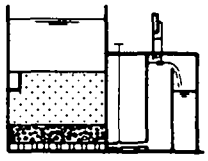
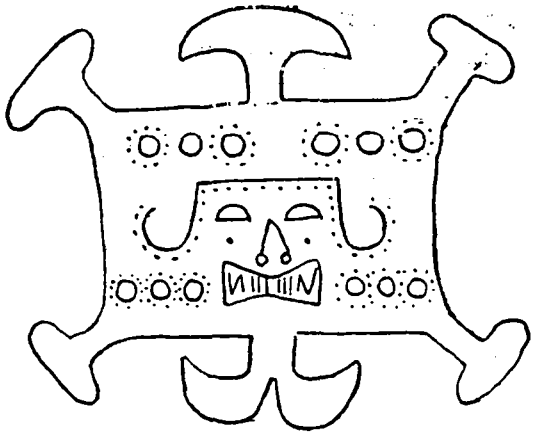
S.S.F.
Research and Demonstration Project on Slow Sand Filtration



August 1981

REPORT ON THE SLOW SAND FILTRATION DEMONSTRATION PROJECTS IN COLOMBIA



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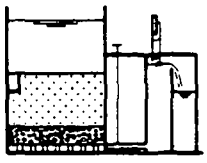

REPORT ON THE SLOW SAND FILTRATION DEMONSTRATION PROJECTS IN COLOMBIA

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Revised April 1982

Occasional Paper
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Col.$ 100,-- = Dfl 5,-- = US$ 2,5. Conversion rate in December 1980

Illustration: Golden frontplate of San Agostin culture. Also depicted on the stone statues found in Alto de los Idolos and other centres of this oldest pre-colombian culture (c.300 BC-1200 AD).

Preface

To promote the use of slow sand filtration (SSF) in water supply schemes in developing countries, an Integrated Research and Demonstration project on Slow Sand Filtration was initiated in 1976. The project comprises three phases focusing respectively on research, demonstration and dissemination.

Colombia, represented by the Instituto Nacional de Salud, joined the project in 1978. At that time the research phase, aimed at adapting the existing knowledge on SSF to the local conditions in third world countries, had already been concluded and the demonstration phase was about to begin. Two communities were selected as project villages: Puerto Asis in Putumayo and Alto de los Idolos in the south of Huila.

In phase II the primary aim of the project is to demonstrate at the village level the effectiveness of slow sand filtration as a simple and reliable purification technique able to produce safe drinking water at low recurrent cost.

As is now widely recognised, the introduction of any water supply scheme to a community should not solely be based on technical considerations but should also take into account the views and wishes of the future consumers. Further, to ensure optimum health impact of the water supply, the population needs to be extensively and repeatedly informed about the health implications that the provision of safe water may have. Thus, to support the smooth integration of the water supply scheme in the community a Community Education and Participation component was included in the programme for Phase II. Through greater perception of health benefits, and through sharing of views and labour with the water supply agency, an understanding of the importance of and a feeling of propriety towards the water supply scheme will be created within the community. This should eventually lead to the self-reliant management of the scheme and a responsible behaviour towards it of each of the community members.

The third phase of the SSF-project tries to gather all the information gained in the course of the various country projects and disseminate that information through national and international seminars as well as articles and publications. In that context this report tries to summarize the activities undertaken in the Colombian SSF-project and make them available for a larger readership.

In the preparation of this report the extensive discussions with staff of I.N.S. and sectional Health Services in Bogota, Neiva and Mocoa were invaluable. The authors especially would like to menition the hospitality and friendliness offered to them during their field visits by the people of Alto de los Idolos and Puerto Asis, and in particular by Mario Santacruz C., the project supervisior, Guillermo Espitia G., Jesus A. Pantoja J., Luis Méndez of the I.N.S. sectional office for Huila and Bernardo Ortega G., José Medardo Burbano P. and Hernan Echeverry G. of the sectional office for Putumayo. The inputs of all our Colombian counterparts are herewith gratefully acknowledged.

1. Introduction

Colombia is one of six countries participating in the second phase of the Slow Sand Filtration project. During this phase a number of village scale water supply systems, including slow sand filters are constructed. In these so-called demonstration plants ample provisions have been made for field testing of the purification system. The communities that are served with the filtered drinking water are involved as much as possible in the planning, implementation and operation of the service. A health education programme and health impact study are part of the project.

The two Colombian demonstration projects are carried out in accordance with the general procedures of the national rural drinking water supply and sanitation programme. This programme is characterized by a high degree of standardization, decentralization and community participation and has been functioning since 1968. Although it is already well-documented (References 1, 2, 3, 4, 5, 6, 7, annex 1), some additional information was collected on a number of details and recent developments.
The first section of this report contains a summary of the general community participation and education procedures of the rural drinking water supply and sanitation programme carried out by I.N.S. The following two sections cover their application in the two SSF project communities, Puerto Asis and Alto de los Idolos. Finally, another large rural drinking water supply programme in Colombia is discussed. This programme is carried out by the National Coffee Federation (CAFEFED).

2. Community Participation in the Rural Water Supply and Sanitation Projects of I.N.S.

2.1 Project Allocation

From 1961 to 1968 the Ministry of Public Health was responsible for environmental sanitation in the rural areas of Colombia. In 1968 this responsibility was delegated to a special and decentralised organization,

the National Institute of Health (I.N.S., formerly INPES). Within this organization, the Division of Basic Rural Sanitation is responsible for rural water supply and waste disposal (piped supply and sewerage systems). The organizational set-up of this institute is shown in annex 4.

From 1970 to 1974, the Division of Basic Rural Sanitation could directly allocate drinking water supply and sanitation projects on request of the communities.
Information on the existing situation in the communities is available from a national survey, carried out in 1972 and covering 70% of the rural areas. This information includes the administrative status of the community, the number of inhabitants, houses and institutions, the existing services (number of connections to public water supply, sewerage and electricity) and the accessibility (distance and ways of access). (For the new national survey carried out in 1978, see 2.6).
When a request for a watersupply or sanitation system is received, an engineer and a promotor of the regional office visit the community to judge the existing situation and the potential for improvements. Selection criteria applied for the preliminary allocation are: the availability of a suitable supply source; waste water disposal site; a felt need, interest and willingness to cooperate in the community; number of inhabitants that can be served and relation to population growth; existence of other development projects; organizational capacities of the community; degree of population density; accessibility and the availability of local resources.

Since 1975 the budget allocated to I.N.S. mainly covers overhead expenses like salaries and equipment funds for the organization itself. The projects have to be financed through a number of special programmes:

a) PAN programme (Plan de Alimentación y Nutrición/Food and Nutrition Plan). This is an integrated programme coordinating the rural health services, INCORA (agricultural reform), I.N.S. (environmental health), SENA (non-formal education), ICA (Instituto Colombiano Agropecuniario), EMPO (Empresa de Obras Sanitarias) etc. in selected communities. The selection is based on a worst-first policy emphasizing health conditions. Thirty percent of the rural communities have

been selected through a central computer programme, using a number of general development indicators, of which health characteristics had the highest weight.

Communities eligible according to the PAN programme may be awarded a subsidy for a watersupply or sanitation project when the public health team at municipio* level positively advises the administrative and the technical committee at departmental level, who decide on the project allocation.

A rural community that is not a PAN community can request a grant through other programmes operating in the region, e.g.

b) DRI programme (Desarrollo Rural Integrado/Rural Integrated Development). This programme is intended for small-scale farming-communities (less than 20 ha) in high-potential areas. Communities in which some farmers with less than 20 ha. have taken out an agricultural loan also qualify for other service programmes. The actual proportion of small farmers in the community does not make any difference to allocation. Present constraints are the reluctance to take loans and the drop in prices of agricultural products when loans are used for undiversified production. These and other factors (better information, more positive experiences with rural development programmes and institutes) make it possible that the majority of applications come from communities with a relatively low percentage of small holders. This has not yet been evaluated.

Many departments only have PAN or DRI programmes and a community belonging to neither has problems in getting (external) funds for the improvement of its environmental sanitation conditions. Remaining alternatives are:

c) Programa Ordinario. This programme is paid from the regular I.N.S. budget. But as most of its funds are used for the financing of its manpower and equipment, few additional communities can be served.

d) Programa Departemental. Three of the 26 departments of Colombia have separate funds for additional projects in their area. An example is the Programa del Fondo de Acueductos y Alcantarillados Rurales in Huila Department.

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*The municipio is the administrative centre at the local level. It includes a group of smaller communities called veredas.

e) Programa de Desarrollo Fronterizo. This programme was set up by Colombia and Ecuador to improve public health conditions in the border region of the two countries.

f) Other Programmes. A number of regional development corporations (C.V.C., C.A.R., Corpouraba) and other organizations (I.C.T., INCORA) also have their own rural water supply and sanitation programmes. The programme of CAFEFED is discussed in section 5 as an example of such a programme. In addition, some municipalities have their own projects.

2.2 Local Planning

2.2.1 Preliminary Studies

As part of the preliminary allocation to the community, a feasibility study is carried out by the engineering section of the sectional office. A suitable source is located with the assistance of the promotor working in the area and the community. A topographic survey is also made. The promotor or other I.N.S. official calls a general meeting to explain the preliminary plans. During this meeting, a comité proacueducto[1] may be elected. The permission is obtained for the right of way (for the water supply system) and a socio-economic study. Through the socio-economic study the promotor asserts the general characteristics of the community, including its environmental sanitation conditions and the willingness and capacity to pay for an improved system (5, 9, 10).

Based on the outcome of the technical and socio-economic studies a preliminary design is made. This design covers as many community households as is technically and economically possible. The universal level of service is individual yard connections. The financial and material requirements of the design are laid down in a memoria[2]. For each unit of the works an estimate is made of the amount of skilled and un-skilled labour and materials required. The un-skilled labour and the local materials are to be provided

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1) a community committee that guides the preparatory phases of the water supply project until its completion.
2) project record

by the community. Together with an amount in cash this will constitute the immediate community contribution towards the project. The direct contribution roughly amounts to 15-20% of the total construction cost. In addition,

the community can obtain a loan to cover the remaining part of the construction costs that it has to pay. The size and terms of the loan depend on the socio-economic conditions as identified by the promotor and the negotiations with the community about the project contract.

> In one community for example, the memoria showed for the construction of the intake works unskilled labour requirements for the excavation of 17 m^3 of soil, valued at 60 $ Col. per m^3 and the transport of 50 m^3 non-local materials at 50 $ Col. per m^3.
> Similarly, the value of the estimated local and external contributions was calculated for the sedimentation tank, the treatment plant, the distribution mains and the reticulation system. The total estimated community contribution in labour and local materials amounted to about 22.0%. 70% of the project funds are financed by I.N.S. while other sources (in this case the Colombian tourist corporation) contributed 8%. Approximately 30% of the I.N.S. contribution is given as a soft loan which the community will have to pay back over a 15 or 20 year period.

2.2.2 Community Contract

In a general assembly, the community is asked to agree with the proposed design and the terms of the community contract as given in the memoria. An example of such a contract has been added as annex 4. In general, approval of the contract does not pose any difficulties. But some negotiation does occur, especially when a project is relatively expensive. Where no reliable and adequate source can be found within a reasonable distance, or where treatment plants are necessary, additional funds may have to be sought thus causing considerable delay before the construction can be started. According to the head office, the waiting time in general is 2 years. But it can be longer when the community does not fall under one of the programmes mentioned in section 2.1. The factual data are in the sectional offices and have not been evaluated.

A quorum of 80% of all future user households have to be represented at the meeting and the contract has to be accepted by majority vote. I.N.S. presents the plan and the costs involved for the agency and the community. From the latter figure the estimated cost per household is derived by dividing the total required community contribution by the number of households that already accepted to take a connection. In theory, this system can bring undue pressures on those households that have not yet decided to take a connection, to also take a connection so as to reduce the average contribution per connection. This aspect could be part of an evaluation of the socio-economic impact of the programme. The construction contract is signed for the community by its legal representatives, the junta de acción comunal* (JAC). Some background information on the formation and functioning of this important local organization is given in the next paragraph (2.2.3).

Recently, the community contract underwent some changes to prevent problems of social access. In the past, the community as the sole legal owner of the system could prevent the expansion of a scheme to neighbouring communities. Similarly, the administrative committee managing the service could deny house connections to families wishing to join at a later stage. Until now, I.N.S. could take no action in such cases, even when expansion is technically possible and compensation is paid by the new user for the lack of labour contributions to the construction of the existing scheme. In the new contract I.N.S. reserves the right to authorize additional connections to the existing net and/or extensions of the net, when technically possible. It is also proposed that the new owner pays connection rights directly to the sectional office and a compensation for missed labour to the local administrative committee. At present the amount of compensation to be paid is determined by the users.

2.2.3 Junta de Acción Comunal

In the initial stages of participatory water supply and sanitation projects the junta de acción comunal plays an important role. This junta is responsible for all local community development activities. It is intended that

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* Community Action Committee

every community with 30 inhabitants or more has such a committee. The committees are elected in a general assembly every other year around the first of July. At least half (+ 1) of the population of 15 years and over must participate in the election. The JAC consists of 7 to 14 members: the president, vice-president, treasurer, secretary and the presidents of the subcommittees (sports, resources, public works, public relations etc.). The revisor fiscal[1] and his/her deputy are elected in a separate meeting. There are no criteria for the membership of the committee other than age (over 18), residence (minimum of 6 months per year in community) and absence of relationship (upto 4th degree).

About 600 promotors in 33 regional offices of the Dirección General de Integración y Desarrollo de la Comunidad (DIGIDEC) in the Ministry of Local Government assist in the formation and functioning of the JACs. In 1979 there were 30,000 juntas de acción comunal in Colombia.

The election of a JAC is prepared by a pre-election committee. It sets the date, explains the voting system, prepares lists of candidates, stimulates participation and nominates the polling-committee. The election is by secret ballot, using one or more candidate-lists. In case of more than one list, the total number of votes is divided by 4 (the number of functions), e.g. 101:4=25. This figure is then subtracted from the number of votes for the lists concerned, e.g.

List 1	List 2	List 3
50 votes	31 votes	20 votes
-25	-25	
25	06	
-25		
0		

Thus, the president will in this case be the first candidate of list 1, vice-president is the first candidate of list 2, treasurer is the second candidate of list 1, and secretary is the first candidate of list 3, having the largest rest-number.

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1) inspector of finances
2) Directorate General for Integration and Development of the Community.

The subcommittees can either be elected during a general assembly or be created by the mesa directiva[1] (president etc.).
The funds of the JAC are formed by subsidies from national, departmental and municipal funds, local fund raising activities, financial support from politicians and sometimes a monthly contribution fixed by the general assembly.

2.3 Community Contributions to Costs and Management

2.3.1 Aportioning between and within communities.

In accordance with the community contract, the participants pay part of the construction costs in labour, local materials, occasionally a deposit, and a loan. The value of the community contribution in kind depends on the type of works. In the construction of a deep well for example, little local participation in kind is possible, and its value may be no more than 5% of the total costs. In surface water projects, this value can be much higher, up to 25-30%.This system implies that communities with a gravity supply and a relatively dispersed settlement in a rugged terrain will contribute more labour over a longer period than communities with a deep well and concentrated settlement in a flat area. In general, there is no problem in getting a longer and larger local labour contribution in large projects, as the existing water supply conditions are often also more unfavourable.

The remaining capital- and recurrent costs for individual schemes can also vary considerably. Part of these costs are covered by the community loan. Usually, this loan covers 40% of the total costs, over a period of 10 to 15 years, with a yearly interest of 6% (1). The actual terms of the loan depend on the payment capacity of the individual communities. Based on the estimated capital- and recurrent costs and the information given by the promotor on the local socio-economic situation, I.N.S. makes up a proposal. This proposal is discussed and agreed upon at the general assembly which is called for the signing of the contract.

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1) executive board

At the completion of the works, the ultimate community loan and household rates are laid down in the act of transfer of the works to the community. Due to the varying costs, the number of people served and the conditions of the loan, the rates can vary a lot. For one department, for example, monthly flat rates diverged from Col. $ 2 to 50 per household per scheme. It is however impossible to say offhand what proportion of the actual household income these rates constitute in the communities concerned.

> An illustration of the above described system provided the general assembly in Salto de Bordones. Here, the JAC had signed a first contract for the construction of a gravity supply. Since then, the engineers found that the source chosen initially was inadequate for the size of the scheme. A better source was located 8 km further. The costs of the scheme will therefore be considerably higher. A new assembly was called to negotiate and sign a new contract. The meeting was held at the local school and people were warned by means of a loudspeaker. The meeting started with the acceptance of a president and secretary of the meeting, proposed by the promotor, the reading of the objectives of the meeting, the registration of the attendants and the calculation of the quorum. The previous act, passed at the preceding (third) general assembly was read and the minutes accepted with one change.

The people of Salto de Bordones gathering to discuss the planned water supply scheme in a general assembly.

Thereafter, the project engineer and the promotor explained the technical problems, using a rough sketch on the blackboard. They indicated the new solution and explained the implications for the community.

Due to the higher costs, the community will now also have to make a down payment, in addition to the local materials and labour. The total value of the community contribution will therefore be:

cash	$ 98,099.60	or $ 832.00 per household
labour	$ 854,796.00	
local materials	$ 71,050.00	
Total	$ 1,023,945.60	

The total contribution by I.N.S. is $ 5,802,358.38. Of this amount, the community will have to pay 35% plus interest. In addition, they will have to pay the monthly costs of administration (operator's salary, insurance, correspondence and transport), operation (chlorine), maintenance and spares. Estimates were given for these items, totalling $ 27,199.17 a month.

Asked if all should pay the same rate, the meeting agreed.
This means that the estimated monthly rate will be Col. $ 230 when all previous 117 households renew their application for a house connection.
When additional households which can now be covered by the new system also take a connection, the rates will be slightly lower. The promotor then took an inventory and registered 125 households eager to take a house connection. A few of the original households dropped out however. This outcome surprised the I.N.S. staff, as they expected some negotiation since the rates are relatively high. They later suggested that the relatively high development of the community and the poor existing sanitary conditions, (great distance and insufficient supply) could have been reasons for the willingness of the people to continue with the project. The meeting ended with the fixing of a date for the signing of the household contracts and the community contract. The fine for joining the scheme after the contract date, which had been decided upon in a previous meeting (Col. $ 2,500), is maintained.

The apportioning of the cash contributions within the communities is usually similar to the system accepted in Salto de Bordones: a flat deposit for a house connection and a flat monthly water rate.
There are cases however, where the community accepts a weighted system. This is usually proposed by the promotor when he finds a considerable variation in income or capacity to contribute construction labour. In a community in Narino Department for example, the monthly rate varies from $ 35 to $ 150 (Santacruz, pers.comm.). In Juanambú, individual households contributed 25, 35 or 55 days of voluntary labour according to their economic status (3).

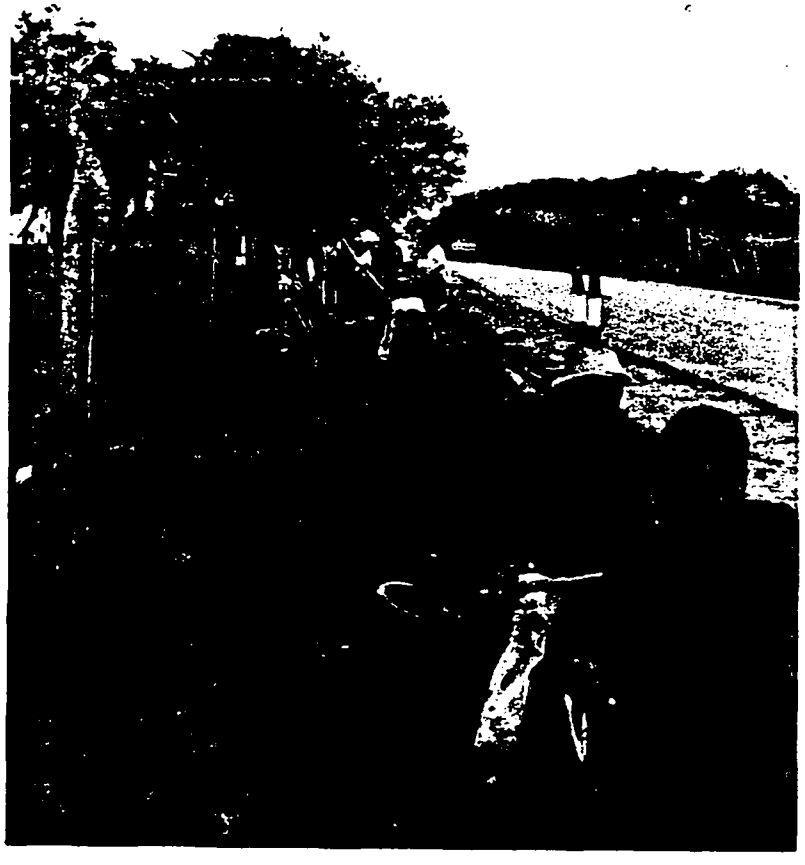
At present, such a weighting is still the exception, but its general introduction was proposed at the national meeting of programme engineers in June 1980 and is presently considered. The major problem is the identification of valid indicators of economic status and income variations in rural communities. This question is now being studied.

> An example of a case where indicators were successfully applied to define differential rates is Sibundoy in Nariño. Here, I.N.S. took over the existing watersupply system from Acuanariño, the departmental watercompany responsible for the provision of water to communities larger than 2500 inhabitants. The system was subsequently extended and improved. Earlier there had already been a slight difference in water-rating for the "indigenas", indian small scale farmers, who paid Col. $ 9 a month and the settlers paying Col. $ 13-15. After the take-over I.N.S. calculated a flat rate of Col. $ 11 a month for a house-connection. This was however not acceptable to the larger poorer section of the community. I.N.S. therefore proposed the evaluation of the economic status of each household to determine a differential rate. Existing data (the government property tax) were supplemented with data collected by the promotor through house visits (e.g. ownership of a lorry, tractor, etc.). In a general assembly, the users decided on rates varying from $ 9 to $ 15, 25 and 36 (Santa Cruz, Echeverry, pers.com.).

2.3.2 Management of Participation in Construction.

The participation of the community in the construction (labour, local materials, transport, refreshments, etc.) is managed by the JAC and its subcommittees and the promotor. Five permanent labour teams are formed, one for each day of the week. Of each household taking a house connection a member has to report for work on his or her particular day of the week. Alternatively, they can hire somebody to do the work for them. In the case of the San Francisco water supply $ 300 was paid for such a replacement. In the highly rural areas, such payments are lower. Only during the coffee harvesting time, when a good picker averages $ 200 per day, up to $ 300 is paid for a substitute in construction work.

If possible, participatory construction work is planned in the off-season. As this is not always possible, especially where more than one cash-crop is grown, the 5 team system is used to ensure that the one activity does not suffer from the other. Nevertheless, delays in construction do occur, but this is a consequence of the participatory approach I.N.S. has chosen.



Digging trenches for the water pipes as part of the community contribution in San Francisco.

The actual organization of the voluntary labour contributions lies with the labour committee, the foreman (usually the contractor) and the promotor. The whole pipeline and all house connections are dug by the teams. When the supply serves more than one community, the length of trench dug per village is divided in accordance with the size of each village. All JAC's of the respective communities are involved in the planning and construction, but for the management of the completed scheme only one administrative committee is elected. The promotor keeps a record of all contributions per household, including the type of labour (own or hired). Non-fulfillment of labour obligations means no connection. Special cases (i.e. widows; poor, older couples) can ask for labour dispensation in the general assembly.

When the work is completed, the supply is turned over to the community. A special ceremony is organized, including the blessing of the works. At least 15 days before the official inauguration of the service an administrative committee has to be elected in a general assembly. This committee is responsible for the administration, operation, maintenance, extension and improvement of the scheme.

2.3.3 Management of Completed Schemes

The junta administradora (administrative committee) consists of a president, a treasurer and a secretary-fiscal. The president is a member of the JAC. The treasurer is elected by the users. An I.N.S. promotor acts as secretary-fiscal and advisor and visits the community regularly. All community functions are unpaid. The administrative committee collects the rate payments, takes care of loan repayment and financing of operation and maintainance, recruits and supervises any operators, decides about extension and improvement of the scheme and promotes adequate use and conservation of the facilities. A positive saldo is sometimes used to give loans towards other village developments.

The continued supervision of the administrative committees is an essential condition for their successful functioning. With an improved supervision, 76.2% of the households had paid their rates in time in 1979. For 1969, this figure was 56.6%. However, problems of transport and manpower impede an even more effective support. The number of committees has increased from 364 in 1969 to 1703 in 1979, and the supervision system has not kept pace with this growth.
In Narino for example, 4 promotors are responsible for the supervision of 231 administrative committees.

Also important is the training of the committees. A training scheme has recently been set up by the promotion section of I.N.S. (see also 2.4.).
A number of changes have been proposed to the management of completed schemes:

a) The consideration of alternative management systems in areas with a divergent situation, e.g.
   - a joint administration with paid personnel for two or more independent systems (Putumayo)
   - an administrative committee composed of representatives of the local government and the users (Caldas)
   - a paid treasurer and operator nominated and supervised by the head of the sectional office and financial supervision by the treasury of the sectional office (Sucre).

b) In case of a large municipal system: the delegation of the financial responsibility to the (paid) treasurer of the municipio and the employment of a paid operator. The junta administradora will retain the final responsibility, however. Also the replacement of the quorum requirement (e.g. for the signing of the contract) by a time limit, as it is very hard to meet in a large municipality.

c) The payment of a monthly salary to an operator of pumping and treatment systems.

d) The -partial- payment of the treasurer of large systems, based on criteria such as the number of users and the distance covered by the scheme.

e) The bestowal of a legal status to the administrative committees, similar to the status of the JAC's.

2.4 Education and Dialogue

2.4.1 Methods and Techniques

The mass media play an important role in the initial stages of the rural water supply and sanitation projects. I.N.S. has at its disposal four mobile audio-visual units donated by Unicef.

Mobile audio-visual unit

Each van contains a loudspeaker, 2 microphones and a set of slides, films and tapes. In addition there is a portable projector that can be used in villages inaccessible for vehicles.

A locally made film and slides ("Agua para Colombia Rural") shows the community what service it can expect and what contributions it has to give to the construction. The general motivation, surveying and decision-making procedures are also shown. The scenes have been taken in the field and give a realistic picture of the execution of the programme, including the rejection of a house connection.

Several mass-meetings are organized by the village development committee to give information on and discussion of the water supply problem, the potential solution and the necessary outside help and surveys. Information on the date and place of a general meeting is diffused through announcements in school and church, by members of the development committee, posters, pamphlets and loudspeaker. The promotor records the attendance of the meetings and visits repeatedly missing households to learn the reasons for non-attendance.

General water assembly, Salto de Bordones

Meeting attendance in rural areas is generally good. In suburban areas labour attendance is easier to realize than meeting attendance.

The preparatory phase ends with the general assembly gathered to sign the community contract. Such a meeting in the village of Salto de Bordones, in the municipality of Buenos Aires, was characterised by the ease and routine apparent in the handling of the meeting; the clear formulation of the messages on technology and community consequences; the interchangeable roles of the I.N.S. staff with the promotor explaining technical aspects and the engineer clarifying social points; and the regular invitation of feedback. The participants were repeatedly invited to comment upon the information given and to ask questions. They made frequent use of this opportunity, men and women alike. The engineer and promotor also regularly checked the understanding of the messages by asking the meeting to explain in their own words what they amounted to.[1)]

Next to mass meetings person-to-person contacts are also used. In the initial stage of the project the promotor visits the formal and informal leaders of the community. He organizes small neighbourhood meetings and meetings with the existing associations. For the socio-economic survey and the follow-up of particular cases the promotor calls at the individual homes.

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1) The first purpose of these meetings is information on and promotion of the supply. The promotor has calculated and estimated the potential benefits of the supply and uses these for promotion in talks and discussions. But in the socioeconomic study and further work in the community he may also come across negative consequences, such as loss of income for water vendors, land speculation, use of agricultural wanworkers as unpaid labour replacements by large landowners, etc. There is occasional attention for such problems (see 3.3.2), but it is not an integral part of the training and task description. It could be considered to discuss such negative consequences and the mediating role the promotor can play during one of the recurrent training courses for promotors. As local interest groups will try to put pressure upon the promotor in various ways, it may also be necessary for I.N.S. to develop stimulants for this mediating behaviour.

2.4.2 Environmental Health Education

Environmental health aspects are part of the general educational programme. The environmental health messages diffused are generally defined, they do not take into account any specific local conditions. The emphasis is on one-way information to improve health knowledge. Diffusion of information is mainly by audio-visual means (films, slides).

The environmental health component in the educational programme gets relatively little attention, unless a water purification plant is included in the supply system. The main emphasis of the programme is on water quantity, supply reliability and ease of access, and its socio-economic benefits. Only when the quality of the water is so poor that the water is unsafe for consumption a treatment system is added. In the motivation more emphasis is then laid on the health impacts. Such treatment systems now exist in about 5% of all systems.

A more permanent health education programme is required. Such a programme should be locally defined by local personnel and community representatives. It should be directed at the necessary changes of local environmental health behaviour and conditions.
The major constraint for such a programme within I.N.S. projects is the lack of sufficient and suitable manpower. The promotors are mobile workers, whose territory covers a considerable number of communities. They do not have enough time to work as intensively with a local health committee as they do with the community development committee for the water project. Moreover, all promotors are male, as a result of the fact that they have been recruited from the ranks of the public health inspectors. The difficult circumstances in the field are also a constraint for the employment of female promotors. In this respect the programme of Colombia differs from similar programmes in Guinea Bissau and Argentina, where female promotors are employed to reach female target groups.

A suitable alternative for linking a more permanent, local and participatory health education programme to the water supply and sewerage pro-

gramme are the "promotores rurales". These are women trained as primary health workers at the village level. The community elects several candidates for training. The regional head-nurse selects the most suitable candidate from them. Criteria are age under 30, literate, a community resident for at least 5 years and if possible single, so as to make travelling and home visits easier. The candidates receive a three months' course at a nursing school at provincial level. The course is financed by the PAN programme. The village health workers receive a financial compensation for their work from the same funds.

The possibility of a link between I.N.S. and the rural promotor programme of the Health Services was discussed at national and regional level. The realization of this link was considered useful and feasible. At the national level the director of I.N.S. proposed to pursue this matter further in the Ministry of Health. At regional level this question was discussed in a meeting with the directing staff of the engineering service and the rural health service for Huila Department. It was agreed that a more formal cooperation between the field staff of I.N.S. and the Huila Health Service would be useful for a greater health impact of rural water supply and sanitation projects. Already during the meeting arrangements were made to involve I.N.S. personnel in the training course for the rural health promotors at the nursing school in Neiva, Huila. The job description of the water and health promotors will also be adapted accordingly.

2.5 Manpower and Manpower Training

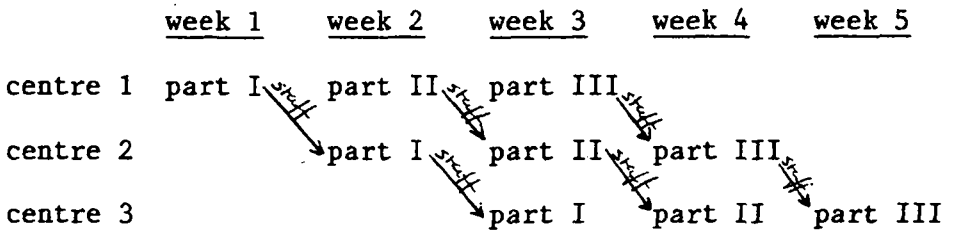
2.5.1 Promotion Section

At the field level, approximately 120 promotors are responsible for the motivation and the organization of the community for the participatory projects. Four promotors work at the head office in programme development and training. For reasons already mentioned they are all males. The promotors are preferably employed in the region they originate from. Turn-over of the promotion staff is low. This is partly attributed to the salaries, which are better than those paid to village health workers. This causes

some friction between I.N.S. and the Health service which may impede the proposed linkage for sanitation education. In general, all programme staff shows great enthusiasm for and commitment to the rural programme.

The promotors are trained through a series of 4 courses. These are given over a period of 3½ years, alternated with field work. The total duration of the training is three months (440 hours). The curriculum includes theoretical background studies (community development, rural sociology, social communication, public health, etc.), programme knowledge and skills (objectives, social investigation, community organization etc.), and specific techniques (leadership identification, meeting and debating techniques, adult recreation etc.). In addition, trainees need to study the various I.N.S. programme manuals.
Part of the lecturers and trainers are provided by the DIGIDEC programme of the Ministry of Local Government and by the Ministry of Health. Training methods used are lectures, discussions, case studies, role playing, individual and group assignments, seminars, workshops in educational aids, observation and practical work in communities. The courses are given in three different places, for groups of approx. 35 trainees. The trainers use a rotational system, as shown in fig. 1 below.

Fig. 1. Rotational Training System for Promotors Course



based on: O. Lopez Orozco, Capacitación Continuada en Desarrollo de la Comunidad para Promotores de Saneamiento Básico Rural, I.N.S., Sección de Promoción, Bogotá, Enero de 1976.

Recently, a training course in educational methods has been added to the existing ones. This course will prepare the promotor better for his task of training the local administrative committees. Of each of the 25 zones, 2

promotors will be sent for central training at the head office. On return these promotors then will organize a two-day training course for administrative committees in a local rural centre.

2.5.2 Training of Community Functionaries

Until recently, training of community representatives for the local involvement in the various project phases was part of the promotion work in the community. The promotor explained the local development committees how to organize the participation in planning and construction and guided the implementation. Similarly, the promotor on the administrative committee gave on-the-job training to the other committee members. As the performance of these administrative committees is not optimal (see 2.6.2) a separate training course has been prepared for them (8). This training has started in June 1981 with a pilot course in Atlantico. Approximately 10 committees or 30 persons will be trained in each course (president, treasurer and operator or second active user representative). Topics to be covered are the role of I.N.S. and its programme, rotating fund, necessity of works and committee, leadership and community action, accounting and functions of the committee. As a result of the discussions on the limitations of the present health education approach, it is planned to also include environmental health education in the course.

2.6 Monitoring and Evaluation

2.6.1 Recording System

The country is divided into 25 sections. Each section sends in a monthly report on I.N.S. sectional finances and progress of works under construction (date of contract, initiation of works, state of affairs; S.B.R. 1). For completed schemes, a monthly report is also made up (S.B.R. 2), giving locality, number of households and people served, total I.N.S. costs, total community- and external contributions. In addition, a quarterly report is drawn up by the visiting I.N.S. official (usually the promotor). The information is summarized in a semestral report for the whole section. This form

(S.B.R. 3) gives the locality, the type of works; the reporting period, the size, present saldo and the due date of the community loan; the value of the monthly reimbursements; the date of the last payment and arrears; the number of house connections, and the number ofhouseholds that are two months or more behind in payment; the state of the works and the number of months the system has not functioned; total income and costs of amortization, operation, maintenance, administration and expansion; debts of the administrative committee to third parties; cash balance of the committee; loans of the committee to the community for other community development activities, e.g. electricity service; average household rate and total paid and yet to be paid; and the type of administration responsible for the system.

This form differs from the previous one. New entries are: the number of sewerage connections; the period covered by the report; the total users debt to the administrative committee; and the total amount paid by the users at the time of the balance. The number of people connected but not adequately served, was dropped[1]. Average water rate and type of administration are also new. These changes were made to get a better insight in the financial status of the administrative committees and to adapt to new developments (see 2.3.1 and 2.3.3). A guideline to fill out the form has also been developed as mistakes occurred frequently.
A remaining problem is the slow forwarding of reports to the central office. It is therefore difficult to get a complete overview of the financial state of affairs at regular intervals.

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1) e.g. households situated up-hill and connected to a gravity supply system. These households cannot get water at peak hours, but only at periods of a low general demand.

2.6.2. Evaluation of Results

In general, I.N.S. does not carry out any periodic national evaluations. The monitoring system serves in the first place to inform the staff at sectional level where action has to be taken. At the central level, the December records are summarized by next June. The annual report is made by the promotion section. This concerns mainly the fulfillment of the financial duties of the administrative committees to I.N.S.

At present there are 1630 committees in 24 sections. Narino has the highest number with 231 and Quindío with 15 the lowest. In the evaluation report are further given the total size of the loans per section, the re-imbursement obtained per section, the number and total value of outstanding terms of redemption and the average amount of arrears per committee. The total and average operation and maintenance costs are also given, and the total and average amount of cash the committees have at their disposal. The total debt the users have with the committee is calculated per section, as well as the average amount. Finally the percentage of non-functioning systems is given for each section. It should be noted that this percentage only refers to systems that have not functioned for one month or more; shorter, periodic breakdowns in service are not recorded.

Arrears in loan repayment are frequent. In absolute figures, Antioquia, Narino and Magdalena have the highest debt. The average arrears per committee is highest for Córdoba, Magdalena and La Guajira. This is not only caused by non-payment but also by suspension of payments when the supply does not function. It is likely that a relationship exists between community payment problems and local scheme problems. This assumption is supported by the information from the evaluation records, as summarized in tables 1 to 4.

Table 1 Sections with the highest number of unpaid terms of redemption on their I.N.S. loan

section	average number of unpaid terms per committee
Guajira	33.3
Córdoba	23.9
Atlantico	21.8
Cesar	20.9
Magdalena	20.5
Bolivar	18.1

Table 2 Sections with the highest percentage of non-functioning systems

section	% of systems out of order
Magdalena	43
Guajira	28
Choco ')	25
Bolivar	23
Atlantico	22
Córdoba	22
Cesar '')	19

') Of Choco, no information was available on the number of unpaid terms of loan redemption.

'') In Cesar, 81% of the systems were reported functioning, on the remaining 19% no information was given.

Table 3 Sections with the highest user debts to the committee

section	average amount of user-debt per committee	
Sucre	Col. $	8,511.00
Cesar		8,240.00
Bolivar		6,820.00
Meta		5,474.00
Córdoba		3,545.00
Guajira		2,707.00

Table 4 Sections with the highest recurrent costs

section	average amount of costs per committee	
Atlantico	Col. $	37,758.00
Córdoba		10,991.00
Meta		10,284.00
Bolivar		10,257.00

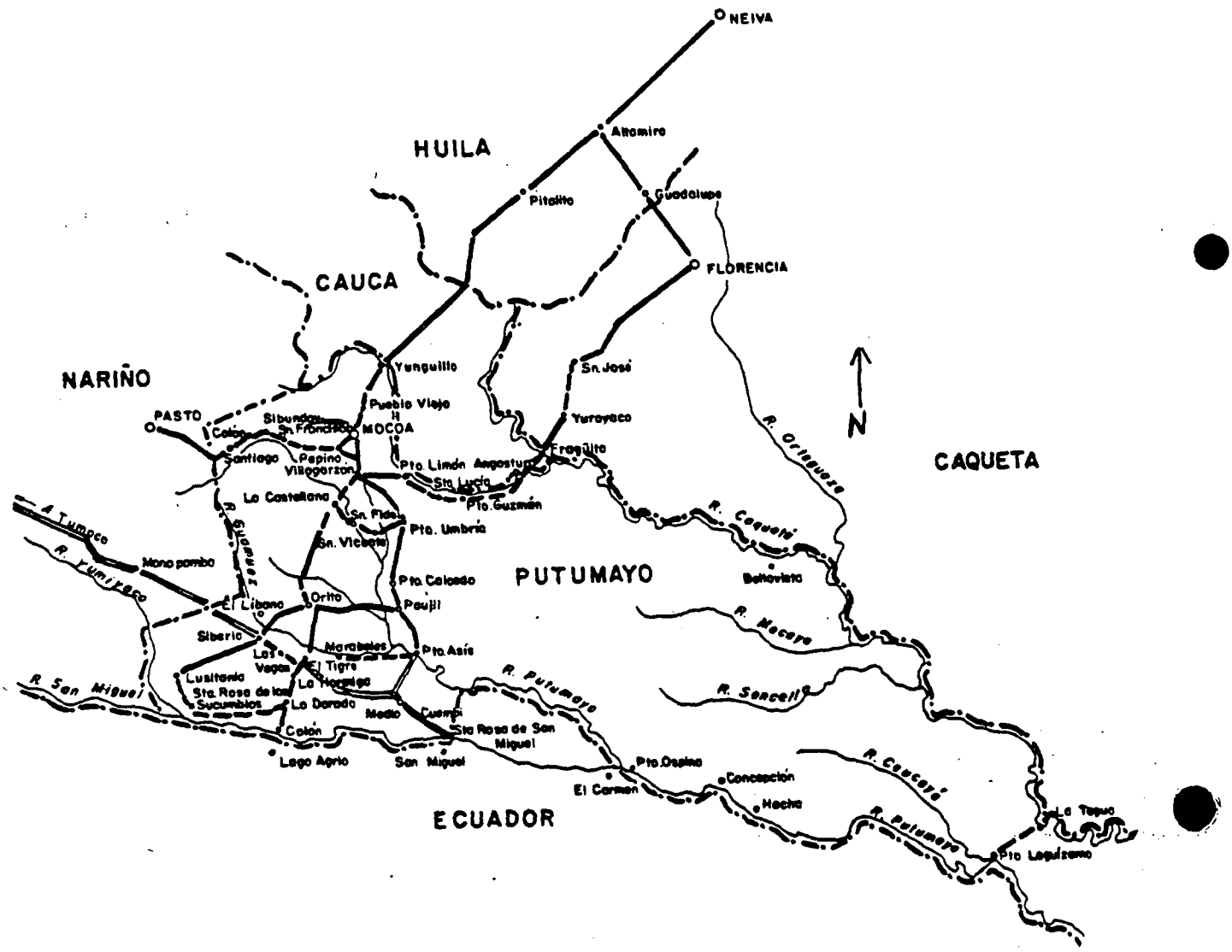
The data given in these tables has been compiled in the first quarter of 1978. Later data have not yet been processed. All sections are behind in loan repayment. Huila has the lowest average number of unpaid terms per committee, namely 0.6.

Remarkable is further that in all sections the total of the saldos of the committees is positive. In 9 out of 23 sections this total is higher than the total arrears on the community loan. But of the sections slowest in repayment (table 1), only Bolivar has almost enough cash with the committees to cover its arrears.

It is possible for committees with a considerable cash balance to invest this money in further development activities. In the monitoring system the size of loans for such purposes is recorded. The overall data are not included in the evaluation, however.

The percentage of non-functioning systems in the other sections varied from 0.9% (in Cundinamarca) to 17% (in Sucre). The average for 1255 supply systems was 8.89%. No or partial information was available for 5 sections, concerning 137 supply systems. The 101 sewerage systems and the 157 combined systems were not included in the evaluation.
The operation and maintenance costs are particularly high for pumping systems. (Atlantico). In those cases the community has a heavy additional financial burden on top of its loan-repayment obligations.

Further evaluation data are available on the coverage of the population with drinking water and sewerage services. The figures for 1972 given in the national plan for public health 1975-1978 show that 29% of the rural population had at that time access to a drinking water service. But other figures show problems of keeping up with the population growth: in 1974, 42% of the rural communities with less than 2500 inhabitants was served by watersupplies and 10% by a sewerage system (1,2). Of the dispersed population (approx. 6 million) between 25-30% were in the same year estimated to have access to safe drinking water and approx. 15% to have waste disposal facilities. In 1978 the rural population of Colombia was 17.812.000 people. Of these, 2,552,000 people or 14.3% live in concentrated rural settlements of 50 to 2500 inhabitants. Of this population 33.8% have a connection to a water supply and 6.6% a connection to a sewerage system. Another 6,654,000 people, or 37.3% are scattered over the rural areas. No figures were available at on their access to safe water supply and excreta disposal systems in that year. These figures indicate a decline, also in absolute terms, of the population served since 1974. In other words population growth has overtaken the coverage capacity during this period.



Map of relevant part of Colombia

3. Slow Sand Filtration Project in Puerto Asís

3.1 Background

3.1.1 Socio-Economic Characteristics

Puerto Asís is larger than the communities that are usually served by I.N.S. It has 14,000 inhabitants and is situated near the Colombian-Ecuadorian border on the Putumayo river. It has a hot, humid climate. Originally (1912-1963) it was a mission and garrison post. The mission started the colonization of the area in 1932. Migration from other areas of Colombia (especially Narino and Valle) to the Putumayo river system led to the development of Puerto Asís as a small trading centre. In 1956 its population was approx. 300.
The discovery of an oil field in Orito, at 35 km NW of Puerto Asís, caused an influx of males in the area from 1963 to 1968. The town became a centre for the oil industry. At first it had the character of a gold-rush town. With the development of Orito as an industrial town, Puerto Asís became the administrative and business centre for the oil-industry. Most migrants who settled there (77%) had an urban background. Nineteen percent came directly from a rural area. The main reason for their migration was an economical one: 44.2% had no work in their own area, 30.7% wanted a better job.

In the last few years the oil production has been going down. But the ongoing colonization of the region has strengthened the role of Puerto Asís as an agricultural and trading centre. Emphasis is on primary consumption: market stalls and general stores account for 80% of the commercial activities. Small workshops and services account for the remaining 20%. The cooperative stores of the farmers' association take an important place. Here also, most sales are of a consumptive nature, however. The sale of productive goods (equipment, fertilizer, etc.) is relatively less important. This shift in the economic outlook of Puerto Asís is realized by its new settlers. In a survey in 1978, 70% of the respondents referred to the agricultural potential of the region as the reason for their settlement in the town. It has also led to a more stable population. The immigration

has slowed down since its peak in 1970, when it accounted for an annual population growth of 9.4%. The immigrants are families rather than bachelors. In 1978 more people (46.4%) had migrated directly from their home area to Puerto Asís than in 1968 (28.8%). The turn-over has however been big: in 1978 half of the population that had arrived between 1964 and 1970 had left again.

In the next decade no great developments of Puerto Asís as an agricultural centre can be expected, unless some problems are solved. The colonization started by the missionaries has greatly affected the small indigenous population of the area. They have either left their lands or live under very poor circumstances. The prospects for the new colonists are not much brighter. The government land reform bureau (INCORA) has allotted 55% of the municipal land between 1962 and 1970 (34,820 ha.).
Another 180-200 additional families can be settled on the remaining arable land (10 to 15%). But thereafter the growth of the economy of Puerto Asís that is based on agriculture will depend on the productivity of the cultivated land.
The chances of a higher productivity are slim under the present circumstances. The productivity of the area is at present lower than that for Colombia as a whole. Land pressure and erosion are increasing. The credit facilities given to the farmers no longer cover the production costs of maize and rice, the two main crops. Moreover, only 8% of the 3000 households profited from these facilities last year.

In the town the decline of the oil industry has contributed to an increase in small companies and shops. Of a total of 77 establishments 70 were started since 1975. Of the larger companies (20), half date from before 1975. The small shops are an answer to the growing unemployment in the town. But this possibility gets exhausted when no new demands develop, either quantitatively or qualitatively.
Employment figures clearly show the problem: of an economically active population of 3,359 people, around 15% is unemployed. Of those employed, 70% work in the service sector, 30% in the productive sector and 10% is underemployed (street vendors etc.).

Many would leave the area if elsewhere better opportunities were available, and a considerable minority plans to do so anyway.

A first possibility for reinforcement of the local economy is the development of the surrounding farmlands. Major elements are the strengthening of farmers' organizations; a better extension service reaching all rather than a selected group of farmers; the expansion of credit facilities in size and scope; better marketing with less intermediaries; and better roads and transport facilities at government-controlled prices.
Secondly there is a potential for small-scale industrialization when the municipality develops a financially attractive policy for this purpose. Puerto Asis is a very important riverport. It has overland connections with Pasto and Neiva. From Puerto Asis barches travel two to three weeks to Leticia, Brazil and Peru. The town has therefore a good potential as a trading and tourism centre for the Amazonas region.

3.1.2. Environmental Sanitation Conditions

A reliable and sufficient supply of safe drinking water does not bring development by itself, but is one of the basic conditions. Such a service does not yet exist in Puerto Asís. People use groundwater from shallow wells, rainwater and riverwater. In the wet season, over 74% of the households use rainwater. The remaining households use groundwater, pumped by a diesel pump (7.7%), hand pump (0.9%) or lifted by hand from a shallow well (15.1%). The wells are all privately owned and are situated near the houses of their owners. In the dry season (November-February) rainwater storage is not sufficient and many shallow wells fall dry. Most people (over 91%) then buy water from water vendors. Most vendors get their water from the river, using a mule cart and drums. Some buy water from the wells that are still functioning.

The quality of the riverwater is very poor. The quality of the water in the wells is not known, but it is most probably contaminated as well. Most wells are unprotected and get flooded during the rainy season. Pollution

through seepage is quite likely because there is an impermeable layer of clay at a depth of 5 metres, causing the upper layers of the soil to become saturated.
In addition, there is a piped sewerage system in part of the town. This system will be expanded to serve the whole town in the near future. During the rainy season this system is below groundwater level. This not only greatly increases the risk of polluted wells, it also means that under all circumstances the new piped system needs to maintain pressure for 24 hours.

The water use practices in Puerto Asís are influenced by the climatic conditions. An investigation of the quantity of water sold in the dry season showed an average use of 83 gallons per day per household and 235 gallons per day for business establishments.
With an average household size of 6.3 this means an average daily consumption of nearly 60 litres per capita in the dry season.

In general, climatic conditions have less influence on the waste disposal behaviour of people. Yet the health risks are greatest in areas with concentrated settlement, a humid climate and drainage problems. Puerto Asís has all these characteristics. Adequate attention to waste disposal will therefore be a necessary addition to the water supply programme if a significant impact on environmental health is to be realized. An inventarization of the existing situation in this field has therefore been executed (see 3.2.4 and annex 10).

3.2. Project History

3.2.1. Allocation and Planning

The construction of a piped water supply in Puerto Asís is no simple affair. Two earlier attempts have failed. The first supply, started in 1967, consisted of a deep well, pump, an elevated storage tank and a small distribution net in the centre of the town. However, the well did not produce water and the supply did not function. A second supply, completed in 1976, did bring water, but not enough, as the treatment plant could only

purify 10 litres per second. Furthermore the site of the plant was such that the plant was sometimes flooded in periods of high river discharge. Moreover due to meandering of the river Putumayo and erosion of the banks it threatened to disappear completely into the river.

The inhabitants of Puerto Asís resented the failures and pointed at the rural communities that are part of the municipality. In all these villages I.N.S. has successfully built or is building piped supplies and sewerage systems. The municipal council therefore decided to apply to INS for a new study and design, despite the fact that it concerned an urban supply. They even appealed to the president. As a result, the whole project, design and construction, was allocated to I.N.S.

The planning process followed the general I.N.S. procedures. To avoid flooding of the treatment plant it was necessary to survey the area and find a site which remained above the maximum water level of the river Putumayo. This was quite hard because the town is subject to severe flooding during the rainy season as the level of the Putumayo river may rise by 5.5 m. A suitable place was found close to the banks of the Agua Negra creek, a tributary of the Putumayo. The average turbidity of this creek is sufficiently low (7-13 NTU) to allow the application of slow sand filters.

During the first months of 1979 the I.N.S. promotor of the regional office in Mocoa, sr. Hernan Echeverry Gutierrez, carried out a socio-economic study in the area (11). This study included an overview of present water supply practices and community perceptions of the new project. The attitudes toward the project are mixed. Although the community requested I.N.S. to take over the project, many people are still sceptical about its chances of success. Some even say that any piped supply in Puerto Asís is doomed. People also dislike the choice of the Agua Negra creek as the source for the new supply, because of its name. (Finally some people are directly prejudiced by the new supply, as will discussed in section 3.3.2.)
The attitudes of the people towards a direct involvement in the construction of the supply were found to be negative. In a rural setting, people are financially and physically more easily involved in the construction of

the works[1]. In a large urban community, such involvement is far more difficult to organize.

Moreover, in urban projects implemented along the usual lines, including the earlier ones in Puerto Asís, this is not done, and people do not expect to be asked. Also, people in Puerto Asís rely on the oil royalties and think the municipality should use these to finance the services. They are only willing to pay when services are actually provided.

In reality these oil royalties are no longer an inexhaustable source of municipal funds. In January 1971 a special government law restricted the production of oil in the area to 70,000 barrels a day. Previously, this production was 85.000 barrels. The state gets 11.5% of the value of this production, and 10% of this amount flows back to the local public funds. Next to the decrease in production, Orito, the seat of the oil industry, has recently become an independent municipality. Puerto Asís therefore now lacks the oil royalties which in the last two annual budgets provided over 90% of its income.

The planning of the project concentrated on the technical design and the financing. Because of the size of the town it is not possible to follow the normal I.N.S. procedures for participatory project planning. Instead, the people participated indirectly, through the formal and informal leaders. The promotor contacted the boards of the community development committees in each quarter of the town, and other community leaders. A general

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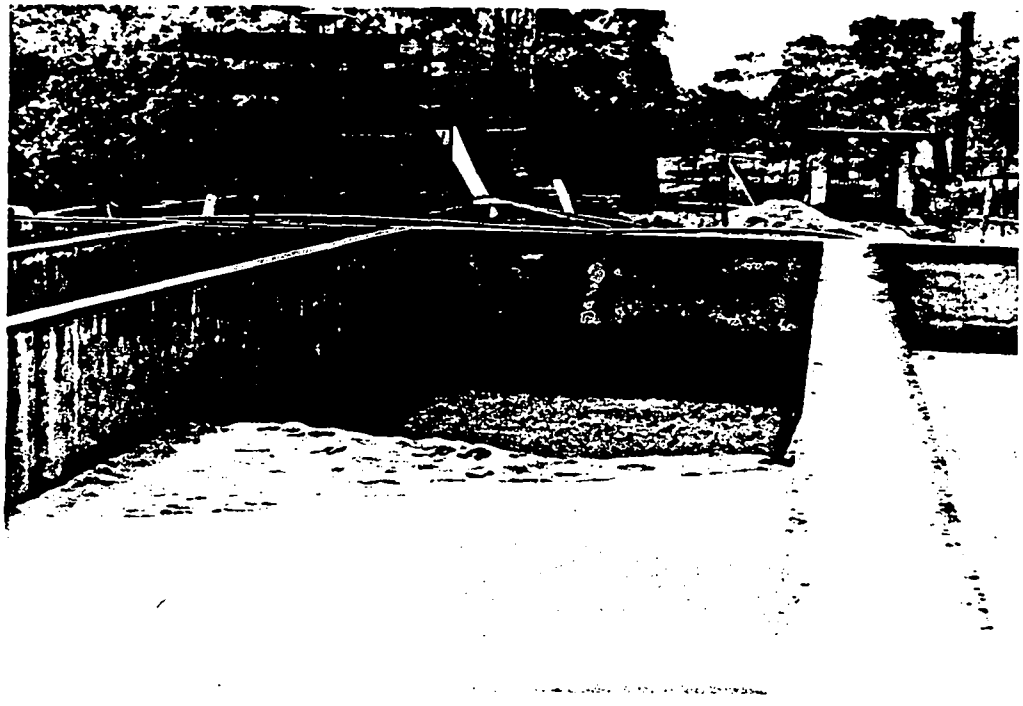
1) This includes the rural communities that are part of the municipality of Puerto Asís. Although the provincial government financed part of the construction of their services from its oil royalties the population still gave free labour and materials amounting to 5% of the total construction costs.

assembly was held, attended by the municipal council, political leaders (member of parliament, mayor), religious leaders, military authorities and the presidents of the JAC's and other groups such as the Chamber of Commerce and the Lions Club.

The municipal council consists of 9 representatives of the major political parties, including the communist party. They are elected by popular vote every two years. The mayor is appointed by the government and may be a politician or a military. In Puerto Asís he is the latter.

After long discussions the meeting agreed upon the technical design of I.N.S., including a slow sand filtration system. This system was preferred over the original rapid filtration system because it can be operated by low-level technicians trained on the job, is easy to expand and does not require chemicals for pretreatment.



Partly filled slow sand filter. Background left, aeration tower.

Because of the local attitudes towards participation in construction the assembly decided to deviate from the usual I.N.S. procedures. For the unskilled construction labour, paid workers are used, partly recruited from the ranks of the unemployed. The main tasks are the digging of the remaining 10% of the trenches for the distribution system and the screening of the sand for the filters. Excavation of the filter beds is done with a bulldozer from the departmental government. The local cash contribution to the construction of the filter costs, Col. $ 51,600 or 3% of the total costs, is paid from the municipal funds. In addition, the municipality will finance the installation of the water meters (Col. $ 2,000,000). The recovery of these costs from the users will be managed through the monthly waterrates.

3.2.2. Design and Construction

The treatment plant consists of the following elements: intake, aerator, plain sedimentation, slow sand filters, clear well, safety chlorinator, elevated storage tank and the distribution network (annex 5 and 6).
The dimensions of the pumping equipment and the slow sand filters are set for a design population of 18,000 inhabitants (1988), while the other elements have been designed for an ultimate population of 24,000 consumers (2000). The present population is just over 11.000 inhabitants.

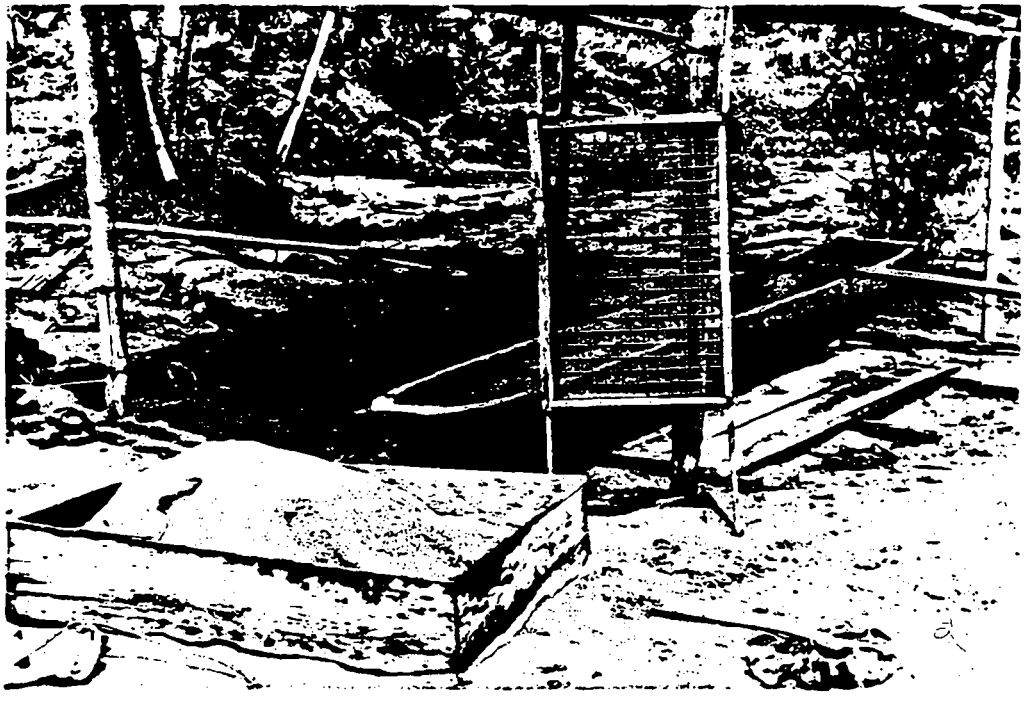
Table 5 Technical Specifications
Treatment plant Puerto Asis

Raw water pumps	2 x 47.5 l/s; 1 standby: diesel/electric
Aerator	4 trickling beds filled with coke
Plain sedimentation	2 rectangular tanks; 3 x 2.5 x 23 m
Slow sand filters	3 x 138 m^2; v = 0,13 m/hr
Clear well	350 m^3
Chlorinator	Manual control, solution-fed type
Clear water pumps	2 x 46 l/s; 1 standby: diesel/electric
Overhead storage	192 m^3 (existing); 500 m^3 (planned)

Initially a design demand of 70 lcd was assumed. A recent survey in Puerto Asis has confirmed that average consumption lies around 60-70 lcd.

To ensure continued functioning of the system electrical and diesel-raw water and clear water pumps have been installed. In an outpost like Puerto Asis this is unfortunately necessary as the town is difficult to reach during the greater part of the year. However some of the pumps could be taken from the municipal stores where the equipment of the two earlier systems was stocked.
The pumps will be running for 8 or 16 hours a day. A standby had to be provided to allow for maintenance and breakdowns.

To select the sand for the filter medium five samples were collected on different river beds located around Puerto Asís and analyzed for organic content and grain size distribution at the Pasto branch of the Mining Institute. The best available sand was at the Putumayo river bed located two kilometers from the treatment plant, but it had to be screened in order to remove the coarser material.



Sieve used for screening the filter sand.

The prepared sand has an effective size of 0.23 mm and a uniformity coefficient of 2,5. No organic content was present.

Soil investigation showed that the quality of the soil in Puerto Asis is very poor. The construction of the intake thus suffered quite some delay since the low strength of the soil required piles for the foundations. Equipment to drive the piles into the ground was however not locally available. In the end a solution was found when an oil company which was prospecting in a nearby district was willing to assist.

Sufficient overhead storage will for the time being not be available as there are no funds remaining for the construction of a 500 m^3 elevated tank. Due to the weak soil this structure also requires piles for the foundation, which makes it very expensive. Though this is awkward especially from the operational point of view, an inventarisation of the existing private storage in the town has shown that 85% of the population has his own tank (concrete, eternit, oil drum) with a total storage of nearly 3000 m^3. However, there may be a health problem as it may not be feasible to keep continuous pressure in the distribution network without a second overhead tank. Without pressure the intrusion of polluted groundwater into the net may occur (Fig. 2).

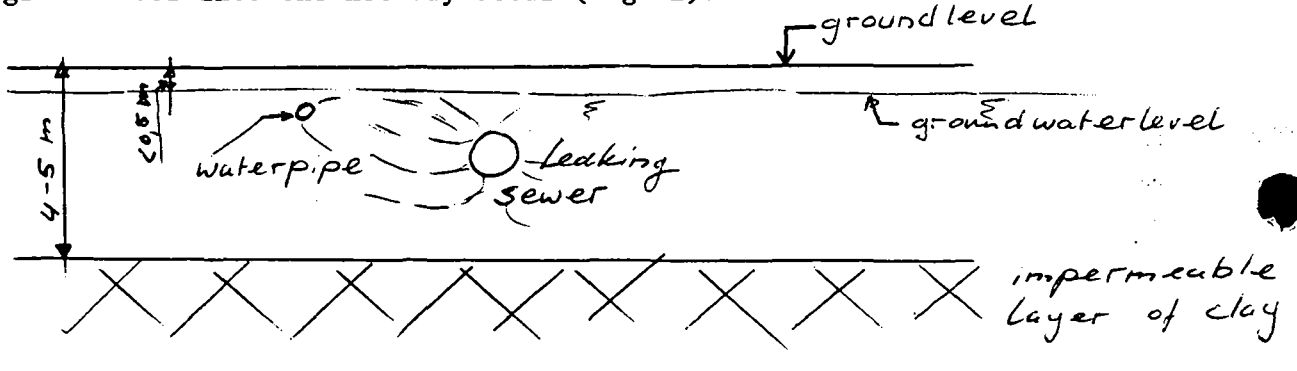


Fig. 2 Risk of pollution of drinking water

Until the 500 m^3 storage tank can be constructed it will be necessary to arrange for sufficient safety chlorination and request the municipal hospital to frequently check the bacteriological quality of the tap water.

The scheme has been jointly financed by DAINCO*, the Department and the Municipality of Puerto Asis, the Colombia-Ecuador Border Development Programme, I.N.S. and IRC. The financial contribution of IRC through its SSF-project relates mainly to the construction of the slow sand filters.

TABLE 6 Construction Cost of Slow Sand Filters Only

Source	Colombian $	U.S.$	%
I.R.C.	1,080,981	25,737	66
Putumayo Intendencia	293,625	6,991	18
National Inst. of Health	220,400	5,248	13
Puerto Asis Municipality	51,600	1,229	3
TOTAL	1.646.606	39.205	100

The treatmentplant has been completed in August 1981. Testing of the distribution system is underway. After a period of ripening of the slow sand filters it is expected that the scheme will start to supply water during the fourth quarter of 1981.

When functioning it will have taken a bit more than two years to complete the system. This is not extremely long if one takes into account:

- the size of the treatment plant.
- the fact that it is difficult to transport materials to Patumayo district. From Pasto to Puerto Asis takes 9 hours by car under favourable weather conditions and days (or months) if the rains cause landslides in the foothills of the Andes.

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* Departemento Administrativo de Intencias y Comisarias. This office is at the national level responsible for underdeveloped areas such as the department of Putumayo.

- the long bureaucratic delays before allocated funds are actually received.
- the time-consuming public tenders which have to be invited when for instance pumping equipment has to be imported from abroad.

The construction of the schemes was awarded to a local contractor and supervised by the I.N.S.-promotor. In fact the contractor works as a kind of foreman as most of the building materials are purchased directly by I.N.S.

The promotor is responsible for the organization of the unskilled labour. The organization of the work is on a weekly basis. When more labour is needed in addition to the regular crew, he recruits this labour from the unemployed. Labour payment is also weekly, by the treasurer of the municipality. It is based on the labour roll kept by the promotor. The promotor also keeps a record of the materials used and writes a monthly progress report for the municipality.

3.2.3. Operation, Maintenance and Administration

During the construction the promotor selects the 3 or 4 most capable people for further training as operators/plumbers. The advantages of this approach are lower training costs and a lower turnover. The main criteria applied in the selection are technical insight and a good sense of responsibility. The operators will work on trial for the legal period of 2 months and be paid the legal minimum wages to start with. Until final management arrangements have been made, they will be responsible to the promotor.

The administration of the supply will be taken care of by an administrative committee with five members. The committee will be elected in a general assemby of representatives of the municipality, the municipal council, each of the existing JAC's, the chamber of commerce, the local health service, I.N.S. and remaining natural leaders of the community. The administrative committee will in addition to the normal tasks I.N.S. allots to this authority, appoint and supervise the Administrador of the scheme.

This Administrador is responsible for day to day management of the service. He is also in charge of personnel.
It is envisaged to employ 9 staff in the overall scheme. Next to the Administrador, two operators, two plumbers, one labourer, one watchman, a meter reader and a clerk.

An estimate of the annual running expenditures of the scheme are given in table 7.

Table 7 Annual Cost of Operation and Maintenance (Estimate)

Hours of daily production:		16 hours	8 hours
Personnel	Col. $	1.117.673	980.113
Fuel		1.007.000	503.700
Lubricants		100.740	50.370
Chlorine		425.700	212.850
Depreciation		716.139	428.558
Office expenditures		60.000	60.000
	subtotal Col. $	3.427.652	2.235.591
Miscellaneous 15%		514.148	335.339
	Total Col. $	3.941.800	2.570.930

With an estimated daily output of 1020 respectively 830 cubic meter a day for 16 and 8 hours of operation the cost per cubic meter would amount to roughly 10.5 and 9 pesos.

Initially 8 hours of operation is likely to satisfy the expected demand with an average consumption of 70 liters a day per inhabitant (lcd). When demand requires average drinking water delivery can be raised to 90 lcd with 16 hours of daily operation.

3.2.4. Tariff structure

As mentioned earlier the Puerto Asis water supply scheme can only boast to have one overhead storage tank of 195 cubic meter capacity. Because there was no money to build an additional high-level reservoir it was suggested to do a survey in the town to find out how necessary such a storage really was in terms of meeting water demand throughout the day. In order to execute the survey every houshould and business had to be visited and questions asked about the private storage available.
In case sufficient private storage* would be available the construction of an overhead reservoir could be postponed.

The survey was executed in April/May 1981 by Mr. Hernan Echeverry Gutierrez, the I.N.S. promotor responsible for the scheme in Puerto Asis. However as it would have been a pity to confine the survey to the capacity of the storagetanks, if any, a limited number of additional questions were included in the questionnaire. These questions aimed to assess the payment capability/wealth of the householder with as ultimate purpose the setting up of a weighted water tariff system. A copy of the questionnaire can be found under annex 10.

To determine the payment capability of the consumers the quality of the materials used and size of the house are used as indicators. Depending on quality the area (A) of the house or floor is multiplied with a factor (F, in Col. $) to arrive at the price of the property. Three factors are used:

F1: 3000 $/m^2, for property with brickwork or block walls, tiled or wooden floors, concrete or eternit roofing. Use of glazed tiles; connected to all services, etc.

F2: 2000 $/m^2, brickwork or block walls, eternit or zinc roof, cement or tile floor, and full services.

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* Only a small number of households turned out not having a (satisfactory) storage. For the time being it is, therefore, likely to be a better solution to subsidise the purchase of a limited number of private storage tanks rather than to construct a municipal overhead tank.

F3: 1000 $/m^3, wooden or adobe walls, zinc roof, poor finish.

Each house and business being valued in this way the consumers were divided into four categories (table 8).

Table 8: Categories of property according to value

Category	Property Value	No. of Owners	No. of Tenants	Total
1	up to $100.00	683	99	782
2	$100.001-250.000	356	74	430
3	$250.001-500.000	227	49	276
4	$500.001-and up	169	53	222
	subtotal	1.435	275	1.710
	to be verified (added to cat. 1)			9
			Total	1.719

For these four categories different water rates and connection fees were fixed (table 9).

Table 9 Monthly water rate and cost of initial connection per category. (1E,2E, etc. are businesses which pay 130% of the rates for the corresponding housing category).

Category	Monthly Rate	Cost of Connection
1	$ 130	$ 500
2	180	1000
3	230	1500
4	280	2000
1E	170	650
2E	235	1300
3E	300	1950
4E	365	2600

The first 18 cubic meters per connection are free, additional cubic meters cost Col. $ 25 for all categories. Each consumer has further to contribute to the cost of the water meter that will be installed. However categories 1,2, and 3 can repay the (subsidized) cost of the meter in respectively 18, 12 and 6 months. The wealthiest category has to pay the full meter cost in cash.
Meter reading and subsequent billing takes place once every two months.

With the present water rates and the expected consumption pattern the Puerto Asis water supply scheme is able to finance its operation and maintenance expenditures and also make some resrvations for future investments (replacements, expansion).

It is noteworthy, however, that the more affluent members of the Puerto Asis community subsidize through the water rates the cost of water for the poorer sections.

3.3. Socio-Economic Consequences

3.3.1. Public Health Impact Study

To determine the health impact of the project the incidence of water-related diseases in Puerto Asís before the installation of the new supply will be compared with the incidence after the installation. For this purpose the promotor collected morbidity and mortality statistics on water-related diseases as registered by the health centre of Puerto Asís.

An important difficulty is the definition of the study population. The 5428 case histories for July 1970 to June 1971 from which the study sample was drawn show that 44% of these patients came from Puerto Asís proper. The remaining 56% came from villages of the municipality. This means that of the total population of Puerto Asís town in that year, 40% visited the health centre. Of the total rural population of the municipal area, 12% came to the centre.

A problem in this definition of the catchment population is the completeness of the registration. When the promotor compared the number of registered (diagnosed?) patients with the attendance figures of the health clinic, he found a discrepancy of over 60%. Taking this difference into account he came to an average of 0.97 to 1.23 annual visits per inhabitant per year. Accidents are however included in this figure.

Limiting a health impact study to the statistics of local health centres implies that part of the water-related diseases go unreported. Not everyone will attend a government clinic for every water-related disease. Many will not report at all, but buy medicines straight from the chemist. Others will go to other official or unofficial medical practitioners. The two private doctors of the oil company who practice part-time in Puerto Asís for example reach an estimated 15% of its population. Their records are not covered by the health study of the project.

Another problem connected to the figures collected was the change in clinic attendance. In the first half year of 1971 this attendance rose sharply. The average number of monthly visits in this period is 750. This brings the total number of visits in the second period of study at 4500. How many of these visits resulted in patient histories is not clear, however.

In view of the above questions, the ultimate design of the health impact study of Puerto Asís is still under discussion. In consultation with doctor Santa Cruz, the zonal engineer supervising the project, it was also decided to see whether a worm infestation study in a representative sample of the project population can be added to the study of the health statistics. A constraint is the rather short notice at which this study needs to be carried out if it is to determine the prevalence of water-related parasites previous to the installation of a safe water supply.

When the new supply has functioned for some time, the health study/-ies will be repeated. In this way some measurement of the impact of the safe drinking water on public health can be obtained.

Other factors, such as a change in hygienic circumstances and behaviour, or in preventive health (e.g. malaria prophylaxis) may however intervene. Such factors have not been controlled and neither is a control population used. The ultimate results can therefore not be contributed with a 100% certainty to the influence of the water supply. Nevertheless, the project is a good example of what the cooperation between health and water agencies can mean for operational research.[1)]

3.3.2. Other Consequences

Puerto Asis is the last town that can be reached by road from Pasto or Huila. Further inland to Leticia, Brasil and Peru, the Putumayo and Amazonas rivers provide the only roads. All cargo transported between Colombia and the Amazon region has to be handled in the river port of Puerto Asis.

A large number of labourers with mule carts find employment in transporting cargo from the market to the quay. In the dry season, due to reduced navigability of the Putamayo and Amazonas river, there is less work in the docks there is less work in the docks. During that period some of the mule cart drivers used to shift their activities from carrying cargo to carrying and selling water (table 10).

Table 10 Selling of water in Puerto Asis

Season	No. of Water vendors	Net daily income	Cost per drum (220 l)
Dry	12	Col.$1.200	Col.$100-120
Wet	4	Col.$700	Col.$50

1) Such research has been advocated by the WHO Scientific Working Group on Environmental Health and Diarrhoeal Disease prevention. It is still rare however.

Now the water supply is functioning water vendors will not find any employment anymore. This may be viewed as a negative consequence of the supply. However, the vendors can always return to the port and find themselves some job. This does not seem too difficult although especially in the dry season with reduced port activities it may mean a lower and less reliable income. Still, some water vendors may resent the coming of the water supply and may seek to damage it as has occurred in similar situations elsewhere.

Especially during the dry season, 3-4 months, the water vendors found a lot of consumers as more than 91% of the people buy water through them. However, the quality of the water they brought was poor for the water was taken from the Putumayo river or from pools, while it was transported in drums which are also unlikely to be unpolluted.

For the consumers the new water supply has a lot of direct advantages. The quality of and access to (drinking) water has imporved considerably while also the price of the water is a lot less.
Water from the vendors had to be purchased at a price of Col. $250 (wet season) or 500-600 (dry season) per cubic meter. Under the new scheme the people will have to pay rates averaging between Col.$ 7.5-17 per cubic meter (see also table 9) which means a very substantial reduction of that part of the income that had to be spent on daily water needs.

In the rainy season they will however have to pay for their water when previously they used free rainwater. Those who have got a good storage tank and a relatively low income will therefore probably go on using some rainwater and consume less supply water than in the dry season. This may affect the management of the system.

Another positive consequence of the water supply is the employment generating effect. During the construction of the scheme ten labourers were employed full time.
For the daily operation, maintenance and management, nine staff are required (ref. 3.2.3).

The effects of the piped supply on economic productivity in the formal and informal sector will depend upon many other factors. One possible spin-off is the establishment of a soft drinks factory in the town. The supply is presently by road from Pasto, the the road is very poor.
The effect the project might have on the redistribution of income has been discussed earlier.

Underdrain system, Alto de los Idolos

4. Slow Sand Filtration Project in Alto de los Idolos

4.1. Background

4.1.1. Socio-Economic Characteristics

Alto de los Idolos is a case more typical for the INS rural water supply and sanitation programme. The community is a part of the municipality of Isnos. It is located at 6 km from the municipal centre of San José, to which it is connected by the municipal road. An all-weather track of 4.5 km forms the link between the centre of the community and the municipal road. Other villages bordering on Alto de los Idolos and involved in the project are Betania, Salen, Las Guacas and Alto Granada.
In 1974, when the project planning started the total number of households in these communities was 168. There are 5 public buildings in the area, 4 schools and one motel. All communities consist of scattered farms, with a distance of 200-300 metres between the houses. The terrain is very rugged. There is a considerable erosion in the area, due to the indiscriminate clearing of the natural vegetation and the existing farming practices. Farming is the main source of income. The principal products in the area are sugarcane, coffee, maize, yam, green bananas and livestock-products. There is no formal industry in the area. In the informal sector, jaggery is produced and sold in the local market. Two craftsmen produce replicas of the idols from which Alto de los Idolos derives its name. These idols are huge stone statues dating from the pre-colombian culture of San Agostin. Little is known about the origin and history of this culture. The park in which the statues and graves are situated has been government property since 1952, when it was taken over from a German. In 1973 a tourist lodge was built in the park.

The farms are all small holdings, with an average size of 15 ha, and a minimum of 1 ha. The five large farms that previously existed in Alto de los Idolos have in the last 5 years all been divided among their legal heirs. The actual number of the smallest farms (1-2 ha) is not exactly known but it was estimated at half of the households. According to the

promotor, it is difficult to determine the levels and variation of income in the area. The quality of the soil and the productivity of the farms varies considerably, so that a farm of 15 ha may in fact give a lower income than a farm of 2 ha. If such information is needed for a weighted rate policy (see 2.3.1), a more detailed investigation is necessary than the present socio-economic study carried out for the project.

The main representative body in the area is the community development committee. It has been in existence since 15 November 1965 and obtained a juridical status on 16 February 1975. Local participation in its assemblies for elections and decision making has been good. The active participation of women in particular is noticeable. In the present committee the president and two other members of the 6-member board are women. Two other sub-committees were created by the community development committee: a work committee and a sports committee. The committee has monthly meetings in the school of Alto de los Idolos which are attended by an average of 30 people. Its major activity was the expansion of the above mentioned school in 1974, at a cost of $ 1,500.00. To rais money several fairs were organized in the area. Felt needs in the area at the time of the socio-economic study were (in order of importance): road improvement, school building improvement, a water supply and agricultural credit and extension services.

4.1.2. Environmental Sanitation and Health Conditions

Before the piped water supply was constructed, people took their water from wells and unprotected springs. The average distance to these wells was 50-100 metres. In the socio-economic study, only the environmental sanitation conditions of Alto de los Idolos were investigated. In this community, 10 out of a total of 45 households (22%) had a latrine in 1974. The remaining 78% used the field. Housing in terms of ventilation, light, crowding and type of floor was poor in 90% of the cases.

The environmental health study carried out in October 1979 gives a picture of the existing environmental sanitation conditions in the whole project area. Of a total of 183 houses, 162 were inhabited at the time of the

study. Private wells were used by 113 households (69.8%). Of these households,
19 or 16.8% had constructed a rudimentary supply with a yard connection. Surface water was used by 49 households (30.2%), of whom 15 or 30.6% had a yard connection. Rainwater was not used. In total, 21% of the households interviewed had tried to improve their private supply by constructing some kind of yard connection (hose).

The quality of the water from these private sources has not been investigated. However, the incidence of water-related diseases in the area is high (ref. section 4.3.1) so that improvements were certainly justified. Also most of the supplies were inadequate during the dry season and the people had to go into the mountains to get their household water.
Twenty-one of the 162 households (12.9%) had in 1979 some type of excreta disposal system, most of them (19) latrines. The remaining 87.1% use the field. Solid waste disposal is rarely by burying (5.5%) or burning (3.1%). Most people deposit their wastes in the field. (91.4%)

To get some insight into the patterns of environmental disease in the area, the respondents were asked about the incidence of diseases in their household. The most frequently reported disease was influenza (38.8% of all cases). Diarrhoea was the second most prevalent disease in the 10 months preceding the interviews; it accounted for 30.8% of all reported diseases. In the age group of 0-5 years it was the most prevalent disease (52 out of a total of 149 reported cases). Skin diseases were the fourth most prevalent health problem in the area (6.5% of all reported diseases). The number of parasitic infections reported by the households was 13.

4.2 Project History

4.2.1 Allocation and Planning

In 1973 the community development committee of Alto de los Idolos requested the I.N.S. sectional office at Neiva to construct a piped water supply in their community.

Subsequently an I.N.S. promotor (Luis Mendez Varon) carried out a first project identification study in the area in August 1974. This study covered socio-economic, environmental sanitation and technical (source selection) aspects. It concentrated on the village of Alto de los Idolos. As a result of the study, the promotor recommended a regional supply, serving also the hamlets Betania and Alto Granada.

The contract between I.N.S. and Alto de los Idolos for the construction of a water supply was signed on 25 April 1976. The signing was preceded by a general assembly in which the population authorized the community development committee to sign the contract on their behalf. This development committee also represents the other communities in the project area. At the authorization and signing of the contract representatives of 76 households were present out of a 100 interested households. Before the authorization was given the project engineer explained the conditions for a house hold connection and answered questions of the meeting. These mainly concerned the cost and feasibility of a connection.
Those whose house is not directly reached by the planned main distribution net have to pay for the additional piping with the exception of the first 50 m. Questions of possibility and costs of a connection appear to be the most relevant to the users. During one field visit a general assembly for the same purpose of authorization was attended at the village of Salto de los Bordones. Here, similar questions were raised. For a more reliable generalization about the major concerns of the future users it would however be necessary to study the meeting minutes of a sample of communities.

During the planning stage the number of households accepting the designed supply in Alto de los Idolos remained 76 (Out of approximately 170 households). New users only joined when the construction was about to start (14 November 1977).

The first phase of the water supply scheme was completed in 1978. The direct community contribution to the project in cash and kind amounted to

nearly 25% of the total cost. In subsequent assemblies between the initiation of the works and October 1979, when all the works including the filters were completed, the number of contributors increased to 173 households. The increase was the greatest during the first period of the construction when the distribution net was built.
Scepticism seemed to be the main reason for this delay in acceptance: people joined when they saw that the plans were actually going to be implemented.
Although the majority of the people of Alto de los Idolos now have access to safe water, not all have joined the project. Fifteen households have not taken a connection because - according to other villagers - they are satisfied with their private source.
In one case, the desired connection gave technical problems.
Because of the high altitude of the house no water could reach during the peak hours. The owner has however accepted that the water only reaches him at the hours of low demand. He pays the same water rates as the other households.

A part of the design covering the hamlet of Alto Granada has not yet been realized. When their local leader died, the people lost their enthusiasm and did not build their part of the distribution net. This caused no problems for the other hamlets as Alto Granada is situated at the very end of the net. However, they now want to join. For this purpose a general assembly will be called. At this meeting, I.N.S. expects some objections from the present users of the scheme against the expansion, based on concerns about quantity of water available and equal contributions to the construction costs of the whole scheme. Because the contract between I.N.S. and Alto de los Idolos is still a contract of the old style (see 2.2.2) the local development committee has the power to sanction such objections. The final outcome will depend on the negotiations about the financing of the expansion and its consequences for both Alto Granada and the users of the present scheme.

Just before the supply was completed, the health staff investigated the feelings towards the project among 162 households. The major reason for

joining cited was time gains (81.8%). Health improvements were named by 10.7% and ease of cleansing by 6.9%. One household mentioned the increased value of the house.

The relatively low appreciation of health benefits is remarkable because the information activities in the planning stage included some health education in the local schools and at the general assemblies. This may be a consequence of the I.N.S. approach to health education. The information side is emphasized as part of the motivation for taking a house connection. Much less attention is paid to the identification and discussion of behaviour patterns necessary for an optimal environmental health.

4.2.2 Design and Construction

The Alto de los Idolos project area is situated in the foothills of the Andes. This facilitated the design of a full gravity scheme. The water is taken from Guadualito Creek at a point about four meters higher than the slow sand filtration treatment station. From there it is fed into a storage tank and further distributed by gravity. The distribution system of 36 kilometers of mains and piping with 173 private (mostly yard) connections and 3 public taps in the school compounds.
The system is designed to supply 1700 inhabitants with potable water by 1998. The project area in 1978 counted 1150 people. The daily per capita consumption was set at 150 l.

Table 11 Technical Specifications Treatment Plant Alto de los Idolos

Plain Sedimentation Tank	0.90 x 1.50 x 3.60 m
Slow Sand Filters	2 x 40 m^2; v = 0.13 m/hr
Clear Well	80 m^3
Chlorinator	Manual control, solution-fed type

The filters were initially designed as upflow filters. From the operational point of view this is an advantageous system as cleaning of the filters can easily be achieved by simply reversing the flow of filtration at the time of cleaning.
However, to avoid repollution of the treated water it is necessary to cover the filters. At present the filters are not covered.

Bacteriological monitoring of the filter performance started in November of 1979. The samples were collected by the Huila Branch of the R.B.S. Division and were analysed at the Neiva laboratory of the Huila Health Service with the following results: The M.P.N. index of Coli content as measured at the inlet of the filters showed a high total coliform count in the raw water.
Although the efficiency of the filters was more than 80% in reducing the M.P.N. index of total coliforum in 3 out of the 4 samples collected, the bacteriological quality was not satisfactory. It was therefore decided to adapt one of the two filters into a downflow slow sand filter and make a comparative study of the operational and bacteriological performance of up-flow and down-flow slow sand filtration. The programme of investigations will comprise the monthly mointoring of pH, temperature, turbidity, color, iron and E. Coli at the inlet and the outlet of the filters. The research programme will last one year, starting from June 1981.

Preliminary results indicate that the performance of the downflow filter is markedly better than that of the upflow filter. Bacteriological efficiency of the downflow filter ranges from 85-95%, while turbidity and color are usually reduced below 1 unit and iron below 0.1 mg/l. The upflow filter presently seems not capable of removing more than 80-90% of bacteriological pollution. The physico-chemical efficiency is also considerably lower than the downflow filter.

However the limited number of, especially bacteriological, samples taken does not yet allow for firm statements with regard to the performance of either type of filtration.

Chlorine dosing equipment is located at the outlet of the filters. It consists of a 250 lt. asbestos-cement container which serves as a floating platform hypochlorinator. 2mg. per liter of available chlorine is added to reach a residual chlorine content of 0.2 mg./liter. The operator checks this dose by counting the number of drops that the pastic tube delivers in one minute.

The construction of the water supply scheme is executed by a contractor under the supervision of the promotor. The contractor in consultation with the promotor and the labour committee organizes the workplan and decides on the number of unskilled labourers required. According to the the contract the community had to contribute free labour and local materials to a total value of $ 558,632.00. In reality, the community contributions had a value of $ 974,540.00. Each household contributed 56 days of voluntary unskilled labour: excavation, transport, screening of sand and gravel, mixing of concrete etc. More than 36 km. of trenches for the distribution net and the house connections were dug. Each household worked one day a week, always on the same day. Allocation was based on the alphabetical order of the family name. The scheme of work was put up at the school. When a particular family could not work on the allotted day, they could either pay the community development committee for a replacement or make up for it later.

Nearly all household provided their own labour. Only 5 households sent paid labourers because they were too old. Every user-household paid the same cash and labour contribution. But the users whose house is farther than 50 m. from the main distribution net have to pay thermselves for the additional piping. The digging of these connection trenches was part of the communal labour. The work continued during the harvesting season. The contractor is further responsible for the quality of the work and also the on-the-job training of the operator. The operator-to-be is during the construction of the scheme employed as a labourer.

Households joining the scheme after the completion of the construction will have to pay an additional amount of $ 17,000 to compensate for the missed share in the construction (56 days at a value of $ 200, local materials and

cash for the connection).This amount can be paid in terms, in arrangement with the administrative committee. The payment needs not be completed before the tap is installed.

Table 12 Construction Cost of Slow Sand Filters Only

Source	Colombian $	U.S. $	%
I.R.C.	465,737	11,089	52.8
I.N.S.	153,329	3,651	17.4
Community	263,250	6,267	29.8
TOTAL	882,316	21,007	100.00

This table does not include the cost of designing of the slow sand filter.

A systematic monitoring programme has been undertaken by the Huila Branch of the Rural Basic Sanitation Division and the Huila Health Service for each of the two units. The parameters for performance temperature, are: pH, turbidity, colour, iron, bacteriological quality and residual chlorine.

4.2.3 Operation, Maintenance and Administration

The scheme was completed on 6 October 1979. The ceremonial transfer of the works took place on 20 October 1979.
Before the transfer of the works the users elected their representative as treasurer on the administrative committee. The president and secretary were appointed on account of their function as member of the community development committee and I.N.S. promotor respectively. In the case of Alto de los Idolos, the vice-president of the community development committee is also the president of the administrative committee.

This committee is responsible for the collection of the monthly water payments. The definite rate was fixed at $ 57 per household per month. New members, who have not yet got water, pay half this amount on top of their installments for their share in the construction costs.

Payment is due every other month on the first Sunday of that month. Ten households have more than one tap. For each additional tap $ 5 is added to the monthly rate. At the time no household was behind in payment, and some have paid in advance, for up to one year. This, and the increase of users since the completion has led to a positive saldo for the administrative committee').
Formally, the committee can use such money as a loan for other development activities. In Alto de los Idolos this is presently planned (ref. 4.3.2).

For the operation of the service, the administrative committee appointed a local operator. He was selected on the basis of his technical capacities, as shown during the construction of the slow sand filters under the supervision of the contractor.
Another criterion was his sense of responsibility, as demonstrated during his term as president in the previous community development committee. He is part-time employed by the committee at a monthly salary of $ 800.

He was trained on-the-job by the contractor. His responsibilities include the daily operation and maintenance of the plant, esp. regular inspection and cleaning of intake and sedimentation chamber, checking the rate of filtration and chlorine addition. Repairs and extensions to te distribution system are also executed by the operator.

') The water rate is based on the actual and estimated costs of the scheme (repayment of loan for part of the construction costs; operation and maintenance costs, e.g. chlorine; administration costs, e.g. salary operator and reserves).
When more users join after completion and/or the costs of exploitation are lower, the supply can function at a small profit.

To get an idea of the satisfaction of the users with the present service three families living at the end of the distribution net were interviewed. If there would be any supply problems these families would supposedly notice them first. In the beginning the supply occasionally did not fuction but this was only during a few days. Now when the supply is cut off for some reason the population is informed in advance so they can store some water. All households were quite satisfied with the service and thought the rates fair.

4.3 Socio-Economic Consequences

4.3.1 Public Health Study

In September-October 1979, just before the completion of the safe drinking water supply a team of the provincial health department investigated the water-related health conditions of the project area. This study was repeated in May-June 1980.

The health statistics of the area are kept by the municipal health post. The village of origin of the patients reporting to the post for their diseases is not registered, however. The health statistics for the project area could therefore not be separated from those for the other villages in the municipality.
In addition, the attendance of the health post as reported by the households themselves is not universal: of 160 households interviewed 79% said they consulted the doctor at the centre, while 8% went to a herbalist and 13% to the chemist.

Instead of the recorded diseases at the health centre other variables were therefore used:

(a) the reported incidence of diseases for all members of the project households between Januari and September 1979.
(b) the incidence of intestinal parasites for a 50% sample of all households.
(c) reported environmental sanitation conditions.
(d) water quality samples at various points in the supply.

The reported incidence of diseases has already been described in section 4.1.2. There was no need to take seasonal variation into account as there is no outspoken wet and dry season in Alto de los Idolos, as is the case in Puerto Asís.

The incidence of intestinal parasites was found to be very high: only 7 out of 400 people, or 1.8% had no parasites.
Many of those infected had more than one type of parasite, both protozoas and helminths (see table 13).

These data contrast sharply with the number of parasitic infections reported by the people themselves (13 cases).

Table 13 Prevalence of Protozoas and Helminths in the Project Area before Treating the Drinking water (September 1979)

Total Number of Infected Persons	Number of persons infected with different types of parasites						
	Protozoa				Helminths		
	E. Histo litica	E. Coli	Giardia Lamblia	Tricho Monas	Ascaris	Tricoce falos	Uncina Rias
393	256	216	81	2	286	231	44

Source: Ministerio de Salud, Servicio Seccional del Huila, El Tratamiento de Aguas en una Zona Rural de San Jose de Isnos y sus Implicaciones en Salud, Seccion de Epidemiologia, Servicio Salud Huila, Division Saneamiento Ambiental, 1979-1980

Of the 393 infected people, 272 or 69% were treated with various types of drugs. The remaining 31% were not treated because of contra-indications (pregnancy, below 1 year). After the treatment the stool examinations were repeated to find out in how far the study group had been successfully dewormed. The respondence to the second examination was more limited as not all people had taken their drugs. Many of them preferred to use traditional medicines. Thus, only 183 patients were reexamined.
Of these, 64 or 35% were found to be free of parasites, while 119 or 65% were still infected.

After the completion of the water supply these people were reexamined again. Out of 180 tests, 65 or 36.1% were found to be negative, while 115, or 63.9% contained protozoas and helminths (see table 14).

The 65 people found to be free of parasites constitute 24% of those given drugs 16% of the total infected sample. Thus the minimum gain form the worm treatment and water improvement is on effective absence of parasitism among 16% of the population 6 months after treatment. Without those actions only 1.8% had no parasites.

Table 14 Prevalence of Protozoas and Helminths after treating the water and the infected persons (April-May 1980)

Total Number of Infected Persons	Number of persons infected according to type of parasite						
	Protozoa				Helminths		
	E. Histo Litica	E. Coli	Giardia Lamblia	Tricho Monas	Ascaris	Tricoce Falos	Uncina Rias
115	74	60	37	-	21	15	2

Source: Ministerio de Salud, Servicio Seccional del Huila, Seccion de Epidemilogia, Division Saneamiento Ambiental, forthcoming report.

The division plans to repeat the same study to measure the long-term effects. Publication of the final results in a journal article is also foreseen.

The testing of the water quality was carried out three times during the survey : at the completion of the distribution net without chlorination; with chlorination only, and with filtration and chlorination. The samples were taken at three points: at the inlet of the storage tank, at the outlet and at a household in Salen, the first hamlet on the net.
The results are summarized in table 15.

table 15 Number of coliforms in 100 cc samples at various points in the scheme, without and with water treatment (October 1979)

	number of total coliforms		
	no treatment	chlorination only	filtration + chlorination
inlet tank	2400 (no E-coli isolated)	210 (no E-coli isolated)	330
outlet tank after chlorination	460 (E-coli pos.)	23 (no E-coli isolated)	0
household	460 (E-coli pos.)	40 (E-coli pos.)	(E-coli pos.)

These initial results show that in all cases E-coli were found at the time the water had reached the household. The subsequent treatment activities show an improvement of the water quality, but contamination still takes place after filtration and chlorination.

The preliminary results of the impact of filtered water and treatment of worm infestation showed that a considerable improvement occurred in those who where given medicines and returned for reexamination. This implies that improvement of drinking water contributes to a better community health. However, other sources of infection besides drinking water exist in the community. These will continue to be a risk. The presence of such sources of pollution is evident from the continued presence of E-coli in the drinking water of a selected household. The provision of filtered drinking water and treatment possibilities alone will therefore not be enough to realize an optimal decrease of faecal-oral and parasitic diseases. For a lasting and maximal public health impact other transmission routes must also be blocked. Most of these routes can be cut off by a change in individual hygiene behaviour and self-improvement of household conditions. Here, health education can play an important role.

In the last few years Colombia has set up a suitable primary health care system at village level. This is not yet utilized by the rural water supply and sanitation programme. The local health promotor in Alto de los Idolos was for instance not involved in the health education programme, the quality testing and the health study. Moreover, she herself did not trust the effectiveness of the slow sand filtration and still advised people to boil their drinking water. It was therefore suggested to the project staff to arrange with the operator that he would show her around the plant, explain the process and demonstrate the water quality sampling.

The local health promotor would also be a suitable person for linking another, more participatory and long-term health education programme to rural water supply projects.

One responsibility in this respect would be the improvement of other environmental sanitation conditions in the individual households. At present, the latrinization of the area is already part of her duty under the MACS programme (Modulo de Ampliación de Cobertura en Salud). The main problem is however the supply of water seal latrines (with raised seat). In Alto de los Idolos, 6 such latrines have now been installed (in 1979 one), but many more people would like to get one. The people who do not yet have a latrine reject other solutions which they can construct with local means (dry latrines).

Another condition demanding action is the disposal of sullage. With the provision of a continuous piped water supply, the problem of its disposal is also introduced. Since the compounds are relatively scattered, seepage pits or soakaways would provide a good solution. Sullage water may during the dry season also be diverted to irrigate kitchen gardens. Stimulated by local health promotor, the villagers will themselves be able to improve their own environmental sanitation conditions. Little is yet done in this area.

Even more importantly, the local health worker can identify local knowledge on causes, prevention and treatment of water related diseases, behavioural patterns that need changing and local constraints to improvements. She can also more easily base such an approach on a direct dialogue with the households. In Alto de los Idolos, the health promotor only used home visits but in Salto de los Bordones her colleague had also formed a women's club for house improvements, which 10% of the households had already joined. This woman also planned to attune her educational activities to the water supply project I.N.S. has started in her area.
Topics she planned to cover were the importance of piped water, the installation of latrines and the digging of composting trenches for solid wastes. This adaptation of her work to the ongoing project was however her own initiative; she had as yet no contacts with I.N.S.

The above field experiences support the earlier conclusion that more cooperation between I.N.S. and the primary health workers is desirable (see 2.4.2). In her turn the health service can make use of the institutionalization and two-way communication of the water programme. Meetings can be held with the local health workers, the promotor and local representative groups such as the community development committee, the administrative committee, women's club and heads of households society. At such meetings, the expert and local knowledge can be compared, local objectives and target groups identified, a plan of action formulated and the progress evaluated periodically.
In Alto de los Idolos, for instance, a joint discussion of the results of the health study could be a good starting point').

') An example of what such a discussion can lead can be illustrated by the village tree plantation. At a previous visit to the project the IRC engineer had remarked that the quality tests of the water samples taken at the intake showed a high pollution for a mountain stream. The I.N.S. staff attributed this to the presence of cattle near the stream. This problem was discussed with the community development committee and they decided to plant trees near the intake to make the cattle drink downstream and further upstream. In the autumn of 1980 800 trees were planted and were seen to be doing well. About 500 m of the brook upstream of the intake was thus protected.

4.3.2 Other Consequences

The major benefit pursued in the SSF project of Alto de los Idolos is an improvement in public health. Other spin-offs can contribute indirectly to this effect. An improvement in bathing facilities for instance can improve personal hygiene. It is therefore noteworthy that about twenty households have already installed a bath or shower since the construction of the supply.

The use of the water for vegetable growing is rarer. The health promotor has established a vegetable garden since the completion of the supply. But she and all other women we spoke with said this was an exception. Still, nutrition problems do occur in the area. Asked for the reasons the women said there was no shortage of seeds but they lacked the time for its cultivation. In Salto de Bordones the health worker and women interviewed said the same, but there there was also a problem of shortage of land for some households.

Another socio-economic effect of the new supply are the time and energy gains. These vary for each household, depending of the type and distance of the traditional source. The women we spoke with all reported considerable time gains, from 50 minutes to 1½ hours per day. In the summer months, long periods of collection were the rule. The benefit observed by them was more social in the sense of quality of life than economical. Their main reaction was that the supply made life much easier.
A more systematic study would have been necessary to get an idea of the overall gains in time and energy and the productive use of these gains.

A negative economic effect a rural supply may have is land speculation. In Salto de Bordones, a household had migrated to the village from the mountains because of its school and the planned water supply. They had purchased a small plot of 10 by 12 metres. Since the water supply was initiated, the price of the land in the village had gone up considerably. In that particular village only one farmer used his 40 ha for land speculation, but in the other villages of the project the same was said to occur. Yet a flat contribution will be paid by all in this project ($ 832 as downpayment and $ 230 as a monthly rate).

A possible long term economic effect of the project in Alto de los Idolos is the development of its tourist potential. In 1973 the Colombian government built a motel and a centre of Colombian culture near the archeological park at a cost of $ 3,000,000. With the present project this motel has now got a safe and reliable water supply.

The project has also stimulated the capacity of the community for self-development. A highly felt local need is the improvement of the school in Alto de los Idolos. For this purpose fund-raising activities have been organized in the past. Some urgent repairs were completed. The real goal is however the replacement of the wooden building by a brick and concrete one, and the installation of a sanitary block.

Some building materials have been purchased but the money for a contractor was lacking. The administrative committee therefore decided to approve a loan to the community development committee to rebuild the school. The loan can be financed from the (slight) profits the administrative committee is making on the running of the water supply scheme. The school was completed in January 1982.

Alto de los Idolos Water Treatment Plant

5. An Alternative Rural Water Supply Programme: CAFEFED

Another large rural water supply programme is carried out by the National Federation of Coffee growers in Colombia. In 1979 this organization had constructed 2106 supplies serving 800,000 people in the coffee production areas. The total population in these areas is around two million.
The planning, implementation and operation of this programme was discussed with the chief engineer and the sociologist at the Planning Office of the Coffee Federation in Bogotá.

5.1 Organizational Characteristics

The national federation of coffee growers was set up by the Colombian government. Its main purpose is the marketing of the coffee and the protection of the infrastructure. The supply of water is an important part of this infrastructure, as it is needed for the production and the processing of the coffee.
It is a master organization which any farmer can join. Most coffee growers in Colombia are small-scale farmers: 51.8% of them have less than 5 ha of land. There is no formal membership of the organization, but the issue of identification cards has recently started. The federation owns the largest bank of Colombia.

The organization is run at the provincial level by departmental committees. There is also a central committee, but this has no decision power. The departmental committees are elected through general assemblies at municipality level. Each municipality has to produce a minimum amount of coffee to be considered a coffee growing area. The number of representatives which an area can elect for the departmental committee depends on the productivity of the area: the more coffee, the more representatives. Our informants knew no details however on the formation and composition of the departmental committees. The budget is also distributed according to productivity: a department that produces 50% of the total coffee production gets 50% of the budget for allocation by its departmental committee.

The funds of the federation originate from various taxes, including a government tax on exported coffee. They are used to finance credit and service programmes (extension, education, water supply etc.). The departmental committees make the policy on type and allocation of these programmes.
In 1974-1978, when coffee prices were high, the goverment tried to intervene in the management of the federation and pressure for the nationalization of the increased coffee production. The federation has however successfully defended its independent status and decentralized structure.

5.2. Rural Water Supply Programme for Coffee Areas

5.2.1 Planning and Construction

Piped water supply systems are part of the service programme meant to increase the productivity of the coffee areas. The programmes are developed and implemented at the departmental level. For this purpose each departmental committee employs one or more water engineers. Sometimes they also cooperate with I.N.S. In such a case, the federation committee allocates the project, but thereafter I.N.S. takes over, following the regular I.N.S. procedures. Coordination with I.N.S. is not always optimal, however. When a community requests a supply at both organizations, overlap in the initial stages of development can occur.
When a joint project is undertaken, the departmental committee of the coffee federation pays 50% of the costs, I.N.S. 20% and the communities served 30%. With the reorganization of the national project allocation policy, I.N.S. no longer has enough money for these projects, unless it gets some funds from the provincial government (see section 2.1).
Present government policy is that coffee areas pay their own services. Farmers in the more marginal coffee areas receive subsidies to change to subsistance crops and other cash crops, to concentrate the coffee production in the high potential areas only.

For the design and planning of water supply projects under their own control, the engineers of the federation can call in the assistance of the engineering division at the central planning office. This division has an advisory task in technical and organizational matters. Until now, however, only technical advice has been asked.

For the allocation of a project, the community or municipal committee can send a request to the departmental committee. This committee decides if a technical and financial feasibility study will be carried out in the area. There are no rules on the regional distribution of projects within the department.The preliminary allocation depends on the size of the budget of the particular departmental committee, the economic capacity of the requesting area and on political factors (e.g. home region of a member). There are many more requests than can be handled.

With regard to the choice of technology, gravity supplies are preferred wherever possible. A major problem is the universal diminishing of water sources. The national congress of the departmental committees of last year asked for a national government policy on source protection and afforestation, but no action has yet been taken.
The scope of the projects varies from a school water supply to a multi-village system. All households, both coffee farms and others within reach of the scheme can get a house connection.

When the project has been allocated, the participating communities have to pay their share (30%) of the construction costs to the departmental committee. This is mostly in cash only. During the coffee-boom this was no problem, but now it is more difficult. The size of the contributions of individual user households is sometimes determined by the committee and sometimes by the communities themselves. Payment is according to the economic capacity of the household; as indicator the cadastral value of the land is mostly used.
Payment in the form of voluntary labour and local materials, a normal procedure in the I.N.S. programme, is less common in federation projects. Only in small and simple schemes voluntary labour is sometimes used. The

actual decision on the use of voluntary or contract labour rests with the departmental committee. It was not known what criteria they apply.

When voluntary labour is used, it is organized by either the agricultural extension workers or technicians from the engineering section. Both types of manpower are employed by the departmental federation committee.

The communities do not sign a formal contract for the construction and management of their supply. The decision to construct the scheme and pay 30% of its capital costs is taken and registered by a general users assembly.

The programme serves a productive rather than a health goal. No health education is therefore included in the subsequent phases of a project. Recently the federation has however become involved in the primary health care service of the coffee regions, in particular in the training and employment of rural health promotors. In future, a linkage between these workers and the rural water supply programme might be possible through a formal involvement of women in the operation and maintenance of the schemes.

5.3. Service Management

When the system has been completed it is either managed by the departmental committee or turned over to the communities it serves. In both cases operation and maintenance problems occur. Once the communities have paid their share in the construction costs, the local project organization disintegrates. The committees therefore prefer the communities to own the supply so that they can solve their own problems. There are no combined management schemes as in the I.N.S. programme; neither are they considered.

In the large area schemes in particular, operations and maintenance are problematic, especially in the growing season. At that time there is a large demand for water.

This causes many inter-village and household conflicts.
In case of serious conflicts, the people can apply to the departmental committee for intervention. Special regulations on valve operation exist, but are not always kept up.

The household water rates are determined by the users' assembly when the system is owned by the community. Otherwise, the departmental committee decides. Where meters are used, a progressive rate is applied, based on the premise that people who consume more, also produce and earn more.
Where no water meters are installed, weighted rates are generally used. These are based on the cadastral value of the land.

The diminishing capacity of the water sources rather than frequent breakdowns are the major cause of an irregular and inadequate service. No operation and maintenance data however were available. All operation and maintenance activities are carried out at the departmental level. At the local level the community is responsible, but they receive no training or regular guidance.
The central planning office of the CAFEFED would like to be more involved in the development of a better organizational set-up and in the evaluation of the existing supplies. This is very difficult, as the departmental committees fear outside interference and centralization. At present the planning office considers the proposal of a manual on supply management and a training course. Their funding will be a problem, however. The national committee of the federation can approve the proposal but it cannot allocate any funds. Only the coffee growers congress (of all departmental committees) can allocate funds.

Summary and Conclusions

6.1. Relationship SSF Project-National Programme

The SSF projects in Colombia are part of a national rural water supply and sanitation programme executed by the National Institute of Health (I.N.S.). This programme has functioned since 1968. It is characterized by a high degree of community participation. A standardized procedure is followed, which is already well documented. Because of the innovative role of the Colombian programme, part of the report is dedicated to the supplementaiton of recent information on the general procedures.
The first part of the report (a) describes recent changes (b) clarifies some details (c) analyses the educational approach including health education, (d) describes the training system and (e) gives the monitoring system and some recent results of the present participatory management system of the agency.

The second part of the report (a) deals with the application of the general procedures in the SSF projects, (b) summarizes the design, construction and performance of the filters, and (c) gives the possible positive and negative consequences of the project for the people.

New experiences gained in the SSF projects concern mainly the technology of slow sand filtration, including its operation by local semi-skilled personnel, health education and health study. These experiences will be shared with technical, social and possibly health personnel in other parts of the country. For this purpose, I.N.S. plans to organize 4 regional seminars. In addition, it will host a seminar for other Latin American countries in 1982.

Another large-scale rural water supply programme in Colombia is the programme of the National Federation of Coffee growers. This programme is characterized by a much lower degree of participation and education. It would be interesting to carry out a comparative evaluation of the two

programmes, to see what difference community participation and education makes in the success of rural water supply projects. No documentaion exists on the CAFEFED programme.

6.2. Community Participation Procedures

I.N.S. no longer directly allocates projects to communities that have submitted a request. In order to qualify for preliminary allocation, communities must now fall under larger development programmes. Major programmes are PAN (for communities with the worst health conditions) and DRI (an agricultural development programme for high potential areas).

After the preliminary project allocation the technical and socioeconomic feasibility is determined. The socio-economic study includes existing environmental sanitation conditions and willingness and capacity of the households to contribute to the project. The preliminary design, including estimated construction costs in cash and kind for user households and estimated user rates, is presented to a users' assembly. For the construction of the water supply scheme a contract is made up between the junta de acción comunal (JAC), an elected community development committee which acts as the local representative of the community, and I.N.S. This contract is countersigned by all heads of household participating in the scheme.

All unskilled labour and local materials are donated by the future users. They also pay part of the construction costs, in the form of a community loan and sometimes a household deposit. The terms of the loan depend on the conomic conditions as apparent from the socio-economic study. The value of local contributions to construction can vary from 5% to over 25% of the costs, depending on the type of works. The loan is paid back from the user rates. There are great differences between the communities in the size of the household contributions in cash and kind.

In general, users pay a flat rate. This rate covers operation and maintenance costs, loan repayment and reserves. When the promotor finds a great variation in capacity to contribute he may propose a weighted rate.

This is still rare, however. The major constraint is the identification of valid and acceptable indicators of payment capacity.

Voluntary labour is only given by user households. Each household sends one adult member on a fixed day of the week. This facilitates a smooth labour organization and limits the negative effect of labour withdrawal from local agriculture.

Once completed the system is managed by an administrative committee. This consists of a member of the JAC, a user representative and an I.N.S. promotor. The continued I.N.S. supervision is a condition for a successful management. A better coverage by the mobile promotors and better training of the committees must lead to a better administration, especially with regard to rate payment.

6.3. Community Education and Training

A variety of communication media and methods are used in the participation and education programme. In the initial stages, personal meetings of the promotor with formal and informal leaders and household visits for the community study serve to investigate felt needs, conditions and interest. Mass meetings, films and slide shows are used to motivate and inform the community. Audiences get frequent opportunities for feedback.

Environmental health education is part of the educational programme. But it gets little emphasis, especially when no water treatment is included in the scheme. Mass media (films, slides) are used for general messages. It is unlikely that this will lead to general and lasting behavioral changes in the field of environmental sanitation. For this to happen, a longer lasting, locally specific programme with participation of the community is necessary. The rural promotors are in the best position to organize and sustain such programmes. At present no link exists at field level between the I.N.S. promotors and the rural (health) promotors. Possibilities of better cooperation are considered. In Huila, the involvement of I.N.S. in the training of the rural health promotors has already been agreed.

The I.N.S. promotors receive a training in applied social sciences and programme tasks. The training is completed over a period of 3½ years, alternated by periods of fieldwork. Selected promotors will be trained as trainers for the administrative committees. These committees are until now trained on-the-job, but their performance is not always satisfactory. A special course has therefore been planned, which will also include health education.

6.4. Evaluation

The performance of the community in construction and management is monitored at sectional and national level. For completed schemes emphasis is on payment and functioning of the system. Short breakdowns (less than 1 month) are not recorded. In all 24 sections an arrear in loan repayment exists. In 9 cases however, the total saldo of the local committees is higher than the total loan arrear. The percentage of non-functioning systems varies from 0,9% to 43%, with an average of nearly 9%. The communities with a pumping system have very high recurrent costs. The average costs per committee vary from $191 to $37758. The data indicate a relationship between local supply problems and community payment problems.

6.5 Slow Sand Filtration Projects

The project in Puerto Asis is unusual in that it concerns a town. Two earlier projects were unsuccessful and the municipal council requested I.N.S. to take over. The town is a business and agricultural centre. Its growth is due to colonization of farmers from other areas and the discovery of oil. The future development mainly depends on an increase in agricultural production, the stimulation of local industries and the growth of the riverport. A basic condition for this development is a safe and reliable water supply.

Previous sources were shallow wells, rainwater and riverwater. In the dry season water vendors supply household water. The type of settlement,

climate and hydrological conditions make proper sanitation very important. If the water supply is to have the desired health impact, an additional sanitation programme may be necessary.

Contrary to the general I.N.S. procedures the user households do not directly participate in the construction of the supply. Reasons are difficult organization, negative attitudes and high unemployment. The council and other formal leaders, including the presidents of the development committees of the various wards represent the households in the planning phases. Major topics were design and financing.

The water supply scheme takes the water from a small river, the Agua Negra. It further consists of an aeration tower, 2 sedimentation tanks, 3 slow sand filters (total area 414 m^2), chlorination and distribution system with metered house connections. The system is intended to provide 70 l. per person day.

For the management of the supply an administrative committee is planned, composed of (a) a representative of the council (b) a representative of the development committees (c) a users' representative and (d) the promotor. The promotor will recruit the most capable construction workers for training as operators and plumbers. The users will pay the connection and meter costs through monthly installments, and a progressive water rate, based on quantity and value of the property.

A negative side effect of the project is the relative loss of income for water vendors. Positive economic effects are the creation of (temporary) employment and a substantial reduction in monthly water costs during the dry season.

The project in Alto de los Idolos was carried out according to the regular I.N.S. procedures. It is a low-income farming area with dispersed settlements. The community consists of 5 hamlets.

Previous water sources were private wells, unprotected springs and streams. Some households had constructed a rudimentary house connection. In the summer, water was brought from the mountains. Over 80% of the households had no excreta disposal facilites.

The supply was requested by the JAC in 1973. This resulted in a feasibility study and design. Of the 168 community households 100 were interested in joining. Of these, 76 signed the community contract. Once the supply was under construction other households joined. Those who joined later and did not contribute the 56 days of free labour paid a compensation in cash.

The project was constructed in two phases. The distribution system was completed in 1978 while treatment (sedimentation, slow sand filters and chlorination) was added in the last quarter of 1979.

The design was adapted to make connection technically possible for all households. Fifteen have not joined, because they have a satisfactory private supply. The hamlet of Alto Granada did initially not join in the project. They now want to join, which can give some problems on financing. In that case, I.N.S. will mediate.

Users pay a flat rate of $57 per month. No household is behind in payment. The books show a positive balance. This will be used to give a loan to the JAC for rebuilding the school of the main village.

The public health impact of the supply in Alto de los Idolos is assessed from (a) reported incidence of water related diseases (b) incidence of intestinal parasites in a 50% population sample, (c) reported environmental sanitation conditions and (d) water quality samples. The stool examinations before the supply showed an infection rate of 98.2%. After treatment and using filtered water, no reinfection occurred. The quality sample show an improvement of water quality. Yet during the survey E-coli were still found at the household tap, showing that contamination from excreta still took place after filtration and chlorination.

The local health worker had not been involved in the water project. Neither had she been directed to adapt her own programme to the project. There is a need for a local follow-up programme in environmental health, especially with regard to waste water and excreta disposal and nutrition. Necessary are (a) cooperation between local health workers and I.N.S. field workers (b) adaptation of the training of health workers (c) coordination between the rural water supply programme and the latrine programme.

Other consequences of the piped supply service in Alto de los Idolos are the installation of some bathing facilites, vegetable gardens, the saving of time and energy for water collection, the development of its tourist potential and the stimulation of self-reliant development (tree planting, school reconstruction). A negative consequence recorded in a nearby project was land speculation.

6.6 An Alternative Rural Programme

A comparable rural water supply programme is the one of the National Federation of Coffee growers in Colombia (CAFEFED). It has built 2106 supplies serving 800.000 people out of a total population of 2 million. Policy making rests with the elected departmental committees. The number of local representatives on the committee and the proportion of the general budget for each department are linked to the coffee productivity.

The departmental committees employ their own engineers. They also cooperate with I.N.S. Some overlap can occur. Their own projects of CAFEFED have a much more limited community participation in the initial phases. After completion, the supply is either managed by the departmental committee or turned over to the communities. There are no combined management schemes as with I.N.S. Neither are community level staff trained. No central operation, maintenance and administration data are available but there are frequent problems.

No link with PHC exists, but with the involvement of the federation in the training of health promotors this will become feasible.

The staff at the central planning office would like to carry out an evaluation of the management of completed schemes. The congress of the departmental committees must approve such a study, but is unlikely to do so for fear of centralization. An outside agency might be more acceptable. Other much needed projects are a manual and training course on supply management.

ANNEX I

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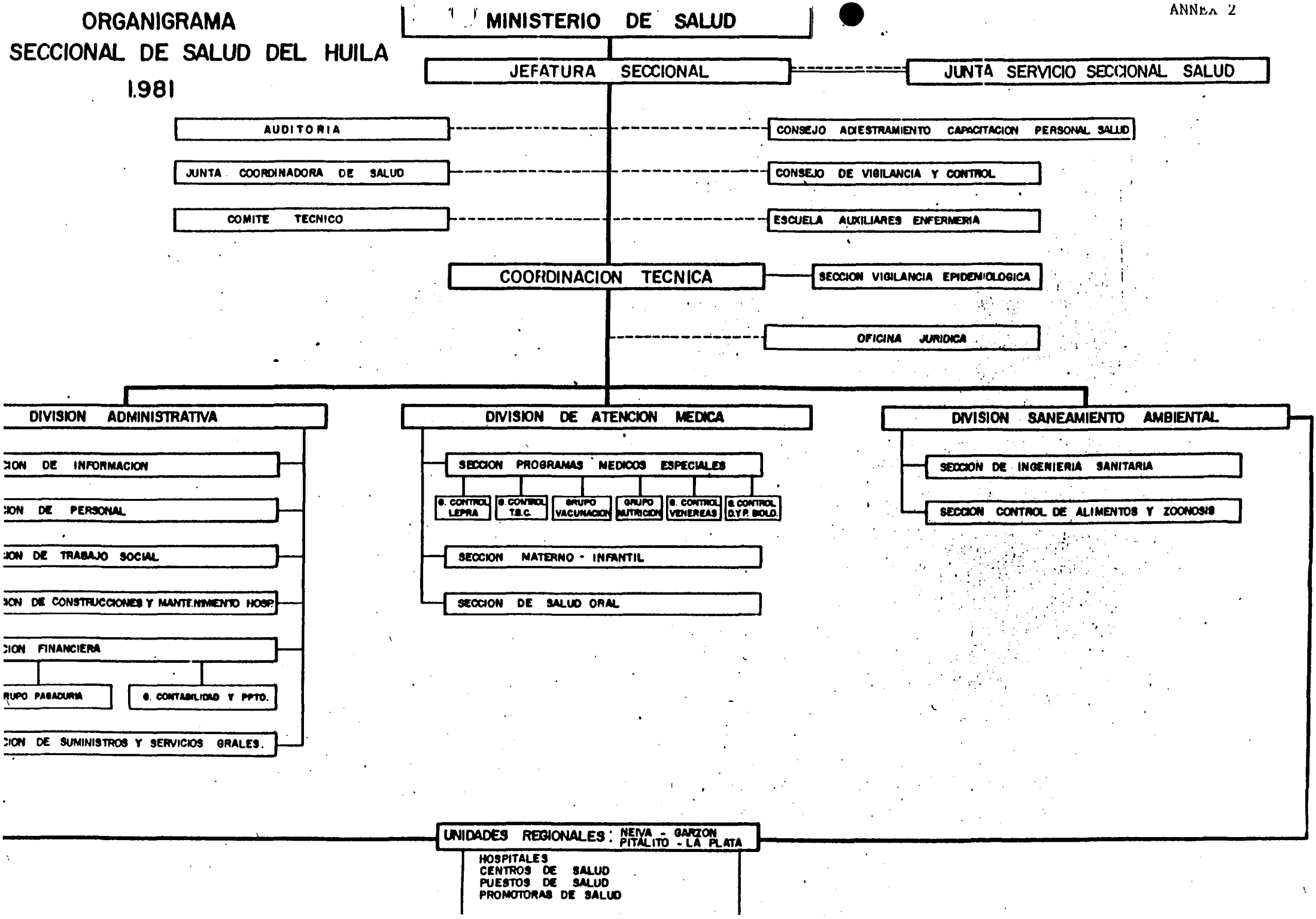
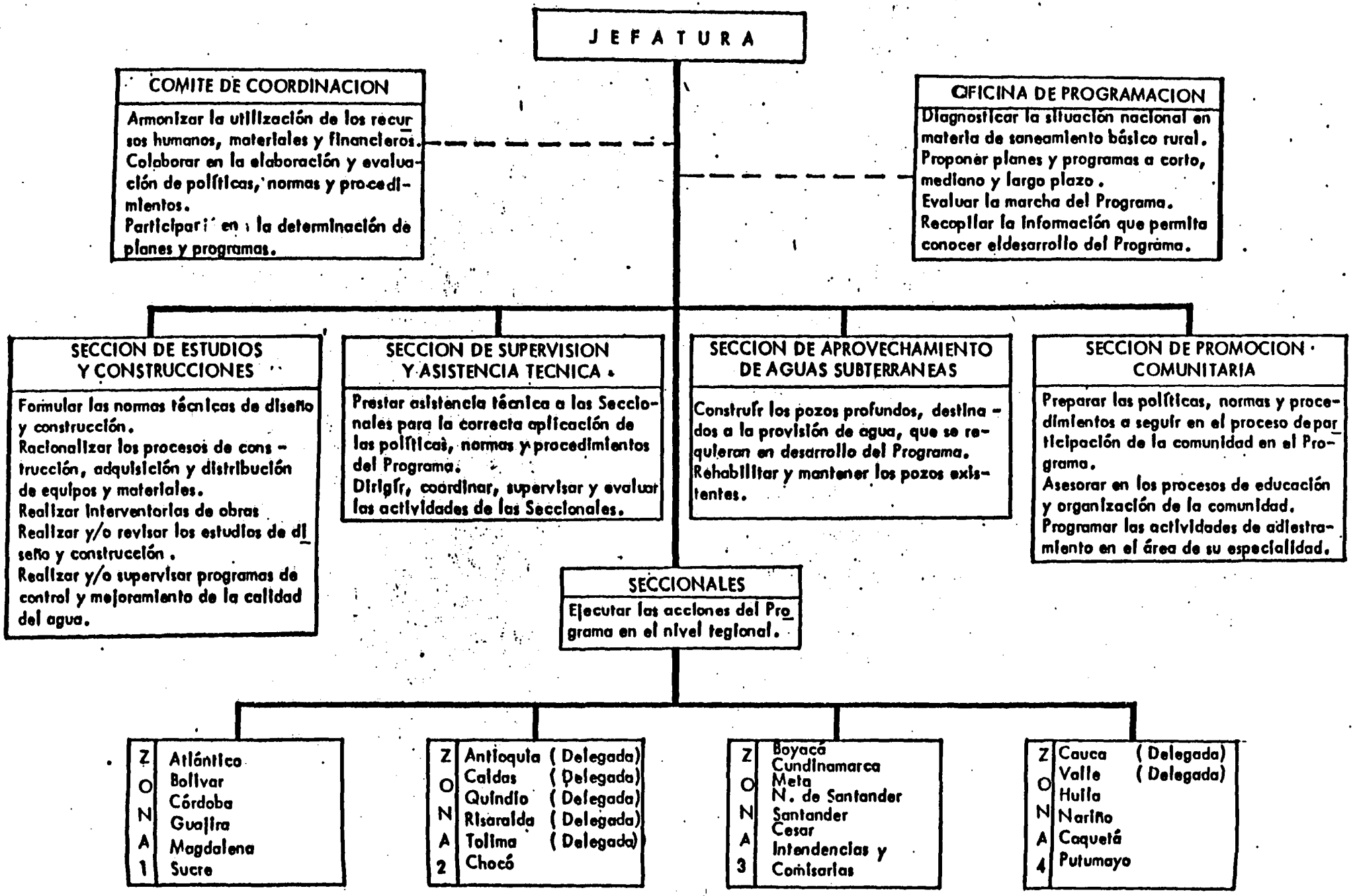
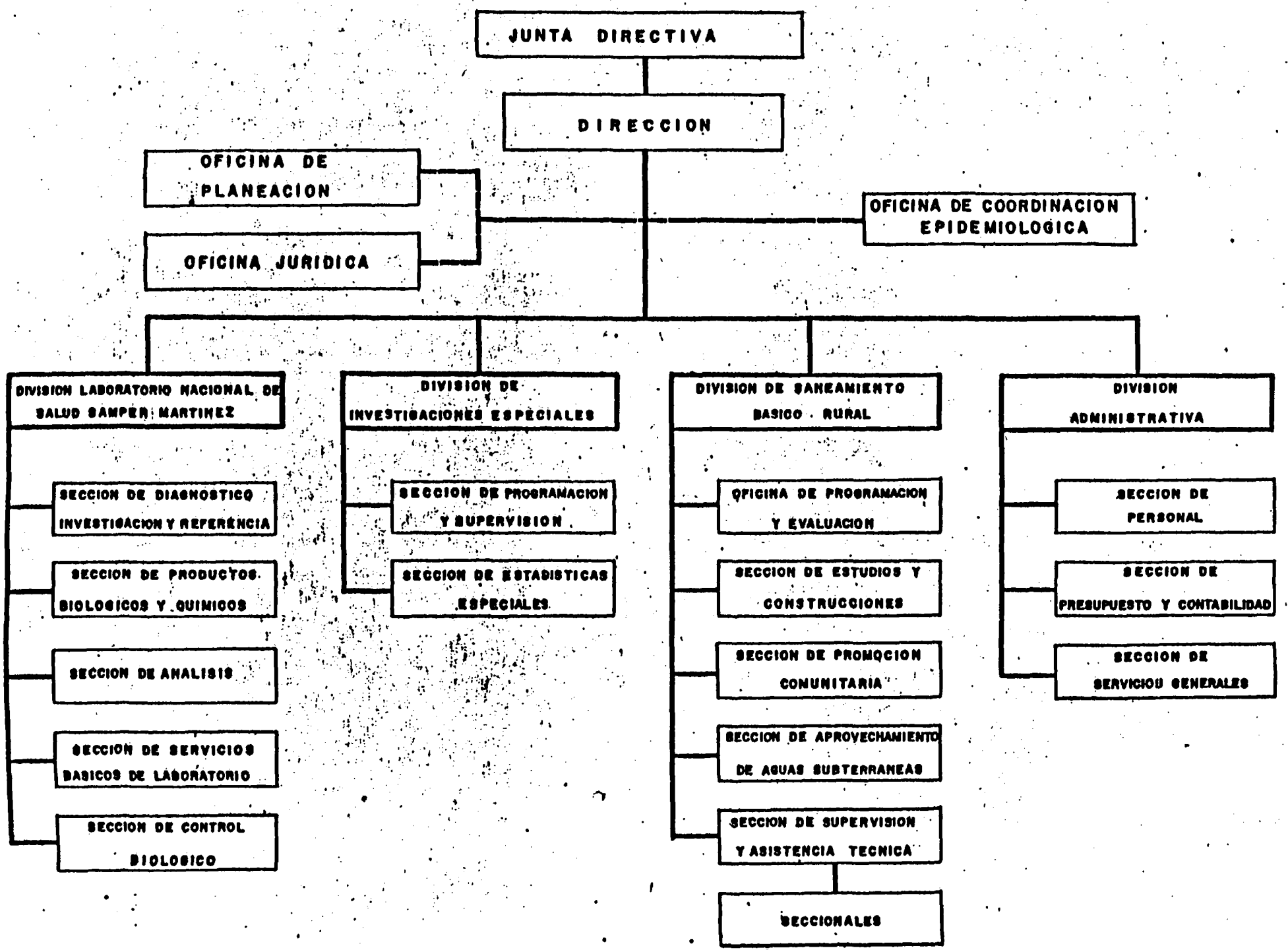
ORGANIGRAMA
SECCIONAL DE SALUD DEL HUILA
1.981



DIVISION DE SANEAMIENTO BASICO RURAL

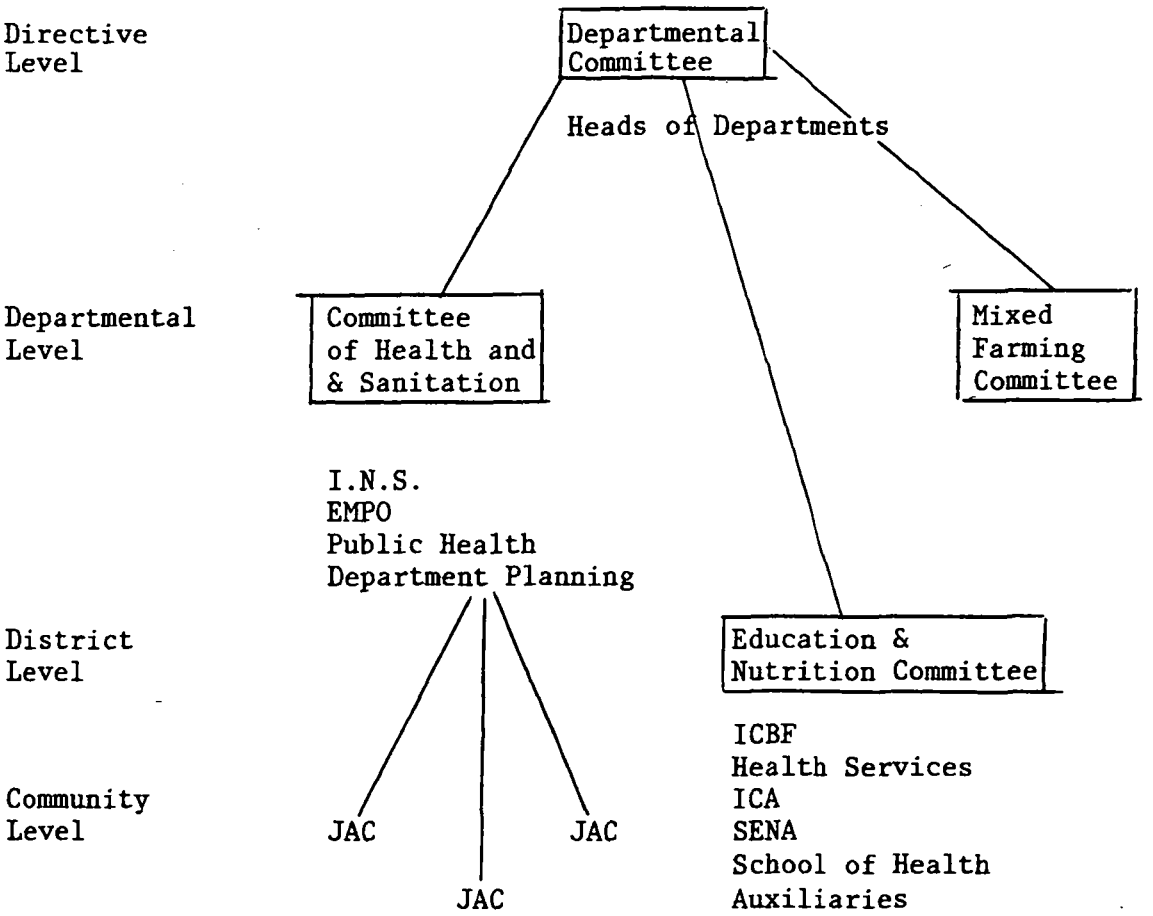
ESTRUCTURA Y FUNCIONES




JUNTA DIRECTIVA
DIRECCION
OFICINA DE PLANEACION
OFICINA JURIDICA
OFICINA DE COORDINACION EPIDEMIOLOGICA
DIVISION LABORATORIO NACIONAL DE SALUD SAMPER MARTINEZ
SECCION DE DIAGNOSTICO INVESTIGACION Y REFERENCIA
SECCION DE PRODUCTOS BIOLOGICOS Y QUIMICOS
SECCION DE ANALISIS
SECCION DE SERVICIOS BASICOS DE LABORATORIO
SECCION DE CONTROL BIOLOGICO
DIVISION DE INVESTIGACIONES ESPECIALES
SECCION DE PROGRAMACION Y SUPERVISION
SECCION DE ESTADISTICAS ESPECIALES
DIVISION DE SANEAMIENTO BASICO RURAL
OFICINA DE PROGRAMACION Y EVALUACION
SECCION DE ESTUDIOS Y CONSTRUCCIONES
SECCION DE PROMOCION COMUNITARIA
SECCION DE APROVECHAMIENTO DE AGUAS SUBTERRANEAS
SECCION DE SUPERVISION Y ASISTENCIA TECNICA
SECCIONALES
DIVISION ADMINISTRATIVA
SECCION DE PERSONAL
SECCION DE PRESUPUESTO Y CONTABILIDAD
SECCION DE SERVICIOU GENERALES

ANNEX 3

ALLOCATION OF PROJECTS UNDER THE PAN PROGRAMME



I.N.S.: Instituto Nacional de Salud

EMPO: Empresa de Obras Sanitarias

ICBF: Instituto Colombiano de Bienastar Familial

ICA: Instituto Colombiano Agropecuniario

SENA: Servicio Nacional de Aprendisaje (Non-formal Education)

MINISTERIO DE SALUD PUBLICA
INSTITUTO NACIONAL DE SALUD

ANNEX 4

DIVISION DE SANEAMIENTO BASICO RURAL

CONTRATO INSTITUTO NACIONAL DE SALUD - COMUNIDAD PARA CONSTRUCCION DE OBRAS DENTRO DEL PROGRAMA NACIONAL DE SANEAMIENTO BASICO RURAL

SECCIONAL DEL HUILA — MUNICIPIO: ISNOS
LOCALIDAD: Alto de los IDOLOS — CLASE DE OBRA: ACUEDUCTO
PRESUPUESTO TOTAL APROXIMADO INCLUYENDO ADMINISTRACION: $ 2.717.864.60

1.0. APORTES DURANTE LA CONSTRUCCION O COSTO DIRECTO TOTAL..... $ 2.516.541.30
1.1 Por el INSTITUTO NACIONAL DE SALUD..... $ 1.757.909.30
1.2 Por la COMUNIDAD ..... $ 558.632.00
1.2.1 En efectivo ..... $
1.2.2 En materiales ..... $ 13.540.00
1.2.3 En mano de obra ..... $ 545.092.00
1.3 Otros aportes ..... $ 200.000.00
1.3.1 CORTURISMO $ 2000.000.00
1.3.2 $

PRESTAMO: (Capital)..... $ 327.372.79 PLAZO: 20 años

Entre los suscritos a saber: HERNANDO GROOT LIEVANO con cédula de ciudadanía Nº 116.075 expedida en Bogotá en su carácter de Director del INSTITUTO NACIONAL DE SALUD, por una parte, y el señor Campo Elías Gómez con cédula de ciudadanía Nº 1.654.908 expedida en San Agustín, en su carácter de Presidente de la Junta de Acción Comunal del Alto de los Idolos, con personería jurídica Nº 045 de fecha Febrero 6 de 1.975, obrando en nombre y representación de la misma, debidamente autorizado para firmar este contrato, según consta en el acta Nº 006 de fecha 25 Abril/76 de la Asamblea General de Vecinos, por otra parte, que en lo sucesivo se llamará la COMUNIDAD han convenido en celebrar el contrato que se expresa en las siguientes cláusulas: PRIMERA: El objeto de este contrato es la construcción del ACUEDUCTO de la localidad del Alto de los Idolos municipio de ISNOS, departamento del Huila. SEGUNDA: El costo Directo Total o valor de la obra a que se refiere la cláusula anterior se ha presesupuestado en la suma de DOS MILLONES QUINIENTOS DIEZ Y SEIS MIL QUINIENTOS CUARENTA Y UN PESOS CON 30/100 ($ 2516.541.30) Mda. Cte. TERCERA: El valor definitivo de la obra se obtendrá mediante acta de liquidación final, la cual hace parte integral de este contrato, en la que se hará relación total de las inversiones efectuadas. Para este efecto cualquier sobre costo por aumento de cantidad de obra o de materiales que exceda la suma mencionada en la Clausula Segunda, será absorvido por el Instituto Nacional de Salud. En caso contrario, el menor costo se aplicará al monto del préstamo concedido a la comunidad. CUARTA: El Instituto Nacional de Salud se compromete a construir, con la colaboración de la comunidad, por administración directa o por medio de contratos y órdenes de trabajo, celebrados con personas idóneas, las obras objeto de este contrato. QUINTA: Durante la construcción, la COMUNIDAD aportará la suma de QUINIENTOS CINCUENTA Y OCHO MIL SEISCIENTOS TREINTA Y DOS PESOS ($558.632.00) M.L. representada en materiales, mano de obra y dinero en efectivo, de acuerdo a los detalles que se expecifican en el encabezamiento del presente contrato. En caso de que la comunidad no suministre la totalidad del aporte a que se obliga en esta cláusula el faltante

será trasladado al valor del préstamo otorgado con el consiguiente reajuste de la cuota de reintegro mensual relacionada en la Cláusula Sexta de este contrato. SEXTA: Por su parte el Instituto Nacional de Salud aportará, a través del Programa de Saneamiento Básico Rural en el Departamento, la suma de: **UN MILON SETECIENTOS CINCUENTA Y SIETE MIL NOVECIENTOS NUEVE PESOS CON30/100 ($ 1'757.909.30/1) M/cte.**

de los cuales la comunidad se obliga a reintegrar al Instituto Nacional de Salud, por conducto del Fondo Rotatorio de Saneamiento Básico Rural del Departamento, la suma de **NOVECIENTOS DIEZ Y NUEVE MIL QUINIENTOS VEINTISEIS PESOS CON40/1CO ($919.526.40)**, por concepto de capital e intereses del 6% anual, en un plazo de **20** años y en **240** cuotas mensuales de: **TRES MIL OCHOCIENTOS TREINTA Y UN PESOS CON 36/100 ($ 3.831.36)** cada una. La COMUNIDAD se obliga, a través de la Junta Administradora que se constituirá a la terminación de la construcción, a efectuar los pagos mensuales en los cinco primeros días de cada mes, a partir del primer mes de haberse dado al servicio la obra y en forma ininterrumpida hasta su completa cancelación. SEPTIMA: La COMUNIDAD se obliga a suministrar los terrenos necesarios para la correcta ejecución de las obras, a garantizar las servidumbres para las mismas y a obtener permisos para el uso de las aguas que se requieran para el sistema, cuestión esta última para la cual contará con la colaboración del personal de Saneamiento Básico Rural del Departamento. OCTAVA: La obra será administrada en todo tiempo, aún después de la cancelación por parte de la comunidad del préstamo efectuado, por una Junta Administradora que se organizará y funcionará conforme a las normas establecidas por el Instituto Nacional de Salud. NOVENA: La cuota familiar por prestación del servicio, será establecida de común acuerdo entre el Instituto Nacional de Salud y la Comunidad y para conocer el monto de la misma se tendrá en cuenta el estudio socio-económico de la comunidad adelantado por el personal de Saneamiento Básico Rural, el monto real del préstamo concedido y los gastos que demande la operación del sistema. DECIMA: El Instituto Nacional de Salud no tendrá responsabilidad por sueldos, jornales, destajos, prestaciones sociales e indemnizaciones del personal no contratado por el Instituto. UNDECIMA: El Instituto Nacional de Salud, para amortizar el total o parte del valor del préstamo concedido a la COMUNIDAD, queda facultado para recibir y formular las cuentas de cobro correspondientes a cualquier auxilio o aporte de carácter nacional, departamental, municipal o de otra entidad que se conceda a la COMUNIDAD con destino a la obra motivo de este contrato. El valor así obtenido por el Instituto Nacional de Salud será abonado a capital con la consiguiente reliquidación de la cuota mensual de amortización del préstamo concedido a la Comunidad. DUODECIMA: En los casos que la Junta Administradora lo solicite por escrito, la Junta de Acción Comunal, como persona jurídica, entablará a nombre de aquella acciones tendientes a favorecer los intereses de la Comunidad representados en el acueducto. DECIMATERCERA: En caso de incumplimiento por parte de la

COMUNIDAD de las obligaciones contractuales, podrá el Instituto Nacional de Salud declarar caducado el presente contrato y a la vez se reserva el derecho de administrar, explotar, o traspasar la obra por el tiempo necesario para asegurar el pago de las sumas de dinero que adeude la COMUNIDAD. DECIMA CUARTA: Para constancia se firma este contrato en original y seis (6) copias, a los **VEINTICINCO DIAS DEL MES DE ABRIL DE 1.976**

POR EL ~~INRES~~ I.N.S.

REPUBLICA DE COLOMBIA Ministerio de Salud Pública DIRECCION

HERNANDO GROOT LIEVANO

POR LA COMUNIDAD:

Junta de Acción Comunal Idolos - Linea Huila

Presidente

TESTIGOS:

Laureano Páez
C.C. Nº 1476091 Sta C

Gabriel Plaza V.
C.C. # 1651919 de Pitalito

CUOTA FAMILIAR:

CALCULO DEFINITIVO

INSTITUTO NACIONAL DE SALUD SECCIONAL HUILA — MUNICIPIO DE: ISNOS
LOCALIDAD : Alto de los IDOLOS — CLASE DE OBRA: ACUEDUCTO
ELABORADO POR: Ing, Guillermo Espitia Gómez — FECHA : VII-15-76

1.0 DATOS GENERALES:

1.1 Número de habitantes	1.120
1.2 Número de inmuebles	200
1.3 Número total de posibles suscriptores	100
1.4 Número de suscriptores para el cálculos(100%)	100

2.0 VALOR DE LA OBRA :

2.1 Edificios y estructuras en concreto, mampostería, otros	$ 402.801.18
2.2 Tubería, redes y accesorios	$ 2.113.740.12
2.3 Maquinaria y equipos	$
2.4 Administración	$ 201.323.30
T O T A L	$ 2.717.864.60

3.0 GASTOS MENSUALES Y CALCULO DE LA CUOTA FAMILIAR		GASTO PARCIAL	CUOTA FAMILIAR Gasto Parcial Nº Suscriptores
3.1 Por administración de la obra		$ 170.00	1.70
3.1.1 Pago empleado (s) pa ra mantenimiento ..	$ 100.00		
3.1.2 Prestaciones sociales empleado (s) ...	$ 40.00		
3.1.3 Seguro de manejo	$ 10.00		
3.1.4 Correspondencia	$		
3.1.5 Transporte	$		
3.1.6 Papelería y útiles de escritorio	$ 20.00		
3.1.7	$		
3.2 Por operación y mantenimiento		$ 510.00	5.10
3.2.1. Combustibles y lubricantes	$		
3.2.2. Energía	$		
3.2.3. Desinfecciónes	$		
3.2.4. Imprevistos	$		
3.3 Reservas por depreciación		$ 900.00	9.00
3.3.1. 0.00049148 X 402.801.18 (valor edificios y estructuras)	$ 197.98	30%	
3.3.2. 0.00133713 X 2'113.740.12 (valor tuberías, redes y accesorios)	$ 2.826.07		
3.3.3. 0.00624740 X (valor maquinaria y equipo)	$		
3.4 Por servicio del préstamo		$ 3.831.36	38.31
Para un préstamo de $527.372.79 a 20 años, la cuota mensual incluyendo interés del 6% anual, corresponde a			
527.372,79 (Prestamo sin interés) X 0.007265 (coeficiente según años de amortización) = $ 3.831.36			
TOTAL GASTOS MENSUALES		$ 5.411.36	54.11
TOTAL CUOTA FAMILIAR			

.0 INGRESOS MENSUALES:

100 X = 55 = $ 5.500.00

(Nº suscriptores) (Cuota Fliar. aproximada)

0 BALANCE:

Gastos mensuales ..... $ 5.411.36

ACTA DE LIQUIDACION Y ENTREGA DE LAS OBRAS DEL PROGRAMA DE SANEAMIENTO BASICO RURAL DEL INSTITUTO NACIONAL DE SALUD

I GENERALIDADES:

SECCIONAL DEL INSTITUTO NACIONAL DE SALUD: HUILA CLASE DE OBRA: ACUEDUCTO Y PLANTA DE TRATAMIENTO
LOCALIDAD: ALTO DE LOS IDOLOS MUNICIPIO: SAN JOSE DE ISNOS

A los 20 días del mes de Octubre de 1.979, se reunieron en esta localidad los funcionarios del Instituto Nacional de Salud GUILLERMO ESPITIA GOMEZ, Ingeniero Jefe de la Seccional del Huila; RAFAEL A. GARCIA T., Ingeniero Auxiliar y JESUS A. PANTOJA Y., Supervisor de Saneamiento Básico Rural, y los representantes de la Junta Directiva de Acción Comunal y de la Junta Administradora del ACUEDUCTO y el Pagador Seccional, el Almacenista Seccional del Instituto, como tambien el Revisor Delegado ante el Instituto, que se indican a continuación: JUAN NASPIRAN - CESAR ROJAS - JAIME PIEDRAHITA TRUJILLO - PANTOJA Y., RAFAEL A. CARDENAS M.

con el objeto de protocolizar la entrega que hace el INSTITUTO NACIONAL DE SALUD (ANTES INPES) a la COMUNIDAD, de la obra indicada en la presente acta:

II PARTES CONSTRUTIVAS

El ACUEDUCTO consta de las siguientes partes:

1º Bocatoma de Fondo
2º Desarenador
3º Conducción en tubería P.V.C. ∅ 6" - 90 metros y ∅ 4" - 710 metros
4º Planta de Tratamiento. Filtro Lento de 80 M2. y cloración.
5º Red de Distribución en tuberías P.V.C. ∅ 4" - 3.064 metros
∅ 3" - 1.380 metros
∅ 2½" - 270 metros
∅ 2" - 3.996 metros
∅ 1½" - 2.364 metros
∅ 1¼" - 4.746 metros
∅ 1" - 3.264 metros
∅ 3/4" - 7.794 metros
TOTAL: 26.878 metros

6º Red domiciliaria en tubería P.V.C. ∅ ½" - 9.014 metros
7º Conexiones Intradomiciliarias con su respectivas cajillas, registros, Arbol y llave terminal en Hierro Galvanizado de 3/8".

Nº Conexiones a viviendas.....: 173

Nº Conexiones a establecimientos educativos....: 3

IV. COSTO DE LA OBRA.

a) COSTO DIRECTO.....	$	3'598.476.39
1. INSTITUTO NACIONAL DE SALUD	$	1'177.005.79
1.1. Préstamo.....	$ 527.372.79	
1.2. Donación.....	$ 649.633.00	
2. COMUNIDAD.....	$	974.540.00
2.1. Inversión directa de obra	$ 974.540.00	
OTROS.....	$	
3.1. Inversión directa de la obra	$	
3.1.1.	$	
3.1.2.	$	
3.1.3.	$	
3.1.4.	$	
3.2. Inversión a través de I.N.S.	$	1'446.930.60
3.2.1. PAN	$ 1'020.030.00	
3.2.2. HOLANDA	$ 426.900.00	
3.2.3.	$	
b) GASTOS DE ADMINISTRACION:		
4. INSTITUTO NACIONAL DE SALUD.....	$	77.660.00
COSTO TOTAL DE LA OBRA	$	3'676.136.39

V. LIQUIDACION DEL PRESTAMO Y DONACION SEGUN CONTRATO.

a) PRESTAMO

Valor pactado en el contrato como aporte de la comunidad durante la etapa de construcción	$ 558.632.00	
Aporte real efectuado en la obra por el concepto anterior	974.540.00	
Diferencia o aporte no invertido por la comunidad durante esta etapa	$	-.-
Valor del préstamo del I.N.S. pactado en el contrato	$	527.372.79
Valor final del préstamo	$	527.372.79

Con base en la suma anterior, la cuota mensual de reembolso al I.N.S. será de TRES MIL OCHOCIENTOS TREINTA Y UN PESOS CON 36/100 ($3.831.36) M/CTE.,

que incluye e intereses al 8% anual. En tal virtud, el monto de la obligación, asciende a la suma de **NOVECIENTOS DIECINUEVE MIL QUINIENTOS VEINTISEIS PESOS CON 40/100 ($ 919.526.40) M/CTE.**

b) DONACION

Teniendo en cuenta que el INAS no carga el rubro de "Construcciones en Proceso" los gastos de Administración, y con base en el "Costo Director" establecido en el Capítulo IV de la presente Acta, el Instituto dona a la Junta de Acción Comunal de **Alto de los Idolos** el siguiente valor en desarrollo del contrato suscrito entre las partes con fecha **Abril 25 de 1.976.**

INVERSION DEL INSTITUTO EN LA OBRA.....	2'623.936.39
Menos valor del préstamo final	527.372.79
TOTAL DE LA DONACION DEL INSTITUTO.....	2'571.198.60

VI. PROPIEDAD DE LA OBRA

En desarrollo de las cláusulas del contrato INSTITUTO-COMUNIDAD para la construcción de esta obra, ésta pasa a ser de propiedad de la comunidad de **Alto de los Idolos** representada en su Junta de Acción Comunal y será controlada y operada por la "Junta Administradora" respectiva. La propiedad antes indicada esté condicionada a la oportuna cancelación de las cuotas de amortización.

VII. OPERACION Y MANTENIMIENTO

Se hace constar que la totalidad de la obra es entregada y recibida a entera satisfacción en lo que concierne a su construcción y funcionamiento, por lo cual la Junta Administradora a partir de la firma de la presente acta, tendrá la responsabilidad en su conservacion operación, mantenimiento y reparación, para lo cual contará con la asesoría del INSTITUTO.

Para constancia se firma a los **20 días del mes de Octubre de 1.979.**

Ing. Jefe Seccional

Supervisor Saneamiento Básico Rural

Fiscalizador INAS

José [illegible]

Presidente Junta de Acción Comunal

Presidente Junta Administradora

Tesorero Junta Administradora

Pagador Seccional INAS Huila

Almacenista Seccional INAS Huila

Secretario Junta Administradora

Revisor Delegado Contraloría ante el Instituto Nacional de Salud-Huila

006

A C T A No _____

En la Escuela de la Vereda de Idolos, Municipio de San José, se reunió en Asamblea General, toda la Comunidad, con el fín de autorizar a los Presidentes de las diferentes veredas, para que firmen el Contrato de Construcción del Acueduc Regional, entre el Instituto Nacional de Salud y la Comunidad.-

Esta Asamblea, tuvo el siguiente Orden del Día;

1).- Llamado a Lista.-
2).- Nombramiento de Presiente Ad-Hoc para presidir la Asamblea.-
3).- Intervención del Ing. Espitia.
4).- Proposiciones Varias.-
5).- Autorización para la firma del Contrato.-

Al primer Punto, fue nombrado úno por úno de los usuarios presentes para la confrontación del quorum y contestaron 76 de los 200 inscritos.-

Al Segundo punto, fue nombrado como Presidente el Sr. Cosme Mantilla, como person que presidirá la asamblea para esta osasión; se le explicaron someramente las fun_ ciones y dijo que aceptaba.-

El sr. Ingeniero Espitia, estuvo de acuerdo para sesionar con los asistentes y que el acueducto se construirá únicamente para éstos, los demás si quieren el agua y quedan fuera de los nuevos trazos, adquirirán el derecho a la conexión, pagando la matrícula, pero tendrán que comprar la tubería necesaria hasta situarla en sus casas pues el Instituto dará a cada usuario tres tubos y el arbolito, a partir de la cajilla donde va el registro.-

El Presidnete tomó la palabra y respaldó en todo lo que el Sr. Ingeniero explicó.-

Por último el Sr. Ingeniero, dijo lo siguiente: Que se reformará el proyecto en el sentido de que se hará la red únicamente para los 76 usuarios que siempre han asistido a las reuniones.-

Preguntado el Sr. Ing. por un usario de que si el agua se la llevarían hasta la casa, el Sr. Ing. manifestó que la pregunta la debía contestar un usuario que haya asistido a las demás reuniones anteriores y en efecto se levantó el Sr. Ventura Guzmán y éste declaró que el Sr. Ingeniero Esítia había explicado hasta la saciedd el contrato de construcción del acueducto y que había sido muy claro cuando dijo que quien trabajare y esté al día en sus jornales, la tubería y el agua iría hasta el patio de la casa, en una extensión de tres tubos de ϕ ½ en P. V. C. y un arboli_ to de H. G. desde la cajilla donde iba conectado el registro hasta la casa.-
De igual forma el Ing. explicó, con ayuda del cartógrafo, la forma como se llevaría el agua a las casas.- El Sr. Gabriel Plazas, preguntó, que si se podían instalar varias llaves, a lo que se contestó, que sí pero en cuanto al valor por el servicio de éstas, únicamente la comunidad, en Asamblea general, lo estipularían.- El Pre_ sidente, observó también que los bebederos, están prohibidos.- Preguntó otravez Plazas, que si los sábados y días festivos había que trabajar, se le contestó que dependía de las circunstancias, pues si se presentaba una minga o querían adelantar trabajos en el acueducto lo podían hacer pero que era voluntariamente además los jornales debían ser completos, útiles, es decir que no manden cuaquier muchacho para salir del paso y luego sí exigir jornal completo,-en el recibo.-

Dn. Noé Calvache, preguntó sobre el horario y forma de trabajo, a lo que contestó el Sr. Promotor Buriticá, que se dividirán los 76 usuarios por los días laborables, principiando por el día lunes, con un jornal por familia por semana y en orden alfabético, lista que se fijará en un lugar visible de la escuela y que el día asignado para el usuario que va a trabjar sea inmodicable salvo cuando no puede ir a trabjaar entonces mandará un jornalero o en su defecto pagará el jornal al comité proacueducto para que éstos busquen el respectivo jornal. Quien tuviere bestias, las puede sacar a trabajar y se le computrá un jornal por cada bestia, más el que las arrié. Preguntó el Sr. Guzmán que en la Vereda Granada se podía instalar un ariete, a lo que contestó el Ing. Espitia, que los métodos mecánicos estaban descontinuados, porque el mantenimiento valía mucho y duraban poco tiempo.- Respecto al pago de la cuota familiar el Sr. Ingeniero dijo que como los usuarios iban a disminuir entonces automáticamente la cuota subiría pero que más o menos estaba entre cuarenta pesos $ 40.oo.- El Dr. Espitia prometi que en el transcurso del mes de Mayo se reformaría el proyecto para los 76 usuari y que luego se llevaría a cabo otra reunión para la firma, quedando para el día 23 del presente en la misma escuela de Idolos a la 1 P.M. y que por razones obvia si para ese día asisten más usuarios fuera de los presentes y que quisieran el agua, éstos quedarían condicionados para aceptarlos o no, pero que en todo caso a los asistentes a la reunió el día 25 de abril del presenta ñaño se les pondrá d todos modos el agua.- El Sr. Ing. Espitia prometió tambien que para el 23 traerá los planos y sobre éllos situar las casas que no estén topografiadas.- El último usuario donde termina la red del acueducto es el Sr. Rafael Carvajal de la vereda IDOLOS .- Para terminar se mostró la tubería P.V.C. la que se empleará en la construcción del acueducto, las garantías que tiene, su fácil transporte, instalac y precio favorable.-

Con respecto a las proposiciones no hubo ninguna y la comunidad se limitó unicame te a hacer preguntas.-

No habiendo más por tratar, se agradeció a la comunidad la concurrencia y se firm por los que en élla intervinieron.-

Idolos, 25 de Abril de 1.976

FIRMAS DE LOS USUARIOS QUE AUTORIZAN AL PRESIDENTE FIRMAR EL CONTRATO DE CONSTRUCCION ALTO DE LOS IDOLOS - INDOS.

C.C. # 14283?3 de Tuquerres

C.C. # 142932 de Pasto

C.C. # de

C.C. # 1655976 de Sapuyes

C.C. # 1852892 de Sotomayor

C.C. # de

C.C. # 4.934.092 de

amigo Hector Sandy C.C. # 1648913

C.C. # 1652183 de Pitalito

C.C. # 1651924 de Pasto

amigo Aparicio Nany C.C. # 1853158

C.C. # 7.675.680 de

C.C. # P9.166 de Suso

C.C. # 16.549.45 de

C.C. # 12165527 de

C.C. # 1655.86 de Cruz.

C.C. # de

C.C. # de

C.C. # 36.180.160 de Ipiales

C.C. # 4609390 de Pasto

C.C. # 1656383 de

Representante

C.C. # 1676091 de Pasto

C.C. # 26.556.440 de Ipiales.

C.C. # 1641917 de

C.C. # 12165506 de

C.C. # 1.655.767 de

C.C. # de

C.C. # 4.736.967 de Ipiales

C.C. # 1.559.244 de

Por Hernán Coéllar M.

C.C. # 1.655.458 de

C.C. # 41654110 de Bogotá

C.C. # de

C.C. # de

1622988

C.C. # 1654902 de

C.C. # de

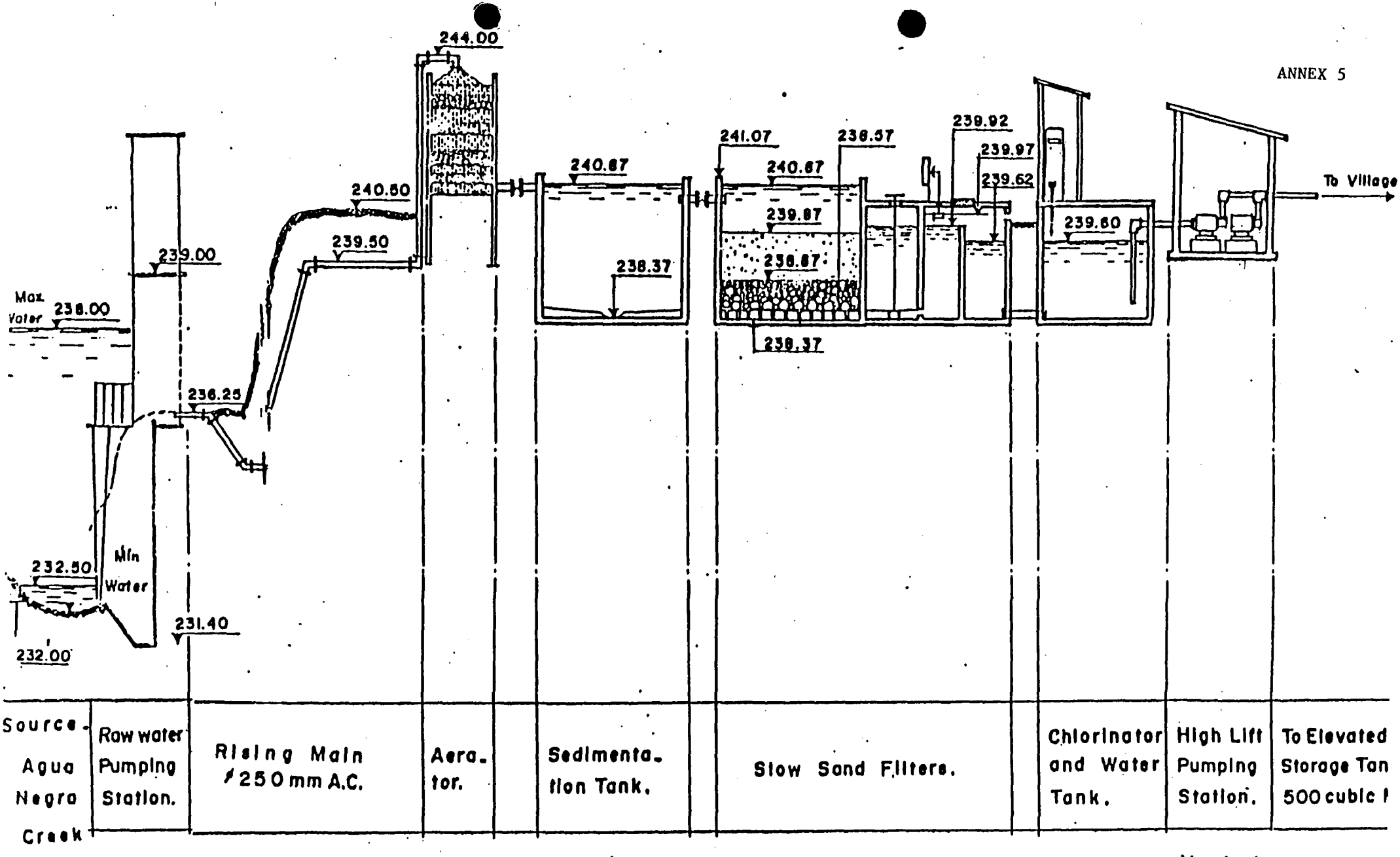
1656424

C.C. # de

12.166.165

C.C. # 1.129.373 de Pasto

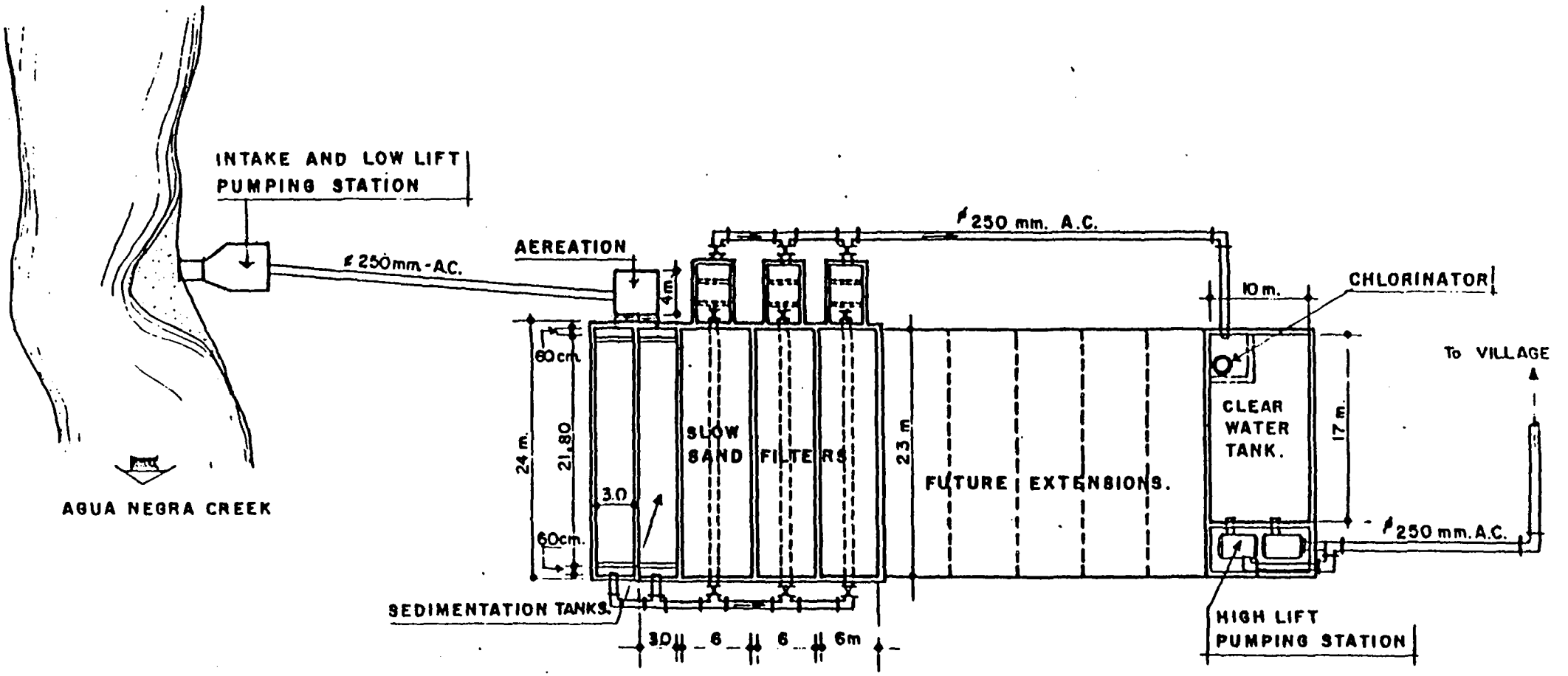
C.C. # de



Vertical
SCALE ; 1:100

FLOW DIAGRAM OF PUERTO ASIS WATER TREATMENT PLANT SCHEME

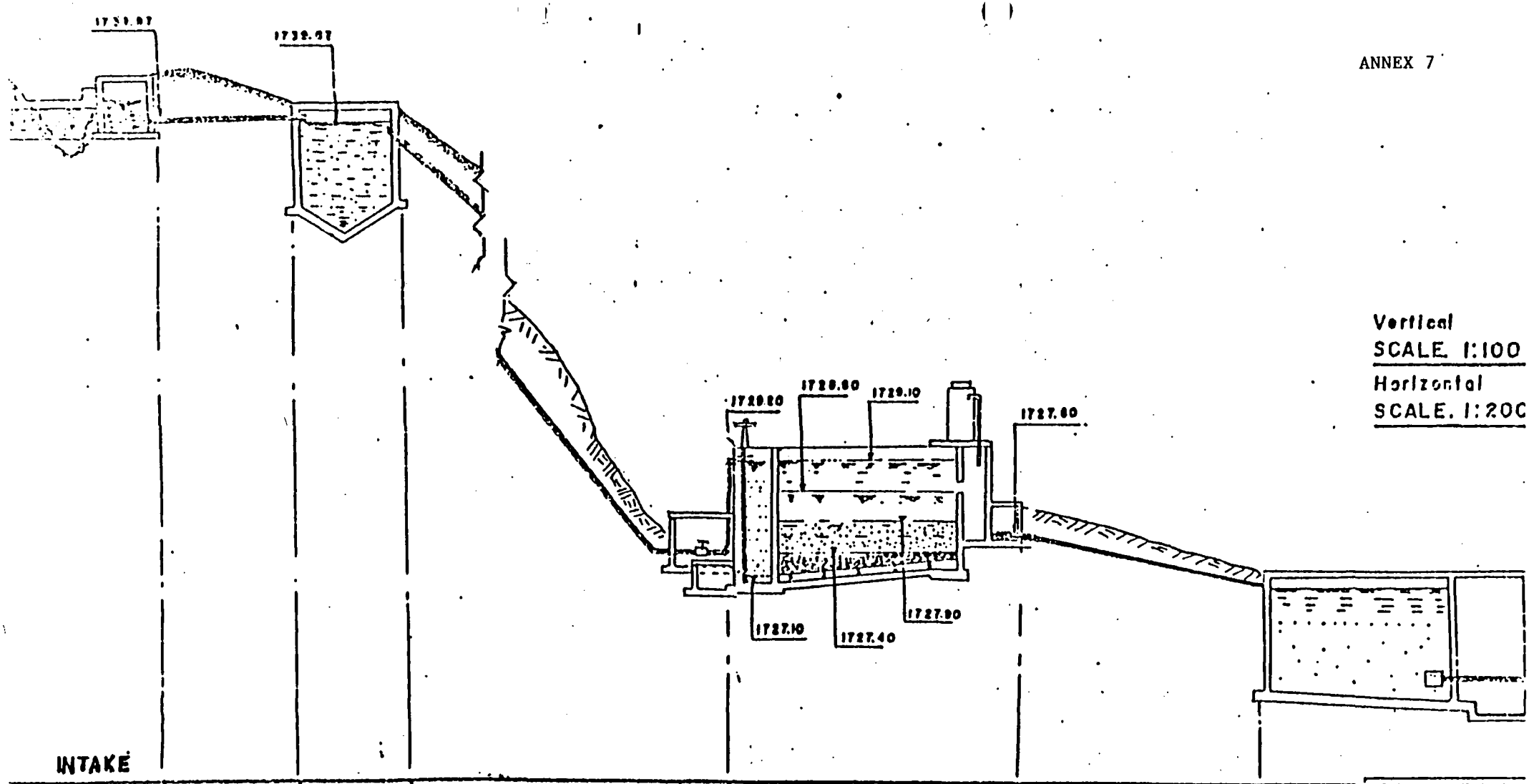
Municipality of Puerto Asis, Intendencia of PUTUMAYO - COLOMBIA -



SCALE H:1:500

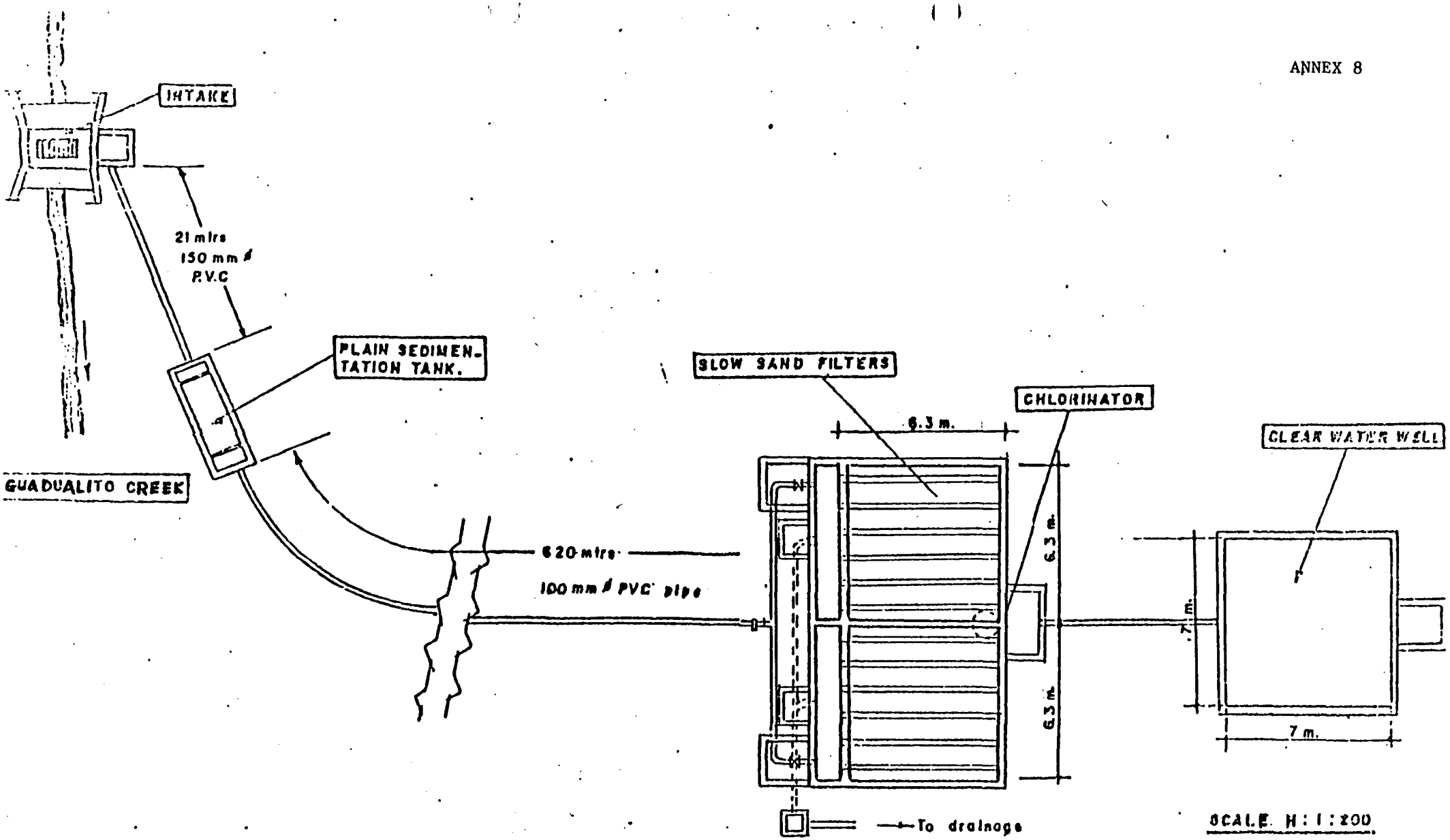
PLAN VIEW OF PUERTO ASIS WATER TREATMENT PLANT SCHEME

Municipality of Puerto Asis, Intendencia of PUTUMAYO - COLOMBIA -



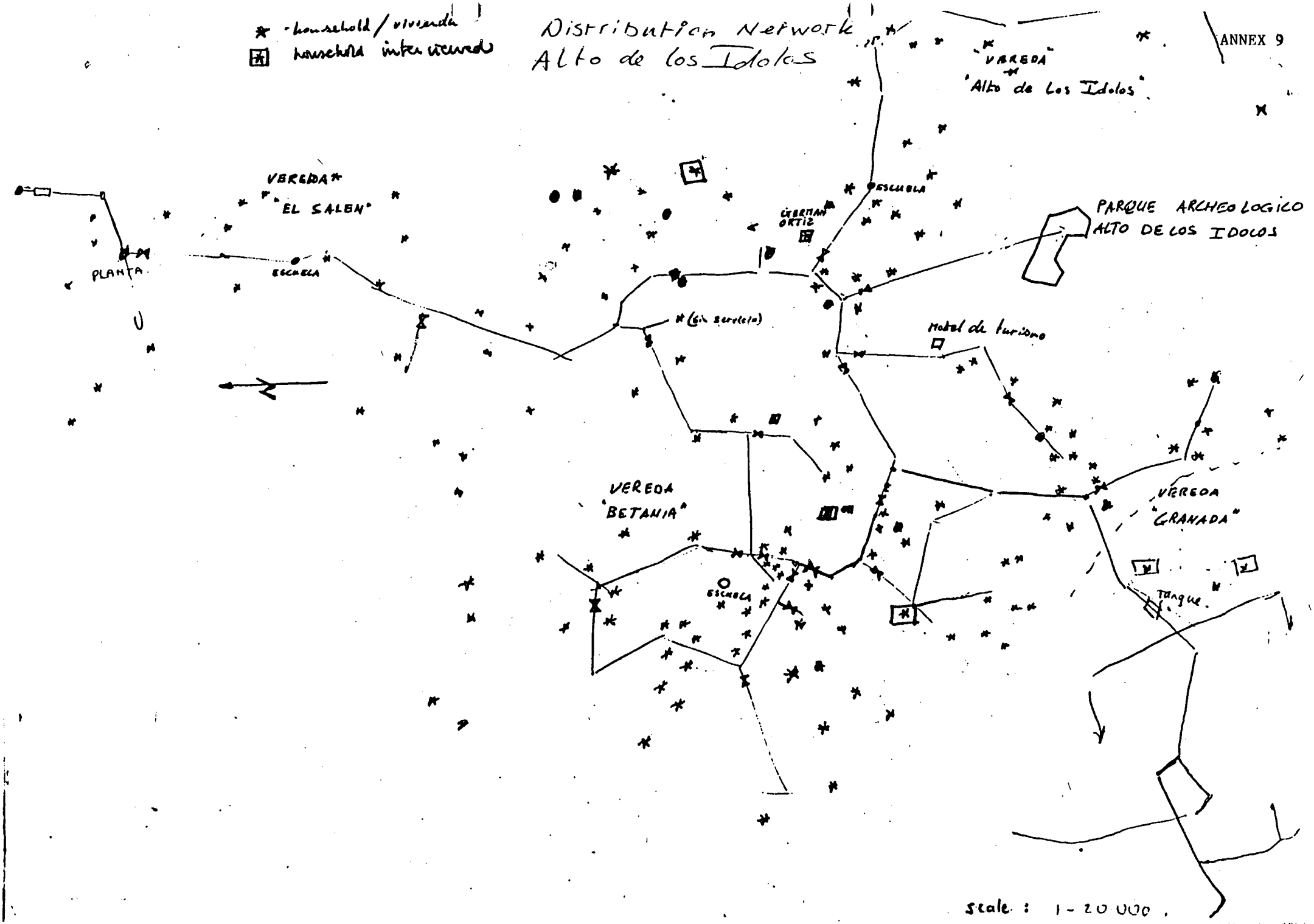
FLOW DIAGRAM OF ALTO DE LOS IDOLOS WATER TREATMENT PLANT SCHEME

Municipality of San José de Isnos Departement of HUILA - COLOMBIA.



PLAN VIEW _ ALTO DE LOS IDOLOS WATER SUPPLY SCHEME

Municipality of San José de Isnos Departament of HUILA - COLOMBIA.


household / vivienda
household interviewed
Distribution Network
Alto de los Idolos
VEREDA
"Alto de Los Idolos"
VEREDA
"EL SALEN"
PLANTA
ESCUELA
GERMAN ORTIZ
ESCUELA
PARQUE ARCHEOLOGICO
ALTO DE LOS IDOLOS
Motel de turismo
VEREDA
"BETANIA"
ESCUELA
VEREDA
"GRANADA"
Tanque
Scale : 1 - 20 000

INSTITUTO NACIONAL DE SALUD

SECCIONAL PUTUMAYO

ENCUESTA PARA USUARIOS - ACUEDUCTO PUERTO ASIS

ENCUESTADOR _____ FICHA No. _____

FIRMA _____ CATEGORIA _____

1-1 NOMBRE DEL PROPIETARIO _____ 1-3 DIRECCION _____

1-2 NOMBRE DEL INQUILINO _____ 1-2 BARRIO _____

1-3 SECTOR _____

1-4 HABITANTES _____

2-1 OCUPACION DE LA EDIFICACION :

A - VIVIENDA 1
B - MULTIFAMILIAR _____
C - HOTEL U HOSPEDAJE _____
D - CAMPAMENTO _____
E - BAR - FUENTE DE SODA 1
F - RESTAURANTE _____
G - ALMACEN - BODEGA _____
H - OTROS _____
I - PUBLICO _____ ESPECIFICARLO _____

3-1 ESPECIFICACION DE LA CONSTRUCCION :

3-2 PISOS
A - BALDOSA _____
B - CEMENTO _____
C - MADERA _____
D - TIERRA _____

3-3 MUROS
A - LADR. BLOQUE-REP _____
B - LADR. BLOQUE-S/R _____
C - MADERA _____
D - BAHAREQUE _____

3-4 TECHOS
A - TEJA _____
B - ETERNIT _____
C - ZINC _____
D - OTROS _____

3-5 OTROS
CIELO RASO
M ___ E ___ N ___
ENCHAPE
A ___ B ___ N ___

4-1 CAPACIDAD Y TIPO DE ALMACENAMIENTO INSTALADA

A - TANQUE CEMENDO _____ VOLUMEN _____ LITROS
B - TANQUE ETERNIT _____ VOLUMEN _____ LITROS
CANECA _____ VOLUMEN _____ LITROS

B - ALTURA
A NIVEL DEL PISO _____
A NIVEL DEL TECHO _____

5-1 SERVICIOS EXISTENTES :

LAVADERO _____
DUCHAS _____
INODOROS _____
LAVAMANOS _____
ORINALES _____
BIDET _____
OTROS _____
TOTAL _____

ESPECIFICAR : _____

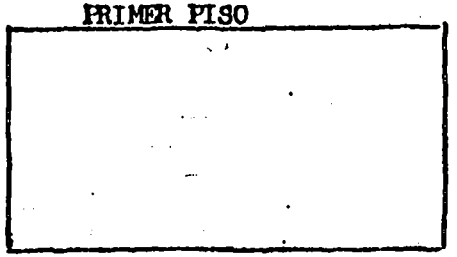
6-1 CUANTO PAGA DE AGUA DIARIAMENTE $_____

6-2 QUE TIPO DE ORGANIZACION OPERA EN EL BARRIO? A- JUNTA A. COMUNAL _____
B- JUNTA CIVIL _____
C- ASOCIACION PADRE FLIA. _____

PERTENECE A LA DIRECTIVA? SI ____ NO ____

7-1 AREAS CONSTRUIDAS (Dibujar y Acotar el largo y el ancho)

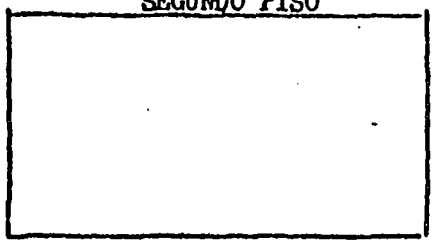
PRIMER PISO



_____ M2

M2

SEGUNDO PISO



_____ M2

M2

TERCER PISO

_____M2

8-1 CONTADOR INSTALADO; A - Marca : KENT _____ TAVIRA _____
B - Referencia No._____

TOTAL AREA _____ M2

FACTOR _____

CATEGORIA (AxF) _____

10-1 OBSERVACIONES _____

_____

FICHA : ELABORACION _____
TABULACION Y REGISTRO _____