

PROGRAM OF OPERATIVE IMPROVEMENT AND OF REHABILITATION
OF DRINKING WATER AND SANITARY SEWAGE SYSTEMS

PRELIMINARY REPORT

1.0 BORROWER AND EXECUTOR. PRIORITY ASSIGNED TO PROGRAM

The borrower shall be the Government of the Republic of Nicaragua, in its name and representation, the Ministry of subscribes the Loan Contract herein.

For its part, the Executing Organization shall be the Nicaraguan Institute of Aqueduct and Sewage System (INAA) to which, in conformity with the Executive Decree No. 123 of October 23, 1979, it assigns planification, execution, control of the municipal and local drinking and sanitary sewage systems, having as principal objectives: to plan, to project, to operate, to maintain and to administer the aqueduct and sewage of the whole country.

As results of such objectives, INAA grants the first priority to the execution of the programs, therefore, it shall fulfill in a partial way its institutional responsibilities in the process of national development, specifically, referring to:

--- Identification of the immediate necessities of repair of infrastructure, which make possible the formulation of the projects of minor importance and immediate execution, which contribute to the generation of

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employment in search of lightening, in part, the existing serious unemployment.

--- Execution of the actions destined to the reconstruction of the infrastructure of basic services, to give support to the establishment of investments destined to assist in the urban area, the initiatives of small production of the goods and services and in the rural area, those of small production, industrialization and commerce.

2.0 PROGRAM AND ITS OBJECTIVES

2.1 OBJECTIVES OF PROGRAM

The Program of Operative Improvement and of Rehabilitation has as general objectives:

1. Improvement of the quality of the drinking water and sanitary sewage services, as the case may be, existing in 50 districts of the country, among them inclusive capital Managua.
2. To improve the institutional responding capacity for the operational problems of the systems, included the actions of preventive character, as well as those of corrective type, in all the components of the said systems.

In order to secure such objectives, the specific courses of action to be secured are proposed in the Program as follows:

1. Referring to the improvement of the quality of the services rendered in 50 districts:

1.1 Drinking water

- To optimize the use of the installed production capacity, by means of the rehabilitation of existing catchment works, such as the rehabilitation of pumping equipment or their substitution in the cases of obsolescence.
- To improve the water delivery capacity to the system by means of the rehabilitation, if required, of the installed transmission facilities.
- To improve the control of the water production and consumption by means of the reestablishment and/or introduction of macro and micro measurement.
- To contribute to the reduction of the water leakage and loss index by means of the rehabilitation, in cases required, of the distribution networks, storing works and house connections.
- Improvement of the supplied water quality, by means of the rehabilitation and/or substitution and/or introduction, as the case may be, of the chlorination treatment plants and stations.

1.2 Sanitary sewage

- To improve the installed collecting capacity by means of the rehabilitation, if required, of piping in recollecting networks, of

manholes and of house connections.

- Improvement of the existing transmission facilities by means of the substitution of the pumping equipment which, in totality, are obsolete and likewise, with the actions of rehabilitation, as the case may be, of the installed pressure lines.
- To rehabilitate, when corresponds, the existing sedimentation basins and to reconstruct, if necessary, the civil works connected to the treatment facilities.

2. Referring to the improvement of the institutional responding capacity to the operational problems of the systems, and the perspective of the strengthening of the Regional Delegations:

2.1 Area of Logistic support

- To improve Vehicles Central Shop, by means of the re-equipment in general of the stock, included fitting out of the physical space to occupy.
- To improve the Communication System, by means of the establishment of a radio-communications network, which permits the fluent and quick communication among the Central Level, Regional Delegations and the Groups of Workers in site.
- To reinforce the existing Transport System, by means of the acquisition of the personnel transporting units and the units with

special accessories, in order to support the actions of preventive and corrective character required.

2.2 Technical Area

- To reinforce Electricmechanical, Chlorinator and Valve Central Shop, by means of the acquisition of the equipment in general, spare parts and accessories. Likewise, to establish Regional Electricmechanical Shops which contribute to diminish the working load in the Central Shop and to the direct participation in a large scale of the Regional Delegations.
- To reinforce Gage Central Shop, by means of the acquisition of the equipment in general, spare parts and accessories. Likewise, to establish Regional Gage Shops which contribute to diminish the working load in the Central Shop and to the direct participation in a large scale of the Regional Delegations.
- To reinforce Maintenance Unit of Wells of Central Level, by means of the acquisition of the equipment in general, materials and accessories.
- To reinforce Maintenance Unit of Sanitary Sewage Networks in 16 cities, included capital Managua, by means of the acquisition of the equipment in general.
- To reinforce Water Quality Central Laboratory, by means of the acquisition of the laboratory equipment in general, materials and

accessories. Likewise, to complete the existing secondary laboratory equipment in 9 sites, which contribute contribute to diminish the working load in the Central Laboaratory Shop and to the direct control in the site of the produced water quality.

The above actions benefit the estimated population of 1,896,000 in total, the whole habitants in the sites, object of the program, and an approximately 1,010,000 people in capital Managau are found among them.

2.2 TECHNICAL DESCRIPTION OF PROGRAM

Being the distinct nature and objectives of the different actions to be realized in the Program, it has been subdivided in 6 sub-programs as follows:

- Sub-program of Rehabilitation of Drinking Water Systems in 49 sites.
- Sub-program of Rehabilitation of Drinking Water System in Managua City.
- Sub-program of Rehabilitation of Sanitary Sewage Systems in 10 sites.
- Sub-program of Rehabilitation of Sanitary Sewage System in Managua City.
- Sub-program of Operational Improvement.
- Sub-program of Pumping Equipment Maintenance.

Annex No.4 shows the diagrams of activities for the Sub-programs of Drinking Water and Sanitary Sewage Rehabilitation, which indicate the structuring form of the Progrm in graph.

1.0 DRINKING WATER REHABILITATION SUB-PROGRAM IN 49 SITES

The general objective is to improve the quality of the drinking water supply service in 409 sites of the country, which rely on the systems administered by INAA. For that purpose, the following actions have been considered to realize:

1.1 For the Improvement of Production

- Cleaning and development of 88 wells, out of which 15 are constructed but not equipped with and 73 are in operation actually.
- Installation of a total of new 128 new pumping equipment, of which 15 equipment will be installed in the wells constructed but unequipped and 113 for substituting the equipment under obsolete condition. Likewise, a total of 35 equipment will be rehabilitated which are in bad condition or in precarious functioning conditions.
- Construction of a total of 15 sartas (sets of equipment) for the same number of pumping equipment to be installed in the wells constructed without equipment, and rehabilitation of 147 sartas in bad condition.
- Introduction of the macro-measurement in a total of 163 pumping equipmentt, of which 15 correspond to the new equipment in the wells to be incorporated, and 148 to the equipment in operation, but with defective macro-gages. Installation of 35 level gages in storing tanks.
- Construction of 15 pumping houses in the wells to be incorporated; rehabilitation of 76 pumping houses in the wells in exploitation and

construction of 60 houses for operators.

1.2 For the Improvement of Transmission

- Rehabilitation of 3 km of conduction lines and installation of 4.5 km of conduction line for the wells to be incorporated.

1.3 For the Improvement of Treatment

- Rehabilitation of 2 Treatment Plants.
- Installation of a total of 54 new chlorination equipment, of which 15 correspond to the wells to be incorporated and 39 for substituting the obsolete equipment. Rehabilitation of 58 chlorination equipment.
- Rehabilitation of laboratories in 9 sites and execution of the chlorination control in the sites with the supplied water treatment.
- Construction of 49 houses for chlorinators.

1.4 For the Improvement of Distribution

- Survey of networks in 8 sites and rehabilitation of 27 km of piping in distribution networks.
- Check of users in 8 sites; installation of 29,932 micro-gages, of which 18,453 will be installed in direct connections and 2,472 will be used for replacing bad gages; general rehabilitation of 2,472 connections.
- Rehabilitation of 3 storing tanks.

2.0 SUB-PROGRAM OF REHABILITATION OF DRINKING WATER OF MANAGUA

Its general objective is to improve the quality of the drinking water supply service of Mangua City. For that purpose, the following actions have been projected:

2.1 For the Improvement of Production :

- Cleaning and development of 81 wells, of which 8 are constructed but not equipped with, and 73 are actually in operation.
- Installation of a total of 103 pumping equipment, of which 8 will be installed in the wells constructed but not equipped with, 62 will be use to replace the obsolete equipment in the wells in exploitation and 33 will replace the obsolete equipment in relief stations. Likewise, a total of 66 pumping equipment will be rehabilitated, of which 11 are the equipment installed in the wells in exploitation and 55 in relief stations.
- Construction of 8 sartas in the wells constructed without being incorporated and rehabilitation of 118 sartas which are found in bad condition.
- Installation of a total of 109 new macro-gages, of which 8 correspond to the new equipment in the wells to be incorporated and 101 for the equipment in operation with bad macro-gages. Installation of 40 level gages in storing tanks.
- Construction of 8 pumping houses in the wells constructed to be

incorporated; rehabilitation of 93 pumping houses in the wells in exploitation and construction of 90 houses for operators.

2.2 For the Improvement of Transmission

- Installation of 0.2 km of piping, for conduction lines from the wells to be incorporated to the distribution networks.

2.3 For the Improvement of Treatment

- Installation a total of 64 new chlorination equipment, of which 8 correspond to the wells constructed to be incorporated.
- Execution of chlorination control.
- Construction of 90 houses for chlorinators, of which 8 correspond to the equipment to be installed in the wells constructed to be incorporated and 82 to the wells in actually exploitation.

2.4 For the Improvement of Distribution

- Survey of 1,200 km of piping and rehabilitation of 177.3 km of piping in distribution networks.
- Check of 96,392 users; installation of 34,980 micro-gages in direct connections and rehabilitation of 8,986 micro-gages installed in bad condition; rehabilitation in general of 8,986 house connections.
- Rehabilitation of 49 storing tanks.

3.0 SUB-PROGRAM OF REHAHABILITATION OF SANITARY SEWAGE SYSTEM IN 10 SITES

Its general objective is to improve the quality of the sanitary sewage system in 10 sites of the country, which rely on the systems administered by INAA. For that purpose, the following actions have been considered to realize:

3.1 For the Improvement of Collection

- Improvement of Recollecting Networks by means of the rehabilitation of 53.6 km of piping and of 706 manholes.

3.2 For the Improvement of Trnsmission

- Substitution of 14 pumping equipment.

3.3 For the Improvement of Treatment

- Rehabilitation of 14 sedimentation basins.
- Rehabilitation of civil works connected to the treatment in 6 basin sites.
- Equipment of the personnel of maintenance of sedimentation basins.

4.0 SUB-PROGRAM OF REHAHABILITATION OF SANITARY SEWAGE SYSTEM OF MANAGUA

Its general objective is to improve the quality of the sanitary sewage system of Managua City. For that purpose, the following actions have been considered to improve Recollecion:

- Improvement of the networks by means of the rehabilitation of 32.6 km

of piping, of 560 manholes of Recollection and of 1,000 house connections.

- Evaluation of Recollection System, by means of the survey of the networks, the introduction of a measurement program and the check of 57,000 users.

5.0 SUB-PROGRAMS OF OPERATIONAL IMPROVEMENT

Its general objective is the institutional reinforcement in its responding capacity to the operational problems of the systems, in the actions of control and of preventive character, as well as, in those of corrective type. For that purpose, the following actions have been considered to realize:

- Reinforcement of the physical space and of the equipment of Gage Central Shop; establishment of 5 Gage Regional Shops.
- Reinforcement of the physical space and of the equipment of Electricmechahical, Chlorinator and Valve Shop; establishment of 5 Regional Shops.
- Reinforcement of the physical space and of the equipment of Auto-Vehicles Central Shop.
- Reinforcement of Water Quality Central Laboratory with the equipment, materials and accessories.
- Reinforcement of Transport System by means of the acquisition of

vehicles of all types.

- Improvement of Communications System by means of the radio-communication equipment.
- Reinforcement of Maintenance Unit of the Wells of Central Level, by means of the acquisition of the equipment in general, materials and accessories.
- Reinforcement of Maintenance Unit of Sanitary Sewage System Networks at Central Level and of 15 sites at Regional Level.

6.0 SUB-PROGRAM OF MAINTENANCE OF PUMPING EQUIPMENT

Its general objective is the improvement of the exploitation capacity of existing sources. For that purpose, the following actions have been considered.

- In 49 sites; To supply the resources in general to Electircmechanical Maintenance Units, to achieve Preventive Maintenace Programs in 390 pumping equipment and Corrective Maintenace Programs in 137.
- In Managua City; To supply the resources in general to Electircmechanical Maintenance Units, to achieve Preventive Maintenace Programs in 177 pumping equipment and Corrective Maintenace Programs in 62.

Annex No. 1 shows the targets of Program, breakdowned per su-program and per site.

3.0 DIRECT COSTS OF PROGRAM

Direct costs of the Program amount to the sum of US\$61,939,520 of which approximately 67% correspond to the direct expenditure of foreign exchange to import the goods required for the execution of the Program. For estimating the cost of imported goods, the existing record was used on acquiring materials and equipment abroad, elaborated, in most parts, through Credit Line subscribed between Government and Government in some cases, or indicated by Suppliers to the Government. Table No. 3.1 shows the breakdown of Direct Costs.

IMPROVEMENT AND REHABILITATION PROGRAM FOR CAPITAL CITY MANAGUA

CHAPTER V

THE PROGRAM, ITS COST AND FINANCING

OBJECTIVES AND TARGETS OF THE PROGRAM

The operative improvement and rehabilitation program has, as its general objective, the improvement of the following aspects:

- Supply of drinking water.
- Water treatment and quality.
- Pressure control in water system.
- Water leakage and loss control.
- Maintenance of equipment, motors, networks and installations in general as well as its rehabilitation.
- Water production and consumption control.
- Flow and obstacles control of sanitary sewage piping and overflow control of dirty water through manholes.
- Final disposal control of dirty water.
- Operation and maintenance activities of the systems through rational and specific training of the personnel.
- Operational supervision and control in general at the whole levels (local, regional and central).
- Control and/or implementation of areas: commercial, administrative (stores,

warehouses and transport, etc.) and other objects of the institution.

- Improvement of communication means and

5.1 Missing

The program contains eleven (11) sub-programs: Improvement of production, Operational improvement, Improvement of water quality and its control, Improvement of physical installations, Improvement of sanitary sewage system, Reinforcement of electricmechanical shops of chlorinators and of valves, Reinforcement of gages central shop, Improvement of computer system, Improvement of communications system, Improvement of vehicles central shop.

Physical targets of each sub-program are detailed per activity in tables No. 5.1. B and No. 5.1.C referring to Managua City in view of its importance.

Quantity, type, and/or mode, capacity, etc. of the equipment and other necessities have been determined in terms on what INAA considers, applying national standards and/or specifications, generally adapted and/or admitted in drinking water and sanitary sewage systems in other countries; in accordance with the diagnosis of Managua City, utilizing the information of official employees and of technical personnel in charge of operation and maintenance of the systems at local, regional and central levels.

5.2 TECHNICAL DESCRIPTION OF PROGRAM:

We indicate in the following the details in conformity with the said sub-programs in which the problems in Managua City are mentioned.

5.2.1 IMPROVEMNT OF PRODUCTION:

Basic objectives are to improve the quantity and the continuity of water to be supplied to Managua City.

There is a deficient supply because of the faults of the equipment in bad functioning conditions by notable deficiencies in maintenance and there are deep wells without equipment by economical reasons and by the failure of maintenance of the actual wells in operation. This sub-program contains the activities under mentioned:

5.2.1.1 REHABILITATION OF PUMPING EQUIPMENT:

As the essential activity, the rehabilitation of pumping equipment has been considered, in consideration of the actual physical situation and performance and more favorable economical conditions in repairing instead of purchasing a new equipment.

Technical characteristics of the equipment installed in the Supply System of Managua differ between 100 to 5,500 g.p.m. driven by electric motors of up to 500 H.P. and installed in piping of 4" to 32" diameter. The most of the said equipment are of 460 volts and are energized by transformer stations of up to 3 x 1,500 kva.

Elements, spare parts and accessories required for this activity consist of pillar piping, steel shafts, electric panels and accessories, transformer banks, electric cables, bearings for repairing turbine pumps

of vertical shaft, centrifugal pumps of horizontal shaft, submersible turbine pumps, various electric motors, etc.

This activity is carried out in INAA's proper shops and in private shops in Managua, according to the conditions where the equipment is found, utilizing the resources, provided that these shops meet the requisites, specifications and standards established by the Institution.

In Table 5-2, the private electromechanical shops are indicated with which INAA is generally related. It is observed that the socio-economical recovery to which the country is confronting, will permit the said shops to activate human resources and materials positively and create others in accordance with the working volume of the said sector.

5.2.1.2 SUBSTITUTION OF PUMPING EQUIPMENT:

Actually more than 70% of the pumping equipment which cover the drinking water supply system for Managua have the age of over 20 years in operation and the most of them requires the expensive and frequent repairs for functioning; there are the equipment not operating, the casting of winding of motores (?) cause of continuous variation of voltage and (?) do not admit more winding by its turn; the deficient maintenance done in these last years is added to this situation.

Under such circumstances, the immediate substitution of an essential

quantity of the equipment is needed such as turbine pumps of vertical shaft (lubricated with water in some cases and with oil in others), submersible pumps and centrifugal pumps of horizontal shaft; in addition, it is necessary to purchase the corresponding pillar piping, transformer banks, electrical panels, with instruments and accessories, electric cables, arresters, etc.

This activity is executed through the tender process in accordance with INAA' standards and regulations on the acquisition of the goods in concordance with the BID, and in other cases through administration.

The Electromechanic General Direction prepares the respective technical specifications and other characteristics of the equipment, instruments and accessories to be acquired.

Mounting and installation of the equipment is executed through private contractors specialized in the works. In Table 5-3, the firms and persons actually existing in the country and holding a relationship with NAA are indicated.

5.2.1.3 INCORPORATION OF WELLS:

In INAA's specified plans, the plan of incorporation of some wells is contained which were perforated but no have been equipped by economical problems. In this sense, it is considered to acquire complete pumping units including panels, transformers and electric lines, in addition to valves, macro-gages, manometers, chlorination system and housing, etc.

This activity is executed through cleaning and developing of wells. Pumping capacity ranges between 500-1,500 g.p.m. and between 130-1,300 ft of total dynamic load.

This activity is similar to the indication in the previous item and the mode of execution is done in the same way.

5.2.1.4 PREVENTIVE MAINTENANCE OF EQUIPMENT :

One of the fundamental activities proposed by INAA which has been unachieved, is to establish a preventive maintenance plan for the equipment and motors to allow them to function efficiently. On the other hand, it is considered necessary to have an organization conform to the said objects, that is, an organization adequate for the efficient supervision and following-up of the actions which have not been achieved by the unfavorable working conditions and the limits of the funds above mentioned.

It is necessary to acquire a series of instruments, spare parts, accessories and other materials indispensable for developing initially the most urgent activities of preventive maintenance.

Then it is necessary to acquire bearings, journal bearings, rubber bushings, elements of union, fuses, magnetic contacts, etc.

This activity is executed by INAA's personnel, although in other items the necessity of the specialized advisory for the planification and the

program of activities such as the training of the personnel is mentioned.

5.2.1.5 CORRECTIVE MAINTENANCE OF EQUIPMENT :

Considering the actual situation of the equipment and motors, it is logical to suppose that one of the most dynamic activities is to furnish the corrective maintenance immediately to motors, pumps, columns, shafts, electric feed, etc.

It is considered that this activity should be diminished into the measure when the preventive maintenance is to be established and enlarged.

Further, it should be noted that the actual situation of the corrective maintenance is so critical that there are the cases in which the emergency repairs have been done adapting the spare parts or elements not fulfilled the characteristics of original design or the technical specifications and other cases in which some pieces of parts or elements have been extracted from the equipment considered as "unusable" or "less important" in order to sustain those considered preferable. These fatal consequences are of so called in common "canibalism". This has been caused by the lack of economical resources for developing these works.

This activity is executed by INAA's personnel in a way similar to that mentioned in other item 5.2.1.4.

5.2.1.6 MAINTENANCE OF CHLORINATORS

Actually the stock of chlorinators is deficient and only 22 units are installed in the whole supply sources (wells and relief stations) of Managua City.

Out of the equipment indicated, only 14 are in operation and the rest show difficulties in functioning owing to the poor maintenance in general. The cannibalism activities realized in the maintenance and the difficulties in securing the personnel specialized in these works should be emphasized, too.

It is necessary to acquire a stock of spare parts for chlorinators and the respective reinforcing pumps, valves, piping, etc. which compose of the unit. And the training course of the personnel for operation and maintenance of this equipment is projected.

This activity is executed by INAA's permanent personnel (III Region) relying on the personnel specialized in these works.

5.2.1.7 MAINTENANCE OF WELLS:

INAA utilizes the two water catchment sources for water supply to Capital City Managua: The lake of Asososca with a production of 19 million gallons per day and underground water from 89 wells distributed in the whole city with a production of 56 million gallons daily, of which 40% may offer the highest profitability and the totality is in short of the important air control line in their operativity.

The efforts for maintaining the wells have been very little and dedicated to solve emergency cases. This results in that 8 wells should have been abandoned by deficiency and this requires their replacements.

The absence of this activity provokes in a systematic form:

- a) Investment in new wells which may be deferred.
- b) Abandonment not totally justified of catchment.
- c) Inadequate exploitation of well fields.

From other view of point, it may be said that the absence of maintenance provokes that the deterioration of wells reaches the irreversible point in a way no action is effective sensibly in improving the production.

Even though the interval between each maintenance is changeable according to several factors such as water quality, design and construction, initial efficiency of wells, flow of exploitation, it is considered that the interval of every 2.5 to 3 years is valid for normal conditions in spite of being unavailable the data based on local experiences in a large scale.

As the wells administered by INAA in Managua water systems are in large numbers, their maintenance is an indispensable activity to secure the objective of maintaining and even elevating water services to the citizen of the capital.

The maintenance of the wells permits that their production is maintained near to the original testing flow and/or permits to

determine the real flow of the output of wells and to select a suitable pumping equipment.

In conclusion, this action gives the possibility of obtaining the best efficiency in the water system with an investment or less expenses. In order to realize logically, the action of maintenance and/or review of the pumping equipment above mentioned should be considered.

It is necessary to re-initiate as soon as possible these works in a way appropriately programmed (See physical targets), requiring crane, drilling machine, compressors, trucks, electric drills, and pumps with diesel engine, gage instruments, tools, instruments, chemicals and other materials. Their acquisition is realized conform to INAA's standards and regulations covering tender and private consuming goods in concordance with the BID.

The execution mode is by direct administration i.e. by INAA's permanent personnel.

5.2.2. OPERATIONAL IMPROVEMENT :

In general terms, the basic objectives are: To improve substantially the critical functioning situation of drinking water and sanitary sewage systems. The principal effects are remarked in the aspects related with the increase in water production, sensible decrease in high percentage of existing leakage loss, the largest income to the institution (INAA), complete control of water system operation; obtaining finally the

adequate water resources distribution and the best evacuation of dirty water.

This sub-program contains the following activities:

5.2.2.1 SURVEY OF NETWORKS

The object of this activity is to get all the technical information on the sector, to know fully the various elements constituting drinking water and sanitary sewage systems, to conceive the most adequate operation to diminish the existing water leakage percentage and the efficient evacuation of residual water. The substantial effects give the possibility for detecting the principal anomalies in the systems of Managua City; and also they have the advantage of being able to elaborate the projects of improvement in future more precisely on the base of the information obtained and to check in the register of networks.

In consideration of the complexity of the actions to proceed, it is convenient to initiate this activity in Managua where the action has been tried but interrupted by lack of funds and assistance.

The execution mode is of "direct administrative" type by INAA, with the executing unit to coordinate the works from the central level in the General Operation and Maintenance Office.

It is necessary to acquire the topography, measuring, drawing equipment, tools, vehicles, office furniture, etc.

5.2.2.2 CHECK OF USERS AND OF HOUSE CONNECTIONS :

The principal objective of this activity is the sensible increase in the income of INAA through identifying and quantifying correctly the number and category of the existing users. It may enter in accounting books more exactly the number and situation of connections, detecting illegal ones which affect uncounted water and loss index, with the positive results. Other advantage of this activity is to obtain the design of routes, zones and accounts permitting the actions of collecting in order and efficiency.

The execution mode is similar to the indication in the above item (survey of networks).

It is necessary to acquire drawing and measuring equipment, vehicles, tools, office furniture, etc.

5.2.2.3 OPERATIONAL CONTROL :

With the correct execution of this activity, it is possible to maintain a constant and effective method of good functioning of drinking water and sanitary sewage systems, preventing a series of difficulties in the operation and the maintenance provoked by the inadequate procedures of operation and of control.

It is necessary to get data and information banks to realise timely the adjustment necessary to improve the efficiency in the services and to project for future similar to the one indicated in the item of survey of

networks.

This activity is executed through INAA's human resources with the specialized advisory (training course to the personnel to be elaborated for this sector). Although there is actually a department in charge of such works but it is limited under the Operation and Maintenance Office.

Materials such as computer, communication equipment, vehicles, etc. are detailed hereafter, considering global necessities of all the sector.

5.2.3 IMPROVEMENT OF WATER QUALITY AND ITS CONTROL:

The principal objective is to supply to the citizen of Managua safety water properly disinfected i.e. applying chlorine for eliminating micro-organism causing disease of hydric origin.

On the other hand, it is convenient to acquire the facilities of bacteriological control and of physical and chemical characteristics in order to know and apply the corrective methods if required.

5.2.3.1 CHLORINATION EQUIPMENT:

Actually the drinking water supply system of Managua relies upon 73 individual sources of which 14 are supplied by chlorate. As the priority measure, the equipment of the chlorination system in the remaining sources to maintain the potabilization of water is needed.

The acquisition of chlorination equipment, formed (?formed) of

chlorinator, of cylinder of chlorine, scale, masks, reinforced pump of water pressure and accessories for the complete installation is required.

This activity is executed through tender process mentioned in item 5.2.1.2 "Substitution of pumping equipment" in the same form for mounting and installation.

5.2.3.2 CONTROL OF CHLORINATION :

With the correct execution of this activity, it is possible to control a constant and effective method of applying chlorine, because through this method a good performance of the equipment is detected.

The acquisition of chlorine, respective accessories and reactant for Mnagua City s required where the control process of residual chlorine is taken place .

This activity is executed by INNA's human resources trained for the use and handling of this equipment.

5.2.3.3 REHABILITATION OF LABORATORY:

In the functions of of water quality control, it is necessary to consider the recovery of the installed capacity of INAA's central laboratory to give more coverage for the number of analysis demanded by Managua and the rest third region. In this way it may assist to define the problems of water quality and the corrective methods in order to prevent the dease of hydric origin.

The acquisition of various equipments is needed: glassware, reagents, materials and accessories for the execution of physical and chemical determinations and bacteriology.

This activity is executed through INAA's proper human resources.

5.2.3.4 REINFORCEMENT OF MONITORING :

Actually sixteen (16) daily analyses (physical- chemical and bacteriological analyses) are carried out in Managua City, controlling 18 districts continuously, and in other sites they are attended in case of appearing critical situations. There are the districts or zones not receiving water with residual choline such as: América # 4, San Judas, Parque Central, Centro América, Bello Horizonte and Reparto Schick.

Through this activity, monitoring may be reinforced in order to achieve the efficient control with bacteriological, physical- chemical quality and also water analyses are implemented such as: mercury, lead, hydrocarbon and phenol in supply sources or control points of the

system, etc.

The equipment to be utilized in this activity are included in the item "Rehabilitation of laboratory" above mentioned.

This activity is executed through INAA's proper human resources.

5.2.4 IMPROVEMENT OF PHYSICAL INSTALLATIONS :

The objective of this sub-program is to improve each one of the drinking water system components to make each of them fulfill or conform to the design and/or construction objects. Its other objective is to detect water not entered in books more precisely, performing the corresponding production-consumption balance and determining loss and leakage.

Likewise, the improvement of "sarta" is needed: a set of piping, valves, macro-gage, manometers, etc. which connect the pumping equipment to the impulsion lines or networks and to the conditions established in designs.

This sub-program covers the following activities.

5.2.4.1 RECONSTRUCTION OF CONDUCTION LINE LNETWORKS :

This activity is to improve the operation of the drinking water system in Managua City by substituting all the piping, valves and hydrants defective due to their age in service (over 30 years). Those asbest, cement and P.V.C piping should be deepened and replaced, which have been exposed in surface for years by undermining caused by rainfall and

actually in bad conditions.

Piping with small diameters (forming part of distribution networks) should be replaced, which do not meet INAA's technical specifications and standards and show the troubles in operation and maintenance.

This activity intends to cover approx. 3% (?30%) of existing piping, 30% of valves and 55% of hydrants. This permits to increase sensibly the water volume lost by visible and invisible leakage (

) with available elements such as piping, valves and hydrants, etc.

This activity is executed through tender process in accordance with INAA's standards and regulations on the acquisition of goods.

The General Operations and Maintenance Office prepares in time the respective technical specifications and other characteristics of piping, valves, hydrants and accessories to be acquired.

Laying or installations and testings, etc. of piping, are to be executed through tenders or private bids by the contractors specialized in these works. Table 5-4 shows the firms or persons existing in Managua in engagement in these works.

5.2.4.2 IMPROVEMENT OF MACRO-MEASUREMENT:

Actually 100% of macro-gages, derivative gages and measuring apparatus installed in the pumping units and storing tanks of Managua water systems are impeded or failed owing to unattendance for these last years, which lead to failure in achieving the exact analysis of the

produced water volume.

Under this improvement concept, macro-gages should be supplied to the impulsion lines of pumping stations and important networks points, and also, derivative gages and manometers to all the pumping units; and level indicators to storing tanks.

Then the acquisition is required: macro-gages, derivative gages, manometers, level indicators and accessories for the complete installation.

This activity is executed through tender process and private bids above mentioned. INAA prepares the respective technical specifications and programs the training course to all the personnel related to this activity.

The installation is executed through tenders or private bids as above mentioned.

5.2.4.3 IMPROVEMENT OF MICROMEASUREMENT:

House water gages constitute without doubt the best way to secure the rational use of drinking water. Water measurement, in addition to a fair and right treatment to users, promotes a considerable saving in the consumption and in operation costs of the system.

Actually Managua is provided with 96,396 house connections of which 46% of gages are in bad conditions.

With preference, repairing or substituting the existing gages in bad conditions, and setting the gages in the places with relatively high water ppressure, such as in the zone with relatively high consumption, have been considered.

It is considered whether the increase in income in addition to expanding the coverqage on more areas is obtainable with the same installation capacity and the same operative costs.

Micro-gages and accessories and gage boxes, if not existed, for the adequate installation are required to acquire.

This activity is executed through tender process and private bids above mentioned. INAA prepares the respective technical specifications and the installationin is executed through tender process or private bids above mentioned.

5.2.4.4 REHABILITATION OF "SARTA" (Full set of mechanical connexion of pumping equipmnt):

One of the essential factors which affects the good performance of pumping stations is that they are well equipped with all the accessories duly designed. In Managua 100% of the accessories of "sarta" are in need of a corrective maintenance and in other cases, the whole change of the "sarta", owing to non-fulfillment of the technical standards of installing the measuremnt equipment specified by INAA.

The objective of this activity is to contribute to the good performance

of the installations to get the longest useful life of the equipment and to prevent the water leakage through accessories.

Acquisition is considered necessary in this activity: shut-off valves, check valves, waste valves, pipes and nipples, etc. of various diameters (2 to 36").

This activity is executed through tender process and/or private bids above mentioned. INAA prepares the respective technical specifications and the installation is executed through private contractors under INAA's personnel supervision.

5.2.4.5 REHABILITATION OF TANKS:

It is confirmed that the most of the water storing tanks in Managua City have been unattended in the last 12 years, with little or non-maintenance. That why their rehabilitation to secure the longer life of the tanks and to fulfill duly the design and construction objects is required.

Out of 59 storing tanks under Managua water system (76% of tanks are of steel and the rest of reinforced concrete), 90% should be attended with the corrective and preventive maintenance and the rest requires the whole replacement as being completely defective.

In this activity, the following works have been considered: For steel tanks, cleaning of inner surface with sand blast, interior and exterior painting in accordance with standards, repairing or installing steel ladder, washing and disinfection of tanks and other general repairs. Acquisition of paints and other materials is made by INNA, in accordance with the tender process above mentioned.

The execution of the works is done with private contractors through the tender or private bids, as the case may be.

5.2.4.6 REHABILITATION OF PUMPING HOUSING:

Under this concept an attention is paid to the pumping equipment housing constructed and spoiled owing to lack of maintenance. Likewise, pumping station and electric control protection housing should be rehabilitated,

90% of the pumping station housing, and electric control protection housing and pumping units of the wells of Managua water system show a high grade of defects, therefore, the immediate improvement is required to impede their complete destruction.

In this activity, the following works have been considered: Reconstruction of civil works such as wall, ceiling, doors and windows, aluminum sash, general painting, fence, etc.

The works are executed by private contractors in accordance with private bids or tender, as the case may be.

5.2.4.8 CONSTRUCTION OF HOUSING FOR OPERATORS AND WATCHMEN:

Actually the operation of the equipment is carried out by the personnel, living at a considerable distance and being unprotected against inclemency. The object is to supply the minimum indispensable conveniences for the operators and/or watchmen of the pumping, chlorination and general installations to get an adequate protection.

In this activity the construction of a housing of 4m x 4m has been considered conveniently located in the limits of pumping and/or re-pumping stations.

The execution of these works is done in a similar way to the one indicated for the pumping housing.

5.2.5. IMPROVEMENT OF SANITARY SEWAGE SYSTEM:

In Managua City the sanitary sewage system started approx. 60 years ago and it is easy to imagine the actual condition without any adequate maintenance and timely renewal. Discharging is done without pre-treatment to the Lake of Managua.

The system consists of piping of from 6" to 18" dia in collecting networks and from 10" to 30" in discharge outlet or collector.

These are continuously obstructed owing to bad situations of the system, causing surface overflow of used water and creating unhealthy

environment.

5.2.5.1 IMPROVEMENT OF SANITARY SEWAGE NETWORKS:

It is important to note that a large piping area is in bad situation, with serious rupture and also a large number of manholes with grave damage in structure, adding settling establishments on collecting lines and/or manholes owing to the disorganized expansion of the city. Therefore, it makes the maintenance difficult, creating serious problems of sanitary service.

In summary this activity consists of: Changing broken piping sections and constructing new manholes in the same places or sectors affected, and constructing house connections in the above points.

The items to be executed in these works include the recovery of discharge outlet or collector in failure owing to their 40 years of age, too. The works are executed by private contractors in accordance with private bids or tender, as the case may be.

5.2.5.2 MAINTENANCE OF SANITARY SEWAGE NETWORKS:

In the sanitary sewage services under the Operation and Maintenance Office of the third region of INAA, there are great difficulties in cleaning and conservation of the networks, collectors, discharge outlets of the sanitary sewage system of Managua City and there is no maintenance program; clearing and washing only when they are obstructed,

causing great troubles by overflow of dirty water.

This is added in the rainy season as the collectors are overloaded with sand and other solid materials introduced through manholes and also with rain water. Further a large number of secret connections to the system cause overflow through manholes.

The situation is still worse as there are found piping of relatively very small diameter in city's some sectors, so old and destroyed; manholes with no covers and the citizen introduce all the classes of solid materials through them.

In the warehouses of the III region, there are flexible rods to clear in stock but unusable without some accessories such as tirobuzón (?pulling-box), spear heads, etc.

In summary a large number of flexible rods to clear the piping and collectors of the sanitary system should be supplied and also motor-driven equipment and other equipment and tools should be assigned: the minimum essential elements for protecting the laborers should be acquired.

To this activity the following programs are added: Gages in collectors, survey of networks, detection of leakage through pumps which serve to the improvement of the operation and maintenance of the system.

Acquisition of the goods is made through tender process in accordance with INAA's standards and rules in concordance with the BID.

This activity is executed by the Institution's personnel in a corrective and preventive maintenance 5-year program.

6.0 REORGANIZATION OF GAGE SHOPS:

Only one central gage shop is actually available in Managua City. In consideration of the complexity of repairing all the gages at national level, it has been considered to relieve the congestion of the central shop with creating gage shops in each one of the regions in the country.

Then the rehabilitation and reorganization of the central shop is required to have a minimum repairing capacity of 120 gages per day.

This implies the corrective and preventive maintenance to 30% per year of the gages in Managua City; This is carried out with a group of 22 persons (one shop manager, 6 repair-men, 2 testers, 6 helpers, 3 painters and one secretary and 3 kardistas(?)).

To realize this activity it is necessary to move the central shop from where a continuous chlorine leakage is produced, as its location is near to Asososca chlorination station, damaging the equipment and the personnel in this central and at the same time, to substitute all the equipment, because these are over 20 years in service and defective owing to lack of the maintenance in these recent years.

Then the construction of a new shop as well as various equipment is required: gage testing bench, repairing metallic bench, hydro-rubber

tank, compressor, tools, various materials such as paint, etc. and furniture and tools, a series of spare parts indispensable for repairing, various marks of gages, observing that some quantity of gages should be thrown away and considered useless owing to their age.

Acquisition is made in accordance with INAA's standards and rules as mentioned in above items.

This sub-program is executed through INAA's personnel, even though it requires a specialized advisory for planning and programming on activities and also training as indicated in other items.

7.0 REORGANIZATION OF ELECTROMECHANICAL CHLORINATOR AND VALVES SHOP:

There is actually one electromechanical shop which renders maintaining services to the units (pumping equipment, panels and electric controllers, transformers) of Managua City and the rest of the III region.

The objective of rehabilitating and reinforcing the shop is to increase its efficiency. This implies the shop's physical modernization such as:

The partial substitution of the equipment which are actually found defective owing to their age (over 10 years) and under bad maintenance service given in these last years.

This shop should be reorganized to realize the preventive and corrective maintenance services in accordance with the following sections:

- Welding (electric and autogenous (?torch))
- Inner combustion stationary engines (industrial machine)
- Pump mechanism
- Chlorinators
- Valves
- Construction of nipples
- General repair and reconstruction of electric panels

In summary, the proper maintenance with this organization should be supplied to all the equipment installed at level of the III Region.

The execution of the works requires: Reconstruction of civil works in the shop; wall, ceiling and doors, etc., and also acquisition of nipple machine, manometer calibrator, rectifier, valves, drill, hydrolic press, emery, etc., instruments such as: ammeter, voltmeter, multimeter, etc., tools such as: llave de copa (? wrench), Allen wrench, wire cutter, tong, pipe cutter, etc.; materials such as: steel sheets, bronze, electrode, cables, etc.

Acquisition is made in accordance with INNA's standards and rules above mentioned.

This sub-program is executed by INAA's personnel, even though it requires a specialized advisory for planning and programming on the activities such as personnel training in other cases discussed.

8.0 REINFORCEMENT OF TRANSPORT SYSTEM WITH EQUIPMENT:

The principal problem for an adequate maintenance and its respective supervision and control is lack of appropriate vehicles, to load and dismantle the pumping equipment and to transport the personnel, materials and tools, etc.

Actually there are no exclusive vehicles for the maintenance activities and the using vehicles are shared with others according to the priority of the problems in the III region.

Lack of these facilities has greatly influenced on the development of the maintenance activities of the equipment and installations in general.

It should be noted that there are no trucks for shop, cranes, fork-lifts, etc. for various works.

It is required to acquire trucks for shop, cranes, fork-lifts and double traction trucks at level of the III region district to furnish the maintenance required in Managua City and the remaining sites of the III region.

Acquisition of the goods is made through tender process in accordance with INAA's standards and rules in concordance with the BID.

9.0 REORGANIZATION OF COMMUNICATION SYSTEM:

Communication is actually realized by using radio stations of TELCOR's telephone communication and system.

This service suffers a series of defectiveness, as out of the existing 9 radio stations 6 are in bad condition (more than 18 years after installed) with little maintenance in these last years. This situation is added with the continuous electric shortage, affecting the whole operative system of Managua.

Referring to the telephone communications, there exist 6 installations with telephones, out of which 2 are in bad condition.

In summary, the radio communication equipment in bad condition should be substituted, as well as the telephones in the same condition.

The objective is to install radio communication and telephone stations (as alternative, radio stations in case of shortage of electricity) in all the pumping stations and the sites of storing tanks.

In some training establishment the communication is guaranteed in case of any abnormal situations. Portable radios equipment should be supplied to the personnel in operation and maintenance who are working in remote stations.

We believe that the implementation of these new systems improves the company's operativity systematically.

Acquisition of the goods is made through tender process in accordance with INAA's standards and rules as mentioned in other items.

DIRECT CONSTRUCTION COST (US\$)
 2600 MAINTENANCE OF PUMPING EQUIPT DRINKING WATER

(CODE) : 2607 MANAGUA

CATEGORIES & SUB-CATEGORIES OF INVESTMENT	QUANTITY	UNIT	COST OF MATERIALS		LABOR	TOTAL
			L O C A L	IMPORTACION		
			UNIT.	TOTAL	UNIT.	TOTAL
1. PRODUCTION						
1.1 PREV. MAINTENANCE	177	C/U		1005520.00	\$151,523.00	1157043.00
1.2 CORR. MAINTENANCE	62	C/U		\$673,016.00	\$134,603.00	\$807,619.00
T O T A L E S				\$0.00	\$296,126.00	1974662.00

- 1.0 PRODUCTION
- 1.1 Inc. of wells
 - 1.1.1 Cleaning Dev. wells
 - 1.1.2 Maintenance Wells
- 1.2 Inst Eqpt in Wells Incorporateds
- 1.3 Reh Pumping Eqpt
- 1.4 Subst. Pump Eqpt
- 1.5 Conn. Pump Eqpt
- 1.5.1 Const. Sartas in Wells incorporated
- 1.6 Imp. Macromasurement
 - 1.6.1 Inst. Macromasurement
 - 1.6.2 Inst. Level Gage
- 1.7 Const. Houses in Wells incorporated
- 1.8 Reh. Pumping Houses
- 1.9 Cons. Hous. Operators
- 2.0 TRANSMISSION
- 2.1 Reh. Connduction Lines
- 2.2 Const Connduction Lines for Wells corporated
- 3.0 TREATMENT
- 3.1 Maint. Chlorinators
 - 3.1.1 Reh. Chlorinators
 - 3.1.2 Substitutin Chlorinators
- 3.2 Chlorination Equipment
 - 3.2.1 Chlorinators
 - 3.2.2 Auxiliary Equipment
- 3.3 Chlorination Control
- 3.4 Reh. Laboratories
- 3.5 Imp. Treatment Plants
- 3.6 Cons. Chlorination Houses
- 3.7 Reh. Chlorination Houses
- 4.0 DISTRIBUTION
- 4.1 Survey of Networks
- 4.2 Check of Users and House Connections
- 4.3 Reh. Networks
- 4.4 Imp. Micromasurement
 - 4.4.1 Eliminaton Dirct Connec.
 - 4.4.2 Maintenance Connections
- 4.5 Rehabilitation of Tanks

- 1.0 PRODUCTION
- 1.1 Inc. of wells
 - 1.1.1 Cleaning Dev. wells
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- 1.2 Inst Eqpt in Wells Incorporated
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 - 3.2.1 Chlorinators
 - 3.2.1 Auxiliary Equipment
- 3.3 Chlorination Control
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- 3.5 Imp. Treatment Plants
- 3.6 Cons. Chlorination Houses
- 3.6 Reh. Chlorination Houses
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- 4.2 Check of Users and House Connections
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- 4.4 Imp. Micromasurement
 - 4.4.1 Eliminaton Dirct Connec.
 - 4.4.2 Maintenance Connections
- 4.5 Rehabilitation of Tanks

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- 1.5 Conn. Pump Eqpt
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 - 1.6.1 Inst. Macromasurement
 - 1.6.2 Inst. Level Gage
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- 2.2 Const Connduction Lines for Wells corporated

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 - 3.1.1 Reh. Chlorinators
 - 3.1.2 Substitutin Chlorinators
- 3.2 Chlorination Equipment
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 - 3.2.2 Auxiliary Equipment
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- 3.5 Imp. Treatment Plants
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- 3.7 Reh. Chlorination Houses

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- 4.5 Rehabilitation of Tanks

DIRECT CONSTRUCTION COST (US\$)
2300 REHABILITATION DRINKING WATER MANAGUA

2301 MANAGUA								
CATEGORIES & SUB-CATEGORIES OF INVESTMENT	QUANTITY	UNIT	COST OF MATERIALS				LABOR	TOTAL
			LOCAL		IMPORTACION			
			UNIT.	TOTAL	UNIT.	TOTAL		
11.0 PRODUCCION								
1.1 Incorporación de Pozos								
1.1.1 Limpieza y Desarrollo de Pozos	81	C/U	150	12150.0			345,696.0	357,846.0
1.1.2 Mantenimiento de Pozos								
1.2 Instalación de Equipos en Pozos Incorporados	8	C/U				380,234.0	127,054.0	507,288.0
1.3 Rehabilitación de Equipos de Bombeo	66	C/U				1,568,466.0	517,594.0	2,086,060.0
1.4 Sustitución de Equipos de Bombeo	103	C/U				4,095,516.0	1,571,585.0	5,667,101.0
1.5 Conexión de Equipos de Bombeo								
1.5.1 Construcción de Sarta en Pozos Incorporados.	8	C/U				75,648.0	16,660.0	92,308.0
1.5.2 Rehabilitación de Sargas	118	C/U		54750.0		174,478.0	55,568.0	204,796.0
1.6 Mejoramiento de Microedición								
1.6.1 Instalación de Macromedidores	109	C/U				273,201.0	113,793.0	386,994.0
1.6.2 Instalación de Medidores de Nivel	40	C/U				3,950.0	1,020.0	4,970.0
1.7 Construcción de Casetas en Pozos Incorporados.	8	C/U		11520.0			3,936.0	15,456.0
1.8 Rehabilitación de Casetas de Bombeo	93	C/U		83420.0			71,670.0	155,090.0
1.9 Construcción de Casetas de Operadores <i>Vigilante</i>	90	C/U		83629.0			22,407.0	106,036.0
12.0 TRANSMISION								
2.1 Rehabilitación de Líneas de Conducción								
2.2 Construcción de Líneas de Conducción para Pozos Incorporados.	0.2	KM				24,700.0	6,236.0	30,936.0
13.0 TRATAMIENTO								
3.1 Mantenimiento de Cloradores								
3.1.1 Rehabilitación de Cloradores								
3.1.2 Sustitución de Cloradores								
3.2 Equipos de Cloración								
3.2.1 Cloradores	64	C/U			11425	731,200.0	104,330.0	835,530.0
3.2.2 Equipo Complementario						7,488.0		7,488.0
3.3 Control de Cloración	6LB	6LB						
3.4 Rehabilitación de Laboratorios								
3.5 Mejoramiento de Plantas de Tratamiento								
3.6 Construcción Casetas de Cloración	90	C/U		21600.0			44,280.0	65,880.0
3.7 Rehabilitación de Casetas de Cloración								
14.0 DISTRIBUCION								
4.1 Catastro de Redes	1200	KM		1004216.0		271,055.0	216,060.0	1,571,331.0
4.2 Catastro de Usuarios y de Conexiones Posiciliares	96392	C/U		12500.0			173,505.0	186,005.0
4.3 Rehabilitación de Redes	177.3	KM		259229.0		3,791,290.0	13,952,942.0	4,002,511.0
4.4 Mejoramiento de Microedición								
4.4.1 Eliminación de Conexiones Directas	34980	C/U				2,361,100.0	103,353.0	2,470,533.0
4.4.2 Mantenimiento de Conexiones	8986	C/U				218,697.0	65,595.0	284,292.0
4.5 Rehabilitación de Tanques	45	C/U		172156.0		1,084,360.0	837,280.0	2,093,796.0
T O T A L				1,800,228.0		15,004,080.0	8,405,514.0	26,009,822.0

2300.WK1

DIRECT CONSTRUCTION COST (US\$)

2400 REHABILITATION DRINKING WATER MANAGUA

2401 MANAGUA

CATEGORIES & SUB-CATEGORIES OF INVESTMENT	QUANTITY	UNIT	COST OF MATERIALS		LABOR	TOTAL
			L O C A L	IMPORTACION		
			UNITARIO	TOTAL	UNITARIO	TOTAL
1.0 COLLECTION						
1.1. Improve Networks						
1.1.1 Rehab. Piping	32.6	KM	694,038.0		260,300.0	954,338.0
1.1.2 Rehab. Manholes	560	C/U	292,984.0		42,000.0	334,984.0
1.1.3 Rehab. House Con.	1000	C/U	91,438.0		47,001.0	138,439.0
1.2 Eval. Recell. System						
1.2.1 Survey Networks	6LE		31,000.0		72,120.0	103,120.0
1.2.2 Flow Program			15,000.0		60,694.0	75,694.0
1.2.3 Detection Control	57000	C/U	12,670,000.0		168,391.0	2,838,391.0
House connection			13,794,460.0		850,506.0	4,444,966.0

240007

DIRECT COST

2500 SUB-PROGRAM OF OPERATIONAL IMPROVEMENT

2507 MANAGUA

CATEGORIES & SUB-CATEGORIES OF INVESTMENT	QUANTITY	UNIT	COST OF MATERIALS			LABOR	TOTAL
			LOCAL		IMPORTACION		
			UNITARIO	TOTAL			
1.0 REORGANIZATION OF GAZE SHOPS	200.0	M2		48,000.0	118,155.0	16,400.0	182,555.0
2.0 REINFORC. ELECTRICMECHANICAL CHLORINATOR VALVE SHOP	450.0	M2		108,000.0	400,000.0	38,900.0	544,900.0
3.0 REINFORCEMENT OF VEHICLES CENTRAL SHOP	450.0	M2		108,000.0	400,000.0	35,900.0	544,900.0
4.0 REINFORCEMENT OF CENTRAL LAB.							
5.0 REINFORCEMENT TRANSP SYS WITH EQUIPMENT	GLOBAL				2,637,220.0	1,360,872.0	3,998,092.0
6.0 IMPROVEMENT COMMUNICATION SYS.	GLOBAL				548,100.0		548,100.0
7.0 REINFORCEMENT OF MAINTENANCE UNIT OF WELLS							
8.0 REINFORCEMENT OF MAINTENANCE UNIT OF SANITARY SEWAGE	1.0	C/U			694,988.0		694,988.0
TOTAL				264,000.0	5,798,463.0	1,451,072.0	6,513,535.0

2500. IKZ

附属資料 8. 3)

2000年のマナグアの人口予測に対する水需要の調査(1983年6月)

実施コンサルタント ① SOGREAH (仏コンサル)
 ② BCEOM (仏コンサル)
 ③ FRANKLIN GAVARRETE C. Y ASOCIADOS (ニカラグァ ローカル
 コンサル)

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人口と都市開発調査

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概 要 と 結 論

ニカラグアの首都マナグア市は、ソロトラン湖(マナグア湖)の南端に位置し、海拔平均70mである。その熱帯気候は、通常12月から5月の乾季と6月から11月の雨季があり、雨量は約1,300mmである。気温は年間を通じ安定しており、平均27.5℃である。

1982年4月に発行されたレギュレータープランの公的範囲によると、マナグア市内の面積は800km²以上であり、都市部は約173km²である。

近年のセンサスデータの不足から、市民の正確な数は不明である。1982年終盤に、都市人口700,000、それに地方地域人口53,000を加えたものと見積られた。

都市部人口のほとんどはINAAのネットから上水の供給を受けている。しかしながら、85%しか個人のドメスティックコネクションを持っておらず、残りの100,000人以上は、ネットへの限られたアクセスしか持たない(公的場所もしくは隣家)。

地方部については、首都への主なルートに沿って(carretera a Masaya, carretera Sur, antigua carretera a Leon)、にのみ公共ネットが繋がれている。

INAAの生産の最近の統計の外挿法によると、現在の全消費(流失流を含む)は、年間約14,000ガロン(38.4MGD)と推定し、その97.5%は都市部地区の消費である。したがって、個人の消費平均は53.5ガロン/人/日である。

公共網による消費は基本的に家屋用(37.7ガロン/人/日)と、公共および商業セクターの需用(6.1ガロン/人/日)である。一部(0.8ガロン/人/日)は、さらに灌漑や公共緑地用に応じている。実際工業用はほとんどなく(0.1ガロン/人/日)、ほとんどがマナグアのローカル帯水層から直接取水している。記載されない水量という現実の重要性(生産量の約30%)は、計算間違いとサブファクトレーションのほとんどを説明する。ディストリビューションシステムの実際の流失は16%(8.8ガロン/人/日)をこえはしない。

政府団体による計画地方分権政策は、マナグア市の人口増加に様々な評価を与える。社会経済の不活動を考慮にいたより現実的な予測は、マナグアの都市部人口は1990年1,094,000人、2000年1,780,000人である。

1982年4月にMINVAHによって実行されたレギュレータープランのレコメンデーションに従うと、市の成長は地方のより良いインフラの開発より中央ゾーンに集中されねばならない。都市化のために11,760haが用意されており、そのうち1990年には60%以上、2000年には90%以上が開発されねばならない。

その開発は、指定された様々なゾーンと共に市の再建設についても実施されねばならない。

水需要の増加は、人口増加、政策の人とネットの関係の採択、工業発展、ローカル帯水層資源の利用から生じている。より可能性の高い予測としては：

- 1990年にはすべての住居が個別サービスを受けられるために、人口からネットへの直接接続に力を入れ続ける；しかし、並行して、マナグアに隣接するゾーンの水供給料金の上昇は、それ

らのセクターネットを拡げること制限するだろう；

- ・雇用促進の必要性は、マナグア市の工業発展を促す；しかし、地方分権プロジェクトは、重工業を、水を大量消費する工業中心地に設置することを制限するだろう；

- ・一つの法規を、マナグアの帯水層からの個人取水コントロールと工業の公共水ネットへの接続促進のために適用する；しかし、ある地域については例外とし、一定量の直接取水を長期にわたり（2000年）維持する。

並行して

- ・ネットの実際水量は85%を超えない、
- ・生産物の設置は、年平均の20%以上の日需要を満たすよう、計算されねばならない、
- ・ディストリビューションの設置は、日需要の代わりに年平均と時変化の“平均”カーブの35%以上に計算されねばならない。

結論として、このスタディーにおける需要計画は、次のように要約できる。

	1982	1990 (%) [↑] 1982	1990	2000 (%) [↑] 1990	2000	2000 (%) [↑] 1982	
人口(1000 hab.)	699,300	5.8	1,094,000	5.0	1,780,500	5.3	
単一需要* (gal/hab/dia)	53.5	1.4	60.0	0.2	61.2	0.7	
需要** {	年 (106 gal)	14,000	7.2	24,307	5.2	40,340	6.0
	日最高量(MGD)	46.0		80.1		132.6	

* 都市部内限定

** 公共網全生産

附属資料 8. 4)

ニカラグァ上下水道庁 (INAA)

より多くの水による新しいマナグァプロジェクト

マナグァ市への水供給源調査報告書

第 2 フェーズ

地下水調査結果および最適代替案の分析と選定

モントゴメリーチャン

コンソーシアム

1981年 6 月

1981年 7 月 1 日

ニカラグァ上下水道庁 (INAA)

マナグァ

オトニエル・アルゲージョ・H長官殿

件名：マナグァ市への水供給源調査報告書、第 2 フェーズ

拝啓

Empresa Aguadora de Managua と共に調印した契約に従い、マナグァ市への水供給源調査一第 2 フェーズの報告書を皆様方に提出できることを大変嬉しく思います。この報告書では地下水調査の結果および供給源開発のための最適代替案の分析および選定結果について記述しております。

この報告書の結論および提案は以下のものである：

1. マナグァ市への使用可能な地下水源の個々の確実な能力は以下の通りに見積りをおこなった：

地下水源	使用可能量	
	m ³ /日	mgd
マサーヤ湖湖畔	49,300	13
ティスマ (Tisma) 地区	132,600	35
ニカラグァ湖湖畔	166,700	44

2. 供給源開発計画のために使用したマナグア市の人口および水の平均需要は見直しを行い、それらを以下に示す：

年	人口	平均需要	
		m ³ /日	mgd
1990	951,770	314,400	83
2000	1,408,850	522,700	100

3. 地下水調査および代替案の技術経済的分析の結果により、提案することは以下の2つの段階による地下水開発を通し、マナグア市への水供給の拡張を実施することである。

第1段階：平均能力が132,600m³/日(35mgd)あるティスマ地区内の井戸の開発。この段階は1985年に完成し、1992年迄のマナグア市の水必要量を確保することになっていた。

第2段階：平均能力が91,000m³/日(24mgd)あるニカラグァ湖北西湖畔の井戸の開発。この段階は1992年に完成し、2000年迄のマナグア市の水必要量を確保することになっていた。

4. 開発第2段階を実施する前に、井戸開発またはニカラグァ湖の表面水の使用代替案を検討しなければならない。このために、報告書に提示してあるようにニカラグァ湖の井戸用地のみならず、湖自身の補足的調査実施を提案いたします。

5. マナグア市への水供給のためにティスマ地区における地下水の独占的使用権を INAA が取得することを提案する。

この第2フェーズ調査を提出できることは私達にとって喜びであり、ニカラグァ上下水道庁のあらゆる人々からの協力、特にプロジェクト調整員カルロス・エスピノーサ技師に対し深く感謝いたします。

敬 具

J・アグスト・チャン(署名)

ジェームス・M・モンゴメリー(署名)

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INSTITUTO NICARAGUENSE DE
ACUEDUCTOS Y ALCANTARILLADOS
(INAA)

PROYECTO MAS AGUA PARA
LA NUEVA MANAGUA

INFORME SOBRE LA
INVESTIGACION DE FUENTES
POTENCIALES DE ABASTECIMIENTO
DE AGUA PARA MANAGUA

FASE II
RESULTADOS DE LA INVESTIGACION
DE AGUAS SUBTERRANEAS
Y
ANALISIS Y SELECCION
DE LA MEJOR ALTERNATIVA

Junio 1981
MONTGOMERY-CHAN
UN CONSORCIO

INSTITUTO NICARAGUENSE DE ACUEDUCTOS Y ALCANTARILLADOS (INAA)

PROYECTO MAS AGUA PARA LA NUEVA MANAGUA

INFORME SOBRE LA INVESTIGACION DE FUENTES
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MONTGOMERY-CHAN
Un Consorcio

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MONTGOMERY · CHAN

- UN CONSORCIO -

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1 de Julio de 1981

Dr. Ottoniel Arguello H.
Director
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Ref. Informe sobre la Investigación
de Fuentes Potenciales de Agua
para Managua, Fase II

Estimado Dr. Arguello:

De acuerdo con nuestro contrato firmado con la Empresa Aguadora de Managua, tenemos mucho gusto de presentar a ustedes nuestro informe sobre la Investigación de Fuentes Potenciales de Abastecimiento de Agua para Managua - Fase II. En este informe se presentan los resultados de la investigación de aguas subterráneas y el análisis y selección de la mejor alternativa para desarrollar las fuentes de abastecimiento.

Las conclusiones y recomendaciones de este informe son las siguientes:

1. Los rendimientos seguros individuales de las fuentes de agua subterránea potenciales disponibles para Managua se han estimado así:

<u>Fuente Subterránea</u>	<u>Rendimiento Seguro Disponible</u>	
	<u>m³/día</u>	<u>mgd</u>
Costa de la Laguna de Masaya	49,300	13
Area de Tisma	132,600	35
Costa del Lago de Nicaragua	166,700	44

2. Las proyecciones de población y demanda de agua promedia de la Ciudad de Managua usadas para el planeamiento del desarrollo de las fuentes de abastecimiento han sido revisadas y son las siguientes:

<u>Año</u>	<u>Población</u>	<u>Demanda Promedia</u>	
		<u>m³/día</u>	<u>mgd</u>
1990	951,770	314,400	83
2000	1,408,850	522,700	100

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3. De acuerdo con los resultados de la investigación de aguas subterráneas y del análisis técnico-económico de las alternativas estudiadas, se recomienda que la expansión del abastecimiento de agua para Managua sea llevada a cabo por medio del desarrollo de aguas subterráneas en las dos etapas siguientes:

Primera Etapa. Desarrollo de un campo de pozos en el área de Tisma con una capacidad promedio de 132,600 m³/día (35 mgd). Esta etapa quedaría terminada en 1985 y cubriría las necesidades de agua de Managua hasta el año 1992.

Segunda Etapa. Desarrollo de un campo de pozos en la costa nor-occidental del Lago de Nicaragua con una capacidad promedio de 91,000 m³/día (24 mgd). Esta etapa quedaría terminada en 1992 y cubriría la demanda de agua hasta el año 2000.

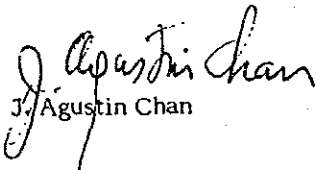
4. Antes de emprender la segunda etapa del desarrollo se deberá de revisar la alternativa de desarrollar el campo de pozos o de usar las aguas superficiales del Lago de Nicaragua. Para esto se recomienda hacer las investigaciones adicionales sugeridas en este informe, tanto en el campo de pozos propuesto del Lago de Nicaragua como en el propio lago.
5. Se recomienda que el INAA obtenga los derechos exclusivos del uso de las aguas subterráneas del área de Tisma para el abastecimiento de Managua.

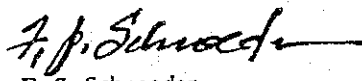
Nos complace el presentar esta segunda fase de los estudios y queremos agradecer la cooperación recibida de todo el personal del Instituto Nicaraguense de Acueductos y Alcantarillados que colaboró con nosotros, especialmente la del Ing. Carlos Espinosa G., coordinador del proyecto.

Muy atentamente,

J. AGUSTIN CHAN
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JAMES M. MONTGOMERY,
CONSULTING ENGINEERS, INC.


J. Agustin Chan
/ts


F. J. Schroeder
Vice-Presidente

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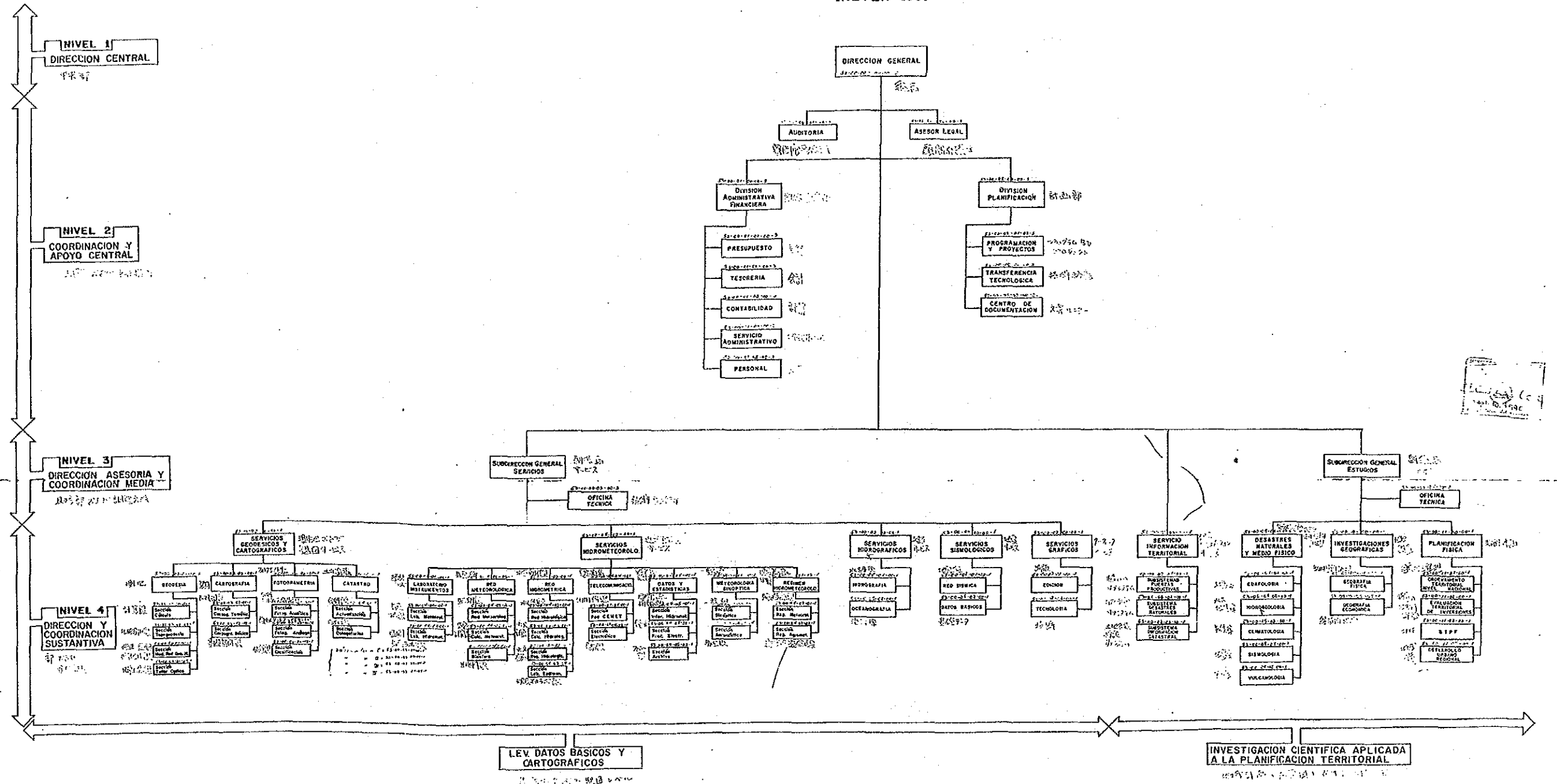
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INSTITUTO NICARAGUENSE DE ESTUDIOS TERRITORIALES
INETER 1991



PROFESIONALES

DISTRIBUCION POR AREAS SUST. Y APOYO

PROFESIONES	AREAS		TOTAL	P R O F E S I O
	SUST.	APOYO	PROF.	
	正職員	補助職員	計	
ING. CIVIL C/MAESTRIA EN ING. SANITARIA	11	-	11	
ING. CIVIL C/ESP. EN HIDROGEOLOGIA	1	-	1	
INGENIEROS CIVILES	42	7	49	
ING. AGRICOLA C/ESP. EN HIDROGEOLOGIA	1	-	1	
INGENIERO-ELECTROMECANICO	1	-	1	
ING. CIVIL Y MASTER DE CIENCIAS EN INGENIERIA	2	-	2	
INGENIEROS AGRICOLAS	3	-	3	
ADMINISTRADORES DE EMPRESA	2	12	14	
CONTADORES PUBLICOS	4	6	10	
CONTADOR PUB. C/ESP. BANCA Y FINANZA	-	1	1	
ECONOMISTAS	3	3	6	
PSICOLOGOS	-	3	3	
TRABAJADORES SOCIALES	-	1	1	
PEDAGOGOS	-	3	3	
LICENCIADAS EN ESPANOL	-	2	2	
BIBLIOTECOLOGA	-	1	1	
MEDICOS	-	4	4	
BIOLOGOS	1	-	1	
QUIMICOS	3	-	3	
ABOGADO Y NOTARIO	-	1	1	
LIC. EN IDIOMA FRANCES	-	1	1	
PERIODISTA	-	1	1	
LIC. EN COMPUTACION	-	1	1	
LIC. EN FISICA Y MATEMATICAS	1	-	1	
TOTAL GENERAL	75	47	122	

CUADRO No 8.6a

SITUACION DE EQUIPOS DE PERFORACION DISPONIBLES EN EL INSTITUTO NICARAGUENSE DE

ACUEDUCTOS Y ALCANTARILLADOS

DESCRIPCION DEL EQUIPO	SISTEMA DE PERFORACION	AÑO	MARCA	SERIE	MODELO	CAPACIDAD	ESTADO ACTUAL		
							PERFORADOR	MOTOR	EN OPERACION
PERFORADOR "J" No 28661 MONTADO SOBRE CANYON MAZ 500	ROTATIVO	83	SOVIETICA	----	1BA-15B1	15,000 LBS, 8" A 1,500'	HALO	HALO	NO
PERFORADOR "K" No 28662 MONTADO SOBRE CANYON MAZ 500	ROTATIVO	83	SOVIETICA	----	URB-3AM	10,000 LBS, 4" A 900'	BUEHO	BUEHO	SI
PERFORADOR "L" No 28663 MONTADO SOBRE CANYON MAZ 500	ROTATIVO	83	SOVIETICA	----	URB-3AM	10,000 LBS, 4" A 900'	HALO	HALO	NO
PERFORADOR "N" No 8816 MONTADO SOBRE TRAILER	PERCUSION A CABLE	88	NELL MASTER	-----	1250	20" A 300'	NUEVO	NUEVO	SI
PERFORADOR "N" No 8817 MONTADO SOBRE CANYON HACK	PERCUSION A CABLE	88	NELL MASTER	-----	5000	20" A 1,100'	NUEVO	NUEVO	SI
PERFORADOR "O" No 8818 MONTADO SOBRE TRAILER	PERCUSION A CABLE	88	NELL MASTER	-----	5000	20" A 1,100'	NUEVO	NUEVO	SI

FUENTE: DIRECCION DE HIDROGEOLOGIA

CUADRO No B.6

SITUACION DE EQUIPOS DE PERFORACION DISPONIBLES EN EL INSTITUTO NICARAGUENSE DE ACUEDUCTOS Y ALCANTARILLADOS

DESCRIPCION DEL EQUIPO	SISTEMA DE PERFORACION	AÑO	MARCA	SERIE	MODELO	CAPACIDAD	ESTADO ACTUAL		
							PERFORADOR	MOTOR	EN OPERACION
PERFORADOR "E" No 035 MONTADO SOBRE CHAZIS CON TORNAMESA RENOLQUE	PERCUSION A CABLE	57	BUCYRUS ERIE	57941	22-W	8,000 LBS, 18" A 200'	MALO	MALO	NO
PERFORADOR "G" No 068 MONTADO SOBRE CAMION FORD F-700	PERCUSION A CABLE	65	BUCYRUS ERIE	129963	60LL	39,500 LBS, 18" A 1,000'	MALO	MALO	NO
PERFORADOR "D" No 095 EN TRAILER COMPLETO	PERCUSION A CABLE	68	SPEED STAR	40044	SS-71-SP	18,000 LBS, 20" A 300'	MALO	MALO	NO
PERFORADOR "C" No 069 MONTADO SOBRE CAMION CHEVROLET 550	PERCUSION A CABLE	69	SPEED STAR	11913	SS71A	10,000 LBS, 20" A 200'	MALO	MALO	NO
PERFORADOR "A" No 74-02 MONTADO SOBRE SEMI TRAILER	PERCUSION A CABLE	74	SPEED STAR	40117	SS-81-SP	20,000 LBS, 20" A 500'	MALO	MALO	NO
PERFORADOR "F" No 78-08 MONTADO SOBRE TRAILER DE RENOLQUE	PERCUSION A CABLE	78	BUCYRUS ERIE	631812	36-1	88,000 LBS, 20" A 1,100'	BUENO	BUENO	SI
PERFORADOR "G" No 80-51 MONTADO SOBRE CAMION FORD F-600	PERCUSION A CABLE	80	BUCYRUS	-----	22/W	8,000 LBS, 20" A 300'	REGULAR	REGULAR	SI
PERFORADOR "I" No 28660 MONTADO SOBRE CAMION MAZ 500	ROTATIVO	83	SOVIETICA	-----	1BA-15B	15,000 LBS, 8" A 1,500'	BUENO	BUENO	SI

FUENTE: DIRECCION DE HIDROGEOLOGIA

CUADRO No 8.7

EDAD Y ESTADO DE LAS UNIDADES DE TRANSPORTE

(A MARZO/1990)

GRUPO DE EDAD	TOTAL DE UNIDADES		UNIDADES ACTIVAS				UNIDADES EN REPARACION							
	CANT. TOTAL	% DEL TOTAL	CAN-TIDAD	%		TOTAL EN REPARACION	REPARACION MENOR		REPARACION MAYOR		Z	DEL TOT. DEL GRUPO		
				DEL TOTAL ACTIVO	DEL TOTAL GRUPO		TOTAL UNIDADES EN REP.	TOTAL UNIDADES EN REP.	Z	Z				
													6	4.
7	5.	1.	3.	8.	82.									
DE 0 A 5 AÑOS	176	48	158	--	71.	90	18	--	6	4.	3.	12	8.	7
DE 5 A 10 AÑOS	112	30	54	--	24	48.	58	--	7	5.	6.	51	36.	46.
MAS DE 10 AÑOS	80	22.	12	--	5.	15.	68	--	2	1.	3.	66	46.	82.
TOTALES	368	100.	224	61.	--	--	144	39.	15	10.	--	129	90.	--

FUENTE : DIRECCION ADMINISTRATIVA

INSTITUTO NICARAGUENSE DE ACUEDUCTOS Y ALCANTARILLADOS
LABORATORIO DE CONTROL DE CALIDAD DE AGUA

INFORME DE ANALISIS FISICO Y QUIMICO DE AGUA

INTERESADO INAA - REGION III INFORME Nº 129
 DIRECCION / SECCION DIREC. GRAL. REGION III ATENCION ING. VICTOR VIDAURRE
 DEPARTAMENTO MANAGUA LOCALIDAD MANAGUA
 FUENTE DE CAPT. P.P. #-3 BLOF PALME FECHA / HORA DE CAPT. _____

RESULTADOS

ASPECTO _____ TEMPERATURA _____ °C
 OLOR _____ COLOR 2.5 UC
 SOLIDOS TOTALES _____ mg/L TURBIDEZ 0.4 UNT
 SOLIDOS DISUELTOS 530 mg/L CONDUCTIVIDAD 520 uS/cm
 DUREZA TOTAL 96 mg/L ALCALINIDAD TOTAL 252 mg/L
 pH 7.7

CATIONES	mg/L	ANIONES	mg/L
CALCIO (Ca ⁺⁺)	<u>24</u>	BICARBONATOS (HCO ₃ ⁻)	<u>288</u>
MAGNESIO (Mg ⁺⁺)	<u>8.7</u>	CARBONATOS (CO ₃ ⁼)	<u>10.4</u>
HIERRO (FE)	<u>0.19</u>	CLORUROS (Cl ⁻)	<u>37.0</u>
SODIO (Na ⁺)	<u>116</u>	SULFATOS (SO ₄ ⁼)	<u>29.0</u>
		NITRATOS (NO ₃ ⁻)	<u>15.9</u>
		NITRITOS (NO ₂ ⁻)	<u>0.0</u>
		FLUORUROS (F ⁻)	<u>0.57</u>

El Laboratorio da fé solo de las muestras presentadas

OBSERVACIONES LOS PARAMETROS ANALIZADOS PRESENTAN CONCENTRACIONES APTAS PARA
EL CONSUMO HUMANO.

Managua, 18 de MARZO de 199 1

Jefe de Laboratorio


 LIT. JULIO DE GADILLO
 VºBº DIRECCION

ニカラグァ概観

在ニカラグァ日本大使館

1991年3月10日

1. 主要指標

- (1) 独立：1821年9月15日
- (2) 国土面積：120,349 km²（北海道及び九州を併せた広さ）
- (3) 人口：375万人（1989年推定）
- (4) 首都：マナグア市（人口約100万人）
- (5) 言語：スペイン語（大西洋岸方言にミスキート語などあり）
- (6) 政治体制：立憲共和国
- (7) 元首：ビオレタ・バリオス・デ・チャモロ大統領（1990年4月25日就任、任期1997年1月まで）
- (8) 立法府：一院制（議席数92、任期6年、国民連合（UNO）51議席）
- (9) 国内総生産：1,146百万ドル（1990年推定、世銀、IDB報告）
- (10) 一人当たり国民総生産：297ドル（1990年推定、同上）
- (11) GDP成長率：1987年-0.7%、1988年-10.9%、1989年-3.0%、1990年推定-5.7%
- (12) インフレ率：88年33,600%、89年1,689%、90年推定10,982%
- (13) 通貨：コルドバ・オロ（5コルドバ・オロ=1米ドル）
- (14) 貿易（1989年）
輸出：290.1百万ドル 輸入：547.1百万ドル
主要輸出品：コーヒー、綿花、砂糖、牛肉

2. 略史

- | | |
|---------|-----------------------|
| 1502年 | コロンブス第4航海にて発見 |
| 1520年ころ | スペイン人の植民開始 |
| 1821年 | スペインからグアテマラ総督府諸州として独立 |
| 1838年 | 中米諸州連合の解体により共和国として独立 |
| 1846年 | ソモサー族の独裁開始 |
| 1972年 | マナグア市大地震 |
| 1979年 | サンディニスタ革命、ソモサ大統領の国外脱出 |
| 1984年 | 正副大統領、国民議会議員選挙 |

1987年 現行憲法発効
1990年 正副大統領、国民議会議員、地方議会議員選挙

3. 最近の政情

(1) 1979年7月19日、40年に亘るソモサ一族の支配を革命により追放。革命武力闘争で中心的役割を果たしたサンディニスタ人民軍兵士を中心に政府主要ポストを占め、次第にサンディニスタの影響力を強化。

(2) サンディニスタの左傾化及び国内の締め付け強化するにつれ、民主勢力、教会、ラ・プレソ紙、私企業連合会はこれに反発。一方、1982年国防次官であったエデン・パストーラらを中心に民主革命同盟(ARDE)、旧国警軍兵士を中心にニカラグァ民主勢力(FDN)を結成し反サンディニスタ武力闘争を開始。

(3) 1984年11月正副大統領及び国民議会議員選挙を実施。サンディニスタ国民解放戦線のオルテガ・サーベドラ及びセルヒオ・ラミレスを正副大統領に選出。民主勢力を構成する野党の一部は、自由かつ民主的な選挙が確保されていないとして選挙をボイコット。

(4) 1987年1月憲法公布。同時に憲法の人権規定を停止する非常事態令を公布。

(5) 1987年8月グアテマラにおいて他の中米諸国と共に、エスキプラス和平合意に署名。同合意に基づき、国内和解、停戦、民主化、自由選挙、非正規軍への援助の停止、他国攻撃のための領土使用の禁止を約束。1989年6月野党14政党は野党連合(UNO)を結成し9月ビオレタ・チャモロ及びビルヒリク・ゴドイを正副大統領候補に指名、サンディニスタ側はオルテガ及びラミレスをそれぞれ指名し、12月から本格的選挙運動を開始。90年2月25日の選挙では野党連合が55%の得票を得て勝利(サンディニスタは40%を獲得)。

(6) 1990年6月反サンディニスタ政府勢力(コントラ)は、約18,000人の武装放棄を完了しニカラグァ内戦が終結。他方、軍については1990年末に規模を28,000人に削減し、更にこれを縮小させる意向。

(7) 新政権発足後、サンディニスタ系労働組合は2度に亘り全国レベルのストライキを実施したが、政府側が譲歩し最初の危機を乗り切った。1990年10月には経済再建と国内安定のため国民合意を労働者、政府、企業家との間で締結し、経済再建、国内安定のための基礎を築いた。

4. 外交

(1) サンディニスタ政権はキューバ、ソ連及び東欧との関係を強化。革命後もキューバ及びソ連から軍事援助を受けるのみならず、経済面においても社会主義諸国との関係を強化。

(2) レーガン政権は、サンディニスタ政権下において、(i)周辺国への革命の輸出、(ii)キューバ及びソ連のプレゼンスの増大、(iii)ニカラグァの共産主義化は、米国の安全保障に対する脅威であ

るとの認識から、「サ」政権の放逐をめざし、対「ニ」強硬路線を取ったため米・ニカラグァ関係は極端に悪化。

(3) 1981年12月から米国は反政府勢力(コントラ)に援助開始し、他方政府はソ連、東欧諸国から武器援助を受けニカラグァ国内の内戦が激化。1985年米国は5月1日対ニカラグァ経済封鎖を開始。

(4) 1990年2月総選挙により野党連合が勝利したことにより、同年3月米国は対ニカラグァ経済封鎖を解除し、同年5月には対ニカラグァ経済援助3億ドルを承認、6月駐ニカラグァ大使を派遣し関係を正常化させた。

(5) 新政権はソ連、東欧諸国及びキューバとの関係を維持しているが、キューバは1990年4月以降軍事顧問、技術協力専門家を引き上げた。他方、1990年11月には台湾との外交関係を再開し、中国は対ニカラグァ関係を断絶した。

5. 経 済

(1) 就業人口の約40%が農牧業に従事。綿花、コーヒー、砂糖、牛肉の輸出が総輸出の65%。サンディニスタ政権は革命後ソモサー族が保有していた財産及び銀行を国有化し、農地改革法を公布し農民への土地の分配を進め、新政権も農地改革を継続する政策を取っているが、サンディニスタ政権により没収されたまま活用されていない土地は旧地主に返還する旨発表。

(2) 新政権はサンディニスタ政権時代壊滅的状态となった経済を立ち直らせるため経済活動の自由化、国営企業の民営化、財政赤字の縮小、補助金のカットなどを実施するとともに、1990年7月1日をもって新通貨としてコルドバ・オロを発行(1コルドバ・オロ=1米ドル)。

(3) 10年間の内戦の間に国内経済は壊滅的打撃を受け、生産の増加、国内経済の復興、対外債務(総額110億ドル)の支払いなど、経済分野での課題は山積している。

6. 我が国との関係

(1) 外交関係

1935年 外交関係開設

1952年11月 外交関係再開

(2) 経済協力関係

1979年 緊急援助(内乱による難民の救済) 2,000万円

1979年 医療機材供与 1,440万円

1980年 国家再建計画に対し5億円相当の無償援助

1982年 水害のための緊急援助 5万ドル

1988年 ハリケーン被害に対し、国際赤十字連盟を通じ緊急援助 2,000万円

1990年 食糧増産援助として肥料 5 億円相当の無償援助
 児童栄養改善計画に粉ミルク 2 億円相当の無償援助
 マナグア市公共輸送網改善計画にバス 6 億円相当の無償援助
 低所得者住宅改善計画に亜鉛鉄板 4 億円相当の無償援助
 食糧増産援助として農業機械 5 億円相当の無償援助

(3) 技術協力関係

1990年12月 末までのニカラグア研修員受入れ 111人

(4) 貿易関係(1988年)

我が国の輸出：13,407千ドル（主要輸出品：機械、自動車）

我が国の輸入：42,956千ドル（主要輸入品：綿花、コーヒー、ゴマ）

(5) 要人往来

(イ) 我が国要人のニカラグア訪問

1987年 列国議員同盟（IPU）議員団（団長 小宮山重四郎議員）

1990年 唐沢俊二郎特派大使（大統領就任式）

1990年 対ニカラグア経済協力調査ミッション
 プロジェクト形成調査団

1991年 杉浦、渡海両衆議院議員

(ロ) ニカラグア要人の我が国訪問

1988年 エルネスト・カルデナル文化大臣
 ヒュッペル大蔵大臣

1989年 ヒュッペル大蔵大臣（大喪の礼参列）
 ラカヨ水産庁長官
 ヘンリー・ルイス対外協力大臣

1990年 チャモロ大統領最高顧問団（F・マジョルガ、A・セサル、E・パラシオ）
 トレーホス最高裁長官（即位の礼参列）

1991年 チャモロ大統領

(6) 在留邦人（1990年10月1日現在） 33人

進出企業 1社

ニカラグァ案内
(滞在注意事項と名所案内)

1. 両替、クレジットカード

- (1) 両替はホテルもしくは政府公認両替所(CASA DE CAMBIO)で行う。為替レートは1米ドルにつき5コルドバである。
- (2) ホテル料金(ドル払い)を除き、当国では一般にクレジットカードは通用しない。

2. 査証

入国より30日間有効。但し、査証発給日より30日以内に入国しない場合は失効するので要注意。

3. 出入国

- (1) 入国時に機内で渡される黄色の入国カードに必要事項を記入の上、入国の際にパスポートと共に提出。入国カードは出国の際に提出する必要があるため紛失しないこと。
- (2) 出国時一人(外交は除く)10ドルの出国税を支払わなければならない。
- (3) 自動車が入国する場合、国境は午後4:00で閉鎖されるため注意が必要。

4. ホテル

- (1) ホテル宿泊料の支払いは外国人はすべてドル払い。飲食料等はコルドバ払い。
- (2) マナグア市のホテルは、空港前にラス・メルセデス(75室-70ドル)、市内と空港の間にカミノ・レアル(117室-95ドル)、市内にインターコンチネンタル(210室-110ドル)があるが、インターコンチネンタルが市内にあり便利である。前記3つのホテル以外は安価であるが設備や衛生面に問題があり、余り奨められない。
- (3) マナグア市のホテルは上記のホテル以外には満足なホテルが無いこともあり、革命記念行事等の大きな事業がある場合にはホテルが満員となるため、前広な予約が必要である。なお、地方都市のホテルは数が少ない上に衛生状態が悪い。

5. 治安

物資不足のため、泥棒、強盗等が増加傾向にあり、男性でも夜間の一人歩きは危険なため慎むこと。昼でもスラム地域の出歩きには十分注意する必要がある。昼間の出歩きにおいても貴金属等はなるべく身につけないほうが望ましい。

6. 衛生及び服装

- (1) 水道の水は飲料に適さないため、ミネラル・ウォーターかソフト・ドリンクを取るよう

心掛ける方が望ましい。なお、長期に亘りニカラグァに滞在する場合には下痢を起こした際の薬品（抗生物質を含む）を携行することが望ましい。

(2) ニカラグァには十分な医療施設を整えた病院はないため、緊急時には国内で応急手当を受けた後、可及的速やかにコスタ・リカ等の国外の病院に入院しなければならない。

(3) 毎週2日（大使館のあるボロニア地区は火曜日及び金曜日）は断水（午前7:00から午後7:00まで）になるので注意（ホテルは給水施設あり）。

(4) マラリヤ、デング熱、肺結核が流行しているため、蚊にさされないよう充分に気をつけること。

(5) 一年中30度を下ろすことはないため夏服だけで十分である。但し、市外に出かける場合には蚊を避けるために長袖の服も必要なこともある。また、冬期には山岳地方では冷え込むこともあるので長袖のシャツ類を携行することが望ましい。

(6) 当国ではスーツを着用する機会は結婚式程度であり、政府の公式行事等の場合でも正装は長袖のグアヤベラと黒または紺のスボンとされている。

7. チップ

(1) 飲食の際の請求書には通常15%の税に加え、10%のサービス料も加算されているが、含まれていないものもあるので要チェック。その場合、通常消費額の10%程度を支払う。なお、請求書の計算ミスが多いのでチェックが必要。

(2) 空港及びホテル等における荷物の運搬については、荷物1個につきUS\$50セント程度または右相当のコルドバ貨。

(3) ベッド・チップは不要。

8. 電気、電話

(1) 電気は115ボルト、60ヘルツ。コンセントは一般に日本と同様二の字形。停電が頻繁にあり再配電の際に高圧電流が流れることがあるため、精密電気製品（ビデオデッキ、ビデオカメラ、ワープロ等）は使用時以外はコンセントを抜いておくことが必要である。

(2) 電話は一般につながりにくく、根気よくダイヤルするほかはない。特に雨期（5-10月）は、特にかかりにくくなる。なお、ニカラグァには公衆電話は少なく、あっても通じないのが一般的である。

(3) ダイヤル直通国際電話はなく、中米及びパナマへは114番、その他のエリアは116番を回しオペレーター経由で申し込む。

9. 大使館関係連絡先

- (1) 大使館連絡先 : 電話 623092、627807、624024 (佐藤・直通)
- (2) 大使公邸連絡先 : 電話 664434
- (3) 館員自宅連絡先 : 望月 625101、上野 23026、佐藤 663143、野村 662462、
杉沢 660955、小野寺 662462

10. ニカラグァ名所案内

ニカラグァ全土で観光名所の類の史跡、観光地、レジャー施設はほとんどない。

(1) マナグァ市

空港から市内に入ると崩壊寸前の建物が幾つか見られるが、これは1972年12月23日未明マナグァ市を襲った大地震(死傷者20万人)のキズ跡である。未だに復興していない光景はここが首都かと思わせる程であり、「都心なき首都」と言われる所以でもある。

(2) マナグァ湖

マナグァ市が面する湖であるが、マナグァ市近郊の生活、工場廃水が流されているため釣りや水泳には不向きである。

(3) カテドラル、国立宮殿及びルーベン・ダリオ劇場

マナグァ湖近くに地震で崩壊しかけた旧カテドラルがあるが現在は使われていない。国立宮殿は1978年10月コマンダンテ・セロことエデン・パストーラ率いるサンディニスタ・ゲリラが急襲し、2,000人以上を人質にし政治犯の釈放、身代金の要求をソモサ大統領に突き付けた所である。現在は大蔵省国税局となっている。国立宮殿の正面に白亜のルーベン・ダリオ劇場があり、ここでは時折音楽会などの公演が行われている。

(4) オリエンタル市場

市内最大のマーケット。野菜、日用品、衣類を販売しているが、一見スラムの様相である。この市場は人混みが多く治安も悪いので貴重品は身に付けないことが望ましい。

(5) マサヤ火山

マナグァ市南25kmの所に位置する活火山であり、火口を覗きこむことができる。同火山入口にはレストランがある。

(6) ニカラグァ湖とグラナダ市

ニカラグァ湖は東京、神奈川、埼玉を併せたとほぼ同じ面積を有する大きな湖である。同湖に生息する鮫は淡水に生息する鮫として有名である。グラナダ市は19世紀までは北米大陸—サン・ファン川—グラナダの交通の要所に栄えた町であり、現在もスペイン時代の面影を残す建築物が少し残っている。

(7) レオン市

マナグア北 120 km にあるニカラグア第 2 の都市であり、文教都市として有名である。同市にはカテドラルとニカラグアを代表する詩人のルーベン・ダリオの墓が同カテドラルの中にある。

(8) モンテリマール

マナグアから 60 km の太平洋沿岸に位置する海岸リゾート地で 1990 年 4 月 オープンした。宿泊施設は一戸建てのバンガロー形式となっている。週末は一人 12 ドルで昼食付き。

11. マナグア市のレストラン

マナグア市内のレストランは少なく、肉料理が中心であるが質は劣る。日本料理店はニカラグアにはない。

- (1) ラ・マルセイエサ (☆☆☆☆市内南部)、フランス料理。
- (2) カミノ・レアル・ホテル (☆☆☆☆市内北部)、フランス料理。
- (3) ロス・ランチョス (☆☆☆☆外務省前)、「チュラスコ」という炭焼き肉が代表的。
- (4) インターコンチネンタル・ホテル (☆☆☆☆市内中心部)、肉料理。
- (5) ラ・プラサ (☆スペイン広場近く)、インターナショナル料理、カレーもある。
- (6) ロス・アントヒートス (☆ホテル・インターコンティネンタル前)、肉料理。
- (7) チナ・パレス (☆市内マサヤ街道近く)、中華料理、但し、料理の味は全て同じ。

12. ショッピング、土産物

(1) ニカラグアにはデパートを始めとする市場はなく、小売店が集合しているセントロ・コメルシアルがあるが、商品も少なく生活日用品が中心。

(2) ニカラグアの土産は木製品がある程度であり魅力的なものは少ないが、黒サンゴの装飾品 (ネックレス、ブレスレット) がニカラグアならではの土産として好評である (空港及びホテル売店で販売している)。

