R E P O R T

ON

FEASIBILITY STUDY

FOR

DEVELOPMENT OF MINE, TOWN AND PORT TERMINAL

RELATED TO MICHIQUILLAY COPPER MINE PROJECT

REPUBLIC OF PERU

NOVEMBER 1976

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In accordance with a request from the Government of Republic of Peru in connection with investigations of development plans for related facilities which are required for the development of Michiquillay Mine as well as surrounding areas, the Government of Japan entrusted the Japan International Co-operation Agency with the execution of such investigations.

The Japan International Co-operation Agency formed a 11-member investigation committee with Mr. Tatsuji Tanaka of Fujita Corporation as the leader and carried out on-the-spot investigation for 46 days from 27th February, 1976 to 12th April, 1976. The investigation work was smoothly carried out thanks to co-operation from related authorities of Republic of Peru and results of investigations have been compiled and elaborated and a report is herewith submitted upon completion of internal work in the country.

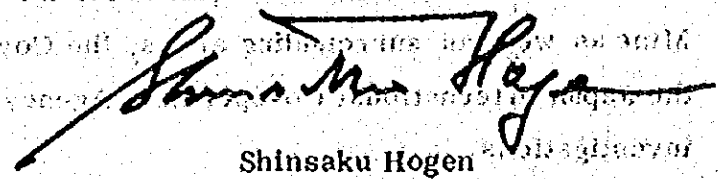
The investigation committee was engaged in the feasibility study of development of mine town as well as harbour facilities required for the development of Michiquillay and its surrounding regions as well as in the technical and economic investigations on each facility and also in the analysis on development effects thereof.

It will be our great pleasure if these investigation results could be of some help to the development of Michiquillay Mine and its surrounding regions as well as contributing for friendly relations between Japan and Peru.

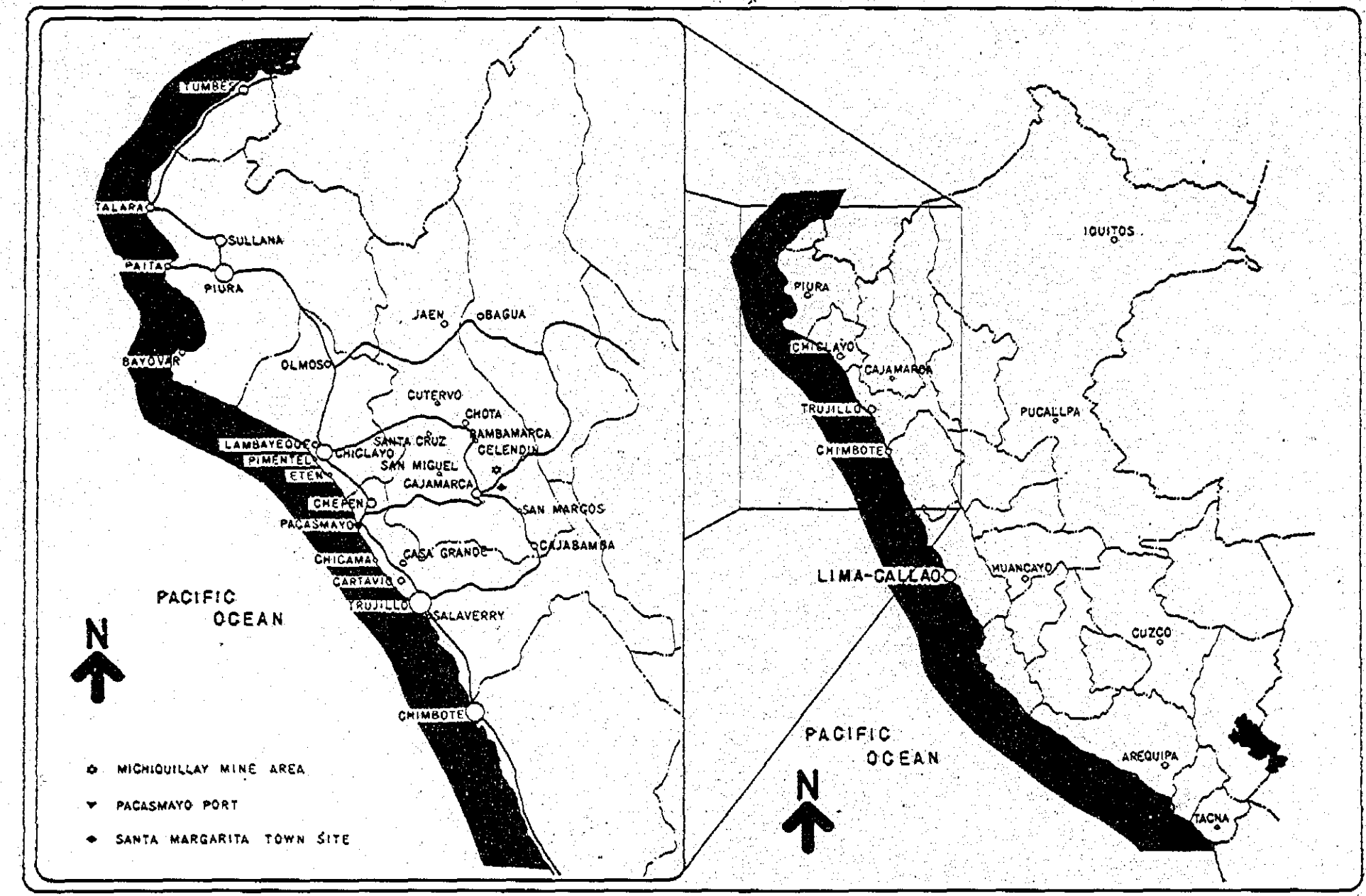
In conclusion, we would like to express our sincere thanks to the related authorities of Peruvian Government as well as Embassy of Japan

for their great co-operation rendered to our investigation work and also to the Ministry of Foreign Affairs, the Ministry of International Trade & Industry and all related agencies for their assistance extended to us in despatching the committee to Peru.

November, 1976



Shinsaku Hogen
President
Japan International Cooperation Agency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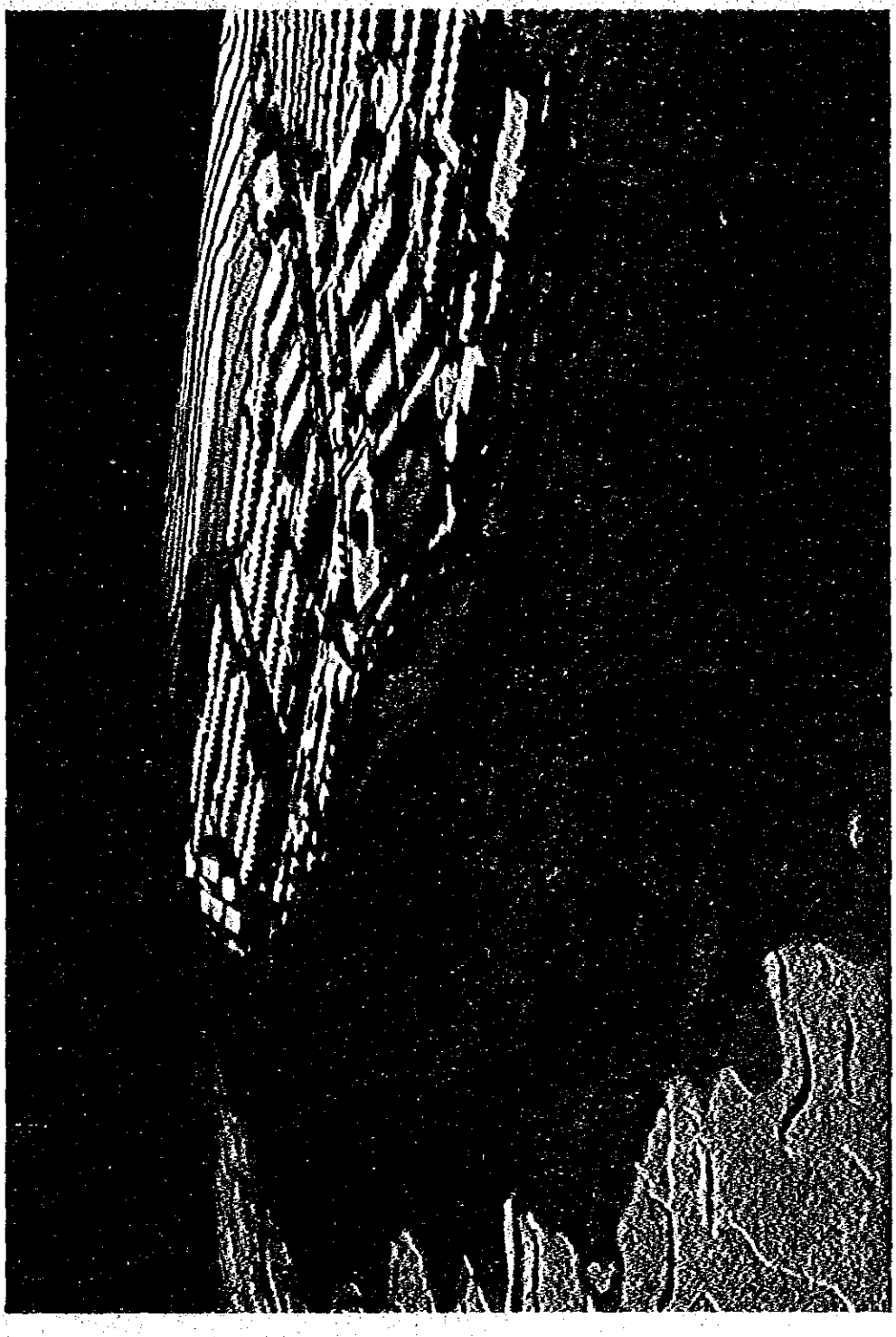

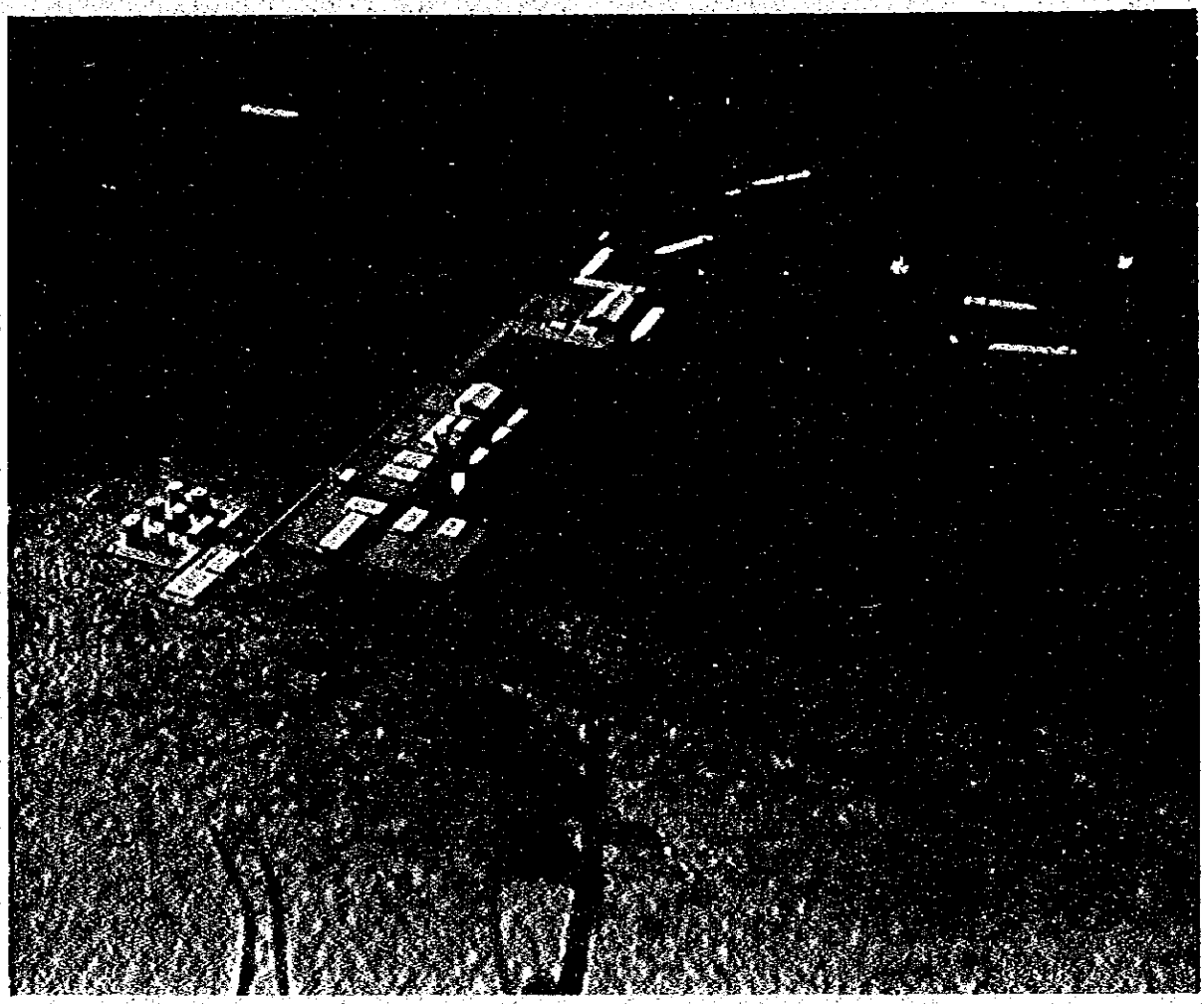

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CHAPTER 1
INTRODUCTION

1. BACKGROUND OF PROJECT

Michiquillay Copper Mine located in Encañada District of Cajamarca Department in north part of Republic of Peru has been under joint preparation for development by the Mining Corporation of Peru i.e. Minero Peru and Japanese enterprises and its deposits in case of cut off quality copper 0.5% are estimated at 419 mil. ton with a finess of 0.76% being one of the leading copper mines in the world.

This development project is a core of a promotion for the development in northern areas and greatly highlighted and furthermore a great effect to the local economic activity by the preparation of infra-structure required in accordance with this mine development is also expected.

In compliance with a request from the Government of Republic of Peru, the Government of Japan delegated a basic investigation committee on Cajamarca District development plan, Republic of Peru, in June, 1973.

Subsequently delegated in November, 1974, based on the proposals obtained from the above investigation was an investigation committee for Michiquillay Power Transmission and further in February, 1975, an investigation committee for road planning on Michiquillay Copper Mine development project was also delegated to Peru.

This investigation concerns urban development related to Michiquillay Copper Mine development and port terminal development plans.

2. PURPOSE OF INVESTIGATION

This investigation was carried out in accordance with a request from the Government of Republic of Peru on mine town development plan in Santa Margarita in Cajamarca Department in relation to

Michiquillay Copper Mine development as well as on new construction of Pacasmayo Port and thereby elaborating a basic plan for the optimum project to be developed or prepared.

3. CONTENTS OF INVESTIGATION

Contents of the principal on-the-spot investigation as well as internal designing work in preparation of this report are as follows:-

(1) Items of On-the-spot Investigation

A Investigations for Mine Town Development

a. Investigations of natural conditions

b. Investigations of plans

c. Investigations of execution of engineering work

d. Investigations of surrounding social conditions

e. Investigations of related laws and ordinances

B Geological Survey

a. Field surveys and investigations on geological structure, nature of rocks, their types and weathering.

b. Investigations by means of boring or elastic waves measuring at required points.

c. Investigations of the neighbouring area around Pacasmayo Port and Santa Margarita town site.

C Investigations for Harbour Development

1) Investigations on proposed harbour site

a) Investigations of marine and residential conditions such as waves, tide level and tidal current, etc.

b) Grasping of depth around scheduled points as well as topographical outlines.

c) Meteorological survey

d) Investigations of sand drifting by means of field exploration and survey. Particularly concerning accumulation and erosion conditions around the surrounding coast.

2) Investigations of Peruvian harbour operations

D Investigations of Surrounding Area Developments and Industrial Development Plans.

(2) Items for Internal Development Work

A Mine Town Development Plans

a. Coordination and compilation of data for plans and investigation thereof.

b. Rough designing of mine town

c. Rough estimate for cost of construction work

d. Effect of development

B Port Development Plans

a. Analysis of geological data

b. Analysis of marine and meteorological data

c. Statistics on cargo volumes handled at the harbour

d. Layout of outlines for harbour facilities

e. Calculation of roughly estimated cost of construction work

f. Economic evaluation and effect of development

4. FORMATION OF INVESTIGATION COMMITTEE FOR ON-THE-SPOT INVESTIGATIONS

Responsibilities of committee members and organizations belonged at the time of investigations are as follows:-

Name		Function	Each member's organization
Leader	Tatsuji Tanaka	General	FUJITA Corporation
Member	Kozo Kimura	Marine and atmosphere	"
"	Takao Entomi	Urban	"
"	Seinosuke Masaki	Port and harbor	"
"	Shiro Hosokawa	Economy	"
"	Katsuo Ogawa	Water of port and harbor	"
"	Taiichiro Agari	Urban	"
"	Takemi Ishii	Geology of port and harbor	"
"	Masashi Arisawa	Marine and atmosphere	"
"	Genichi Koguchi	Economy	Ministry of International Trade & Industry
"	Eiichi Asano	Coordinator	Japan International Cooperation Agency

SUMMARY AND CONCLUSIONS

CHAPTER 2
SUMMARY AND CONCLUSIONS

This report is based on technical and economic investigations on mine town development plans and port development plans as related facilities in connection with Michiquillay Copper Mine development.

As far as mine town development plans are concerned, Santa Margarita, a proposed site for the project, has favourable natural conditions and to construct the town there is well justified and besides a stabilization of a new population including people for various service industries in addition to constructions of various facilities such as hospital and thereby economic activities in Cajamarca Basin can be actively increased which consequently contribute for the improvement of local welfare.

Regarding port development plans, Pacasmayo Port, a proposed harbour site, is located near Pan American Highway with some 16 Km^2 large flat backland around the site thus having a high potential as a new industrial locality. If a port with shipment facilities for copper ores from Michiquillay Mine is constructed in this area, it is possible to reduce the land transportation cost comparing with the shipment from other ports and besides this port can be established as a key terminal for cargo distribution by developing it as a public harbour for vessels engaged in international trade as well as in coastal trade transportation, and consequently it is expected that this new port will contribute to the development of northern regions.

The natural conditions as a harbour can be technically overcome by selecting suitable engineering methods and machinery to meet marine meteorological and geological conditions which is also judged feasible in view of economicality. However, it is necessary to obtain detailed technical data prior to the commencement of construction work and particularly adequate and continuous investigations must be urgently carried out on wave conditions and the ground in the sea area proposed for the project.

The summary and conclusion on the mine town development plans and harbour preparation plans are as follows:-

1. MINE TOWN DEVELOPMENT PLANS

(1) Conditions Around The Proposed Site for Mine Town

The site proposed for mine town is located on the hills 2,900 - 3,085 metre above sea level with an area of 297 ha, 22.5 Km east by north east away from Cajamarca City and 10 Km south of Michiquillay Mine and presently the site is owned by Minero Peru. Surrounding areas are pastures and those topographical and geological conditions, sources for water, distance to Michiquillay Mine are in conformity with various conditions on mine town construction.

(2) Mine Town Population Plan :

The population for the mine town was planned by taking into consideration the long range plan-1990 for town development, the report by Ministry of Housing and Construction, the conditions of Cajamarca City and surrounding areas, etc. with daily mine production of 40,000 tons and 2,000 mine workers as a basis.

The population of the mine town at start of mine operation is 8,500 and will increase to approximately 12,500 after 10 years with stable increase of 5 - 6 % in 5 years period thereafter. The population of mine related workers will reach a peak of 9,500 after 15 years of mine operation and decrease thereafter. At 30th year of mine operation, the mine related workers will form 57 % of the total mine town population.

Table 2-111 Mine Town Population Plan

Year of operation	Mine related workers				Service related workers	Total			
	Male	Female	Total	% of Total	Total	Male	Female	Total	Increase in 5 years
0	4,266	3,609	7,875	0.929	600	4,590	3,885	8,475	
5	4,726	4,169	8,895	0.819	1,991	5,790	5,095	10,885	0.284
10	4,977	4,451	9,428	0.752	3,108	8,611	5,935	12,546	0.152
15	5,012	4,479	9,491	0.710	3,855	7,029	6,341	13,316	0.066
20	4,943	4,382	9,325	0.661	4,775	7,494	6,606	14,100	0.054
25	4,853	4,278	9,131	0.612	5,786	7,891	7,026	14,917	0.058
30	4,799	4,218	9,017	0.571	6,772	8,268	7,521	15,789	0.058

(3) Mine Town Development Plan :

The mine town is composed of 3 housing zones with school district as an unit; and to avoid steeply sloped land the town was laid out on 116 hectares portion on east side of the site.

Initially, by placing 3 bachelor workers in one family house unit, dormitory accommodating 432 bachelor workers and 1,428 units of family house will be constructed. The final number of family houses planned for construction will be 1,580 units. The family house will be planned as 2 storyed continuous row of houses and effort is made to improve living environment by securing wide open spaces. Construction method suited to mass production of family units in shortest time possible is also under consideration.

In planning of commercial, educational, medical and other facilities the Mining Laws and the conditions of Cajamarca City and surrounding areas were taken into

consideration. The scale of these facilities were based on town population of 12,500 and in case of certain facility the residents of surrounding areas were also included.

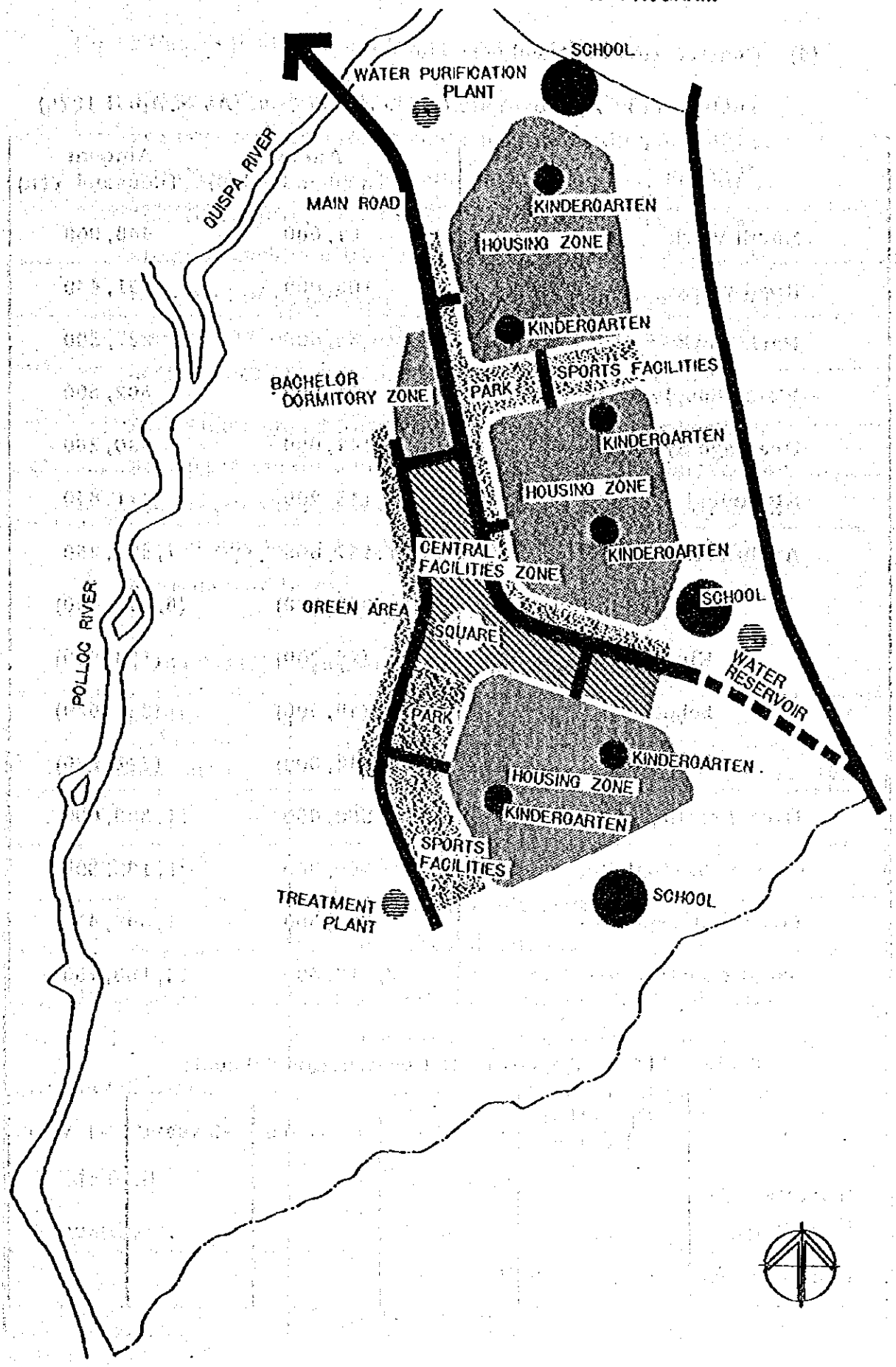
Quispa River will be the source of water supply and drainage system which will be of separate system. Treated sewage will be discharged into Polloc River.

Table 2-112 List of Facilities

Facility in ( ) planned after start of mine operation

Administrative Facility	Police · Fire Station, Post · Telephone Office, (Town Office)
Commercial Facility	Market, Repair Shop, (Bank, Store, Restaurant, Hotel)
Educational Facility	Kindergarten, School, Adult School
Social Cultural Facility	Church, Meeting Hall, Motion Picture Theater, (Library)
Medical Facility	Hospital
Welfare Facility	Club House, Sports Facility, Central Square, Park

FIG. 2-111 ROUGH LOYOUT FOR MINE TOWN DEVELOPMENT PROGRAM



(4) Construction Cost and Schedule .

Table 2-113 Approximate Construction Cost (As of April 1976)

Item	Amount (Thousand Soles)	Amount (Thousand Yen)
Earth Work	67,000	448,900
Road Work	103,000	691,440
Park Work	34,000	227,800
Water Supply System	75,000	502,500
Drainage System	147,000	990,260
Electrical System	115,200	771,840
Architectural Work	1,147,800	7,690,260
Related to House	(962,000)	(6,445,400)
Kindergarten	(25,200)	(168,840)
School	(49,500)	(331,650)
Hospital	(48,000)	(321,600)
Direct Construction Cost	1,690,000	11,323,000
Technical Cost	169,000	1,132,300
Overhead Expense	253,500	1,698,450
Total Construction Cost	2,112,500	14,153,750

Table 2-114 Approximate Construction Schedule

Item	Operation -5 years	-4 years	-3 years	-2 years	-1 year
Investigation Design					
Construction					

(5) Effect Resulting from Development of Mine Town :

The development of urban facilities will produce various regional welfare effects and among these the post office, telephone office, commercial service facility, hospital, athletic facility, etc. will benefit a wide sphere and the effect of such facilities is judged to be great. Especially, the effect of hospital on Cajamarca Region where medical standard is very low will be to increase the number of hospital beds in Cajamarca Basin by nearly 70 %.

Also, the demand for tertiary industry by mine workers settling in the town and, although general, the demand for construction industry during construction stage will absorb the surplus labor force of Cajamarca Region and improve their income level.

Table 2-115 Benefits Resulting from Facilities

Facility	Resulting Benefits
Administrative	Administrative service, improve security, increase in information exchange
Commercial	Increase in consumption activity, expand distribution for surrounding products, diversify livelihood
Educational	Effectivation of compulsory education, increase opportunity for adult re-education
Social · Cultural	Increase community activity, fulfillment of leisure activity
Medical	Improve level of medical insurance
Welfare	Increase community activity, fulfillment of leisure activity, improve living environment

Facility	Resulting Benefits
Transportation	Increase movement between region, secure safety
Supply • Treatment	Secure living water and source of energy, improve standard of sanitary environment

2. PORT DEVELOPMENT PLANS

(1) Conditions on Proposed Port Site

The proposed port site is located approximately 240 kilometre away from Michiquillay Mine in the northern region of La Libertado Department, the present facility is a simple structure wharf/quay with extension of 535 metre and width of 10 metre and was constructed in 1884. Neither breakwater nor berthing wharf and mooring facility are available and as result, loading and unloading work has so far been carried out by means of 4 small cranes and barges. No public warehouse is available and other private warehouses are also not actively operating.

(2) Estimate of Cargoes Handled

In order to absorb a trend of growth in the volume of cargoes brought by various industrial developments, it is necessary to improve the efficiency of land transportation by approximately 40 %, however, in view of difficulties in the land transportation systems as well as the necessity for mass-handling of cargoes in case of such an increase in future, a dependence on marine transportation is well conceivable.

The anticipated type of cargoes to be handled and the total

volume is as follows : -

(Shipments) Fine copper from Michiquillay Mine
Rice, fruits, vegetables and sugar from Jequetepeque, Sana and surrounding areas,
Pacasmayo cement.

(Unloading) Fertilizers and sundry goods for surrounding areas as well as for Cajamarca.

(Volumes of cargoes)
Total of 310,000 ton except copper and petroleum at the stage of operation start-up.

(3) Port Development

A Natural Conditions

1) Geological Features : The accumulation age of those deposits in the area of Pacasmayo is said to be Naupe layer of Paleozoic Devonian Period. On the land part of planned harbour site are mainly conglomerates and Talus while on the sea bed are overlapped layers of breccia and sandstones as well as sand layer. According to the jet piercing investigation with compressed hydraulic jetting, water depth of more than 9 meters can be secured by dredging approximately 650 meters offshore from the shoreline. Those layers which can not be penetrated by jet piercing is assumed as well consolidated conglomerates comparing with the boring observation on the land.

As the result of elastic wave observation, it has been found that the rockbeds generally spread over relatively shallow sea bed around the proposed reclamation site, depending on a degree of weathering influence. Therefore, for the construction of port structures as well as dredging work, the excavation by means of blasting should be conducted along with ordinary method, if the required excavation is 1 - 2 meters below the sea bed.

2) Meteorological Conditions : According to observations of wind velocity at the site and the analysis of other existing data, it is noticed that the wind velocity during past one year is within 15 meter/second. Since the site is not in the route of typhoon, there is no presence of strong wind. The annual average temperature is 20.7°C, rainfall is approximately 40 mm, average humidity is approximately 70 %, occurrence of clouds in daytime is 3/10 - 4/14, the field of vision in daytime is above 20 km and the influence of fog in the port is presumably little. In winter season, the wind from the south becomes stronger and the sea rises higher.

3) Marine Meteorological Conditions : The study covers 200 meter wide and 2 km long inland area and the shore area as well as 2 km offshore from shoreline.

Wave : The maximum height of wave during the observation period is 2.1 meters while the longest cycle is 26 seconds and the most frequent wave direction is east.

The assumption of wave is based on weather charts from 1957 to 1975. Three kinds of sea winds are adopted as the source of waves in order to calculate

the height of wave, i.e., the one around 30 - 40 degrees south latitude, the other at and around 20 degrees south latitude and last but not least is the sea wind around the investigated sea area and consequently the structure and layout of the breakwater has been determined and designed based on the designing wave-height of 4.90 meters. According to the analysis of the deflection of waves caused by the breakwater and change of waves inside the harbour, it is noticed that the waves in the direction of south west bring stronger internal influence to the harbour.

Taking above factors into consideration, it can be said that the surface condition inside the embankments would be calm once the breakwater construction has been completed.

Tide Level: The analysis of the tide level is based on the results of observation from 16th March, 1976 to 5th April, 1976, the maximum tide difference during said period is 115 cm while the minimum is 35 cm.

Tidal Current : As the result of buoy test at the time of the flood tide, it has been noticed that a stable current running in the direction of north by north east in the offshore exists and judging from this test as well as from the result of analysis on the current observation by the current meter, it is presumed that a clockwise tidal current will be produced inside the embankments after the completion of the breakwater construction.

Earthquake : Though earthquake occasionally occurs due to the activity of fault running parallel to the deep offshore Peru, there has so far been no earthquake with

epicenter located around Pacasmayo according to the past records.

Sand Drifting : The source of sand drifting is in the south of the light-house and out of those drifting sands such as silt and clay are forming a belt type current in the offshore of Pacasmayo City roughly running parallel to the coast. From the formula of wave carrying energy, the volume of coastal sand drifting is estimated at 261,000 ton per year. After the construction of the breakwater, it is anticipated that the sand moving round its end will be accumulated inside the embankments. Furthermore, the investigation carried out on main ports in the northern portion of Lima shows that the accumulation of drifting sands is particularly conspicuous in case of the port of Salaverry.

Coastal Erosion : Even if those coastal drifting sands are blocked by the breakwater, there is presumably no occurrence of the coastal erosion around the present quay.

Sea Water Temperature : The measuring of the sea water temperature carried out during April 1 - 4 at the midway point of the quay as well as the observatory points of the current situation within the depth of 2 - 6 meters shows the temperature range of 17.6°C to 19.8°C.

B Port Facility

In line with the volume of cargoes being handled, the following berth is to be constructed.

- o Exclusive berth for ores (-10.5 meter x 190 meter) 1
- o Berth for sundry goods (-10 meters x 185 meter) 1

- Berth for small cargo crafts and barges (-4 meter) totally 120 meter
- Dolphin for tankers (for 10,000 D/W) 1 unit

It is anticipated that the volume of fine copper ores shipped from the port of Pacasmayo upon commencement of its harbour operations would be 370,000 ton. Assuming the year of operation start-up as 1983 and judging from the situation in the northern part of Republic of Peru at that time, the volume of overall import/export as well as transportation except for the copper ores would be 310,000 ton of liquefied petrochemicals and another 310,000 ton of agric products and goods for mining industry etc. and accordingly the necessary facilities are being designed based on these figures.

Vessel size of 18,800 D.W.T. was considered for shipping 15,000 tons of copper concentrates on single vessel at one time. Furthermore, in view of this port being served for Asia and Europe service and opened for Pacific Ocean Route as well as North American Route, those 15,000 D/W class vessels should be subject to investigation.

As far as petrochemicals are concerned, they are to be handled by the exclusive dolphin because of their features and property and any unloading equipment or pipe lines installed on the dolphin should be separately planned by users.

Taking into consideration that the loading and unloading apparatus such as loaders etc. would be arranged so as to quickly execute the loading of the fine copper ores, the loading berth for them would have to be considered as

exclusive configuration, however, in such a case the percentage of its berth occupancy per year is only 13 % and thus the idea of exclusive utilization for the fine copper ores for the port of Pacasmayo looks uneconomical operation.

On the other hand, in case of those sundry goods mainly consisting of the agric products, the percentage of the berth occupancy as the berth for sundry goods served for the cargoes loaded into 10,000 D/W - 15,000 D/W class vessels is 78 %, i.e., totally 305 days per year and the number of mooring will presumably increase. In this respect, it is now planned to partly utilize the vacant exclusive berth for ores from time to time so as to manage such an excessive mooring. For the vessels mainly used for carrying (incoming/outgoing), some 3,000 D/W class vessels are considered objectively.

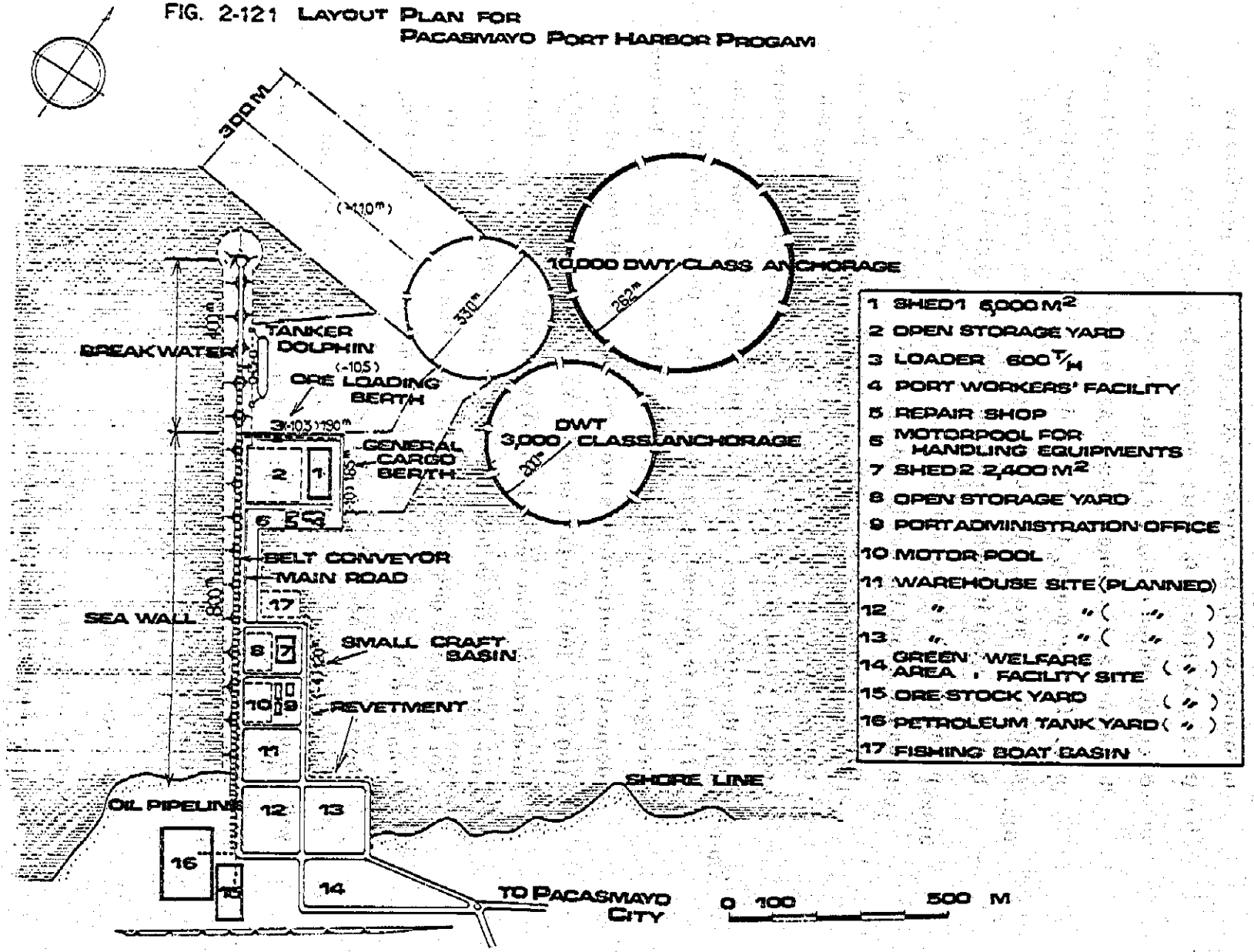
These vessels will be served by vacant exclusive berth for the ores as well as by berth for sundry goods as mentioned above, however, this will not be that effective and thereby some congestions are anticipated due to excessive mooring of vessels and consequently the existing loading and unloading facility by means of barges presently available at the port of Pacasmayo will have to be used during the initial period. At the same time, however, in view of loading and unloading efficiency in such a barge system, it is also necessary to elaborate the equipment and organizational power on the pier so that the work by the barge system can well be backed.

For this purpose, the berth for barges, sufficiently wide apron, warehouse, loading and unloading machinery mainly consisting of forklifts and cranes will be arranged.

In order to enhance the efficiency of offshore loading and

unloading work, the working sea area is to be provided by the breakwater to facilitate stevedore's workability. In view of construction cost, the location of such berth should desirably be near the shoreline as much as possible, but in case of the port of Pacasmayo, the rockbeds running through relatively shallow sea area will involve expensive dredging work and besides, even if such a dredging work is carried out in parallel with the construction of the breakwater, it is presumed that the dredged part under the sea may easily be filled by controversialy and remarkable sand drifting phenomenon. Such being the case, taking into consideration the cost of maintenance for the dredging work inside the harbour and the effect upon loading and unloading work, the location of berth is planned as far as possible in the offshore where dredging is minimized with least influence by waves. For the domestic transportation from coastal point to point, some 100 ton - 400 ton class small cargo crafts are presumably used rather than those 3,000 D/W class vessels, particularly for carrying fresh foodstuffs. For this purpose, the berth for barges is designed in such a way that the same berth can also be used by small cargo crafts. As far as fishing boats are concerned, it will not be necessary to consider marine products processing plant and markets thereof during the initial period judging from the present situation, but a wharf for such fishing boats is being arranged from the beginning in the sea area adjoining the berth for barges.

FIG. 2-121 LAYOUT PLAN FOR PACASMAYO PORT HARBOR PROGAM



(4) Construction Cost and Schedule

Approximate construction cost and construction schedule are as follows :

Table 2-121 Approximate Construction Cost

1 Sole = 6.7 Yen

Construction Cost	in 1,000 soles	in 1,000 Yen
Phase - 1	1,611,940	10,800,000
Phase - 2	268,657	1,800,000
Phase - 3	313,433	2,100,000

Construction Phases

The construction scale for each phase is shown in the Figure 2-121 dividing into 4 phases and a phase - 1 plan is shown in the Figure 2-122.

Preparatory Stage (Operation - 5 years ~ operation - 4 years)

During this period, such as designing, estimate and working contract should be finalized and full scale investigation of bed rocks, continuous marine study, construction work for a by-pass from the north of Pacasmayo City as well as model testing for important structures etc. should also be carried out.

Phase - 1 (Operation - 4 years ~ December in the previous year to operation)

The construction work is scheduled for basic facilities such as seawalls and breakwaters based on a concept of 310,000 ton of sundry goods, 370,000 ton of copper ores and petroleum cargoes. At the same time, a wharf with 4 meter deep

small scale mooring facility is constructed for serving small cargo crafts and barges.

Phase - 2 (Operation + 1 year ~ operation + 2 years.)

To prepare for increasing volume of cargoes for coastal trade, berths for sundry goods are planned at two places for mooring of 3,000 - 5,000 D/W class vessels. At the same time, an increase of the wharf for mooring of small crafts is also possibly actualized.

Phase - 3 (Operation + 6 years ~ operation + 7 years)

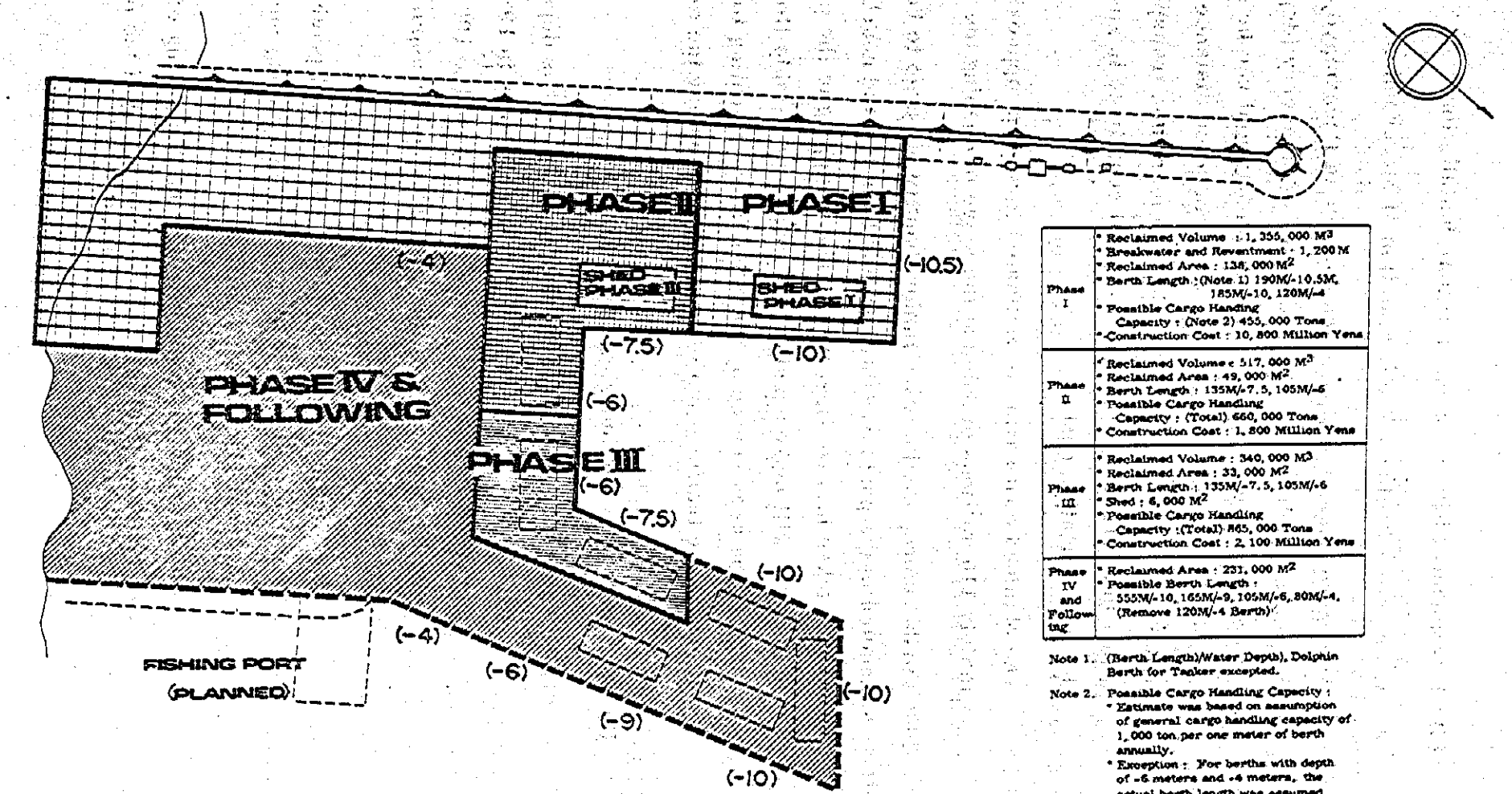
In order to cope with the increasing volume of cargoes, another berths for coastal trade are planned at two places with a leeway for further extension. A warehouse of 6,000 m^2 is also planned.

Phase - 4 (Operation + 8 years and onward.)

The reclamation area is to be further expanded and facilities such as warehouse, godown etc. are planned. In this case, it is possible to construct several berths according to the depth without any large scale dredging work.

Rough estimate for port development and construction is as follows:

FIG. 2-122 CONSTRUCTION PHASES AND SCALE OF WORKS



Phase I	* Reclaimed Volume : 1, 355, 000 M³ * Breakwater and Revetment : 1, 200 M * Reclaimed Area : 138, 000 M² * Berth Length : (Note 1) 190M/-10.5M, 185M/-10, 120M/-4 * Possible Cargo Handing Capacity : (Note 2) 455, 000 Tons * Construction Cost : 10, 800 Million Yens
Phase II	* Reclaimed Volume : 517, 000 M³ * Reclaimed Area : 49, 000 M² * Berth Length : 135M/-7.5, 105M/-6 * Possible Cargo Handling Capacity : (Total) 660, 000 Tons * Construction Cost : 1, 800 Million Yens
Phase III	* Reclaimed Volume : 340, 000 M³ * Reclaimed Area : 33, 000 M² * Berth Length : 135M/-7.5, 105M/-6 * Shed : 6, 000 M² * Possible Cargo Handling Capacity : (Total) 865, 000 Tons * Construction Cost : 2, 100 Million Yens
Phase IV and Following	* Reclaimed Area : 231, 000 M² * Possible Berth Length : 555M/-10, 165M/-9, 105M/-6, 80M/-4, (Remove 120M/-4 Berth)

Note 1. (Berth Length)/Water Depth), Dolphin Berth for Tanker excepted.

Note 2. Possible Cargo Handling Capacity :
* Estimate was based on assumption of general cargo handling capacity of 1, 000 ton per one meter of berth annually.
* Exception : For berths with depth of -6 meters and -4 meters, the actual berth length was assumed as 2/3.

(5) Development Effects of The Harbour Installations

A Economic Effects on The Circulation of Merchandise

As consequence of equipping the harbour of Pacasmayo, the cargo handled up to now in the port of Salaverry (depending consequently on the overland transportation) can be now unloaded in a place with shorter transportation distance, making possible the use of the cheaper maritime transportation in a larger scale. This fact will contribute in saving the transportation costs.

The obtained cost saving is estimated to amount approximately 110 millions of Soles at the stage of opening the port.

Furthermore, the increase in the quantity of cargo to be handled in the ports of Salaverry and Eten located nearby is also taken into consideration. The equipping of the port in question will make possible the smooth and stable flow of cargo in the area served by these ports, contributing to attenuate the traffic jamming in the roads serving the area.

B Contribution to The Industrial Activities

1) The transportation of the mining products has depended approximately 80 % on the port of Salaverry in 1970 and recently this dependence has increased to 100 %. With the completion of this port overland transportation costs will be saved in large scale.

In the Michiquillay Mine, planning an annual production of 370 thousand tons, will be possible a saving amounting at least 115 thousand dollars.

2) With regard to the cement will occur the saving of the raw material (fuel oil) cost and the saving of the over-

land transportation cost. Regarding the agriculture will be possible the massive transportation of rice (which increase of production is expected) and furthermore will be possible to secure the supply of fertilizers, which is a kind of cargo with need of concentrated transportation during a limited season, by equipping the mass transportation facilities. Regarding sugar, its controlled shipping will be possible thanks to the new installations, contributing to the improvement of the transportation efficiency and naturally to reduce the corresponding cost.

The conditions for the transportation of fruits and green vegetables will be improved, with consequent improvement of the chances for their commercialization and further increase in the added value of the products.

3) The most important effect of the development in question will be the recuperation of the function as a harbour, which will bring the activation of the commercial and service activities of the city of Pacasmayo. The resulting increase in demand of the commercial activities is estimated in at least 95 million Soles.

4) For the peasant and fishing population in the area in question and surroundings the project will result in better conditions of commercialization of the crops and marine products, with consequent increase in the earnings.

New activities, such as the transportation related with the harbour can be introduced in the area after the materialization of the project.

Furthermore, food industry (including conservation of

foods and cattle products), industry of corrugated cardboard and other packing materials utilizing sugar cane, seaside type luber industry, wholesale and retail sale of traditional arts and crafts of Cajamarca and other activities can be taken into consideration.

5) After a further decurrence of time, other industrial activities, such as the industry of parts and components related with the automotive industry of Trujillo, the origination of the "assembly type" industry taking the advantage of the location as point of convergence of the overland and maritime transportation routes, the refining of copper (which exploitation is advancing) and the related fertilizer industry can be taken into consideration as candidates to be introduced in the area in question.

C Improvements in The Local Community and in The Administrative Efficiency

Regarding the peasants and the inhabitants in the surrounding areas, they will be favored by an indirect increase in earnings by reduction in the transportation costs, resulting in a smooth supply of general goods and fertilizers and shipping of rice and fruits.

The annual increase in income is estimated as approximately 13,000 Soles per family in the area of Pacasmayo and approximately 1,000 Soles in the area of Cajamarca.

The opening of the port will bring the reactivation of the existing industry and increase employment opportunities due to new related activities (with consequent increase in the income) and the return of the population drained to the larger urban area. These facts will contribute to improve the

solidarity and the stability of the local community.

The increase in the income level and the increase of the tax earnings will result in a relative reduction of administrative expenses, and the increase in the quantities of the different types of informations resulting from the increase of the rate of employment will enhance the social development, improving the effects of the communication.

(6) Economic Evaluation

A The feasibility study make assumptions regarding the construction of facilities and the quantities of cargo handled in the different stages of the project. The interest rates are assumed as 11 % for the part corresponding to the Peruvian government, 8 % for the international institutions, and 5 % for the foreign parts. Under these conditions it was concluded that 8 years are necessary for the origination of the current term profit, 13 years for the absorption of the accumulated deficits, 14 years for the occurrence of surplus and 14 years for the reimbursement of the short term loans.

B Study of The Benefits

The obtained benefits are taken as the total of the saving of the overland transportation costs between Pacasmayo and Salaverry and the cost saving resulting from the replacement of the overland transportation. The expenses are calculated as the sum of the current expenses, the reimbursement of the interests and of the principal.

C The internal profitability will be 11.31 % if the earning period is taken as 20 years and 15.6 % for 30 years.

D Carrying out the calculations with the DCF rate as 10 % the PV index will be 0.54 for 20 years, and 2.69 for 30 years. For DCF rate 12 % the PV index will be 0.19 for 20 years and 1.49 for 30 years.

E Carrying out the experimental analysis of the sensitivity taking the saved amount and the expense as main elements, the profitability will be 17 % when the interests are not included and that figure will become 13 % when the investment recuperation is considered, including the interests.

In the calculation of profits and losses the long term fund turning is studied based on the assumption of six different cases of interest rates. The corresponding results indicated a variation of 3 years in the term of reimbursement of the loans.

Furthermore, the oscillation of the income has a remarkable influence on the profitability.

F In the risk analysis the income and the expenses regarding the harbour were taken respectively with an annual variation probability of ±10 %. The result of such analysis indicated a small variation related to the average value, this fact meaning small risks.

From the results of the considerations presented above, it was obtained the conclusion that the equipping of the port of Pacasmayo is economically feasible as a public harbour.

PROGRAM FOR DEVELOPMENT OF MINE TOWN

CHAPTER 3

PROGRAM FOR DEVELOPMENT OF MINE TOWN

SECTION 1. SOCIAL AND ECONOMIC CHARACTERISTICS OF CAJAMARCA REGION

The general outline of Cajamarca Region is covered by 3 clauses in this Section. Clause 1 shows the location, natural conditions and regional definition of Cajamarca Region. Clause 2 shows the population movement, transportation system and housing situation; and Clause 3 shows the outline of agricultural and stock farming industry, mining, secondary and tertiary industries.

1-1 Location and Sphere of Cajamarca Region

Cajamarca Region where Michiquillay Mine is located belongs to the Sierra belt in northern part of the Republic of Peru with the City of Cajamarca as its center and covers an area that includes mid-south portion of Cajamarca Department and northeast portion of La Libeltad Department.

The greater part of the region is a tranquil rolling mountain belt with elevation of around 3,000 meters. The climate becomes complex with elevation; but in general the climate is rather chilly due to Alpine Andes. The rainy season extends from October to April while the dry season is from May to September.

As main industry, agriculture and stock farming are conducted widely in the Alpine region. The weight held by secondary and tertiary industry is small.

The west side of the Region is bordered by Costa zone of Lambayeque Department and La Libeltad Department and spherically the region is included in the sphere of urban Trujillo. The east side is bordered by Amazonas Department and San Martin Department that is a continuation of Celva zone; but there is very little traffic from east

of Marañon River.

Furthermore, the descriptive definition of the region is from the Ministry of Housing and Construction and National Institute of Planning; and as can be seen in Figure 3-112 the sphere of the region differs slightly. In this Chapter, the descriptive definition of both the Ministry of Housing and Construction and National Institute of Planning will be used according to circumstance.

FIG. 3-111 LOCATION OF CAJAMARCA REGION

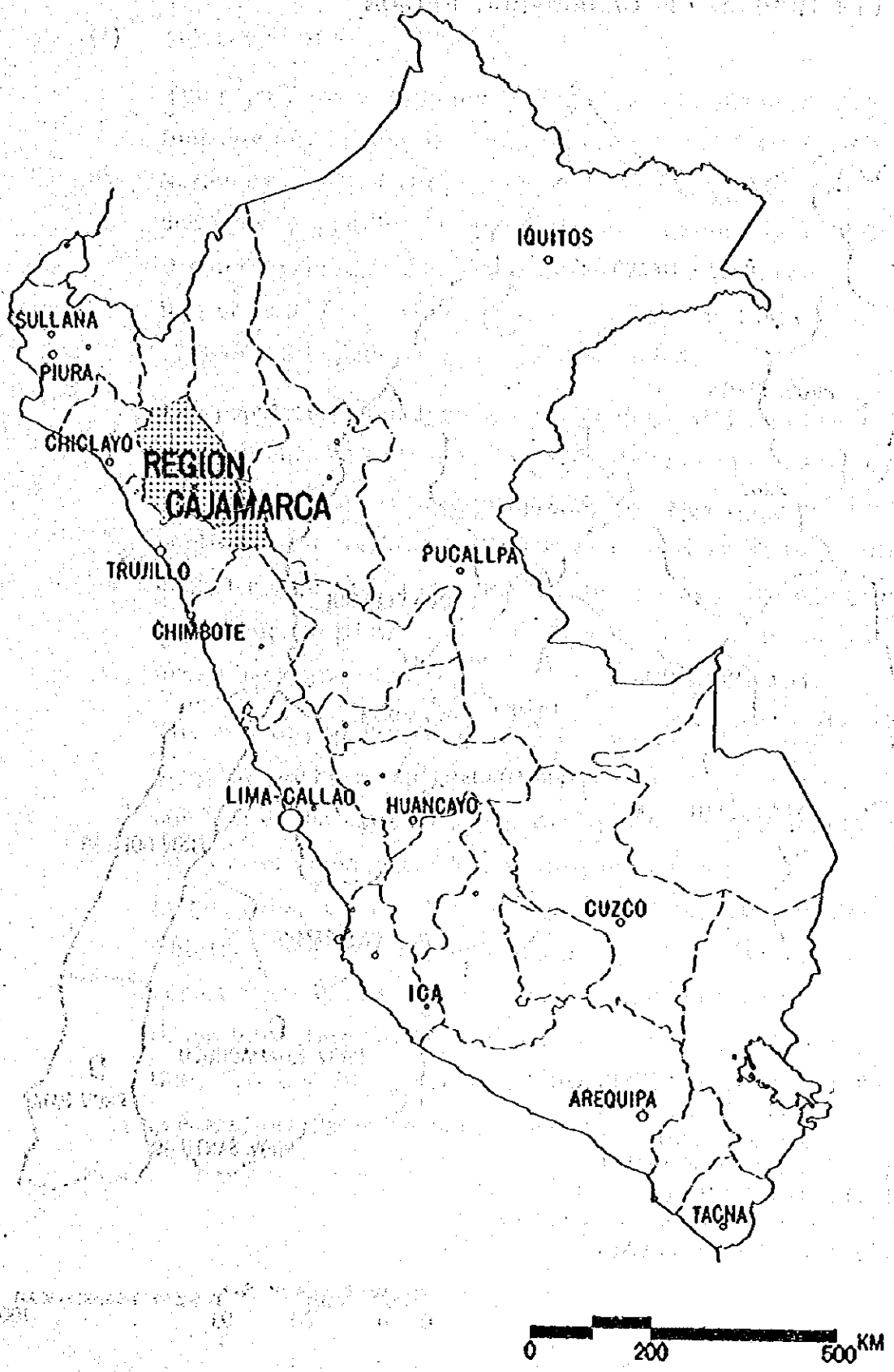
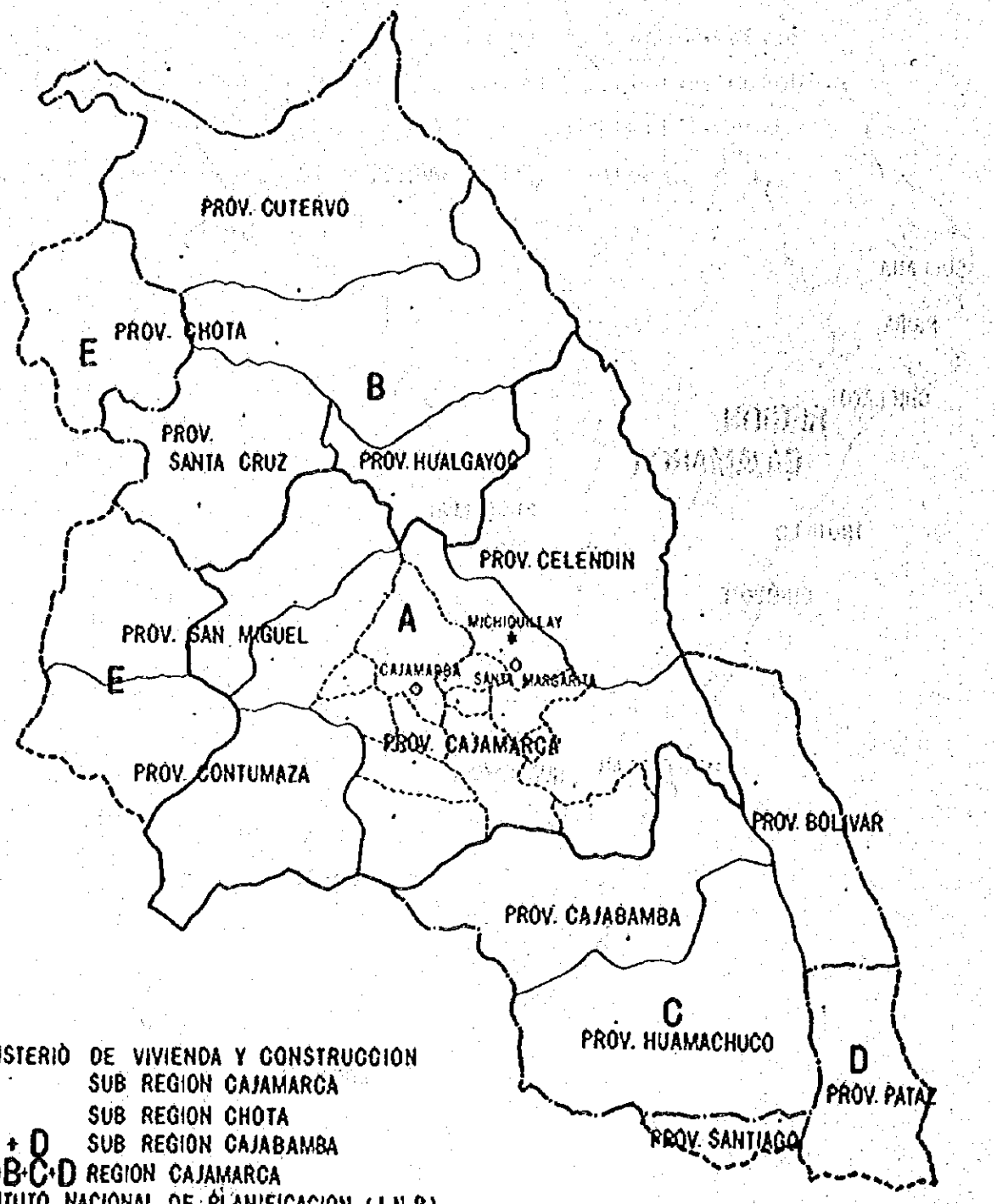


FIG. 3-112 SPHERE OF CAJAMARCA REGION



1-2 Social Characteristic of Cajamarca Region

(1) Movement of Population

The population of Cajamarca Region as defined by National Institute of Planning is shown in Table 3-121 from the National Census of 1972. Figure 3-121 shows the urban and rural population of each province. From this Table, it can be seen that the total population of Cajamarca Region is 857,956 and of this total population 146,176 or 17 % of the population is in the urban area.

The population structure by age group for Cajamarca Department and Cajamarca Province shows the same cross section and compared to the national average the low proportion of the working age group of 15 - 34 years is significant; but in contrast the increase in 15 - 34 years age group in Cajamarca District is striking and shows an urban type cross section. (see Figures 3-122 and 3-123)

The rate of population increase in Cajamarca Region is very low. The rate for 1960 ~ 1972 was 14.7 % or only one half of the national average. This low rate is due to outflow of population and this flow is mainly towards large cities, such as Lima-Callao, Trujillo, Pacasmayo, Chiclayo, etc. located near sea coast. From the recent result of study of the motive for movement of the population into Lima, 61 % gave economic reason, 9 % education, 3.4 % military service, so it can be seen that the greatest motive is economic reason.

Table 3-121 Population of Cajamarca Region (1972 Census)

PROVINCE		TOTAL			URBAN			RURAL		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
Cajamarca Department	Cutervo	110, 381	54, 416	55, 965	12, 087	5, 981	6, 106	98, 294	48, 435	49, 859
	Chota	129, 571	61, 448	68, 123	16, 530	8, 049	8, 481	113,041	53, 399	59, 642
	Santa Cruz	41, 621	20, 375	21, 246	5, 367	2, 625	2, 742	36, 254	17, 750	18, 504
	Hualgayoc	62, 217	29, 871	32, 346	6, 171	2, 977	3, 194	56, 046	26, 894	29, 152
	San Miguel	51, 842	25, 119	26, 723	4, 443	2, 140	2, 303	47, 399	22, 979	24, 420
	Celendin	64, 878	31, 131	33, 747	13, 074	6, 064	7, 010	51, 804	25, 067	26, 737
	Cajamarca	207, 744	101, 052	106, 692	50, 651	24, 661	25, 990	157,093	76, 391	80, 702
	Contumaza	37, 851	19, 328	18, 523	12, 785	6, 374	6, 411	25, 066	12, 954	12, 112
	Cajabamba	61, 279	29, 939	31, 340	9, 608	4, 525	5, 083	51, 671	25, 414	26, 257
La Libertad Department	Huamachuco	77, 265	-	-	11, 517	-	-	65, 748	-	-
	Bolivar	13, 307	-	-	3, 943	-	-	9, 364	-	-
TOTAL		857, 956			146,176			711,780		

FIG. 3-121 POPULATION OF CAJAMARCA REGION (1972 CENSUS)

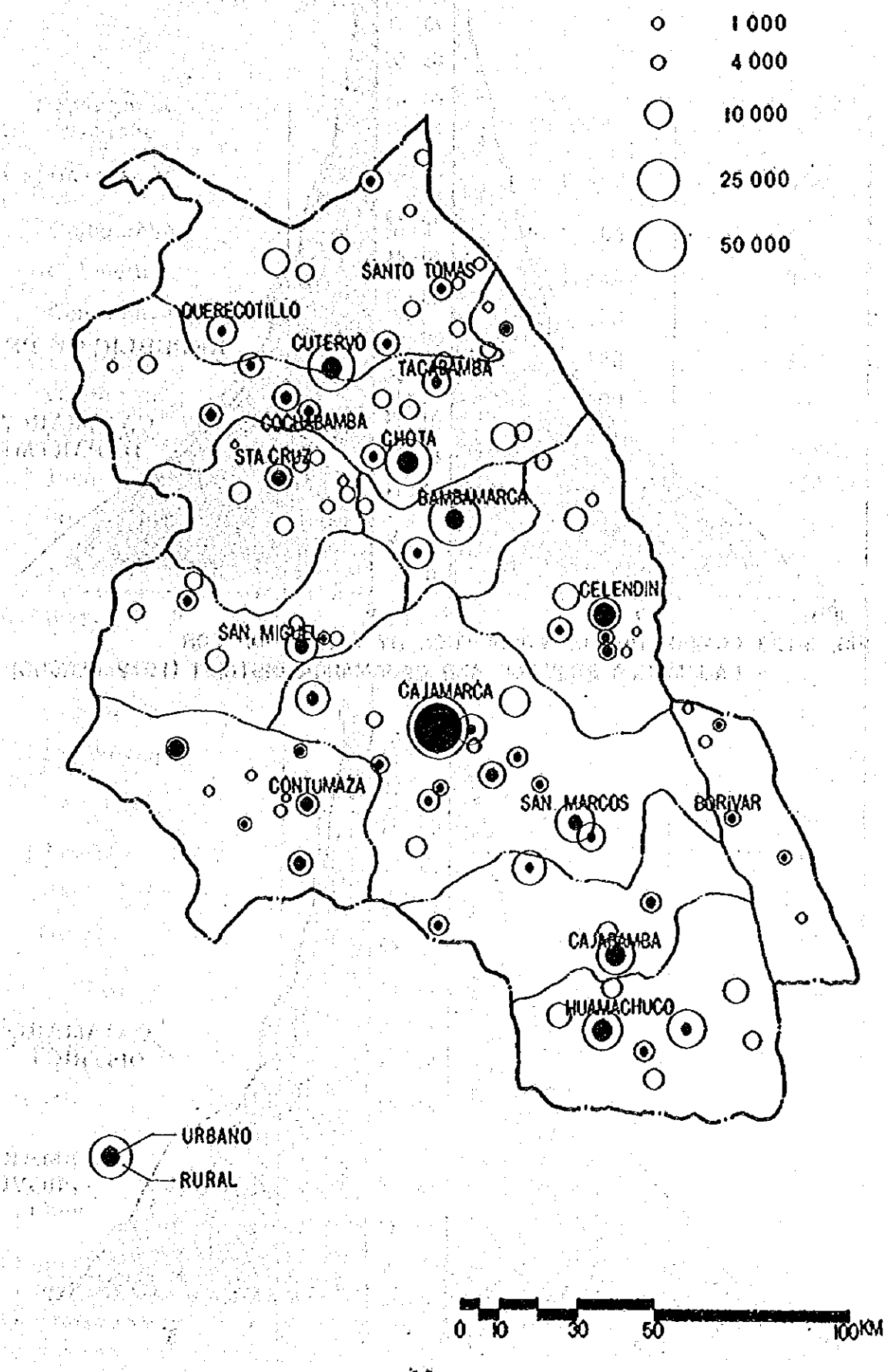


FIG. FIG. 3-122 COMPOSITION OF POPULATION BY AGE GROUP FOR PERU AND CAJAMARCA DEPARTMENT (1972 CENSUS)

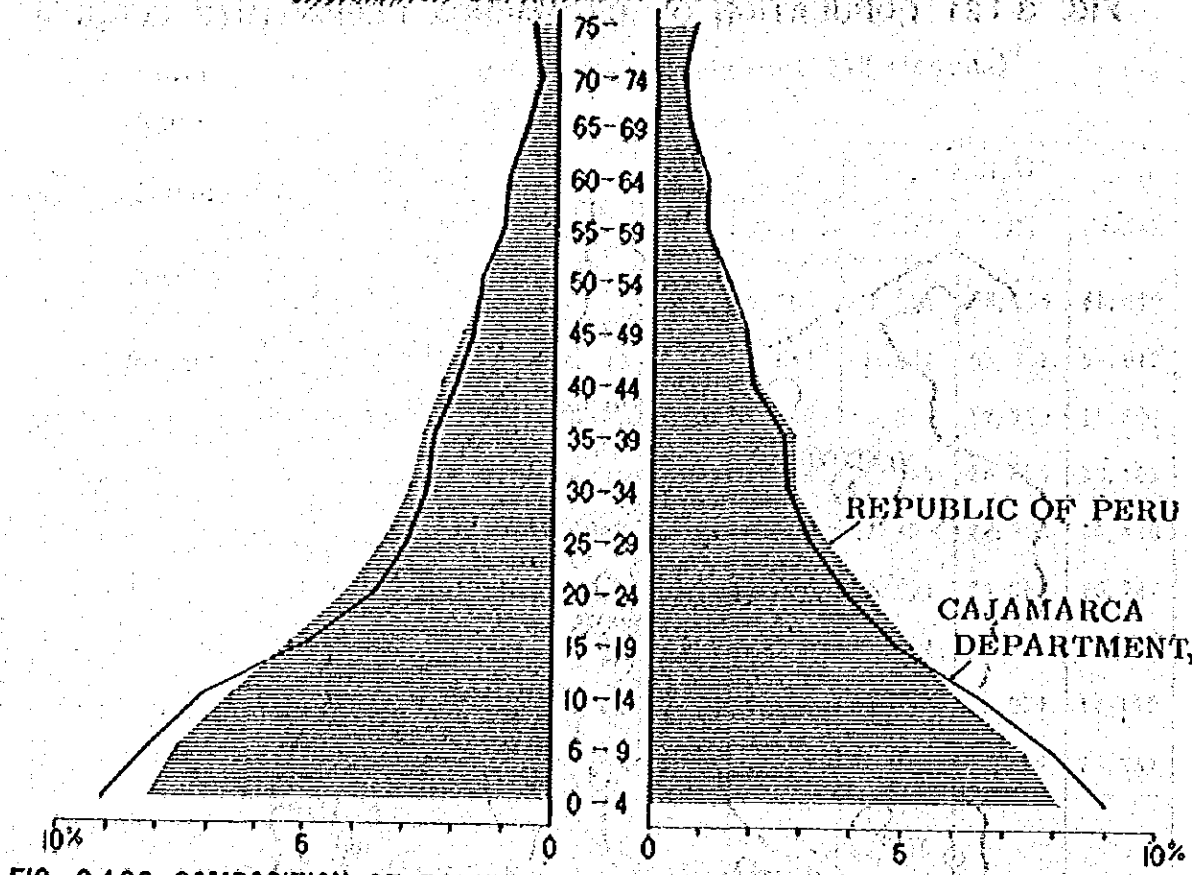


FIG. 3-123 COMPOSITION OF POPULATION BY AGE GROUP FOR CAJAMARCA PROVINCE AND CAJAMARCA DISTRICT (1972 CENSUS)

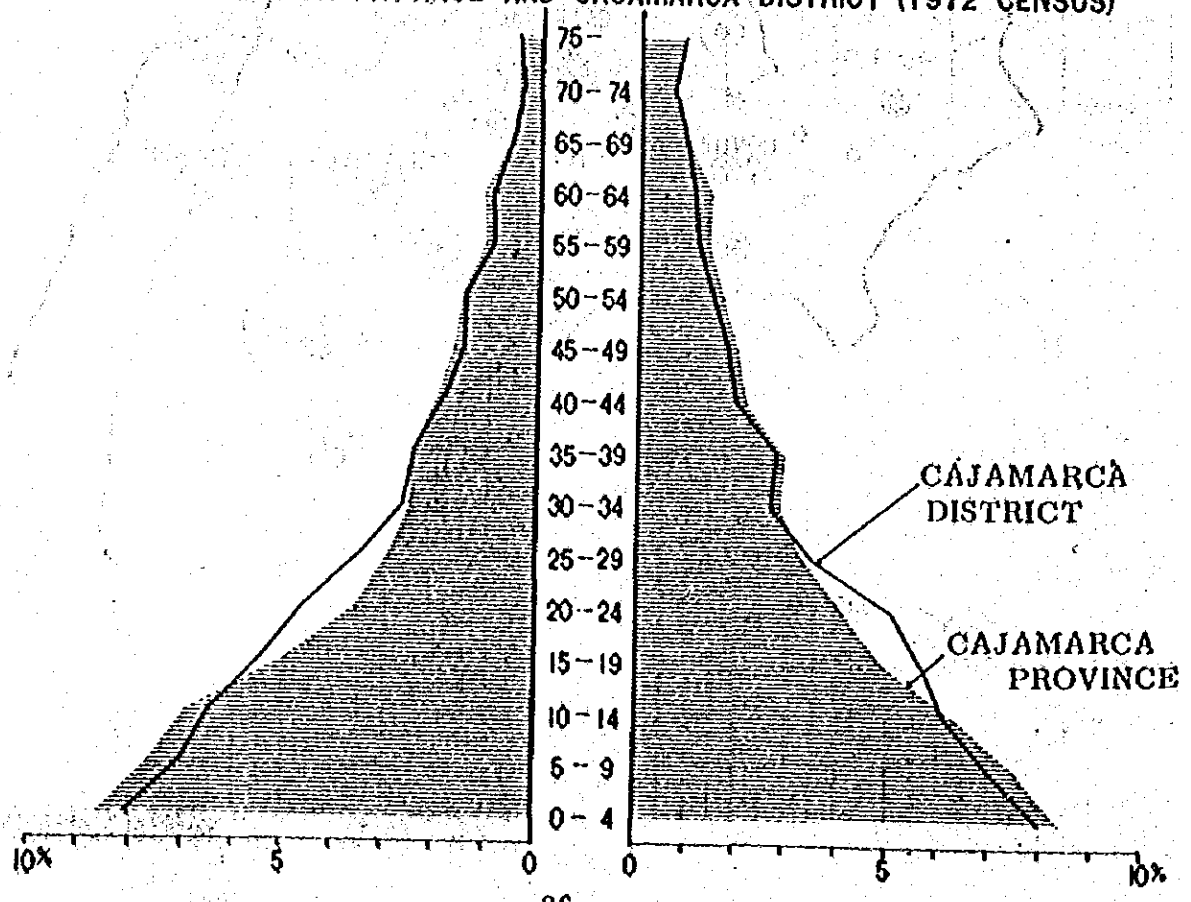


Table 3-122 Population Movement of Cajamarca Province
(Period unknown)

Department Province	Inflow	Outflow	Balance
Cajamarca	4,911	6,409	- 1,498
Cajabamba	689	1,100	- 411
Celendin	1,618	1,330	288
Contumaza	652	2,372	- 1,720
Cutervo	245	128	117
Chota	467	100	367
Hualgayoc	1,141	715	426
Jaen	33	631	- 598
Sta. Cruz	66	33	33
Lambayeque	291	3,862	- 3,571
Chiclayo	225	3,461	- 3,236
Ferrenafa	8	89	- 81
Lambayeque	58	312	- 254
La Libertad	1,634	20,329	- 18,695
Trujillo	785	12,526	- 11,741
Pacasmayo	410	7,135	- 6,725
Others	439	668	- 229
Lima-Callao	905	19,034	- 18,129
Amazonas	100	1,043	- 943
Ancash	128	1,735	- 1,607
Piura	156	808	- 652
Tumbes	28	388	- 360
Others	549	1,637	- 1,088
Total	8,702	55,245	- 46,543

(2) Transportation System

Access to Cajamarca Region is National Highway No. 8 that starts from Pan American Highway near Pacasmayo and runs easterly along Jequetepeque River Valley. In Cajamarca Region several roads radiate from Cajamarca City and connect with cities of Chota, San Miguel, Celendin, Cajabamba, etc. The percentage of paved road in Cajamarca Region is 2.7 % which is very low compared to the national average of 9.9 %. The density of traffic is shown in Figure 3-124. Also, from Table 3-123 it can be seen that means of transportation for this Region is concentrated in Cajamarca Province.

Also, 3.5 km northeast of Cajamarca City, Cajamarca Airport is located and the number of flights from this airport is shown in Table 3-124.

FIG. 3-124 VOLUME OF TRAFFIC IN CAJAMARCA REGION
(ANALYSIS OF SUB-REGION CAJAMARCA)

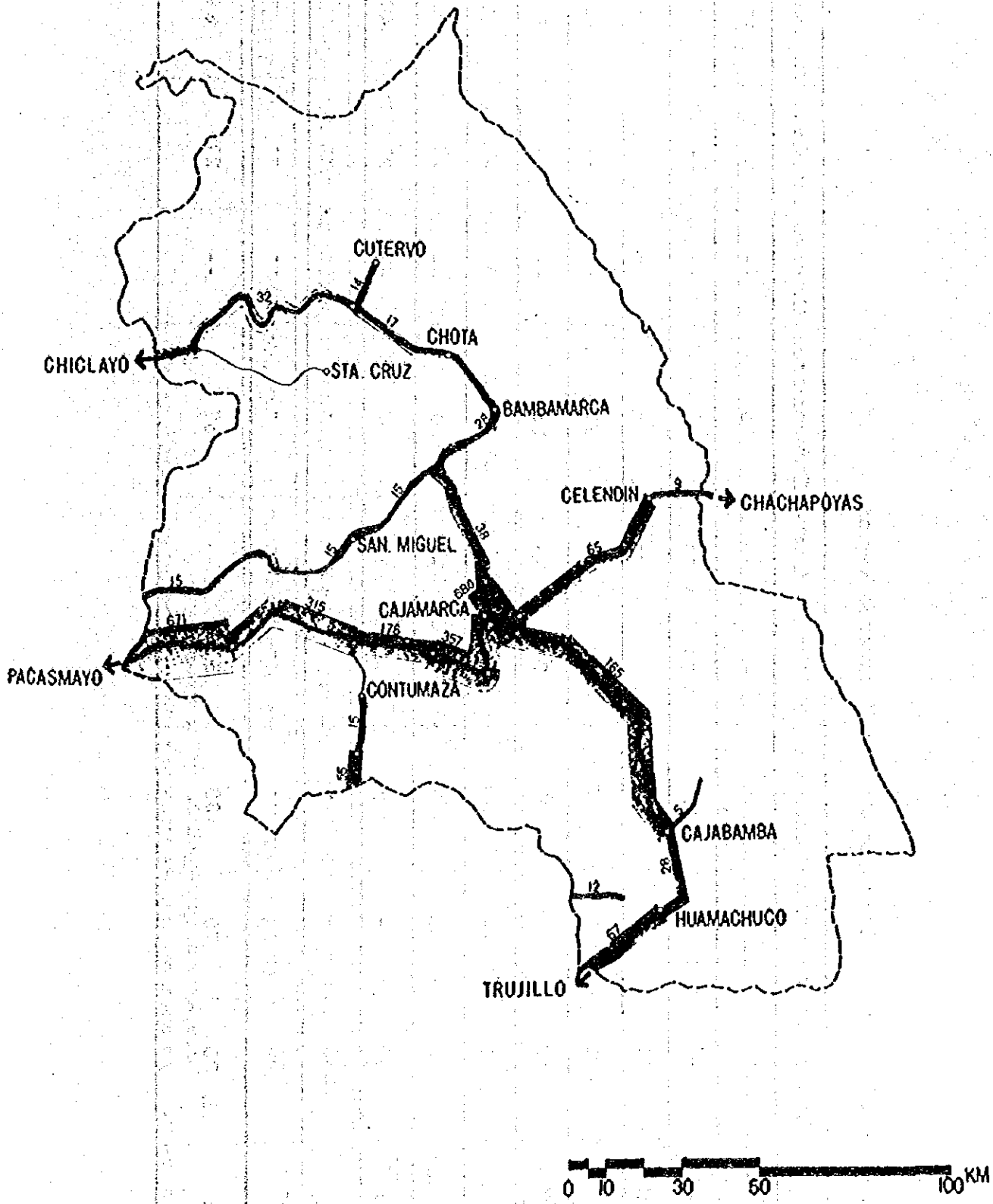


Table 3-123 Types of Transportation in Cajamarca Region

	Cajamarca	Celendin	Contumaza	S. Miguel	Chota	Bambamarca	Cutervo	Sta. Cruz	Cajabamba
Autos Part.	734	33	6	-	--	5	--	--	17
Taxis	51	--	-	-	--	1	--	--	1
Colect	13	--	-	-	--	-	--	--	-
Camio-netas	432	27	7	2	--	22	--	--	41
Camio-nes	410	16	26	2	--	25	--	--	12
Micros	20	--	--	-	--	--	--	--	3
Omni bus	83	3	--	-	--	2	--	--	-
Motos	59	-	--	1	--	2	--	27	44
Dici-cjetas	283	-	--	-	--	-	--	--	4
Trici-clos	50	-	--	--	--	-	--	--	-
Total	2,135	79	39	5	--	57	--	27	84

Table 3-124 Number of Private Airline Flights at Cajamarca Airport (1971)
(Analysis of Sub-Region Cajamarca)

	No. of Flights		No. of Passengers		Cargo (kg)		Mail (kg)	
	Arrival	Departure	Arrival	Departure	Arrival	Departure	Arrival	Departure
Cajamarca	105	107	3,177	3,106	36,118	8,758	4,649	2,953
Northern Part of Peru	7,376	7,367	90,368	90,754	2,103,787	3,620,399	57,329	24,694
National	31,354	31,406	1,011,518	999,398	23,954,681	18,824,345	401,955	401,115
Percentage Against Northern Part of Peru	%	%	%	%	%	%	%	%
	1.42	1.42	3.51	3.51	1.72	0.24	8.10	12.00
Percentage Against National	0.34	0.34	0.31	0.31	0.15	0.05	1.16	0.74

(3) Housing Situation

Table 3-125 shows the type of house and form of ownership in Cajamarca Department based on the National Census of 1972. According to this Table, 71.8 % of all homes are independent house and 85.0 % are self owned. However, 92.5 % of the houses have less than 3 rooms and 62.8 % have only one room. Especially in the rural area, 69.3 % are of one room house and the living environment is not good. The availability of water supply and drainage system is very low and for electric service the percentage of utilization is 6.0 % and 0.4 % if limited to rural areas.

Table 3-125 Type of Houses in Cajamarca Department (1972 Census)

	Total	Percentage(%)	Self-owned	Purchase	Rental	Others
Cajamarca Department	185,411	100.0	157,521	1,072	8,364	18,454
Percentage (%)	100.0		85.0	0.6	4.5	9.9
Independent House	133,100	71.8	113,298	816	6,570	12,416
Apartment	123	0.1	20		94	9
Tenement House	161	0.1	57	5	86	13
Rooming House	1,634	0.9	469	42	908	215
Improvised House	423	0.2	324	2	19	78
Shack	49,692	26.8	43,294	203	654	5,541
Non-Hvable House	262	0.1	52	4	33	173
Others	16		7			9

1-3 Economic Characteristic of Cajamarca Region

According to "Analysis of Sub-Region Cajamarca", 85.0 % of the employed population are engaged in primary industry (Agricultural, stock farming, mining) and the proportion of the total production for this Region held by this group of population is 49.4 % and the added value of 47.1 % is the highest, so it can be said that the primary industry is the main constituent of the economic structure (see Figure 3-131). However, in Table 3-131, the net productivity is 6.5 thousand soles per man which is very low compared to other industry.

The added value of entire industries in Cajamarca Region accounts for a very low 1.0 % of the gross national product. The reason for this low proportion is that there is no industry outside of agricultural and stock farming industry that can become a nucleus of production activity; and in addition, the lack of infrastructure to link this Region with economic and industrial districts in the coastal area have caused economic stagnation in this Region.

FIG. 3-131 INDUSTRIAL STRUCTURE IN CAJAMARCA REGION

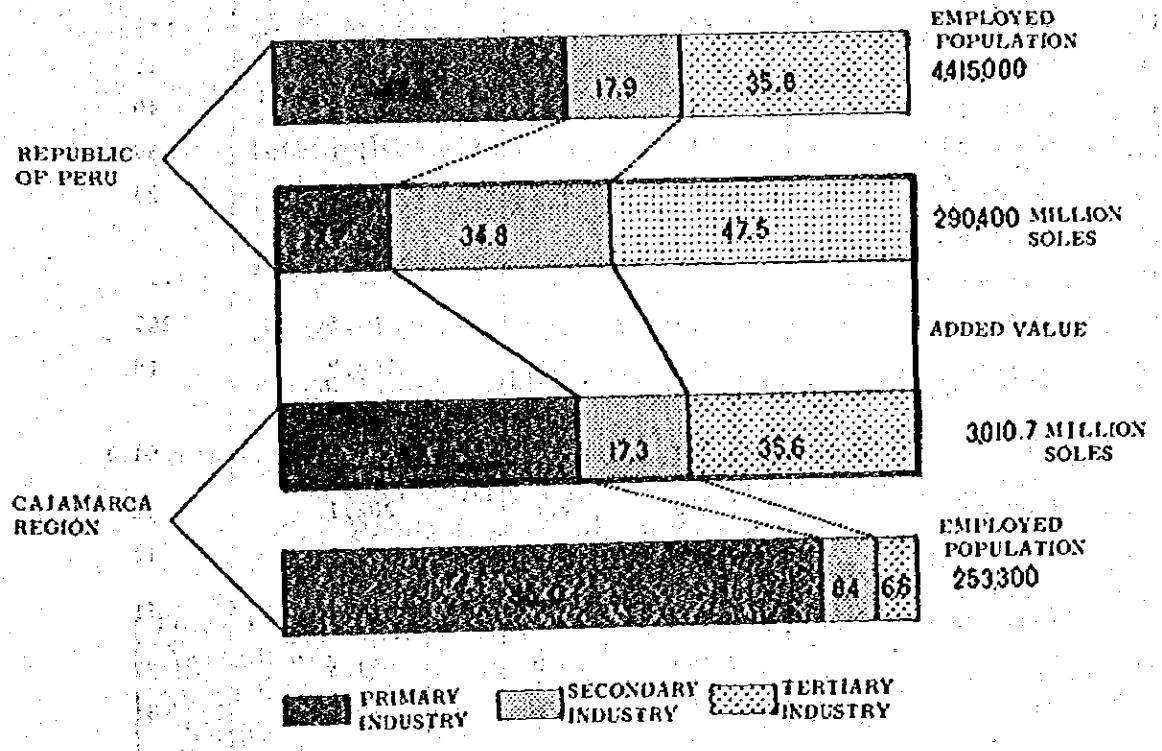


Table 3-131 Industrial Population and Productivity in Cajamarca Region

(Analysis of Sub-Region Cajamarca)

	Industrial Population (W)	(%)	Added Value (S/.000,000)	Net Productivity (S/.000)
PRIMARIA	215,302	85.0	1,418.1	6.5
1. Agricultura	213,800	84.4	1,300.8	6
2. Pecuario				
3. Minerales Metalicos	1,400	0.6	99.7	71
4. Minerales No Metalicos	102		17.6	172
INTERMEDIAS MOTRICES Y PRODUCTOS DESTINADOS A LOS HOGARES	21,334	8.4	450.1	21.1
5. Precondensado de Leche	76		9.4	124
6. Otras Industrias Alimenticias	111		3.0	27
7. Bebidas	38		3.4	89
8. Textil	19		0.2	10
9. Prendas de vestir	16		0.2	12
10. Madera	104		18.4	177
11. Muebles	--		--	--
12. Imprenta	24		0.5	21
13. Cuero	10		0.4	40
14. Diversos	28		1.1	39
15. Construccion	1,554	0.6	35.4	23
16. Vivienda			127.1	
17. Bienes de Capital	--		--	--
18. Electricidad	54		15.5	287
19. Artesania de Produccion	19,300	7.6	306.2	16
SERVICIOS	16,660	6.6	1,071.8	64.3
20. Comercio	5,400	2.1	282.1	52
21. Transporte	850	0.3	61.0	72
22. Otros Servicios Privados	710	0.3	50.4	71
23. Estatal	7,500	3.0	631.9	77
24. Artesania	2,200	0.9	46.4	21
TOTAL GENERAL	253,296	100	3,010.7	12

(1) Agricultural and Stock Farming Industry

Table 3-132 shows that the agricultural production of Cajamarca Region accounts for 4.7 % of the national production while stock farming accounts for 9.4 %; and together they account for a high 6.2 % of the national production. If the 84.0 % of the working population engaged in agriculture and stock farming is considered, this agricultural and stock farming industry is the core of the production structure. Table 3-137 shows that 6.9 % of this Region or 200,000 hectares are arable lands and 81 % of them or 161,975 hectares are cultivated lands for rotation crops such as grains, root crops, beans, etc.; and 2.9 % or 5,710 hectares are lands for perennial crops such as coffee and cocoa and the remaining area is forest and pasture land. Table 3-133 shows the principal agricultural products for each province and grain is found to be the principal crop. Table 3-135 shows productivity in units for each crop.

From viewpoint of land ownership, it can be seen from Table 3-136 that 71 % of the land owners own 5 % of the total cultivated land area, so the present situation is that the number of person engaged in agriculture with very small plots is great.

As to stock farming, Table 3-134 shows the large share accounted by edible rodent, cattle, pig, horse, etc.

Table 3-132 Total Agricultural and Stock Farming Production of CAJAMARCA Region and Proportion to National Production (Analysis of Sub-region CAJAMARCA)

(unit : Million Soles)

Total Production	Cajamarca Region	National	Share
Agriculture	1, 380	29, 526	4.7%
Stock Farm	1, 300	13, 762	9.4%
Total	2, 680	48, 288	6.2%

Table 3-133 Principal Agricultural Products in Cajamarca Region

Province	Rotation Crop			Perennial Crop
	Grain	Root	Bean	
Chota	Corn	Potato	Pea	Coffee
Cutervo	Corn	Yuca	String Bean	Coffee
Santa Cruz	Corn	Yuca	String Bean	Coffee
Bolivar	Wheat	Potato	Pea	Cocoa
Huamachuco	Wheat	Potato	Pea	Cocoa
Cajabamba	Barley	Potato	Nuna	——
Coutumaza	Rice	Potato	Pea	——
Cajamarca	Barley	Potato	Pea	——
Celendin	Barley	Potato	String Bean	——
Hualgayoc	Barley	Potato	String Bean	——
San Miguel	Corn	Potato	String Bean	

Table 3-134 Number of Livestocks in Cajamarca Department
(San Ignacio, Jean not included)

Species	Cajamarca Department	Total National	Percentage
POULTRY	1, 205, 000	21, 913, 000	5.5%
Costa	105, 000	15, 455, 000	
Sierra	1, 100, 000	6, 458, 000	
GOAT	106, 500	1, 931, 600	5.5%
Costa	11, 500	763, 800	
Sierra	95, 000	1, 167, 800	
RODENT	3, 840, 000	20, 091, 000	19.1%
Costa	240, 000	1, 585, 000	
Sierra	3, 600, 000	18, 506, 000	
HORSE	100, 000	1, 366, 700	7.3%
Costa	10, 000	163, 200	
Sierra	90, 000	1, 203, 500	
SHEEP	709, 000	16, 888, 700	4.2%
Costa	9, 000	209, 700	
Sierra	700, 000	16, 679, 000	
HOG	158, 300	1, 795, 300	8.8%
Costa	8, 300	475, 300	
Sierra	150, 000	1, 320, 000	
CATTLE	442, 000	3, 976, 300	11.1%
Costa	22, 000	520, 800	
Sierra	420, 000	3, 455, 500	

Table 3-135 Agricultural Productivity in Cajamarca Region (Analysis of Sub-Region Cajamarca)

kg/ha
Soles/ha

Province	Rotation Crop									
	Grain				Root		Bean		Perennial Crop	
	Corn	Wheat	Barley	Rice	Poteto	Orchid	String bean	Pea		
Chota	540 1,890	600 2,700	650 1,300	4,600 13,800	9,000 22,500	6,000 12,200	500 1,500	1,372 5,488	477 4,770	---
Cutervo	500 1,250	---	650 1,417	4,200 18,480	10,000 26,600	7,000 10,500	836 3,650	1,266 10,128	587 5,870	---
Santa Cruz	600 1,800	900 3,150	600 1,800	5,978 32,879	9,000 20,700	7,000 12,600	350 2,100	844 3,882	510 7,140	---
Bolivar	900 2,520	800 2,800	900 1,800	---	6,000 12,000	5,000 7,500	600 1,300	900 2,700	450 5,400	800 16,000
Huamachuco	1,022 5,335	805 1,660	214 4,760	---	6,767 25,105	6,719 13,303	---	1,177 3,766	483 5,796	780 7,839
Cajabamba	966 2,441	972 1,863	864 1,717	---	6,523 12,702	8,182 16,200	800 3,200	756 3,774	600 7,200	699 7,032
Contumaza	1,038 4,559	973 3,424	983 2,606	5,414 27,455	7,310 16,470	10,380 20,510	242 11,935	892 5,329	450 4,725	989 23,736
Cajamarca	945 3,768	931 4,189	930 1,862	3,500 17,745	8,319 12,746	7,250 13,800	835 4,153	1,080 4,858	600 7,200	575 9,200
Celendin	730 2,261	740 2,508	794 1,500	---	5,434 9,956	4,977 4,977	352 1,729	432 1,713	---	762 12,188
Hualgayoc	1,020 3,070	884 3,257	800 1,600	---	6,780 13,638	---	1,184 6,862	1,000 5,927	---	---
San Miguel	700 2,140	662 2,768	742 2,122	5,300 26,871	6,030 12,720	5,673 8,144	414 2,342	405 1,967	650 9,317	---
Average	500 1,650	665 2,657	630 1,556	4,500 22,500	7,400 12,225	6,700 11,053	355 2,313	520 4,058	490 4,900	970 29,100

Table 3-136 Land Ownership in Cajamarca Areas
(Analysis of Sub-Region Cajamarca)

Land Owner				Area	
	Classification (Ha)	Number	%	Ha	%
Cajamarca	- 3.5	10, 960	75	9, 890	7
	3.5 - 11	2, 315	16	14, 040	9
	11 - 30	995	7	19, 170	12
	30	370	2	112, 880	72
	TOTAL	14, 640	100	155, 980	100
San Marcos	- 3.5	6, 710	72	9, 110	5
	3.5 - 11	1, 732	18	9, 530	5
	11 - 30	673	7	12, 870	7
	30	245	3	158, 820	83
	TOTAL	9, 360	100	190, 330	100
Cajabamba	- 3.5	8, 915	74	9, 630	6
	3.5 - 11	1, 695	14	10, 815	7
	11 - 30	1, 155	9	21, 550	13
	30	385	3	120, 015	74
	TOTAL	12, 150	100	162, 010	100
San Pablo	- 3.5	4, 200	61	5, 820	5
	3.5 - 11	1, 770	25	10, 570	15
	11 - 30	755	8	14, 590	24
	30 -	205	3	96, 210	76
	TOTAL	6, 930	100	127, 190	100
TOTAL	- 3.5	30, 785	71	34, 450	5
	3.5 - 11	7 512	18	44, 955	7
	11 - 30	3, 578	8	68, 180	11
	30 -	1, 205	3	487, 925	77
	TOTAL	43, 080	100	635, 510	100

Table 3-137 Area of Land Utilized in Cajamarca Region (Analysis of Sub-Region Cajamarca)

Province		Area of Land Utilized								Total
		Forest	Pasture	Cultivated land for perennial crops		Cultivated Land for Rotation Crops				
						Grain	Root	Bean	Other	
Chota	ha	570	380	1,330	35,720	11,250	2,680	1,610	20,180	38,000
	%	(1.5)	(1.0)	(3.5)	(94.0)	(31.5)	(7.5)	(4.5)	(56.5)	(100)
	%				(100)					
Cutervo	ha	200	700	1,500	17,600	7,570	1,940	2,640	5,450	20,000
	%	(1.0)	(3.5)	(7.5)	(88.0)	(43.0)	(11.0)	(15.0)	(31.0)	(100)
	%				(100)					
Santa Cruz	ha	210	210	1,050	19,530	9,180	1,370	3,320	5,660	21,000
	%	(1.0)	(1.0)	(5.0)	(93.0)	(47.0)	(7.0)	(17.0)	(29.0)	(100)
	%									
Bolivar	ha	210	30	165	2,595	1,545	610	210	230	3,000
	%	(7.0)	(1.0)	(5.5)	(86.5)	(59.5)	(23.5)	(8.0)	(9.0)	(100)
	%				(100)					
Huamachuco	ha	1,160	1,890	310	17,640	11,820	3,530	440	1,850	21,000
	%	(5.5)	(9.0)	(1.5)	(84.0)	(67.0)	(20.0)	(2.5)	(10.5)	(100)
	%				(100)					
Cajabamba	ha	630	1,040	220	7,110	4,590	670	1,280	570	9,000
	%	(7.0)	(11.5)	(2.5)	(79.0)	(64.7)	(9.5)	(18.0)	(8.0)	(100)
	%				(100)					
Contumaza	ha	60	390	330	12,220	9,040	1,220	1,350	610	13,000
	%	(0.5)	(3.0)	(2.5)	(94.0)	(74.0)	(10.0)	(11.0)	(5.0)	(100)
	%				(100)					
Cajamarca	ha	1,260	13,860	180	20,700	10,560	4,040	4,140	1,960	36,000
	%	(3.5)	(38.5)	(0.5)	(57.5)	(51.0)	(19.5)	(20.0)	(9.5)	(100)
	%				(100)					
Celendin	ha	100	1,300	100	8,500	4,635	2,125	1,230	510	10,000
	%	(1.0)	(13.0)	(1.0)	(85.0)	(54.5)	(25.0)	(14.5)	(6.0)	(100)
	%				(100)					
Hualgayoc	ha	160	1,760	0	6,080	1,610	1,065	1,795	1,610	8,000
	%	(2.0)	(22.0)	(0)	(76.0)	(26.5)	(17.5)	(29.5)	(26.5)	(100)
	%				(100)					
San Miguel	ha	210	5,985	525	14,200	8,495	2,500	1,930	1,355	21,000
	%	(1.0)	(28.5)	(2.5)	(68.0)	(59.5)	(17.5)	(13.5)	(9.5)	(100)
	%				(100)					
Total	ha	4,770	27,545	5,710	161,975	80,295	21,750	19,945	39,985	200,000
	%	(2.4)	(13.8)	(2.8)	(81.0)	(49.6)	(13.4)	(12.3)	(24.7)	(100)
					(100)					

(2) Mining Industry

The net productivity of mining industry in Cajamarca Region is high and the industry is stable; but the production in year 1970 was 199 million Soles and accounted for only 3, 4 % of the total production in this Region with very little effect upon regional economy.

Mined products are limestone, copper, lead and zinc. Four principal districts for mine production are Hualgayoc, Cachachi, Sayapullo and Chilete. Of these 4 districts, Hualgayoc and Cachachi accounted for 73 % of the total production.

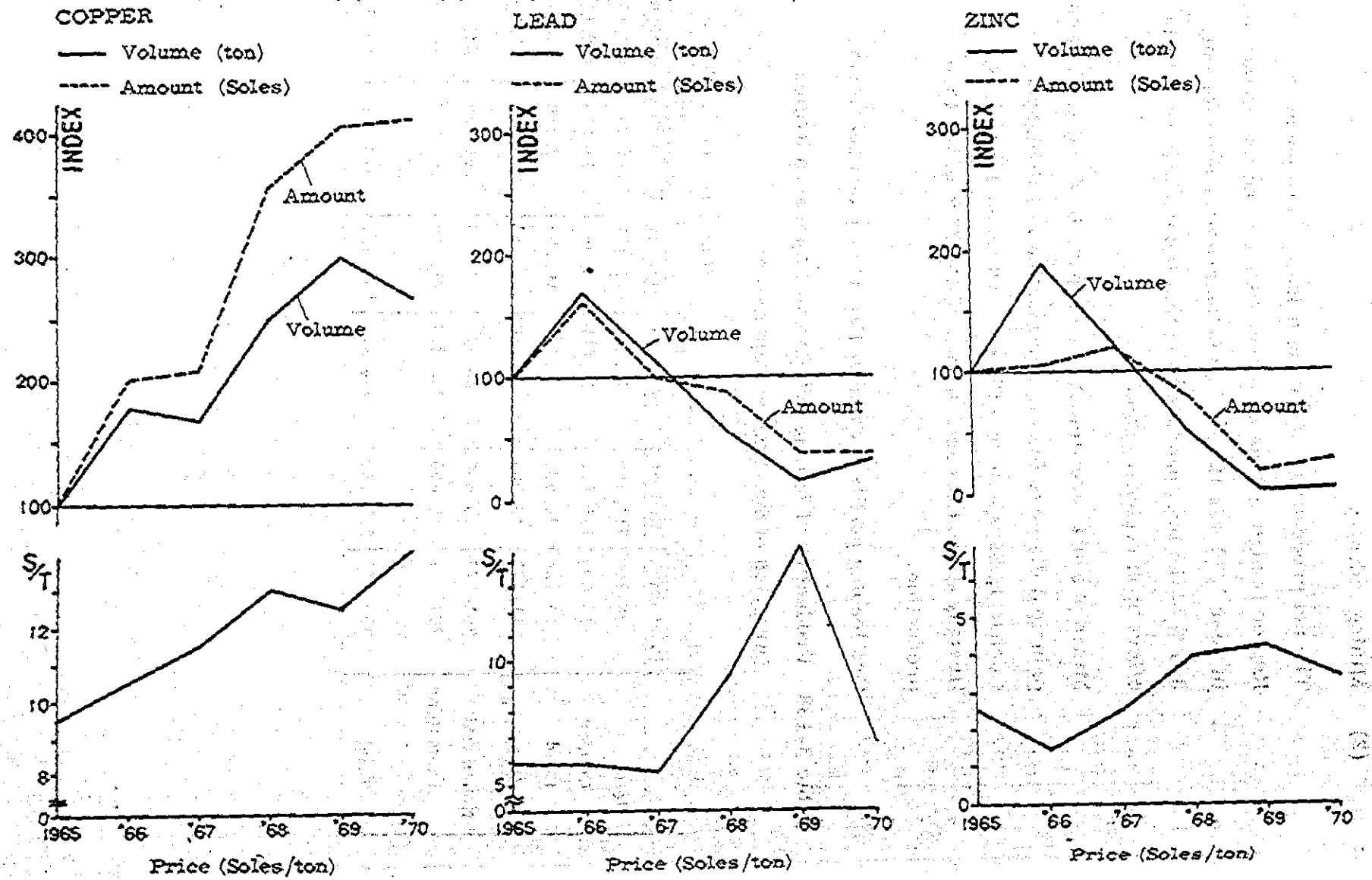
Ore loading port is located at Pacasmayo and Salaverry.

Table 3-138 Production of Mining Industry in Cajamarca Region (Analysis of Sub-Region Cajamarca)

(Unit ; Ton and 1, 000 Solles)

	1968		1969		1970	
	Production	Amount	Production	Amount	Production	Amount
Metal	26, 299	211, 499	15, 965	171, 451	17, 730	174, 670
Copper	10, 699	129, 007	12, 800	146, 996	11, 515	149, 032
Lead	4, 128	38, 588	1, 129	16, 293	2, 290	14, 979
Zinc	11, 472	43, 904	2, 036	8, 162	3, 925	10, 659
Non-metal	264, 177	5, 690	280, 378	21, 816	301, 238	24, 339
Limestone	264, 177	5, 690	280, 378	21, 816	301, 238	24, 339
Total	290, 476	217, 189	296, 343	193, 267	318, 968	199, 008

FIG. 3-132 TRANSITION IN VOLUME AND AMOUNT OF PRODUCTION OF PRINCIPAL METAL (ANALYSIS OF SUB-REGION CAJAMARCA)



(3) Secondary Industry

Secondary industry includes food processing, milk processing, beverage, clothing, mill work, furniture, printing, construction and traditional craft and accounts for 19.7 % of the total production in this Region and employs 8.4 % of the working population. Compania Peruana de Alimentos Lacteos, a milk product processing company and Padron, a dealer of semi-finished lumber products are the only 2 companies in this Region that are relatively large in scale. All others are small family business and traditional craft industry. Thus, industries in this Region produce only simple secondary products and manufacturers of high grade products are not established.

(4) Tertiary Industry

Commercial enterprises dealing principally in selling primary products and food products are located in urban areas. As to financial houses in Cajamarca Region, there are 36 national banks, 4 government banks and 7 commercial banks. Also, in areas around Cajamarca City there are many sources of tourist attraction such as ruins of Incas and large Spanish cathedral built in the 17th century; but lack of lodging accommodation is the present situation.

SECTION 2. CONDITIONS FOR DEVELOPMENT OF MINE TOWN

This Section mentions the existing conditions of the proposed town site and surrounding areas based on the findings of this Mission; and with conditions assumed for development of mine town, the basic concept for the development and planning for population are indicated. In Clause 1, the existing conditions of areas around the proposed mine town and informations on the development of Cajamarca Basin were arranged. Natural conditions such as weather, topography, geology and vegetation of the proposed mine town site are mentioned in Clause 2, while in Clause 3 related programs and conditions of Cajamarca City and other mine towns were analyzed to show the basic concept for the development and classification of mine town. In Clause 4, the population of the mine town was planned based on the number of mine workers.

2-1. Existing Conditions of Areas Surrounding the Mine Town

Development of a mine town brings upon the people of the Region great social and economic effect, so conditions for development must be established after considering the existing conditions and the future images of the Region. Especially, since this Region lags in development, solution to problems such as lack of basic city facilities and community facilties, low income due to industrial structure with agricultural and stock farming industry as nucleus, etc. must be included in the development program.

From number of proposed sites, the land in Santa Margarita owned by Minero Peru was selected as proposed site for the mine town by Michiquillay Commission. In this Clause, the existing conditions of Cajamarca Basin will be analyzed since this valley is directly in the sphere influenced by the development of the mine town.

For information, the assessment of each proposed site for the

mine town is shown in Table 3-211.

Table 3-211 Assessment of Each Proposed Site for Mine Town

(1975 Information of Bureau of Housing and Construction)

Report on Mine Town Development by the Ministry of Housing and Construction and 1973 Report on Basic Investigation of Cajamarca Basin.

Proposed Site	Conditions of Location					Remark
	Commuting Distance	Area Topography	Present Use	Potable Water	Safeness	
Cajamarca-A	Unsuitable (48 Km)	Unsuitable (Too small)				
Cajamarca-B	Unsuitable (45 Km)			Unsuitable		Under route of flight for new airport
Los Baños Del Inca	Unsuitable (40 Km)	Unsuitable (Too rugged)	Unsuitable (Hot spring, Farm land)		Unsuitable (Possible Earthquake)	
Llacanora	Unsuitable (36 Km)		Unsuitable (Pasture land)			Site for new airport
Pampa La Culebra	(22 Km)		Unsuitable (Ore tailing pond)			
Rodacocha	(5 Km)	Unsuitable (Steep Slope)				Elevation over 3,500 m
Santa Margarita	(20 Km)					

(1) Natural Condition

Cajamarca Basin is surrounded by 4,000 meters high mountain ranges of the Andes and oval in shape with longitudinal axis in west-northwest to east-southeast direction. The basin is 75 km long and 35 km wide and the elevation is 2,400 - 3,200 meters above sea level. Cajamarca, the central city of the Region, is located in the northwest end of the basin and San Marcos in the southeast end. Others within the basin are Los Baños Del Inca, Jesus and all together 9 districts of Cajamarca Province. Cajamarca River flowing in the direction of San Marcos from

Cajamarca is a branch of Marañon River which is a part of the Amazon River system. Beyond the watershed in west side of the basin, all rivers flow into the Pacific Ocean.

The existing condition of land utilization is shown in Figure 3-272; but greater part of the agricultural land is pasture land.

(2) Population

According to the Census of 1972, the population of Cajamarca Basin is 162,231 which is 78 % of the total population of Cajamarca Province, and of this population 28 % or 45,846 are in the urban areas.

By district, the rate of dependence on the population of Cajamarca is high for 38.5 % of the total population and 84 % of the urban population are concentrated in Cajamarca.

Figure 3-213 shows the distribution of population in the basin, and the concentration of urban population in Cajamarca, Los Baños Del Inca, Jesus, Namora, Matara and San Marcos is conspicuous. The population density of rural areas is high in areas surrounding Cajamarca - Los Baños Del Inca and San Marcos - Ichocan. The population density of entire Cajamarca Province is 42.4 persons per square kilometer.

FIG. 3-211 TOPOGRAPHY OF SURROUNDING AREAS (REVISED 1:100,000 SCALE MAP)
(REPRODUCED INSTITUTE OF MIUTARY GEOGRAPAY OF LIMA-PERU 1975)

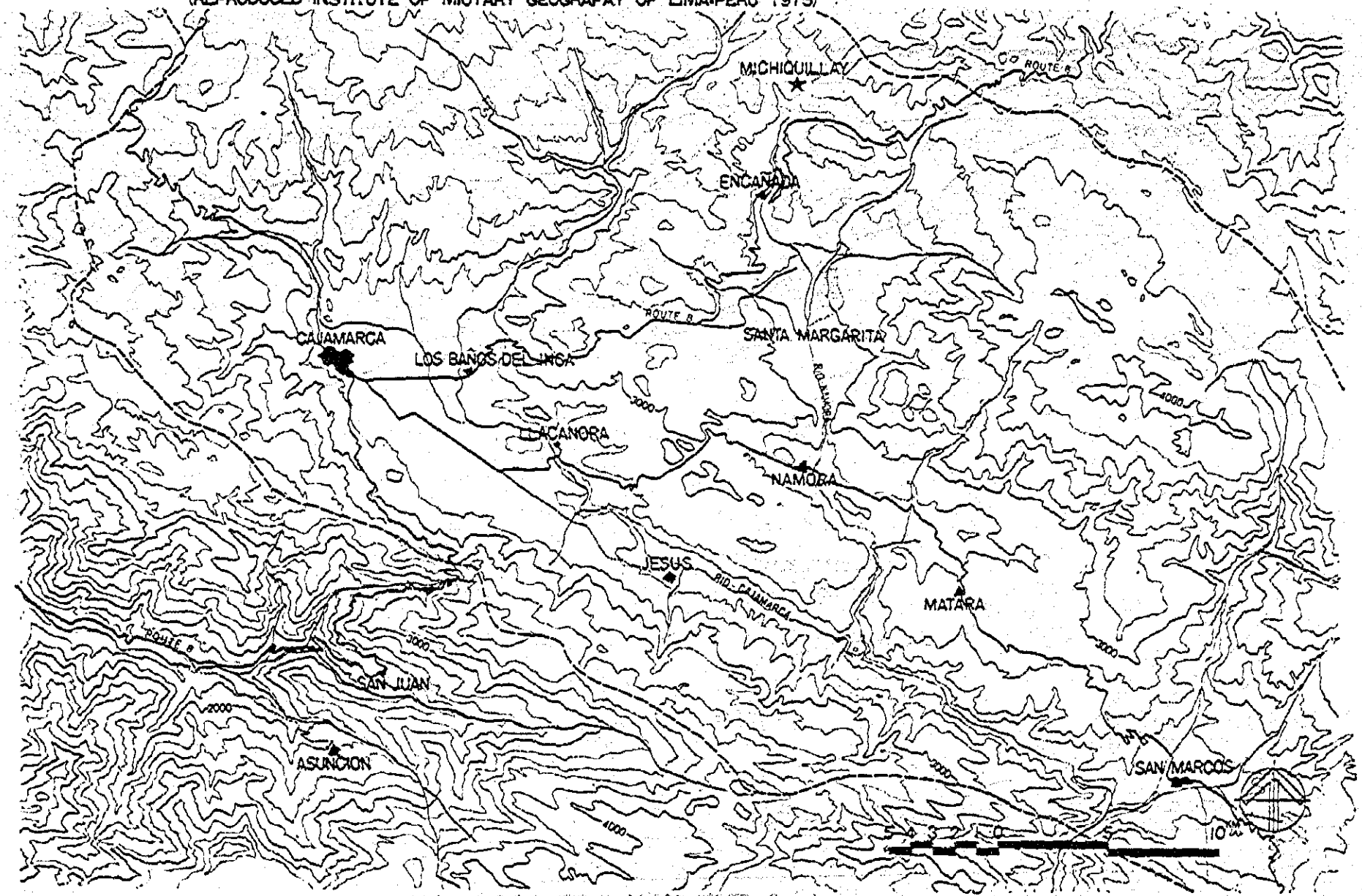


FIG. 3-212 LAND USE OF SURRUUNDING AREAS (FROM 1:100,000 SCALE MAP)

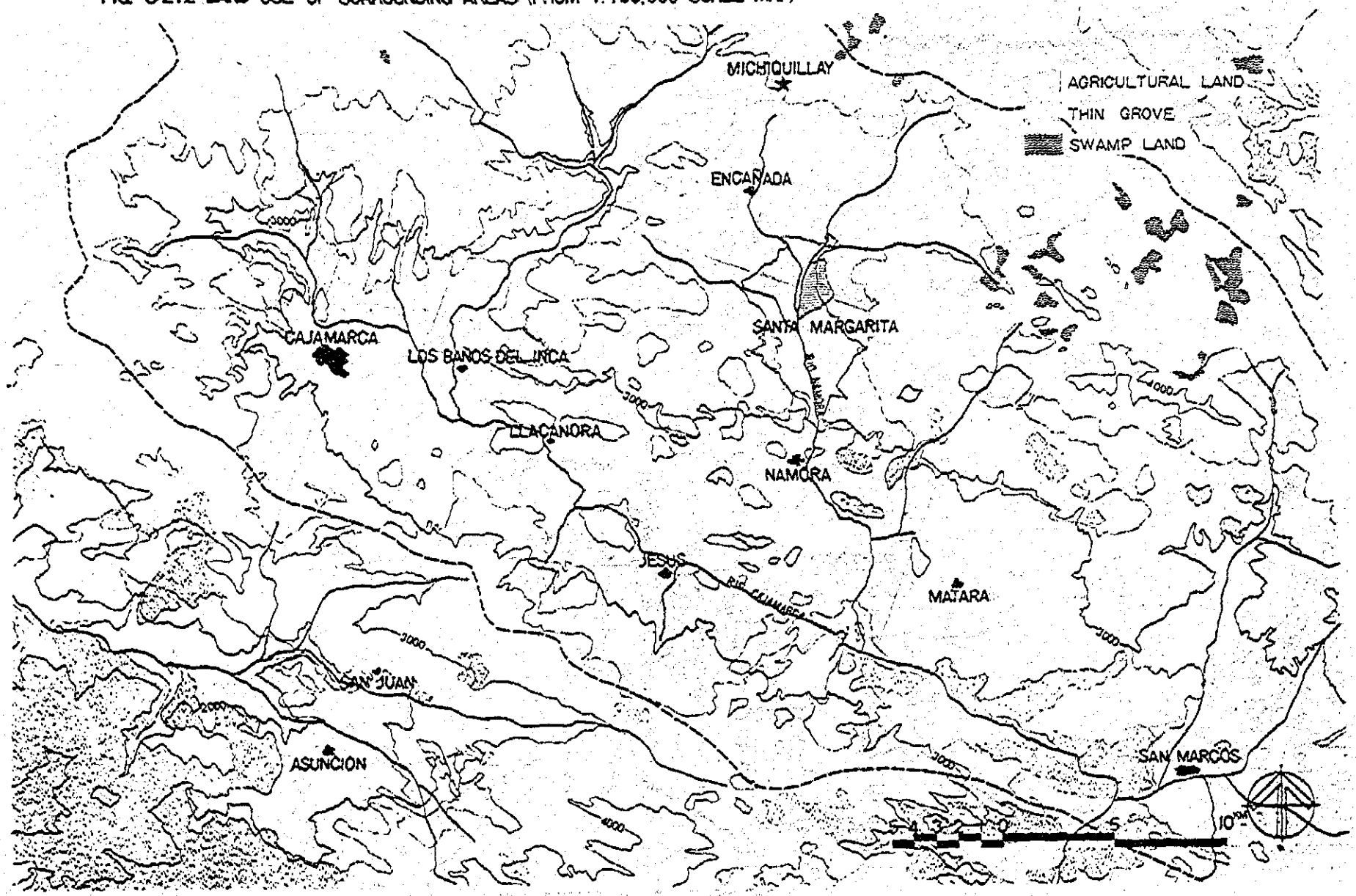
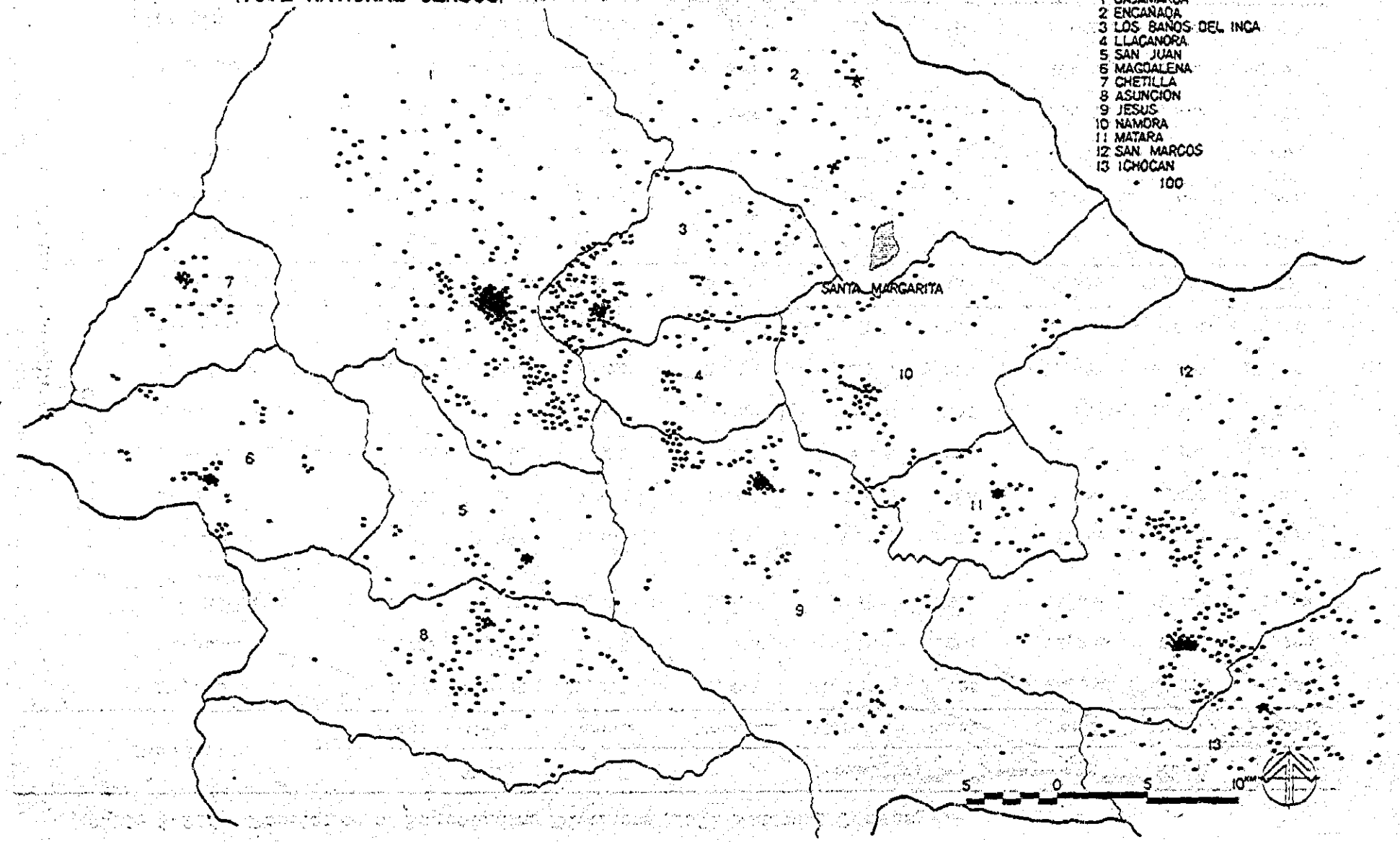


Table 3-212 Population of Surrounding Districts (1972 National Census)

		District	Total			Urban			Rural		
			Total	Male	Female	Total	Male	Female	Total	Male	Female
CAJAMARCA PROVINCE	Cajamarca Basin	Cajamarca	62,513	30,536	31,977	38,477	18,752	19,725	24,036	11,784	12,252
		Encanada	15,738	7,740	7,998	399	198	201	15,339	7,542	7,790
		Los Baños Del Inca	17,516	8,832	8,684	1,190	589	601	16,326	8,243	8,083
		Llacanora	3,271	1,562	1,709	131	61	70	3,140	1,501	1,639
		Jesus	11,179	5,206	5,973	1,619	754	865	9,560	4,452	5,108
		Namora	7,605	3,590	4,015	680	309	371	6,925	3,281	3,644
		Matara	3,956	1,865	2,091	652	317	335	3,304	1,548	1,756
		San Marcos	28,060	13,640	14,420	2,135	1,060	1,075	25,925	12,580	13,345
		Ichocan	12,393	5,927	6,466	563	267	296	11,830	5,660	6,170
		Total Basin	162,231	78,898	83,333	45,846	22,307	23,539	116,385	56,591	59,794
		San Pablo	19,242	4,315	9,927	1,929	956	973	17,313	8,359	8,954
		Chetilla	2,952	1,352	1,600	261	106	155	2,691	1,246	1,445
		Magdalena	5,051	2,545	2,506	865	441	424	4,186	2,104	2,082
		San Juan	3,491	1,666	1,825	579	277	302	2,912	1,389	1,523
		Asuncion	9,301	4,069	4,232	690	347	343	7,611	3,722	3,889
		Cospan	6,476	3,207	3,269	481	227	254	5,995	2,980	3,015
		Total Province	207,744	101,052	106,692	50,651	24,661	25,990	157,093	76,391	80,702

FIG. 3-213 DISTRIBUTION OF POPULATION IN SURROUNDING AREAS
(1972 NATIONAL CENSUS)



(3) Transportation

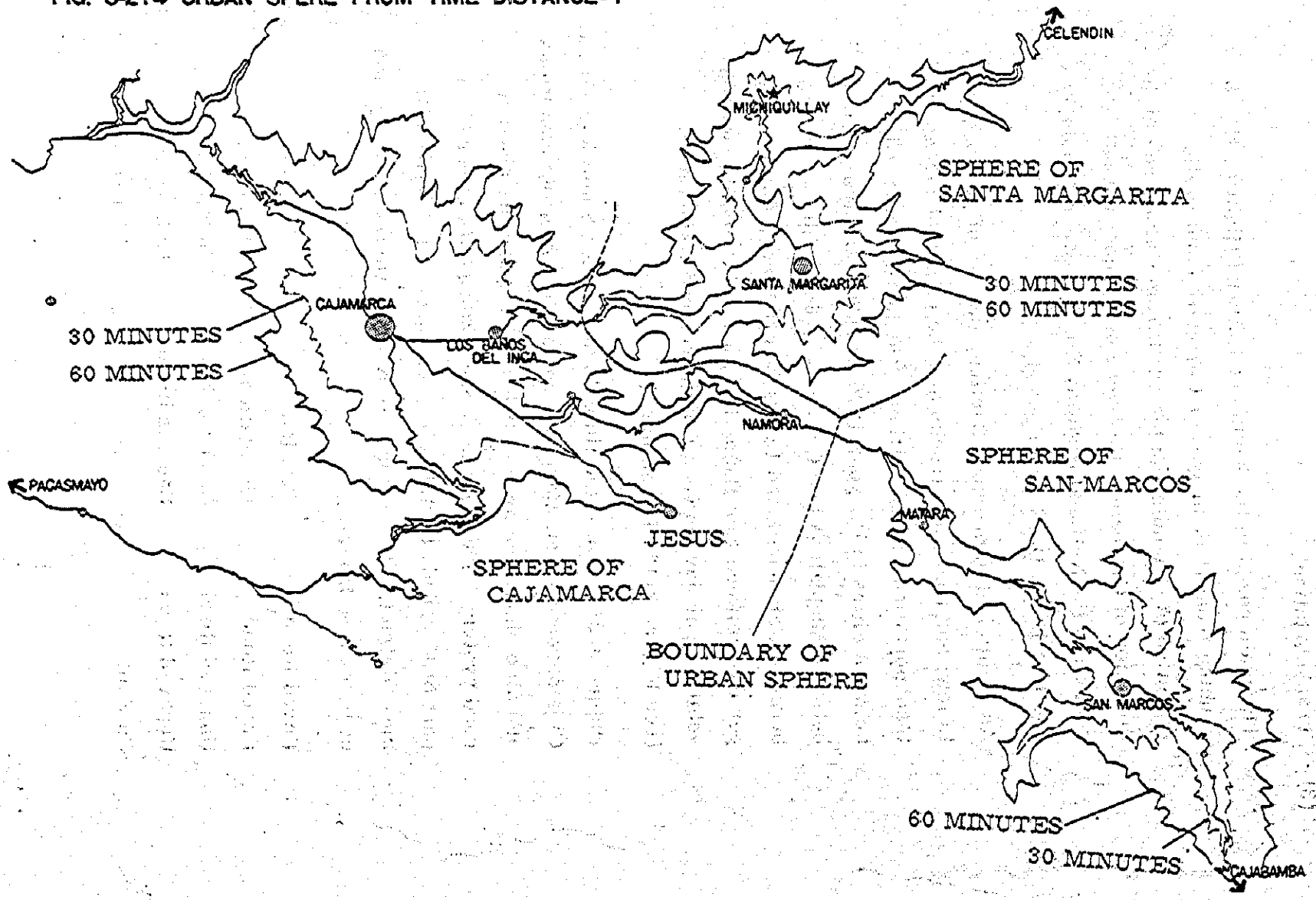
The main roads in the basin are National Highway No. 8 running from Pacasmayo to Cajamarca and in the direction of Celendin and the road from Cajamarca in the direction of Cajabamba through San Marcos; but only the section of the National Highway No. 8 between Cajamarca and Los Baños Del Inca is paved.

As mentioned in previous Section, the use of passenger car is low; and buses and trucks are the principal means of transportation between cities. The density of traffic between cities in the year 1970 was 357 vehicles per day between Magdalena and Cajamarca, 680 vehicles per day between Cajamarca and Los Baños Del Inca, 65 vehicles per day between Los Baños Del Inca and Celendin and 165 vehicles per day between Cajamarca and Cajabamba. (see Figure 3-124 in Section 1)

Figure 3-214 shows the time distance from Santa Margarita, Cajamarca and San Marcos based on the following conditions and also shows the area of urban sphere for the present road system. The sphere of Santa Margarita covers larger part of Encañada District, eastern part of Los Baños Del Inca District, northern part of Namora District and portion of Llacanora District.

Paved Road	Flat land	60 km/hr.
Paved Road	Mountain area	50 km/hr.
Unpaved Road	Good condition	30 km/hr.
Unpaved Road	Bad condition	15 km/hr.
On Foot		4 km/hr.

FIG. 3-214 URBAN SPERE FROM TIME DISTANCE-1



(4) Facilities

Tables 3-213 and 3-214 and Figure 3-215 show the various facilities existing in Cajamarca Basin. From these informations, it can be seen that establishment of service facilities for this region is lagging; and moreover, the one side distribution of these facilities in Cajamarca City at northwest edge of the basin is conspicuous. Also, the content and scale of the facilities are very limited with the exception of facilities in Cajamarca City; and outside of Cajamarca City there are no cultural or medical facilities to speak of. As to basic urban facilities, so far a sort of development can be observed in the cities; but from the national standard it is still very low. Lag is most conpicuous, especially, in road and communication facilities. Study related to each facility is added below:

Commercial facilities:

There is only one banking service in San Marcos while Cajamarca City has 9 banks and concentration of almost all of cooperative associations. One market place is found in Cajamarca, Los Baños Del Inca and San Marcos and 70 % of the general stores are concentrated in Cajamarca.

Educational facilities:

At present, improvement of educational system is progressing; but primary school in each district is well developed and secondary technical school and technical high school are found in Cajamarca. University of Cajamarca as only university in Cajamarca Region assumes the role of raising the cultural level of the Region.

Social and cultural facilities:

The church reflects the high religious activity in Republic of Peru and church can be found in each district. The church in Cajamarca was built in 17th century and is a source of tourist attraction. There are three libraries and museums in Cajamarca, one each in Los Baños Del Inca and San Marcos, four motion picture theaters in Cajamarca and one in San Marcos.

Medical facilities:

In Cajamarca there is a 145 bed general hospital and a clinic with one bed each in San Marcos and Ichocan. Other areas receive medical treatment by travelling doctors. The level of medical standard is low in Cajamarca Region and the number of beds per 10,000 persons for the 7th Medical Area - Cajamarca is 4.8 and the figure for Cajamarca Basin alone is 9.2 which is very far from the national average of 23.2.

Roads:

In Cajamarca City almost all roads are paved; but in other districts the percentage of paved roads is exceedingly low. Only the section of the National Highway No. 8 between Cajamarca and Los Baños Del Inca is paved.

TABLE 3-213 PRESENT CONDITION OF FACILITIES IN CAJAMARCA BASIN - 1

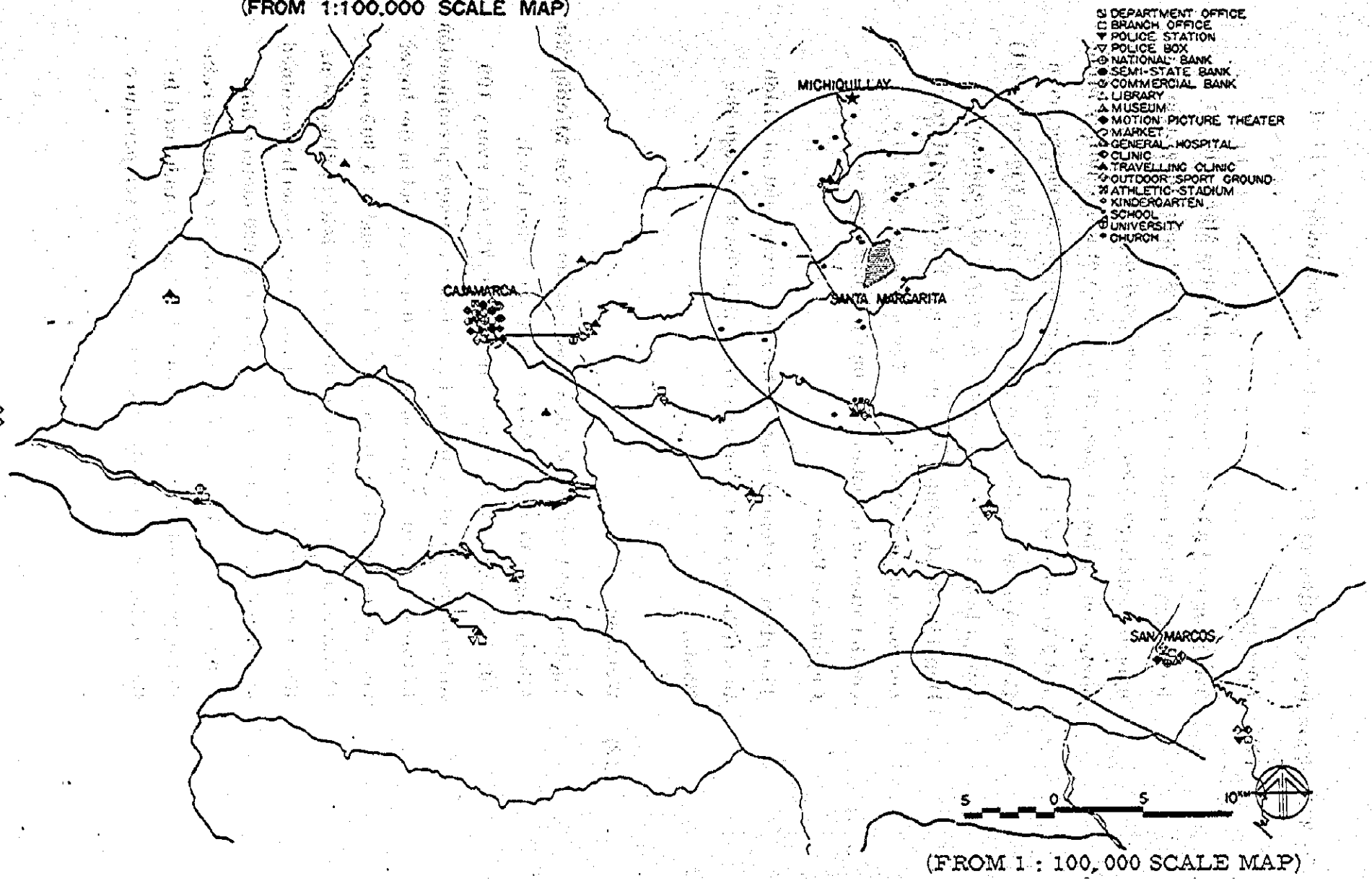
			CAJAMARCA REGION															
			Cajamarca Basin															
			Cajamarca	Encañada	Los Baños Del Inca	Llacanora	Jesus	Namora	Matara	San Marcos	Ichocan	San Pablo	Chechilla	Magdalena	San Juan	Asuncion	Cospan
Administrative	Central Departmental Provincial Administration		Department Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office	Branch Office
	District Administration		Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office	Public Office
	Courthouse				1	1	3	1	2	3	3			1			
Security	Police Station		Police Station	Police Box	Police Box		Police Box	Police Box	Police Box	Police Box	Police Station		Police Box	Police Box		Police Box	Police Box
	Prison		1														
Educational	Kindergarten	Urban	10		1		1	1	1	1	1	1	1	1			
		Rural	1				1			1							
	Grammar School	Urban	24	2	2	1	2	2	2	2	2	3	1	1	1	2	1
		Rural	23	29	7	4	21	14	5	40	20	24	6	8	10	11	18
	Junior High School		8				1		1	1	1						
	Occupation Jr. H. School		5														
	Jr. High School(Boy Night)		2														
	Technical High School		2														
Health Insurance	Hospital (No. of Bed)		145														
	Clinic (No. of Bed)									1	1	1					
	Health Office			1	1	1	1	1	1				1	1	1	1	1
Cultural Recreational	Library Museum		3		1					1							
	Historic Ruins		8		4	1											
	Athletic Stadium		1														
	Outdoor Sport Ground		2			1		1	1	1	1						
	Motion Picture Theater		4							1							
	Coloseum		1								1						
Religious	Catholic Church		6		1	1	1	1	1	1	2		1	1	1	2	1
	Other Churce				1	1	2	1			2			1		1	
Savings Trust	Agr. Co-op. Assoc.		2		1		1			1							
	Savings Trust Co-op. Assoc.		3														
	Housing Co-op. Assoc.		1														
	National Bank		1							1		1		1			
	Commercial Bank		8														
	Market		1		1					1							
	Slaughter House		1														
	Monday Market																
	Store		555	19	40	7	41	35	35		15		2	30	11	20	3
	Book Store							1									
	Hardware Store																
	Gasoline Station		Exists														
	Express Office		10				1		1	1							
	Electric Communication Bureau		1			1	1	1	1	1							
	Hotel		9		1									1	1	1	
	Cemetary		1													1	

TABLE 3-214 PRESENT CONDITION OF FACILITIES IN CAJAMARCA BASIN - 2

(INFORMACION BASICA DE LAS AREAS NUCLEADAS DE LA REGION corrected in parts)

Basic Urban Facilities		Cajamarca Region														
		Cajamarca Basin														
		Cajamarca	Encañada	Los Baños Del Inca	Llananora	Jesus	Namora	Matara	San Marcos	Ichocan	San Pablo	Chechilla	Magdalena	San Juan	Asuncion	Cospan
Population	Urban Population 1972(1,000)	38.5	0.4	1.2	0.1	1.6	0.7	0.7	2.1	0.6	1.9	0.3	0.9	0.6	0.7	0.5
Water Supply	Water Source	River	Spring Pond	Spring Pond	Spring Pond	Spring Pond	Spring Pond	Spring Pond	River	Spring Pond	River	Spring River Brook	Spring Pond		Spring Pond	Brook
	Treatment (Chlorine)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes		No		Yes		Yes	No
	Water Supply	Water Service Community Tap	Water Service	Water Service	Water Service	Water Service	Water Service	Water Service	Water Service	Water Service Community Tap	Water Service	Water Service	Water Service		Water Service	Community Water Tap
	Supplied Household	4,818.3				234	67	92	262		135		98		234	7
	Operator	State	Private	Private	State	State	Semi-state	State	Semi-state	Semi-state	Same-state		Jointly		State	Semi-state
	Unit of Measurement			m^3						m^3						
	Price Unit			2.5						1.0						
	Price Rate	50	10	10	10	10	12	10	10	15	15		10		10	
Drainage	Discharge Point	River	River	River					River	Ditch	Ditch					Open Field
	Treatment	No	No	No					No		No					No
	Drainage	Sewer System		Sewer System					Sewer System	Sewer System	Sewer System					Ditch
	No. of Household with Drain.	3,428		220						10						
	Operator	State		Private					Semi-state	Semi-state	Semi-state					Semi-state
Electricity	Power Generator	Motor		Hydro				Motor	Hydro	Hydro	Hydro		Motor			
	Electric Potential (Kw) Existing							54	75		70		85			
	Electric Potential (Kw) Spare							35	35	(San Marcos)	70					
	Operator	State		Semi-state				Semi-state	Semi-state	State	Semi-state		Semi-state			
	Unit of Measurement	Kw		Kw					W	W			W			
	Price Unit	1.4		1.1					0.2	0.2			0.4			
	Price Rate			15				10	10	11	18					
Bubbish Disposal	Collection	Truck		Truck					Truck							
	Number of Collection	Daily		Daily					Twice weekly							
	Place of Disposal	Open Field		River	River				River		Open Field				Open Field	Open Field
	Operator	State		Semi-state					Semi-state							
Pavement	Concrete (%)	70	20		20						30				25	5
	Asphalt (%)			5												
	Rock (%)		30	5	40						60				50	
	Dirt (%)	30	50	90	40	100	100	100	100		10	30	100		25	95
Communication	Short Distance Communication	Yes	Yes	Yes									Yes		Yes	
	Far Distance Communication	Yes	Yes	Yes				Yes					Yes			
	Telegraph	Yes	Yes	Yes		Yes	Yes		Yes		Yes		Yes			
	Radio	Yes														
	Mail	Yes		Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes

FIG. 3-215 DISTRIBUTION OF FACILITIES IN CAJAMARCA BASIN
(FROM 1:100,000 SCALE MAP)



(FROM 1 : 100,000 SCALE MAP)

2-2. Existing Condition of Proposed Site for Mine Town

(1) Location

The proposed site for mine town in Santa Margarita is located at 7°10' south latitude and 78°20' west longitude and approximately 22.5 km east-northeast of Cajamarca, 29 km northwest of San Marcos, 10 km south of Michiquillay Mine and 3 km east of the National Highway No. 8 running from Cajamarca in the direction of Celendin. (see Figure 3-221) This site is in the administrative sphere of Cajamarca Department, Cajamarca Province and Encañada District surrounded by pasture land. The northeast side is a continuation of mountain belt on the outer edge of Cajamarca Basin.

The river system belongs to Namora River system which is a tributary of Cajamarca River that flows through the Basin.

(2) Weather

Tables 3-221 and 3-222 show the weather data for Michiquillay Mining Camp located 3,450 meters above sea level.
The increase in temperature is 0.6 - 0.7°C for every 100 meters drop in elevation and the annual average precipitation in Portrello with elevation of 3,010 meters and in the lower reaches of Encañada River is 829.5 mm and at 3,905 meters elevation at the summit of Brillantana in Michiquillay Mine the average is 1,215.4 mm. From this, it can be assumed that Santa Margarita with elevation of 3,000 meters the temperature will be approximately 3°C higher and the rainfall approximately 20 % less than the figures indicated in the Table. Accordingly, the annual average temperature

is 11°C with small variation in temperature throughout the year and the maximum and minimum daily temperature is 14.5°C and 7.3°C. The annual precipitation is 800 - 850 mm and the year is clearly divided into rainy (October ~ April) and dry (May ~ September) seasons and 80 - 90 % of the annual precipitation comes in the rainy season. Most of the wind are easterly from the mountain and for 1974 the average wind velocity was 1.0 meter per second. However, as can be observed generally in Alpine Region, the weather of this area shows considerable complexity locally. As to disaster, occurrence of disaster has not been recorded since 1957.

FIG. 3-221 GENERAL LAYOUT OF MICHIQUILLAY MINE FACILITIES

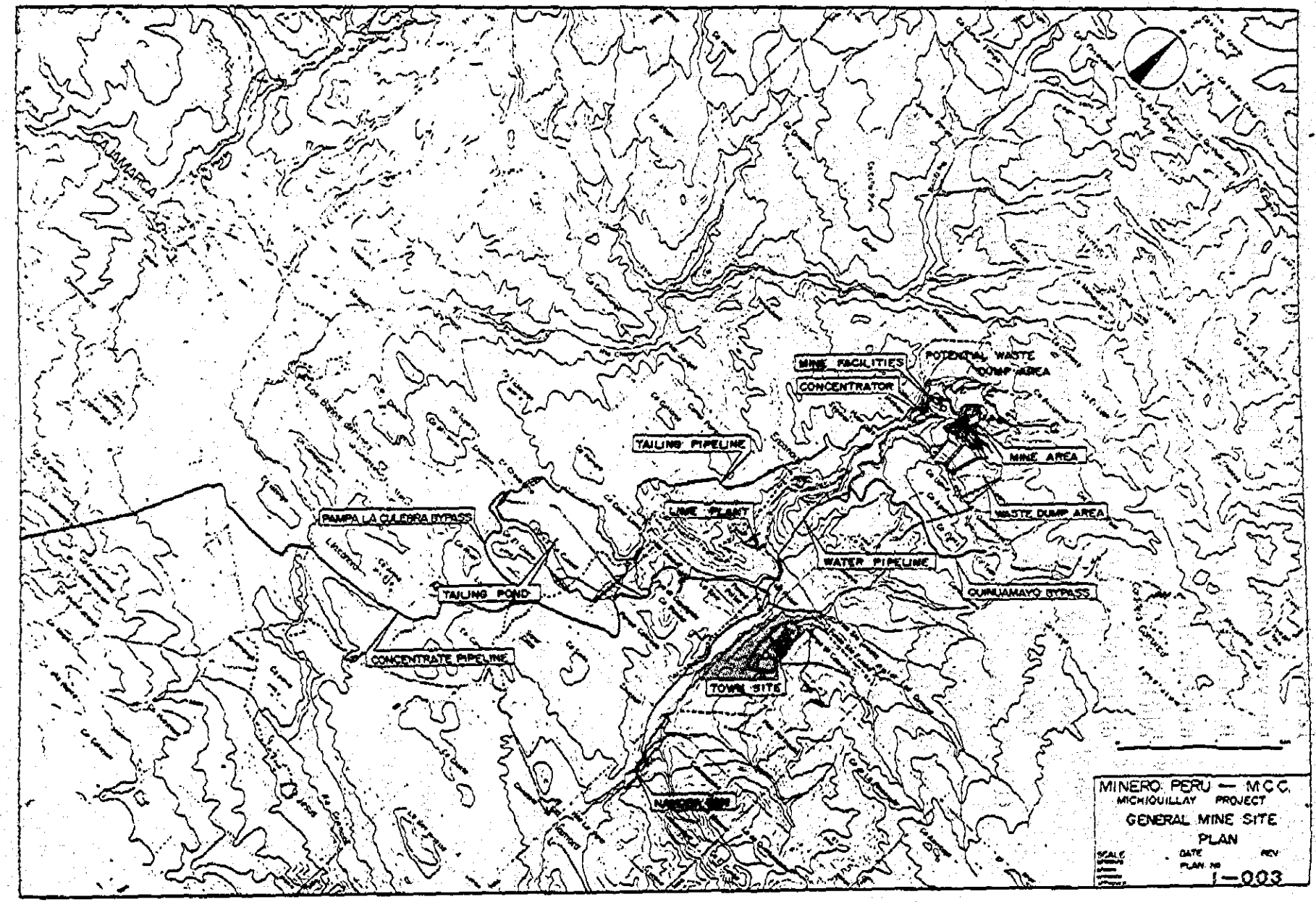


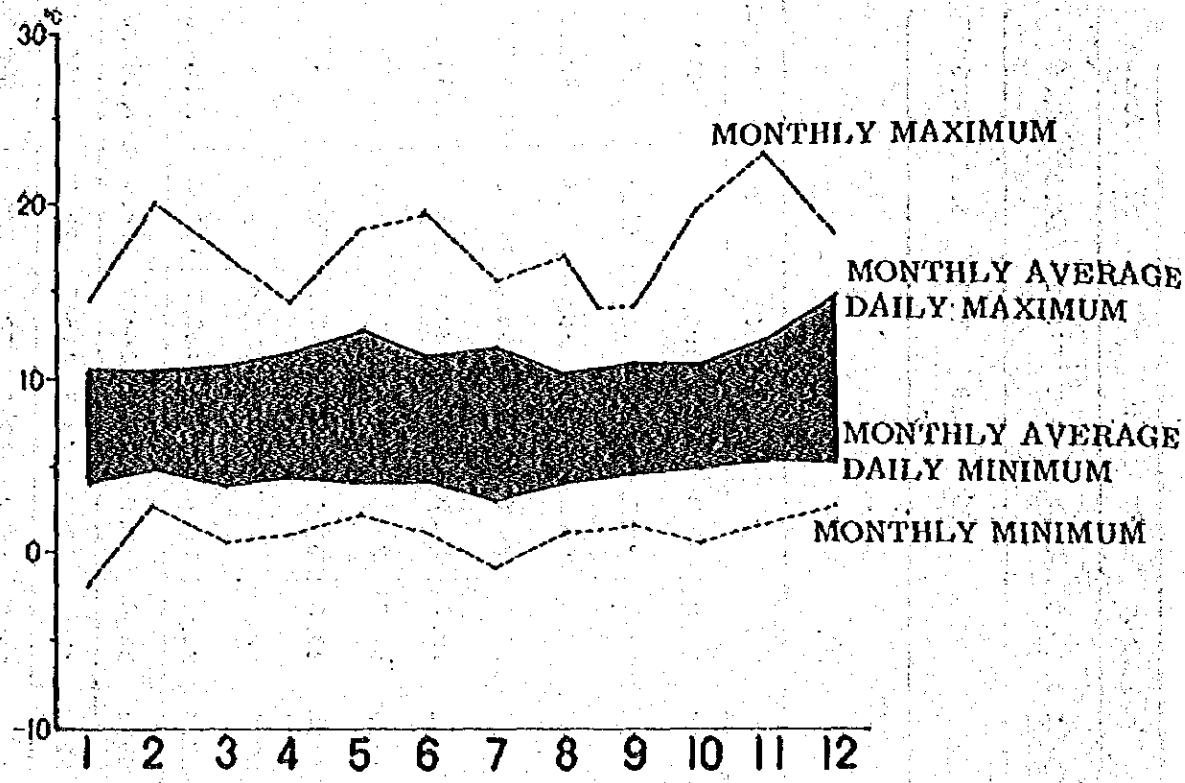
Table 3-221 Temperature at Michiquillay Mine Camp (1974)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Average Daily Maximum (°C)	10.5	10.4	10.8	11.5	12.7	11.3	11.7	10.3	10.8	10.9	12.2	14.5	11.5
Average Daily Minimum (°C)	3.9	4.8	3.8	4.3	3.9	4.0	2.9	4.0	4.5	4.9	5.2	5.1	4.3

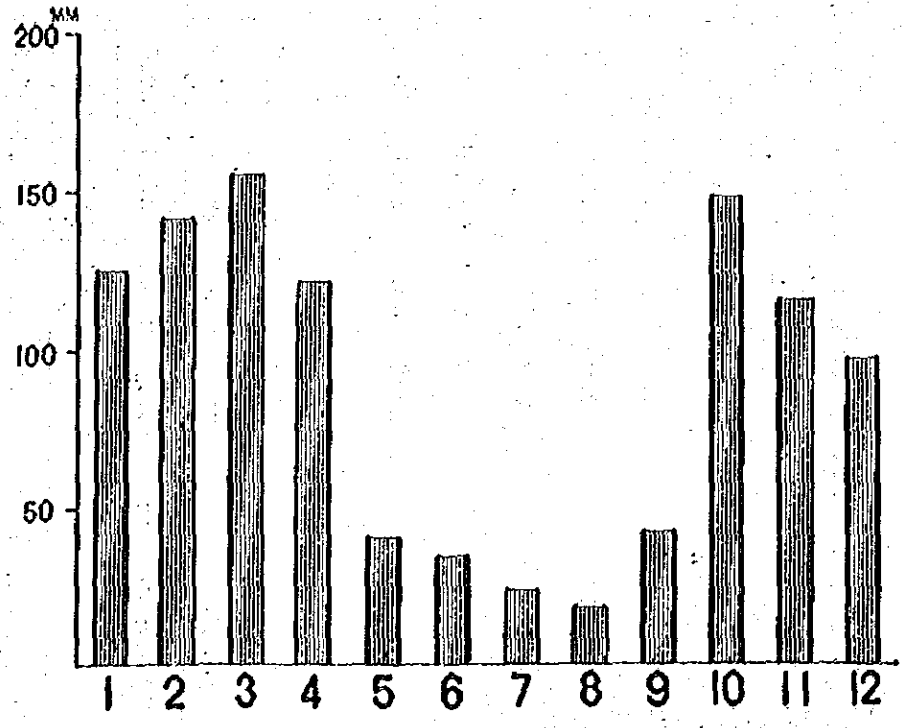
Table 3-222 Rainfall at Michiquillay Mine Camp (1966-1974)

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12	Annual
1966	87.6	102.1	104.6	111.0	46.5	31.8	7.4	13.2	32.0	169.9	103.9	42.4	852.4
1967	163.3	193.8	144.8	135.1	18.0	11.4	39.6	12.7	32.3	155.7	72.6	82.6	1,061.9
1968	90.9	147.6	145.5	32.3	39.9	8.1	11.9	19.3	69.9	176.0	80.3	73.9	895.6
1969	92.2	134.4	111.8	192.3	7.4	60.2	4.3	15.7	34.8	129.0	160.0	115.8	1,057.9
1970	128.5	81.5	87.1	120.1	62.5	40.1	12.2	19.3	35.8	165.9	188.7	138.4	1,080.1
1971	110.2	103.4	285.8	146.0	56.4	40.1	19.8	13.2	26.9	115.6	94.2	96.0	1,107.6
1972	111.5	-	213.6	96.5	69.3	11.9	15.5	20.8	51.1	-	117.3	100.3	-
1973	167.4	87.6	110.0	220.7	41.4	49.0	69.6	-	-	165.9	114.6	-	-
1974	176.0	275.1	202.7	48.8	12.7	51.6	23.4	22.6	39.4	112.5	108.2	131.8	1,204.8
Maximum (mm)	176.0	275.1	285.8	220.7	69.3	60.2	69.6	22.6	69.9	176.0	188.7	138.4	1,752.3
Average (mm)	125.3	140.7	156.2	122.5	39.3	33.8	22.6	17.1	40.3	148.8	115.5	97.7	1,059.8
Minimum (mm)	87.6	81.5	87.1	32.3	7.4	11.4	4.3	12.7	26.9	112.5	72.6	42.4	578.7

FIG. 3-222 WEATHER AT MICHIQUILLAY CAMP



TEMPERATURE



RAINFALL

(3) Topography

The proposed site for mine town in Santa Margarita is a hilly region on the east bank of Polloc River which is a upper stream of Namora River and as mentioned in previous section, this site is presently owned by Minero Peru. The site is a quadrilateral with maximum north-south length of 2,900 meters and maximum east-west length of 1,800 meters with Polloc River on the west side, Quispa River on the northwest, road on the east and Alzos marsh on the south side as borders. The maximum elevation above sea level is 3,035 meters and the minimum is 2,900 meters with an elevation differance of 135 meters. Excepting Alzos marsh and the two eroded ravines in the marsh area at south of the site running parallel to Alzos marsh, the over-all site has a flat sloping surface in one direction; but near the elevation of 2,985 meters the site is cleary divided into gently sloped portion on the road side and sharply sloped portion on the Polloc River side as boundary.

The gentle slope has a grade of 5 - 6 % while the steep slope is about 15 % but in parts the grade is about 30 %. Also, in the sharply sloped portion there are three irrigation canals running parallel to Polloc River.

FIG. 3-223 AERIAL PHOTOGRAPH OF SANTA MARGARITA AREA

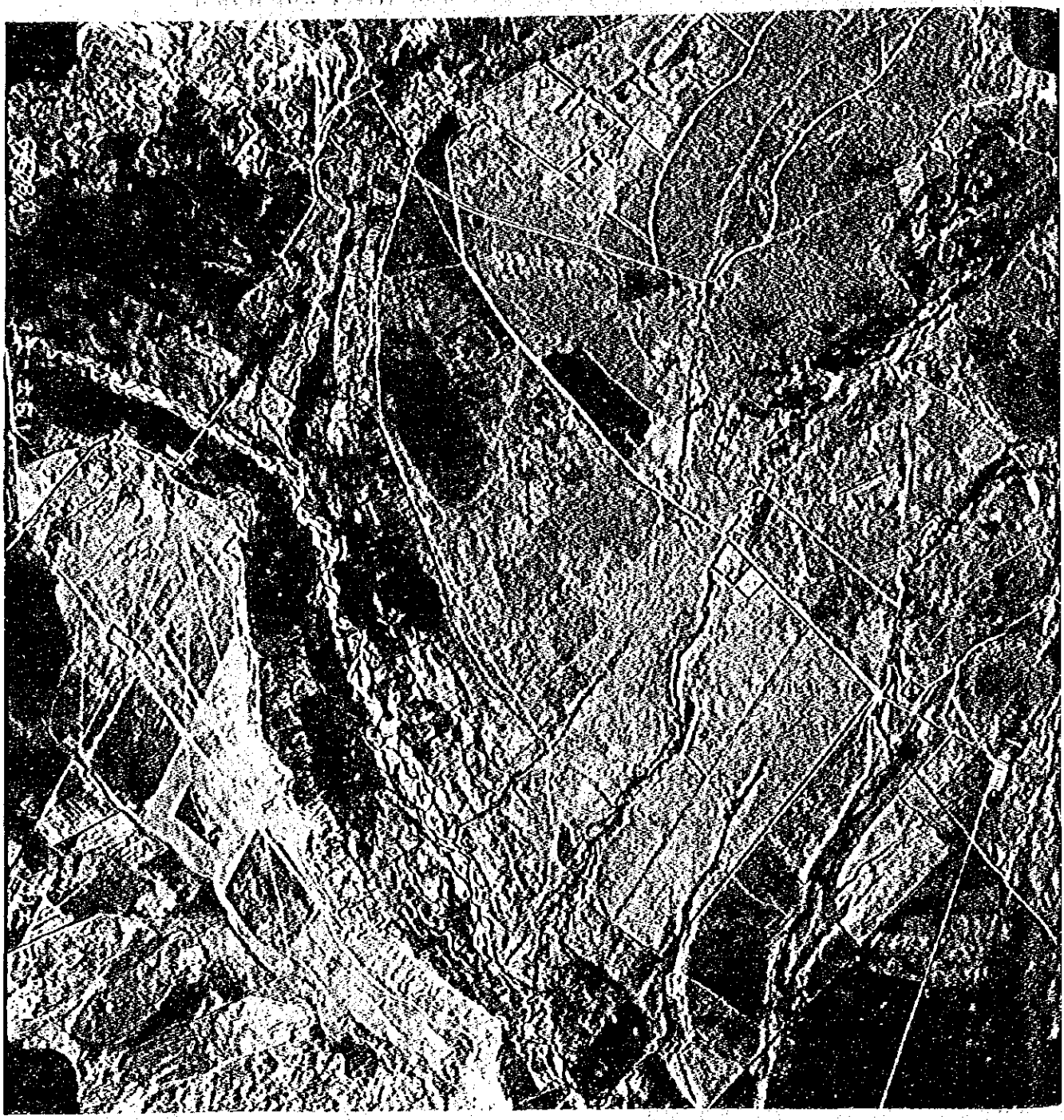
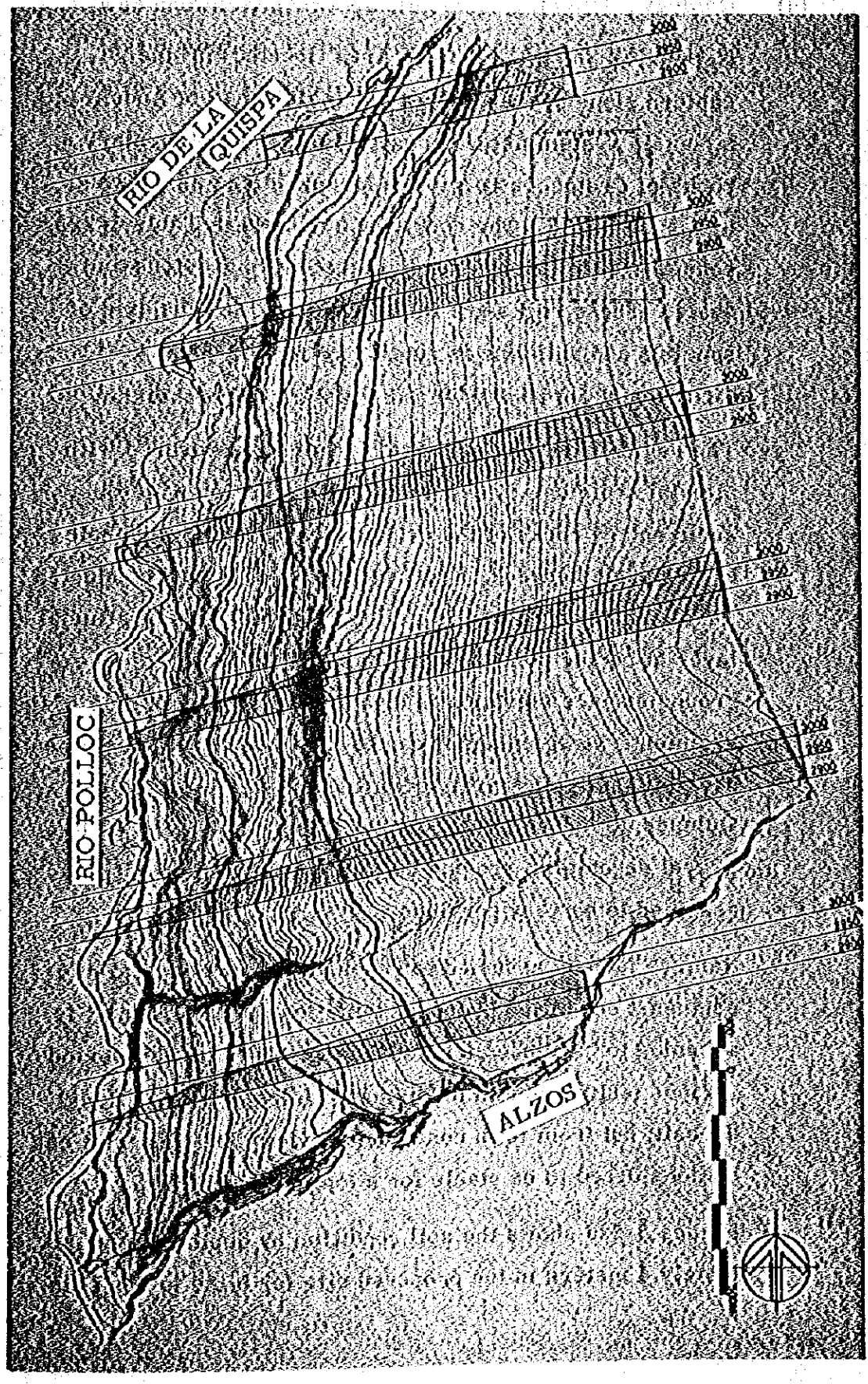


FIG. 3-224 TOPOGRAPHICAL PLAN AND SECTION SANTA MARGARITA AREA



(4) Geology

Cajamarca and Michiquillay Area located in the eastern slope of the western mountain range of Andes mountain system are composed of marine sedimentary rocks of Cretaceous period in Mesozoic era as shown in Figure 3-225. The rock type,as shown in Table 3-223, consists of limestone, sandy limestone, sandstone and shale. These rocks are in folded layers and the axis of syncline and anticline is roughly between east to west direction and west-northwest to east-southeast direction.

The region surrounding Santa Margarita is covered with alluvial sedimentary deposit of the 4th period with the sedimentary rocks of the cretaceous period in Mesozoic era as basic bedrock. From the result of boring conducted for test water well in this region, the thickness of alluvial layer at boring point was around 90 - 120 meters. The ground surface elevation is high at east and north side of the sedimentary region and it can be assumed that the sediments consist mainly of gravel sediments originating from old Quinuas River and old Quispa River. Therefore, like gravel deposits in erosion control dam, this deposit is assumed to be very pervious.

Namora fault is assumed to run north-northeast near the southeast end of the proposed mine town; but this fault is assumed to have been formed during the formation period of various faults prior to formation of Michiquillay mineral deposit; but from town construction viewpoint this fault can be considered to be stable for a long period.

Figure 3-226 shows the soil condition by depth of approxi-, mately 4 meters in the proposed site for mine town. This

was shown by drawings after correcting the results of test boring conducted by Minero Peru with records of site soil and photographs.

The boring specimen from the site is shown in Figure 3-227 and the area north of the site consists, in the order from ground surface, layer of mixture of humus soil and cobble stone with scattered limestone and shale of mainly 10 - 20 cm diameter, layer of mixture of cobble stone and angular gravel and layer of cobble stone with mixture of clay. The central area of the site consist of humes volcanic ash soil, layer of volcanic ash, clayey gravel layer and cobble stone layer with mixture of clay. Also the southern area of the site consists of layer of gravel mixed cobble stone, layer of clay mixed gravel and layer of clay mixed cobble stone, while in the area at southwest edge of the site adjacent to Pollac River existence of clayey layer is recorded at lower depths.

From the very few recorded photographs of out crops and test holes, the long term allowable soil bearing capacity shown in Figure 3-227 was assumed. Accordingly, if the layer with plant roots and vegetations are removed from the ground surface, the ground will be able to support a medium scale structure. Furthermore, in case a large scale structure extending over the confine of soils shown in Figure 3-226 is planned, load test should be conducted to confirm the amount of settlement.

FIG. 3-225 GEOLOGY OF SANTA MARGARITA AREA

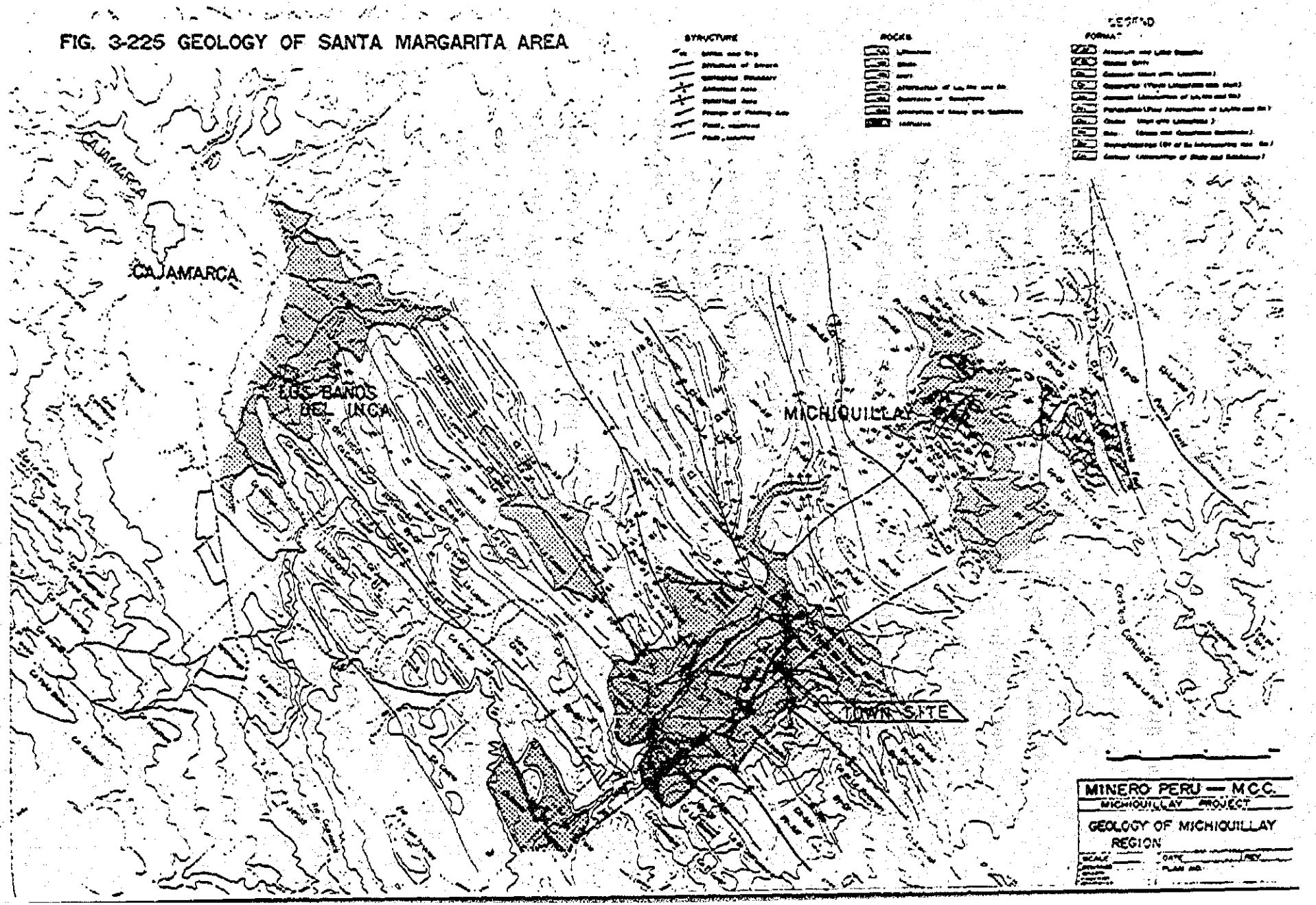


FIG. 3-226 CONDITION OF LAND IN SANTA MARGARITA AREA

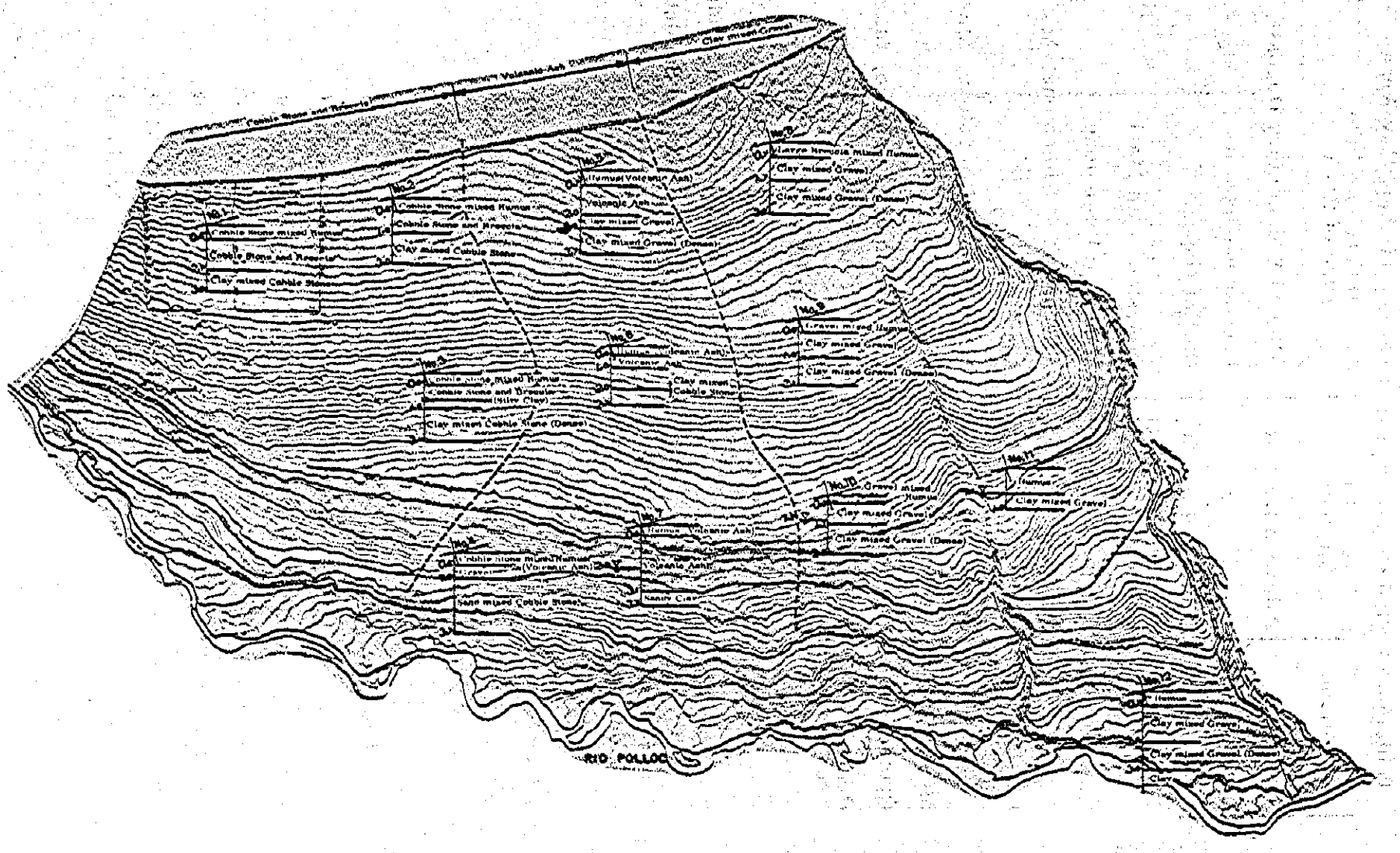
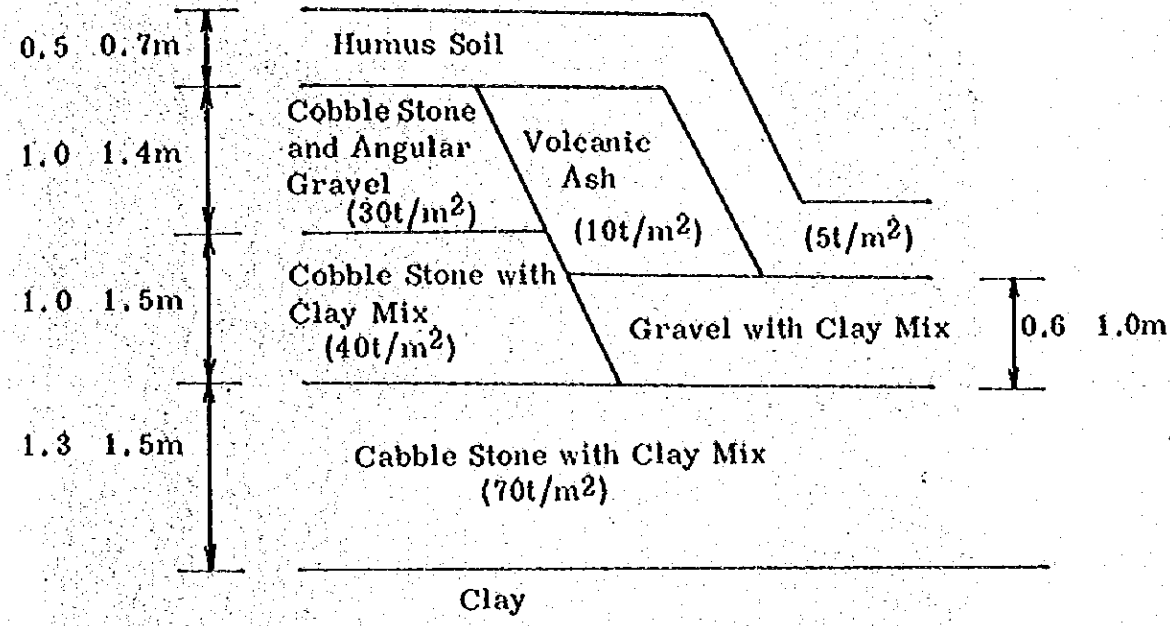


Table 3-223 Soil Condition of Cajamarca - Michiquillay Area

Period	Stratum	Type of Rock
Cenozoic Era	Alluvium Deposit	Alluvial Sedimentary Deposit,
		Lacustrine Deposit
	Diluvium Deposit	Glacial Deposit
Mesozoic Era Cretaceous Period	Celendin	Limestone with Marl
	Cajamarca	Marl with Limestone
	Jumasha	Alternation of Limestone, Marl, Shale
	Pariatambo	Lamination of Limeutone, Marl, Shale
	Chulec	Lamination of Limestone, Marl, Shale
	Inca	Shale to Limy Sandstone
	Goyllarisquizga	Lamination of Thin Bed of Shale with Silicate Sandstone to Sandstone
	Carhuaz	Lamination of Shale and Sandstone

FIG. 3-227 BORING LOG AND ASSUMED LONG TERM ALLOWABLE SOIL BEARING CAPACITY FOR SANTA MARGARITA



(5) Vegetation

Since surrounding area of Santa Margarita is an alpine pasture land, the vegetations in the proposed site for the mine town do not show striking difference from vegetations in surrounding areas. As shown in Figure 3-228, the gently sloped land on east side of the site formerly used as pasture land is a grassy plain except for a portion planted with Eucalyptus and Orchid; and sharply sloped land on west side leading to Pollac River and Quispa River is covered with vegetations consisting mainly of low to medium height trees that are found in swamp lands. In the planning of mine town program, it was assumed that there will be no point requiring special attention except for the abovementioned grove of Eucalyptus.

FIG. 3-228 VEGETATION IN SANTA MARGARITA AREA

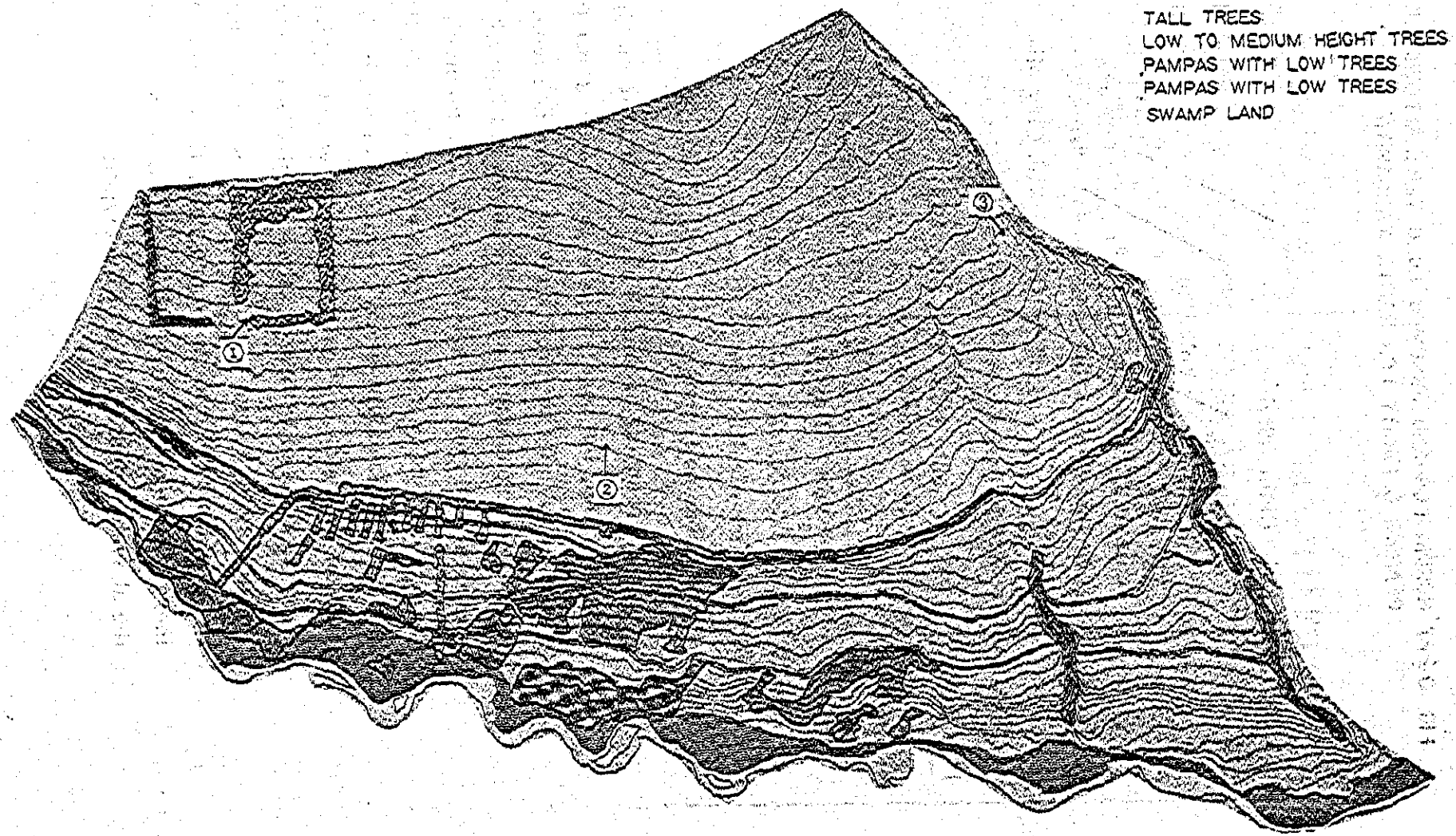
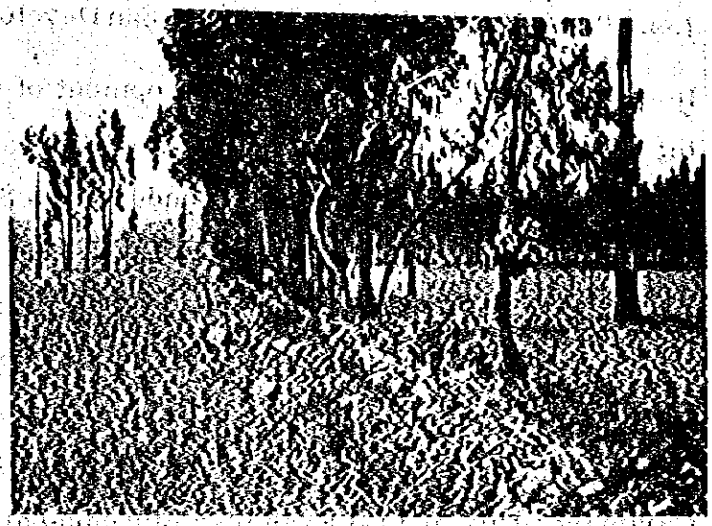
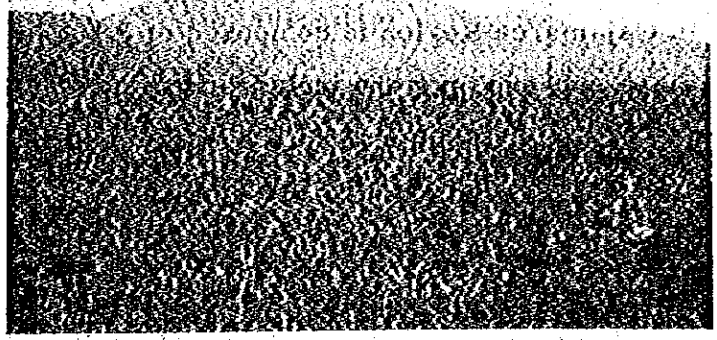


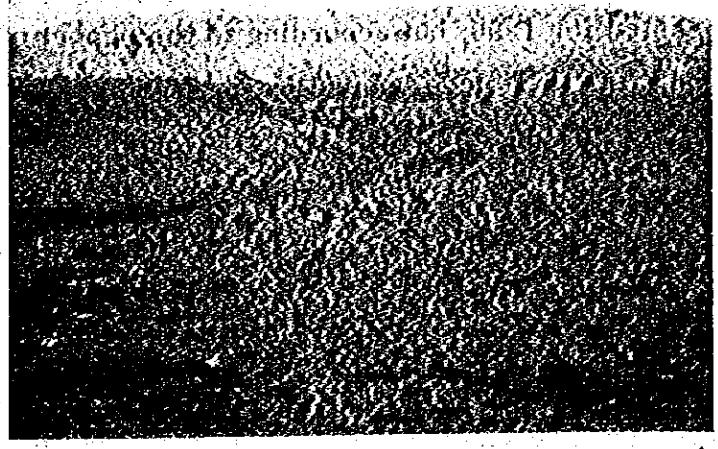
FIG. 3-229 PHOTOGRAPH OF VEGETATION IN SANTA MARGARITA
(LOCATION SHOW IN FIG. 3-228)



1



2



3

2-3 Classification and Basic Concept of Mine Town

(1) Long Range National Program for Urban Development - 1990

In establishing a program for development of mine town, the basic concept indicated for the development of mine town is based on items of study conducted in Section 1 and up to Clause 2 of Section 2 with (1) Long Range National Program for Urban Development - 1990, (2) Report on mine town development by the Ministry of Housing and Construction together with the opinion of Michiquillay Committee, (3) Present condition and future program of Cajamarca City and (4) Examples of Toquepala and Cuajone taken into consideration.

According to the Normal National Urban System in the Long Range National Program for Urban Development - 1990 by the Ministry of Housing and Construction, the urban group in Cajamarca Region is composed of 3 sub-systems; and these sub-systems are included in the Cajamarca Urban System with Cajamarca as the core. In this system, Santa Margarita is indicated as Michiquillay and as a town for mine industry, Michiquillay is classified as 5th rank and central town in the sector. In this Cajamarca Sub-system, Michiquillay together with Celendin follows Cajamarca's rating of 3rd rank. The population of 85,000 for Cajamarca, 18,700 for Celendin, and 5,000 for Michiquillay are forecasted for 1990; but according to the report of August 1975 on mine town development by the Ministry of Housing and Construction, the population of Michiquillay is corrected to 42,000. However, in Cajamarca Sub-system, Michiquillay though having the characteristics of a mine town, is expected to function as a central town in the sector that is in a supporting position to Cajamarca.

FIG. 3-231 NORMAL URBAN SYSTEM

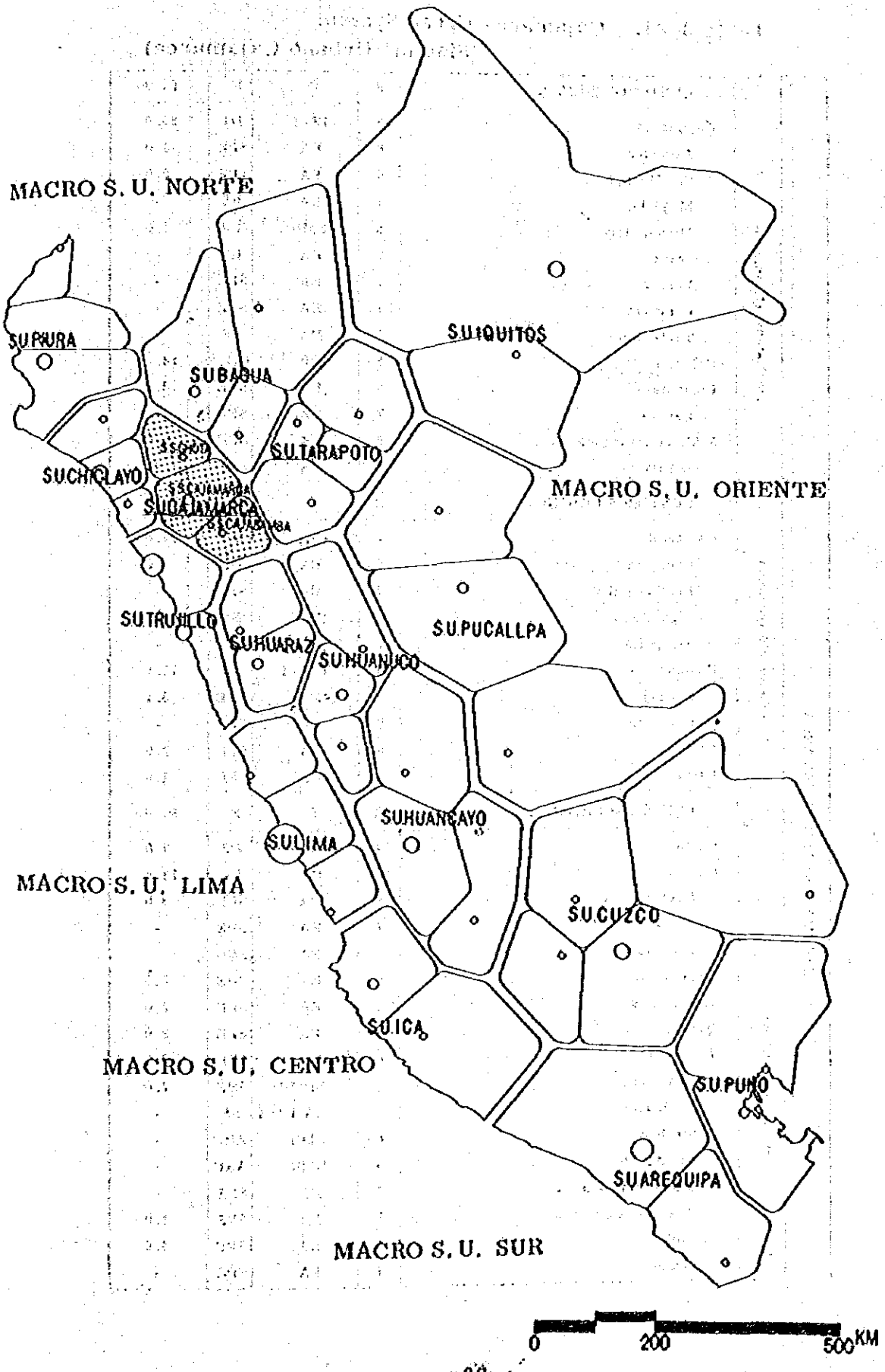


Table 3-231 Cajamarca Urban System
(Sistema Urbano Cajamarca)

SISTEMA URBANO CAJAMARCA		CENTOROS URBANOS	R	T	F	P. 90
	Sub Sistema Cajamarca	Cajamarca	3	IF-T	D1	85.0
		Asuncion	6	EA	SPE	2.0
		San Marcos	6	EA	SPE	5.0
		Magdelane	7	EA	RS	-
		Michiquillay	5	EMH	UA	5.0
		Jesus	7	EA	RS	-
		Porcon	7	EA	SPE	-
		Combayo	7	EA	SPE	-
		Tartarchico	7	EA	RS	-
		Celendin	5	DP	UC	18.7
		Contumaza	6	EA	SPE	3.0
		Cascas	7	EA	SPE	-
		S.M. de Pallaques	6	EA	SPE	8.0
		San Pablo	7	EA	SPE	-
		CENTOROS URBANOS	R	T	F	P.90
	Sub Sistema Cajabamba	Cajabamba	4	CIL	D2	17.0
		Cachachi	6	EA	ARC	2.0
		Lluchubamba	7	EA	SPE	-
		Algamarca	7	EMH	RS	-
		Sayapullo	7	EMH	RS	-
		Huamachuco	5	CIL-T	UC	16.5
		Chugay	6	EA	SPE	3.1
		Caracmaca	7	EA	SPE	-
		Bolivar	6	EA	SPE	2.0
		Pataz	6	EA	SPE	2.0
		CENTOROS URBANOS	R	T	F	P. 90
	Sub Sistema Chota	Chota	4	CIL	D2	8.0
		Cutervo	5	DP	UC	13.8
		Cochabamba	6	EA	SPE	3.0
		Socota	7	EA	SPE	-
		Sumidero	7	EA	SPE	-
		Tacabamba	6	EA	SPE	2.5
		Sto. Tomas	6	EA	SPE	2.0
		Querocotillo	6	EA	SPE	2.0
		Santa Cruz	6	EA	SPE	6.0
		Bambamarca	6	EPMH	SPE	7.0
		Hualgayoc	7	EA-EMH	RS	-
		Sinchao	8	EMH	ARC	-
		San Agustin	8	EMH	ARC	-
		S.J. de la Camaca	7	EA	SPE	-
		S.A. de la Camaca	6	EA	SPE	4.0
		Tallamac	6	EA	SPE	4.0
		Moran	7	EA	SPE	-

R = Rango Jerarquico

Unidades Espciales Para la Planificacion del Sistema Urbano	Centros Urbanos	
	Rol (Para Fines de la Planificacion Urbana)	Rango Jerarquico
Macro Sistemas Urbanos	Metropoli Nacional	1
	Centro Principal de Macro Sistema Urbano	2
Sistemas Urbanos	Centro Principal de Sistema Urbano	3
Sub Sistemas Urbanos	Centro Principal de Sub Sistema Urbano	4
Sectores Urbanos	Centro Urbano Principal de Sector	5
	Centro Urbano Secundario de Sector	
Areas Nucleadas Urbanas	Centro Principal de Area Nucleada Urbana	6
	Centro Secondario de Area Nucleada Urbana	
Centros Poblados Rurales		
Area Rurales	Centro Poblado de Servicios	7
	Centro Poblado Primario	8

T = Tipologia (Define la Naturaleza de la Estructura Economica del Centro Urbano o Rural)

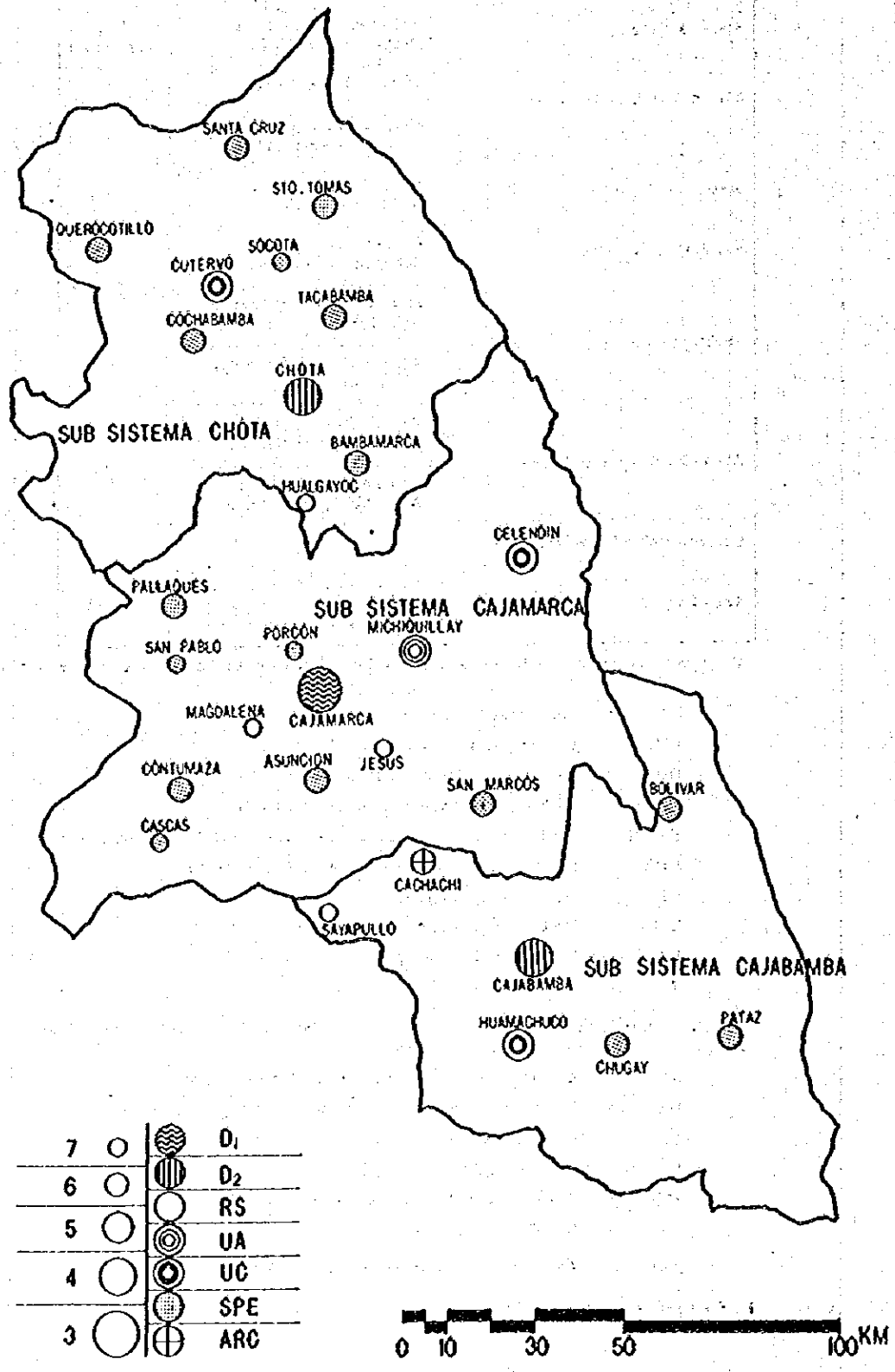
- IF = Industrial Financiero
- CIL = Comercial y de Industria Ligera
- DP = De Distribucion de la Produccion
- EPP = De Extraccion y Procesamiento Pesquero
- EPMH = De Extraccion y Procesamiento Minero O/Y de Hidorocarburos
- EPA = De Extraccion y Procesamiento Agropecuario
- EP = De Extraccion Pesquera
- EMH = De Extraccion Minera O/Y Midrocarburos
- EA = De Extraccion Agropecuaria
- T = Turisticos

F = Funcion (Define la Modalidad de Funcionamiento del Centro Dentro del Sistema Urbano Nacional Normativo)

- D1 = Dinamizador Principal (Centro Motriz del Sistema)
- D2 = Dimanizador Secundario (Centro Motriz de Sub Sistema)
- UC = Urbano Complementario
- UA = Urbano de Apoyo
- SPE = Sustento a la Produccion Extractiva
- RS = Rural de Servicios
- ARC = Asentamientos Rurales Concentrados

P. 90 = Poblacion Normativa a 1990

FIG. 3-232 CAJAMARCA URBAN SYSTEM



(2) Report on Mine Town Development by The Ministry of Housing and Construction

According to the report on mine town development by the Ministry of Housing and Construction, 6 points to be considered for development of mine town are indicated as (a) the type and period of basic economic activity, (b) the role and function of central development structure, (c) land ownership system and house acquisition system, (d) social and cultural characteristics of town, (e) space treatment for various physical conditions and (f) legal condition and furthermore several points related to administration of the region are pointed out and proposed.

As to point (a), by observing the regional movement of laborers during construction period, the housing program after the start of mine operation must be more complete. The problem of housing for workers other than mine workers moving into the mine town after start of mine operation must also be well planned. Construction program that will avoid waste as much as possible at time of mine abandonment must also be planned.

As to point (b), the role of the mine town is to become strictly a second town in Cajamarca; and proposal is made for various facilities in development of the mine town, as shown in Table 3-237.

As to point (c), Minero Peru shall secure land necessary for construction through offices and agencies concerned with land and building. As to lots for sale, the town government shall take over, allocate and administer the land with the technical and economic assistance of Minero Peru and the Ministry of Housing and Construction. Land for commercial

use and residential area for people other than mine workers is to be leased through the town office, while Minero Peru is to administer the dwellings.

As to point (e), planning of town layout including roads, streets, public squares, parks and residential areas shall be conducted with effects of earthquake and large families taken into consideration.

As to point (f), the Mining Laws, the Ministry of Housing and Construction Regulations and Water Standards shall be strictly followed.

Lastly, as overall recommendation several items are presented; but the principal recommendations related to development of the mine town are indicated below:

- All activities related to mine development are for the benefit of the region and the nation, so the activities are considered as social and economic development in accordance with the Mining Laws.
- In executing the program, inflexible investments should be avoided and the program systematized socially, economically and physically.
- The inequality of wage between mine workers and regional people can be offset by the possibility of employment opportunity in entire Cajamarca Region.
- Due to the co-operation of Minero Peru and the Ministry of Housing and Construction, the great influence of the new economic activity upon Cajamarca and Los Baños Del Inca is assured.
- Minero Peru, Ministry of Housing and Construction and Local Construction Bureau shall consolidate

the planning and construction of various facilities, housing, etc.

- o Minero Peru shall co-operate with Ministries concerned and mobilize economic activities and labor and establish wage standards, occupational ability, market capability, permanent residency while taking into consideration the life span of the mine.
- o Pay attention to analysis of the trend of mine town population.
- o Prior to start of construction, systematization of people for the mine town.
- o Apply, assess and correct the structure and function of population in accordance with the principle of development.
- o Regional activities shall be realized with the co-operation of the Ministry of Agriculture and the Ministry of Housing and Construction and promoted for the growth of villages, such as Namora District, receiving the effect of the development.

Table 3-232 Facilities for Mine Town

	Initial Stage and Mid Stage	Long Range
Educational Facility	Kindergarten	Adult school
	School CEB-II	
	School CEB-III	
Recreational Facility	Public park	
	Public square	
	Urban park	
	Sports park	

	Initial Stage and Mid Stage	Long Range
Medical Facility	Travelling clinic	Clinic
Social and Cultural Facility	Apartment	
	Nursery	
	Church	
	Library	
	Movie theater	
Commercial Facility	Retail shop	
	Public shop	
	Open air market	
	Local open air shop	
	Market	
Communication Facility	Mail post	
	Telephone	
	Post office	
	Telephone exchange office	
Security Facility	Police station	
	Command headquarter	
	Fire station	

(3) Existing Condition and Future Program for Cajamarca City

City of Cajamarca has prospered for a long time as political, economic and cultural center of Cajamarca Region; and even today office of Cajamarca Department and local offices of various Ministries are located; and as distribution center for agriculture and stock farm products from surrounding area the financial business is thriving. Also, the only university in Cajamarca Region which is the University of Cajamarca is located here. The row of Spanish type houses in the central district of the city and the great

cathedral build in the 17th century together with Los Baños Del Inca are drawing attention as tourist attraction for this region. However, as mentioned in Section 1, the economic stagnation of Cajamarca Region is also affecting the growth of Cajamarca City in no small ways.

The population of the city is 38,477 according to the National Census of 1972 and 236.69 hectares in area. According to the report by the Ministry of Housing and Construction on the Normal Urban System in the Long Range Program for Urban Development - 1990, Cajamarca is ranked as central city in Cajamarca Urban System with rating of 3rd rank with a population of 85,000 forecasted by 1990.

On the other hand, according to Cajamarca Program - 1971 by the Ministry of Housing and Construction, Cajamarca is classed as tourist city and shows a future plan for locating new town around the present city with a population of 90,000 forecasted by 1980.

FIG. 3-233 AERIAL PHOTOGRAPAPH OF CAJAMARCA AREA

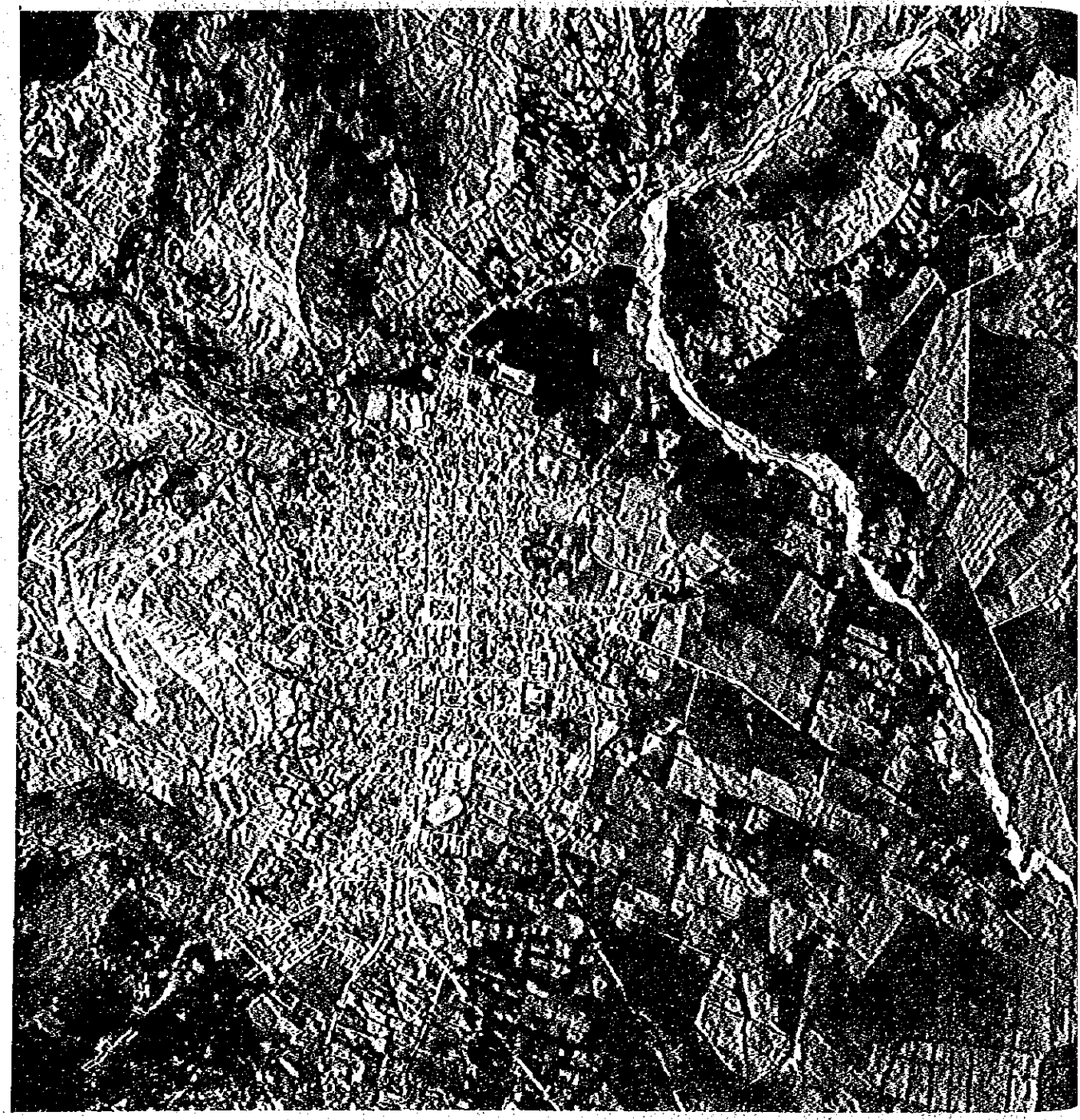


FIG. 3-234 PLAN FOR EXPANSION OF CAJAMARCA

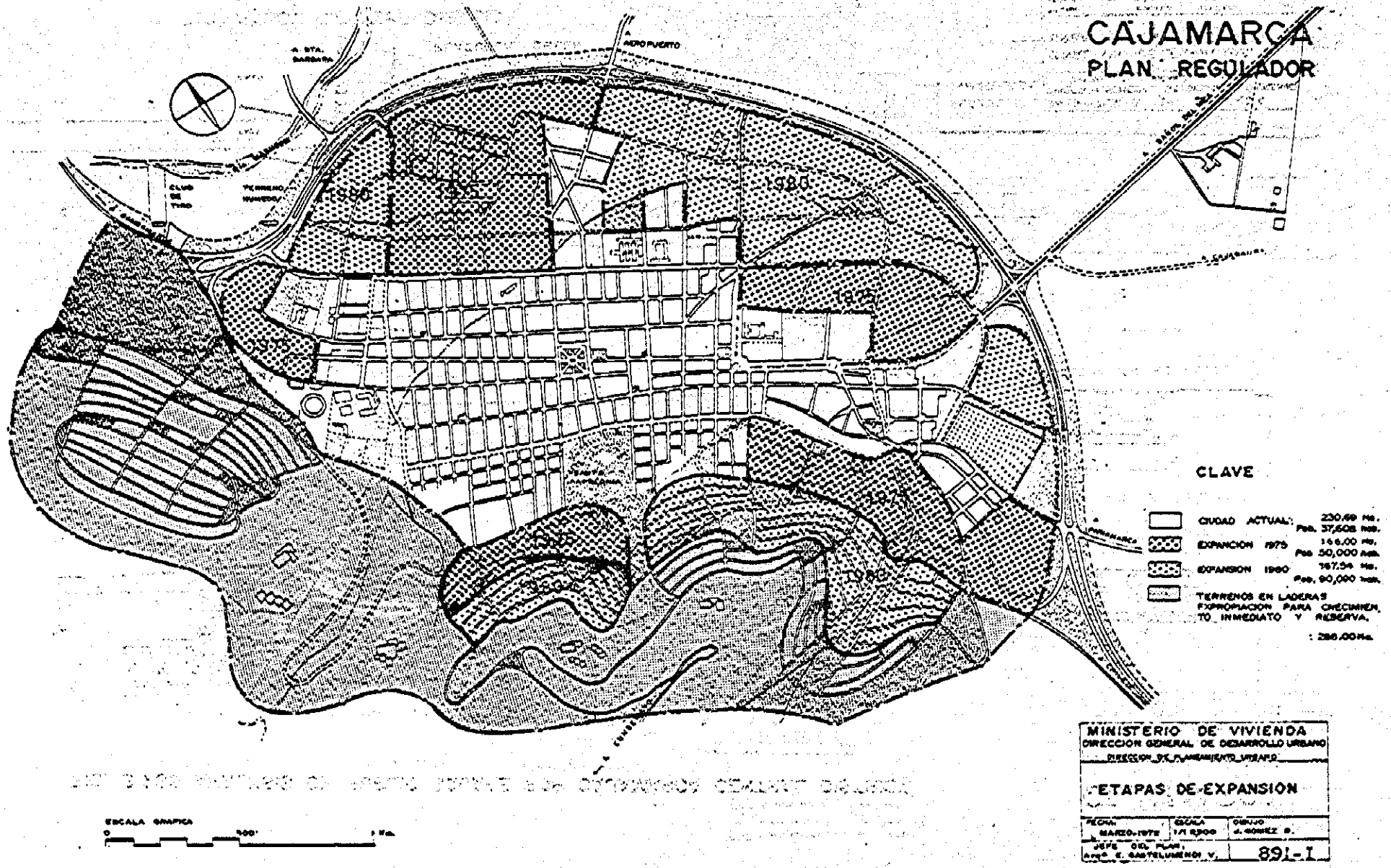
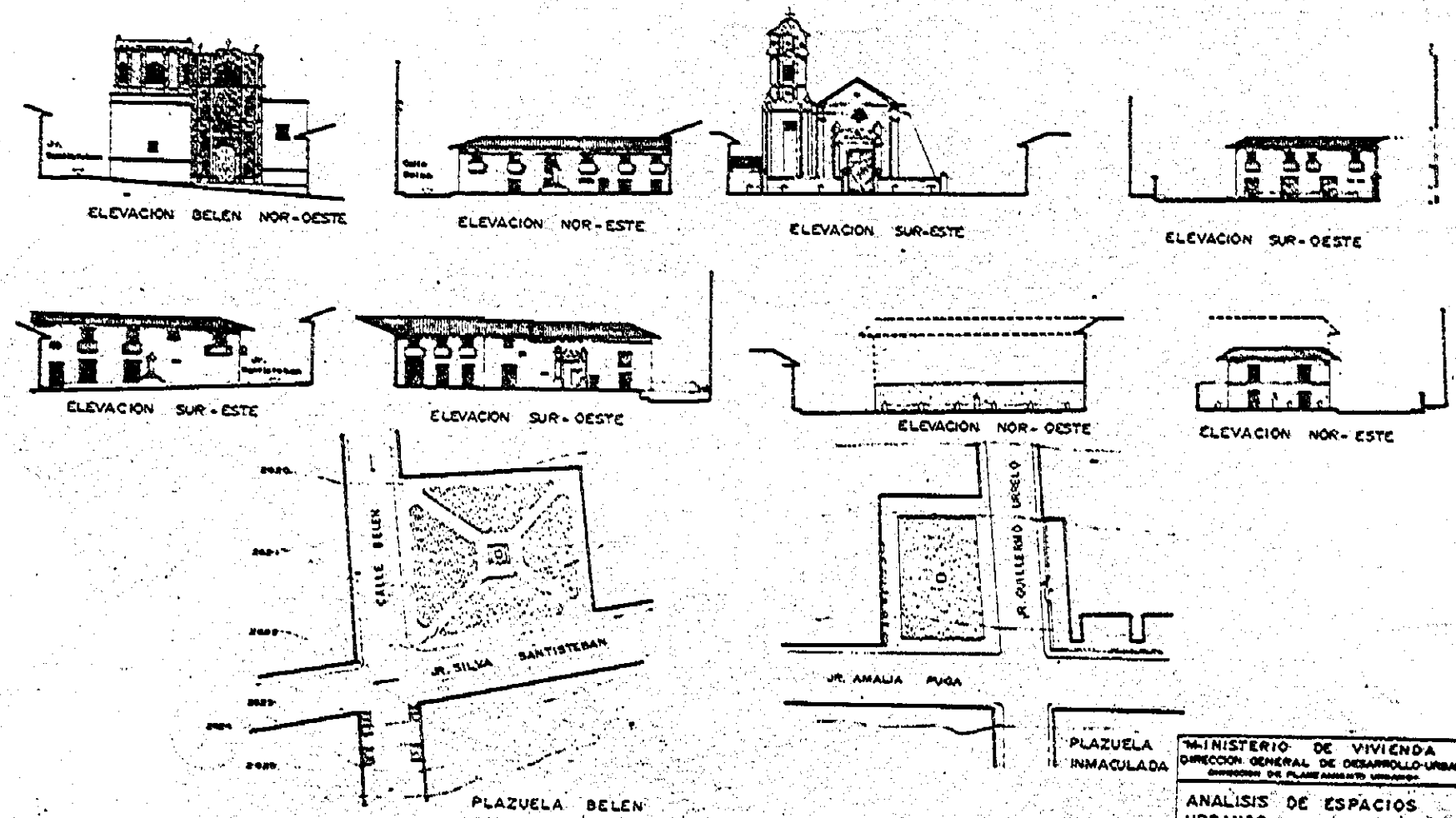


FIG. 3-235 ANALYSIS OF PUBLIC SQUARE FOR CAJAMARCA CENTRAL DISTRICT

CAJAMARCA
PLAN REGULADOR



MINISTERIO DE VIVIENDA
DIRECCION GENERAL DE DESARROLLO URBANO
DIRECCION DE PLANEAMIENTO URBANO

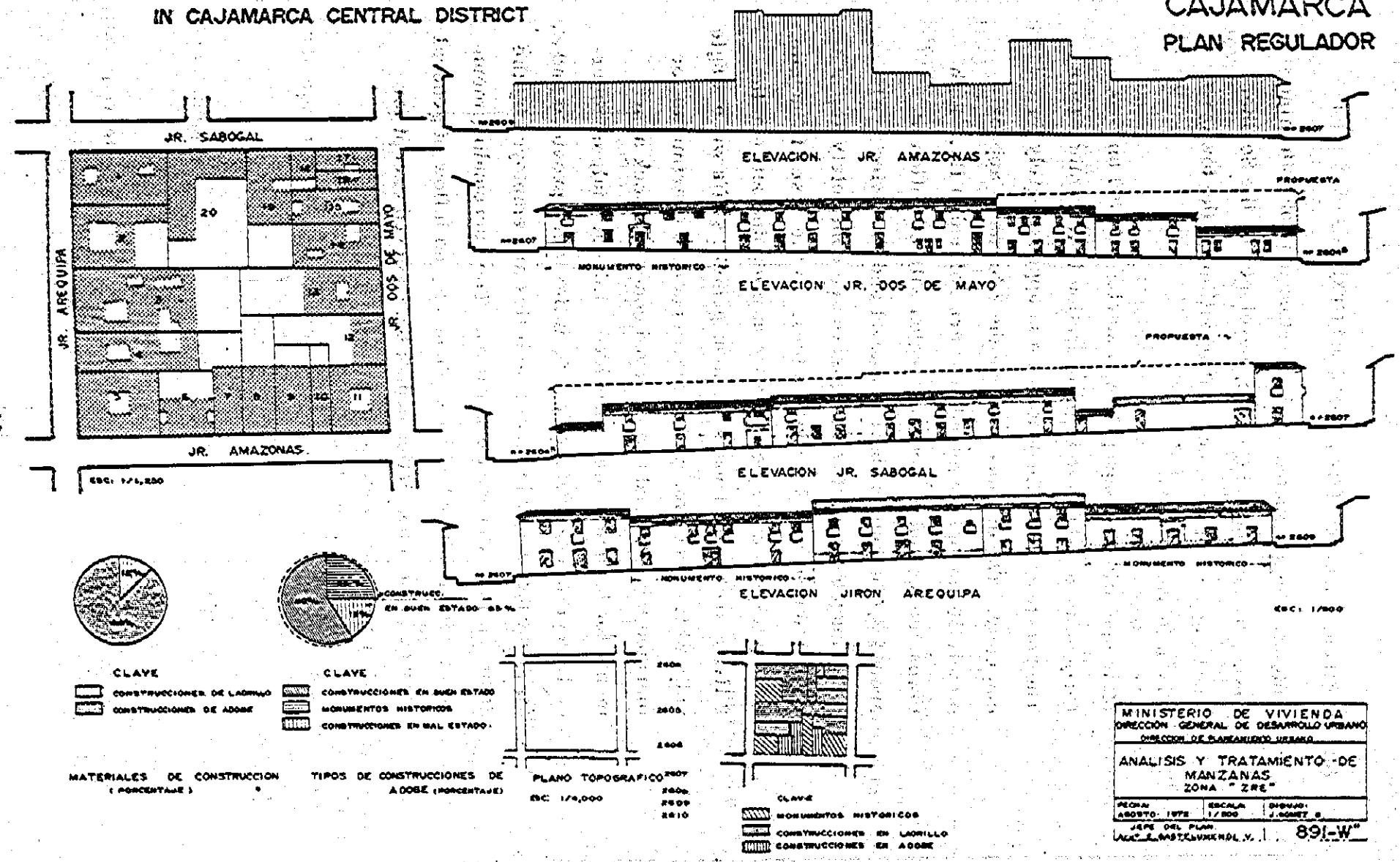
ANALISIS DE ESPACIOS URBANOS "ZONA" "ZRE"

FECHA: AGOSTO 1974 | ESCALA: 1/500 | DIBUJO: J. GOMEZ P.

JEFE DEL PLAN: ARQ. CARLOS CASTELLANOS V.

891-V

FIG. 3-236 ANALYSIS AND TREATMENT OF BLOCK OF HOUSES IN CAJAMARCA CENTRAL DISTRICT



(4) Present condition of Toquepala and Cuajone

This Mission conducted an observation tour of both mine towns, Toquepala and Cuajone, developed by the Southern Peru Copper Corporation. The outline of the towns is shown in Table 3-233.

Mine operation in Toquepala was started in 1960 and Cuajone is scheduled to begin operation in November 1976. The construction of Cuajone Town is approximately 80 % complete. The distance between the 2 towns is approximately 50 km.and the mined ores are refined at Ilo. Both towns are located in mountain region with elevation of around 3,000 meters above sea level and the living areas for management staffs and laborers are completely separated by a distance of 2 - 3 kilometers. In the case of Cuajone, a hospital was under construction at midpoint between the 2 living areas; and houses for management staffs were single units while three storeyed precast concrete apartments for married laborers and two storeyed concrete block apartments for bachelors were provided. Educational, commercial, recreational and medical facilities were provided and all personnel related to these facilities are employed by the Southern Peru Copper Corporation. The surrounding mountain region is almost without inhabitant, so inflow of general service related population cannot be observed except for workers in general stores at Toquepala Mine.

Table 3-233 Principal Statistics for Toquepala and Cuajone

Item		Toquepala	Cuajone
Developed		S.P.C. Corporation	S.P.C. Corporation
Location		Tacna Department, Ilabaya Province	Moquegua Department, Torata Province
Start of Construction		1956	1970
Start of Operation		1960	1976
Distance to Mine		5 km	15 km
Elevation		2,800 meters	3,200 meters
Town Population		18,000 2,800 Mine Workers	2,000 Mine Workers (Including 300 for management)
		Separate area for management and labor personnel (approx. 2 km)	Separate area for management and labor personnel (approx. 2 km)
Type of House	Management	Single Unit	Single Unit
	Laborer	3 Floor Apartment(P.C.)	3 Floor Apartment (P.C. and min. of 3 LDK) Bachelor - 2 Floor Apartment (Concrete Block)
Principal Facility		Kindergarten, Grammar School, Jr. High School, Commercial Facilities, Church, Club House, Hospital, Hotel	Kindergarten, Grammar School, Jr. High School, Commercial Facilities, Club House, Hospital (Under construction)
Water Supply		Lake Water + Well	Lake Water + Well
Sewer Drainage		Discharge into river	After treatment discharge into river. Excepting drinking water Water reutilized.

Item	Toquepala	Cuajone
Power Service	Diesel Power Generator (S.P.C.C.) Hydroelectric Power Plant (National)	Same as for Toquepala
Others		

(5) Basic Concept

From the studies in (1) to (4), the following subjects are the basic concept for the development of mine town.

- o Santa Margarita should become the second city after Cajamarca which is a central city for the Basin and the various facilities would become available to the residents. The scale and kind of facilities shall be determined with Santa Margarita considered in supporting relationship to Cajamarca City. Attention to the coexistence of the 2 cities was taken.
- o With mine workers as basis, the program for population should be based on careful population planning and should be able to cope with any future expansion.
- o Housing program shall be planned in accordance with Mining Laws and related regulations to attain housing with high standard and good environment.

2-4 Population Program for Mine Town

As to the population of Santa Margarita, there are, besides the report of the Ministry of Housing and Construction, several forecasts; but in this report population planning was conducted independently based on the National Census of 1972.

The population of the mine town will be composed of mine workers, their families, and workers and families related to various service enterprises that are necessary in the daily livelihood of the mine industry employees and families. The number of mine workers will vary with mine production; but according to the forecast made by Minero Peru in March 1976, for production of 40,000 t/day, the required number of mine workers will be 2,000. Also, according to Feasibility Report of Michiquillay Project of June 1976, for production of 40,000 t/day the number of mine workers, including 400 men in the mining industry's own service facilities, will be 1,858. From this and allowing some margin, the number of mine workers is assumed as 2,000, and of this number 400 will be in the mining industry's service facilities, and assuming that 600 men in service related enterprises will come in gradual stage by 10th year of mine operation, a population forecast was made for Case A and Case B based on separately noted conditions. This result is shown in Table 3-241 and Figure 3-241.

Both Case A and Case B, show similar increase until 15th year of mine operation, but thereafter, the rate of increase for Case A is 5 - 6 % per 5 years while in Case B the rate will be 10 - 12 % per 5 years. This rate of increase for Case A and Case B corresponds with the rate of increase for the entire Cajamarca Region and for the urban area in Cajamarca Region; but according to the report by I.N.P. on the study of population of Peru, the rate of population increase will drop gradually from 1980 - 1990. Actually, the condition indicated hereafter for Case B is difficult to consider, so in this Report a study for development of mine town was conducted based on the population plan for Case A.

Conditions Established in Forecast of Population
(Common for Case A and Case B)

(1) Number of mine workers:

2,000 (all male and inclusive of 400 in the mining industry's own service facilities).

Composition of labor force by age group for 0 year of operation

Age Group	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	Average Age
Number	200	300	450	450	300	200	100	30.4

(2) Retirement and replacement:

Excluding workers leaving the mining industry by reason of death or compulsory retirement at the age of 60 years, in 5 year period it is assumed that 20 % of all workers in each age group would leave their job for other reasons. Age groups of 15 - 19, 20 - 24, 25 - 29, and 30 - 34 will be replaced at a rate of 0.2, 0.3, 0.3 and 0.2 respectively to maintain a continuous labor force of 2,000 men.

(3) Proportion of bachelor male:

The proportion of bachelor male calculated from the National Census of 1972 was corrected so that all bachelor male will marry by the age of 44.

Age Group	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
Cajamarca Region Bachelor Proportion	0.96	0.74	0.42	0.21	0.14	0.12	0.10
Corrected Proportion	0.96	0.72	0.36	0.12	0.06	0.02	0

50 - 54	55 - 59	60 - 64	65 - 69	70
0.07	0.08	0.10	0.04	0.09
0	0	0	0	0

(4) Age of wife:

Wife's age was assumed to be 5 years less than the husband's, so the man's average marrying age would be 28.2 years and the woman's 23.2 years. (The average marrying age of

male and female in Cajamarca Department is 28.5 years and 23.5 years respectively according to calculation made from National Census of 1972)

(5) Number of children:

Following Table is based on the report by I.N.P. on the Study of Population in Peru. Male : Female ratio of 1 : 1 was assumed.

Age of Mother	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49
No. of Baby Born in 5 Years	0.44	1.28	1.62	1.37	0.88	0.38	0.23

(6) Rate of survival after 5 years:

Based on report by I.N.P. on the Study of Population in Peru 1980 - 1985.

Age Group	National (Pb)	0 -4	5 -9	10 -14	15 -19	20 -24	25 -29	30 -34	35 -39	40 -44	45 -49	50 -54
Male	.951	.984	.994	.994	.990	.989	.988	.986	.982	.974	.962	.942
Female	.960	.987	.996	.995	.993	.991	.990	.988	.985	.980	.972	.959

55 -59	60 -64	65 -69	70 -74	75 -79	80 -
.912	.867	.800	.706	.583	.353
.938	.900	.839	.747	.627	.375

(7) Separation of child from family:

Age Group	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39
Separation Rate for Male	0.00	0.25	0.50	0.75	1.00
Separation Rate for Female	0.00	0.33	0.67	1.00	1.00

(Case A)

(8) Number of workers in service related enterprises:

As to the number of workers in basic service enterprises, a total of 600 men will be recruited at a rate of 150, 300 and 150 during the 0 year, 5th year and 10th year of mine operation respectively and the age composition, separation and replacement of workers are to be treated in the same manner as in the case for mine workers. It is also assumed that 50 % of male children will separate from mine worker's family, 25 % of workers of age over 60 years and 75 % of the male children separated from basic service related enterprise worker's family will remain in Santa Margarita as workers in service related enterprise.

(Case B)

(9) Number of workers in service related enterprises :

In Case B, the number of workers in service related enterprises is assumed to be same as in Case A mentioned in previous Paragraph 8; and in addition it is assumed that 100 % of male children separated from mine worker's family, men over 60 years of age and male separated from service related enterprises worker's family will remain in Santa Margarita as workers in service related enterprises.

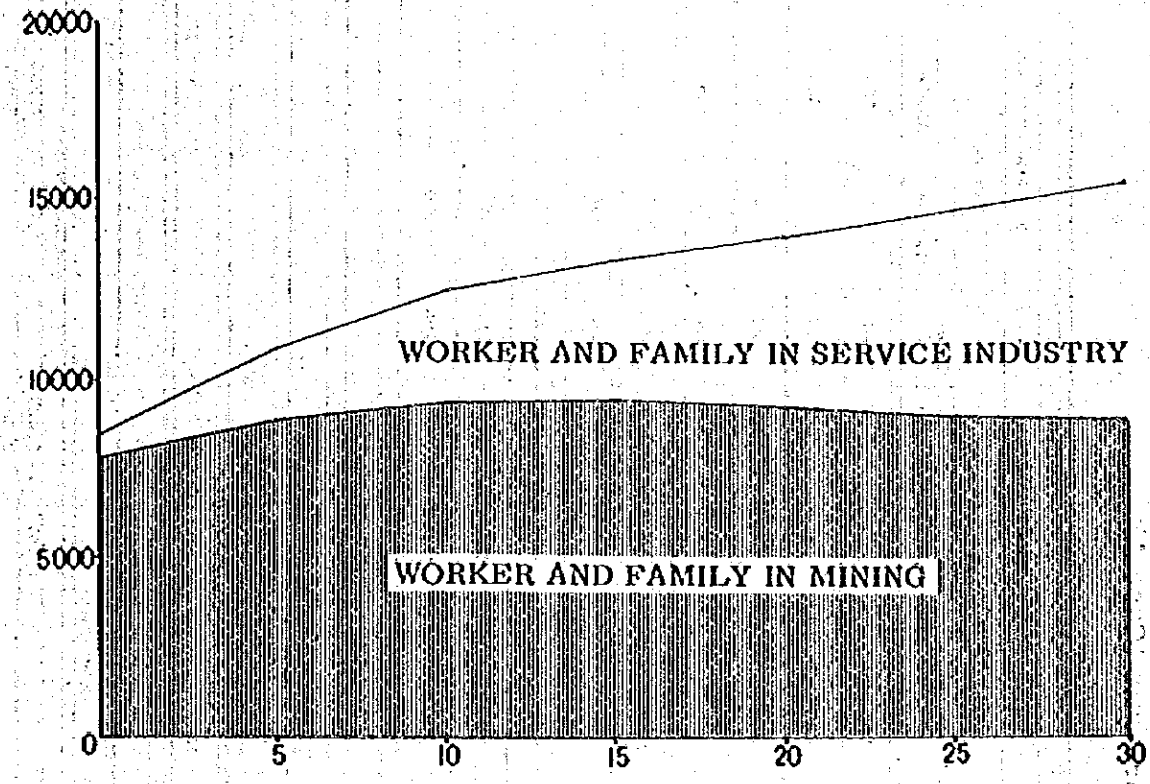
Table 3-241 Population of Santa Margarita

Case	Year of Operation	Mine Worker			Service Related Worker			Total Number			
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Rate of Increase for 5 Years
Case A	0	4,266	3,609	7,875	324	276	600	4,590	3,885	8,475	
	5	4,726	4,169	8,895	1,064	927	1,991	5,790	5,096	10,886	1,284
	10	4,977	4,461	9,438	1,634	1,474	3,108	6,611	5,935	12,546	1,152
	15	5,012	4,479	9,491	2,017	1,868	3,885	7,029	6,347	13,376	1,066
	20	4,943	4,382	9,325	2,461	2,314	4,775	7,404	6,696	14,100	1,054
	25	4,853	4,278	9,131	2,968	2,818	5,786	7,821	7,096	14,917	1,058
	30	4,799	4,218	9,017	3,469	3,303	6,772	8,268	7,521	15,789	1,058
Case B	0	4,266	3,609	7,875	324	276	600	4,590	3,885	8,475	
	5	4,726	4,169	8,895	1,118	981	2,099	5,844	5,150	10,994	1,297
	10	4,977	4,461	9,438	1,816	1,656	3,472	6,793	6,117	12,910	1,174
	15	5,012	4,479	9,491	2,475	2,322	4,797	7,487	6,801	14,288	1,107
	20	4,943	4,382	9,325	3,312	3,157	6,469	8,255	7,539	15,794	1,105
	25	4,853	4,278	9,131	4,307	4,147	8,454	9,160	8,425	17,585	1,113
	30	4,799	4,218	9,017	5,405	5,225	10,630	10,204	9,443	19,647	1,117

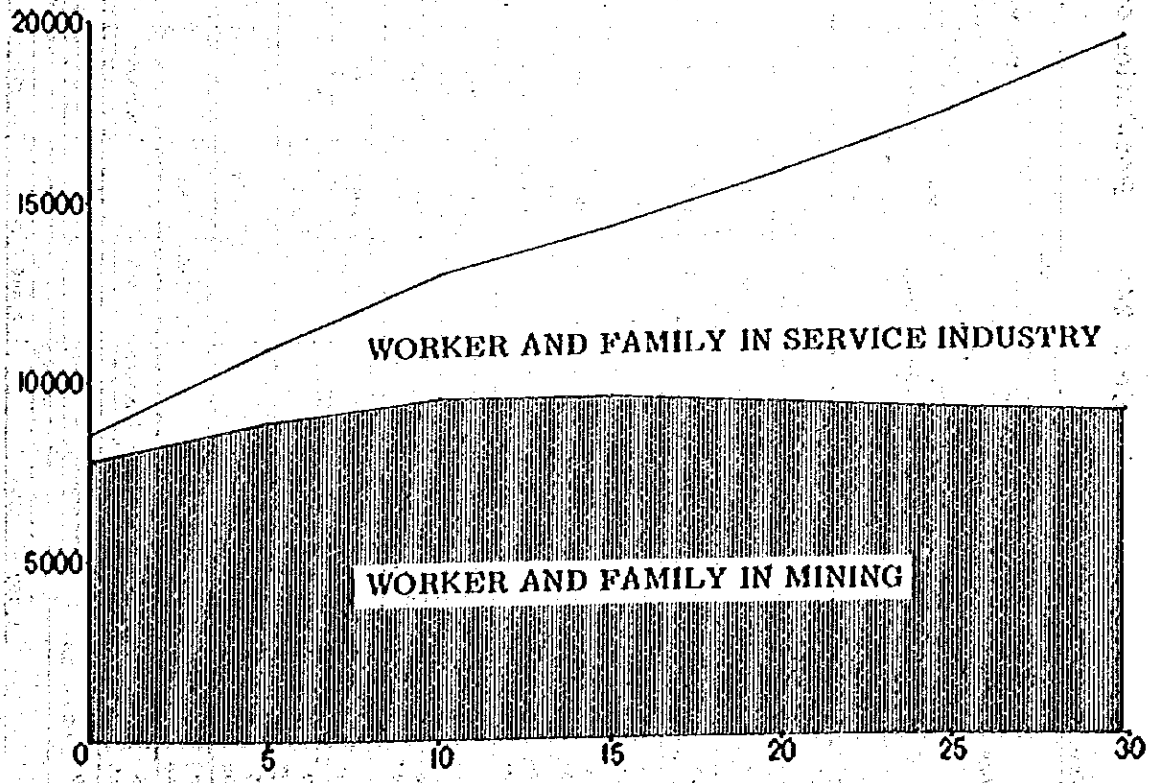
Table 3-242 Number of Household in Santa Margarita

Case	Year of Operation	Mine Worker			Service Related Worker			Total			
		One person household	Multiple household	Total	One person household	Multiple household	Total	One person household	Multiple household	Total	Number of person in multiple household
Case A	0	646	1,354	2,000	47	103	150	693	1,457	2,150	5.34
	5	497	1,503	2,000	134	367	501	631	1,870	2,501	5.48
	10	423	1,577	2,000	152	585	737	575	2,162	2,737	5.54
	15	420	1,580	2,000	131	731	862	551	2,311	2,862	5.55
	20	437	1,563	2,000	122	885	1,007	559	2,448	3,007	5.53
	25	452	1,548	2,000	119	1,041	1,160	571	2,589	3,160	5.54
	30	467	1,533	2,000	123	1,186	1,309	590	2,719	3,309	5.59
Case B	0	646	1,354	2,000	47	103	150	693	1,457	2,150	5.34
	5	497	1,503	2,000	134	404	538	631	1,907	2,538	5.41
	10	423	1,577	2,000	152	688	840	575	2,265	2,840	5.45
	15	420	1,580	2,000	131	943	1,074	551	2,523	3,074	5.44
	20	437	1,563	2,000	122	1,235	1,357	559	2,798	3,357	5.44
	25	452	1,548	2,000	119	1,551	1,670	571	3,099	3,670	5.49
	30	467	1,533	2,000	123	1,897	2,020	590	3,430	4,020	5.56

FIG. 3-241 FORECAST OF SANTA MARGARITA POPULATION



CASE A



CASE B

Table 3-243 Population of Santa Margarita (Case A)

Operation : 0 Year

Age	Total	Male									Female						
		Total					For Mine Workers				Total				For Mine Workers		
		Household Head		Others		Total	Household Head	Others		Total	Household Head	Others		Total	Others		Total
		Married	Single	Married	Single		Married	Single			Married	Single			Married	Single	
0 -4	1,692				846	846			785	785			846	846		785	785
5 -9	1,474				737	737			685	685			737	737		685	685
10 -14	1,005				498	498			463	463		9	498	507	8	463	471
15 -19	841	9	206		268	483	8	192	249	449		90	268	358	84	249	333
20 -24	783	90	232		80	402	84	216	74	374		310	71	381	288	66	354
25 -29	929	310	174		11	495	288	162	10	460		426	8	434	396	7	403
30 -34	787	426	58			484	396	54		450		303		303	282		282
35 -39	522	303	19			322	282	18		300		211		211	196		196
40 -44	323	211	4			215	196	4		200		108		108	100		100
45 -49	108	108				108	100			100							
50 -54																	
55 -59																	
60 -64																	
65 -69																	
70 -																	
Total	8,475	1,457	693		2,440	4,590	1,354	646	2,266	4,266		1,457	2,428	3,885	1,354	2,255	3,609
		2,150			2,440		2,000					3,885			3,609		
														3,885			3,609

Operation : 5th Year

Age	Total	Male									Female						
		Total					For Mine Workers				Total				For Mine Workers		
		Household Head		Others		Total	Household Head	Others		Total	Household Head	Others		Total	Others		Total
		Married	Single	Married	Single		Married	Single				Married	Single		Married	Single	
0 -4	2,016				1,008	1,008			813	813			1,008	1,008		813	813
5 -9	1,872				936	936			770	770			936	936		770	770
10 -14	1,408				702	702			587	587		4	702	706	3	587	590
15 -19	1,120	4	117		436	557	3	82	370	455		127	436	563	80	370	450
20 -24	1,005	127	253		169	549	80	205	146	431		306	150	456	234	130	364
25 -29	1,018	306	165		43	514	234	131	38	403	1	475	28	504	384	25	409
30 -34	946	480	65		2	547	388	53	2	443	2	397		399	329		329
35 -39	700	405	25			430	336	21		357	1	269		270	223		223
40 -44	459	277	6			283	230	5		235	2	174		176	149		149
45 -49	259	181				181	155			155	1	77		78	72		72
50 -54	83	83				83	77			77							
55 -59																	
60 -64																	
65 -69																	
70 -																	
Total	10,856	1,863	631		3,296		1,503	497				1,824	3,260		1,474	2,695	
		2,494			3,296		2,000		2,776		7	5,084			4,169		
		5,790					4,776				5,091				4,169		

Operation : 10th Year

Age	Total	Male									Female						
		Total					For Mine Workers				Total				For Mine Workers		
		Household Head		Others		Total	Household Head	Others		Total	Household Head	Others		Total	Others		Total
		Married	Single	Married	Single		Married	Single			Married	Single			Married	Single	
0 -4	2,166				1,083	1,083			782	782			1,083	1,083		782	782
5 -9	2,072				1,036	1,036			782	782			1,036	1,036		782	782
10 -14	1,668				832	832			650	650		4	832	836	3	650	653
15 -19	1,401	4	116		578	698	3	83	466	552		125	578	703	55	466	521
20 -24	1,168	125	197		261	583	55	141	216	412		353	232	585	227	192	419
25 -29	1,125	353	168		86	607	227	127	74	428	1	460	57	518	327	49	376
30 -34	956	464	60		9	533	330	45	7	382	3	420		423	322		322
35 -39	795	429	27			456	329	21		350	3	336		339	266		266
40 -44	575	346	7			353	274	6		280	3	219		222	175		175
45 -49	360	228				228	182			182	1	131		132	112		112
50 -54	197	139				139	119			119		58		58	53		53
55 -59	63	63				63	58			58							
60 -64																	
65 -69																	
70 -																	
Total	12,546	2,151	575		3,885		1,577	423				2,106	3,818		1,540	2,924	
		2,726			3,885		2,000		2,977		11		5,924			4,461	
		6,611					4,977				5,935				4,461		

Operation : 15th Year

Age	Total	Male								Female						
		Total					For Mine Workers			Total				For Mine Workers		
		Household Head		Others		Total	Household Head	Others	Total	Household Head	Others		Total	Others		Total
		Married	Single	Married	Single		Married	Single		Married		Single		Married	Single	
0 -4	2,212				1,106	1,106			735	735			1,106	1,106		735	735
5 -9	2,142				1,071	1,071			755	735			1,071	1,071		755	755
10 -14	1,765				880	880			653	653		5	880	885	4	653	657
15 -19	1,570	5	117		654	776	4	92	506	602		140	654	794	59	506	565
20 -24	1,290	140	200		324	664	59	152	258	469		339	287	626	191	229	420
25 -29	1,182	339	143		119	601	191	107	96	394	2	500	79	581	328	64	392
30 -34	974	505	59		14	578	331	45	9	385	4	392		396	273		273
35 -39	768	401	24			425	279	18		297	3	340		343	260		260
40 -44	625	350	8			358	268	6		274	3	264		267	209		209
45 -49	442	275				275	218			218	3	164		167	131		131
50 -54	272	175				175	140			140	1	96		97	82		82
55 -59	119	105				105	90			90		14		14			
60 -64	15			15		15											
65 -69																	
70 -																	
Total	13,376	2,295	551	15	4,168	7,029	1,580	420	3,012	5,012		2,254	4,077	6,347	1,537	2,942	4,479
		2,846			4,183		2,000				16		6,331		4,479		

Operation : 20th Year

Age	Total	Male									Female						
		Total					For Mine Workers				Total				For Mine Workers		
		Household Head		Others		Total	Household Head	Others		Total	Household Head	Others		Total	Others		Total
		Married	Single	Married	Single		Married	Single			Married		Single		Married	Single	
0 -4	2,296				1,148	1,148			704	704			1,148	1,148		704	704
5 -9	2,208				1,104	1,104			716	716			1,104	1,104		716	716
10 -14	1,833				914	914			628	628		5	914	919	4	628	632
15 -19	1,664	5	122		693	820	4	97	502	603		151	693	844	64	502	566
20 -24	1,405	151	206		359	716	64	163	273	500		371	318	689	204	242	446
25 -29	1,250	371	147		142	660	204	114	108	426	3	493	94	590	294	72	366
30 -34	1,012	498	53		21	572	297	40	12	349	6	434		440	274		274
35 -39	794	444	24			468	280	18		298	5	321		326	221		221
40 -44	610	331	7			338	228	5		233	3	269		272	204		204
45 -49	482	280				280	213			213	3	199		202	157		157
50 -54	334	211				211	167			167	3	120		123	96		96
55 -59	159	132				132	106			106	2	25		27			
60 -64	40			28		28						12		12			
65 -69	13			13		13											
70 -																	
Total		2,423	559	41	4,381		1,563	437				2,400	4,271		1,518	2,864	
		2,982		4,422			2,000		2,943		25	6,671			4,382		
	14,200	7,404					4,943				6,696				4,382		

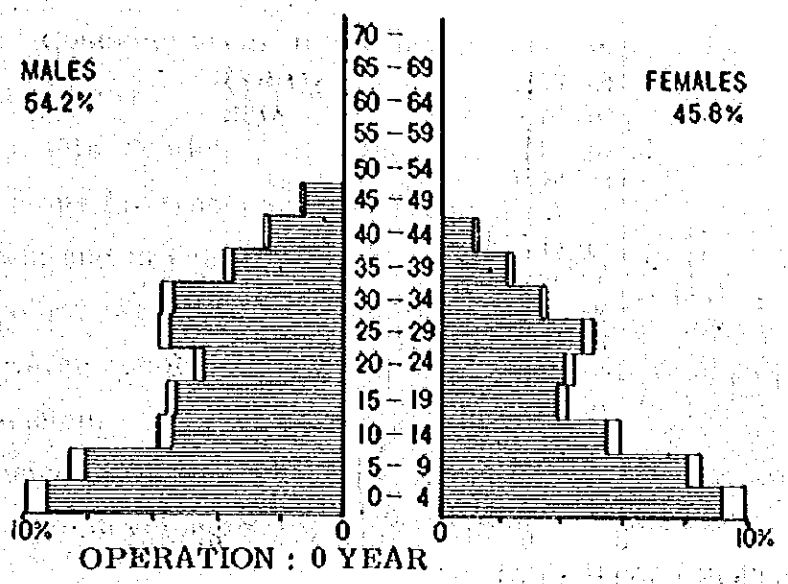
Operation : 25th Year

Age	Total	Male									Female						
		Total					For Mine Workers				Total				For Mine Workers		
		Household Head		Others		Total	Household Head	Others		Total	Household Head	Others		Total	Others		Total
		Married	Single	Married	Single		Married	Single			Married	Single			Married	Single	
0 -4	2,426				1,213	1,213			698	698			1,213	1,213		698	698
5 -9	2,330				1,165	1,165			695	695			1,165	1,165		695	695
10 -14	1,923				959	959			595	595		5	959	964	4	595	599
15 -19	1,740	5	125		727	857	4	99	478	581		156	727	883	66	478	544
20 -24	1,479	156	213		381	750	66	169	267	502		391	338	729	214	237	451
25 -29	1,330	391	151		151	693	214	120	107	441	2	534	101	637	309	71	380
30 -34	1,063	539	55		25	619	312	43	13	368	6	438		444	246		246
35 -39	839	447	21			468	251	16		267	6	365		371	222		222
40 -44	645	376	6			382	229	5		234	5	258		263	174		174
45 -49	475	268				268	181			181	5	202		207	153		153
50 -54	365	215				215	163			163	4	146		150	116		116
55 -59	198	161				161	128			128	3	34		37			
60 -64	61			38		38						23		23			
65 -69	33			23		23						10		10			
70 -	10			10		10											
Total		2,538	571	71	4,621		1,548	452				2,562	4,503		1,504	2,774	
		3,129		4,692			2,000		2,853		31	7,065			4,278		
	14,917	7,821					4,853				7,096				4,278		

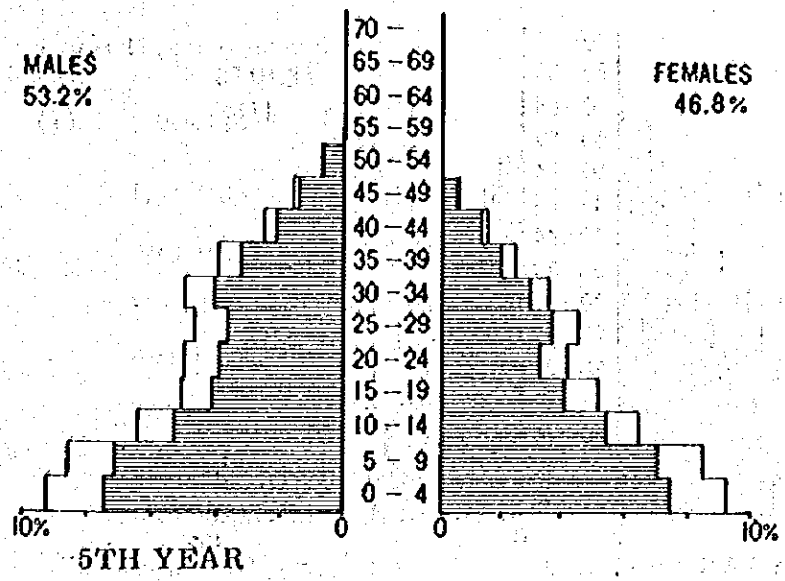
Operation : 30th Year

Age	Total	Male								Female					
		Total					For Mine Workers			Total				For Mine Workers	
		Household Head		Others		Total	Household Head	Others	Total	Household Head	Others		Total	Others	Total
		Married	Single	Married	Single		Married	Single		Married		Single		Married	Single	
0 -4	2,554				1,277	1,277			711	711			1,277	1,277		711	711
5 -9	2,470				1,235	1,235			696	696			1,235	1,235		696	696
10 -14	2,045				1,020	1,020			578	578		5	1,020	1,025	4	578	582
15 -19	1,834	5	130		771	906	4	103	451	558		157	771	928	68	451	519
20 -24	1,535	157	220		401	778	68	174	248	490		402	355	757	221	220	441
25 -29	1,392	402	156		163	721	221	124	103	448	3	559	109	671	324	69	393
30 -34	1,137	565	57		28	650	327	45	12	384	7	480		487	259		259
35 -39	886	489	22			511	264	17		281	7	368		375	200		200
40 -44	690	379	5			384	206	4		210	7	299		306	175		175
45 -49	515	311				311	182			182	5	199		204	131		131
50 -54	364	211				211	139			139	5	148		153	111		111
55 -59	207	162				162	122			122	4	41		45			
60 -64	78			47		47						31		31			
65 -69	50			31		31						19		19			
70 -	32			24		24						8		8			
Total		2,681	590	102	4,895		1,533	467				2,716	4,762		1,493	2,725	
		3,271		4,997			2,000		2,799		38	7,483			4,218		
	15,789	8,268					4,799			7,521						4,218	

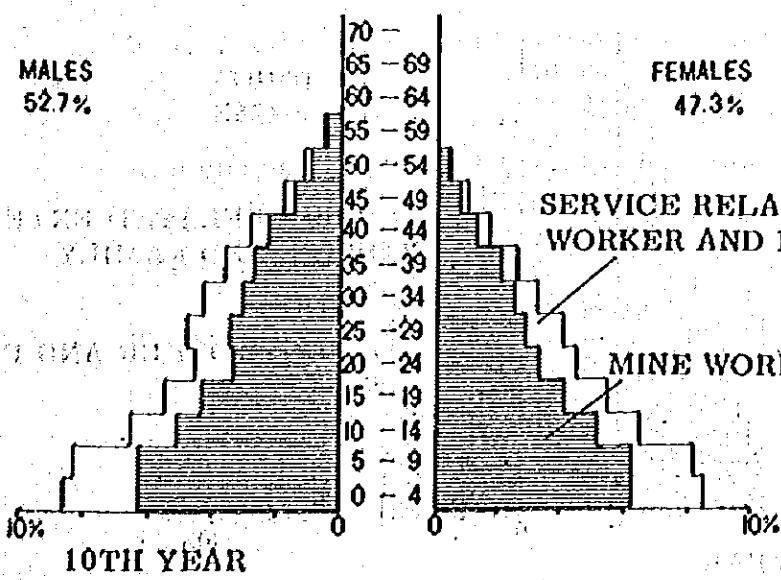
FIG, 3-242 COMPOSITION OF POPULATION BY AGE GROUP OF SANTA MARGARITA



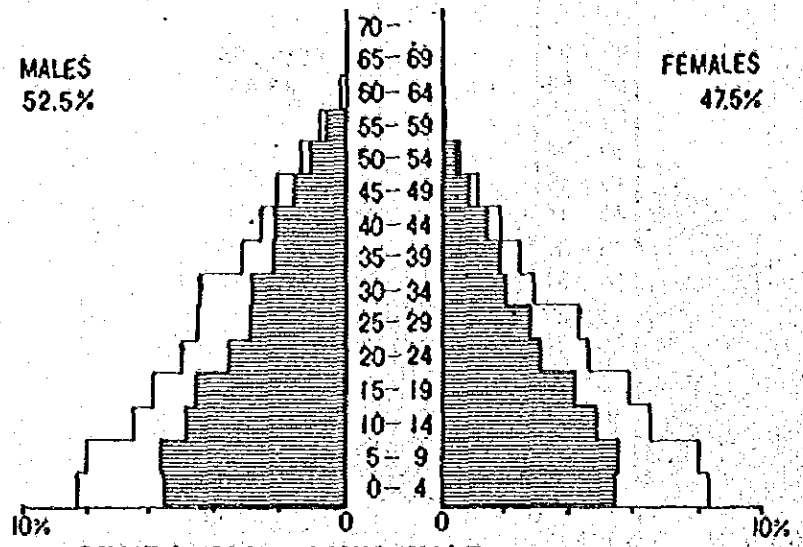
OPERATION : 0 YEAR



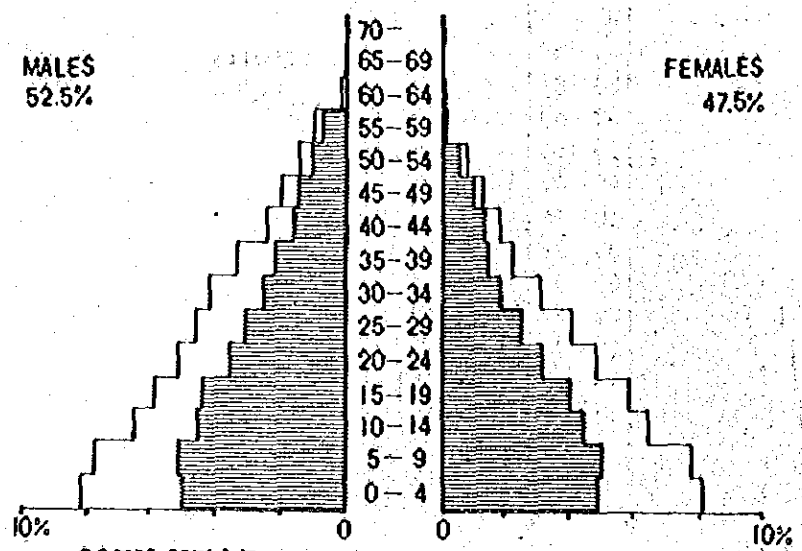
5TH YEAR



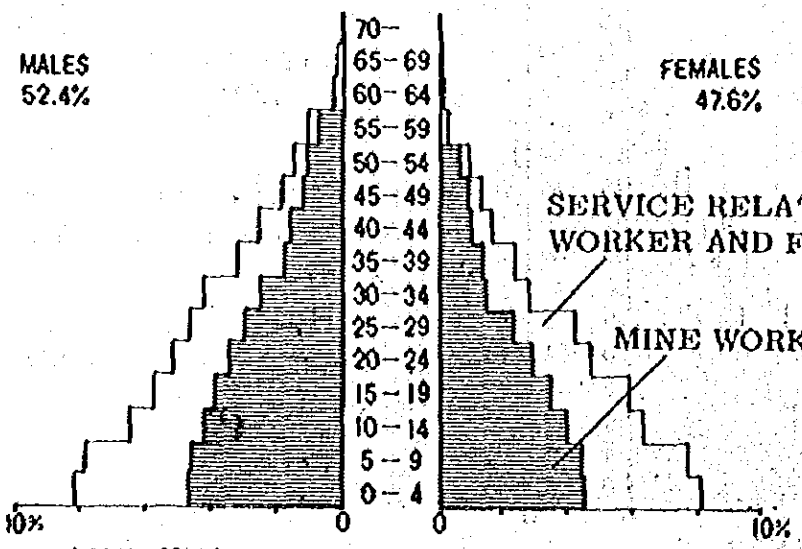
10TH YEAR



OPERATION : 15TH YEAR



20TH YEAR



25TH YEAR