIAS, EN TODAS LAS ACTIVIDADES QUE ESTOS LLEVEN A CABO Y QUE TENGAN RELACION CON EL PROGRAMA NACIONAL DE AGUA POTABLE RURAL.
- b) PROVEER LOS TERRENOS PARA LA INSTALACION DEL SERVICIO, CUANDO EL CASO LO REQUIERA.
- c) HACER CUMPLIR A SUS ASOCIADOS Y CUMPLIR ANTE EL SERVICIO NACIONAL DE OBRAS SANITARIAS, CON EL PAGO DE LOS APORTES EN DINERO QUE ESTE FIJE, PARA LA INSTALACION DEL SERVICIO Y EN EL PLAZO QUE SE CONVENGA.
- d) RECAUDAR Y ADMINISTRAR LOS DINEROS PROVENIENTES DE LAS TARIFAS, ASICOMO LOS FONDOS ORIGINADOS DE ACTIVIDADES SOCIALES, QUE SE REALICEN PARA INCREMENTAR LOS RECURSOS DEL COMITE.
- e) HACER CUMPLIR A LOS USUARIOS, EL REGLAMENTO DE EXPLOTACION Y LAS NORMAS QUE SE DICTEN, PARA EL ADECUADO FUNCIONAMIENTO DEL COMITE Y DEL SERVICIO DE AGUA POTABLE.
- f) PROMOVER LA PARTICIPACION DE LA COMUNIDAD, EN TODAS LAS ACTIVIDADES QUE SE LLEVEN A CABO, PARA LA CONSECUCION DE LOS OBJETIVOS DEL PROGRAMA DE AGUA POTABLE RURAL.

4.- ESTE CONVENIO ENTRARA EN VIGENCIA, EN EL MOMENTO DE SER FIRMADO POR LAS PARTES.


POR EL COMITÉ DE AGUA
POTABLE


POR EL SERVICIO NACIONAL
DE OBRAS SANITARIAS


POR EL DEPTO. NACIONAL DE
AGUA POTABLE RURAL
JEFE DEPTO. NAC. A.P. RURAL
SENDOS

ANEXO B

PROCEDIMIENTO DE LICITACIONES

De conformidad con lo establecido en la Parte Primera, Cláusula 6.01, del presente Contrato de Préstamo (en adelante denominado "Contrato de Préstamo") las licitaciones se sujetarán al siguiente procedimiento de licitación (en adelante denominado el "Procedimiento"), que será utilizado por el Organismo Ejecutor a que se refiere la Cláusula 1.03 del Contrato.

I. APLICACION

El Procedimiento se utilizará en la adquisición de maquinaria, equipos y otros bienes para el Programa definido en el presente Contrato de Préstamo, y en la ejecución de obras para dicho Programa, en los casos en que el valor de las adquisiciones y obras exceda el equivalente de doscientos mil dólares (US\$200.000).

Asimismo se utilizará este Procedimiento en el caso de que se declare caducado el contrato para la ejecución de una obra o la adquisición de bienes producto de una licitación anterior, salvo que las partes acuerden lo contrario.

Por tratarse de un financiamiento de fuente internacional, este procedimiento de licitaciones requerirá colocar a los proponentes extranjeros, originarios de países miembros del Banco de conformidad con lo que se establece en este Procedimiento, en un plano de igualdad frente a posibles proponentes nacionales, de suerte que en el caso de que surgiera contraposición con la legislación chilena, las bases especiales de licitación deberán ser aprobadas por Decreto del Presidente de la República. En lo no contemplado en este Procedimiento, cada licitación se registrará, con carácter supletorio, por la Ley 15.840 y por el Reglamento para Contratos de Obras Públicas y sus modificaciones. Se mantendrá en todo caso, el trato igualitario en materia de oportunidades tanto para nacionales como para extranjeros.

II. MODALIDADES DE LICITACION

(a) Licitación Pública Internacional

Se entenderá por Licitación Pública Internacional la que permita la libre concurrencia de bienes y servicios originarios de países miembros del Banco. Deberá utilizarse el sistema de Licitación Pública Internacional en cada caso en que la adquisición de bienes o la ejecución de obras se financie, total o parcialmente, con divisas del Préstamo del Banco.

(b) Licitación Pública Nacional

Se entenderá por Licitación Pública Nacional, la Licitación Pública que se restrinja a bienes o servicios de origen nacional y cuya adquisición se financie exclusiva y totalmente con el aporte local o con la parte en pesos chilenos del financiamiento del Banco.

III. PROCEDIMIENTO A SEGUIR EN LAS LICITACIONES PUBLICAS INTERNACIONALES Y NACIONALES COMPRENDIDAS EN EL PROYECTO

(a) Precalificación

Se procederá a la precalificación de las firmas interesadas en los casos de licitaciones para la ejecución de obras, pudiéndose utilizar también el mismo sistema en otros casos en que el Prestatario y el Banco así lo acuerden. La precalificación se verificará en un plazo que armonice con el calendario de inversiones acordado entre el Prestatario y el Banco para el Proyecto, y de acuerdo con lo dispuesto en el párrafo III (d) de este Procedimiento.

(b) Convocatoria a Licitación

- (i) Los avisos de convocatoria contendrán los elementos y características esenciales de la respectiva licitación, indicación de que la adquisición o contratación se financia total o parcialmente por el Banco Interamericano de Desarrollo, la fuente de los recursos, e indicación de que la licitación se limita a bienes y servicios procedentes u originarios de países miembros del Banco.
- (ii) Se enviarán al Banco para su conformidad los textos de la convocatoria y de los documentos de licitación incluyendo los correspondientes a los instructivos para proponentes, planos, especificaciones y proyecto de contrato y demás documentos de la licitación.
- (iii) Producido el acuerdo entre el Prestatario y el Banco respecto de los documentos de licitación indicados en el párrafo anterior, se procederá a la publicación de la convocatoria en dos o más de los periódicos de amplia circulación en Santiago durante tres o más días alternados, de manera que la última publicación se realice con una anticipación no menor de 45 días calendario de la fecha que se señala para la apertura de las ofertas en dicha convocatoria.

Simultáneamente, se cursará copia de la convocatoria a las Representaciones Diplomáticas--o en su defecto los Consulados --de los países miembros del Banco y a las firmas que hayan sido precalificadas para la licitación.

En los casos de licitación pública nacional, podrá reducirse a dos el número de días de publicación, a uno el número de periódicos, a 30 días calendario el plazo para la presentación de ofertas y se omitirá el envío de la convocatoria a las Representaciones Diplomáticas.

- (iv) Si se tratare de construcción de obras y si con anterioridad se hubiere procedido a la precalificación de empresas constructoras, de acuerdo a lo establecido en el párrafo III (a) de este Procedimiento, la presentación de ofertas deberá circunscribirse a las firmas ya precalificadas.

(c) Apertura de las ofertas

- (i) Las ofertas y demás documentos exigidos a los proponentes se presentarán en sobre cerrado. El representante del Organismo Ejecutor designado para el efecto, firmará el recibo anotando la hora y fecha de entrega de las propuestas. Serán rechazadas las ofertas que se reciban después de la hora indicada para la apertura de las propuestas, así como, en licitaciones para ejecución de obras, las presentadas por firmas que no estén precalificadas.
- (ii) El proponente incluirá con su propuesta las garantías exigidas en los documentos de licitación para asegurar la firma del contrato correspondiente, si resultare favorecida.
- (iii) El representante del Organismo Ejecutor se reunirá en acto público con los representantes de los proponentes a la hora y fecha de vencimiento del plazo para la presentación de las ofertas señalado en la convocatoria. A partir de dicha hora los proponentes no podrán retirar las propuestas ni hacer cambios o arreglos en las mismas, ni se admitirá aclaraciones sobre las mismas no solicitadas por el Organismo Ejecutor. El representante de éste procederá a la revisión de los documentos presentados y las garantías, devolviéndose inmediatamente los sobres de las ofertas cuyas garantías no cumplan lo exigido.
- (iv) El representante del Organismo Ejecutor abrirá los sobres leyendo los nombres de los proponentes y los precios globales de las ofertas y de las alternativas, de habérselas pedido. Los proponentes tendrán derecho a tomar los datos principales de las ofertas, entre ellos: su valor total, plazos y otros datos que serán determinados en el acto por el representante del Organismo Ejecutor.
- (v) Terminada la apertura de la última propuesta, el funcionario del Organismo Ejecutor que se designe elaborará el Acta correspondiente en la que se consignarán las observaciones y

reservas hechas por los proponentes, antes de la apertura del primer sobre como durante la apertura de los mismos, así como los comentarios que el representante del Organismo Ejecutor y los proponentes deseen hacer. Leída el Acta, se invitará a los proponentes a firmarla. La rúbrica de las propuestas la hará el o los representantes que los proponentes elijan, o de lo contrario, el representante de ellos que designe el funcionario del Organismo Ejecutor, quien deberá foliar y rubricar todas las hojas de las diversas propuestas así como los planos y demás documentos. Los proponentes podrán presentar además, por escrito, observaciones de forma, dentro de los 3 días hábiles siguientes al acto de apertura.

- (vi) El Organismo Ejecutor se reservará el derecho de admitir aquellas ofertas que presenten defecto de forma, omisiones o errores evidentes, siempre que éstos no alteren el tratamiento igualitario de los proponentes ni la correcta evaluación de las propuestas. El Organismo Ejecutor podrá solicitar por escrito, con posterioridad al acto de apertura, las aclaraciones o informaciones que considere oportunas, que no violen o modifiquen las bases de licitación ni el principio de igualdad entre los proponentes ni que signifiquen alteración de la oferta. Las respuestas serán presentadas por escrito y se limitarán a los puntos solicitados.
- (vii) Concluida la apertura y el estudio de las propuestas, el Organismo Ejecutor preparará un cuadro comparativo de todas las ofertas y un informe razonado de los aspectos técnicos, financieros, legales y administrativos de las mismas. Copia del cuadro y del informe se enviarán al Banco junto con la opinión del Organismo Ejecutor con respecto a la propuesta que se considere más ventajosa, a fin de que el Banco pueda emitir su parecer.
- (viii) Si el Organismo Ejecutor considerare: (1) adjudicar la licitación a un postor diferente al recomendado en el informe que hubiere merecido la conformidad del Organismo Ejecutor y del Banco; o (2) introducir otros cambios sustanciales en el informe, se procederá nuevamente a obtener la aceptación del Banco transmitiéndole las razones que tiene el Organismo Ejecutor para hacer los cambios.
- (ix) Una vez que el Organismo Ejecutor y el Banco estén de acuerdo en lo que se refiere al adjudicatario, se adjudicará la licitación y el resultado será comunicado por escrito, dentro de los 10 días hábiles siguientes, a todos los proponentes en el domicilio que hayan señalado y se enviará al Banco, para su conformidad, el proyecto de contrato negociado que el Organismo Ejecutor se propone firmar con el adjudicatario. Una vez celebrado dicho contrato se enviará copia del mismo al Banco.

(d) Precalificación

El Organismo Ejecutor efectuará las precalificaciones de las firmas constructoras como condición previa a la iniciación de la licitación de la construcción de obras. En la precalificación se observarán las siguientes normas:

- (i) se efectuará una precalificación específica para cada licitación o grupos de licitaciones que vayan a realizarse dentro del Programa, de conformidad con la información requerida por el párrafo IV de este procedimiento;
- (ii) el llamado de precalificación, que deberá contener la información indicada en el párrafo (b)(i) anterior, así como el formulario, las instrucciones para los interesados y el método de precalificación que se proponga utilizar, requerirán la conformidad del Banco antes de ser hechos públicos;
- (iii) el llamado será publicado en la prensa local y comunicado a las Representaciones Diplomáticas de los países miembros del Banco, en la forma indicada en el párrafo (b)(iii), para la convocatoria a licitación, pudiéndose reducir a 2 el número de publicaciones en la prensa y a no menos de 30 días calendario el plazo entre la última publicación y la fecha de entrega de los formularios por los interesados;
- (iv) el informe técnico sobre la precalificación, y el criterio del Organismo Ejecutor sobre las firmas cuya calificación se recomienda y sobre aquellas que no calificarían, con las razones en que se fundan ambas recomendaciones, se enviarán al Banco, a fin de que éste exprese su conformidad o sus reservas al respecto;
- (v) encontrándose conformes el Organismo Ejecutor y el Banco con respecto al resultado de la precalificación, el Organismo Ejecutor aprobará el informe definitivo acordado y se notificarán los resultados a las firmas calificadas y a las que no resultasen calificadas, y
- (vi) una vez precalificada una firma no podrá ser descalificada para la licitación correspondiente, salvo en caso de que la precalificación se hubiera efectuado sobre la base de informaciones incorrectas presentadas por la firma, o por circunstancias sobrevinientes después de la fecha de precalificación.

IV. CONDICIONES GENERALES

- (a) Toda modificación o ampliación de las bases y especificaciones de la licitación o de variación de la fecha de presentación de ofertas, deberá contar con la previa conformidad del Organismo Ejecutor y

del Banco y, será comunicada a todos los interesados que hayan retirado los documentos de licitación. En caso de que, a juicio del Organismo Ejecutor y del Banco, la modificación o ampliación fuese sustancial, deberán mediar por lo menos 30 días calendarios entre la comunicación a los interesados y la fecha de apertura de las ofertas.

- (b) Cualquier consulta fundamentada, dirigida al Organismo Ejecutor por parte de los interesados, sobre la interpretación de los documentos de licitación, que no comportara modificación o ampliación de las bases y especificación de licitación, será resuelta dentro de un plazo de 15 días de recibida la comunicación y puesta en conocimiento de los demás interesados y del Banco. La consulta y respuesta no producirán efecto suspensivo sobre el plazo de presentación de las ofertas.
- (c) Cuando el Organismo Ejecutor, en cualquiera de las licitaciones comprendidas dentro del Programa, considere necesario desestimar todas las propuestas presentadas, se comunicará dicha opinión al Banco antes de hacer la correspondiente declaratoria a fin de que éste pueda manifestar su parecer al respecto. Este derecho del Organismo Ejecutor se hará constar expresamente en las bases y en la convocatoria a licitación.

En este caso, salvo acuerdo en contrario de las partes, se efectuará una nueva licitación que se ajustará a las disposiciones establecidas en el Procedimiento. Asimismo, se efectuará una nueva licitación en los casos en que se declare nula cualquier licitación realizada o en vías de realización.

- (d) En la evaluación y adjudicación de las ofertas que se reciban como consecuencia de una licitación internacional para la adquisición de bienes (maquinaria, equipo, materiales, etc.), podrá reconocerse a los bienes de origen chileno o de origen en países pertenecientes a la Asociación Latinoamericana de Libre Comercio (ALALC) 1/ un margen de preferencia conforme a las siguientes normas:

(i) Margen de Preferencia Nacional

- (1) Se considerará que un bien es originario de Chile cuando el costo de los materiales, mano de obra y servicios chilenos empleados en su fabricación represente por lo menos 40% del costo total del bien.

1/ Esta referencia y las que aparecen a continuación se entenderán hechas a la Asociación Latinoamericana de Integración (ALADI) cuando entre en vigor el Tratado de Montevideo del 12 de agosto de 1980.

- (2) A los efectos de la comparación de propuestas, se tendrá como precio de la oferta de productos de origen chileno, el precio de entrega del producto puesto al pie de la obra, una vez deducido lo siguiente: los derechos de importación pagados sobre materias primas principales o sobre componentes manufacturados, y los impuestos nacionales sobre ventas, al consumo y al valor agregado, incorporados al costo del artículo ofertado. El oferente deberá proporcionar la prueba documentada de las cantidades que deben deducirse, con el solo objeto de facilitar el cotejo de propuestas.
- (3) También a los efectos de esa comparación, se tendrá como precio de la oferta de productos de origen extranjero, el precio CIF del mismo producto (excluidos derechos de importación, consulares y portuarios), al cual deberá sumarse el importe de los gastos siguientes: los de manipuleo en puerto, y los de transporte local, desde el puerto o lugar fronterizo de entrada hasta el pie de la obra.
- (4) Para efectuar cotejo de precios entre ofertas de origen nacional y extranjero se estará a lo siguiente:
 - (aa) los costos expresados en moneda extranjera se convertirán a su equivalente en pesos chilenos, para lo cual se utilizará el tipo de cambio aplicado por el Banco en sus contratos; y
 - (bb) al precio de las ofertas de productos extranjeros, calculados conforme se estipula en el inciso (3), y expresados en el equivalente en pesos chilenos se sumará un margen de preferencia del 15% o el derecho aduanero real, según cual sea menor.
- (5) Cuando aplicando las normas anteriores resulte que la oferta del producto nacional es más conveniente que la del producto extranjero, podrá hacerse uso para su adquisición de las divisas que formen parte del Préstamo.

(ii) Margen de Preferencia Regional

- (1) Se considerará que un bien es originario de un país miembro de la ALALC cuando: (aa) se lo produzca en dicho país y cumpla con los requisitos establecidos en los instrumentos jurídicos que gobiernan esa Asociación en cuanto a origen y otras materias vinculadas con los

programas de liberación del comercio regional, y (bb) el valor local añadido en el país miembro de origen, no sea inferior al 40% del costo total del bien.

- (2) Para efectuar el cotejo de precios entre ofertas de bienes originarios de países de la ALALC y las de bienes originarios de otros países extranjeros elegibles, se estará a lo siguiente:

(aa) también se convertirán a su equivalente en pesos chilenos los precios expresados en moneda extranjera, sobre la misma base de cálculo establecida en el inciso (i)(4)(aa) anterior, y

(bb) se sumará a las ofertas de bienes originarios de países que no sean parte de la ALALC, y expresados en el equivalente en pesos chilenos, un margen del 15%, o bien la diferencia entre los derechos de importación aplicables a bienes originarios de países que integran esa Asociación y los derechos aplicables a bienes originarios de países extranjeros elegibles que no sean parte de la ALALC, según cual sea menor.

- (3) Cuando aplicando las normas anteriores resulte que la oferta del producto originario de un país miembro de la ALALC es más conveniente que la del producto originario de un país que no sea miembro de la ALALC podrá hacerse uso para su adquisición de las divisas que formen parte del Préstamo.

(e) El origen de un bien o artículo "producido" es el país en el cual, por conducto de actividades de manufactura, elaboración o montaje, se crea otro artículo comercialmente reconocido que difiere de manera sustancial en sus características básicas, propósito o utilidades de cualquiera de sus componentes importados. La nacionalidad de la firma que produce o vende los bienes o equipo carece de significación para determinar el origen de esos bienes y equipo.

(f) En el caso de las licitaciones para contratar la construcción de obras, las firmas que deseen participar deberán suministrar igualmente la siguiente información:

(i) clase de sociedad junto con los estatutos y otros documentos relativos a su constitución;

(ii) indicación de si la empresa es filial o subsidiaria de cualquier otra institución;

- (iii) en caso de consorcios, el nombre de cada uno de los componentes con copia de los estatutos o del instrumento que sirvió de base para el establecimiento del consorcio. Cada miembro del consorcio deberá llenar por separado, el cuestionario respectivo, estableciendo que la responsabilidad de cada uno de los miembros del consorcio, será indivisible y solidaria;
- (iv) la empresa o compañía debe indicar donde fue constituida y legalmente organizada; la sede principal de sus negocios; determinación de que más del 50% de las acciones pertenece a ciudadanos de país miembro del Banco y señalamiento de que la compañía, como un todo, es parte integrante de la economía de uno de dichos países. Para estos efectos se deberá demostrar:
 - (aa) que la empresa dicha está constituida u organizada en un país miembro del Banco;
 - (bb) que el asiento principal de sus negocios está ubicado en un país miembro del Banco de cuya economía la empresa debe ser parte integral;
 - (cc) que sea de propiedad en más de 50% de una firma o firmas o ciudadanos residentes auténticos de un país miembro del Banco;
 - (dd) que no exista un arreglo en virtud del cual una parte sustancial de las utilidades netas u otros beneficios tangibles de la firma pasen o sean pagados a personas que no sean ciudadanos o residentes auténticos de países miembros del Banco; y
 - (ee) que no menos del 80% de todas las personas que vayan a prestar servicios en virtud del contrato, sean ciudadanos de un país miembro del Banco. A los fines de este cálculo respecto de una firma de un país distinto del emplazamiento de la construcción, no se tendrán en cuenta los ciudadanos o residentes permanentes del país en el cual se ejecutará la construcción.

Los requisitos de nacionalidad se aplicarán también a las empresas que realicen partes de los trabajos pertinentes en virtud de subcontratos con un contratista calificado y a todos los integrantes de una empresa conjunta o consorcio;

- (v) expresión de que no ha celebrado acuerdo en virtud del cual una parte sustancial de sus ganancias o beneficios pase a

personal o entidades que no sean nacionales de un país elegible;

- (vi) debe establecerse que los consorcios que incluyen uno o más miembros que no sean elegibles por razón de nacionalidad, no serán calificados como elegibles;
 - (vii) si el oferente se propone celebrar subcontratos, los subcontratistas deberán ser elegibles por razones de nacionalidad de acuerdo con las reglas establecidas en este Procedimiento;
 - (viii) manifestación de que por lo menos el 80% de todas las personas que presten servicios conforme al contrato de construcción han de ser residentes "bonafide" de los países miembros del Banco;
 - (ix) antecedentes técnicos acerca de la empresa o sociedad, con detalles acerca del personal y equipos especializados de que dispone, así como su experiencia en la construcción de obras similares a las del Programa; y
 - (x) otros antecedentes que permitan apreciar la idoneidad y solvencia del proponente, tales como: Certificado (s) de cumplimiento en la prestación de servicios u obras, copia del último balance o certificado de solvencia emitido por una entidad bancaria, certificado (s) de idoneidad emitido por la Cámara de Comercio u otra entidad similar del país de procedencia.
- (g) No se exigirá a los proveedores extranjeros que no tengan domicilio o representantes en Chile la inscripción en el registro de proveedores como requisito para que puedan presentar ofertas.
- (h) A solicitud del Prestatario, por intermedio del Organismo Ejecutor, el Banco podrá aceptar que las licitaciones para ejecución de obras se hagan mediante el sistema de doble sobre; en estos casos el sobre No. 1 debe contener los antecedentes de las firmas, requeridas en el párrafo IV (f) precedente, para los efectos de evaluar su capacidad jurídica, técnica y financiera para construir la respectiva obra, y el sobre No. 2 debe contener la oferta y la garantía de mantenimiento de la misma. El sobre No. 2 será abierto en reunión posterior a la de apertura del sobre No. 1, a la cual el Organismo Ejecutor convocará sólo a quienes hayan sido precalificados con base en el sobre No. 1. La reunión para la apertura del sobre No. 2 se hará por lo menos una semana después del día de la apertura del sobre No. 1.
- (i) El Banco se reserva el derecho de abstenerse de financiar cualquier adjudicación en la cual no se haya observado este Procedimiento.

PROGRAMA NACIONAL AGUA POTABLE RURAL

CUARTA ETAPA

CRONOGRAMA DE LICITACION Y EJECUCION DE ESTUDIOS Y POZOS

[illegible]

SINBOLOGIA:
A: PUBLICACION O CONVOCATORIA
B: APERTURA
C: ADJUDICACION
D: ENTREGA INF.HIDROGEOLOGICO
E: ENTREGA OBSERVACIONES INF. H.

F: ENTREGA PROY. FUENTE DE AGUA
G: ENTREGA OBSERV. PROY. FUENTE DE AGUA
H: APROBACION PROY. FUENTE DE AGUA
I: ENTREGA ANTEPROYECTO
J: ENTREGA OBSERVACIONES ANTEPROYECTO

K: ENTREGA PROJ. INST. DE SERV.
L: ENTREGA OBSERV. PROJ. INST. DE SERV.
M: APROBACION PROJ. INST. DE SERV.
N: TERMINO OBRA

ESTUDIOS Y POZOS

TERCERA ETAPA

CUARTA ETAPA

QUINTA ETAPA

CATEGORIA	1			2			3			4			TOTAL	TOTAL	TOTAL	TOTAL	TOTAL
	BID-IC	BID-OC	LOCAL	BID-IC	BID-OC	LOCAL	BID-IC	BID-OC	LOCAL	BID-IC	BID-OC	LOCAL	BID-IC	BID-OC	BID	LOCAL	GENERAL
Administración	---	---	1124	---	---	1829	---	---	587	---	---	586	0	0	0	3325	3325
Diseños	---	---	349	---	---	349	---	---	---	---	---	---	0	0	0	697	697
Costos en Operación	---	---	189	---	---	94	---	---	---	---	---	---	0	0	0	283	283
Manutención	---	---	224	---	---	224	---	---	224	---	---	224	0	0	0	895	895
Reparación	---	---	363	---	---	363	---	---	363	---	---	362	0	0	0	1450	1450
	2379	754	1997	2668	820	2116	2558	435	1756	2230	437	1667	9827	2445	12274	7536	19810
Personales	---	268	54	---	268	53	---	---	---	---	---	---	0	537	537	186	643
Transportados	459	---	155	458	---	120	459	---	---	---	---	---	1377	0	1377	275	1652
Mano de Servicios	1770	268	1501	1778	238	1687	1711	285	1556	1798	255	1467	7848	958	7990	6210	14200
Mano de Sondajes	---	138	127	---	138	56	---	---	---	---	---	---	0	268	268	185	445
Mano de Ampliación	150	96	168	448	192	200	388	238	200	448	182	288	1418	788	2110	768	2869
Costos	0	0	181	0	0	325	718	348	588	0	348	555	718	688	1398	1648	3845
Comunal	---	---	183	---	---	183	---	---	183	---	---	183	0	0	0	413	413
Costos V Etapa	---	---	---	---	---	---	---	228	332	---	228	299	0	455	455	631	1886
Etapa	---	---	---	---	---	---	---	113	75	---	113	75	0	225	225	158	375
Costos/Servidumbres	---	---	78	---	---	78	---	---	78	---	---	78	0	0	0	318	318
	---	---	---	---	---	144	718	---	---	---	---	---	718	0	718	144	862
Costos	279	45	178	634	88	148	919	115	95	1123	133	87	2955	373	3328	492	3820
Costos de Crédito	245	36	---	688	71	---	885	186	---	1898	125	---	2828	338	3158	0	3158
	---	---	178	---	---	148	---	---	95	---	---	87	0	0	0	492	492
	34	9	---	34	9	---	34	9	---	33	0	---	135	35	178	0	178
	2658	888	3471	3382	988	3618	4187	898	3825	3353	918	2894	13588	3588	17888	13888	38888

A N E X O 6.1.

REGLAMENTO PARA LA ADMINISTRACION, OPERACION Y
MANTENIMIENTO DE LOS SERVICIOS RURALES DE AGUA POTABLE

(EN TRAMITE RESOLUCION QUE OFICIALIZA SU
USO EN REEMPLAZO DEL REGLAMENTO ANTERIOR)

T I T U L O I

DISPOSICIONES GENERALES

- Artículo 1° El presente Reglamento, se aplicará a todos los servicios rurales de agua potable, que se encuentren bajo la tutela y asesoría del Servicio Nacional de Obras Sanitarias (SENDOS).
- Artículo 2° Para la correcta interpretación del presente Reglamento, se entenderá por:
- a) Aporte: suma de dinero estipulada por el Servicio Nacional de Obras Sanitarias, que cada socio deberá cancelar por el derecho a conectarse a la red pública y contar con agua potable domiciliaria.
 - b) Conexión domiciliaria: la cañería y accesorios que, partiendo de la red en dirección al inmueble o vivienda, entrega el agua potable hasta un metro adentro, desde la línea de edificación de la propiedad del socio.
 - c) Consumo: cantidad de agua determinada por SENDOS, destinada a satisfacer las necesidades domésticas, a que tiene derecho el socio usuario del servicio.
 - d) Entidad: organismo comunitario al que se le ha entregado la responsabilidad de administrar, operar y mantener los servicios rurales de agua potable.
 - e) Extensión de la red: cualquiera prolongación de la red inicialmente instalada.
 - f) Fondo de mantención y reposición: El formado por una parte de los ingresos por tarifas o por otros conceptos, y que tiene por objeto, financiar los gastos de asistencia técnica, reparaciones y reposiciones de equipo que se requieran para el normal funcionamiento del servicio.
 - g) Instalación interior: el conjunto de cañerías distribución de agua potable, artefactos y accesorios, instalados en el interior del inmueble, a partir de la conexión domiciliaria.
 - h) Intervención: acto por el cual, SENDOS u otra institución, toma a su cargo en forma provisoria, la administración y operación del servicio, con el objeto de normalizar su funcionamiento, ante irregularidades que se hayan detectado.

- i) Interventor: funcionario de SENDOS o de otra institución, que tomará a su cargo la administración y operación del servicio intervenido.
- j) Línea de edificación: la formada por el deslinde de la propiedad con la acera, calle o camino.
- k) Proyecto: el conjunto de planos, detalles, memoria y especificaciones técnicas, correspondientes a una obra de agua potable determinada.
- l) Red pública: el conjunto de cañerías y accesorios, que sirven para llevar el agua desde la fuente, hasta las conexiones domiciliarias.
- m) Socio: aquella persona que, representando a un grupo familiar usuario del servicio, ha firmado la solicitud de incorporación al servicio, se encuentra inscrita en el libro de registro de socios de la entidad y ha cancelado o se encuentra cancelando el aporte correspondiente.
- n) Tarifa: valor en dinero que cada socio o usuario del servicio cancela regularmente a la entidad, por el consumo de agua potable de su vivienda o propiedad.
- ñ) Usuario: aquella persona, que representando a un grupo familiar, hace uso del servicio de agua potable, sin tener la calidad de socio de la entidad.

- Artículo 3° El agua que suministren los servicios rurales, será destinada exclusivamente a abastecer a los socios y usuarios para la bebida y usos domésticos. Sólo en casos calificados por la entidad y con autorización de SENDOS, se podrá destinar el agua para otros fines.
- Artículo 4° Podrán las entidades distribuir agua a terceros, no socios ni usuarios, durante un período previamente fijado, en un volumen que no afecte el servicio previsto para los socios, pagando aquellos las tarifas. Cumplido el período y subsistiendo la necesidad, deberán adquirir la calidad de socio y cancelar los aportes correspondientes.
- Artículo 5° Sin perjuicio de las atribuciones de control y supervigilancia, que corresponda desarrollar a otros organismos del Estado, la supervisión técnica, administrativa y contable a los servicios rurales de agua potable, le corresponderá a SENDOS.

- Artículo 6° Corresponderá a los Inspectores Sanitarios de los Servicios de Salud, en conformidad con el Código Sanitario, controlar periódicamente la calidad sanitaria del agua que las entidades suministran.
- Artículo 7° SENDOS podrá intervenir un servicio, cuando a su juicio, haya abandono o cuando la operación, administración o mantenimiento, sea manifiestamente deficiente.
- Será obligación del interventor normalizar al más breve plazo el servicio intervenido. La intervención no podrá durar más de dos meses, renovable por igual período, en caso de excepción. Los gastos que demande esta intervención, serán de cargo de la entidad intervenida.
- Artículo 8° SENDOS podrá requerir de las entidades, todos los antecedentes que juzgue convenientes, tales como, la exhibición de libros contables, contratos, convenios, documentos y en general, todo lo que estime de interés para una adecuada supervigilancia. Además, podrá exigir la comparecencia de los representantes de ellas, cuando lo estime necesario.
- Artículo 9° Corresponderá a SENDOS, en forma privativa, interpretar las disposiciones técnicas de este Reglamento, aclararlas y fijar su verdadero sentido y alcances.

T I T U L O I I

DE LOS SERVICIOS

- Artículo 10° Las entidades estarán obligadas a mantener en perfecto estado de funcionamiento las instalaciones, a fin de evitar interrupciones en el servicio, debiendo además, proporcionar a sus socios agua potable en la calidad y cantidad determinadas en el proyecto de las obras, o, en sus modificaciones posteriores aprobadas por SENDOS.
- Artículo 11° Todas las entidades deberán tener un operador encargado del servicio, debidamente capacitado para el desempeño de sus funciones. Este será propuesto por la entidad y su designación definitiva deberá contar con la aprobación de SENDOS.

La remuneración que irroque su contratación, será de cargo de la entidad.

Para el cumplimiento de su labor, deberá ceñirse estrictamente a las instrucciones contenidas en el Manual de Operación y a las que imparte SENDOS, en las visitas de inspección técnica que realice.

- Artículo 12° Periódicamente, el operador del servicio deberá efectuar una prolija revisión de las instalaciones, a fin de determinar su estado de limpieza, funcionamiento y conservación. Para estos efectos, se ceñirá estrictamente a lo establecido en el Manual de Operación y a las instrucciones de SENDOS.
- Artículo 13° Para financiar las reparaciones y reposiciones que la entidad deba efectuar en el servicio de agua potable, deberá recurrir al Fondo de Mantención y Reposición, creado para tales efectos.
- Artículo 14° Las entidades deberán tener un registro de personas capacitadas para ejecutar los trabajos de instalaciones de conexiones domiciliarias - reparaciones menores, debidamente autorizadas por SENDOS.
- Estas personas deberán ceñirse estrictamente a las normas e instrucciones impartidas por SENDOS, para la ejecución de trabajos en el servicio.
- Artículo 15° Se prohíbe estrictamente a cualquier persona que no se encuentre registrada y autorizada por SENDOS, hacer trabajos en la red, conexiones domiciliarias, equipos motobombas, y demás instalaciones del servicio.
- Artículo 16° Las entidades deberán someter a la aprobación de SENDOS, toda proposición de extensión o mejoramiento de la red, o de cualquier parte del servicio. SENDOS resolverá, atendiendo a la factibilidad técnica que el proyecto de la obra determine.
- Artículo 17° Para las extensiones de redes, los interesados deberán cumplir con los siguientes requisitos:
- a) Presentar una solicitud a la entidad, la que será sometida a la aprobación de SENDOS. Esta deberá acompañar un croquis con el detalle de la extensión solicitada y el número de viviendas a conectarse, con su ubicación.
 - b) Solicitar la inscripción como socio, cancelando los aportes correspondientes.

- c) Cancelar el valor íntegro de la extensión y su costo de instalación. Si son varias las personas solicitantes, los gastos serán prorrateados entre todas ellas.
- d) Cumplir con lo dispuesto en el Título III, sobre instalaciones domiciliarias.

Artículo 18° Las obras de extensión de redes, serán inspeccionadas por un funcionario de SENDOS.
Toda extensión, ampliación y/o mejoramiento de las instalaciones pasarán a constituir parte del patrimonio de SENDOS.

TÍTULO III

DE LAS INSTALACIONES DOMICILIARIAS

- Artículo 19° Las conexiones domiciliarias tendrán un diámetro único de 13 mm (1/2 "). La instalación de conexiones de otra dimensión, deberá ser aprobada por SENDOS. Todas ellas llevarán una llave de paso, ubicada antes de la línea de edificación.
- Artículo 20° La entidad, previa aprobación de SENDOS, será la única autorizada para permitir la instalación de conexiones domiciliarias y medidores, una vez que comience a explotar el servicio.
- Artículo 21° Las reparaciones que se deban efectuar en la conexión domiciliaria y hasta la llave de paso más cercana al inmueble o vivienda, será responsabilidad del socio o usuario cancelar su valor.
- Artículo 22° La entidad podrá exigir la instalación de medidores de consumo, para lo cual, el socio o usuario deberá cancelar el total de su valor y los gastos de instalación. Una vez instalados, deberá velar por su conservación, pasando a ser parte de las instalaciones del servicio.
- En aquellos arranques largos, el medidor deberá instalarse lo más cerca de la matriz.

- Artículo 23° Las reparaciones que se deben efectuar en los medidores instalados, será responsabilidad del socio o usuario cancelar su valor. Sólo el operador del servicio estará facultado para retirarlos, cuando éstos presenten fallas.
- Artículo 24° El socio o usuario que sea sorprendido alterando el funcionamiento del medidor, será sancionado por la entidad, con una multa en dinero, equivalente a la suma de las tarifas canceladas por él durante los seis meses anteriores al hecho; esto, sin perjuicio de las acciones legales que podrá iniciar la entidad en contra del socio o usuario.
- Artículo 25° Todas las instalaciones interiores que el socio ejecute en su propiedad, deberán contar con la aprobación de SENDOS, antes de ser puestas en uso. SENDOS además, deberá aprobar el material que se emplee.
- Artículo 26° Las instalaciones interiores conectadas al servicio de agua potable, no podrán en ningún caso conectarse a otro sistema de abastecimiento de agua, como ser noria, pozo u otro, existente o futuro y que no forme parte del servicio de agua potable de la localidad.
- Artículo 27° Queda estrictamente prohibido hacer extensiones de la conexión domiciliaria, sean por mangueras, cañerías plásticas o cualquier otro medio, con el fin de proporcionar agua a vecinos.
- Desde cada arranque domiciliario sólo podrá abastecerse una vivienda o inmueble. Excepcionalmente, la entidad podrá autorizar el abastecimiento a más de una vivienda desde una sola conexión domiciliaria, siempre y cuando no sea aconsejable una conexión individual. En tal caso será obligatoria la instalación inmediata de un medidor.
- Artículo 28° Los socios y usuarios facilitarán el acceso a sus inmuebles o viviendas, a los encargados del servicio, dirigentes de la entidad y funcionarios de SENDOS, con el exclusivo objeto de velar por el cumplimiento de las disposiciones del presente Reglamento.
- En el caso de negativa, cuando existan presunciones fundadas del incumplimiento de estas disposiciones, los encargados podrán requerir la intervención de las autoridades competentes.

- Artículo 29° Excepcionalmente y con la autorización de SENDOS, en inmuebles cuyo consumo sea muy alto, se podrá instalar estanque de regulación, los que deberán tener una capacidad no inferior al 30% del consumo estimado diario de cada uno de dichos inmuebles.
- Artículo 30° Cuando se requiera de un sistema de impulsión mecánico para abastecer una vivienda, no podrá éste surtirse directamente de la red, sino a través de una cámara o depósito especial de separación, que permita aislar y proteger de todo riesgo de contaminación el agua potable.

T I T U L O I V

DE LOS APORTES, TARIFAS Y OTROS PAGOS

- Artículo 31° Los aportes serán fijados por SENDOS y deberán ser cancelados por la entidad, en los lugares que ésta indique; el plazo de cancelación será el que se haya convenido por ambas partes. Los socios deberán cancelar directamente los aportes a la entidad, respondiendo ésta por el mismo número de conexiones que se hayan instalado.
- Artículo 32° Los socios que se incorporen con posterioridad a la puesta en marcha del servicio, cancelarán el aporte, debidamente reajustado, más un 20% que pasará a incrementar los fondos de la entidad. El plazo de cancelación será convenido entre el socio y la entidad.
- Artículo 33° Los socios que hayan firmado su solicitud de incorporación al servicio, empezarán a cancelar sus aportes, desde el mes en que se inició la construcción del servicio. Al momento de ejecutarse los trabajos de conexiones domiciliarias, se conectará sólo a aquellos que se encuentren al día en el pago de sus aportes.
- Los socios, que al iniciarse el funcionamiento del servicio, se encuentren atrasados en más de tres meses en el pago de sus aportes, no se les entregará el suministro de agua.

- Artículo 34° Las tarifas se fijarán de modo que con el producto de ellas, se cubran sin problemas los gastos de administración, operación y mantenimiento del servicio y se forme un fondo de mantención y reposición.
- Artículo 35° Las tarifas iniciales serán fijadas por SENDOS en conjunto con la entidad y se considerarán en revisión, durante los primeros meses de funcionamiento del servicio. Terminado este período, la entidad, basándose en la tarifa inicial, fijará la definitiva, la que en ningún caso podrá ser inferior a la primera.
- Artículo 36° SENDOS tendrá la facultad para estudiar, determinar y/o proponer a las entidades, las tarifas que se aplicarán en los diferentes tipos de servicios, según tengan o no sistema de elevación mecánica, y tengan o no medidores de consumo domiciliario instalados, como asimismo, las tarifas para conexiones de diámetro mayor que 13 mm (1/2").
- Artículo 37° Las entidades emitirán boletas, recibos o comprobantes, por los pagos de los consumos de agua potable. Estos pagos se harán por mes vencido, dentro de los cinco primeros días del mes, en la sede de la entidad o en el lugar que ella determi-ne.
- Artículo 38° Cuando en una vivienda o inmueble no exista consumo, ya sea por suspensión del servicio a petición del interesado o por corte de suministro por morosidad, será obligación del socio o usuario, cancelar la tarifa mínima o un monto mínimo deter-minado por la entidad.
- Artículo 39° Las instituciones de derecho público o privado existentes en la localidad, estarán obligadas a cancelar las tarifas por los consumos que se efectúen en sus recintos. ...

T I T U L O V

DE LAS SANCIONES Y MULTAS

- Artículo 40° Toda infracción al presente Reglamento, cometida por el socio o usuario, que no tenga contemplada una pena especial, será sancionada con una multa máxima, equivalente a la suma de las tarifas canceladas por él durante los dos meses anteriores al hecho. La reincidencia será penada con el doble de la última multa.

- Artículo 41° Si la multa no se cancela dentro del plazo estipulado por la entidad, ésta podrá ordenar la suspensión del suministro de agua potable, al socio sancionado.
- Artículo 42° Serán además, causales de suspensión del suministro de agua potable a un servicio o usuario:
- a) el atraso por más de 60 días, sin causa justificada, en el pago de las tarifas.
 - b) el atraso por más de 90 días, sin causa justificada, en el pago de los aportes, aunque se encuentre al día en la cancelación de sus tarifas.
 - c) la utilización del agua en usos distintos de lo establecido en el presente Reglamento, o cuando se compruebe que ha causado daños a las instalaciones o a los bienes de la entidad.

El costo de la reposición del suministro de agua potable, será determinado por la entidad, en relación al valor de un día salario agrícola.

- Artículo 43° Con la cancelación de las deudas, multas, intereses y costos de reposición, será repuesto el suministro de agua potable.

- Artículo 44° En el caso de constatarse la existencia de una conexión domiciliaria o de una instalación clandestina, el propietario o usuario del respectivo inmueble deberá cancelar una multa equivalente a diez veces el valor de la tarifa mínima. Además, estará obligado a cumplir en el plazo de un mes con los requisitos generales establecidos en el presente Reglamento, para ejecutar la conexión domiciliaria o instalación interior y a pagar el aporte por el derecho a conectarse al servicio, en el plazo que le fije la entidad, sin perjuicio de las acciones legales que la entidad pueda iniciar en su contra.

T I T U L O VI

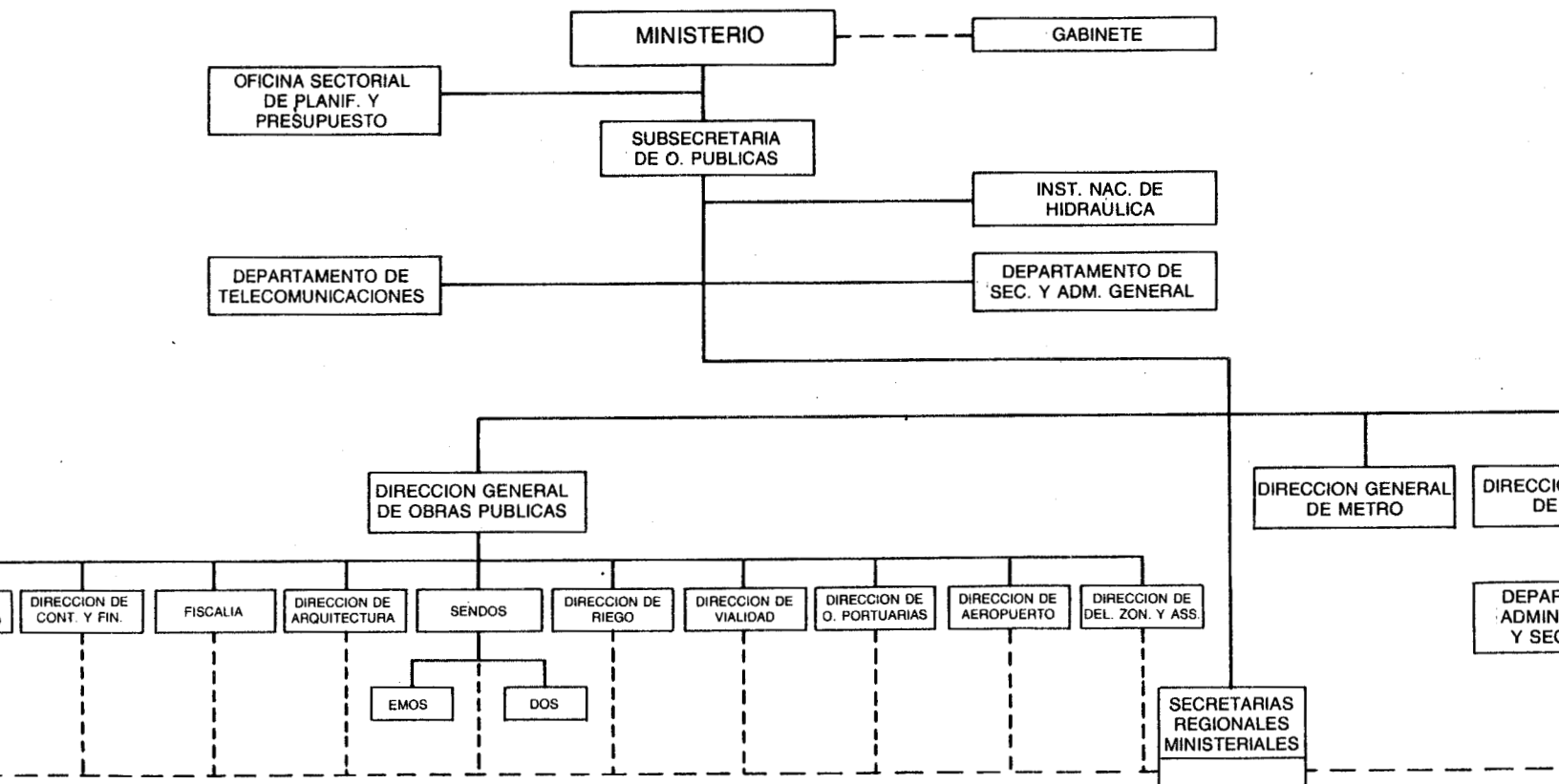
NORMAS GENERALES ADMINISTRATIVAS Y CONTABLES

- Artículo 45° Toda entidad estará obligada a mantener en su sede o domicilio social, los siguientes libros y archivos:
- a) Libro de Registro de Socios, con todos los datos de identificación de cada uno de ellos.
 - b) Libro de Actas, donde se dejará constancia de los acuerdos tomados en asambleas generales de socios o en reuniones de dirigentes de la entidad.

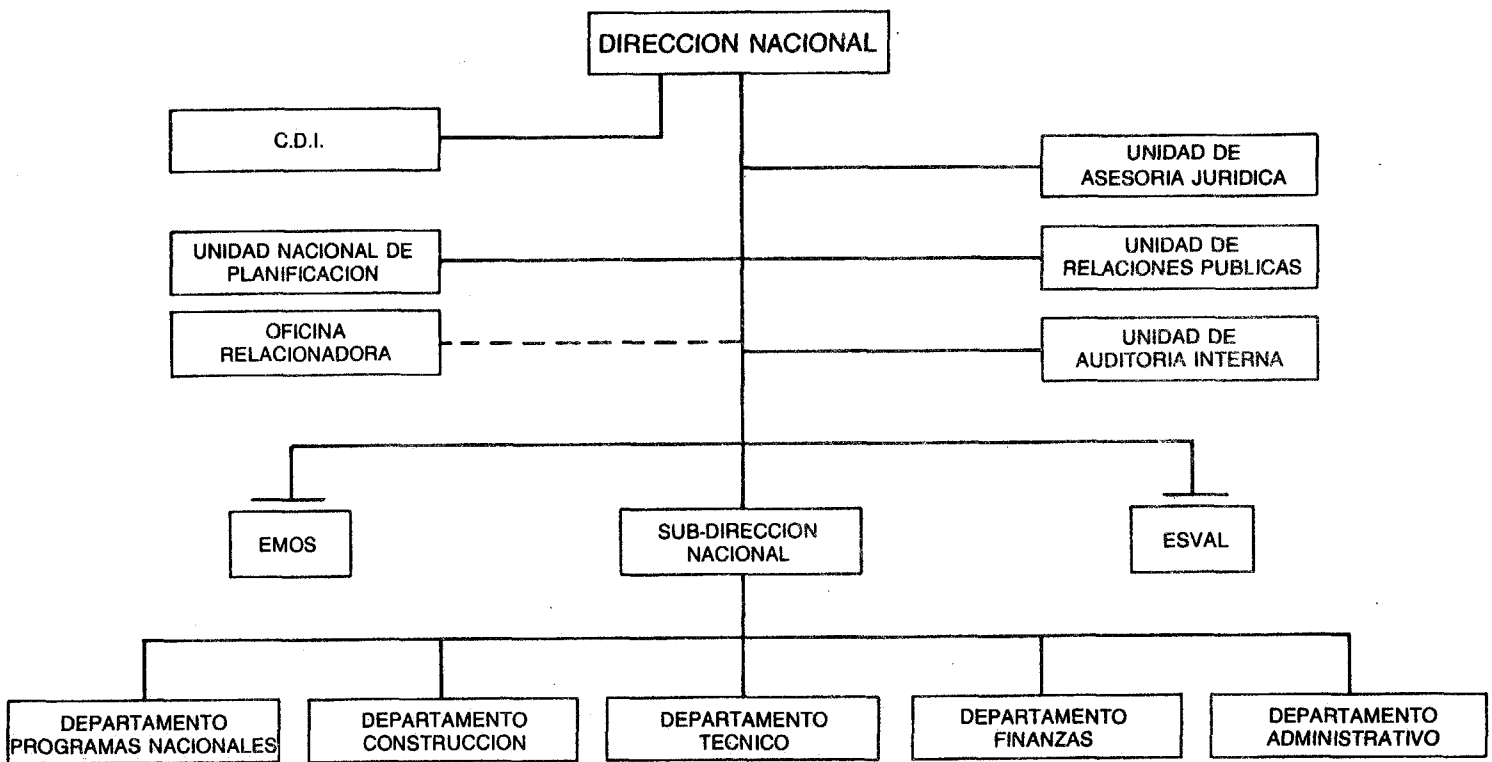
- c) Libro de Ingresos y Egresos, donde se registrará diariamente, todo el movimiento contable de la entidad.
 - d) Libro de Control de Tarifas y Aportes, donde se registrará, periódicamente, las cancelaciones que hagan los socios, por estos conceptos.
 - e) Archivo de documentación y correspondencia.
 - f) Talonarios de ingresos y egresos.
-

SUB DEPTO. PROMOCION
Diciembre 1984.

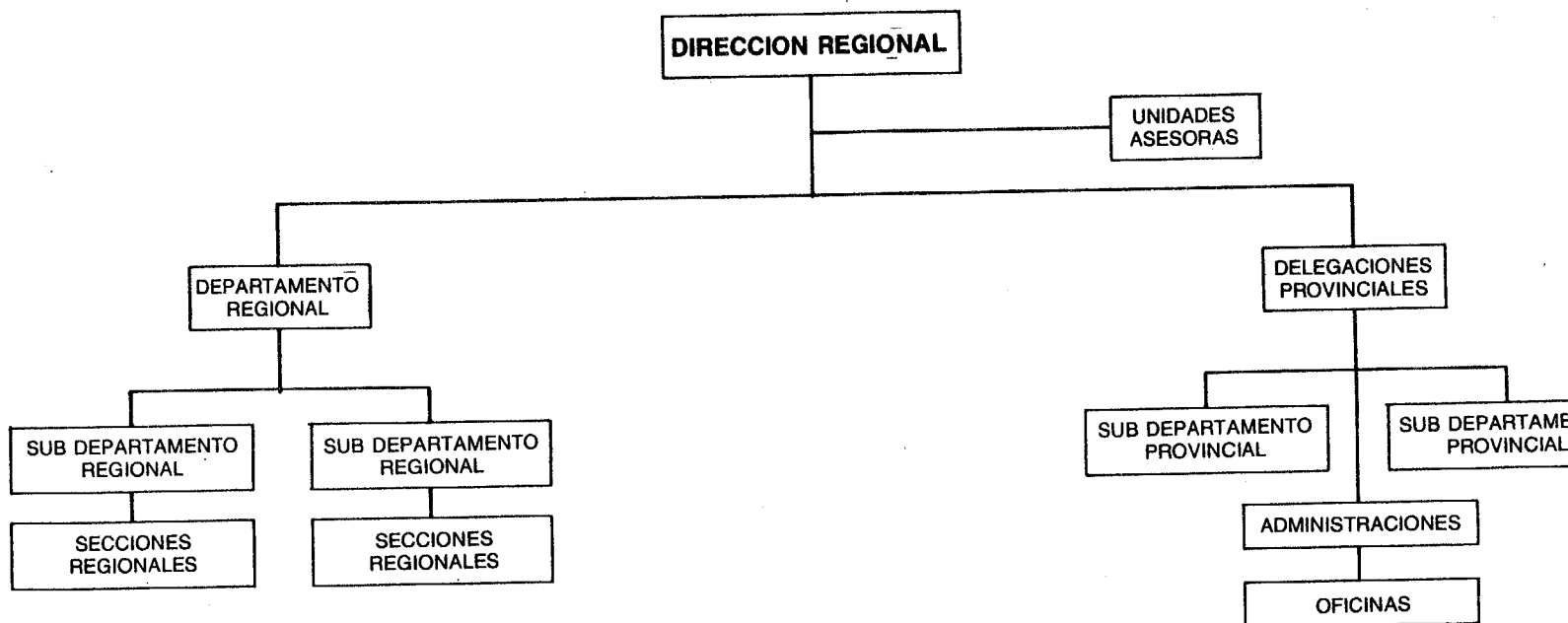
ORGANIGRAMA DEL MINISTERIO DE OBRAS PUBLICAS



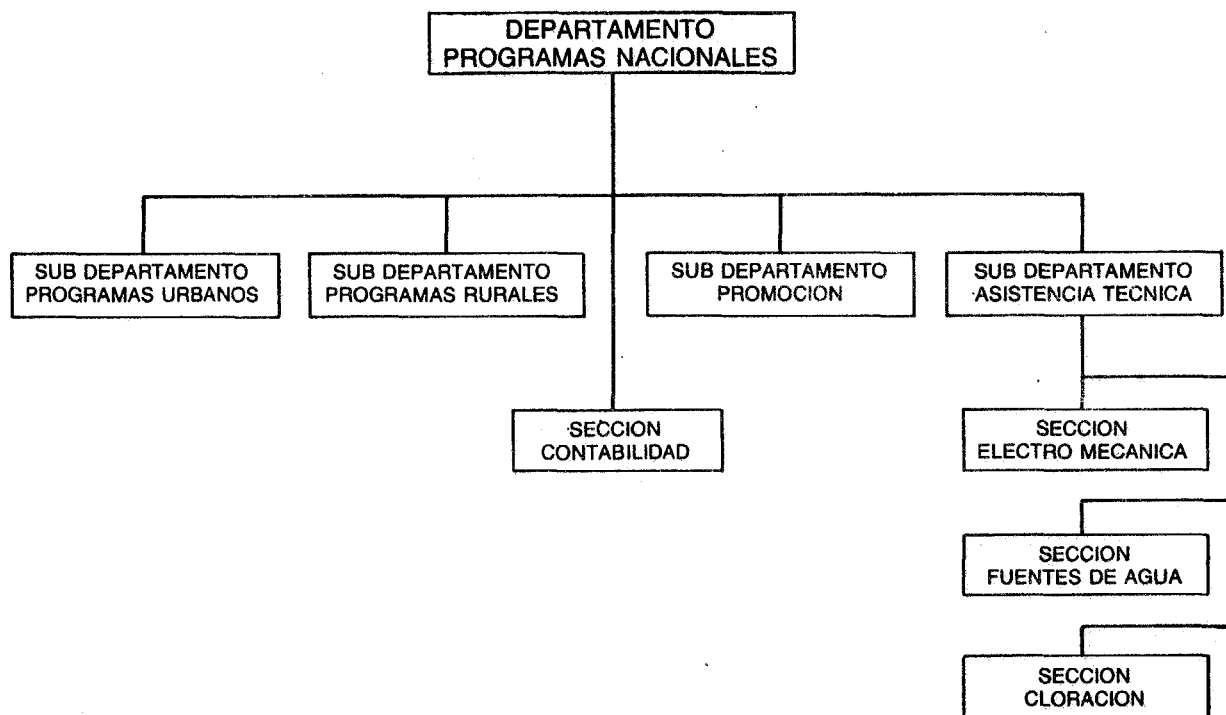
**ESTRUCTURA ORGANICA NIVEL CENTRAL
SERVICIO NACIONAL DE OBRAS SANITARIAS**



**ESTRUCTURA ORGANICA BASICA
DE LAS DIRECCIONES REGIONALES DEL SENDOS**



**ESTRUCTURA ORGANICA
DEPARTAMENTO PROGRAMAS NACIONALES
SENDOS NIVEL CENTRAL**



REPUBLICA DE CHILE
MINISTERIO DE OBRAS PUBLICAS
SERVICIO NACIONAL OBRAS SANITARIAS

PERSONAL NACIONAL CONTRATADO EN LAS PLANTAS DE SENDOS
QUE CUMPLEN FUNCIONES PARA EL PROGRAMA NACIONAL DE AGUA POTABLE RURAL

ESTAMENTOS	NIVEL CENTRAL	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
INGENIEROS	16	-	-	-	-	-	1	1	-	-	-	-	-
CONSTRUCTORES CIVILES	5	1	-	1	3	2	3	3	2	2	2	1	-
TECNICOS UNIVERSITARIOS	3	-	-	-	-	-	-	1	-	-	-	-	-
GEOLOGOS	2	-	-	-	-	1	-	1	1	1	-	-	-
TECNICO ELECTROMECHANICO	-	-	-	-	-	1	-	1	1	2	1	1	-
ASISTENTES SOCIALES	3	1	-	1	1	2	3	1	3	-	-	-	-
PERIODISTA	1	-	-	-	-	-	-	-	-	-	1	-	-
CONTADORES	5	-	-	-	-	-	-	-	-	-	-	-	-
SECRETARIAS	9	-	-	-	-	-	1	1	-	-	-	-	-
ADMINISTRATIVOS	12	1	-	1	1	-	3	-	1	1	-	-	-
CHOFERES	1	1	-	-	1	-	1	2	1	-	-	-	-
AUXILIARES	7	-	-	-	-	-	-	2	-	-	-	-	-
DIBUJANTES	1	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	65	4	-	3	6	5	12	12	8	7	4	2	-

SENDOS

BASES PARA LAS PROYECCIONES PRESUPUESTARIAS

Las proyecciones presupuestarias que se incluyen en el capítulo V del Informe Técnico, se han preparado de conformidad con los siguientes criterios:

1. Datos de operación: El volumen facturado en agua potable, expresado en metros cúbicos, fué estimado con base en la proyección de población abastecible y en la relación del volumen abastecido por conexión domiciliaria conforme la experiencia de SENDOS.
2. Ingreso medio: El ingreso medio de agua potable y alcantarillado es el resultante para el año 1985, ajustado para expresarlo en moneda de junio de 1985 y para tomar en cuenta la plena vigencia del aumento tarifario que, se ha asumido, se concretaría en el año 1986. Desde 1986 en adelante el valor del ingreso medio se ha mantenido constante.
3. Efectividad de la recaudación: se ha supuesto, con base en la experiencia de SENDOS, que los ingresos reales serán equivalentes al 90% de los facturados y que el 10% restante habría de incrementar los saldos a cobrar de clientes.
4. Recuperaciones por convenios: se ha estimado que entre 1985 y 1989 por ese concepto ingresarían US\$597.000 anuales conforme con los convenios suscritos por aplicación de la Ley No.18354, y posteriormente a esa fecha, US\$592.000 anuales.
5. Otros ingresos de operación: fueron proyectados en función del incremento estimado para los parámetros físicos de operación.

6. Egresos de explotación: se los calculó conforme el siguiente detalle:

- a) Gastos de personal: El valor del gastos correspondiente a 1984 fue expresado en moneda de junio de 1985 y, para ese año y posteriores, también para reflejar los reajustes aplicables en el nivel de remuneraciones y bonificaciones y el mayor costo anual derivado del reforzamiento en la dotación de SENDOS a iniciarse durante 1985.
- b) Bienes y servicios para la producción: este rubro refleja el mayor consumo de productos químicos, para cumplir con las normas de calidad de agua acordadas con el Banco, y el mayor gasto a realizar en concepto de reparación y mantenimiento de equipos e infraestructura para satisfacer necesidades hasta ahora postergadas.

7. Endeudamiento: El posible financiamiento del Banco sería repasado por las autoridades nacionales a SENDOS, tomando también el Gobierno la obligación de repago al Banco, que otorgaría el préstamo en las siguientes condiciones:

<u>Concepto</u>	<u>Moneda local (OC)</u>	<u>BID IC</u>
Monto recursos US\$ miles	4.766	14.329
Intereses en período de gracia y amortización (%)	4,0	9,5
Plazo (años)		
1. gracia	4 1/2	4 1/2
2. amortización	20 1/2	20 1/2
3. total	<u>25.0</u>	<u>25.0</u>
Inspección y vigilancia (%)	1,0	1,0
Comisión de crédito (%)	--	1,25
Desembolso (años)	4	4

8. Servicio de la deuda: fue calculado conforme con las condiciones financieras contratadas para los préstamos existentes y las asumidas para el posible financiamiento del Programa en estudio conforme se indica en el inciso 7. anterior.
9. Aporte fiscal: refleja el aporte local al Programa así como la atención del servicio de la deuda correspondiente a los posibles préstamos del Banco. También expresa las contribuciones complementarias que otorga el Estado a través de la Ley de Presupuestos, destinadas a la inversión real y la atención de otras obligaciones financieras.
10. Inversión real: incluye los desembolsos correspondientes a la IV Etapa del Programa de Agua Potable Rural de acuerdo con su calendario de ejecución. Además, muestra los demás montos de inversión establecido en el Programa Trienal del Ministerio de Obras Públicas, así como las estimaciones de inversión a realizar con posterioridad a 1987, que es el último año incluido en el Programa Trienal mencionado.

Análisis SocioeconómicoI. Introducción

En este anexo se presenta una descripción del modelo utilizado en el cálculo de los indicadores de rentabilidad económica de la muestra representativa; seguidamente se describe la estimación de la curva de demanda y de la encuesta socioeconómica realizada con este fin. Finalmente se presentan los costos del proyecto que fueron incluidos en el análisis económico.

II. Modelo de Simulación

Para determinar los beneficios económicos, la Tasa Interna de Retorno (TIR), el Valor Presente Neto (VPN), el Costo Eficiencia (CE) y el Costo Incremental Actualizado (CIAC) de cada subproyecto de la muestra representativa, se elaboró un modelo microeconómico de simulación, el cual sigue los siguientes lineamientos:

La hipótesis fundamental del modelo consiste en que el consumo anual de agua potable de una familia es función inversa del precio que se le cobra por el agua y función directa del ingreso y el tamaño de la familia. Para cada localidad, el modelo calcula los consumos de agua durante la vida útil del proyecto con base en el precio del agua, el ingreso y el tamaño familiar promedio del segmento o región en el cual se encuentra la localidad.

El agua consumida produce a su vez un beneficio equivalente a la disposición de la familia a pagar por ella. En los casos en los que con anterioridad a la ejecución del proyecto existen sistemas de abastecimiento precarios, el modelo calcula el ahorro en recursos que se obtiene al dejar de utilizar estos sistemas y lo suma a los beneficios producidos por consumo de agua. Una vez estimados los beneficios totales, éstos se actualizan a valor presente y se comparan con los costos también en su valor actual, para determinar el VPN del subproyecto, y otros indicadores de rentabilidad tales como la TIR, el CE y el CIAC.

En el modelo, la tarifa que se utiliza para estimar los consumos familiares de agua potable en cada sistema varía de acuerdo a los costos de administración, operación y mantenimiento e incluye un sobrecargo ^{1/} permitiendo así que se establezca un fondo para renovación de equipo.

A continuación se especifica formalmente el modelo, el cual se aplica en cada uno de los 79 subproyectos que componen la muestra representativa.

^{1/} Este sobrecargo es de 35% para sistemas por elevación y de 50% para sistemas por gravedad. La tarifa incluye un cargo fijo del 75% de los costos de Administración y Mantenimiento y un cargo variable del cual dependen las cantidades consumidas.

Modelo de Simulación

$$Q_t = \beta_1 P_t^{\beta_2} Y_s^{\beta_3} N_s^{\beta_4} \quad (1)$$

$$QL = \beta_1 PL^{\beta_2} Y_s^{\beta_3} N_s^{\beta_4} \quad (2)$$

$$P_t = \frac{(1+f)(ADM_t)}{Q_t} - CF \quad (3)$$

$$CF = 0.75 (A_t + M_t)$$

$$AOM_t = A_t + O_t + M_t \quad (4)$$

$$A_t = \beta_5 + \beta_6 PO_t \quad (5)$$

$$O_t = E_t + PQ_t \quad (6)$$

$$M_t = \beta_7 + \beta_8 PO_s + \beta_9 IN \quad (7)$$

$$B_t = \int_{QL}^{Q_t} P_t dQ_t + (QL - QO_t)P_1 \quad (8) *$$

$$S_t = s QO_t \quad (9)$$

$$BT_t = B_t + S_t \quad (10)$$

$$C_t = IN + AOM_t \quad (11)$$

*/ Cuando $QO > QL$ el modelo hace que $QL = QO$ y (8) se torna

$$B_t = \int_{QO}^{Q_t} P_t dQ_t$$

$$VPN = \sum_{t=1}^{20} \frac{BT_t - C_t}{(1.12)^t} \quad (12)$$

$$0 = \sum_{t=1}^{20} \frac{BT_t - C_t}{(1+TIR)^t} \quad (13)$$

$$CE = \frac{\sum_{t=1}^{20} \frac{C_t}{(1.12)^t}}{\sum_{t=1}^{20} \frac{PO_t}{(1.12)^t}} \quad (14)$$

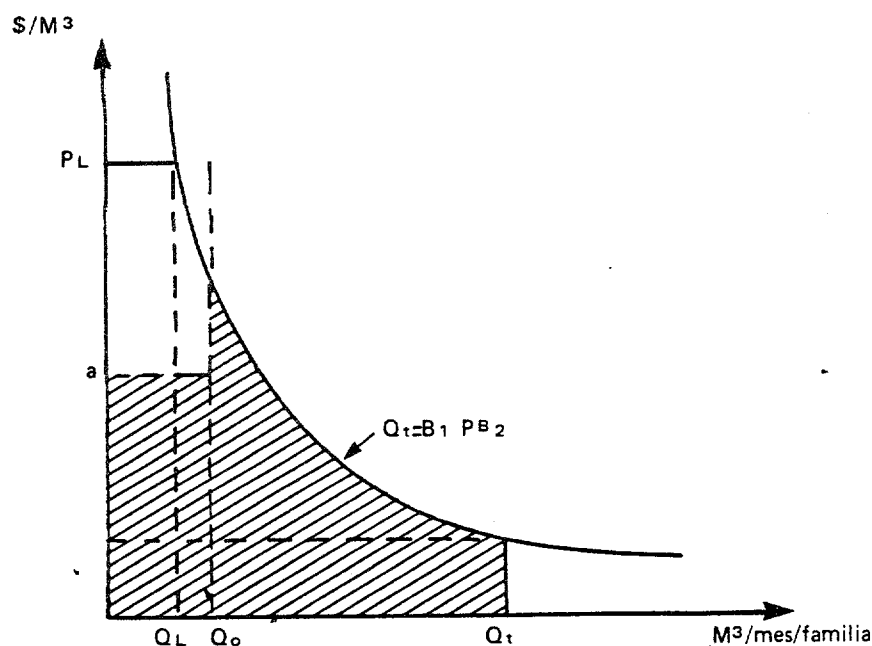
$$CIAC = \frac{\sum_{t=1}^{20} \frac{C_t}{(1.12)^t}}{\sum_{t=1}^{20} \frac{Q_t}{(1.12)^t}} \quad (15)$$

donde:

- Q_t = cantidad de agua consumida al año en una localidad en miles de M^3 .
 P_t = Tarifa marginal cobrada por M^3 de agua consumida.
 Y_s^t = Ingreso promedio del segmento en el cual se encuentra la localidad. 1/
 N_s = Tamaño familiar promedio del segmento en el cual se encuentra la localidad.

1/ Para efectos de estimación de las curvas de demanda y de cálculo de beneficios se dividió al país en seis segmentos, los cuales definen la situación geográfica y características socioeconómicas de las localidades. (Ver Sección III-A de este Anexo).

AOM_t	=	Costos de Administración, Operación y Mantenimiento del Sistema de Agua Potable a ser construido.
f	=	Proporción de los costos de AOyM que se cobrarán adicionalmente para efectos de reposición de equipo. (=0,35 para sistemas de bombeo y 0,5 para sistemas por gravedad).
CF	=	Cargo fijo cobrado en forma mensual a los usuarios (75% del costo de administración y mantenimiento).
A_t	=	Costos de Administración en el año t.
PO_t	=	Población servida de la localidad.
O_t	=	Costos de Operación del Sistema a construirse.
E_t	=	Costos de Energía para sistemas por bombeo el cual depende directamente de la cantidad de agua producida y consumida.
PQ_t	=	Costo de productos químicos el cual similarmente depende de la cantidad de agua producida y consumida.
M_t	=	Costos anuales de mantenimiento del sistema.
IN	=	Costos de inversión en el sistema existente, a precios actuales.
S_t	=	Ahorro anual en el costo de operación del sistema existente (anual).
s	=	Ahorro por costo de operación del sistema existente por m producido.
BT_t	=	Beneficio total anual.
TIR	=	Tasa Interna de Retorno.
VPN	=	Valor Presente Neto.
CE	=	Costo Eficiencia.
$CIAC$	=	Costo Incremental Actualizado.



En el Gráfico 1 se presenta una curva de demanda de una localidad en un año, la cual relaciona precios del agua con cantidades consumidas. Los beneficios B_t en un año t determinado vienen dados por el área sombreada. Q_t corresponde a la función (1).

La simulación consiste en que dadas las variables exógenas en un año determinado PO_t , IN , PQ_t , PL y los parámetros $\beta_1, \beta_2, \dots, \beta_9, Y, N$, el modelo resuelve valores para las variables endógenas Q_t , Q_L , P_t^S , CF , ADM_t , S_t , BT_t , C_t , VPN , TIR , CE y $CIAC$.

Los cuadros A20-1 a A20-5 presentan los resultados de un ejemplo de la simulación de para la localidad de Algarrobo.

PERIODO	AÑO	POB. TOTAL	COBERTURA	POB. ABAST.	CONEX.	CARGO FIJO	PRECIO	DOT. MEDIA	CONS. TOTAL	PRODUCCION	DOT. PROD.
0	1985	386	0.	0	0	0.	0.	0.	0	0	0.
1	1986	394	0.	0	0	0.	0.	0.	0	0	0.
2	1987	402	80.00	322	60	85.88	23.17	42.40	4983	5862	43.36
3	1988	410	85.00	349	65	81.44	21.57	43.22	5586	6478	50.35
4	1989	418	90.00	376	70	77.65	20.17	44.13	6057	7126	53.32
5	1990	426	95.00	405	76	73.51	18.94	45.03	6657	7882	53.38
6	1991	435	100.00	435	81	70.91	17.80	45.89	7286	8572	53.39
7	1992	444	100.00	444	83	69.77	17.50	46.12	7474	8793	54.25
8	1993	453	100.00	453	85	68.68	17.22	46.35	7664	9016	54.53
9	1994	462	100.00	462	86	68.43	16.95	46.58	7855	9241	54.30
10	1995	471	100.00	471	88	67.41	16.69	46.81	8047	9467	55.07
11	1996	480	100.00	480	90	66.44	16.44	47.03	8239	9693	55.33
12	1997	490	100.00	490	91	66.28	16.18	47.26	8452	9944	55.60
13	1998	500	100.00	500	93	65.42	17.26	46.41	8469	9964	54.60
14	1999	510	100.00	510	95	64.59	17.02	46.53	8662	10191	54.75
15	2000	520	100.00	520	97	63.80	16.76	46.75	8873	10439	55.00
16	2001	530	100.00	530	99	63.04	16.51	46.97	9086	10689	55.25
17	2002	541	100.00	541	101	62.36	16.25	47.20	9321	10965	55.53
18	2003	552	100.00	552	103	61.71	15.99	47.43	9556	11242	55.80
19	2004	563	100.00	563	105	61.08	15.75	47.66	9793	11521	56.06
20	2005	574	100.00	574	107	60.48	15.52	47.87	10030	11800	56.32
21	2006	585	100.00	585	109	59.89	15.31	48.09	10268	12080	56.57

1

Cuadro A20-2

LOCALIDAD: ALGARRERO

VALORES PRIVADOS

INVERSIONES Y COSTOS DE OPERACION REGION: 4

PERIODO	AÑO	INVERSION	CON IVA	SIN IVA	Y ESTUDIOS	ADMINIS	MANTENI	ENERGIA	PROB. QUIM.	TOTAL
0	1985	0	0	0	0	0	0	0	0	0
1	1986	7656149	0	7019004	3505205	0	0	0	0	0
2	1987	0	0	0	0	46319	33323	46234	2638	131314
3	1988	0	0	0	0	46339	36304	47399	2915	135017
4	1989	0	0	0	0	50179	36784	48624	3207	138794
5	1990	0	0	0	0	52090	37299	49959	3524	142872
6	1991	0	0	0	0	54068	37833	51358	3857	147116
7	1992	0	0	0	0	54661	37993	51775	3957	148386
8	1993	0	0	0	0	55254	38153	52197	4057	149661
9	1994	0	0	0	0	55848	38313	52622	4158	150941
10	1995	0	0	0	0	56441	38473	53050	4260	152224
11	1996	0	0	0	0	57034	38633	53477	4362	153506
12	1997	188000	0	164857	93436	57693	38811	53951	4475	154930
13	1998	0	0	0	0	58353	38988	60547	4484	162372
14	1999	0	0	0	0	59012	39166	60977	4586	163741

LOCALIDAD: ALGARROBO

VALORES SOCIALES

INVERSIONES Y COSTOS DE OPERACION REGION: 4

PERIODO	AÑO	INVERSION	IMPREVISTOS Y ESTUDIOS	COSTOS ADMINIS	DE OPERACION MANTENI	ENERGIA	PROD.QUIM.	TOTAL
0	1985	0	0	0	0	0	0	0
1	1986	4973886	2442277	0	0	0	0	0
2	1987	0	0	25856	24275	25280	2860	77881
3	1988	0	0	27442	24658	25998	2277	86175
4	1989	0	0	28452	24984	26753	2505	82634
5	1990	0	0	29535	25334	27575	2753	85197
6	1991	0	0	30657	25696	28437	3013	87883
7	1992	0	0	30993	25805	28694	3091	88583
8	1993	0	0	31329	25914	28954	3169	89366
9	1994	0	0	31666	26022	29216	3248	90152
10	1995	0	0	32002	26131	29480	3328	90941
11	1996	0	0	32338	26240	29743	3407	91728
12	1997	131276	61148	32712	26360	30035	3496	92603
13	1998	0	0	33086	26481	30099	3503	97169
14	1999	0	0	33460	26602	30364	3582	98008
15	2000	0	0	33834	26722	30653	3670	98879
16	2001	0	0	34207	26843	30944	3757	99751
17	2002	0	0	34618	26976	31267	3855	100716
18	2003	0	0	35029	27109	31588	3952	101678
19	2004	0	0	35441	27241	31913	4050	102645
20	2005	0	0	35852	27375	32238	4148	103613
21	2006	0	0	36263	27508	32565	4246	104582

Cuadro A20-4

LOCALIDAD: ALGARROBO

INGRESOS PRIVADOS REGION 4

PERIODO	AÑO	CONEXIONES	CONSUMO	INGRESOS		S/AÑO
				CARGO FIJO	VENTA AGUA	TOTAL
0	1985	0	0	0	0	0
1	1986	0	0	0	0	0
2	1987	60	4983	61831	115443	177274
3	1988	65	5506	63527	118746	182273
4	1989	70	6057	65222	122150	187372
5	1990	76	6657	67041	125836	192877
6	1991	81	7286	68925	129682	198607
7	1992	83	7474	69498	130831	200321
8	1993	85	7664	70055	131987	202042
9	1994	86	7855	70620	133150	203770
10	1995	88	8047	71185	134317	205502
11	1996	90	8239	71758	135483	207233
12	1997	91	8452	72378	136777	209155
13	1998	93	8469	73005	146197	219202
14	1999	95	8662	73633	147417	221050
15	2000	97	8873	74261	148702	222963
16	2001	99	9086	74889	149994	224883
17	2002	101	9321	75579	151422	227001
18	2003	103	9556	76269	152846	229115
19	2004	105	9793	76960	154280	231240

Cuadro A20-5

LOCALIDAD: ALGARROBO

BENEFICIOS SOCIALES S/ANO REGION 4

PERIODO	AÑO	SIN RESTRICCIÓN		CONSUMO	BENEFICIOS		BENEFICIOS
		DEMANDA	PRECIO		TIPO1	TIPO2	PONDERADOS
0	1985	0	0.	0	0	0	0
1	1986	0	0.	0	0	0	0
2	1987	4983	23.17	4983	1187772	0	1187772
3	1988	5386	21.57	5386	1289717	0	1289717
4	1989	6857	20.17	6857	1392112	0	1392112
5	1990	6657	18.90	6657	1582086	0	1582086
6	1991	7286	17.80	7286	1615852	0	1615852
7	1992	7474	17.59	7474	1649943	0	1649943
8	1993	7664	17.22	7664	1684059	0	1684059
9	1994	7855	16.95	7855	1718181	0	1718181
10	1995	8047	16.69	8047	1752310	0	1752310
11	1996	8239	16.44	8239	1786429	0	1786429
12	1997	8452	16.18	8452	1824323	0	1824323
13	1998	8469	17.26	8469	1858954	0	1858954
14	1999	8662	17.82	8662	1896538	0	1896538
15	2000	8873	16.76	8873	1934423	0	1934423
16	2001	9086	16.51	9086	1972330	0	1972330
17	2002	9321	16.25	9321	2014028	0	2014028
18	2003	9556	15.99	9556	2055714	0	2055714
19	2004	9793	15.75	9793	2097421	0	2097421
20	2005	10038	15.52	10038	2139117	0	2139117
21	2006	10268	15.31	10268	2180818	0	2180818

INDICADORES DE RENTABILIDAD SOCIAL

PAGINA : 6

LOCALIDAD: ALGARROBO

REGION : 4

COSTO SOCIAL ACTUALIZADO \$ 7260222

BENEFICIO SOCIAL ACTUALIZADO \$ 9495785

VALOR ACTUAL NETO \$ 2235563

RELACION BENEFICIO/COSTO 1.31

TASA INTERNA DE RETORNO % 16.47

COSTO INCREMENTAL ACTUALIZADO \$/M3 116.79

COSTO EFICIENCIA \$/M3/ANO 2522.67

Los siguientes datos fueron utilizados en la simulación:

1. Las funciones de demanda fueron estimadas económicamente utilizando datos de las localidades a ser atendidas y de los sistemas existentes, según se explica en la sección IV de este Anexo.
2. El precio límite PL corresponde a 423 pesos para la Zona Norte, 421 pesos para la Zona Central y 697 pesos para la Zona Sur. Estos precios corresponden a los precios más altos pagados ya sea en efectivo o en trabajo por el 85% de los pobladores de localidades a ser incluidas dentro del programa. El 15% restante paga precios aún más elevados por el agua.
3. Para los sistemas existentes, se supone un costo de operación de \$0.35 a 1.40 durante 75% del año, y PL durante el restante 25% del año, período en el cual se supone que secan las fuentes existentes y es preciso utilizar fuentes alternativas de abastecimiento.
4. Los costos son los que aparecen explicados en la sección V de este Anexo. Todos los costos se corrigen para que reflejen su verdadero costo de oportunidad, de acuerdo a instructivo de ODEPLAN. (Ver Sección V-B).

La simulación se realizó para los 79 subproyectos y los valores resultantes aparecen en el Cuadro No. A20-6. En el listado aparecen, para cada subproyecto, la tasa interna de retorno, los cálculos del VPN, el costo eficiencia (o costo anualizado per cápita), y el costo incremental actualizado (o costo de cada unidad de agua consumida por el proyecto actualizados a valor presente).

El criterio para seleccionar aquellos proyectos que cumplen con los requisitos de rentabilidad mínima de un 12% es el valor presente neto por peso invertido (o VPN/IN), ya que el hecho de que éste sea positivo, indica que los beneficios del subproyecto son mayores que sus costos. Tanto los beneficios como los costos son descontados a una tasa de descuento del 12%, o sea, que valores positivos del indicador reflejan tasas internas de retorno superiores al 12%. Según este criterio, por lo tanto, la muestra representativa se reduce a 59 subproyectos, ya que 20 de ellos obtienen costos superiores a sus beneficios.

No obstante la correlación que existe entre estos indicadores y los de rentabilidad económica son extremadamente bajos. 1/ Si se utilizaran el CE y CIAC como indicadores de rentabilidad económica y dado que la correlación existente entre los indicadores de costo y el VPN/IN, aunque

1/ Coeficientes de Correlación:
 VPN/I - C/E = 0.29
 VPN/I - C.Inc. Ac. = 0.44

Cuadro A20-6
RESUMEN INDICADORES DE RENTABILIDAD SOCIAL POR LOCALIDAD

pag. 10 de 27

REGION CÓDIGO	LOCALIDAD	VALOR ACTUAL NETO		TIPO INTERNO	COSTO INCREMENTAL ACTUALIZADO		COSTO EFICIENCIA	
		\$	US\$	RETORNO %	(\$/HC)	(US\$/HC)	(\$/HED./ANO)	(US\$/HED./ANO)
4 1	ALBERROJO	2235563	14949	16.47	116.79	0.78	2522.67	16.76
4 2	EL PAITE	448913	2961	13.62	163.83	1.89	2441.97	15.95
4 3	LOS MOLINOS	3643237	24200	20.46	103.48	0.69	2110.70	14.82
4 4	URULLAR	2453075	16294	17.79	112.89	0.74	2361.46	15.69
4 5	EL MARCHO	-3594737	-23876	3.95	369.25	2.45	4707.35	31.27
4 6	EL SPUCE	-127769	-848	11.74	167.45	1.11	3328.62	22.11
4 7	SANO BAJO	1825108	6809	14.57	135.56	0.98	2882.89	18.62
4 8	LA CULEBRA	1353494	8928	15.48	135.51	0.98	2663.67	17.69
4 9	TUNCA SUR	4519813	30817	20.33	89.85	0.68	2887.43	13.87
4 10	CHUCHINI	-556154	-3693	9.88	193.89	1.29	3770.18	25.84
5 1	EL SPUCE	-388531	-2848	11.58	152.79	1.81	2688.58	17.92
5 2	RIO BLANCO	1327967	8821	12.92	77.11	0.51	1917.84	12.74
5 3	LA POLICIA-LA CHINCHA	41977	279	12.13	149.45	0.99	2608.49	17.33
5 4	LA ESTANCILLA	-28278	-187	11.91	143.59	0.95	2660.18	17.67
5 5	PORVISTA ROSA-EL ROJO	14512196	96394	25.47	71.44	0.47	1339.21	8.98
5 6	PICACHEN	2928321	19398	21.64	89.84	0.68	1574.58	18.46
5 7	CERRILLOS	618848	4874	21.58	85.73	0.57	1576.83	18.47
5 8	EL REDOLITO	9142022	68724	28.71	66.01	0.44	1284.39	8.88
5 9	CULETRA QUINTRA	3100153	28592	15.11	131.89	0.87	2227.43	14.88
5 10	QUECHUA ALVARADO	529855	3514	12.58	97.22	0.65	1698.65	11.28
6 1	IBRAVILLO	663802	4404	12.82	121.74	0.81	2584.76	17.17
6 2	PELEQUEN-PORTEZUELO	1128538	7496	13.37	119.44	0.79	2582.02	16.62
6 3	SANTA INES	1871983	7120	13.72	128.67	0.88	2373.85	15.76
6 4	LOS BULOS	-188437	-1198	11.64	149.77	0.99	2693.29	17.89
6 5	SAN JOSE DE PATRICIAS	1522840	10110	14.49	113.88	0.76	2336.79	15.52
6 6	TUNCA ALVARO	9478537	62986	27.61	56.79	0.38	1265.35	8.40
6 7	SAN PATRONIO	-1138885	-7697	8.77	178.33	1.18	3482.81	22.68
7 1	PLACILLA	-174451	-11560	8.55	184.48	1.22	3541.09	22.19
7 2	LA OSEA	4184570	27264	18.81	87.84	0.58	1888.46	11.96
7 3	LOS PIERRES	-182697	-1213	11.57	153.07	1.02	2781.68	17.95
7 4	CAPILLA PIRACIO	-1699536	-11288	6.15	234.38	1.56	4887.20	28.62
7 5	TRAPICHE-LONGUITILLA	4862246	26983	17.81	181.87	0.68	1966.89	13.06
7 6	RINCON DE BELLAJO	1749428	11620	13.32	138.48	0.87	2428.39	16.88
7 7	LOS PUZOS-SANC-AYON	1673682	11117	15.88	188.46	0.72	2887.97	13.87
8 1	CHILLANCITO DE CHURE	2232403	14828	18.74	97.22	0.65	1854.71	12.32
8 2	TILCOMAYUBA	9483539	62993	23.97	58.95	0.34	879.15	5.84
8 3	CHORRUA	6316786	41958	24.35	69.58	0.46	1396.96	9.28
8 4	TILLOUTEN	6854216	45528	21.97	76.68	0.51	1592.12	18.58
8 5	PICHILLO	743287	4937	13.31	135.37	0.98	2418.35	16.86
8 6	LINTARO	2568279	17886	15.76	88.52	0.59	2186.88	13.99
8 7	CORRAL LINDO	2152778	14299	17.35	81.99	0.54	1932.83	12.84

RESUMEN INDICADORES DE RENTABILIDAD SOCIAL POR LOCALIDAD

REGION CONLOC	LOCALIDAD	VALOR ACTUAL NETO		TASA INTERNA RETORNO %	COSTO INCREMENTAL		COSTO EFICIENCIA	
		\$	US\$		ACTUALIZADO (\$/M3)	(US\$/M3)	(\$/MB/ANO)	(US\$/MB/ANO)
8 13	LOS LLETIGUES	3347695	22236	17.16	45.51	0.30	1135.10	7.54
9 1	QUELLE	4648650	30825	16.10	94.96	0.63	1743.66	11.58
9 2	SPH BARRON	2886860	19175	20.65	136.65	0.91	2559.01	17.00
9 3	CAHUIMPANCHE	1417297	9414	18.76	154.01	1.02	2810.27	18.67
9 4	SANTA ENA	4423802	29384	20.73	148.43	0.99	2535.31	16.84
9 5	QUILLEN	-1273004	-8455	8.37	333.60	2.22	5245.81	34.84
9 6	CURBOSCHUE	28630733	198174	44.32	23.73	0.16	1017.42	6.76
9 7	PARZAMAR	16630874	110467	52.41	23.56	0.16	1014.48	6.74
9 8	TROULHUE	17515149	116341	33.61	36.98	0.25	-853.86	5.67
9 9	TROYO	7141395	47435	37.78	59.43	0.39	1381.09	9.17
10 1	ISLA QUEMUI	2652353	17618	20.51	182.66	0.68	4137.57	27.48
10 2	QUICRAU	1045282	6943	15.71	153.65	1.02	3310.78	21.99
10 3	PID-PID	-855965	-5685	9.14	295.83	1.96	8082.28	53.69
10 4	RILAN	4648833	30879	32.46	78.80	0.47	1616.54	10.74
10 5	ISLA MECHIQUE	1795975	11929	19.08	126.78	0.84	2766.90	18.38
10 6	RELUO	3873384	25728	33.32	61.15	0.41	2506.83	16.65
10 7	HELLNAME	-732894	-4867	18.52	116.11	0.77	2528.11	16.78
10 8	CHAMIZA	7481069	49692	27.08	95.34	0.63	1949.53	12.95
10 9	LLAY-LLO	13321422	88485	45.45	45.97	0.31	1829.36	12.15
10 10	LA REJADERA	3884496	25802	19.42	66.12	0.44	1504.59	9.99
10 11	RIO NEGRO	8804782	53178	22.94	98.49	0.65	2283.59	15.17
10 12	MIELLA - LOS MOLINOS	-6219872	-41313	8.97	158.18	1.05	2885.10	17.84
10 13	QUEMUIR	36275922	240956	52.75	47.02	0.31	1614.69	10.73
10 14	RIO PIELO	8281270	55007	38.82	64.33	0.43	2735.24	18.17
10 15	TEMAM	3882286	19942	24.83	55.67	0.37	1245.23	8.27
11 1	LAGO VERDE	16562318	118012	51.57	36.12	0.24	1579.50	10.49
13 1	EL COLORADO	357517	2375	12.75	152.01	1.01	2486.14	16.51
13 2	PELVIN	1146556	7616	15.02	117.03	0.78	2195.87	14.59
13 3	STB JNES DE PORTICILL	7531364	58826	16.96	98.59	0.65	2830.34	13.49
13 4	EL CAISIG - LOS QUILL	3258759	21646	16.14	181.05	0.67	2859.37	13.68
13 5	LOS DIECISIEITE	-1875718	-12458	6.56	231.78	1.54	3981.83	26.45
13 6	CHAMPUSANO	1791487	11900	15.62	118.73	0.79	2116.62	14.06
13 7	LOS HERMINOS CARREIRA	8833194	53359	21.96	79.93	0.53	1548.48	10.29

de signo correcto, es menor al 50%, existirían errores de predicción en más del 50% de los casos. Es decir, se aceptarían proyectos con rentabilidades inferiores al 12% y se rechazarían proyectos rentables. Dados estos problemas de predicción, se recomienda que se haga un análisis beneficio costo para comprobar la rentabilidad de los subproyectos que no están incluidos en la muestra. Quedando como criterio de selección final el que el análisis beneficio costo de los mismos produce rentabilidades superiores al 12%.

III. Encuesta Socioeconómica

La encuesta socioeconómica se realizó en una muestra de 35 localidades del total de 240 que se encontraban pre-seleccionadas para la IV etapa. Sus objetivos generales fueron el obtener información necesaria para definir la relación entre el precio del agua y su consumo (curva de demanda para el agua), y recolectar datos sobre las condiciones económicas de los habitantes de las localidades.

A. Selección de la Muestra

Para seleccionar las 35 localidades de la muestra se trabajó con el universo de las 240 localidades pre-seleccionadas para la IV Etapa. Con el objeto que esta muestra fuera lo más representativa posible, se dividieron las localidades en dos grupos, uno de acuerdo a sus características geográficas y climáticas, y el otro, de acuerdo a sus condiciones socio-económicas.

La primera división determinó que las localidades quedaran segmentadas en tres grupos:

1. Grupo de la Zona Norte (con localidades de las Regiones I, II, III y IV).
2. Grupo de la Zona Central (con localidades de las Regiones V., Metropolitana, VI, VII y VIII).
3. Grupo de la Zona Sur (con localidades de las Regiones IX, X, XI y XII).

La segunda división determinó que las localidades quedasen segmentadas en dos grupos:

1. Grupo de nivel socioeconómico bajo.
2. Grupo de nivel socioeconómico aceptable.

De acuerdo a estas divisibles se procedió a agrupar las localidades en los seis grupos o segmentos correspondientes.

Una vez dividido el universo de 240 localidades en estos seis grupos o segmentos, se procedió a determinar proporcionalmente el número de localidades por segmento, que integrarían la muestra de 35 localidades. En esta operación fueron descartadas las localidades de las Regiones, I, II, XI y XII, ya que por las dificultades de acceso que ellas presentan, no iba a ser posible realizar el estudio en el plazo estimado para su ejecución. Por consiguiente, en esta fase, el universo se redujo a 220 localidades.

B. Aplicación de la Encuesta

En las cuatro páginas siguientes se presenta el formulario de encuesta aplicado en el mes de marzo de 1985. Aún cuando sólo se requerían 20 encuestas por localidad, se realizaron un total de 842 utilizables en las 35 localidades escogidas.

Cabe señalar que en lo referente al ingreso del grupo familiar, se incluyó el total de las utilidades por la venta de productos agropecuarios que no se dejaban para el consumo de la familia. En la pregunta relacionada con el autoconsumo, se señalaron solamente los productos agropecuarios que se dejaban para el consumo familiar.

Respecto a la pregunta 12, sobre el acarreo de agua, las instrucciones estuvieron encaminadas a obtener la mayor cantidad de información posible, para llegar a determinar con el máximo de rigurosidad, el total de agua consumida diariamente por el grupo familiar.

De acuerdo a la distribución porcentual de localidades por segmento, se llegó al siguiente número de localidades de la muestra, por cada segmento:

Segmento 1:	2 localidades
Segmento 2:	2 localidades
Segmento 3:	11 localidades
Segmento 4:	14 localidades
Segmento 5:	3 localidades
Segmento 6:	3 localidades
Total	35 localidades

Enseguida se procedió a numerar las 229 localidades en forma correlativa, quedando cada localidad con un número interno, el que fue utilizado posteriormente para la elección de las 35 localidades. Esta elección se efectuó totalmente al azar, mediante números aleatorios. Efectuado el sorteo, quedaron elegidas las localidades que se indican en el Cuadro A20-8.

Cuadro A20-7

SEGMENTO	LOCALIDAD	REGION	No. INTERNO	No. ENCUESTAS
1.	1 EL HUACHO	IV	012	23
	2 LA ISLA	IV	016	29
2.	3 CUNALAGUA	IV	009	29
	4 EL SAUCE	IV	014	28
3.	5 MALVILLA	V	037	23
	6 HERMANOS CARRERA	METROPOLITANA	062	28
	7 NUEVO SENDERO	METROPOLITANA	064	26
	8 SAN LUIS	VI	073	24
	9 LAS CRUCES	VI	085	24
	10 LIMAHUE	VI	086	22
	11 LA PUNTILLA	VI	103	24
	12 EL MAITEN	VII	128	24
	13 LOS GUINDOS	VII	162	25
	14 MATA VERDE	VII	164	24
	15 LOS CANELOS	VIII	178	23
4.	16 LA ESTANCIILLA	V	033	24
	17 RIO BLANCO	V	047	23
	18 EL ROBLE	V	050	24
	19 EL PRINCIPAL	METROPOLITANA	056	27
	20 RANGUE	METROPOLITANA	066	26
	21 CALLEJONES	VI	071	24
	22 LA ESTACADA	VI	081	20
	23 PEÑUELAS	VI	093	25
	24 EL CUADRO	VI	099	24
	25 SANTA MATILDE	VI	117	23
	26 GUAICO	VII	131	24
	27 QUIRIQUINA SUR	VIII	186	20
	28 SAN VICENTE	VIII	189	20
	29 VILLA LAS ROSAS	VIII	191	23
5.	30 CAHUIMPANGUE	IX	195	23
	31 TRINTRE	IX	206	23
	32 LOS MOLINOS	X	221	22
6.	33 METRENCO	IX	200	23
	34 ENSENADA	X	212	24
	35 LLAU-LLAO	X	219	24

MINISTERIO DE OBRAS PUBLICAS
SERVICIO NACIONAL DE OBRAS SANITARIAS
DEPARTAMENTO DE PROGRAMAS NACIONALES

FECHA

ENCUESTA SOCIO-ECONOMICA

1	REGION	LOCALIDAD	N° INTERNO
2	SEGMENTO		
3	¿CUANTAS PERSONAS VIVEN EN ESTA CASA?		
4	¿CUANTOS SON MENORES DE 7 AÑOS?		

1	2	3	4	5

5	1 ¿ME PODRIA INDICAR EL NOMBRE DE LAS PERSONAS QUE HABITUALMENTE VIVEN EN ESTA CASA?			
	2 ¿CUAL ES SU PARENTESCO CON EL JEFE DE HOGAR?			
	3 ¿CUAL ES EL INGRESO MENSUAL DE LOS QUE TRABAJAN O QUE TIENEN UNA PENSION?			
	4 ¿CUANTOS MESES DEL AÑO CUENTAN CON ESTE INGRESO?			
	TOTAL ANUAL DE INGRESOS			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
TOTAL ANUAL DE INGRESOS DEL GRUPO FAMILIAR				\$

11	12	13	14	15	16

6	¿CUANTO SE GASTA AL MES EN ALIMENTACION EN ESTA CASA?	\$
---	---	----

7	¿COSECHA UD. PRODUCTOS AGRICOLAS O TIENE CRIANZA DE ANIMALES QUE DEJA PARA EL CONSUMO DE LA FAMILIA O QUE VENDE EN EL MERCADO?	
	SI	NO
	1 <input type="checkbox"/>	2 <input type="checkbox"/>
(pase a pregunta 9)		

23	24	25	26	27	28

L
29

L

31 32 33

44
34 3

4

32

11	1 ¿QUE PROFUNDIDAD TIENE LA NORIA?	MTS
	2 ¿CUANTOS CABALLOS DE FUERZA TIENE LA BOMBA?	H.P.
	3 ¿TIENE ESTANQUE DE ALMACENAMIENTO?	SI <input type="checkbox"/> NO <input type="checkbox"/> 1 2
	4 ¿TIENE INSTALACIONES SANITARIAS INTERIORES?	SI <input type="checkbox"/> NO <input type="checkbox"/> 1 2
	(pase a pregunta 14)	

38 39
40 41 42
43
44

12	1 (SOLO SI SE ABASTECE DE NORIA) ¿QUE PROFUNDIDAD TIENE LA NORIA?	MTS																																																	
	2 ¿QUE RECIPIENTES USA HABITUALMENTE PARA ACARREAR AGUA?																																																		
	3 ¿QUE CAPACIDAD EN LITROS TIENEN ESTOS RECIPIENTES?																																																		
	4 ¿CUANTAS VECES AL DIA ACARREA AGUA CON ESTOS RECIPIENTES?																																																		
	5 ¿CUANTOS DE ESTOS RECIPIENTES TRAE EN CADA VIAJE?																																																		
	6 ¿CUANTO TIEMPO SE DEMORA EN CADA VIAJE? (IDA - VUELTA Y ESPERA)	MIN.																																																	
	7 ¿CUANTAS PERSONAS VAN EN CADA VIAJE?	PERS.																																																	
	8 ¿CUANTO PAGA POR LLENAR CADA UNO?																																																		
	<table border="1"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>TOTAL</td> <td>\$</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="5">TOTAL DE LITROS Y TOTAL VALOR CANCELADO</td> <td>LTS</td> <td>\$</td> </tr> <tr> <td colspan="7">(pase a pregunta 14)</td> </tr> </table>							TOTAL	\$																													TOTAL DE LITROS Y TOTAL VALOR CANCELADO					LTS	\$	(pase a pregunta 14)						
					TOTAL	\$																																													
TOTAL DE LITROS Y TOTAL VALOR CANCELADO					LTS	\$																																													
(pase a pregunta 14)																																																			

45 46

47 48
49

50 51 52 53 54 55

13	1 ¿CUANTOS TAMBORES (200 LITROS) COMPRA SEMANALMENTE?	
	2 ¿CUANTO PAGA POR CADA TAMBOR?	\$
	(pase a pregunta 14)	

56
57 58 59

14 ¿COMO ENCUENTRA EL AGUA QUE CONSUME ACTUALMENTE?

BUENA	1	<input type="checkbox"/>	MALA-POR SU COLOR	4	<input type="checkbox"/>
MALA-ESTA CONTAMINADA	2	<input type="checkbox"/>	ES INSUFICIENTE	5	<input type="checkbox"/>
MALA-POR SU SABOR Y OLO	3	<input type="checkbox"/>	ESTA MUY DISTANTE	6	<input type="checkbox"/>

☐
60

15 ¿ESTARIAN UDS. DISPUESTOS A PAGAR \$ 200 MENSUALES POR TENER UN SERVICIO CONTINUO DE AGUA POTABLE?

SI ☐ 1 NO ☐ 2 NO SABE ☐ 3

☐
61

16 ¿QUE TIPO DE BAÑO SE UTILIZA EN ESTA CASA?

ALCANTARILLADO O FOSA SEPT.	1	<input type="checkbox"/>	POZO NEGRO	3	<input type="checkbox"/>
TRINA SANITARIA	2	<input type="checkbox"/>	CAMPO ABIERTO	4	<input type="checkbox"/>

☐
6

OBSERVACIONES:

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SUB-DEPTO. PROMOCION
MPC/ 04.04.85

IV. Estimación de Elasticidades

A. El Modelo

Como se indicó en la descripción del modelo de simulación, para la estimación de los beneficios del proyecto se partió del siguiente modelo:

$$Q = f(P, Y, N) \quad (1)$$

La función (1) indica que la cantidad de agua consumida diariamente por la unidad familiar (Q) depende del precio del agua (P), del ingreso mensual de la familia (Y) y del tamaño de la misma (N). Los datos utilizados para investigar la relación estadística entre P, Y, N y Q son los recolectados en la encuesta socioeconómica antes descrita, complementados con información de ventas de agua en 1984 en 40 localidades rurales ya atendidas. A continuación se presentan las características globales de la población encuestada.

B. Descripción de la Población

La distribución de las familias entrevistadas, según la fuente primordial de agua e ingreso fue la siguiente:

Cuadro A20-8

Fuentes primarias * de agua potable e ingreso
familiar promedio

<u>Fuente Primaria en Epoca de Estío</u>	<u>No.</u>	<u>%</u>	<u>Ingreso Mensual Familiar</u>	
			<u>(\$)</u>	<u>(US\$)</u>
Conexión domiciliaria	102	12,1	15,552	103,3
Noria propia eléctrica	53	6,3	35,870	238,3
Noria con balde	335	40,0	16,539	109,9
Acarreo	324	38,7	13,895	92,3
Camión aljibe	23	2,7	14,288	94,9
TOTAL	837	100,0	16,557	110,0
	==	=====	=====	=====

*/ Para beber y cocinar.

Como se puede observar en el cuadro anterior, las familias de mayores ingresos logran instalar su noria eléctrica y sólo constituyen un 6,3% de la población a ser beneficiada. Los datos utilizados en la estimación de la curva de demanda incluyen solamente aquellos domicilios que tienen sistema de noria con balde, acarreo de agua o camión aljibe, o sea, el 81,7% de los potenciales beneficiarios.

El cálculo del precio y cantidad se hizo difícil en el caso de las familias con conexión o noria eléctrica, dado que éstas no mantienen un registro de las cantidades consumidas. Para el caso de las familias que precisan acarrear agua, ya sea de noria o de otras fuentes, se estimó el precio pagado valorando el tiempo gastado en el acarreo (en horas) de acuerdo al ingreso per cápita horario de la familia. Las cantidades consumidas y los precios pagados se presentan en el siguiente Cuadro A20-9.

Cuadro A20-9

Consumo y Precios según Fuente y Encuesta Socioeconómica

Fuente Primaria de Agua en Epoca de Estío	Consumo (m3/mes/familia)	Precio (\$/m3)
Noria con balde	5,06	142
Acarreo	3,36	275
Camión aljibe	1,62	124
Promedio	4,14	203
	=====	=====

Para complementar estos datos de cantidades y precios se utilizaron los registros bimensuales de 40 localidades con sistemas de agua potable, las cuales fueron atendidas por las etapas anteriores y cuyos consumos se encontraban medidos en 1984. En el Cuadro A20-10 se presenta las cantidades de agua promedio consumidas a distintos rangos de precios. Como puede apreciarse en términos generales, a mayores precios menores son las cantidades consumidas.

Cuadro A20-10

Relación entre las Cantidades Consumidas y
Precios del Agua

Rangos de Precios (*\$/m3)	Consumos Promedio (m3/familia/mes)
Menos de 25	7,16
25 a 50	4,98
51 a 100	5,28
101 a 150	3,83
151 a 200	3,99
201 a 500	3,36
501 a 2000	2,48

Como puede observarse, en este cuadro se incluyen tanto datos de familias que tienen sistemas precarios con escasez de agua, como aquellas que viven en localidades atendidas por SENDOS con servicio 24 horas al día. Estos datos son los utilizados en la estimación de la curva de demanda por agua. Cabe resaltar los consumos relativamente bajos, los cuales surgen como resultado de la existencia de niveles medidores y los relativamente bajos en localidades rurales.

C. Regresiones

Utilizando métodos econométricos, se estimaron los coeficientes de regresión para las dos formas funcionales siguientes:

$$\text{Lineal: } Q = \beta_1 + \beta_2 P + \beta_3 Y + \beta_4 N + e \quad (2)$$

$$\text{Hiperbólica: } Q = \beta_1 P^{\beta_2} Y^{\beta_3} N^{\beta_4} e \quad (3)$$

donde: $\beta_1 \dots \beta_4$ = coeficiente de regresión
e = Término de error estadístico

Los resultados de estas estimaciones aparecen en el siguiente cuadro:

Cuadro A20-11

Resultados de Salarios

Forma Funcional	$B_1(t)$	$B_2(t)$	$B_3(t)$	$B_4(t)$	R^2
1. Lineal	3,195 (8,30)	-0,005 (-6,20)	0,00007 (4,74)	0,199 (3,26)	0,117
2. Hiperbólica	0,183 (-4,19) *	-0,310 (-10,68)	0,432 (8,36)	0,169 (2,69)	0,251

*/ Se refiere al estadístico t de $\text{Log} B_1$

Los resultados de la estimación del modelo lineal aún cuando posee los signos correctos, tiene un R^2 muy bajo. Por esta razón se escogió la forma funcional logarítmica o hiperbólica. Los resultados de esta estimación indican que la elasticidad precio de demanda (estadístico B_2) es -0,310 y su intervalo de confianza estaría entre los valores -0,366² y -0,253 con un 95% de probabilidad. Este valor es razonable y se utiliza en la estimación de los beneficios de los potenciales usuarios del proyecto.

Cuadro A20-12

Calculo de la Constante para la Funcion de Demanda
de acuerdo al Ingreso y Tamaño Familiar 1/

REGION	Hiperbola Rectangular			Lineal		INGRESO	TAMAÑO
	Log 2/	Antilg 2/	(LCD)	(m3/f/mes)	(LCD)	PROMEDIO	FAMILIAR
1 NORTE INGRESOS BAJOS	2.501	12.20	91.71	4.72	35.55	9379.8	4.37
2 NORTE INGRESOS ACEPTABLES	2.549	12.00	112.13	4.72	41.41	11127.8	3.75
3 CENTRO INGRESOS BAJOS	2.749	15.63	89.59	5.30	30.91	14962.8	5.73
4 CENTRO INGRESOS ACEPTABLES	2.701	16.14	92.39	5.47	31.33	16119.6	5.74
5 SUR INGRESOS BAJOS	2.739	15.47	90.27	5.29	33.65	15200.7	5.17
6 SUR INGRESOS ACEPTABLES	3.042	20.95	157.11	6.36	47.77	32751.6	4.38

1/ De acuerdo a la estimacion de las funciones de demanda

las constantes son: Funcion Hiperbolica $-1.699 + 0.432\text{Log}Y + 0.169\text{Log}N$

Funcion Lineal $3.196 + .00007Y + 0.199N$

Donde: Y = Ingreso Familiar Mensual

N = Tamano Familiar

2/ En terminos de m3 por familia por mes

Para cada segmento de población a ser analizado, la constante de la función de demanda varía dependiendo del nivel de ingresos promedio del segmento y del tamaño familiar promedio. El valor de la constante para cada segmento aparece calculado en el siguiente cuadro A20-12.

V. Costos

A. Inversión

En el análisis económico se incluyeron todos los costos directos con la excepción de los costos de rehabilitación y ampliación de sistemas ya existentes los cuales no entran en el análisis. Adicionalmente se incluyeron los costos de estudios y diseños que restan por realizarse y los costos de recuperación y administración de obras. Entre los costos concurrentes se incluyeron la promoción comunal, las expropiaciones y los vehículos. Se incluyó así mismo una partida de 12% sobre todos los costos anteriores para efectos de imprevistos técnicos.

En el cuadro A20-7 siguiente, se presentan para cada proyecto de la muestra sus costos directos de inversión desglosados de acuerdo a los distintos componentes del sistema (captación, conducción, caseta, etc.) Para el análisis económico se multiplican estos costos por factores de inversión. Con el fin de corregirlos para que reflejen el verdadero costo de gratuidad de los recursos en Chile. Con el mismo objeto se llevó a cabo un estudio de costos unitarios para sistemas de agua potable rural, en el cual se desglosó en términos porcentuales cada uno de los componentes de inversión en materiales y equipos importados, nacionales, IVA, Derechos de Aduana, Mano de Obra no Calificada, Semi Calificada y Calificada. Los costos materiales nacionales fueron multiplicados por el factor de conversión estándar, los impuestos fueron eliminados y la mano de obra por las distintas razones de salario eficiencia según se explica a continuación. Los beneficios del proyecto se consiguieron por el factor de conversión de consumo.

B. Cálculo de Factores de Conversión

Este cálculo se basó en un instructivo de ODEPLAN del 31 de enero de 1985. Los ajustes que aquí se presentan transforman el numerario de consumo nacional a divisas libremente convertibles (al tipo de cambio referencial).

1. Factor de conversión estándar.

$$FCS = \frac{1}{1 + t} \quad \text{donde: } t = \text{arancel promedio}$$

los aranceles promedios actuales son del 30%.

$$FCS = \frac{1}{1.3} = 0,7692$$

INVERSION-PRIVADA Y SOCIAL POR LOCALIDAD (EN \$)

REGION	NOMBRE	CAPTAC. CONDUC.	CASETA	TRATAM.	REGULAC. DISTRIB.	INSTAL. PRIERA	INVERSION	TOTAL
CODIGO	LOCALIDAD		CONDUCO			ELECTR. COMUNT.	PRIVADA	SOCIAL
4	1 ALCARROBO	520942	1482269	130000	893977	2376261	1935000	7656149
4	2 EL MATEN	780776	247727	130000	907583	1451611	746390	4428487
4	3 LAS MOLLERES	523533	1276852	130000	853553	3011385	871000	6829923
4	4 VARELLAR	620693	610116	130000	885944	3189400	828000	6546833
4	5 EL HUACHO	370792	1926284	186304	804879	1042623	1748000	8447444
4	6 EL SAUCE	359113	1572856	172120	1519096	3280862	1822500	8220947
4	7 SARAO BAJO	741838	801477	130000	959696	2464217	1071000	6332628
4	8 LA CALEDA	334513	964518	98800	625900	2864100	1078000	6259031
4	9 TUNER SUR	391300	297560	98800	582708	4734580	1758000	8136060
4	10 CHUCHINI	295960	554450	98800	582700	1710056	934800	4477566
5	1 EL SAUCE	2129612	0	0	1132276	5679487	335108	55587
5	2 RIO BLANCO	0	0	197874	0	18455389	85059	44226
5	3 LA POLICIA-LA CHINDA	474479	352590	180040	855942	2528559	564200	164400
5	4 LA ESTRELLA	371961	0	182800	1425116	1845806	1094800	164400
5	5 PORO-STR ROSA-EL ROO	990654	1858871	37500	1127369	11039541	529350	164400
5	6 PIGUCHEN	850522	573713	122400	488311	1096824	622200	164400
5	7 CERRILLOS	592786	1685071	229200	933056	4518364	1371500	164400
5	8 EL APOLITO	766741	11037894	0	145300	3374062	3686004	164400
5	9 CALETA QUINRY	1722400	4860000	123000	1897800	5847400	1220000	174200
5	10 QUEROCOA ALVARADO	537000	0	137000	663400	9111100	1210000	174200
6	1 IDAHUILLO	354980	0	381200	2959719	7443843	805441	383100
6	2 PELEQUEN-PORTIZUELO	416300	0	297600	3257737	7540889	1247300	381600
6	3 SANTA INES	354500	0	204800	2348069	5570564	971500	331600
6	4 LOS BOLLAS	947018	0	162000	2008947	4147719	95400	394000
6	5 SAN JOSE DE PATACURAS	433834	0	393900	2724701	4308862	1015500	381600
6	6 TUNCA RARJO	693166	0	160800	0	8661003	0	261500
6	7 SAN ANTONIO	711283	1249795	132111	2834671	2283434	752500	381600
7	1 PLACILLA	845619	0	160800	0	1310540	2035643	61871
7	2 LAS PIEDRAS	852099	0	160800	0	1659277	5309684	386600
7	3 CAPILLA PALACIO	879105	0	160800	0	1838925	2788575	486600
7	4 TRAPICHE-LONQUILLA	775800	2958000	130000	678000	6145000	810000	1178000
7	5 RINCON DE MELLADO	920000	1140000	130000	890000	16330000	1500000	920000
7	6 LOS POZOS-CARC-ARON	690000	0	130000	1420000	2990000	1100000	240000
8	1 CHILLANCITO DE CABRE	447122	518500	128000	1306611	1375345	322930	174200
8	2 TALCAHUA	434850	0	128000	1143866	7257695	891660	174200
8	3 CHARRUA	301210	0	128000	1943583	3893757	903600	174200
8	4 TALQUEN	615900	0	112000	2873373	6446425	741800	174200
8	5 PICHILLO	1022120	518593	394440	798385	4886671	963000	174200
8	6 LAUTARO	810820	795248	311527	1179400	666665	6720949	0
8	7 CALETA LEMER	955000	458000	190000	700000	1799400	2900000	295000
8	8	1495000	980000	230000	1330000	2700000	1200000	240000
8	9	0	0	0	0	0	0	0
8	10	0	0	0	0	0	0	0
8	11	0	0	0	0	0	0	0
8	12	0	0	0	0	0	0	0
8	13	0	0	0	0	0	0	0
8	14	0	0	0	0	0	0	0
8	15	0	0	0	0	0	0	0
8	16	0	0	0	0	0	0	0
8	17	0	0	0	0	0	0	0
8	18	0	0	0	0	0	0	0
8	19	0	0	0	0	0	0	0
8	20	0	0	0	0	0	0	0
8	21	0	0	0	0	0	0	0
8	22	0	0	0	0	0	0	0
8	23	0	0	0	0	0	0	0
8	24	0	0	0	0	0	0	0
8	25	0	0	0	0	0	0	0
8	26	0	0	0	0	0	0	0
8	27	0	0	0	0	0	0	0
8	28	0	0	0	0	0	0	0
8	29	0	0	0	0	0	0	0
8	30	0	0	0	0	0	0	0
8	31	0	0	0	0	0	0	0
8	32	0	0	0	0	0	0	0
8	33	0	0	0	0	0	0	0
8	34	0	0	0	0	0	0	0
8	35	0	0	0	0	0	0	0
8	36	0	0	0	0	0	0	0
8	37	0	0	0	0	0	0	0
8	38	0	0	0	0	0	0	0
8	39	0	0	0	0	0	0	0
8	40	0	0	0	0	0	0	0
8	41	0	0	0	0	0	0	0
8	42	0	0	0	0	0	0	0
8	43	0	0	0	0	0	0	0
8	44	0	0	0	0	0	0	0
8	45	0	0	0	0	0	0	0
8	46	0	0	0	0	0	0	0
8	47	0	0	0	0	0	0	0
8	48	0	0	0	0	0	0	0
8	49	0	0	0	0	0	0	0
8	50	0	0	0	0	0	0	0
8	51	0	0	0	0	0	0	0
8	52	0	0	0	0	0	0	0
8	53	0	0	0	0	0	0	0
8	54	0	0	0	0	0	0	0
8	55	0	0	0	0	0	0	0
8	56	0	0	0	0	0	0	0
8	57	0	0	0	0	0	0	0
8	58	0	0	0	0	0	0	0
8	59	0	0	0	0	0	0	0
8	60	0	0	0	0	0	0	0
8	61	0	0	0	0	0	0	0
8	62	0	0	0	0	0	0	0
8	63	0	0	0	0	0	0	0
8	64	0	0	0	0	0	0	0
8	65	0	0	0	0	0	0	0
8	66	0	0	0	0	0	0	0
8	67	0	0	0	0	0	0	0
8	68	0	0	0	0	0	0	0
8	69	0	0	0	0	0	0	0
8	70	0	0	0	0	0	0	0
8	71	0	0	0	0	0	0	0
8	72	0	0	0	0	0	0	0
8	73	0	0	0	0	0	0	0
8	74	0	0	0	0	0	0	0
8	75	0	0	0	0	0	0	0
8	76	0	0	0	0	0	0	0
8	77	0	0	0	0	0	0	0
8	78	0	0	0	0	0	0	0
8	79	0	0	0	0	0	0	0
8	80	0	0	0	0	0	0	0
8	81	0	0	0	0	0	0	0
8	82	0	0	0	0	0	0	0
8	83	0	0	0	0	0	0	0
8	84	0	0	0	0	0	0	0
8	85	0	0	0	0	0	0	0
8	86	0	0	0	0	0	0	0
8	87	0	0	0	0	0	0	0
8	88	0	0	0	0	0	0	0
8	89	0	0	0	0	0	0	0
8	90	0	0	0	0	0	0	0
8	91	0	0	0	0	0	0	0
8	92	0	0	0	0	0	0	0
8	93	0	0	0	0	0	0	0
8	94	0	0	0	0	0	0	0
8	95	0	0	0	0	0	0	0
8	96	0	0	0	0	0	0	0
8	97	0	0	0	0	0	0	0
8	98	0	0	0	0	0	0	0
8	99	0	0	0	0	0	0	0
8	100	0	0	0	0	0	0	0

Cuadro A20-13

INVERSION PRIVADA Y SOCIAL POR LOCALIDAD (EN \$)

REGION	NOMBRE	CAPTAC.	CONDUCC.	CASETA	TRATAM.	REGULAC.	DISTRIB.	INSTAL.	PRUEBA	INVERSION	TOTAL
CODIGO	LOCALIDAD			COMANDO				ELECTR.	CONJUNT.	PRIVADA	SOCIAL
8 13	LOS LLEQUQUES	351000	61000	0	305000	1193000	7414000	0	340000	9664000	6013895
9 1	QUEULE	1066960	5207180	1018293	1822500	803565	5836252	997700	174200	16926650	10773205
9 2	SAN RAMON	383000	150453	112000	118000	1501000	1862374	655000	174200	4964033	3225905
9 3	CAHUINPANGUE	248687	145288	112000	118000	806985	971800	579600	174200	3156564	2070697
9 4	SANTA EMA	475035	729077	128000	1253500	826775	3250035	717300	174200	7553922	4875386
9 5	QUILLEN	614820	401220	128000	601000	1366686	1439228	1437000	174200	6162154	4076801
9 6	CURARREHUE	448981	3500964	0	0	120000	6303643	0	0	11203831	6916517
9 7	MANZANAR	661200	0	0	1046800	794600	2244700	0	0	4747300	3118820
9 8	TROVULHUE	149134	0	0	398106	0	10448500	0	0	10995740	6719224
9 9	TROYO	471000	0	0	25000	776800	2554600	0	0	3827400	2392004
10 1	ISLA QUEMUI	2630602	672371	194522	242109	725086	0	0	146286	4610976	3048081
10 2	QUICAVI	1001849	87460	0	479727	759923	2035180	0	10206	4374345	2858857
10 3	PID-PID	1159799	378486	120000	35000	664914	815108	1643746	260000	5077053	3390875
10 4	RILAN	771616	218564	100000	0	750136	1094887	0	210000	3145203	2021504
10 5	ISLA MECHUQUE	927441	209245	109000	0	671099	1745095	0	260000	3921880	2582778
10 6	RAUCO	507890	266968	0	0	818517	627230	0	260000	2488605	1686914
10 7	HUELLEHUE	1594881	1909087	120000	678177	1234405	2227563	246391	138000	8140424	5215875
10 8	CHAMIZA	310550	143737	120000	40000	1698978	3643199	854076	270000	7080531	4538118
10 9	LLAU-LLAU	963285	2442405	75000	50000	675905	503405	400000	170000	5280000	3384047
10 10	LA AGUADA	723977	432735	137458	0	2246348	2984585	706034	253013	7484150	4814210
10 11	RIO NEGRO	473109	0	0	0	1312574	6167800	0	219966	10823117	6852976
10 12	MIEBLA - LOS MOLINOS	3190000	1560000	0	1630000	1780000	27133337	991600	0	36284937	22555396
10 13	QUEMUI	1206000	0	90000	2064000	1458000	5936700	837120	0	11591820	7478771
10 14	RIO PUELO	1457218	1760395	0	0	762462	2289765	0	0	6269848	3953707
10 15	TENAMU	330600	0	0	75000	849800	1532510	0	0	3126410	1987578
11 1	LAGO VERDE	1001537	360879	100000	0	679279	3426995	0	0	5568690	3479778
13 1	EL COLORADO	652991	0	160800	125420	1680017	3910250	629020	333100	7491598	4807415
13 2	PELUM	607445	0	160800	150500	1161123	2655338	1033669	212000	5980875	3886748
13 3	SAN INES DE PRATAGUIL	1163717	0	160800	0	3423421	18236046	767500	396600	24140084	15075122
13 4	EL CRISTO - LOS QUIL	804708	0	142000	0	2076125	8243903	749000	381600	12397336	7828875
13 5	LOS DIECISIETE	769243	0	162000	0	1991001	2177712	749000	384000	6233756	4079338
13 6	CAMPUSANO	869187	0	162000	0	2228011	3356055	749000	384000	7748253	5019471
13 7	LOS HERNANOS CARRERA	917214	0	160800	0	2914688	6904190	749000	381600	12027492	7662695

2. Factor de conversión del consumo (FCC)

$$FCC = \frac{\text{Precios Internacionales Bienes Consumo}}{\text{Precios Domésticos}}$$

Según el instructivo el precio social de la divisa (precio de la divisa en términos de consumo doméstico) se computará así en los años siguientes:

Año	Precio Social Divisa	FCC
1985	1,16	0,862
1986	1,14	0,877
1987	1,13	0,885

Por lo tanto, el FCC será el inverso.

3. Mano de obra

Según el instructivo, las correcciones serían:

Año	No Calificada		Semi Calificada		Calificada	
	PS*	RSE**	PS	RSE	PS	RSE
1985	0,45	0,388	0,47	0,405	1,0	0,962
1986	0,46	0,403	0,48	0,421	1,0	0,877
1987	0,48	0,425	0,50	0,443	1,0	0,885
1988	0,50	0,443	0,52	0,460	1,0	0,885

*/ PS = Precio Sombra

**/ Razón de Salario de Eficiencia = (Precio Sombra) x (FCC).

D. Costos de Administración, Operación y Mantenimiento

1. Costos de Administración

Los costos de administración anual por localidad se estiman en función de la población abastecida, a través de una regresión lineal. Estas

regresiones se determinaron con información de servicios existentes y varían según la zona en que se encuentre el proyecto. 1/

2. Costos de Mantenimiento

La determinación de los costos de mantenimiento anual por localidad se realizó en función de la inversión inicial y la población abastecida. Las correlaciones resultantes se obtuvieron con información disponible de Servicios existentes, también separándose según tipo de proyecto. 2/

3. Costo de Energía

Los costos anuales por concepto de energía se calcularon específicamente para cada localidad en función de la altura de elevación del equipo y de producción total requerida por la localidad. El costo total por este concepto comprende tres ítems que son: por cargo fijo, por potencia y por energía. Los valores o costos unitarios de ellos (\$/mes, \$/KW/mes, \$/KWH, respectivamente) son diferentes para cada localidad y dependen de la Empresa Eléctrica que suministra el servicio. 3/

4. Costos Productos Químicos

Para determinar el costo por concepto de productos químicos se ha utilizado una dosificación de hipoclorito de 0,8 p.p.m.. Este costo se ha considerado constante por Región y resulta con un valor promedio de 0,45 \$/m³ de agua producida.

<u>1/</u>	<u>Zona</u>	<u>Curva de Regresión</u>
	Norte	C. Adm. = 25 392,62 + . 65,92 Pobl.
	Centro	C. Adm. = 6 349,42 + 76,74 Pobl.
	Sur	C. Adm. = 6 349,42 + 141,64 Pobl.
<u>2/</u>	<u>Tipo de Sistema</u>	<u>Curva de Regresión</u>
	Elevación	C.Mant.= 15398,51+17,78 Pobl.+0,00192 Inver.
	Gravitacional	C.Mant.= 2069,86+17,78 Pobl.+0,00192 Inver.
<u>3/</u>	Los costos se calcularon de la siguiente forma:	
	Cargo Fijo (\$/AÑO) = CFM x 12	
	Cargo por Potencia (\$/AÑO) = CPx22,2xQ (m ³ /seg)	
	Cargo por Energía (\$/AÑO) = CEx0,066xQ (m ³ /seg) x H(m)	

donde:

CFM: Cargo fijo mes (\$/mes)
 CP : Cargo por potencia (\$/KW/mes)
 CE : Cargo por energía (\$/KW)