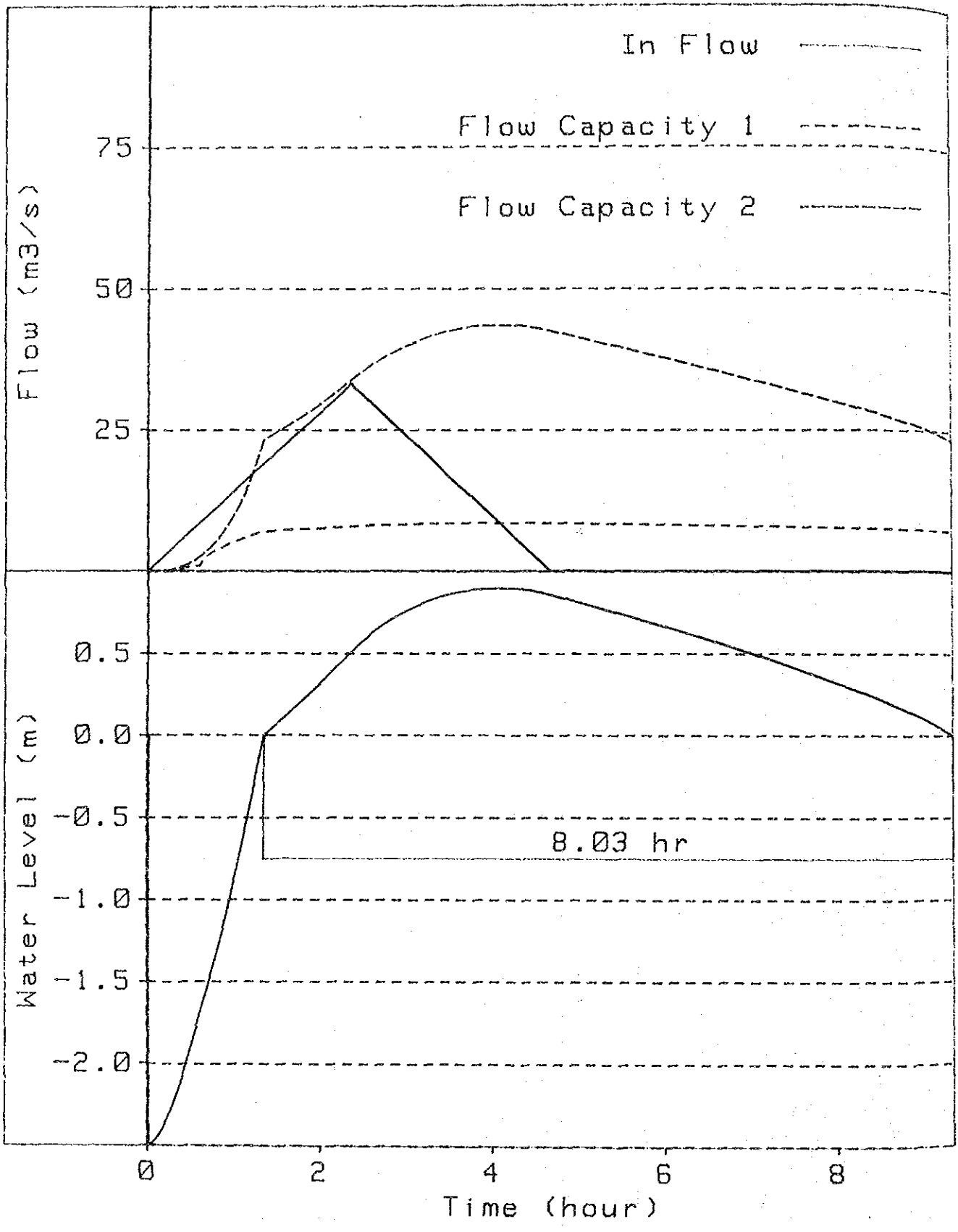
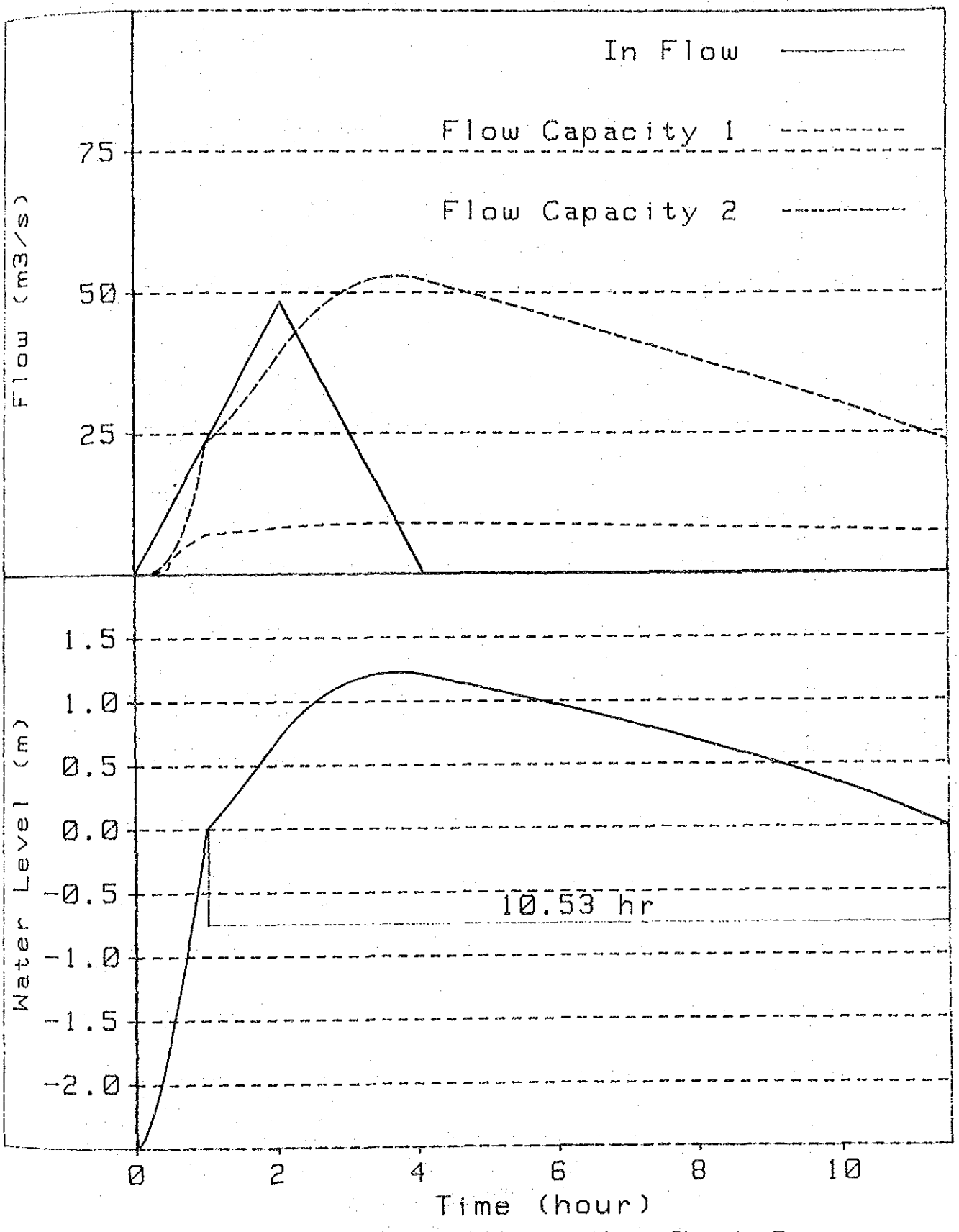


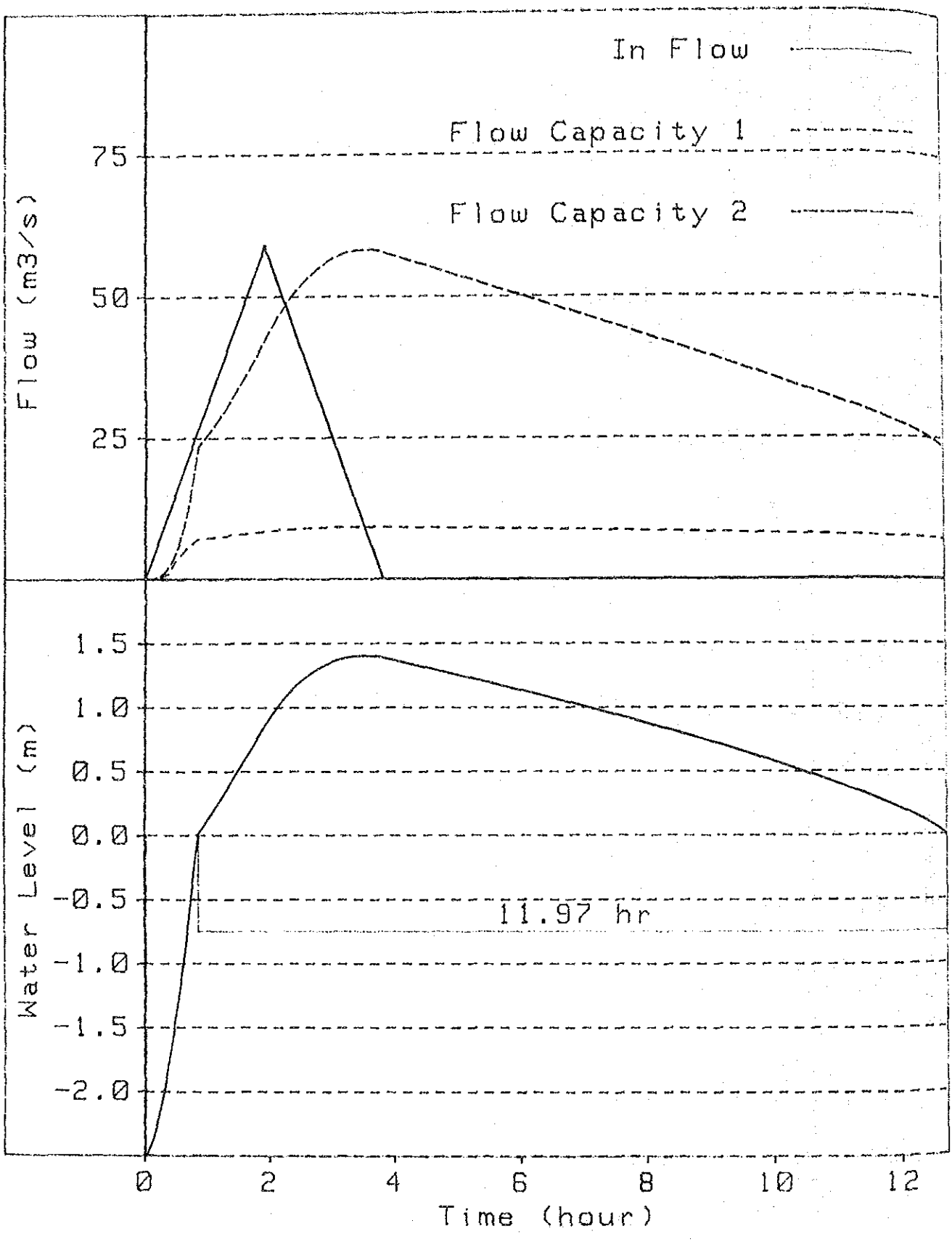

Note: Capacity 1 is for Check Point
Capacity 2 is for Cano

Fig.I-3-3 (1) Calculation of Inundation Time
(Caño Venado-2 Existing Condition for Return Period 1/2)



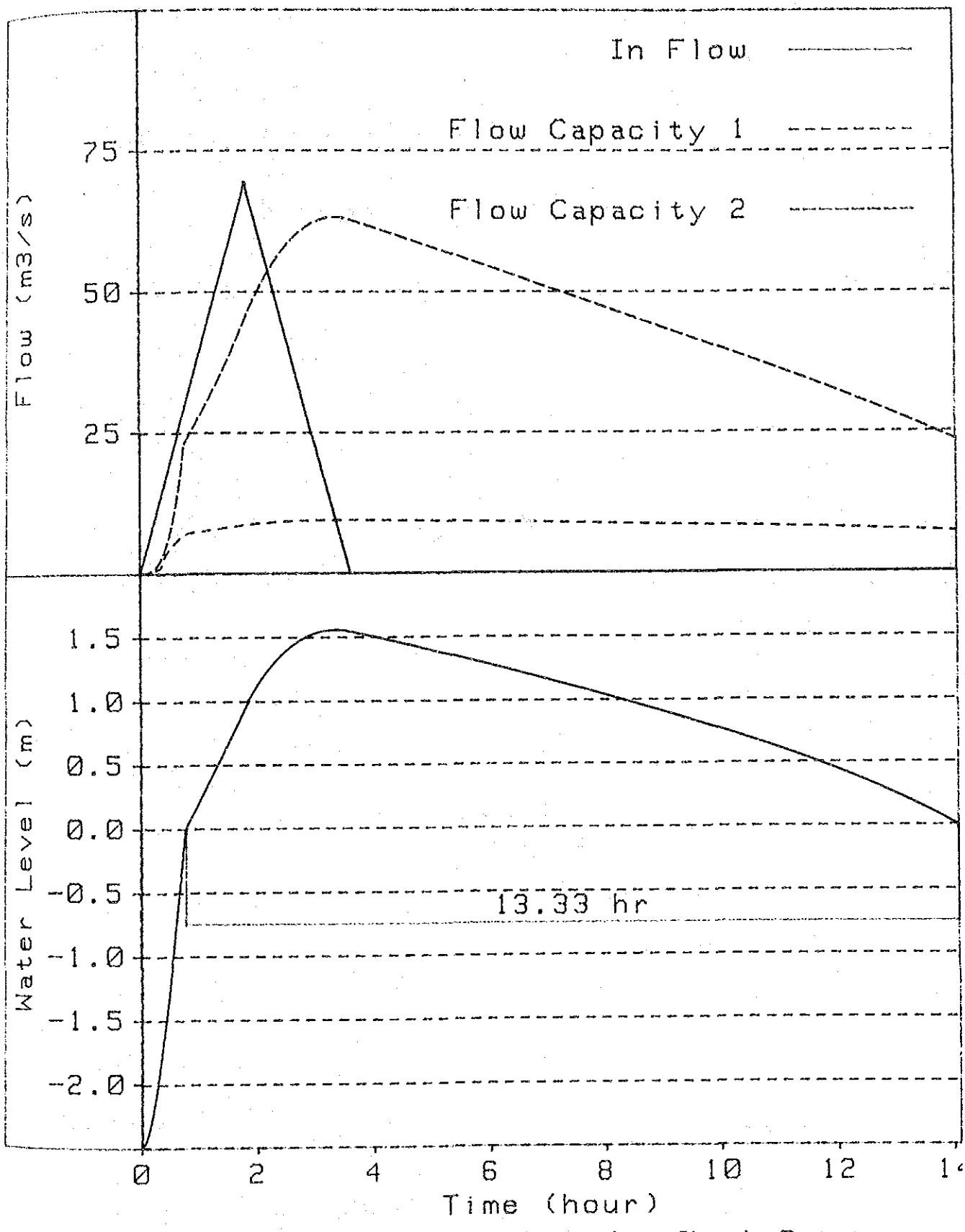

Note: Capacity 1 is for Check Point
Capacity 2 is for Cano

Fig.I-3-3 (2) Calculation of Inundation Time
(Caño Venado-2 Existing Condition for Return Period 1/5)



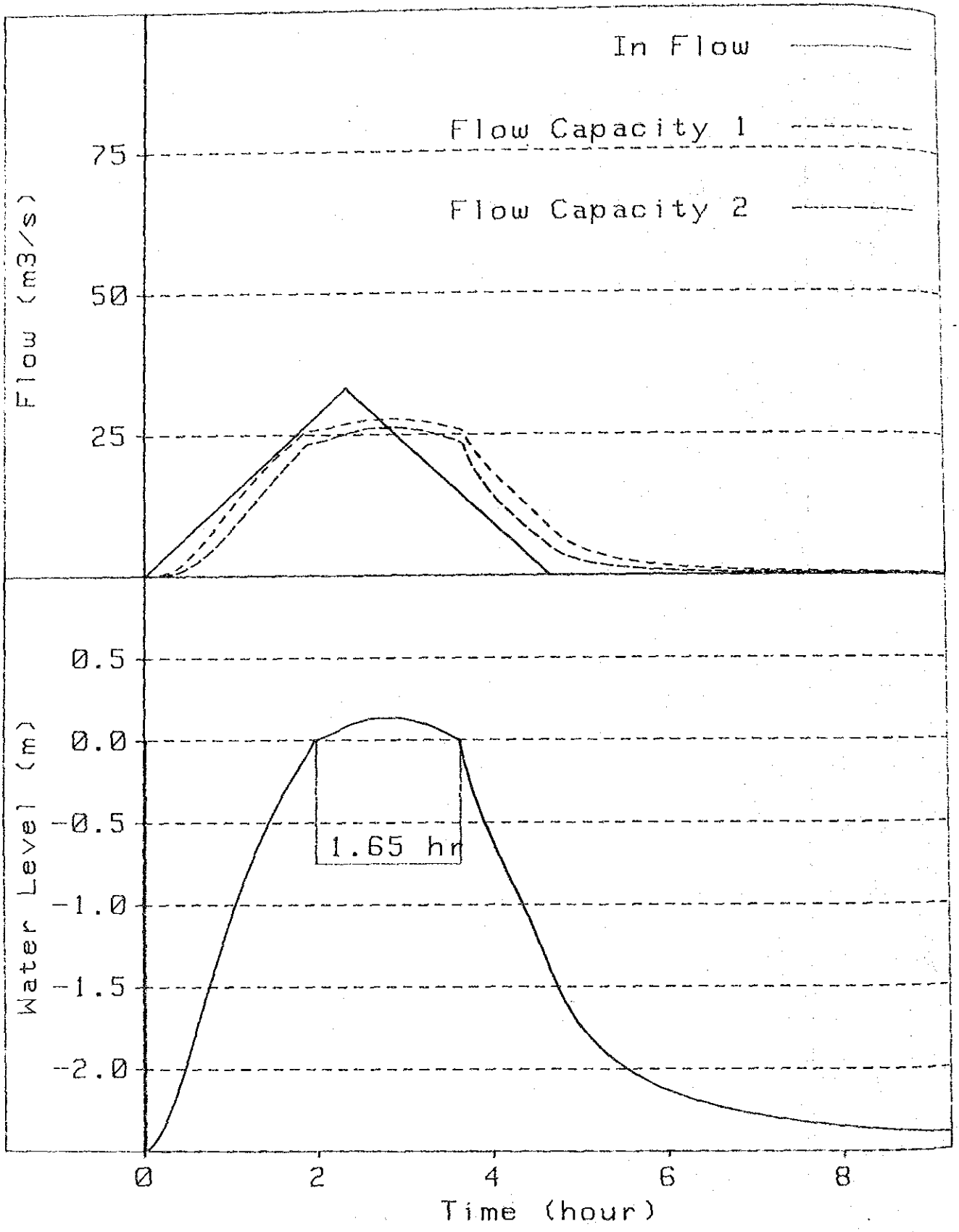

Note: Capacity 1 is for Check Point
Capacity 2 is for Cano

Fig.I-3-3 (3) Calculation of Inundation Time
(Caño Venado-2 Existing Condition for Return Period 1/10)



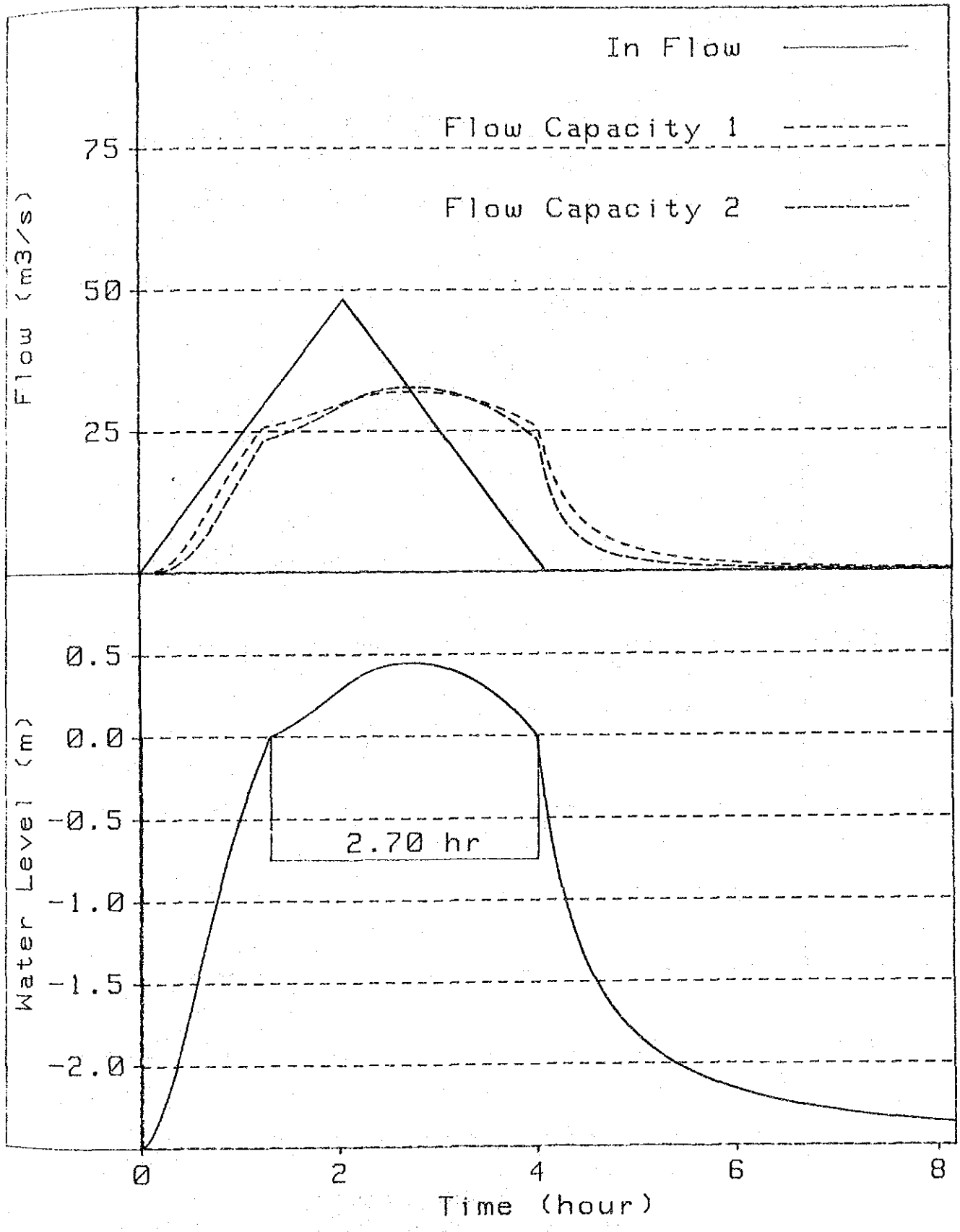

Note: Capacity 1 is for Check Point
Capacity 2 is for Cano

Fig.I-3-3 (4) Calculation of Inundation Time
(Caño Venado-2 Existing Condition for Return Period 1/20)



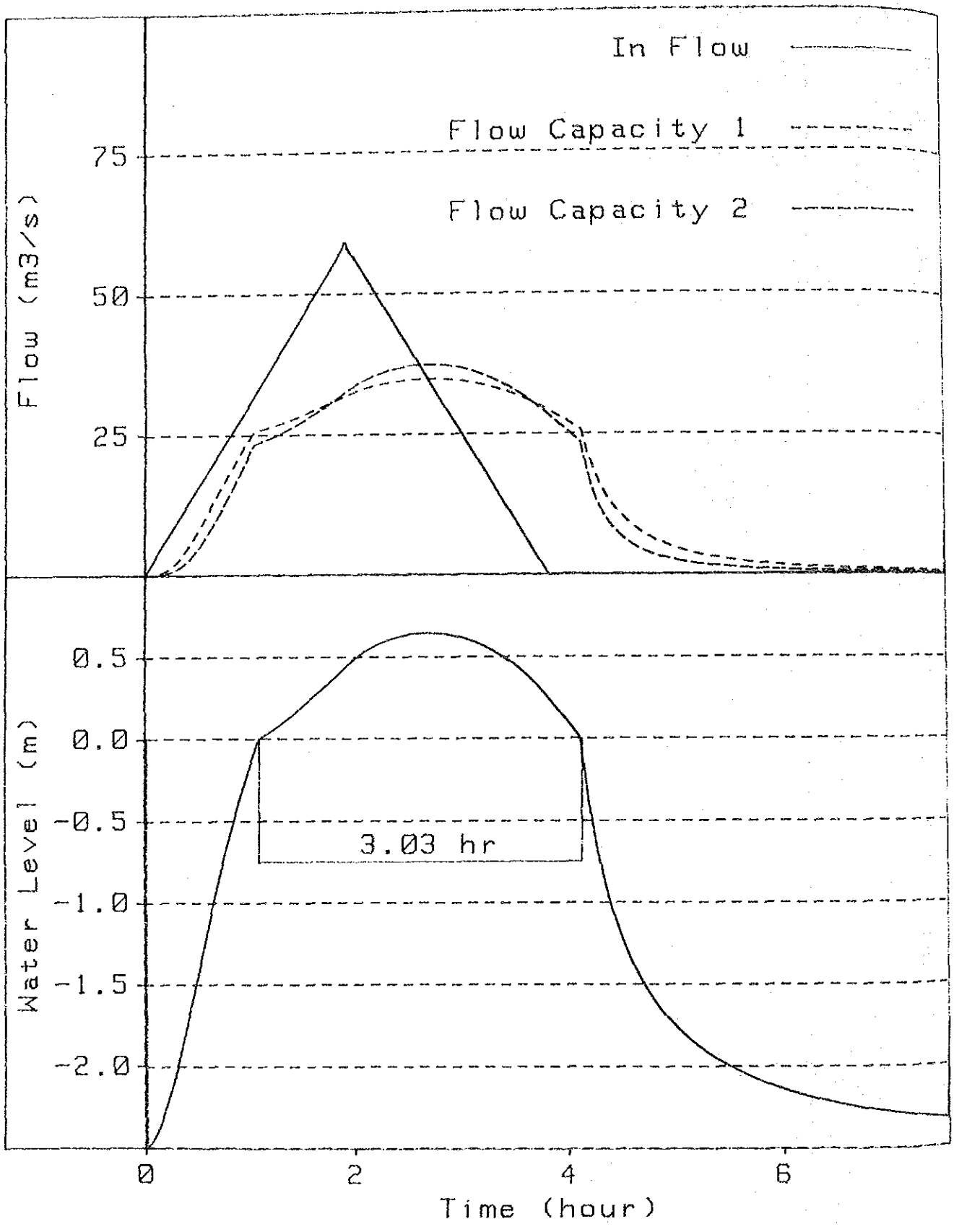

Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (5) Calculation of Inundation Time
(Caño Venado-2 Proposed Plan for Return Period 1/2)



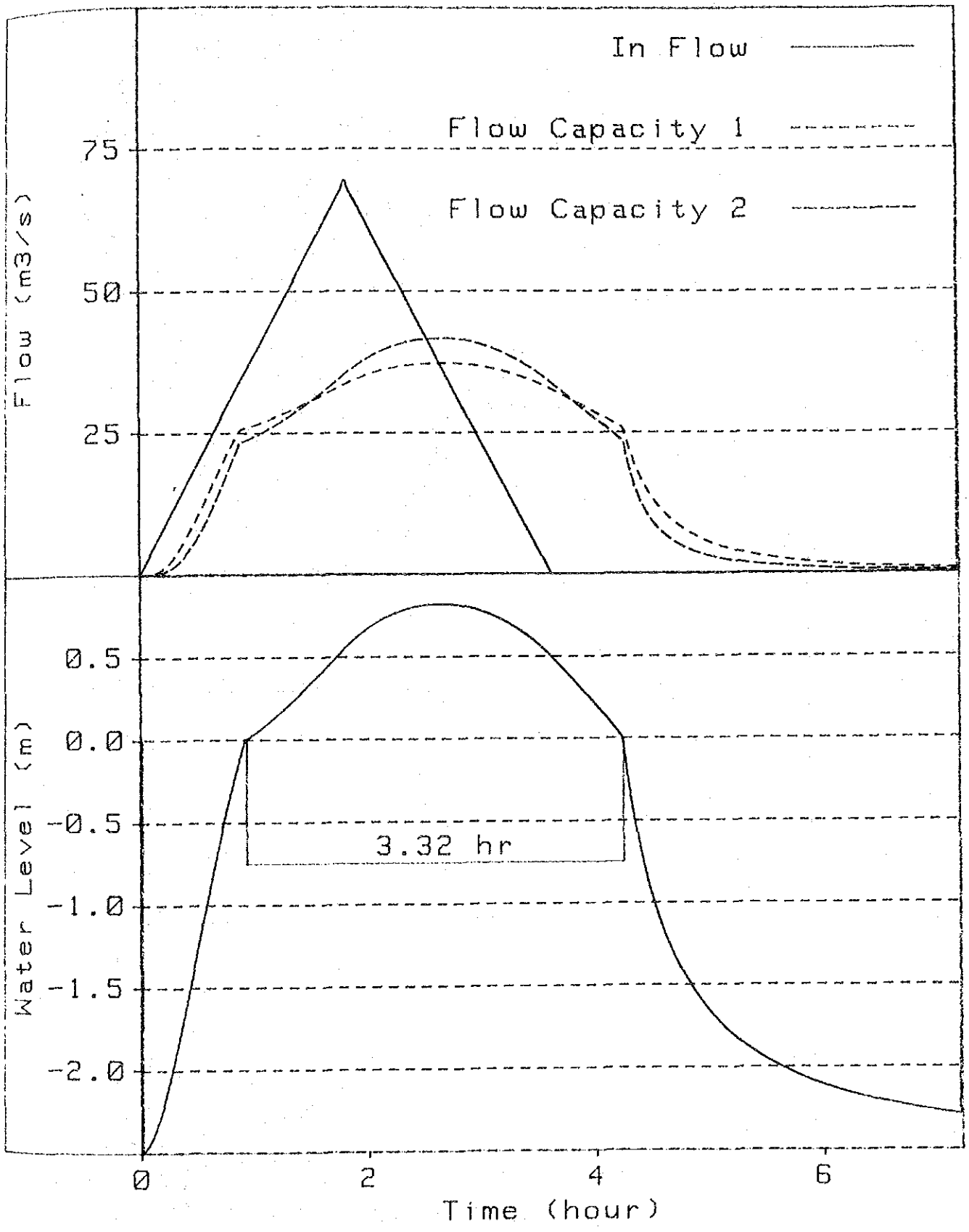

Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (6) Calculation of Inundation Time
(Caño Venado-2 Proposed Plan for Return Period 1/5)



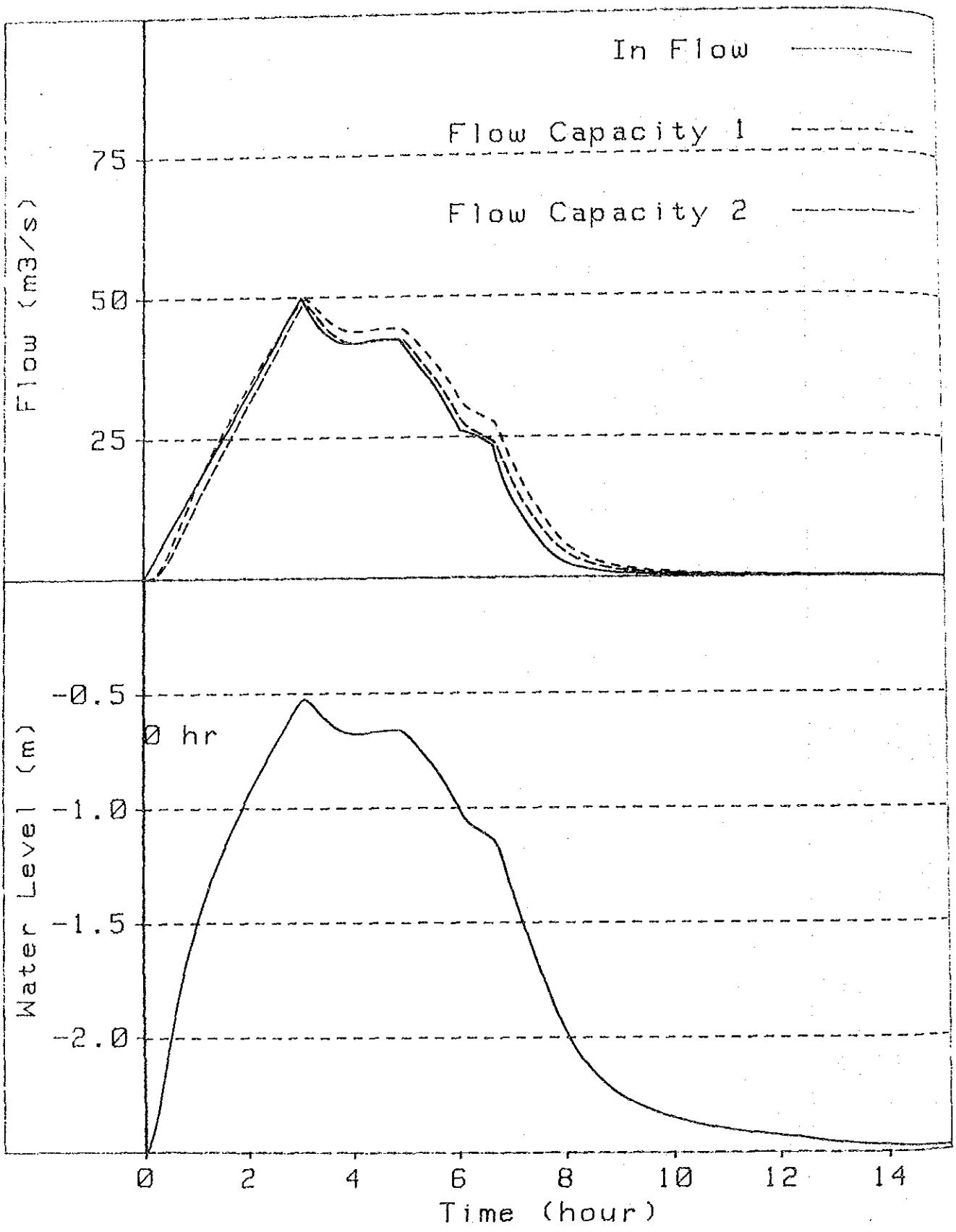

Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (7) Calculation of Inundation Time
(Caño Venado-2 Proposed Plan for Return Period 1/10)



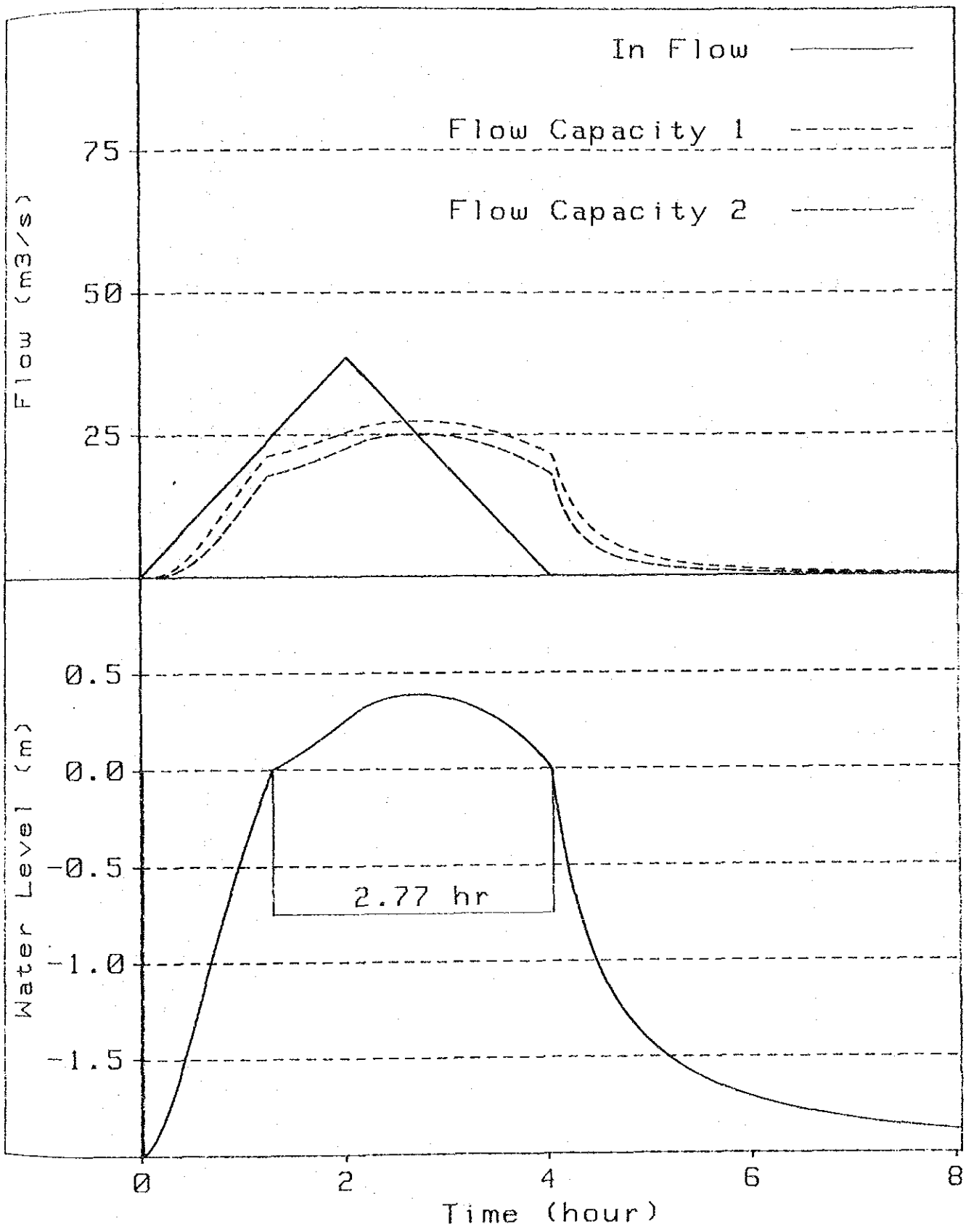

Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (8) Calculation of Inundation Time
(Caño Venado-2 Proposed Plan for Return Period 1/20)



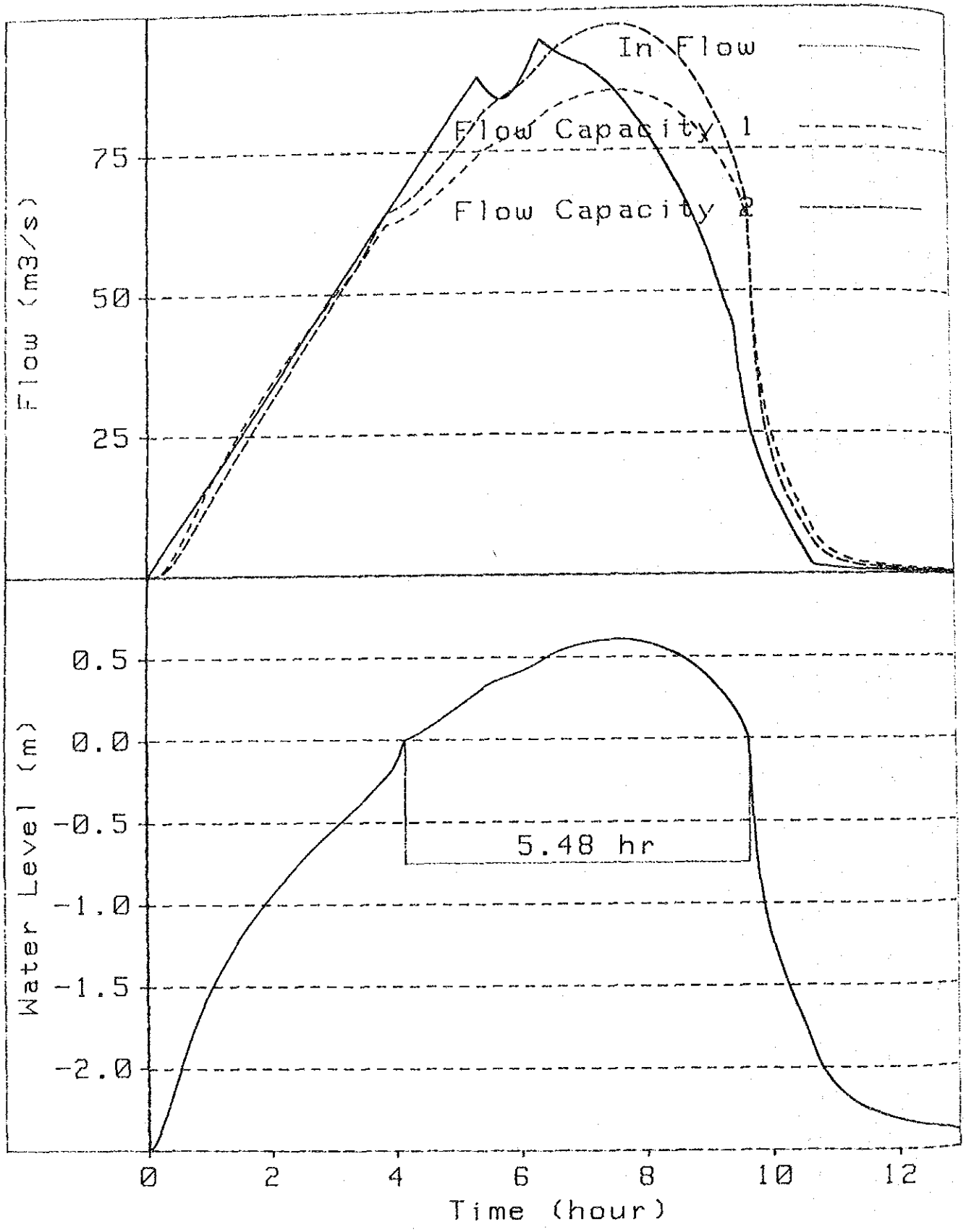

Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (9) Calculation of Inundation Time
(Caño Venado-1 Proposed Plan for Return Period 1/2)



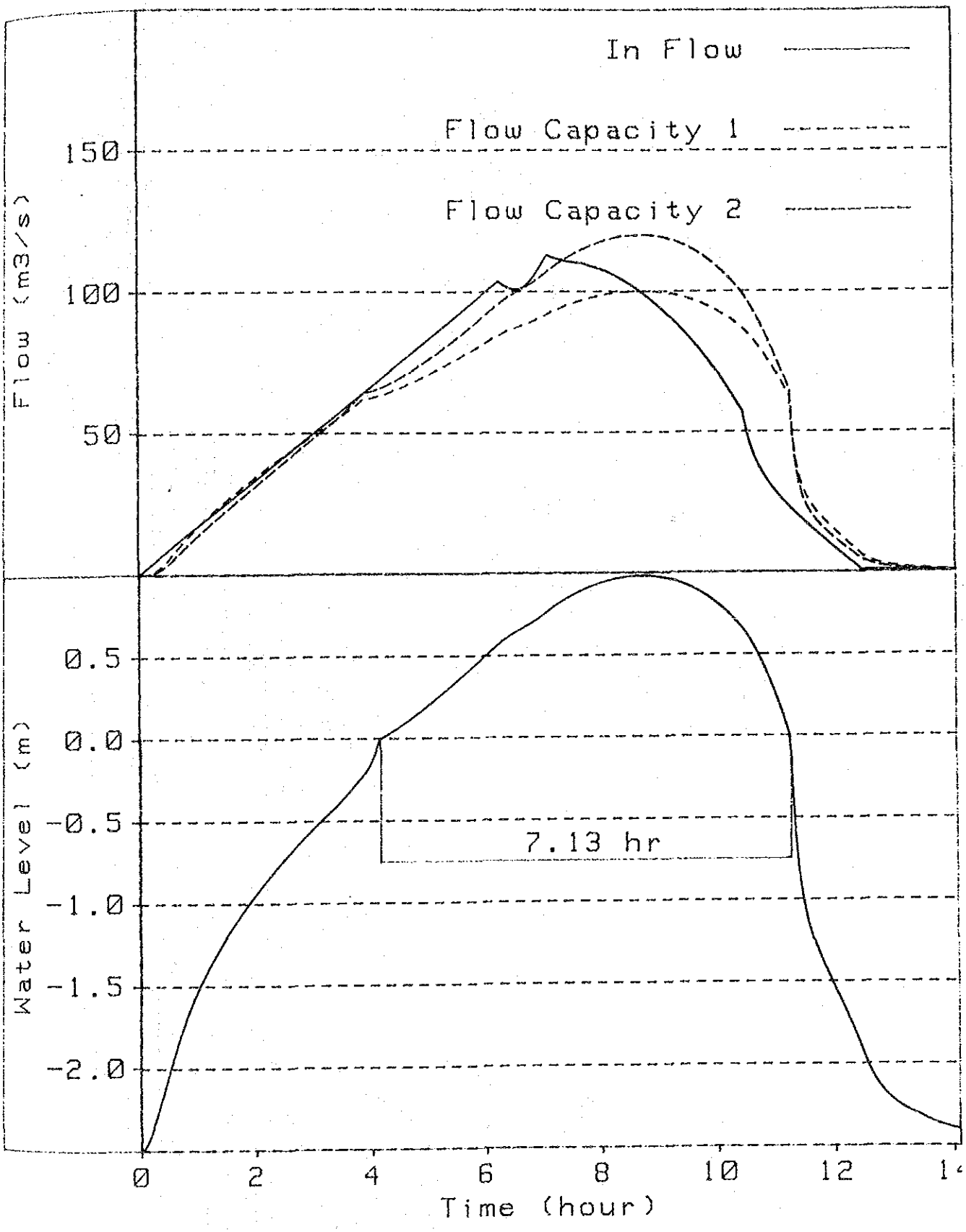

Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (10) Calculation of Inundation Time
(Caño Venado-1 Proposed Plan for Return Period 1/5)




Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (11) Calculation of Inundation Time
(Caño Venado-1 Proposed Plan for Return Period 1/10)




Note:Capacity 1 is for Check Point
Capacity 2 is for Caño

Fig.I-3-3 (12) Calculation of Inundation Time
(Caño Venado-1 Proposed Plan for Return Period 1/20)

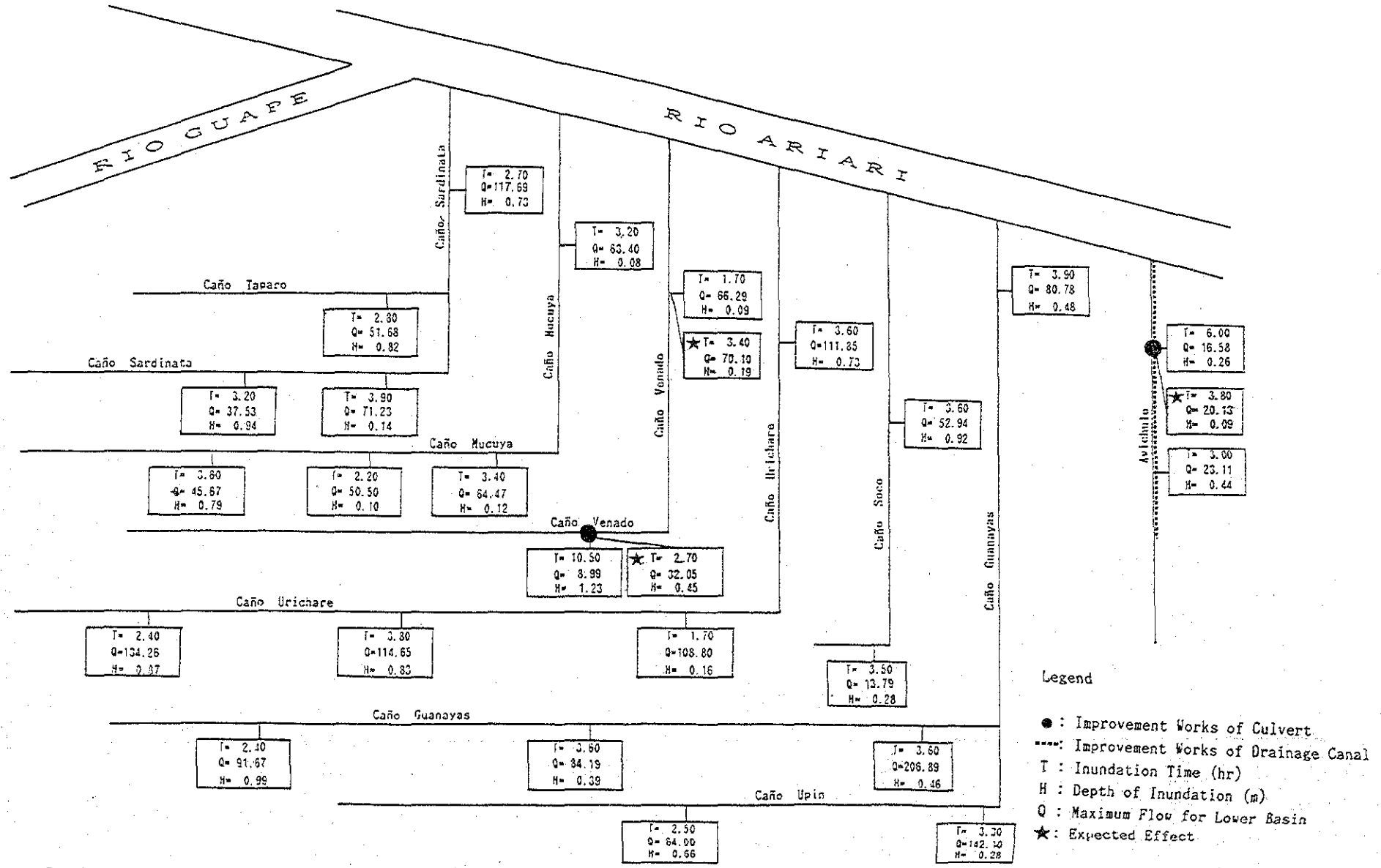



Fig. I-3-4 Drainage System Plan

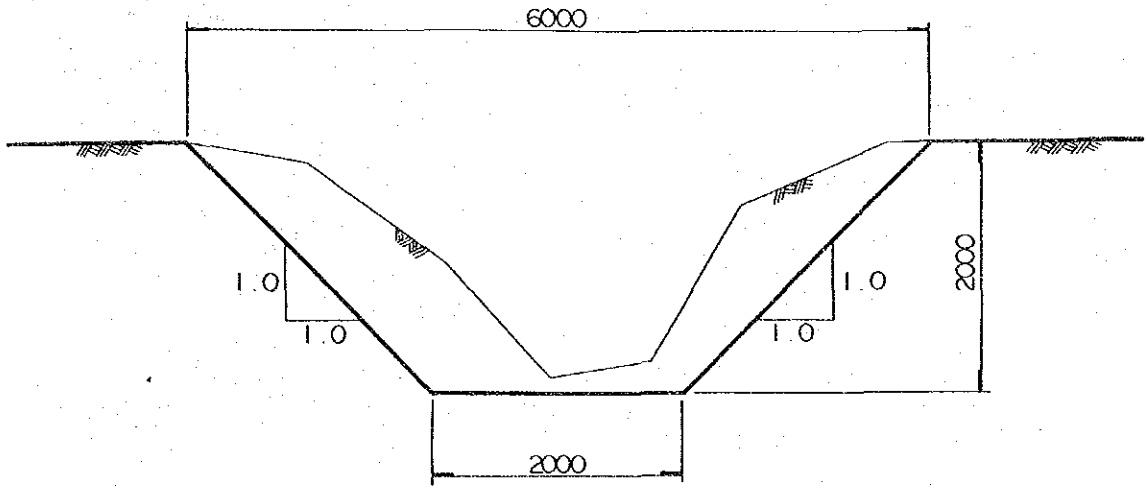



Fig. I-3-5 Standard Section of Drainage Canal

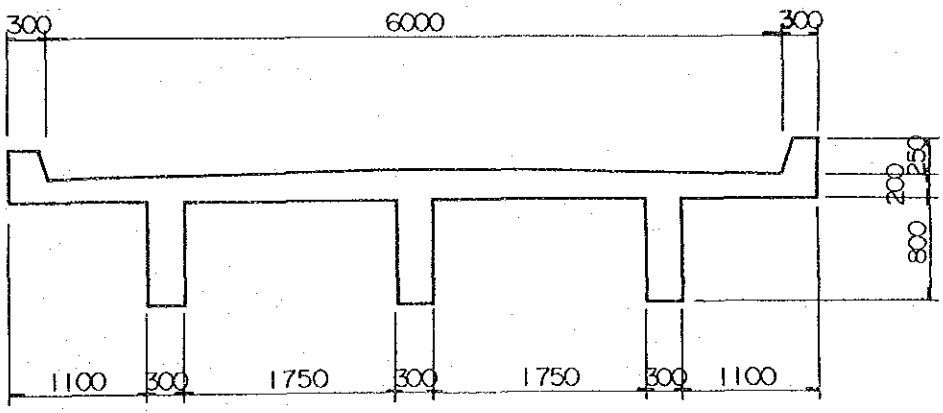



Fig. I-3-6 Standard Section of Drainage Bridge

# ANNEX J : LAND CONSERVATION AND DISASTER PREVENTION

# ANNEX J : LAND CONSERVATION AND DISASTER PREVENTION

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# ANNEX J : LAND CONSERVATION AND DISASTER PREVENTION

## J.1 General

The disaster prevention work which forms a link in the chain of the Plan Nacional de Rehabilitacion (PNR) is executed in the Project area.

Therefore, the studies on land conservation and disaster prevention in this chapter (Annex J) are made for the bounds, which have been effected on directly agricultural production by flooding.

## J.2 Present Condition

### J.2.1 General

Damages to farmlands in the study area are mainly caused by flooding in rainy season and by bank erosion of the Guape and Ariari Rivers. No soil erosion such as galley and rill have been occurred in the study area.

### J.2.2 Flooding

On the result of the field survey, the situations of floodings along the Guape and Ariari Rivers were clarified as follow;

- The area between the crotch of Cubillera tributary which is diverted from the Guape River and its confluence with the Ariari River.

- The area between the confluence of the Ariari River and the Cubillera tributary and Puerto Cardas.

In these sections, terraces are not so developed as to protect the flood then the flood flows over the banks. As the Guape River is steep in a longitudinal gradient, and is wide, the variation of the water level by flooding is rather small. Therefore, it is notable that the flooded areas are narrow in width but long in length from upstream and downstream.

- The area extended to 5 km upstream from the confluence of Mogotes River and the Ariari River.

The Ariari River branches at Puerto Cardas, then joins again near Verda Puerto Nuevo, wherein the Cano Mogotes, a small river also flows in. These area are inundated by flooding once every two or three years with a depth of 50 to 60 cm and the vegetation is groves and plantain.

### J.2.3 Bank Erosion

Bank erosion occurs along the Guape River, Cubillera River and Ariari River. At the section where main streams close together and lower parts (talus) of the river terrace are formed of sandy-gravel

deposit, bank erosion is advanced not only during high water period but also low water period. These situations can be seen remarkably along the river about 30 km downstream from Puerto Cardas.

## J.3 Development Plan

### J.3.1 Flood Protection Plan

(1) Scope of Works

The conditions of the river in the upper zone are wide and steep in gradient, it is rarely the cases that the flood flow over the banks in rainy season. And the inundated lands are spread longitudinally along the river, while there are many non-cultivated lands which are classified into lower classes. Therefore, the upper zone is eliminated from the project area.

Considering the economy of countermeasures for the flooded area (205 ha) of Puerto Nuevo in the lower zone, the construction scheme has been examined.

(2) Flooding Occurrence and Extent

1) Flooding Occurrence

Based on the field survey, it was founded that flooding in the Puerto Nuevo occurs once every two or three years with inundation depth of 50 to 60 cm and a duration of about a half day.

2) Extent of Flooding

The situations of flooding over both banks of the Ariari River and Cano Mogotes are as shown in Fig. J-3-1, and the inundated areas are utilized as shown below;

| Land Use | Inundated Area(ha) |
|---|---|
| Pasture | 20 |
| Plantain | 150 |
| Forest | 35 |
| Total | 205 |

(3) Construction Cost and benefit

1) Construction Cost

Construction of levees along the Ariari River and sluice gate settled at the river mouse of the Cano Mogotes is schemed. The construction cost for these facilities is estimated as follows.

Table J-3-1 Construction Cost for Flood Protection Work

(Unit: Col.$1,000)

| Description | Construction Cost | Remarks |
|---|---|---|
| Levee | 25,650 | Height: 1.50 m<br>Length: 3.8 km |
| Sluice Gate | 13,500 | Width : 3.00 m<br>Height: 2.00 m<br>Unit : 3 |

2) Benefit

The increase of agricultural products by implementation of the flood protection facilities is expected, and the annual incremental benefit is estimated to be Col.$ 3,750,000 which brings by 5 % upgrading in yield of the plantain.

(3) Conclusion

Indices for the project evaluation, such as IRR and B/C correspond to the above-mentioned construction cost and benefit were analyzed with an assumption of 50 years as the project life. The results are shown in Table J-3-2 and Table J-3-3.

Estimated IRR and B/C are 10.5 % and 0.9, respectively. The indices are comparatively low and it suggests that exclusion of flood protection work from an agricultural development project is desirable, since, the all construction cost shall be born by the beneficiaries.

However, after the living environment in this district has been improved and living standards has been upgraded by implementation of the agricultural development project, flood protection works for prevent inundation of farmlands and habitations shall be executed as a public work.

J.3.2 Bank Erosion Control Plan

(1) General

Based on the program "PNR", river training works for the left bank of the Ariari River have been carried out mainly by HIMAT. However, it is recommended that the countermeasures for the lower zone, where bank erosion has been in an advanced stage shall be executed by the project. (Agricultural development project) while for the other areas shall be carried out under the "PNR" program.

(2) Scope of Works

The following three sections as shown in Fig. J-3-2 have been selected as a priority project

- Section of 1.0 km, near Puerto Cardas community (Puerto Cardas)
- Meandering section of 1.0 km where "Trocha 5" runs along the Ariari River (Cano Venado)
- Meandering section of 2.0 km of the Ariari River near La Cooperativa (La Cooperativa)

(3) Countermeasures

The lower part of the banks and a river bed composed of sandy-gavel have been eroded, then a revetment works are proposed. This plan shall be adjusted to "Flood Protection Plan and Bank Erosion Control Plan" of HIMAT. Taking account of the situations of bank erosion in the area and the construction costs of these facilities, the foot-protection work and foot-protection gabion work are recommended, which controls the scouring of the river bed and protects the lower part of the bank.

(4) Design Criterion of Facilities

1) Design Flood Discharge and Flood Depth

The design flood discharge and depth at the proposed site are decided after hydraulic analysis. The results are as shown below;

Table J-3-4 Design Flood discharge

(Unit: m3/s)

| Location | D.A (km2) | Return Period 1/2 | 1/5 | 1/10 | 1/20 |
|---|---|---|---|---|---|
| Puerto Cardas | 3,012 | 723 | 819 | 905 | 922 |
| Cano Venado | 3,100 | 741 | 840 | 924 | 945 |
| La Cooperativa | 3,160 | 754 | 854 | 937 | 961 |

Table J-3-5 Design Flood Depth

(Unit: m)

| Location | Return Period | | Remarks |
|---|---|---|---|
| | 1/10 | 1/20 | |
| Puerto Nuevo | 1.106 | 1.187 | I=1/280, B=500 |
| Cano Venado | 2.179 | 2.341 | I=1/400, B=200 |
| La Cooperativa | 2.159 | 2.319 | I=1/370, B=200 |

Taking into account of the costs and benefits on construction of the facilities, the capacities correspond to the return period T=1/10 years are recommendable.

2) Dimensions of Facilities

Concerning the revetment work, laying of gavions filled with boulder and concrete blocks (about one ton/pc. weight) are recommended for the sites of the Puerto Cardas and the Cano Venado and La Cooperativa respectively as shown in Table J-3-6 and Fig J-3-3.

Table J-3-6 Dimensions of Proposed Revetment work

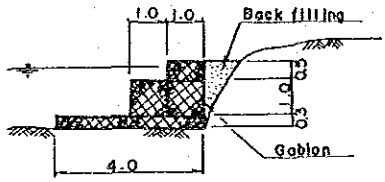
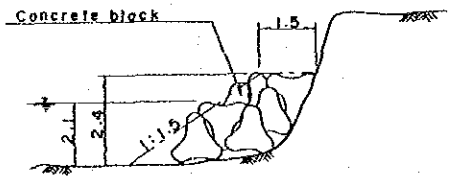
| Location | Item | Dimensions |
|---|---|---|
| Puerto Cardas | Length | 1,000 m |
| | Section |  |
| Cano Venado | Length | 1,000 m |
| La Cooperativa | Length | 2,000 m |
| | Section |  |

Table J-3-2 Estimation of IRR for Flood Protection Work

| Year | Const. Cost | Project Cost | Incre. Benefit | Project Return |
|---|---|---|---|---|
| 1 | 39,150 | 39,150 | 3,750 | -35,400 |
| 2 | | 0 | 3,750 | 3,750 |
| 3 | | 0 | 3,750 | 3,750 |
| 4 | | 0 | 3,750 | 3,750 |
| 5 | | 0 | 3,750 | 3,750 |
| 6 | | 0 | 3,750 | 3,750 |
| 7 | | 0 | 3,750 | 3,750 |
| 8 | | 0 | 3,750 | 3,750 |
| 9 | | 0 | 3,750 | 3,750 |
| 10 | | 0 | 3,750 | 3,750 |
| 11 | | 0 | 3,750 | 3,750 |
| 12 | | 0 | 3,750 | 3,750 |
| 13 | | 0 | 3,750 | 3,750 |
| 14 | | 0 | 3,750 | 3,750 |
| 15 | | 0 | 3,750 | 3,750 |
| 16 | | 0 | 3,750 | 3,750 |
| 17 | | 0 | 3,750 | 3,750 |
| 18 | | 0 | 3,750 | 3,750 |
| 19 | | 0 | 3,750 | 3,750 |
| 20 | | 0 | 3,750 | 3,750 |
| 21 | | 0 | 3,750 | 3,750 |
| 22 | | 0 | 3,750 | 3,750 |
| 23 | | 0 | 3,750 | 3,750 |
| 24 | | 0 | 3,750 | 3,750 |
| 25 | | 0 | 3,750 | 3,750 |
| 26 | | 0 | 3,750 | 3,750 |
| 27 | | 0 | 3,750 | 3,750 |
| 28 | | 0 | 3,750 | 3,750 |
| 29 | | 0 | 3,750 | 3,750 |
| 30 | | 0 | 3,750 | 3,750 |
| 31 | | 0 | 3,750 | 3,750 |
| 32 | | 0 | 3,750 | 3,750 |
| 33 | | 0 | 3,750 | 3,750 |
| 34 | | 0 | 3,750 | 3,750 |
| 35 | | 0 | 3,750 | 3,750 |
| 36 | | 0 | 3,750 | 3,750 |
| 37 | | 0 | 3,750 | 3,750 |
| 38 | | 0 | 3,750 | 3,750 |
| 39 | | 0 | 3,750 | 3,750 |
| 40 | | 0 | 3,750 | 3,750 |
| 41 | | 0 | 3,750 | 3,750 |
| 42 | | 0 | 3,750 | 3,750 |
| 43 | | 0 | 3,750 | 3,750 |
| 44 | | 0 | 3,750 | 3,750 |
| 45 | | 0 | 3,750 | 3,750 |
| 46 | | 0 | 3,750 | 3,750 |
| 47 | | 0 | 3,750 | 3,750 |
| 48 | | 0 | 3,750 | 3,750 |
| 49 | | 0 | 3,750 | 3,750 |
| 50 | | 0 | 3,750 | 3,750 |
| Total | 39,150 | 39,150 | 187,500 | 148,350 |

Estimated FIRR = 10.5%

Table J-3-3 Estimation of B/C for Flood Protection Work

| Year | Const. Cost | Incre. Benefit | N.P.V(D.R = 12%) C. Cost | I. B. |
|---|---|---|---|---|
| 1 | 39,150 | 3,750 | 34,955 | 3,348 |
| 2 | | 3,750 | | 2,989 |
| 3 | | 3,750 | | 2,669 |
| 4 | | 3,750 | | 2,383 |
| 5 | | 3,750 | | 2,128 |
| 6 | | 3,750 | | 1,900 |
| 7 | | 3,750 | | 1,696 |
| 8 | | 3,750 | | 1,515 |
| 9 | | 3,750 | | 1,352 |
| 10 | | 3,750 | | 1,207 |
| 11 | | 3,750 | | 1,078 |
| 12 | | 3,750 | | 963 |
| 13 | | 3,750 | | 859 |
| 14 | | 3,750 | | 767 |
| 15 | | 3,750 | | 685 |
| 16 | | 3,750 | | 612 |
| 17 | | 3,750 | | 546 |
| 18 | | 3,750 | | 488 |
| 19 | | 3,750 | | 435 |
| 20 | | 3,750 | | 389 |
| 21 | | 3,750 | | 347 |
| 22 | | 3,750 | | 310 |
| 23 | | 3,750 | | 277 |
| 24 | | 3,750 | | 247 |
| 25 | | 3,750 | | 221 |
| 26 | | 3,750 | | 197 |
| 27 | | 3,750 | | 176 |
| 28 | | 3,750 | | 157 |
| 29 | | 3,750 | | 140 |
| 30 | | 3,750 | | 125 |
| 31 | | 3,750 | | 112 |
| 32 | | 3,750 | | 100 |
| 33 | | 3,750 | | 89 |
| 34 | | 3,750 | | 80 |
| 35 | | 3,750 | | 71 |
| 36 | | 3,750 | | 63 |
| 37 | | 3,750 | | 57 |
| 38 | | 3,750 | | 51 |
| 39 | | 3,750 | | 45 |
| 40 | | 3,750 | | 40 |
| 41 | | 3,750 | | 36 |
| 42 | | 3,750 | | 32 |
| 43 | | 3,750 | | 29 |
| 44 | | 3,750 | | 26 |
| 45 | | 3,750 | | 23 |
| 46 | | 3,750 | | 20 |
| 47 | | 3,750 | | 18 |
| 48 | | 3,750 | | 16 |
| 49 | | 3,750 | | 15 |
| 50 | | 3,750 | | 13 |
| Total | 39,150 | 187,500 | 34,955 | 31,142 |

Estimared B/C = 0.9

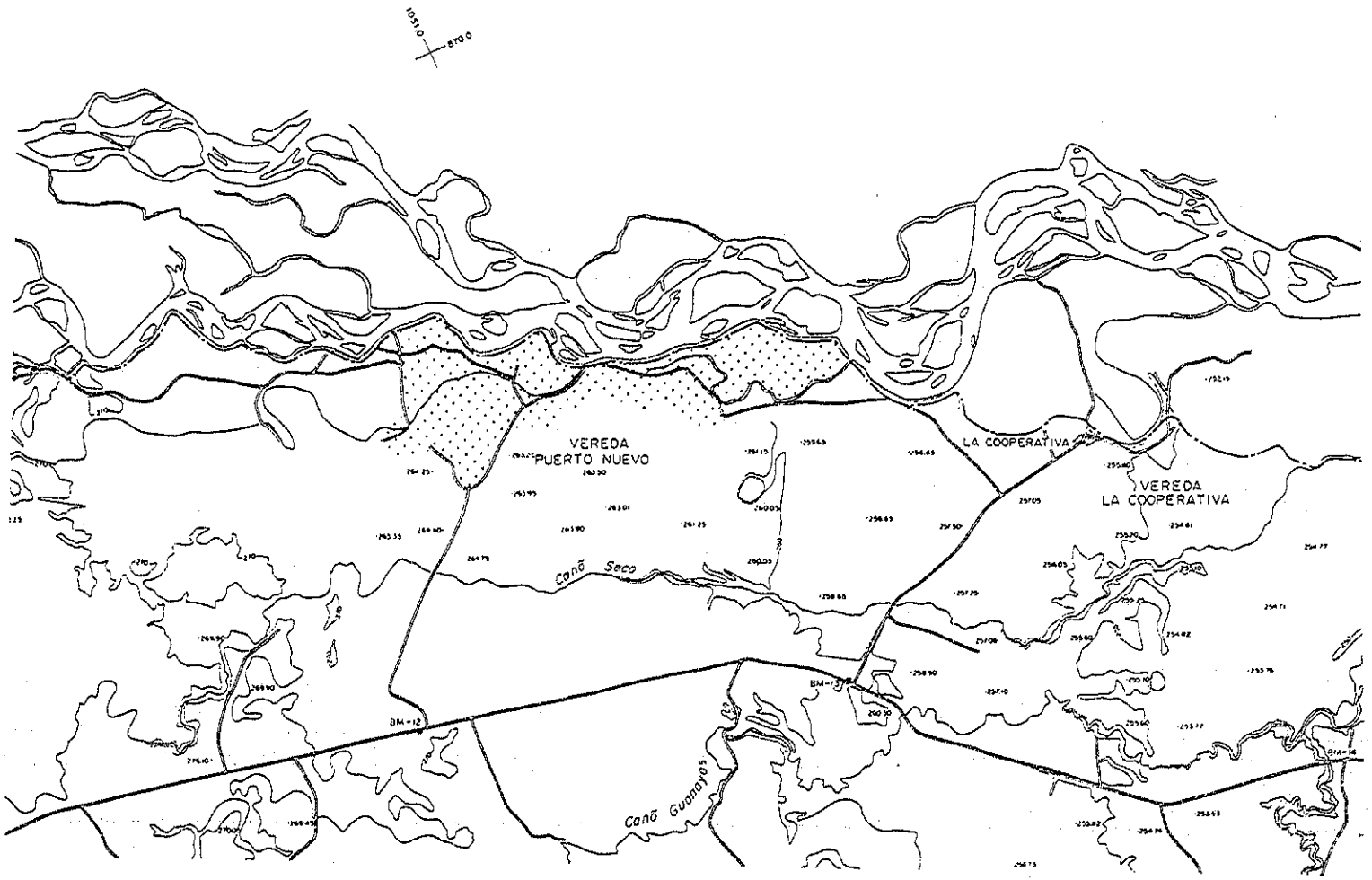



Fig. J-3-1 Flooded Area

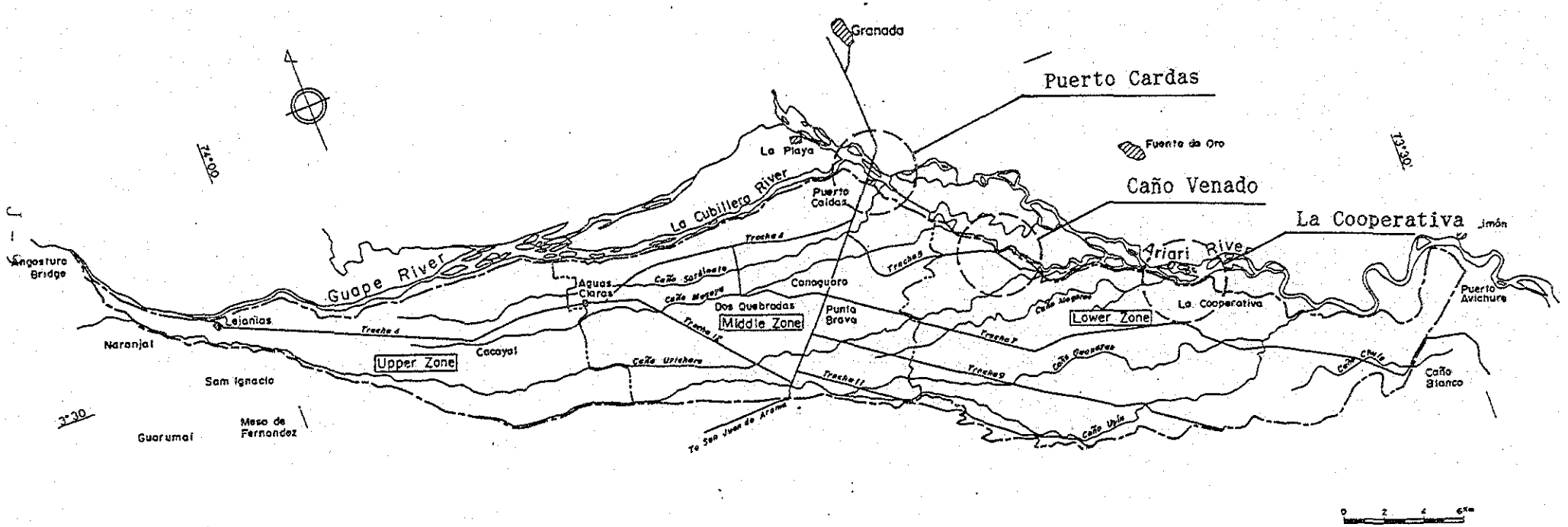
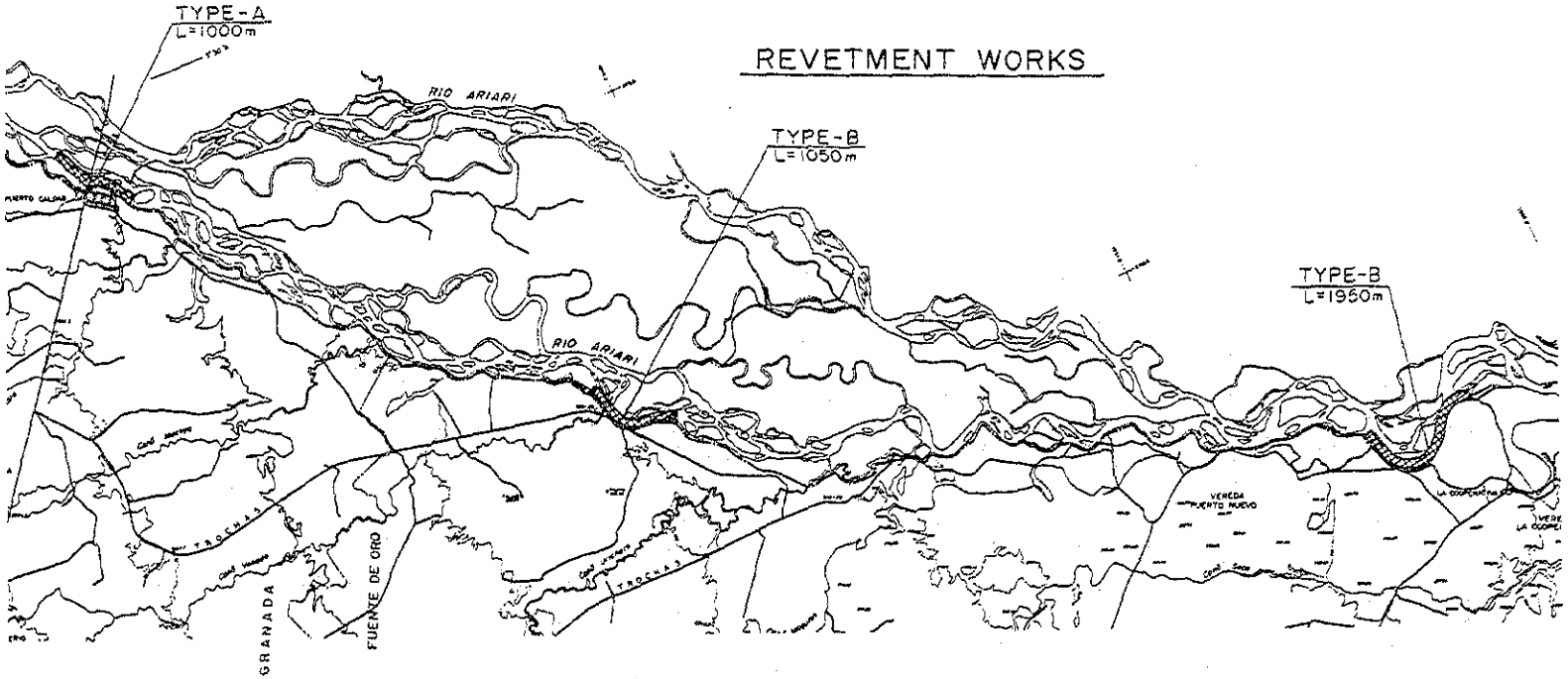
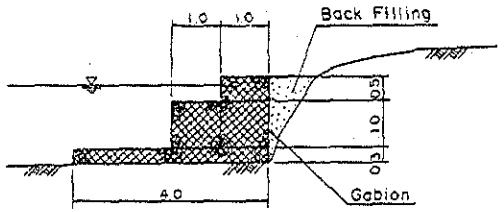
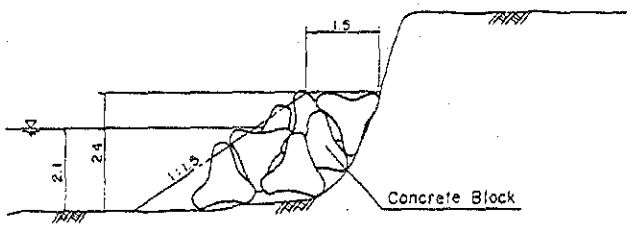



Fig. J-3-2 Eroded Area




TYPE-A




TYPE-B

Fig. J-3-3 General Plan of Levetment

# ANNEX K : RURAL INFRASTRUCTURE

# ANNEX K : RURAL INFRASTRUCTURE

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# ANNEX K : RURAL INFRASTRUCTURE

## K.1 Introduction

The rural infrastructure forms the living base of rural inhabitants with public interests. For this project, which concerns a specific kind of person, it is difficult to summarize the whole rural infrastructure in this project. This annex relates primarily to the study of rural infrastructures directly concerned with agricultural production.

## K.2 Present Condition

### K.2.1 Road Network

As shown in Fig. K-2-1, the present road network includes a national road at the center of the study area from Villavicencio, capital of Meta department, through San Juan de Arama via Granada. The national road ia two-lane road and presently paved by MOPT.

The national road plays an important role in the transportation of agricultural input and agricultural products in the area.. It is regarded as a lifeline in the study area and the southern region.

From this national road, there are two routes (Trocha 4 and 12 departmental roads) bound for Lejanias in the upper zone and four routes (Trocha 5, 7, 9 and 11 departmental roads) bound for Cano Blanco in the lower zone. Furthermore, there exist farm roads and private roads connecting farms from departmental road.

Among these departmental roads, "Trocha 4" which is connects to the national road and Lejanias, has heavy traffic and plays an important role for the upper zone. About 50% of the roads are paved, but the maintenance is not managed properly and smooth traffic of vehicles is now disturbed. Other departmental roads have a width of 5 m paved with gravel, and there are no traffic jams.

The road density including farm roads in the study area is about 10 m/ha , as shown in Table K-2-1, and function of the road network is somewhat meager.

Table K-2-1 Existing Road Density

| Zone | Length (km) | Road density (m/ha) |
|---|---|---|
| Upper | 121 | 13 |
| Middle | 169 | 11 |
| Lower | 164 | 10 |
| Total | 454 | 11 |

### K.2.2 Electric Service and Telecommunication

Electric power is supplied by E.M.S.A to the urban area in Granada but not to the study area. However, some villages (Lejanias, Aguas Claras, Puerto Cardas, Dos Quebtadas and Canaguaro) in the area have their own power generating plant as shown in Table K-2-2 and some farmers are equipped with a small scale generator or a storage battery harnessing solar heat.

Regarding communication system in the study area, some stations of TELECOM are established at Lejanias, Aguas Claras, Puerto Cardas and Canaguaro. In addition, some relatively large scale farmers have a radio-telephone system.

### K.2.3 Water Supply and Sewerage

In the villages of the study are, small scale public waterworks as shown in Table K-2-3, which make use of well or river as their sources, are utilized. Some farmers take domestic water from private wells.

In some parts of Lejanias, canaguaro and Puerto Cardas, a sewerage system is partly furnished but other areas are not.

### K.2.4 Education

As for educational facilities, in three municipalities including the study area there exist seven kindergarten, 76 primary schools and 11 secondary schools as shown in Table K-2-4.

Despite the considerable number of primary schools, installation of secondary school is less than 10 % of the primary school at present. Also, there is a general shortage of education material and equipment.

### K.2.5 Medical Care

The study area falls under the jurisdiction of Granada Regional Hospital as shown in Fig. K-2-2. Medical care is offered by Granada Regional Hospital, public central health centers at Lejanias and Fuente de Oro and Public centers at Canaguaro, Aguas Claras, Dos Quebradas and LA Cooperativa. However, medical care service is insufficient at present because of lack of materials, devices, doctors and nurses.

## K.3 Development Plan

### K.3.1 General

The rural infrastructure is of national rather than regional interest, and it is difficult to cover entirely in the proposed project. Currently, the development of rural infrastructure is being carried out by the concerned authorities in accordance with the program "PNR" as shown in Table K-3-1. Therefore, in this project the road improvement plan which has direct influences over the efficiency of agricultural production and has high priority ia carried out.

Therefore, in this project, rural infrastructure which is directly concerned with the agricultural production and has comparatively high priority, will be planned.

Table K-3-1 Infrastructure Improvement Plan based on "PNR"

| Improvement Plan | Concerned Authority |
|---|---|
| Road Improvement Plan ..... | MOPT, FNCV |
| Telecommunication and Electric Plan ..... | TELECOM, EMSA, ICEL |
| Education Facilities Improvement Plan ..... | MUNICI.-SEC. META |
| Public Medical Improvement Plan ..... | S.S.S META |
| Water Supply and Sewerage Improvement Plan .. | FONAM |

### K.3.2 Road Improvement Plan

(1) Basic Plan

By the improvement of "Trocha 4" in quality and the the construction of service roads along the irrigation canals and farm road based on the land consolidation plan, the road network in the whole are will be planned.

It is considered that a road network including service roads along the irrigation canals and farm roads to be constructed in this project and farm roads is satisfied in quantity.

The department road "Trocha 4", which is one of the existing roads, is a principal route which connects the national road to Lejanias municipality. At present, a part of its road has been surfaced with asphalt but the pavement is in bad condition. For this road, the benefit through reduction of fruits' damage loss, such as Papaya cultivated at Lejanias and surrounding area is sufficiently expected. Therefore, the asphalt pavement improvement is planned. For the other departmental roads, an improvement plan which adjusts to one on FNCV is planned.

The service roads will be constructed along those principal and secondary canals which will not run along the existing roads.

(2) Lengths of Proposed Roads

The total length of roads including service roads proposed on the basis of the irrigation and drainage plan will be 1,002 km as shown in Table K-3-2 and Fig. K-3-1.

Table K-3-2 Proposed Road Density

| Zone | Existing Road (km) | Service Road (km) | Farm Road (km) | Total (km) | Agricultural Land (ha) | Road Density (m/ha) |
|---|---|---|---|---|---|---|
| Upper | 121 | 36 | 71 | 228 | 9,100 | 25 |
| Middle | 169 | 77 | 150 | 396 | 15,400 | 26 |
| Lower | 164 | 77 | 137 | 378 | 16,600 | 23 |
| Total | 454 | 190 | 358 | 1,002 | 41,100 | 25 |

(3) Cross-Sectional

The cross-section of proposed roads will be planned considering the existing agricultural roads. Their specific features will be shown in Fig. K-3-2 and Table K-3-3.

Table K-3-3 Dimensions of Proposed Roads

| Item | Trocha 4 | Service Road | | Farm Road |
|---|---|---|---|---|
| | | Type A | Type B | |
| Total Width (m) | 8.0 | 8.0 | 6.0 | 4.0 |
| Effective Width (m) | 6.0 | 6.0 | 4.5 | 3.0 |
| Pavement | Asphalt | Gravel | Gravel | Gravel |
| Pavement Thin (cm) | 7 | 20 | 20 | 20 |

K.3.3 Mini-Hydroelectric Power Station Plan

For the steady electric-power supply in the area, the following three plans will be considered;

- to use hydro-electric power generation plant planned by ICEL at the upper stream of the Guape River,
- to use mini hydro-electric power generation plant which may be constructed in this project and
- to expand the transmission line, which at present transmits electricity to Granada, in order to cover farther areas.

Feasibility of these three plans is will be studied.

(1) Guape River Power Station Plan

The plan was formed by ICEL and its outline is for a gravity dam to be constructed 300 m upstream from the Angosturas bridge, to generate 33,000 kw power for supply to Lejanias, Mesetas and San

Juan de Arama. However, this plan is not yet realized because of the budget and priority problems.

(2) Power network Expansion Plan

A power transfer network plan, as shown in Table K-3-4 and Table K-3-5, has been planned by ICEL and EMSA. The plan proceeds in accordance with the PNR program, and supply of power to the study are will start by 1991.

(3) Mini-Hydroelectric Power Station Construction Plan

Since the upper zone of the study area is steep geographically (average longitudinal slope I=1/80 to 1/100), an effective head can be obtained from the geographical features utilizing water in the irrigation principal canal constructed by this project. Therefore, the construction of an inflow type mini-hydroelectric power station will be available.

1) Diagram of Power Station Plan

A layout of the mini-hydroelectric power station, which utilizes an irrigation principal canal for power generation, is shown in Fig. K-3-3. The water taken at headworks constructed on the Guape River flows down toward the lower zone through the principal canal. At the intake gate installed at principal canal, the water is divided into the power station though a penstock from the Principal canal, where power generation is carried out utilizing the difference of head. Used water at the power generation plant flows again into the principal canal. Surplus water is discharged into Guape River through the floodway.

2) Available Water for Power Generation

The estimated discharge at the headworks on the Guape River is shown in Table K-3-6 and Fig. K-3-4. Toward these discharges, since the diversion water requirement is approximately 36 m3/s, lower discharge than the diversion water requirement is available for the power generation.

3) Effective Different of Head

The effective difference of head for the power output can be expressed by the water level difference between intake and outlet water levels. Accordingly, taking account of the geographical gradient of the area (I=1/100) and allowable length of penstock, the effective difference of head for the power generation is estimated as around 10 m.

4) Maximum Power output

The maximum power output (P) under the condition mentioned above is calculated as follows;

$$P = 9.8 \times \eta_t \times \eta_g \times Q \times H$$

where
$\eta_t$ : turbine efficiency
$\eta_g$ : generating efficiency
Q : discharge
H : Effective difference of head

$$P = 9.8 \times 0.86 \times 0.94 \times 36.0 \times 10.0$$
$$= 2,852 \text{ (kw)}$$

5) Annual Power Generation

The annual power generated under the following condition is 23.2 Mkw with a utility rate of 93%, as shown in Table K-3-7.

6) Facility Plan

A layout of the mini-hydroelectric power station under the conditions mentioned above is shown in Fig. K-3-5.

7) Construction Cost

The construction cost of mini-hydroelectric power station plan will be approximately estimated as follows.

Table K-3-8 Construction Cost of Mini-hydroelectric Power Station

(Unit: U.S.$1,000)

| Description | Cost | Remarks |
|---|---|---|
| Civil works | 2,070 | |
| Intake Equipment | 960 | |
| Mechanical Equipment | 2,760 | |
| Electric Equipment | 3,380 | |
| Tailrace Structure | 210 | including draft gate |
| Equipment for Power Horse | 690 | |
| Sub-total | 8,000 | |
| Total | 10,070 | |

8) Power Generation Cost

Probability of the power station will be estimated according to indices as follows;

- Construction unit cost and
- Power generation cost.

a) Construction unit Cost

The total construction cost of the power station is expressed by the ratio of maximum power output or power generation as follows:

Construction Cost per kw

$$= \frac{\text{Gross construction cost of power station (U.S.\$)}}{\text{Maximum power output of power station (kw)}}$$

= 10,070/ 2,825
= 35,309 (US$/kw)

Construction cost per kwh

$$= \frac{\text{Gross construction cost of power station (U.S.\$)}}{\text{Annual power generation (kwh)}}$$

= 10,070,000/ 23,310,091
= 0.43 (US$/kwh)

b) Power Generation Cost

The power generation cost is the cost for production, calculated generally by following equation:

Power generation Cost

$$= \frac{\text{Total expenses at power generation terminal}}{\text{Available power supply}}$$

Table K-3-9 Power Generation Cost

(UNIT: US$)

| Description | | | Cost |
|---|---|---|---|
| Total expenses at power generation terminal | Capital | Interest | 2,014,000= (10,070,000)X0.2 |
| | | Depreciation | 201,400=(10,070,000)x0.9/45 |
| | Direct Cost | Running Cost | 58,275=0.0025x23,310,091 |
| | | Repair Cost | 5,704=2,000x2.852 |
| | Total | | 2,273,675 |
| Annual Available power supply | | | 22,144,586=23,310,091x0.95 |

Therefore, the power generation cost will be estimated as follows:

Power generation Cost

= 2,273,675 / 22,144,586
= 0.10 (US$/kwh) = 33.25 (Col.$/kwh)

(4) Conclusion

Taking into account that the actual electricity charge in Colombia is Col.$ 12 to 29/kwh, and that electric power will be supplied to the study area to 1991 by EMSA, the feasibility of constructing a mini-hydroelectric power station by this project is low.

However, when the feature power demand will increase in the this area and near-by area, the feasibility of constructing a mini-hydroelectric power station utilizing the principal canal must be studied as a public work.

Table K-2-2 Electric Power Generating Plant

| Location | Municipal-ity | Capacity | | Type | Remarks |
|---|---|---|---|---|---|
| | | KVA | KW | | |
| Lejanias | Lejanias | 250 | 200 | T | La Junta de Action Comunal |
| Cacayal | Lejanias | 32 | 26 | T | La Junta de Action Comunal |
| Puerto Cardas | Granada | 55 | 35 | T | La Junta de Action Comunal |
| Dos Quebradas | Granada | 32 | 26 | T | La Junta de Action Comunal |
| Canaguaro | Granada | 60 | 48 | T | La Junta de Action Comunal |

NOTE : 'T' signifies a diesel-power electric generating plant.
Souce : INVENTARIO DE PLANTAS HIDRAULICAS Y TERMICAS 1986, ICEL

Table K-2-3 Water Supply Facilities

| Location | | Type | | Popu-lation | Capa-city (l/s) | Water Resouces |
|---|---|---|---|---|---|---|
| Area | Municipality | Gravi. | Pump | | | |
| Dos Quebradas | Granada | ○ | | 385 | 1.2 | Caño |
| Canaguaro | Granada | | ○ | 847 | 2.5 | Well |
| Aguas Claras | Granada | ○ | | 581 | 3.7 | Caño Sardinata |
| Pto. Cardas | Granada | | ○ | 1,015 | 5.1 | Well |
| Lejanias | Lejanias | ○ | | 6,293 | 10.5 | Caño Urichare |
| Cacayal | Lejanias | | ○ | 294 | 2.0 | Well |
| El Topacio | Lejanias | | ○ | 385 | 8.0 | Well |
| Trocha 22-24 | Lejanias | ○ | | 630 | 3.0 | Caño |
| Regional Naranjal | Lejanias | ○ | | 387 | 6.0 | Caño |
| Caño Blanco | Fuente de Oro | | ○ | 119 | 1.2 | Well |

Table K-2-4 Education Facilities

| Item | | Municipality | Number of Student | | | Number of Teacher | | | Number of School | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total |
| Kinder Garden | Public | Lejanias | - | - | - | - | - | - | - | - | - |
| | | Granada | 133 | - | 133 | 4 | - | 4 | 3 | - | 3 |
| | | Fuente de Oro | - | - | - | - | - | - | - | - | - |
| | | Total | 133 | - | 133 | 4 | - | 4 | 3 | - | 3 |
| | | All Depertment | 2,689 | 66 | 2,755 | 78 | 3 | 81 | 48 | 3 | 51 |
| | Private | Lejanias | - | - | - | - | - | - | - | - | - |
| | | Granada | 120 | - | 120 | 5 | - | 5 | 4 | - | 4 |
| | | Fuente de Oro | - | - | - | - | - | - | - | - | - |
| | | Total | 120 | - | 120 | 5 | - | 5 | 4 | - | 4 |
| | | All Depertment | 1,520 | 122 | 1,642 | 64 | 6 | 70 | 39 | 4 | 43 |
| Primary School | Public | Lejanias | 785 | 883 | 1,668 | 18 | 13 | 31 | 1 | 16 | 17 |
| | | Granada | 3,418 | 1,589 | 5,007 | 75 | 44 | 119 | 9 | 27 | 36 |
| | | Fuente de Oro | 467 | 1,195 | 1,662 | 11 | 29 | 40 | 1 | 26 | 27 |
| | | Total | 4,670 | 3,667 | 8,337 | 104 | 86 | 190 | 11 | 69 | 80 |
| | | All Depertment | 45,475 | 20,042 | 65,517 | 1,215 | 562 | 1,777 | 115 | 442 | 557 |
| | Private | Lejanias | - | - | - | - | - | - | - | - | - |
| | | Granada | 397 | - | 397 | 19 | - | 19 | 6 | - | 6 |
| | | Fuente de Oro | - | - | - | | | - | | | - |
| | | Total | 397 | - | 397 | 19 | - | 19 | 6 | - | 6 |
| | | All Depertment | 4,154 | 185 | 4,339 | 142 | 13 | 155 | 40 | 2 | 42 |
| High School | Public | Lejanias | 169 | - | 169 | 9 | - | 9 | 1 | - | 1 |
| | | Granada | 1,010 | 539 | 1,549 | 40 | 20 | 60 | 2 | 3 | 5 |
| | | Fuente de Oro | - | - | - | - | - | - | - | - | - |
| | | Total | 1,179 | 539 | 1,718 | 49 | 20 | 69 | 3 | 3 | 6 |
| | | All Depertment | 1,626 | 1,373 | 2,999 | 729 | 81 | 810 | 28 | 13 | 41 |
| | Private | Lejanias | - | - | - | - | - | - | - | - | - |
| | | Granada | 404 | - | 404 | 35 | - | 35 | 4 | - | 4 |
| | | Fuente de Oro | 239 | - | 239 | 4 | - | 4 | 1 | - | 1 |
| | | Total | 643 | - | 643 | 39 | - | 39 | 5 | - | 5 |
| | | All Depertment | 1,195 | 741 | 1,936 | 547 | 24 | 571 | 38 | 5 | 43 |

Table K-3-4 Transmission Plan

| Section | Voltage (KV) | Distance (Km) | Remarks |
|---|---|---|---|
| Villavicencio - Granada | 115 | 86 | |
| Granada - San Juan de Arama | 34.5 | 33 | |
| Cruce Lejanias - Mun. Lejanias | 34.5 | 38 | |
| Granada - Fuente de Oro | 34.5 | 17 | |
| | | | |
| Granada - Puerto Cardas | 13.2 | 7 | |
| Puerto Cardas - Cruce Lejanias | 13.2 | 2 | |
| Cruce Lejanias - Canaguaro | 13.2 | 5 | |
| Canaguaro - Dos Quebradas | 13.2 | 3 | |
| Lejanias - Cacayal | 13.2 | | |
| Cacajal - Aguas Clasras | 13.2 | | |
| Granada - Fuente de Oro | 13.2 | 17 | |
| Puerto Cardas - Punta Brava | 13.2 | 3 | |
| Punta Brava - Canaguaro | 13.2 | 5 | |

Table K-3-5 Substation Plan

| Location | Capacity | | Remarks |
|---|---|---|---|
| | (MVA) | (KV) | |
| Granada | 30 | 115/34.5/13.2 | |
| Fuente de Oro | 3 | 34.5/13.2 | |
| Lejanias | 3 | 13.5/13.2 | |

Table K-3-6 River Discharge on the Guape River

Year: 1987 Unit: m3/s

| DAY | JAN. | FEB. | MAR. | APR. | MAY | JUN. | JUL. | AUG. | SEP. | OCT. | NOV. | DEC. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 26.2 | 22.5 | 35.0 | 25.6 | 78.8 | 108.0 | 95.0 | 80.9 | 90.2 | 54.0 | 72.0 | 82.0 |
| 2 | 26.5 | 21.6 | 31.5 | 35.3 | 63.9 | 71.4 | 73.8 | 96.8 | 96.6 | 69.0 | 58.8 | 48.9 |
| 3 | 25.5 | 212.9 | 31.0 | 177.4 | 49.6 | 52.4 | 137.2 | 75.4 | 84.6 | 144.6 | 64.2 | 37.4 |
| 4 | 25.1 | 88.8 | 28.7 | 85.3 | 46.4 | 47.4 | 175.4 | 68.6 | 79.0 | 67.8 | 73.8 | 40.4 |
| 5 | 24.7 | 25.3 | 29.3 | 59.9 | 50.8 | 80.9 | 136.8 | 61.0 | 87.0 | 83.0 | 132.4 | 55.8 |
| 6 | 24.3 | 23.6 | 28.0 | 57.1 | 45.6 | 79.3 | 133.6 | 59.1 | 96.4 | 88.6 | 115.1 | 37.4 |
| 7 | 23.6 | 22.8 | 26.8 | 48.0 | 57.4 | 75.4 | 92.0 | 59.1 | 113.8 | 89.0 | 75.4 | 38.7 |
| 8 | 26.5 | 22.8 | 26.3 | 64.9 | 56.3 | 84.8 | 86.4 | 69.1 | 86.2 | 67.2 | 60.0 | 38.7 |
| 9 | 28.7 | 33.3 | 26.0 | 62.8 | 59.6 | 165.6 | 90.3 | 65.3 | 101.2 | 70.2 | 48.9 | 35.7 |
| 10 | 29.3 | 77.8 | 25.7 | 50.5 | 75.6 | 116.7 | 229.0 | 250.5 | 81.4 | 61.8 | 46.8 | 41.2 |
| 11 | 25.6 | 182.2 | 25.3 | 68.2 | 79.3 | 211.8 | 147.9 | 143.5 | 70.8 | 56.4 | 48.9 | 39.5 |
| 12 | 24.5 | 66.3 | 25.2 | 43.0 | 113.6 | 158.5 | 139.3 | 215.3 | 74.4 | 54.6 | 41.7 | 64.6 |
| 13 | 23.7 | 55.8 | 25.3 | 85.3 | 158.5 | 79.3 | 147.9 | 126.3 | 72.0 | 54.6 | 37.4 | 115.0 |
| 14 | 23.3 | 53.8 | 34.1 | 55.4 | 172.7 | 74.3 | 186.9 | 76.5 | 73.8 | 50.2 | 35.3 | 49.7 |
| 15 | 23.7 | 40.5 | 75.4 | 38.1 | 104.3 | 80.9 | 179.8 | 87.5 | 67.8 | 48.0 | 34.0 | 44.6 |
| 16 | 24.9 | 33.7 | 87.1 | 34.0 | 80.3 | 72.8 | 133.6 | 88.6 | 66.0 | 50.6 | 35.8 | 37.4 |
| 17 | 27.7 | 35.0 | 66.2 | 34.7 | 73.2 | 62.5 | 126.3 | 67.0 | 99.0 | 47.6 | 32.5 | 33.7 |
| 18 | 43.7 | 35.2 | 50.2 | 75.2 | 69.0 | 58.7 | 99.0 | 74.9 | 69.0 | 66.0 | 29.8 | 32.5 |
| 19 | 27.5 | 57.7 | 30.3 | 103.5 | 63.9 | 58.2 | 90.3 | 61.0 | 60.0 | 79.0 | 32.8 | 36.8 |
| 20 | 25.6 | 33.8 | 28.3 | 58.0 | 68.6 | 62.9 | 79.3 | 60.1 | 72.0 | 60.0 | 32.8 | 169.6 |
| 21 | 24.7 | 33.7 | 28.5 | 48.5 | 60.5 | 64.8 | 70.5 | 63.9 | 99.0 | 50.2 | 33.4 | 66.8 |
| 22 | 23.9 | 30.5 | 33.5 | 50.4 | 59.1 | 59.1 | 67.2 | 76.5 | 69.0 | 46.3 | 33.7 | 34.2 |
| 23 | 23.2 | 29.0 | 29.0 | 131.2 | 73.8 | 110.0 | 63.9 | 90.3 | 66.0 | 46.8 | 33.1 | 31.9 |
| 24 | 22.5 | 27.8 | 28.8 | 104.0 | 99.0 | 238.7 | 76.5 | 102.5 | 63.0 | 45.9 | 32.5 | 30.4 |
| 25 | 22.3 | 35.4 | 27.8 | 109.5 | 79.3 | 165.6 | 96.8 | 126.2 | 112.5 | 74.8 | 31.6 | 27.3 |
| 26 | 22.7 | 35.2 | 26.5 | 81.3 | 66.3 | 134.0 | 84.8 | 108.0 | 78.2 | 73.8 | 33.1 | 26.5 |
| 27 | 22.1 | 80.7 | 26.5 | 83.5 | 155.0 | 137.2 | 71.8 | 349.4 | 66.6 | 57.0 | 31.9 | 25.3 |
| 28 | 21.6 | 40.8 | 26.2 | 62.3 | 115.5 | 90.3 | 60.1 | 161.5 | 55.8 | 228.7 | 31.3 | 24.3 |
| 29 | 20.1 | | 26.0 | 59.9 | 87.5 | 79.3 | 60.1 | 117.8 | 63.0 | 72.0 | 33.1 | 22.9 |
| 30 | 29.2 | | 28.7 | 54.5 | 76.5 | 79.3 | 65.3 | 87.0 | 66.0 | 65.6 | 33.4 | 23.5 |
| 31 | 23.6 | | 26.0 | | 100.5 | | 74.1 | 78.2 | | 74.4 | | 71.0 |
| MEAN | 25.4 | 52.1 | 33.7 | 68.2 | 81.9 | 98.7 | 108.7 | 104.8 | 79.3 | 70.9 | 47.9 | 47.2 |
| MAX. | 43.7 | 212.9 | 87.1 | 177.4 | 172.7 | 238.7 | 229.0 | 349.4 | 113.8 | 228.7 | 132.4 | 169.6 |
| MIN. | 20.1 | 21.6 | 25.2 | 25.6 | 45.6 | 47.4 | 60.1 | 59.1 | 55.8 | 45.9 | 29.8 | 22.9 |

Table K-3-7 Annual Generated Energy

| Description | Qi (m3/s) | He (m) | $\eta$ | P (kw) | N (day) | V (m3/s·day) | E (kw·h) |
|---|---|---|---|---|---|---|---|
| Qmax-Q185 | 36.0 | 10.0 | 0.808 | 2,852 | 185 | 6,660 | 12,663,036 |
| Q185-Q253 | 36.0 | 10.0 | 0.808 | 2,852 | 68 | 2,448 | 4,654,521 |
| Q253-Q275 | 34.4 | 10.0 | 0.808 | 2,724 | 22 | 756 | 1,438,319 |
| Q275-Q355 | 26.8 | 10.0 | 0.808 | 2,122 | 80 | 2,143 | 4,074,227 |
| Q355-Qmin | 20.0 | 10.0 | 0.808 | 1,583 | 10 | 200 | 379,986 |
| | | | | | 365 | 12,207 | 23,210,091 |

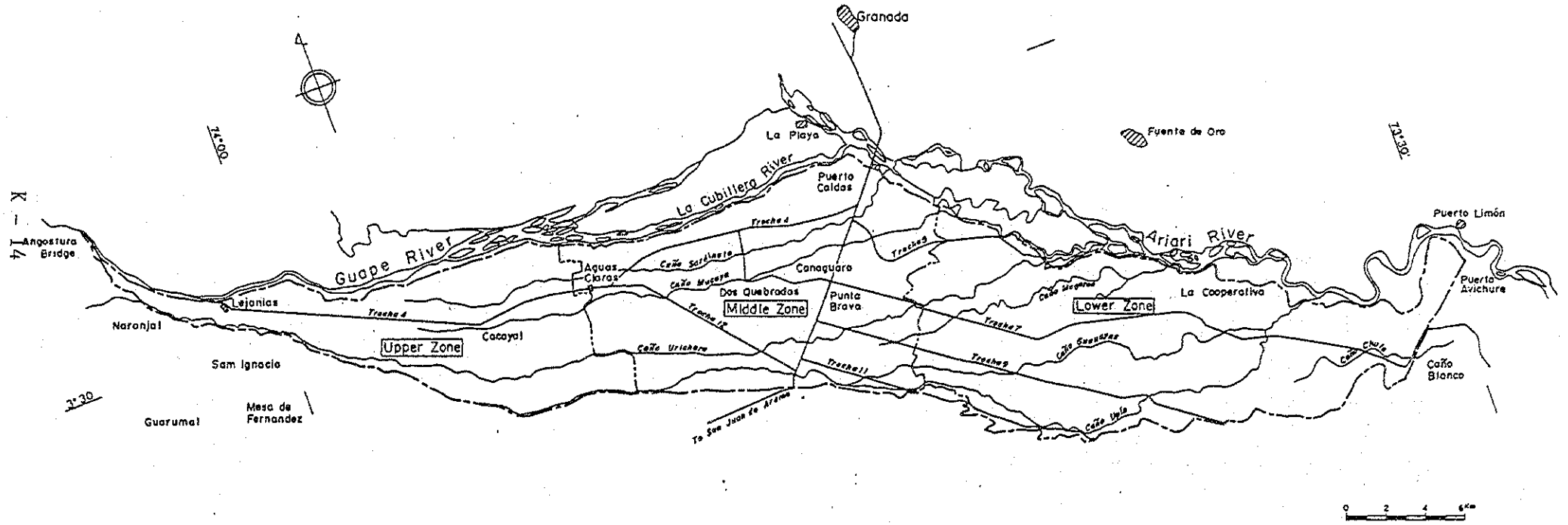
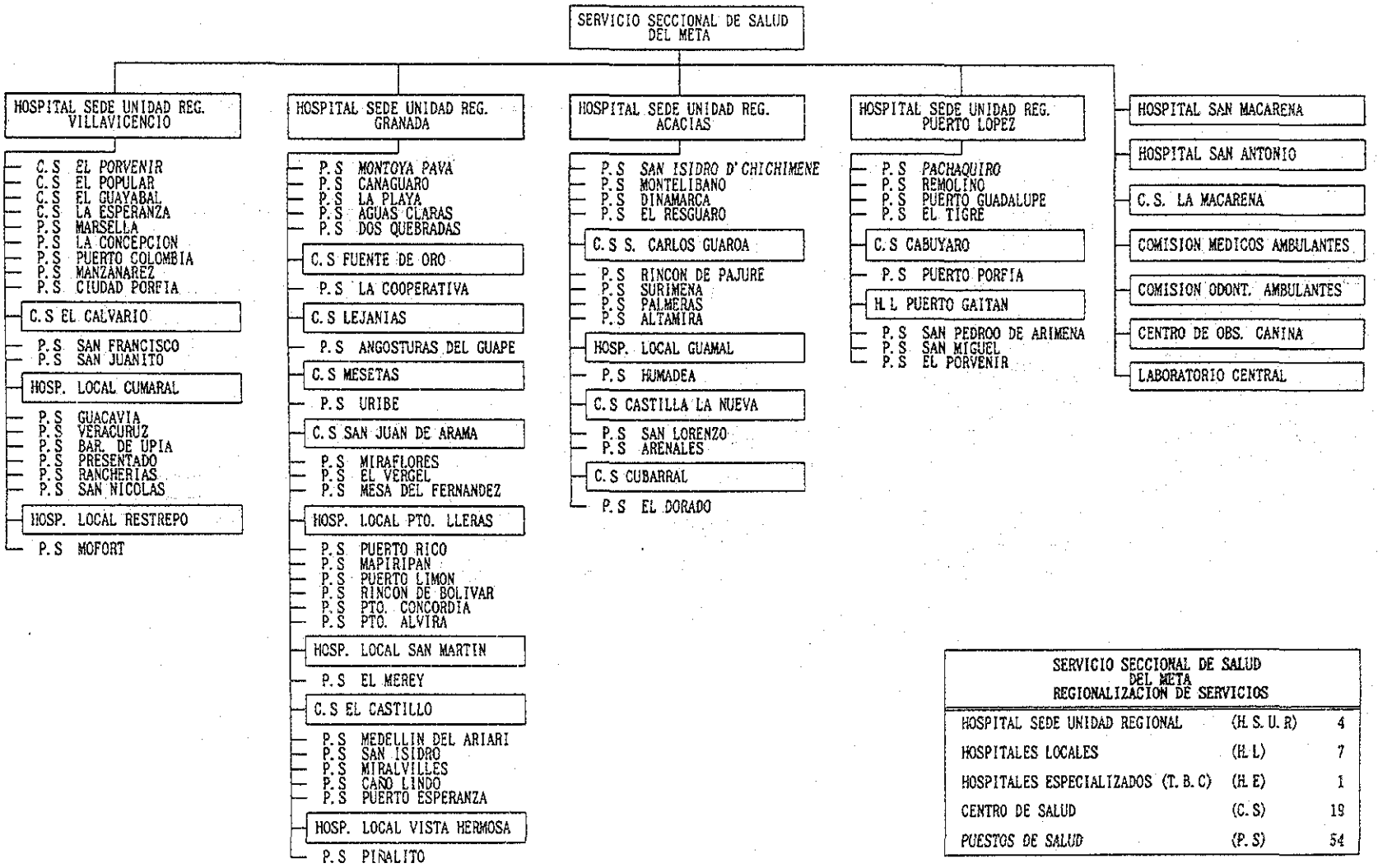



Fig. K-2-1 Existing Road Network




SERVICIO SECCIONAL DE SALUD DEL META
REGIONALIZACION DE SERVICIOS

| | | |
|---|---|---|
| HOSPITAL SEDE UNIDAD REGIONAL | (H.S.U.R) | 4 |
| HOSPITALES LOCALES | (H.L) | 7 |
| HOSPITALES ESPECIALIZADOS (T.B.C) | (H.E) | 1 |
| CENTRO DE SALUD | (C.S) | 19 |
| PUESTOS DE SALUD | (P.S) | 54 |

Fig. K-2-2 Medical Care Organization Diagram

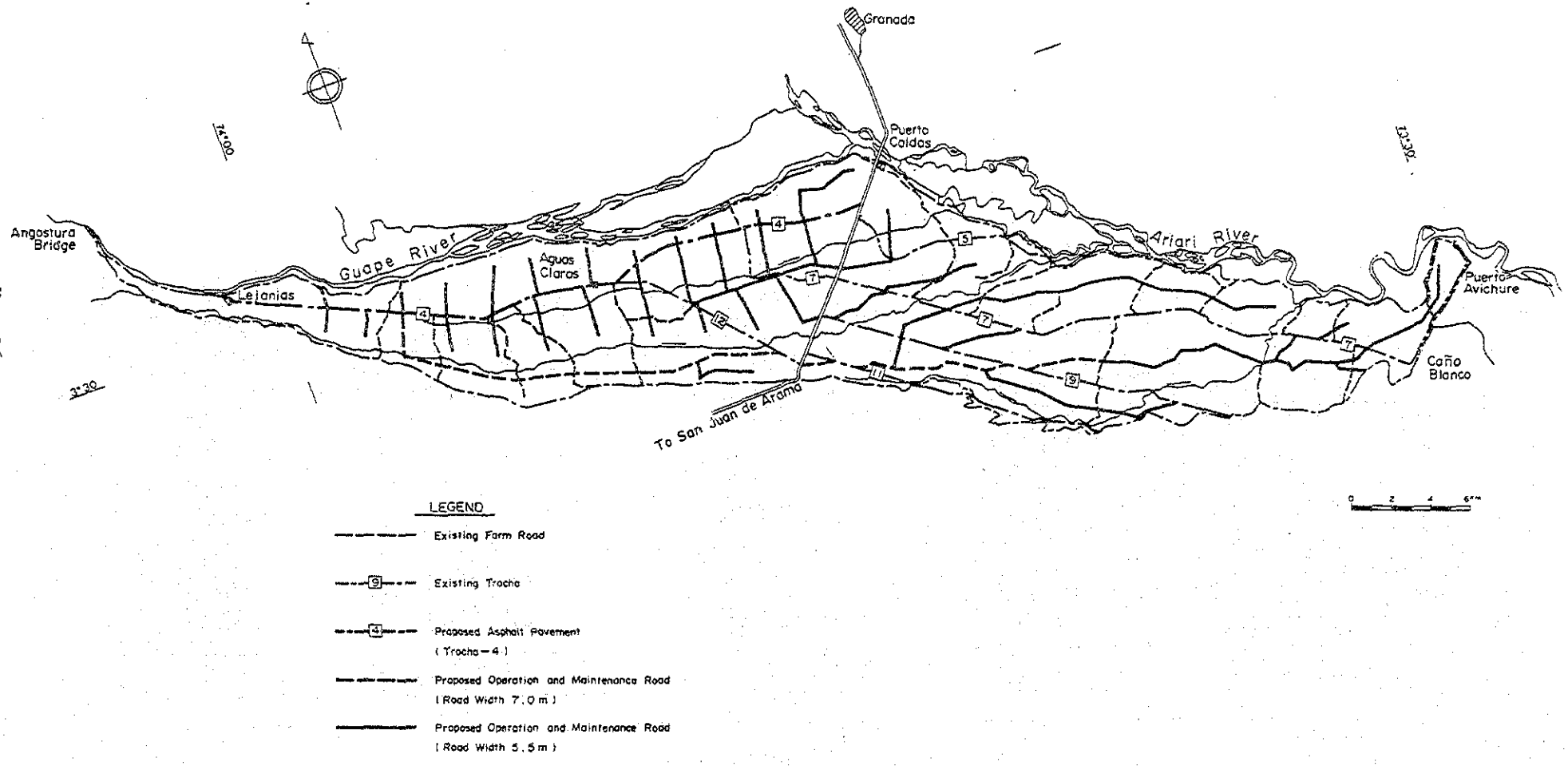
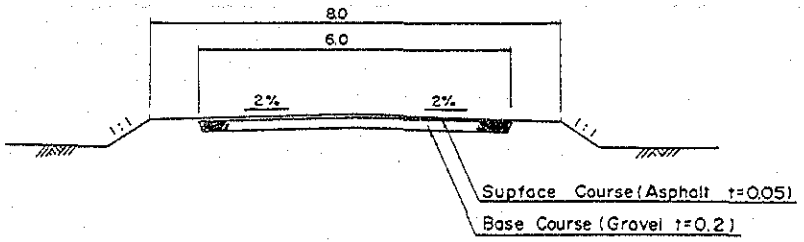
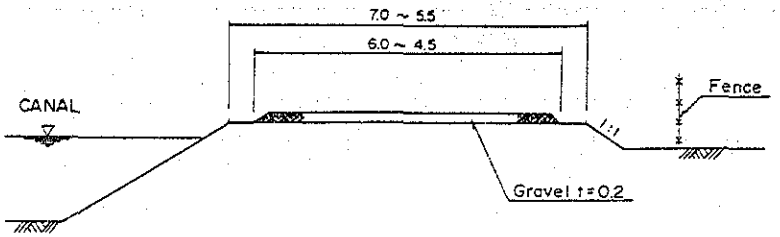


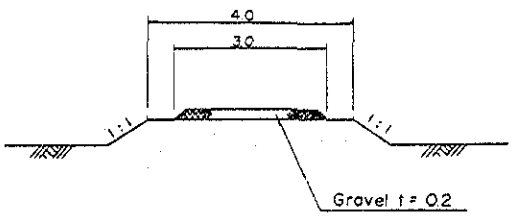

Fig. K-3-1 Proposed Road Net Work




TROCHA-4 ROAD




OPERATION AND MAINTENANCE ROAD




ON-FARM ROAD

Fig. K-3-2 Typical Road Section

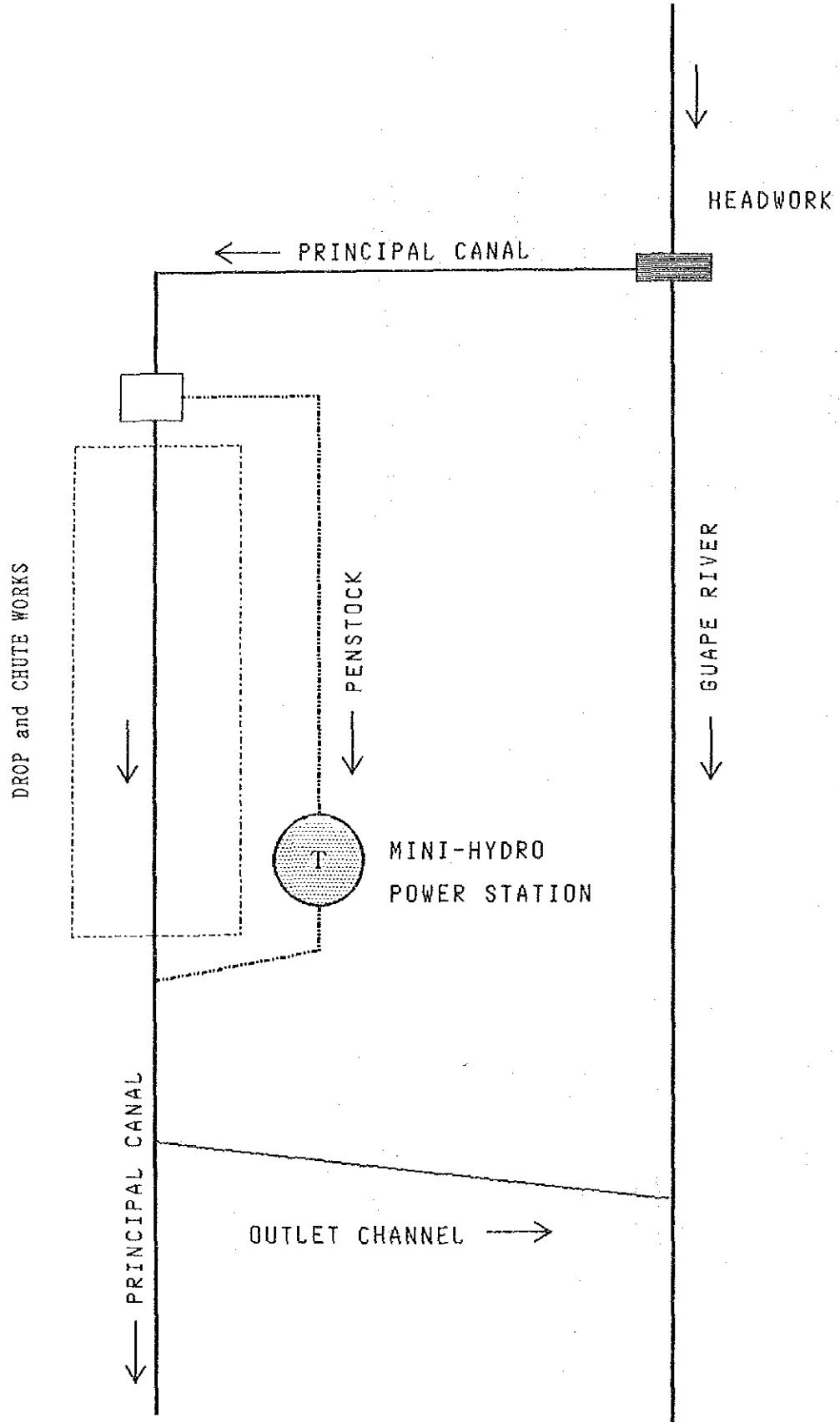



Fig. K-3-3 Mini-Hydroelectric Power Station System

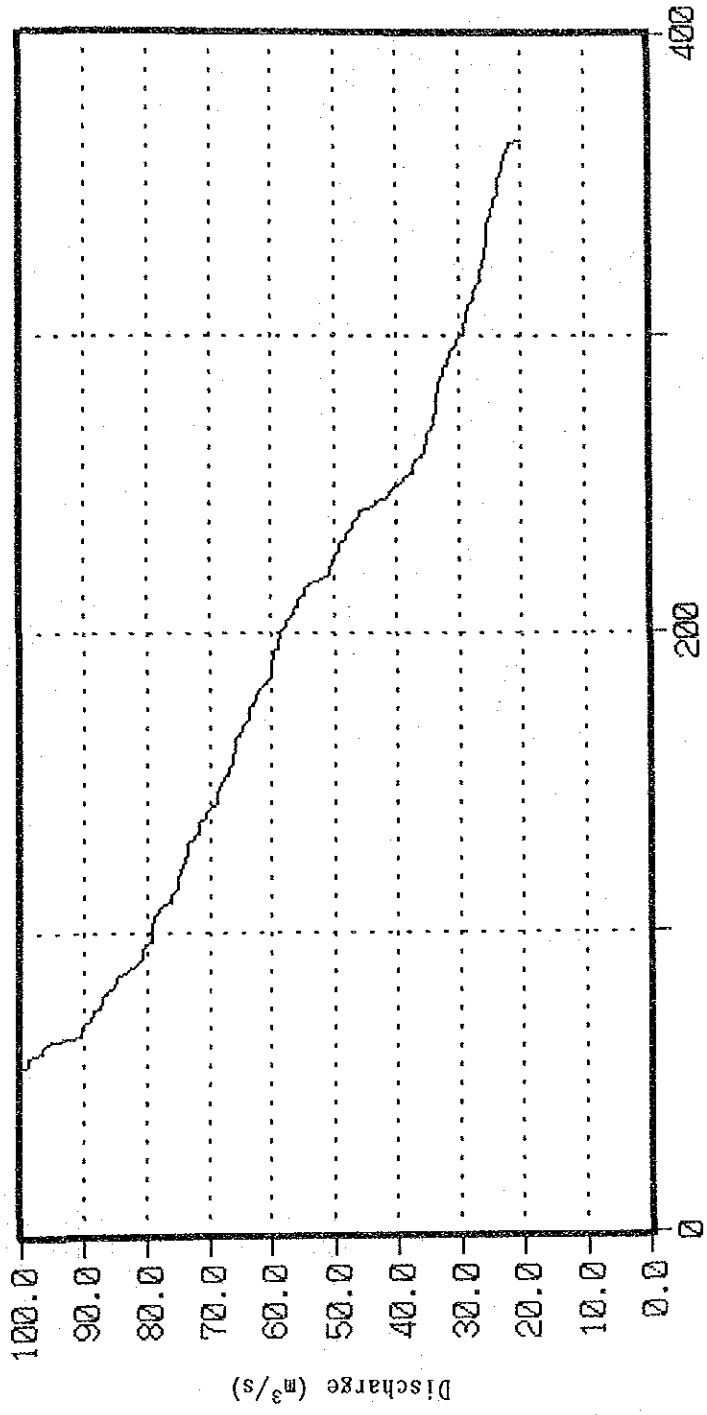
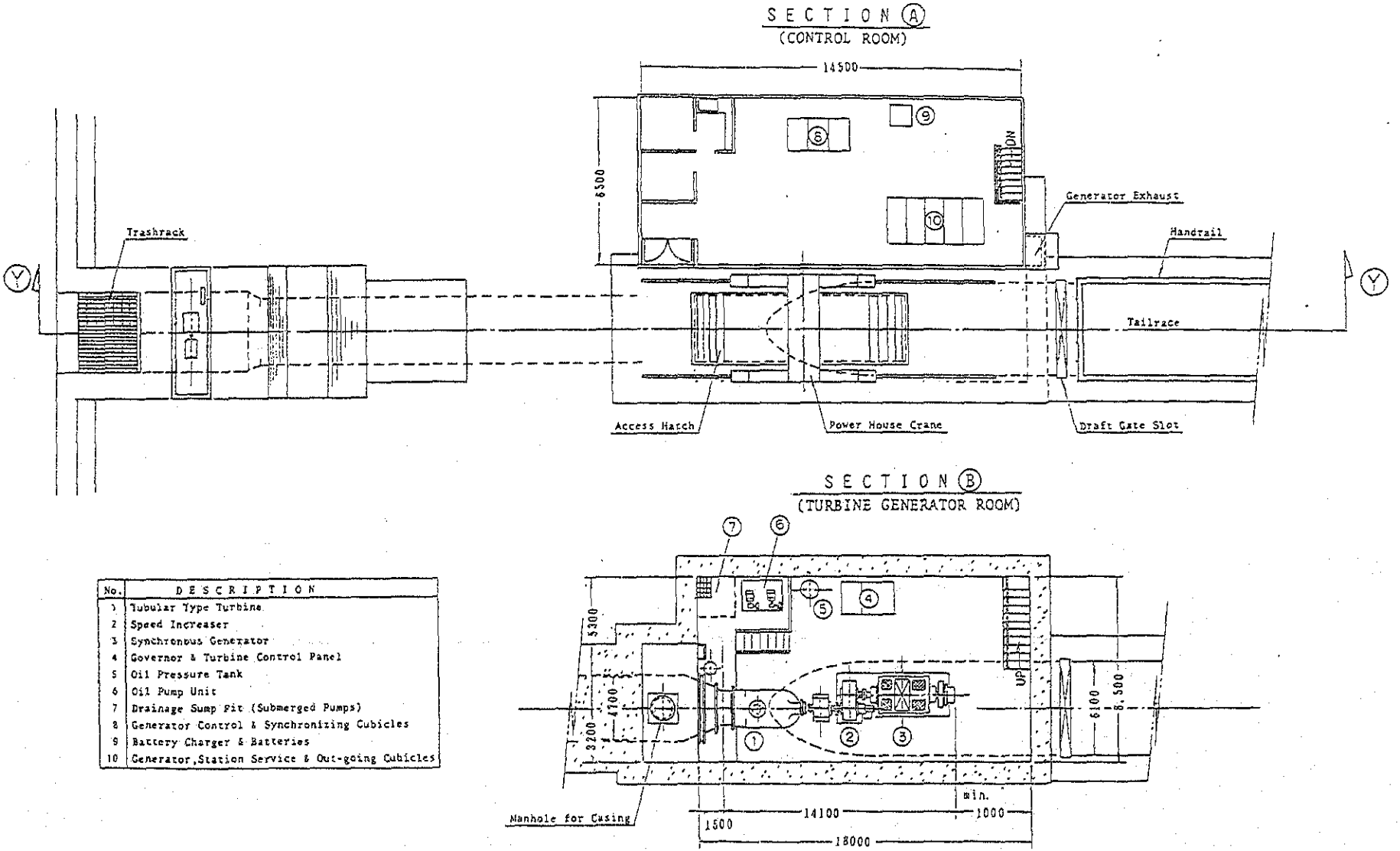



Fig. K-3-4 River Discharge on the Guape River




| No. | DESCRIPTION |
|---|---|
| 1 | Tubular Type Turbine |
| 2 | Speed Increaser |
| 3 | Synchronous Generator |
| 4 | Governor & Turbine Control Panel |
| 5 | Oil Pressure Tank |
| 6 | Oil Pump Unit |
| 7 | Drainage Sump Pit (Submerged Pumps) |
| 8 | Generator Control & Synchronizing Cubicles |
| 9 | Battery Charger & Batteries |
| 10 | Generator,Station Service & Out-going Cubicles |

Fig. K-3-5 Layout of Mini-Hydroelectric Power Station (1)

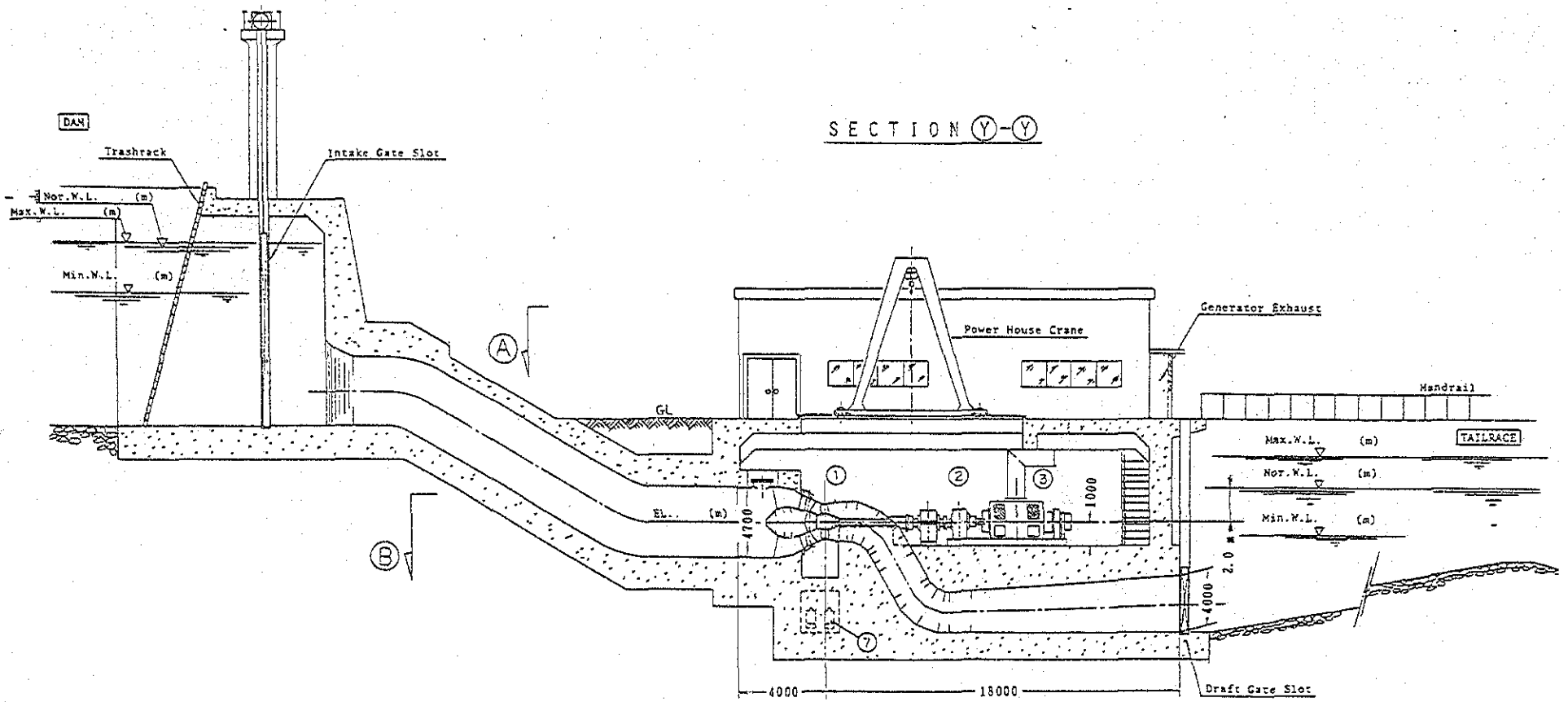



Fig. K-3-5 Layout of Mini-Hydroelectric Power Station (2)

# ANNEX L : PROJECT COST ESTIMATION

# ANNEX L : PROJECT COST ESTIMATION

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# ANNEX L : COST ESTIMATION

## L.1 Assumption on Cost Estimation

The Project cost has been estimated on the following assumptions.

### L.1.1 Means of Execution

Civil engineering work will be executed by the contract entered into between the promoter and the contractor. The machinery and equipment required for construction works will be provided by the contractors.

### L.1.2 Basic Rate

The basic rates of labor, materials, construction machinery and equipment on the cost estimation are adopted the actual rates in Colombia as shown in Table L-1-1 and Table L-1-2.

### L.1.3 Overhead and Profit

Overhead and profit, which equal to 30% of the direct cost in total is included in each unit price.

### L.1.4 Exchange Rate

U.S.$1.00 equals to Col.$332.56 (the average official exchange rate in December, 1988).

### L.1.5 Contingency Allowance

The physical contingency allowance is calculated applying the following rates.

- for construction work : 15% of accumulated direct costs
- for engineering fee : 5% of accumulated direct costs
- for operation and maintenance cost : 5% of accumulated direct costs

## L.2 Project Cost

### L.2.1 Project Cost

Project cost is composed of the following items.

- Construction Cost
- Land Acquisition Cost
- Cost of Equipment and Machinery for O/M
- Administration Cost
- Engineering Fee
- Physical Contingency Allowance

The project cost is shown in Table L-2-1, and its disbursement schedule is as shown in Table L-2-2.

L.2.2 Construction Cost

Civil work is composed of the following items.

- Diversion Weir
- Irrigation Canals
- Drainage Canals
- Roads
- Revetment works
- Land Consolidation works

The construction cost and its breakdown are as shown in Table L-2-3 and L-2-8 respectively.

L.2.3 Land Acquisition Cost

The land acquisition cost required for construction of irrigation canals and their related facilities is shown in Table L-2-4.

L.2.4 Cost of Equipment and Machinery for Operation and Maintenance

The cost of equipment and machinery required for operation and maintenance of headworks, roads, irrigation and drainage canals is shown in Table L-2-5.

L.2.5 Administration Cost

The administration cost required during the period of the construction is composed of the following items.

- Rental of office
- Office supplies cost
- Labor cost
- Miscellaneous expenses

The administration cost is shown in Table L-2-7.

L.2.6 Engineering Fee

Field surveys, site exploration (geological surveys), detailed design, preparation of contract documents and construction supervision will be executed by the engineer, and the fee is estimated as shown in the Table L-2-7.

Table L-1-1 Labor Rates

| Description | Rate/Day (Col.$) |
|---|---|
| General Foreman | 2,700 |
| Skilled Laborer | 1,450 |
| Laborer | 1,000 |
| Carpenter | 1,450 |
| Steel man | 1,450 |
| Driver (heavy equip.) | 1,900 |
| Driver (general) | 1,350 |
| Watchman | 1,000 |
| Operator(mixing plant) | 1,450 |

Table L-1-2 Unit Cost of Construction Materials

| Description | Unit | Unit Price (Col.$) |
|---|---|---|
| Portland Cement | kg | 23 |
| Reinforcing Bar | kg | 210 |
| Sand | m3 | 3,000 |
| Gravel | m3 | 3,000 |
| Timber | m3 | 625 |
| Gasoline | l | 195 |
| Diesel | l | 250 |
| RC Pipe Dim. 600 | unit | 14,920 |
| -do- 700 | unit | 24,920 |
| -do- 800 | unit | 31,700 |
| -do- 900 | unit | 39,330 |
| -do- 1,000 | unit | 48,070 |
| -do- 1,100 | unit | 51,030 |
| -do- 1,200 | unit | 63,940 |
| Small Gate | | |
| 300x 500mm | unit | 250,000 |
| 500x 700mm | unit | 350,000 |
| 1,000x1,000mm | unit | 500,000 |
| Asphalt mixture | m3 | 33,050 |
| Asphalt emulsion | l | 39 |

Table L-2-1 Project Cost

(Unit: Col.$1,000)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Construction Cost | | | | | | 9,381,480 | 7,658,149 | 17,039,629 | |
| Land Acquisition Cost | | | | | | 0 | 205,216 | 205,216 | |
| Acquisition Cost of O/M | | | | | | 694,356 | 0 | 694,356 | |
| Administration Cost | | | | | | 0 | 90,063 | 90,063 | |
| Consulting Services Cost | | | | | | 1,353,357 | 529,581 | 1,882,938 | |
| Sub-total | | | | | | 11,429,193 | 8,483,009 | 19,912,202 | |
| Physical Contingency | | | | | | 1,509,608 | 1,210,487 | 2,720,095 | |
| Sub-total | | | | | | 1,509,608 | 1,210,487 | 2,720,095 | |
| Total | | | | | | 12,938,801 | 9,693,496 | 22,632,297 | |

Table L-2-2 Disbursement Schedule of the Project Costs

(Unit:Col. $1,000)

| Description | Year | 1 st | 2 nd | 3 rd | 4 th | 5 th | 6 th | 7 th | Total |
|---|---|---|---|---|---|---|---|---|---|
| Detailed Design | F/C | 227,144 | 170,710 | | | | | | 397,854 |
| | L/C | 139,764 | 105,040 | | | | | | 244,804 |
| | Total | 366,908 | 275,750 | | | | | | 642,658 |
| Land Acquisition | F/C | | | | | | | | 0 |
| | L/C | | 205,216 | | | | | | 205,216 |
| | Total | | 205,216 | | | | | | 205,216 |
| Administration | F/C | | | | | | | | 0 |
| | L/C | | 8,188 | 16,375 | 16,375 | 16,375 | 16,375 | 16,375 | 90,063 |
| | Total | | 8,188 | 16,375 | 16,375 | 16,375 | 16,375 | 16,375 | 90,063 |
| Headwork | F/C | | | 647,836 | 647,836 | | | | 1,295,672 |
| | L/C | | | 235,995 | 235,994 | | | | 471,989 |
| | Total | | | 883,831 | 883,830 | | | | 1,767,661 |
| Irrigation Canal | F/C | | | 1,413,935 | 1,413,935 | 1,413,935 | 1,413,934 | | 5,655,739 |
| | L/C | | | 1,401,649 | 1,401,649 | 1,401,649 | 1,401,650 | | 5,606,597 |
| | Total | | | 2,815,584 | 2,815,584 | 2,815,584 | 2,815,584 | | 11,262,336 |
| Drainage Canal | F/C | | | 31,540 | 31,539 | | | | 63,079 |
| | L/C | | | 18,364 | 18,364 | | | | 36,728 |
| | Total | | | 49,904 | 49,903 | | | | 99,807 |
| Road (O/M Road) | F/C | | | 45,357 | 45,357 | 45,357 | 45,356 | | 181,427 |
| | L/C | | | 24,423 | 24,423 | 24,423 | 24,422 | | 97,691 |
| | Total | | | 69,780 | 69,780 | 69,780 | 69,778 | | 279,118 |
| Road (Trocha 4) | F/C | | | 109,578 | 109,578 | 109,578 | 109,579 | | 438,313 |
| | L/C | | | 123,567 | 123,567 | 123,567 | 123,566 | | 494,267 |
| | Total | | | 233,145 | 233,145 | 233,145 | 233,145 | | 932,580 |
| Land Consolidation | F/C | | | 318,980 | 318,980 | 318,980 | 318,980 | 159,489 | 1,435,409 |
| | L/C | | | 171,758 | 171,758 | 171,758 | 171,758 | 85,881 | 772,913 |
| | Total | | | 490,738 | 490,738 | 490,738 | 490,738 | 245,370 | 2,208,322 |
| Revetment | F/C | | | | 47,992 | 95,985 | | | 143,977 |
| | L/C | | | | 115,276 | 230,552 | | | 345,828 |
| | Total | | | | 163,268 | 326,537 | | | 489,805 |
| O/M Equipment | F/C | | | | | | | 694,356 | 694,356 |
| | L/C | | | | | | | 0 | 0 |
| | Total | | | | | | | 694,356 | 694,356 |
| Supervision | F/C | | | 211,685 | 210,294 | 210,294 | 211,685 | 111,545 | 955,503 |
| | L/C | | | 63,090 | 62,676 | 62,676 | 63,090 | 33,245 | 284,777 |
| | Total | | | 274,775 | 272,970 | 272,970 | 274,775 | 144,790 | 1,240,280 |
| Sub-total | F/C | 227,144 | 170,710 | 2,778,911 | 2,825,511 | 2,194,129 | 2,099,534 | 965,390 | 11,261,329 |
| | L/C | 139,764 | 318,444 | 2,055,221 | 2,170,082 | 2,031,000 | 1,800,861 | 135,501 | 8,650,873 |
| | Total | 366,908 | 489,154 | 4,834,132 | 4,995,593 | 4,225,129 | 3,900,395 | 1,100,891 | 19,912,202 |
| Physical Contingency | F/C | 11,357 | 8,536 | 395,668 | 402,797 | 308,090 | 293,762 | 64,218 | 1,484,428 |
| | L/C | 6,988 | 36,444 | 300,337 | 317,607 | 296,745 | 262,183 | 15,363 | 1,235,667 |
| | Total | 18,345 | 44,980 | 696,005 | 720,404 | 604,835 | 555,945 | 79,581 | 2,720,095 |
| Total | F/C | 238,501 | 179,246 | 3,174,579 | 3,228,308 | 2,502,219 | 2,393,296 | 1,029,608 | 12,745,757 |
| | L/C | 146,752 | 354,888 | 2,355,558 | 2,487,689 | 2,327,745 | 2,063,044 | 150,864 | 9,886,540 |
| | Total | 385,253 | 534,134 | 5,530,137 | 5,715,997 | 4,829,964 | 4,456,340 | 1,180,472 | 22,632,297 |
| (%) | F/C | 1.9% | 1.4% | 24.9% | 25.3% | 19.6% | 18.8% | 8.1% | 100.0% |
| | L/C | 1.5% | 3.6% | 23.8% | 25.2% | 23.5% | 20.9% | 1.5% | 100.0% |
| | Total | 1.7% | 2.4% | 24.4% | 25.3% | 21.3% | 19.7% | 5.2% | 100.0% |

Table L-2-3 Construction Costs

(Unit: Col.$1,000)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Headwork | | | | | | 1,295,672 | 471,989 | 1,767,661 | |
| Irrigation Canal | | | | | | 5,655,739 | 5,606,597 | 11,262,336 | |
| Drainage Canal | | | | | | 63,079 | 36,728 | 99,807 | |
| Land Consolidation | | | | | | 1,435,409 | 772,913 | 2,208,322 | |
| Road work | | | | | | 787,604 | 424,094 | 1,211,698 | |
| Revetment work | | | | | | 143,977 | 345,828 | 489,805 | |
| Total | | | | | | 9,381,480 | 7,658,149 | 17,039,629 | |

Table L-2-4 Land Acquisition Cost (1)

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Principal Canal No. 1 | | | | | | | 85,744,000 | 85,744,000 | |
| Secondary Canal No. 1-1 | | | | | | | 660,000 | 660,000 | |
| Secondary Canal No. 1-2 | | | | | | | 660,000 | 660,000 | |
| Secondary Canal No. 1-3 | | | | | | | 770,000 | 770,000 | |
| Secondary Canal No. 1-4 | | | | | | | 1,882,000 | 1,882,000 | |
| Secondary Canal No. 1-5 | | | | | | | 20,900,000 | 20,900,000 | |
| Secondary Canal No. 1-6 | | | | | | | 5,413,000 | 5,413,000 | |
| Secondary Canal No. 1-7 | | | | | | | 10,694,000 | 10,694,000 | |
| Secondary Canal No. 1-8 | | | | | | | 3,125,000 | 3,125,000 | |
| Secondary Canal No. 1-9 | | | | | | | 6,250,000 | 6,250,000 | |
| Secondary Canal No. 1-10 | | | | | | | 1,470,000 | 1,470,000 | |
| Sub-total | | | | | | | 137,568,000 | 137,568,000 | |
| Principal Canal No. 2 | | | | | | | 20,956,000 | 20,956,000 | |
| Secondary Canal No. 2-1 | | | | | | | 1,058,000 | 1,058,000 | |
| Secondary Canal No. 2-2 | | | | | | | 2,117,000 | 2,117,000 | |
| Secondary Canal No. 2-3 | | | | | | | 1,764,000 | 1,764,000 | |
| Secondary Canal No. 2-4 | | | | | | | 1,176,000 | 1,176,000 | |
| Secondary Canal No. 2-5 | | | | | | | 1,294,000 | 1,294,000 | |
| Secondary Canal No. 2-6 | | | | | | | 1,588,000 | 1,588,000 | |
| Secondary Canal No. 2-7 | | | | | | | 1,176,000 | 1,176,000 | |
| Secondary Canal No. 2-8 | | | | | | | 1,529,000 | 1,529,000 | |
| Secondary Canal No. 2-9 | | | | | | | 1,058,000 | 1,058,000 | |
| Secondary Canal No. 2-10 | | | | | | | 2,058,000 | 2,058,000 | |
| Secondary Canal No. 2-11 | | | | | | | 2,184,000 | 2,184,000 | |
| Secondary Canal No. 2-12 | | | | | | | 1,058,000 | 1,058,000 | |
| Secondary Canal No. 2-13 | | | | | | | 2,302,000 | 2,302,000 | |
| Secondary Canal No. 2-14 | | | | | | | 1,411,000 | 1,411,000 | |
| Secondary Canal No. 2-15 | | | | | | | 2,335,000 | 2,335,000 | |
| Sub-total | | | | | | | | | |

Table L-2-4 Land Acquisition Cost (2)

(Unit: Col.S)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Secondary Canal No.2-16 | | | | | | | 5,000,000 | 5,000,000 | |
| Secondary Canal No.2-17 | | | | | | | 1,705,000 | 1,705,000 | |
| Secondary Canal No.2-18 | | | | | | | 1,646,000 | 1,646,000 | |
| Secondary Canal No.2-19 | | | | | | | 1,470,000 | 1,470,000 | |
| Sub-total | | | | | | | 54,885,000 | 54,885,000 | |
| Principal Canal No.3 | | | | | | | 12,763,000 | 12,763,000 | |
| Sub-total | | | | | | | 12,763,000 | 12,763,000 | |
| Total | | | | | | | 205,216,000 | 205,216,000 | |

Table L-2-5 Acquisition Cost of O/M Equipment

(Unit: Col.$1,000)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Tractor shovel | unit | 2 | 37,847 | 0 | 37,847 | 75,694 | 0 | 75,694 | |
| Backhoe (wheel type) | unit | 2 | 33,348 | 0 | 33,348 | 66,696 | 0 | 66,696 | |
| Backhoe (crawler type) | unit | 2 | 46,936 | 0 | 46,936 | 93,872 | 0 | 93,872 | |
| Bulldozer | unit | 2 | 54,117 | 0 | 54,117 | 108,234 | 0 | 108,234 | |
| Drag-line (crawler type) | unit | 2 | 57,618 | 0 | 57,618 | 115,236 | 0 | 115,236 | |
| Truck Crane | unit | 1 | 32,169 | 0 | 32,169 | 32,169 | 0 | 32,169 | |
| Motorgrader | unit | 2 | 16,351 | 0 | 16,351 | 32,702 | 0 | 32,702 | |
| Vibrating Compactor | unit | 2 | 22,949 | 0 | 22,949 | 45,898 | 0 | 45,898 | |
| Tractor | unit | 4 | 9,345 | 0 | 9,345 | 37,380 | 0 | 37,380 | |
| Dump Truck | unit | 5 | 9,339 | 0 | 9,339 | 46,695 | 0 | 46,695 | |
| Vehicle | unit | 4 | 7,500 | 0 | 7,500 | 30,000 | 0 | 30,000 | |
| Motorcycle | unit | 10 | 978 | 0 | 978 | 9,780 | 0 | 9,780 | |
| Total | | | | | | 694,356 | 0 | 694,356 | |

Table L-2-6 Administration Cost

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| 1. Temporary office (rental) | year | 5.5 | | 200,000 | 200,000 | 0 | 1,100,000 | 1,100,000 | |
| 2. Office equip. and facil. | L.S | 1 | | 1,500,000 | 1,500,000 | 0 | 1,500,000 | 1,500,000 | |
| 3. Motor pool | m2 | 200.0 | | 5,000 | 5,000 | 0 | 1,000,000 | 1,000,000 | |
| Sub-total | | | | | | 0 | 3,600,000 | 3,600,000 | |
| 4. Salaries | | | | | | 0 | 40,609,800 | 40,609,800 | |
| Officer in cahrge | M/M | 66.0 | | 126,500 | 126,500 | 0 | 8,349,000 | 8,349,000 | |
| Civil engineer | M/M | 132.0 | | 106,000 | 106,000 | 0 | 13,992,000 | 13,992,000 | |
| Asst. Civil Engineer | M/M | 132.0 | | 81,500 | 81,500 | 0 | 10,758,000 | 10,758,000 | |
| Secretary | M/M | 66.0 | | 35,000 | 35,000 | 0 | 2,310,000 | 2,310,000 | |
| Driver | M/M | 132.0 | | 39,400 | 39,400 | 0 | 5,200,800 | 5,200,800 | |
| 5. General Expence | L.S | | | | | 0 | 38,725,505 | 38,725,505 | |
| 6. O/M of Vehicle | month | 66.0 | | 108,000 | 108,000 | 0 | 7,128,000 | 7,128,000 | |
| Sub-total | | | 0 | 496,400 | 496,400 | 0 | 86,463,305 | 86,463,305 | |
| 7. Total | | | | | | 0 | 90,063,305 | 90,063,305 | |

Table L-2-7 Disbursement Schedule of Consulting Fee

(Unit:Col.$1,000)

| Description | Year | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | Total |
|---|---|---|---|---|---|---|---|---|---|
| Detailed Design | F/C | 227,144 | 170,710 | | | | | | 397,854 |
| | L/C | 139,764 | 105,040 | | | | | | 244,804 |
| | Total | 366,908 | 275,750 | | | | | | 642,658 |
| Supervision | F/C | | | 211,685 | 210,294 | 210,294 | 211,685 | 111,545 | 955,503 |
| | L/C | | | 63,090 | 62,676 | 62,676 | 63,090 | 33,245 | 284,777 |
| | Total | | | 274,775 | 272,970 | 272,970 | 274,775 | 144,790 | 1,240,280 |
| Total | F/C | 227,144 | 170,710 | 211,685 | 210,294 | 210,294 | 211,685 | 111,545 | 1,353,357 |
| | L/C | 139,764 | 105,040 | 63,090 | 62,676 | 62,676 | 63,090 | 33,245 | 529,581 |
| | Total | 366,908 | 275,750 | 274,775 | 272,970 | 272,970 | 274,775 | 144,790 | 1,882,938 |

Table L-2-8 Breakdown of Construction Cost

(1) Headwork

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary Works | | | | | | 24,566,019 | 8,531,260 | 33,097,279 | |
| Excavation | m3 | 65,000 | 494 | 266 | 760 | 32,110,000 | 17,290,000 | 49,400,000 | |
| Embankment | m3 | 30,000 | 585 | 315 | 900 | 17,550,000 | 9,450,000 | 27,000,000 | |
| Reinforced Concrete | m3 | 6,248 | 11,376 | 13,904 | 25,280 | 71,077,248 | 86,872,192 | 157,949,440 | |
| Plain Concrete | m3 | 14,624 | 10,931 | 13,360 | 24,290 | 159,847,632 | 195,369,328 | 355,216,960 | |
| Base Concrete | m3 | 626 | 9,693 | 11,847 | 21,540 | 6,067,818 | 7,416,222 | 13,484,040 | |
| Form Type 1 | m2 | 11,061 | 1,026 | 1,254 | 2,280 | 11,348,586 | 13,870,494 | 25,219,080 | |
| Form Type 2 | m2 | 3,810 | 873 | 1,067 | 1,940 | 3,326,130 | 4,065,270 | 7,391,400 | |
| Reinforcing bar | t | 421 | 137,012 | 167,459 | 304,470 | 57,681,842 | 70,500,029 | 128,181,870 | |
| Riprap | | | | | | | | | |
| Plain Concrete | m3 | 978 | 10,931 | 13,360 | 24,290 | 10,690,029 | 13,065,591 | 23,755,620 | |
| Form Type 2 | m2 | 3,931 | 873 | 1,067 | 1,940 | 3,431,763 | 4,194,377 | 7,626,140 | |
| Gabion | m3 | 480 | 7,619 | 9,312 | 16,930 | 3,656,880 | 4,469,520 | 8,126,400 | |
| Gate | L.S. | 1 | | | | 851,513,000 | 0 | 851,513,000 | |
| Temporary Works | | | | | | | | | |
| Embankment | m3 | 33,000 | 585 | 315 | 900 | 19,305,000 | 10,395,000 | 29,700,000 | |
| Dewatering | L.S. | 1 | | | | 23,500,000 | 26,500,000 | 50,000,000 | |
| Total | | | | | | 1,295,671,946 | 471,989,283 | 1,767,661,229 | |

(2) Irrigation Canal (No.1)

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Principal Canal No.1 | | | | | | 3,165,060,886 | 3,222,575,710 | 6,387,636,596 | |
| Secondary Canal No.1-1 | | | | | | 5,419,964 | 5,060,944 | 10,480,908 | |
| Secondary Canal No.1-2 | | | | | | 9,146,126 | 9,615,142 | 18,761,268 | |
| Secondary Canal No.1-3 | | | | | | 5,897,263 | 5,383,733 | 11,280,996 | |
| Secondary Canal No.1-4 | | | | | | 15,001,099 | 14,043,605 | 29,044,704 | |
| Secondary Canal No.1-5 | | | | | | 333,143,515 | 277,490,522 | 610,634,037 | |
| Secondary Canal No.1-6 | | | | | | 61,245,217 | 51,239,771 | 112,484,988 | |
| Secondary Canal No.1-7 | | | | | | 126,320,380 | 98,768,936 | 225,089,316 | |
| Secondary Canal No.1-8 | | | | | | 17,191,845 | 14,536,479 | 31,728,324 | |
| Secondary Canal No.1-9 | | | | | | 44,762,577 | 40,973,350 | 85,735,927 | |
| Secondary Canal No.1-10 | | | | | | 8,904,447 | 7,530,813 | 16,435,260 | |
| Sub-total | | | | | | 3,792,093,319 | 3,747,219,005 | 7,539,312,324 | |
| Principal Canal No.2 | | | | | | 1,322,058,774 | 1,352,006,937 | 2,674,065,711 | |
| Secondary Canal No.2-1 | | | | | | 9,793,775 | 9,556,441 | 19,350,216 | |
| Secondary Canal No.2-2 | | | | | | 10,133,894 | 9,972,142 | 20,106,036 | |
| Secondary Canal No.2-3 | | | | | | 15,264,473 | 17,445,907 | 32,710,380 | |
| Secondary Canal No.2-4 | | | | | | 12,001,167 | 11,986,173 | 23,987,340 | |
| Secondary Canal No.2-5 | | | | | | 11,522,032 | 11,132,372 | 22,654,404 | |
| Secondary Canal No.2-6 | | | | | | 16,075,006 | 16,026,638 | 32,101,644 | |
| Secondary Canal No.2-7 | | | | | | 11,661,048 | 11,570,472 | 23,231,520 | |
| Secondary Canal No.2-8 | | | | | | 15,055,986 | 14,915,276 | 29,971,262 | |
| Secondary Canal No.2-9 | | | | | | 11,386,046 | 11,502,550 | 22,888,596 | |
| Secondary Canal No.2-10 | | | | | | 17,804,396 | 17,826,448 | 35,630,844 | |
| Secondary Canal No.2-11 | | | | | | 20,306,864 | 20,236,300 | 40,543,164 | |
| Secondary Canal No.2-12 | | | | | | 10,251,765 | 10,622,127 | 20,873,892 | |
| Secondary Canal No.2-13 | | | | | | 24,646,495 | 25,525,061 | 50,171,556 | |
| Secondary Canal No.2-14 | | | | | | 11,013,062 | 10,242,106 | 21,255,168 | |
| Secondary Canal No.2-15 | | | | | | 30,626,285 | 32,829,343 | 63,455,628 | |
| Secondary Canal No.2-16 | | | | | | 67,726,156 | 67,082,807 | 134,808,963 | |
| Secondary Canal No.2-17 | | | | | | 12,864,821 | 11,834,887 | 24,699,708 | |

(2) *Irrigation Canal (No. 2)*

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Secondary Canal No. 2-18 | | | | | | 14,946,356 | 14,513,080 | 29,459,436 | |
| Secondary Canal No. 2-19 | | | | | | 12,699,918 | 12,169,722 | 24,869,640 | |
| Sub-total | | | | | | 1,657,838,319 | 1,688,996,789 | 3,346,835,108 | |
| Principal Canal No. 3 | | | | | | 205,807,088 | 170,381,050 | 376,188,138 | |
| Sub-total | | | | | | 205,807,088 | 170,381,050 | 376,188,138 | |
| Total | | | | | | 5,655,738,726 | 5,606,596,844 | 11,262,335,570 | |

(3) Principal Canal No.1 (No.1)

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 62,060,017 | 63,187,759 | 125,247,776 | |
| Surface soil removing | ha | 50 | 271,700 | 146,300 | 418,000 | 13,585,000 | 7,315,000 | 20,900,000 | |
| Excavation | m3 | 696,000 | 351 | 189 | 540 | 244,296,000 | 131,544,000 | 375,840,000 | |
| Embankment | m3 | 343,000 | 364 | 196 | 560 | 124,852,000 | 67,228,000 | 192,080,000 | |
| Spreading | m3 | 283,400 | 592 | 319 | 910 | 167,631,100 | 90,262,900 | 257,894,000 | |
| Slope finishing | m2 | 644,600 | 572 | 308 | 880 | 368,711,200 | 198,536,800 | 567,248,000 | |
| Leveling | m2 | 79,950 | 33 | 18 | 50 | 2,598,375 | 1,399,125 | 3,997,500 | |
| Lining concrete | m2 | 397,596 | 1,517 | 1,854 | 3,370 | 602,954,334 | 736,944,186 | 1,339,898,520 | |
| Drain | m3 | 1,450 | 2,990 | 1,610 | 4,600 | 4,335,500 | 2,334,500 | 6,670,000 | |
| Drop Type 1 | unit | 32 | 10,701,450 | 13,079,550 | 23,781,000 | 342,446,400 | 418,545,600 | 760,992,000 | |
| Drop Type 2 | unit | 37 | 6,266,700 | 7,659,300 | 13,926,000 | 231,867,900 | 283,394,100 | 515,262,000 | |
| Drop Type 3 | unit | 64 | 5,156,100 | 6,301,900 | 11,458,000 | 329,990,400 | 403,321,600 | 733,312,000 | |
| Drop Type 6 | unit | 17 | 3,384,000 | 4,136,000 | 7,520,000 | 57,528,000 | 70,312,000 | 127,840,000 | |
| Drop Type 7 | unit | 8 | 2,747,700 | 3,358,300 | 6,106,000 | 21,981,600 | 26,866,400 | 48,848,000 | |
| Sifon Type 2 | unit | 1 | 2,653,200 | 3,242,800 | 5,896,000 | 2,653,200 | 3,242,800 | 5,896,000 | |
| Sifon Type 3 | unit | 1 | 2,169,900 | 2,652,100 | 4,822,000 | 2,169,900 | 2,652,100 | 4,822,000 | |
| Sifon Type 5 | unit | 2 | 3,811,500 | 4,658,500 | 8,470,000 | 7,623,000 | 9,317,000 | 16,940,000 | |
| Sifon Type 6 | unit | 7 | 2,174,400 | 2,657,600 | 4,832,000 | 15,220,800 | 18,603,200 | 33,824,000 | |
| Sifon Type 8 | unit | 2 | 1,394,550 | 1,704,450 | 3,099,000 | 2,789,100 | 3,408,900 | 6,198,000 | |
| Sifon Type 17 | unit | 1 | 7,808,850 | 9,544,150 | 17,353,000 | 7,808,850 | 9,544,150 | 17,353,000 | |
| Diversion works Type | unit | 1 | 69,854,850 | 85,378,150 | 155,233,000 | 69,854,850 | 85,378,150 | 155,233,000 | |
| Diversion works Type | unit | 1 | 12,978,900 | 15,863,100 | 28,842,000 | 12,978,900 | 15,863,100 | 28,842,000 | |
| Diversion works Type | unit | 1 | 25,689,150 | 31,397,850 | 57,087,000 | 25,689,150 | 31,397,850 | 57,087,000 | |
| Diversion works Type | unit | 1 | 8,761,050 | 10,707,950 | 19,469,000 | 8,761,050 | 10,707,950 | 19,469,000 | |
| Diversion works Type | unit | 65 | 629,100 | 768,900 | 1,398,000 | 40,891,500 | 49,978,500 | 90,870,000 | |
| Sub-total | | | | | | 2,771,278,126 | 2,741,285,670 | 5,512,563,796 | |

(3) Principal Canal No.1 (No.2)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Waterway Type 1 | unit | 6 | 47,825,550 | 58,453,450 | 106,279,000 | 286,953,300 | 350,720,700 | 637,674,000 | |
| Waterway Type 3 | unit | 2 | 13,590,000 | 16,610,000 | 30,200,000 | 27,180,000 | 33,220,000 | 60,400,000 | |
| Waterway Type 4 | unit | 1 | 6,587,100 | 8,050,900 | 14,638,000 | 6,587,100 | 8,050,900 | 14,638,000 | |
| Waterway Type 5 | unit | 1 | 4,482,000 | 5,478,000 | 9,960,000 | 4,482,000 | 5,478,000 | 9,960,000 | |
| Bridge Type 1 | unit | 10 | 1,208,700 | 1,477,300 | 2,686,000 | 12,087,000 | 14,773,000 | 26,860,000 | |
| Bridge Type 2 | unit | 4 | 931,050 | 1,137,950 | 2,069,000 | 3,724,200 | 4,551,800 | 8,276,000 | |
| Bridge Type 3 | unit | 8 | 899,100 | 1,098,900 | 1,998,000 | 7,192,800 | 8,791,200 | 15,984,000 | |
| Bridge Type 5 | unit | 2 | 771,750 | 943,250 | 1,715,000 | 1,543,500 | 1,886,500 | 3,430,000 | |
| Bridge Type 6 | unit | 1 | 990,450 | 1,210,550 | 2,201,000 | 990,450 | 1,210,550 | 2,201,000 | |
| Bridge Type 13 | unit | 4 | 711,900 | 870,100 | 1,582,000 | 2,847,600 | 3,480,400 | 6,328,000 | |
| Bridge Type 17 | unit | 1 | 1,703,700 | 2,082,300 | 3,786,000 | 1,703,700 | 2,082,300 | 3,786,000 | |
| Fence | km | 114.2 | 337,050 | 411,950 | 749,000 | 38,491,110 | 47,044,690 | 85,535,800 | |
| Sub-total | | | | | | 393,782,760 | 481,290,040 | 875,072,800 | |
| Total | | | | | | 3,165,060,886 | 3,222,575,710 | 6,387,636,596 | |

(4) Secondary Canal No.1-1

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 106,274 | 99,234 | 205,508 | |
| Irrigation canal Type 3 | Km | 1.2 | 1,868,100 | 1,005,900 | 2,874,000 | 2,241,720 | 1,207,080 | 3,448,800 | |
| Sifon Type 16 | unit | 1 | 655,650 | 801,350 | 1,457,000 | 655,650 | 801,350 | 1,457,000 | |
| Diversion works Type 16 | unit | 1 | 210,150 | 256,850 | 467,000 | 210,150 | 256,850 | 467,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 2.4 | 337,050 | 411,950 | 749,000 | 808,920 | 988,680 | 1,797,600 | |
| Total | | | | | | 5,419,964 | 5,060,944 | 10,480,908 | |

(5) Secondary Canal No.1-2

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 179,336 | 188,532 | 367,868 | |
| Irrigation canal Type 3 | Km | 1.2 | 1,868,100 | 1,005,900 | 2,874,000 | 2,241,720 | 1,207,080 | 3,448,800 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 2 | 738,450 | 902,550 | 1,641,000 | 1,476,900 | 1,805,100 | 3,282,000 | |
| Sifon Type 16 | unit | 2 | 655,650 | 801,350 | 1,457,000 | 1,311,300 | 1,602,700 | 2,914,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 2.4 | 337,050 | 411,950 | 749,000 | 808,920 | 988,680 | 1,797,600 | |
| Total | | | | | | 9,146,126 | 9,615,142 | 18,761,268 | |

(6) Secondary Canal No.1-3

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 115,633 | 105,563 | 221,196 | |
| Irrigation canal Type 3 | Km | 1.4 | 1,868,100 | 1,005,900 | 2,874,000 | 2,615,340 | 1,408,260 | 4,023,600 | |
| Sifon Type 16 | unit | 1 | 655,650 | 801,350 | 1,457,000 | 655,650 | 801,350 | 1,457,000 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Fence | km | 2.8 | 337,050 | 411,950 | 749,000 | 943,740 | 1,153,460 | 2,097,200 | |
| Total | | | | | | 5,897,263 | 5,383,733 | 11,280,996 | |

(7) Secondary Canal No.1-4

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 294,139 | 275,365 | 569,504 | |
| Irrigation canal Type 2 | Km | 3.2 | 1,922,700 | 1,035,300 | 2,958,000 | 6,152,640 | 3,312,960 | 9,465,600 | |
| Drop Type 14 | unit | 5 | 865,350 | 1,057,650 | 1,923,000 | 4,326,750 | 5,288,250 | 9,615,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Diversion works Type 6 | unit | 4 | 210,150 | 256,850 | 467,000 | 840,600 | 1,027,400 | 1,868,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Fence | km | 6.4 | 337,050 | 411,950 | 749,000 | 2,157,120 | 2,636,480 | 4,793,600 | |
| Total | | | | | | 15,001,099 | 14,043,605 | 29,044,704 | |

(8) Secondary Canal No.1-5 (No.1)

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 6,532,226 | 5,440,991 | 11,973,216 | |
| Surface soil removing | ha | 12 | 271,700 | 146,300 | 418,000 | 3,260,400 | 1,755,600 | 5,016,000 | |
| Excavation | m3 | 120,900 | 351 | 189 | 540 | 42,435,900 | 22,850,100 | 65,286,000 | |
| Embankment | m3 | 58,100 | 364 | 196 | 560 | 21,148,400 | 11,387,600 | 32,536,000 | |
| Spreading | m3 | 50,800 | 592 | 319 | 910 | 30,048,200 | 16,179,800 | 46,228,000 | |
| Slope finishing | m2 | 153,800 | 572 | 308 | 880 | 87,973,600 | 47,370,400 | 135,344,000 | |
| Leveling | m2 | 21,600 | 33 | 18 | 50 | 702,000 | 378,000 | 1,080,000 | |
| Lining concrete | m2 | 8,806 | 1,517 | 1,854 | 3,370 | 13,354,299 | 16,321,921 | 29,676,220 | |
| Drain | m3 | 126 | 2,990 | 1,610 | 4,600 | 376,740 | 202,860 | 579,600 | |
| Drop Type 7 | unit | 3 | 2,747,700 | 3,358,300 | 6,106,000 | 8,243,100 | 10,074,900 | 18,318,000 | |
| Drop Type 8 | unit | 9 | 2,405,250 | 2,939,750 | 5,345,000 | 21,647,250 | 26,457,750 | 48,105,000 | |
| Drop Type 9 | unit | 8 | 2,064,600 | 2,523,400 | 4,588,000 | 16,516,800 | 20,187,200 | 36,704,000 | |
| Drop Type 11 | unit | 4 | 1,641,150 | 2,005,850 | 3,647,000 | 6,564,600 | 8,023,400 | 14,588,000 | |
| Drop Type 16 | unit | 4 | 770,400 | 941,600 | 1,712,000 | 3,081,600 | 3,766,400 | 6,848,000 | |
| Sifon Type 4 | unit | 1 | 1,703,250 | 2,081,750 | 3,785,000 | 1,703,250 | 2,081,750 | 3,785,000 | |
| Sifon Type 8 | unit | 4 | 1,394,550 | 1,704,450 | 3,099,000 | 5,578,200 | 6,817,800 | 12,396,000 | |
| Sifon Type 10 | unit | 1 | 1,542,600 | 1,885,400 | 3,428,000 | 1,542,600 | 1,885,400 | 3,428,000 | |
| Diversion works Type 4 | unit | 1 | 8,761,050 | 10,707,950 | 19,469,000 | 8,761,050 | 10,707,950 | 19,469,000 | |
| Diversion works Type 5 | unit | 22 | 629,100 | 768,900 | 1,398,000 | 13,840,200 | 16,915,800 | 30,756,000 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 4 | unit | 1 | 6,587,100 | 8,050,900 | 14,638,000 | 6,587,100 | 8,050,900 | 14,638,000 | |
| Waterway Type 5 | unit | 3 | 4,482,000 | 5,478,000 | 9,960,000 | 13,446,000 | 16,434,000 | 29,880,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sub-total | | | | | | 314,255,215 | 254,404,822 | 568,660,036 | |

(8) Secondary Canal No. 1-5 (No. 2)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Bridge Type 6 | unit | 2 | 711,900 | 870,100 | 1,582,000 | 1,423,800 | 1,740,200 | 3,164,000 | |
| Bridge Type 13 | unit | 3 | 990,450 | 1,210,550 | 2,201,000 | 2,971,350 | 3,631,650 | 6,603,000 | |
| Fence | km | 43.0 | 337,050 | 411,950 | 749,000 | 14,493,150 | 17,713,850 | 32,207,000 | |
| Sub-total | | | | | | 18,888,300 | 23,085,700 | 41,974,000 | |
| Total | | | | | | 333,143,515 | 277,490,522 | 610,634,036 | |

(9) Secondary Canal No.1-6

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 1,200,887 | 1,004,701 | 2,205,588 | |
| Surface soil removing | ha | 3 | 271,700 | 146,300 | 418,000 | 815,100 | 438,900 | 1,254,000 | |
| Excavation | m3 | 20,900 | 351 | 189 | 540 | 7,335,900 | 3,950,100 | 11,286,000 | |
| Embankment | m3 | 12,200 | 364 | 196 | 560 | 4,440,800 | 2,391,200 | 6,832,000 | |
| Spreading | m3 | 6,600 | 592 | 319 | 910 | 3,903,900 | 2,102,100 | 6,006,000 | |
| Slope finishing | m2 | 30,000 | 572 | 308 | 880 | 17,160,000 | 9,240,000 | 26,400,000 | |
| Leveling | m2 | 6,300 | 33 | 18 | 50 | 204,750 | 110,250 | 315,000 | |
| Drop Type 13 | unit | 5 | 1,009,800 | 1,234,200 | 2,244,000 | 5,049,000 | 6,171,000 | 11,220,000 | |
| Drop Type 14 | unit | 6 | 864,900 | 1,057,100 | 1,922,000 | 5,189,400 | 6,342,600 | 11,532,000 | |
| Sifon Type 11 | unit | 1 | 1,011,150 | 1,235,850 | 2,247,000 | 1,011,150 | 1,235,850 | 2,247,000 | |
| Diversion works Type 5 | unit | 7 | 629,100 | 768,900 | 1,398,000 | 4,403,700 | 5,382,300 | 9,786,000 | |
| Waterway Type 5 | unit | 1 | 4,482,000 | 5,478,000 | 9,960,000 | 4,482,000 | 5,478,000 | 9,960,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Fence | km | 12.6 | 337,050 | 411,950 | 749,000 | 4,246,830 | 5,190,570 | 9,437,400 | |
| Total | | | | | | 61,245,217 | 51,239,771 | 112,484,988 | |

(10) Secondary Canal No.1-7

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 2,476,870 | 1,936,646 | 4,413,516 | |
| Surface soil removing | ha | 6 | 271,700 | 146,300 | 418,000 | 1,630,200 | 877,800 | 2,508,000 | |
| Excavation | m3 | 48,800 | 351 | 189 | 540 | 17,128,800 | 9,223,200 | 26,352,000 | |
| Embankment | m3 | 27,300 | 364 | 196 | 560 | 9,937,200 | 5,350,800 | 15,288,000 | |
| Spreading | m3 | 16,700 | 592 | 319 | 910 | 9,878,050 | 5,318,950 | 15,197,000 | |
| Slope finishing | m2 | 65,400 | 572 | 308 | 880 | 37,408,800 | 20,143,200 | 57,552,000 | |
| Leveling | m2 | 116,000 | 33 | 18 | 50 | 3,770,000 | 2,030,000 | 5,800,000 | |
| Drop Type 12 | unit | 7 | 1,336,500 | 1,633,500 | 2,970,000 | 9,355,500 | 11,434,500 | 20,790,000 | |
| Drop Type 13 | unit | 5 | 1,009,800 | 1,234,200 | 2,244,000 | 5,049,000 | 6,171,000 | 11,220,000 | |
| Sifon Type 10 | unit | 1 | 1,542,600 | 1,885,400 | 3,428,000 | 1,542,600 | 1,885,400 | 3,428,000 | |
| Sifon Type 15 | unit | 2 | 885,600 | 1,082,400 | 1,968,000 | 1,771,200 | 2,164,800 | 3,936,000 | |
| Diversion works Type 5 | unit | 10 | 629,100 | 768,900 | 1,398,000 | 6,291,000 | 7,689,000 | 13,980,000 | |
| Diversion works Type 6 | unit | 4 | 210,150 | 256,850 | 467,000 | 840,600 | 1,027,400 | 1,868,000 | |
| Waterway Type 5 | unit | 2 | 4,482,000 | 5,478,000 | 9,960,000 | 8,964,000 | 10,956,000 | 19,920,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 3 | 655,200 | 800,800 | 1,456,000 | 1,965,600 | 2,402,400 | 4,368,000 | |
| Fence | km | 23.2 | 337,050 | 411,950 | 749,000 | 7,819,560 | 9,557,240 | 17,376,800 | |
| Total | | | | | | 126,320,380 | 98,768,936 | 225,089,316 | |

(11) Secondary Canal No.1-8

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 337,095 | 285,029 | 622,124 | |
| Irrigation canal Type 2 | Km | 1.8 | 1,953,900 | 1,052,100 | 3,006,000 | 3,517,020 | 1,893,780 | 5,410,800 | |
| Irrigation canal Type 3 | Km | 3.0 | 1,922,700 | 1,035,300 | 2,958,000 | 5,768,100 | 3,105,900 | 8,874,000 | |
| Diversion works Type 6 | unit | 8 | 210,150 | 256,850 | 467,000 | 1,681,200 | 2,054,800 | 3,736,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 9.6 | 337,050 | 411,950 | 749,000 | 3,235,680 | 3,954,720 | 7,190,400 | |
| Total | | | | | | 17,191,845 | 14,536,479 | 31,728,324 | |

(12) Secondary Canal No.1-9

(Unit: Col.S)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 877,698 | 803,399 | 1,681,097 | |
| Surface soil removing | ha | 6 | 271,700 | 146,300 | 418,000 | 1,630,200 | 877,800 | 2,508,000 | |
| Excavation | m3 | 10,290 | 351 | 189 | 540 | 3,611,790 | 1,944,810 | 5,556,600 | |
| Embankment 1 | m3 | 2,379 | 364 | 196 | 560 | 865,956 | 466,284 | 1,332,240 | |
| Embankment 2 | m3 | 14,326 | 267 | 144 | 410 | 3,817,879 | 2,055,781 | 5,873,660 | |
| Spreading | m3 | 7,444 | 507 | 273 | 780 | 3,774,108 | 2,032,212 | 5,806,320 | |
| Slope finishing 1 | m2 | 23,067 | 72 | 39 | 110 | 1,649,291 | 888,080 | 2,537,370 | |
| Slope finishing 2 | m2 | 7,218 | 572 | 308 | 880 | 4,128,696 | 2,223,144 | 6,351,840 | |
| Leveling | m2 | 6,700 | 33 | 18 | 50 | 217,750 | 117,250 | 335,000 | |
| Drop Type 16 | unit | 3 | 770,400 | 941,600 | 1,712,000 | 2,311,200 | 2,824,800 | 5,136,000 | |
| Sifon Type 15 | unit | 1 | 885,600 | 1,082,400 | 1,968,000 | 885,600 | 1,082,400 | 1,968,000 | |
| Diversion works Type 5 | unit | 4 | 629,100 | 768,900 | 1,398,000 | 2,516,400 | 3,075,600 | 5,592,000 | |
| Diversion works Type 6 | unit | 8 | 210,150 | 256,850 | 467,000 | 1,681,200 | 2,054,800 | 3,736,000 | |
| Waterway Type 5 | unit | 2 | 4,482,000 | 5,478,000 | 9,960,000 | 8,964,000 | 10,956,000 | 19,920,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 15.2 | 337,050 | 411,950 | 749,000 | 5,123,160 | 6,261,640 | 11,384,800 | |
| Sub-total | | | | | | 44,762,577 | 40,973,350 | 85,735,927 | |
| Total | | | | | | 44,762,577 | 40,973,350 | 85,735,927 | |

(13) Secondary Canal No.1-10

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 174,597 | 147,663 | 322,260 | |
| Irrigation canal Type 2 | Km | 2.5 | 1,922,700 | 1,035,300 | 2,958,000 | 4,806,750 | 2,588,250 | 7,395,000 | |
| Diversion works Type 6 | unit | 4 | 210,150 | 256,850 | 467,000 | 840,600 | 1,027,400 | 1,868,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 5.0 | 337,050 | 411,950 | 749,000 | 1,685,250 | 2,059,750 | 3,745,000 | |
| Total | | | | | | 8,904,447 | 7,530,813 | 16,435,260 | |

(14) Principal Canal No.2 (No.1)

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 25,922,721 | 26,509,940 | 52,432,661 | |
| Surface soil rem | ha | 15 | 271,700 | 146,300 | 418,000 | 4,075,500 | 2,194,500 | 6,270,000 | |
| Excavation | m3 | 264,200 | 351 | 189 | 540 | 92,734,200 | 49,933,800 | 142,668,000 | |
| Embankment | m3 | 76,700 | 364 | 196 | 560 | 27,918,800 | 15,033,200 | 42,952,000 | |
| Spreading | m3 | 161,200 | 592 | 319 | 910 | 95,349,800 | 51,342,200 | 146,692,000 | |
| Slope finishing | m2 | 267,200 | 572 | 308 | 880 | 152,838,400 | 82,297,600 | 235,136,000 | |
| Leveling | m2 | 32,450 | 33 | 18 | 50 | 1,054,625 | 567,875 | 1,622,500 | |
| Lining concrete | m2 | 155,695 | 1,517 | 1,854 | 3,370 | 236,111,468 | 288,580,683 | 524,692,150 | |
| Drain | m3 | 1,449 | 2,990 | 1,610 | 4,600 | 4,332,510 | 2,332,890 | 6,665,400 | |
| Drop Type 2 | unit | 28 | 6,266,700 | 7,659,300 | 13,926,000 | 175,467,600 | 214,460,400 | 389,928,000 | |
| Drop Type 3 | unit | 24 | 5,156,100 | 6,301,900 | 11,458,000 | 123,746,400 | 151,245,600 | 274,992,000 | |
| Drop Type 4 | unit | 21 | 4,526,100 | 5,531,900 | 10,058,000 | 95,048,100 | 116,169,900 | 211,218,000 | |
| Drop Type 5 | unit | 14 | 3,694,950 | 4,516,050 | 8,211,000 | 51,729,300 | 63,224,700 | 114,954,000 | |
| Drop Type 8 | unit | 8 | 2,405,250 | 2,939,750 | 5,345,000 | 19,242,000 | 23,518,000 | 42,760,000 | |
| Drop Type 11 | unit | 9 | 1,641,600 | 2,006,400 | 3,648,000 | 14,774,400 | 18,057,600 | 32,832,000 | |
| Sifon Type 3 | unit | 2 | 2,169,900 | 2,652,100 | 4,822,000 | 4,339,800 | 5,304,200 | 9,644,000 | |
| Sifon Type 4 | unit | 3 | 1,783,350 | 2,179,650 | 3,963,000 | 5,350,050 | 6,538,950 | 11,889,000 | |
| Sifon Type 7 | unit | 2 | 1,703,250 | 2,081,750 | 3,785,000 | 3,406,500 | 4,163,500 | 7,570,000 | |
| Diversion works | unit | 2 | 8,761,050 | 10,707,950 | 19,469,000 | 17,522,100 | 21,415,900 | 38,938,000 | |
| Diversion works | unit | 16 | 629,100 | 768,900 | 1,398,000 | 10,065,600 | 12,302,400 | 22,368,000 | |
| Waterway Type 1 | unit | 2 | 47,825,550 | 58,453,450 | 106,279,000 | 95,651,100 | 116,906,900 | 212,558,000 | |
| Waterway Type 2 | unit | 1 | 19,796,400 | 24,195,600 | 43,992,000 | 19,796,400 | 24,195,600 | 43,992,000 | |
| Waterway Type 5 | unit | 1 | 4,482,000 | 5,478,000 | 9,960,000 | 4,482,000 | 5,478,000 | 9,960,000 | |
| Sub-total | | | | | | 1,280,959,374 | 1,301,774,337 | 2,582,733,711 | |

(14) Principal Canal No. 2 (No. 2)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Bridge Type 2 | unit | 9 | 931,050 | 1,137,950 | 2,069,000 | 8,379,450 | 10,241,550 | 18,621,000 | |
| Bridge Type 3 | unit | 9 | 899,100 | 1,098,900 | 1,998,000 | 8,091,900 | 9,890,100 | 17,982,000 | |
| Bridge Type 5 | unit | 1 | 771,750 | 943,250 | 1,715,000 | 771,750 | 943,250 | 1,715,000 | |
| Bridge Type 6 | unit | 1 | 711,900 | 870,100 | 1,582,000 | 711,900 | 870,100 | 1,582,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 10 | unit | 2 | 1,433,700 | 1,752,300 | 3,186,000 | 2,867,400 | 3,504,600 | 6,372,000 | |
| Bridge Type 13 | unit | 1 | 990,450 | 1,210,550 | 2,201,000 | 990,450 | 1,210,550 | 2,201,000 | |
| Bridge Type 21 | unit | 1 | 1,123,650 | 1,373,350 | 2,497,000 | 1,123,650 | 1,373,350 | 2,497,000 | |
| Fence | km | 50.0 | 337,050 | 411,950 | 749,000 | 16,852,500 | 20,597,500 | 37,450,000 | |
| Sub-total | | | | | | 41,099,400 | 50,232,600 | 91,332,000 | |
| Total | | | | | | 1,322,058,774 | 1,352,006,937 | 2,674,065,711 | |

(15) Secondary Canal No. 2-1

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 192,035 | 187,381 | 379,416 | |
| Irrigation canal Type 2 | Km | 1.8 | 1,922,700 | 1,035,300 | 2,958,000 | 3,460,860 | 1,863,540 | 5,324,400 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 3 | 655,650 | 801,350 | 1,457,000 | 1,966,950 | 2,404,050 | 4,371,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Fence | km | 3.6 | 337,050 | 411,950 | 749,000 | 1,213,380 | 1,483,020 | 2,696,400 | |
| Total | | | | | | 9,793,775 | 9,556,441 | 19,350,216 | |

(16) Secondary Canal No.2-2

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 198,704 | 195,532 | 394,236 | |
| Irrigation canal Type 2 | Km | 1.8 | 1,922,700 | 1,035,300 | 2,958,000 | 3,460,860 | 1,863,540 | 5,324,400 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 2 | 738,450 | 902,550 | 1,641,000 | 1,476,900 | 1,805,100 | 3,282,000 | |
| Sifon Type 16 | unit | 2 | 655,650 | 801,350 | 1,457,000 | 1,311,300 | 1,602,700 | 2,914,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 3.6 | 337,050 | 411,950 | 749,000 | 1,213,380 | 1,483,020 | 2,696,400 | |
| Total | | | | | | 10,133,894 | 9,972,142 | 20,106,036 | |

(17) Secondary Canal No.2-3

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 299,303 | 342,077 | 641,380 | |
| Irrigation canal Type 2 | Km | 3.0 | 1,922,700 | 1,035,300 | 2,958,000 | 5,768,100 | 3,105,900 | 8,874,000 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 7 | 655,650 | 801,350 | 1,457,000 | 4,589,550 | 5,609,450 | 10,199,000 | |
| Bridge Type 7 | unit | 3 | 451,360 | 1,004,640 | 1,456,000 | 1,354,080 | 3,013,920 | 4,368,000 | |
| Fence | km | 6.0 | 232,190 | 516,810 | 749,000 | 1,393,140 | 3,100,860 | 4,494,000 | |
| Total | | | | | | 15,264,473 | 17,445,907 | 32,710,380 | |

(18) Secondary Canal No. 2-4

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 235,317 | 235,023 | 470,340 | |
| Irrigation canal Type 2 | Km | 2.0 | 1,922,700 | 1,035,300 | 2,958,000 | 3,845,400 | 2,070,600 | 5,916,000 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 2 | 738,450 | 902,550 | 1,641,000 | 1,476,900 | 1,805,100 | 3,282,000 | |
| Sifon Type 16 | unit | 4 | 655,650 | 801,350 | 1,457,000 | 2,622,600 | 3,205,400 | 5,828,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 4.0 | 337,050 | 411,950 | 749,000 | 1,348,200 | 1,647,800 | 2,996,000 | |
| Total | | | | | | 12,001,167 | 11,986,173 | 23,987,340 | |

(19) Secondary Canal No.2-5

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 225,922 | 218,282 | 444,204 | |
| Irrigation canal Type 2 | Km | 2.2 | 1,922,700 | 1,035,300 | 2,958,000 | 4,229,940 | 2,277,660 | 6,507,600 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 4 | 655,650 | 801,350 | 1,457,000 | 2,622,600 | 3,205,400 | 5,828,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Fence | km | 4.4 | 337,050 | 411,950 | 749,000 | 1,483,020 | 1,812,580 | 3,295,600 | |
| Total | | | | | | 11,522,032 | 11,132,372 | 22,654,404 | |

(20) Secondary Canal No. 2-6

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 315,196 | 314,248 | 629,444 | |
| Irrigation canal Type 2 | Km | 2.7 | 1,922,700 | 1,035,300 | 2,958,000 | 5,191,290 | 2,795,310 | 7,986,600 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 2 | 738,450 | 902,550 | 1,641,000 | 1,476,900 | 1,805,100 | 3,282,000 | |
| Sifon Type 16 | unit | 5 | 655,650 | 801,350 | 1,457,000 | 3,278,250 | 4,006,750 | 7,285,000 | |
| Bridge Type 7 | unit | 3 | 655,200 | 800,800 | 1,456,000 | 1,965,600 | 2,402,400 | 4,368,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 5.4 | 337,050 | 411,950 | 749,000 | 1,820,070 | 2,224,530 | 4,044,600 | |
| Total | | | | | | 16,075,006 | 16,026,638 | 32,101,644 | |

(21) Secondary Canal No. 2-7

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 228,648 | 226,872 | 455,520 | |
| Irrigation canal Type 2 | Km | 2.0 | 1,922,700 | 1,035,300 | 2,958,000 | 3,845,400 | 2,070,600 | 5,916,000 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 5 | 655,650 | 801,350 | 1,457,000 | 3,278,250 | 4,006,750 | 7,285,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Fence | km | 4.0 | 337,050 | 411,950 | 749,000 | 1,348,200 | 1,647,800 | 2,996,000 | |
| Total | | | | | | 11,661,048 | 11,570,472 | 23,231,520 | |

(22) Secondary Canal No. 2-8

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 295,216 | 292,456 | 587,672 | |
| Irrigation canal Type 2 | Km | 2.6 | 1,922,700 | 1,035,300 | 2,958,000 | 4,999,020 | 2,691,780 | 7,690,800 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 3 | 655,650 | 801,350 | 1,457,000 | 1,966,950 | 2,404,050 | 4,371,000 | |
| Bridge Type 7 | unit | 5 | 655,200 | 800,800 | 1,456,000 | 3,276,000 | 4,004,000 | 7,280,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 5.2 | 337,050 | 411,950 | 749,000 | 1,752,660 | 2,142,140 | 3,894,800 | |
| Total | | | | | | 15,055,996 | 14,915,276 | 29,971,272 | |

(23) Secondary Canal No. 2-9

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 223,256 | 225,540 | 448,796 | |
| Irrigation canal Type 2 | Km | 1.8 | 1,922,700 | 1,035,300 | 2,958,000 | 3,460,860 | 1,863,540 | 5,324,400 | |
| Diversion works Type 6 | unit | 2 | 210,150 | 256,850 | 467,000 | 420,300 | 513,700 | 934,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 3 | 655,650 | 801,350 | 1,457,000 | 1,966,950 | 2,404,050 | 4,371,000 | |
| Bridge Type 7 | unit | 3 | 655,200 | 800,800 | 1,456,000 | 1,965,600 | 2,402,400 | 4,368,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 3.6 | 337,050 | 411,950 | 749,000 | 1,213,380 | 1,483,020 | 2,696,400 | |
| Total | | | | | | 11,386,046 | 11,502,550 | 22,888,596 | |

(24) Secondary Canal No. 2-10

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 349,106 | 349,538 | 698,644 | |
| Irrigation canal Type 1 | Km | 2.1 | 1,953,900 | 1,052,100 | 3,006,000 | 4,103,190 | 2,209,410 | 6,312,600 | |
| Irrigation canal Type 2 | Km | 0.8 | 1,922,700 | 1,035,300 | 2,958,000 | 1,538,160 | 828,240 | 2,366,400 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 11 | unit | 3 | 1,011,150 | 1,235,850 | 2,247,000 | 3,033,450 | 3,707,550 | 6,741,000 | |
| Sifon Type 15 | unit | 4 | 885,600 | 1,082,400 | 1,968,000 | 3,542,400 | 4,329,600 | 7,872,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 5.8 | 337,050 | 411,950 | 749,000 | 1,954,890 | 2,389,310 | 4,344,200 | |
| Total | | | | | | 17,804,396 | 17,826,448 | 35,630,844 | |

(25) Secondary Canal No.2-11

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 398,174 | 396,790 | 794,964 | |
| Irrigation canal Type 1 | Km | 1.1 | 1,953,900 | 1,052,100 | 3,006,000 | 2,149,290 | 1,157,310 | 3,306,600 | |
| Irrigation canal Type 2 | Km | 2.3 | 1,922,700 | 1,035,300 | 2,958,000 | 4,422,210 | 2,381,190 | 6,803,400 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 11 | unit | 2 | 1,011,150 | 1,235,850 | 2,247,000 | 2,022,300 | 2,471,700 | 4,494,000 | |
| Sifon Type 15 | unit | 5 | 885,600 | 1,082,400 | 1,968,000 | 4,428,000 | 5,412,000 | 9,840,000 | |
| Sifon Type 16 | unit | 3 | 655,650 | 801,350 | 1,457,000 | 1,966,950 | 2,404,050 | 4,371,000 | |
| Bridge Type 7 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 6.8 | 337,050 | 411,950 | 749,000 | 2,291,940 | 2,801,260 | 5,093,200 | |
| Total | | | | | | 20,306,864 | 20,236,300 | 40,543,164 | |

(26) Secondary Canal No. 2-12

(Unit: Col.S)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 201,015 | 208,277 | 409,292 | |
| Irrigation canal Type 1 | Km | 1.4 | 1,953,900 | 1,052,100 | 3,006,000 | 2,735,460 | 1,472,940 | 4,208,400 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 11 | unit | 3 | 1,011,150 | 1,235,850 | 2,247,000 | 3,033,450 | 3,707,550 | 6,741,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 2.8 | 337,050 | 411,950 | 749,000 | 943,740 | 1,153,460 | 2,097,200 | |
| Total | | | | | | 10,251,765 | 10,622,127 | 20,873,892 | |

(27) Secondary Canal No.2-13

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 483,265 | 500,491 | 983,756 | |
| Irrigation canal Type 1 | Km | 1.8 | 1,953,900 | 1,052,100 | 3,006,000 | 3,517,020 | 1,893,780 | 5,410,800 | |
| Irrigation canal Type 2 | Km | 1.6 | 1,922,700 | 1,035,300 | 2,958,000 | 3,076,320 | 1,656,480 | 4,732,800 | |
| Diversion works Type 6 | unit | 4 | 210,150 | 256,850 | 467,000 | 840,600 | 1,027,400 | 1,868,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 11 | unit | 4 | 1,011,150 | 1,235,850 | 2,247,000 | 4,044,600 | 4,943,400 | 8,988,000 | |
| Sifon Type 15 | unit | 8 | 885,600 | 1,082,400 | 1,968,000 | 7,084,800 | 8,659,200 | 15,744,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 11 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 6.8 | 337,050 | 411,950 | 749,000 | 2,291,940 | 2,801,260 | 5,093,200 | |
| Total | | | | | | 24,646,495 | 25,525,061 | 50,171,556 | |

(28) Secondary Canal No.2-14

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 215,942 | 200,826 | 416,768 | |
| Irrigation canal Type 2 | Km | 2.4 | 1,922,700 | 1,035,300 | 2,958,000 | 4,614,480 | 2,484,720 | 7,099,200 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 2 | 738,450 | 902,550 | 1,641,000 | 1,476,900 | 1,805,100 | 3,282,000 | |
| Sifon Type 16 | unit | 1 | 655,650 | 801,350 | 1,457,000 | 655,650 | 801,350 | 1,457,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Fence | km | 4.8 | 337,050 | 411,950 | 749,000 | 1,617,840 | 1,977,360 | 3,595,200 | |
| Total | | | | | | 11,013,062 | 10,242,106 | 21,255,168 | |

(29) Secondary Canal No. 2-15

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 600,515 | 643,713 | 1,244,228 | |
| Irrigation canal Type 1 | Km | 2.0 | 1,953,900 | 1,052,100 | 3,006,000 | 3,907,800 | 2,104,200 | 6,012,000 | |
| Irrigation canal Type 2 | Km | 1.4 | 1,922,700 | 1,035,300 | 2,958,000 | 2,691,780 | 1,449,420 | 4,141,200 | |
| Diversion works Type 6 | unit | 4 | 210,150 | 256,850 | 467,000 | 840,600 | 1,027,400 | 1,868,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 11 | unit | 8 | 1,011,150 | 1,235,850 | 2,247,000 | 8,089,200 | 9,886,800 | 17,976,000 | |
| Sifon Type 15 | unit | 8 | 885,600 | 1,082,400 | 1,968,000 | 7,084,800 | 8,659,200 | 15,744,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 14 | unit | 3 | 905,850 | 1,107,150 | 2,013,000 | 2,717,550 | 3,321,450 | 6,039,000 | |
| Fence | km | 6.8 | 337,050 | 411,950 | 749,000 | 2,291,940 | 2,801,260 | 5,093,200 | |
| Total | | | | | | 30,626,285 | 32,829,343 | 63,455,628 | |

(30) Secondary Canal No.2-16

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 1,327,964 | 1,315,349 | 2,643,313 | |
| Surface soil removing | ha | 4 | 271,700 | 146,300 | 418,000 | 1,086,800 | 585,200 | 1,672,000 | |
| Excavation | m3 | 8,882 | 351 | 189 | 540 | 3,117,582 | 1,678,698 | 4,796,280 | |
| Embankment 1 | m3 | 1,443 | 364 | 196 | 560 | 525,252 | 282,828 | 808,080 | |
| Embankment 2 | m3 | 13,971 | 267 | 144 | 410 | 3,723,272 | 2,004,839 | 5,728,110 | |
| Spreading | m3 | 7,420 | 371 | 200 | 570 | 2,749,110 | 1,480,290 | 4,229,400 | |
| Slope finishing 1 | m2 | 12,520 | 72 | 39 | 110 | 895,180 | 482,020 | 1,377,200 | |
| Slope finishing 2 | m2 | 17,886 | 572 | 308 | 880 | 10,230,792 | 5,508,888 | 15,739,680 | |
| Leveling | m2 | 5,350 | 33 | 18 | 50 | 173,875 | 93,625 | 267,500 | |
| Drop Type 11 | unit | 2 | 1,641,150 | 2,005,850 | 3,647,000 | 3,282,300 | 4,011,700 | 7,294,000 | |
| Drop Type 14 | unit | 6 | 864,900 | 1,057,100 | 1,922,000 | 5,189,400 | 6,342,600 | 11,532,000 | |
| Sifon Type 4 | unit | 3 | 1,703,250 | 2,081,750 | 3,785,000 | 5,109,750 | 6,245,250 | 11,355,000 | |
| Sifon Type 8 | unit | 6 | 1,394,550 | 1,704,450 | 3,099,000 | 8,367,300 | 10,226,700 | 18,594,000 | |
| Sifon Type 11 | unit | 1 | 1,011,150 | 1,235,850 | 2,247,000 | 1,011,150 | 1,235,850 | 2,247,000 | |
| Sifon Type 16 | unit | 1 | 655,650 | 801,350 | 1,457,000 | 655,650 | 801,350 | 1,457,000 | |
| Diversion works Type 5 | unit | 6 | 629,100 | 768,900 | 1,398,000 | 3,774,600 | 4,613,400 | 8,388,000 | |
| Waterway Type 5 | unit | 2 | 4,482,000 | 5,478,000 | 9,960,000 | 8,964,000 | 10,956,000 | 19,920,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Bridge Type 14 | unit | 2 | 905,850 | 1,107,150 | 2,013,000 | 1,811,700 | 2,214,300 | 4,026,000 | |
| Fence | km | 13.6 | 337,050 | 411,950 | 749,000 | 4,583,880 | 5,602,520 | 10,186,400 | |
| Total | | | | | | 67,726,156 | 67,082,807 | 134,808,963 | |

(31) Secondary Canal No.2-17

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 252,251 | 232,057 | 484,308 | |
| Irrigation canal Type 2 | Km | 2.9 | 1,922,700 | 1,035,300 | 2,958,000 | 5,575,830 | 3,002,370 | 8,578,200 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 1 | 738,450 | 902,550 | 1,641,000 | 738,450 | 902,550 | 1,641,000 | |
| Sifon Type 16 | unit | 1 | 655,650 | 801,350 | 1,457,000 | 655,650 | 801,350 | 1,457,000 | |
| Bridge Type 7 | unit | 3 | 655,200 | 800,800 | 1,456,000 | 1,965,600 | 2,402,400 | 4,368,000 | |
| Fence | km | 5.8 | 337,050 | 411,950 | 749,000 | 1,954,890 | 2,389,310 | 4,344,200 | |
| Total | | | | | | 12,864,821 | 11,834,887 | 24,699,708 | |

(32) Secondary Canal No. 2-18

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 293,066 | 284,570 | 577,636 | |
| Irrigation canal Type 2 | Km | 2.8 | 1,922,700 | 1,035,300 | 2,958,000 | 5,383,560 | 2,898,840 | 8,282,400 | |
| Diversion works Type 6 | unit | 3 | 210,150 | 256,850 | 467,000 | 630,450 | 770,550 | 1,401,000 | |
| Waterway Type 6 | unit | 1 | 600,300 | 733,700 | 1,334,000 | 600,300 | 733,700 | 1,334,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Sifon Type 12 | unit | 2 | 738,450 | 902,550 | 1,641,000 | 1,476,900 | 1,805,100 | 3,282,000 | |
| Sifon Type 16 | unit | 3 | 655,650 | 801,350 | 1,457,000 | 1,966,950 | 2,404,050 | 4,371,000 | |
| Bridge Type 7 | unit | 2 | 655,200 | 800,800 | 1,456,000 | 1,310,400 | 1,601,600 | 2,912,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 5.6 | 337,050 | 411,950 | 749,000 | 1,887,480 | 2,306,920 | 4,194,400 | |
| Total | | | | | | 14,946,356 | 14,513,080 | 29,459,436 | |

(33) Secondary Canal No.2-19

(Unit: Col.S)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 249,018 | 238,622 | 487,640 | |
| Irrigation canal Type 2 | Km | 2.5 | 1,922,700 | 1,035,300 | 2,958,000 | 4,806,750 | 2,588,250 | 7,395,000 | |
| Drop Type 14 | unit | 3 | 865,350 | 1,057,650 | 1,923,000 | 2,596,050 | 3,172,950 | 5,769,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 7 | unit | 3 | 655,200 | 800,800 | 1,456,000 | 1,965,600 | 2,402,400 | 4,368,000 | |
| Bridge Type 14 | unit | 1 | 905,850 | 1,107,150 | 2,013,000 | 905,850 | 1,107,150 | 2,013,000 | |
| Fence | km | 5.0 | 337,050 | 411,950 | 749,000 | 1,685,250 | 2,059,750 | 3,745,000 | |
| Total | | | | | | 12,699,918 | 12,169,722 | 24,869,640 | |

(34) Principal Canal No.3

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 4,035,433 | 3,340,805 | 7,376,238 | |
| Surface soil removing | ha | 7 | 271,700 | 146,300 | 418,000 | 1,901,900 | 1,024,100 | 2,926,000 | |
| Excavation | m3 | 75,800 | 351 | 189 | 540 | 26,605,800 | 14,326,200 | 40,932,000 | |
| Embankment | m3 | 33,700 | 364 | 196 | 560 | 12,266,800 | 6,605,200 | 18,872,000 | |
| Spreading | m3 | 34,500 | 592 | 319 | 910 | 20,406,750 | 10,988,250 | 31,395,000 | |
| Slope finishing | m2 | 95,800 | 572 | 308 | 880 | 54,797,600 | 29,506,400 | 84,304,000 | |
| Leveling | m2 | 12,050 | 33 | 18 | 50 | 391,625 | 210,875 | 602,500 | |
| Drop Type 9 | unit | 6 | 2,064,600 | 2,523,400 | 4,588,000 | 12,387,600 | 15,140,400 | 27,528,000 | |
| Drop Type 11 | unit | 10 | 1,641,150 | 2,005,850 | 3,647,000 | 16,411,500 | 20,058,500 | 36,470,000 | |
| Drop Type 13 | unit | 9 | 1,009,800 | 1,234,200 | 2,244,000 | 9,088,200 | 11,107,800 | 20,196,000 | |
| Drop Type 14 | unit | 2 | 864,900 | 1,057,100 | 1,922,000 | 1,729,800 | 2,114,200 | 3,844,000 | |
| Sifon Type 4 | unit | 2 | 1,703,250 | 2,081,750 | 3,785,000 | 3,406,500 | 4,163,500 | 7,570,000 | |
| Sifon Type 8 | unit | 3 | 1,394,550 | 1,704,450 | 3,099,000 | 4,183,650 | 5,113,350 | 9,297,000 | |
| Sifon Type 16 | unit | 1 | 655,650 | 801,350 | 1,457,000 | 655,650 | 801,350 | 1,457,000 | |
| Diversion works Type 5 | unit | 14 | 629,100 | 768,900 | 1,398,000 | 8,807,400 | 10,764,600 | 19,572,000 | |
| Waterway Type 4 | unit | 1 | 6,587,100 | 8,050,900 | 14,638,000 | 6,587,100 | 8,050,900 | 14,638,000 | |
| Waterway Type 5 | unit | 2 | 4,482,000 | 5,478,000 | 9,960,000 | 8,964,000 | 10,956,000 | 19,920,000 | |
| Waterway Type 7 | unit | 1 | 491,400 | 600,600 | 1,092,000 | 491,400 | 600,600 | 1,092,000 | |
| Bridge Type 6 | unit | 2 | 711,900 | 870,100 | 1,582,000 | 1,423,800 | 1,740,200 | 3,164,000 | |
| Bridge Type 7 | unit | 1 | 655,200 | 800,800 | 1,456,000 | 655,200 | 800,800 | 1,456,000 | |
| Bridge Type 13 | unit | 2 | 990,450 | 1,210,550 | 2,201,000 | 1,980,900 | 2,421,100 | 4,402,000 | |
| Fence | km | 25.6 | 337,050 | 411,950 | 749,000 | 8,628,480 | 10,545,920 | 19,174,400 | |
| Total | | | | | | 205,807,088 | 170,381,050 | 376,188,138 | |

(35) Drainage Canal

(Unit: Col.S)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary works | | | | | | 1,236,839 | 720,168 | 1,957,007 | |
| Excavation | m3 | 56,250 | 350 | 189 | 539 | 19,707,188 | 10,611,562 | 30,318,750 | |
| Embankment | m3 | 3,900 | 267 | 144 | 411 | 1,041,885 | 561,015 | 1,602,900 | |
| Spreading | m3 | 52,350 | 272 | 146 | 418 | 14,223,495 | 7,658,805 | 21,882,300 | |
| Slope finishing | m2 | 39,480 | 572 | 308 | 880 | 22,582,560 | 12,159,840 | 34,742,400 | |
| Leveling | m2 | 10,000 | 33 | 18 | 50 | 325,000 | 175,000 | 500,000 | |
| Bridge Type 13 | unit | 4 | 990,450 | 1,210,550 | 2,201,000 | 3,961,800 | 4,842,200 | 8,804,000 | |
| Total | | | | | | 63,078,766 | 36,728,591 | 99,807,357 | |

(36) Land Consolidation

(Unit: Col.S)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| Temporary Works | L.S. | | | | | 28,145,281 | 15,155,152 | 43,300,433 | |
| Tertiary canal | ha | 23,815 | 6,744 | 3,631 | 10,375 | 160,602,406 | 86,478,219 | 247,080,625 | |
| Branch Canal | ha | 23,815 | 16,478 | 8,873 | 25,350 | 392,411,663 | 211,298,588 | 603,710,250 | |
| Farm Drain | ha | 23,815 | 7,134 | 3,841 | 10,975 | 169,890,256 | 91,479,369 | 261,369,625 | |
| On Farm Road | ha | 23,815 | 28,737 | 15,473 | 44,210 | 684,359,748 | 368,501,402 | 1,052,861,150 | |
| Total | | | | | | 1,435,409,354 | 772,912,729 | 2,208,322,083 | |

(37) Road Works

(Unit: Col.$

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| (1) Road for Operation and Maintenance | | | | | | | | | |
| Temporary Works | L.S. | | | | | 3,557,385 | 1,915,515 | 5,472,900 | |
| Gravel | m2 | 912,150 | 195 | 105 | 300 | 177,869,250 | 95,775,750 | 273,645,000 | |
| Total | | | | | | 181,426,635 | 97,691,265 | 279,117,900 | |
| (2) Road Improvement of Trocha 4 | | | | | | | | | |
| Temporary Works | L.S. | | | | | 11,885,822 | 6,400,058 | 18,285,880 | |
| Asphalt pavement | m2 | 202,200 | 1,827 | 983 | 2,810 | 369,318,300 | 198,863,700 | 568,182,000 | t= 5cm |
| Upper course | m2 | 202,200 | 624 | 336 | 960 | 126,172,800 | 67,939,200 | 194,112,000 | t=20cm |
| Removement of existing upper course | m3 | 100,000 | 988 | 532 | 1,520 | 98,800,000 | 53,200,000 | 152,000,000 | |
| Total | | | | | | 606,176,922 | 326,402,958 | 932,579,880 | |
| (3) Grand Total | | | | | | 787,603,557 | 424,094,223 | 1,211,697,780 | |

(38) Revetment works

(Unit: Col.$)

| Description | Unit | Q'ty | Unit Rate | | | Amount | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | | F/C | L/C | Total | F/C | L/C | Total | |
| 1. Temporary Work | L.S | | | | | 2,823,086 | 6,780,946 | 9,604,032 | 2 % |
| 2. Puerto Cardas | | | | | | | | | |
| Gabion | m3 | 3,700 | 3,788 | 15,151 | 18,939 | 14,014,860 | 56,059,440 | 70,074,300 | |
| 3. Cano Venado | | | | | | | | | |
| Concrete block | units | 10,395 | 4,281 | 9,528 | 13,809 | 44,498,812 | 99,045,743 | 143,544,555 | |
| 4. La Cooperativa | | | | | | | | | |
| Concrete block | units | 19,305 | 4,281 | 9,528 | 13,809 | 82,640,651 | 183,942,094 | 266,582,745 | |
| 5. Total | | | | | | 143,977,409 | 345,828,223 | 489,805,632 | |