APPENDIX A-4-2

# Questionnaire Survey for Residents

## 1 Objective

The door-to-door questionnaire survey was conducted to obtain the basic information on the resident's living conditions, water use patterns, responses to the municipal system and/or their own water sources and willingness for house-connection supply, and covered the area served or unserved by the municipal water supply system.

## .2 Survey Area

The survey area was dIvided into 7 blocks taking into account the scale of communities as shown in Figure A1-2-1. Blocks 2 (Thalang), 3 (Choeng Thale) and 5 (Sapam) were at present, partially served by the rural system.

## .3 Survey Item

The form used for the questionnaire survey was originally written by Thai and included the following items.

1. General

    1.1 Address
    1.2 Type of House
    1.3 No. of Persons in Family
    1.4 No. of Employees
    1.5 Average Monthly Income
    1.6 Average Monthly Medical Expense

2. Type of Water Supply

3. Conditions in case of Municipal System

    3.1 Pressure
    3.2 Quantity

4. Other Sources than Municipal System

    4.1 Type of Source
    4.2 Conditions in case of Groundwater

5. Potability

6. Water Quality in case of Municipal System

    6.1 Color
    6.2 Smell
    6.3 Turbidity

7. Average Monthly Water Consumption

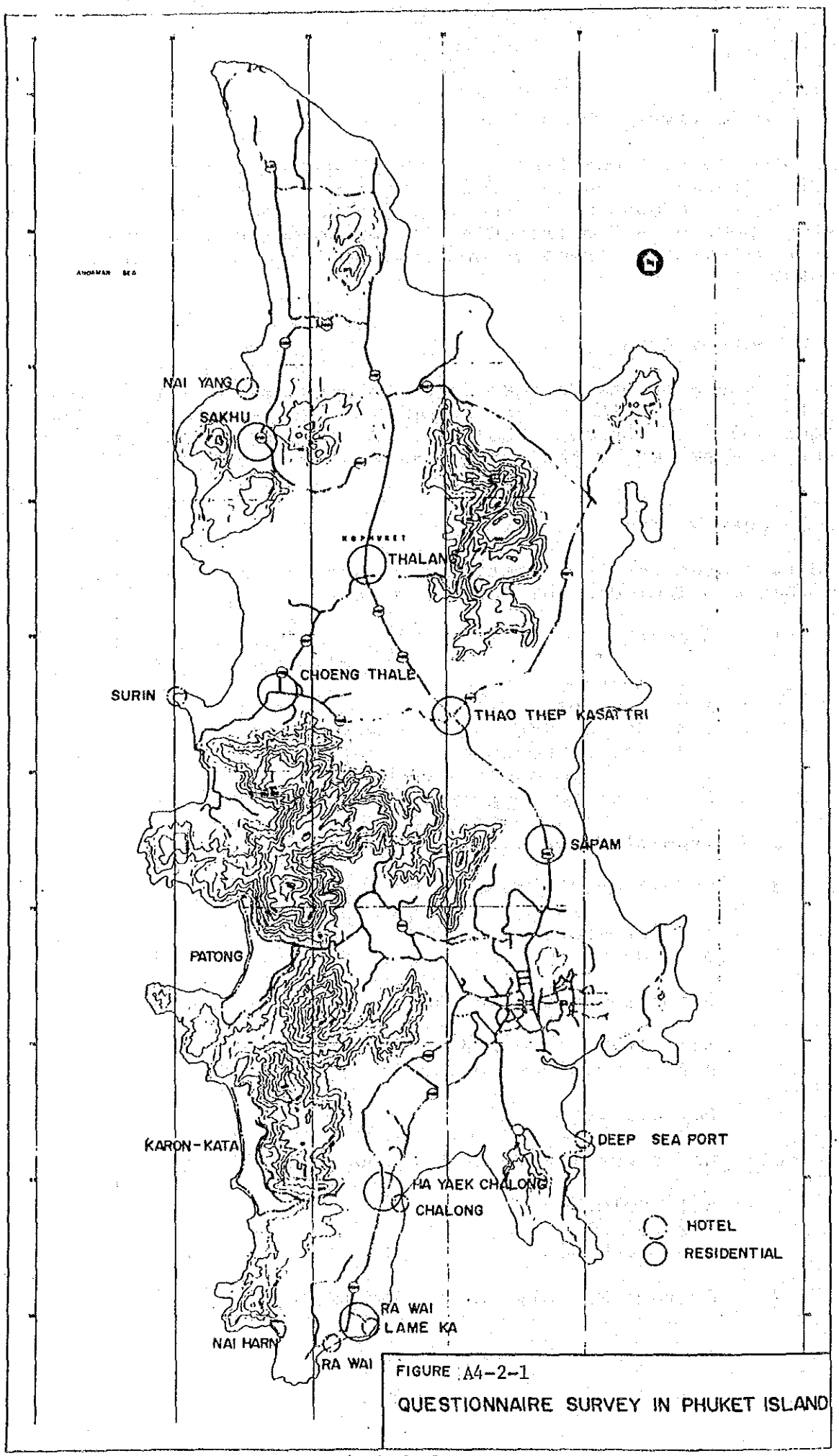



FIGURE A4-2-1

QUESTIONNAIRE SURVEY IN PHUKET ISLAND

8. Average Monthly Water Charge

9. Willingness to Pay for Water Charge

10. Water Quality in case of Other Source

    10.1 Color
    10.2 Smell
    10.3 Turbidity

11. Willingness to Connect to the Municipal System

12. Willingness to Pay for Connection Fee

13. Willingness to Pay for Water Charge

## 4 Survey Method

College students were employed as interviewers and were engaged in the questionnaire survey with the guidance of the PWA Head Office staff. The survey was conducted to 166 residents on August 28, 1988.

## 5 Survey Results

The results of the questionnaire survey are summarized in Table A1-5-1.

1) General

69.9% of the respondents lived in residential houses while 28.9% in commercial buildings and the remaining 1.2% was unknown due to the omission of confirmation by the interviewers.

The total numbers of persons in families and employees were 904 and 431, respectively. Accordingly, one household is composed of 5.45 family members and 2.60 employees on an average with a total of 8.05 persons.

Regarding the average monthly income, 70.0% of the respondents were in the up-to-6,000 Baht bracket, or 15.7% in the up-to-2,000 Baht, 25.3% in the 2,001-3,000 Baht, 14.5% in the 3,001-4,500 Baht and 14.5% in the 4,501-6,000 Baht brackets, respectively. The average in respondents weighted by the number of persons and the median in each income bracket was approximately 5,510 Baht, but the number of persons was biggest in the 2,001-3,000 Baht bracket.

As to the average monthly medical expense, 27.1% was in the up-to-50 Baht bracket and 15.1%, 19.3% and 24.1% were in the 51-100, 101-200 and 201-500 Baht brackets, respectively. The average in respondents calculated by the same method as the above is 310 Baht, but the number of persons was biggest in the the up-to-50 Baht bracket.

2) Type of Water Supply

6.0% of the respondents used the municipal system only. 75.3% used sources other than the municipal system and 18.7% the combined system of the municipal system and other source(s).

98.1% or 153 out of 156 other sources was groundwater as shown below.

| Block No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total |
|---|---|---|---|---|---|---|---|---|
| Municipal System Only | - | 3 | 2 | - | 4 | 1 | - | 10 |
| plus Rain/River | - | - | - | - | 3 | - | - | 3 |
| plus Well | - | 11 | 10 | - | 3 | - | - | 24 |
| plus Others | - | - | - | - | 4* | - | - | 4 |
| Well Only | 19 | 14 | 18 | 20 | 11 | 20 | 15 | 117 |
| plus Rain | 1 | 2 | - | - | 1 | 2 | 1 | 7 |
| plus Water Vendor | - | - | - | - | - | - | 1 | 1 |
| Total | 20 | 30 | 30 | 20 | 26 | 23 | 17 | 166 |

* Rain/River and Well

3) Response to Municipal System

The reputation of the waterworks among 41 respondents using the rural system was not so good, that is to say, 41.5% complained of low pressure, 29.3% of insufficient water, 46.3% of color, 51.2% of smell and 46.3% of turbidity. However, there were big gaps in response by the block. The low pressure and insufficient water mainly took place in Block 2 (Thalang). The complaint of color occurred in all served Blocks, or Blocks 2, 3 and 5. However, the complaints of smell and turbidity were relatively less in Block 3 (Choeng Thale).

4) Potability

This question was originally intended to know the potability of tap water, but the answer seemed to be made not only for the tap water but also for other source water, since the question followed that on other sources.

Accordingly, the evaluation was made extracting the data from respondents using tap water or well water only.

| | Tap Water | Well Water |
|---|---|---|
| Drinking | 1 (10.0%) | 18 (15.4%) |
| Not Drinking | 4 (40.0%) | 13 (11.1%) |
| Both | 5 (50.0%) | 85 (72.6%) |
| Unknown | - (-) | 1 (0.9%) |
| Total | 10 (100%) | 117 (100%) |

15.4% used well water for drinking and 72.6% for drinking and not-drinking.

The doubt as to the kind of water the respondents (who answered that they didn't use only one source for drinking) used for drinking is remained. They may use the water vendor, although this is not expressed clearly in the survey.

5) Water Quality of Other Sources

As mentioned above, groundwater was the main water source. 5.1% complained of color, 7.1% of smell and 10.3% of turbidity. Such reponses were common to all blocks and the people were much blessed with well water.

6) Conditions of Wells

The well depth distribution is shown below. It ranged between 2.4 and 22 m and 84.3% wells had depths of not more than 10 m. The wells with depths of more than 15 m were located in Blocks 4 (Thao Thep Kasattri) and 7 (Ra Wai).

| Block No. | <5 m | >5 m <10 m | >10 m <15 m | >15 m <20 m | >20 m <30 m | Un-known | Total |
|---|---|---|---|---|---|---|---|
| 1 | 8 | 12 | - | - | - | - | 20 |
| 2 | 10 | 15 | 2 | - | - | - | 27 |
| 3 | 9 | 14 | 4 | - | - | 1 | 28 |
| 4 | 5 | 12 | 2 | 1 | - | - | 20 |
| 5 | 5 | 9 | 4 | - | - | 1 | 19 |
| 6 | 14 | 7 | 1 | - | - | - | 22 |
| 7 | 2 | 7 | 5 | 1 | 1 | 1 | 17 |
| Total | 53 | 76 | 18 | 2 | 1 | 3 | 153 |
| Well Dep. (m) | 4.2 (53) | 8.0 (74) | 13.1 (.8) | 17.5 (2) | 22.0 (1) | | |
| Water Dep. (m) | 2.6 (53) | 4.5 (76) | 5.9 (18) | 7.8 (1) | 20.0 (1) | | |
| Operation Time (h/d) | 2.2 (37) | 2.3 (48) | 3.4 (13) | 1.0 (2) | 0.7 (1) | | |
| No.of Fetching Times (1/d) | 11.6 (19) | 13.9 (32) | 16.5 (4) | 2.0 (2) | 5.0 (1) | | |

The figures in parentheses show the number of wells used for the average calculation.

7) Average Monthly Water Consumption, Water Charge and Willingness-to-Pay

Regarding the average monthly water consumption, 24.4% belonged to the up-to-15 cu m bracket and 31.7% and 22.0% to the 16-30 cu m and 31-50 cu m brackets, respectively. 53.6% paid for the water charge in the up-to-50 Baht bracket and 74.4% in the 51-100 Baht brackets, while, according to the result on the willingness-to-pay for water charge, 53.7% wanted that the water charge would be in the up-to-50 Baht bracket and 36.6% in the 51-100 Baht bracket. The expectant amount was less than the actual payment.

8) Willingness-to-Connect

Out of 166 respondents, 125 didn't use the municipal system at present. However, 48.0% was willing to connect to the municipal system. The willingness is predominant in Blocks 1 (Sakhu) and 7 (Ra Wai), while the unwillingness in Block 2 (Thalang). They wanted that the connection fee would be less than 2,500 Baht (95.0%) and the water charge less than 200 Baht (85.1%), This suggests that the possible consumers expect the higher water charge than the existing consumers.

Reasons for unwillingness-to-connect were summarized below.

| Block No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total |
|---|---|---|---|---|---|---|---|---|
| There is a well | - | - | - | - | - | - | 3 | 3 |
| Well water is enough | 6 | 13 | 9 | 1 | 2 | 12 | 1 | 44 |
| Well water is clean | - | - | 1 | 4 | - | - | - | 5 |
| Well water is convenient | - | - | - | - | 1 | - | - | 1 |
| Tap water is expensive | - | - | - | 3 | 1 | - | - | 4 |
| Others | - | - | - | 2 | - | - | - | 2 |
| Unknown | - | - | 1 | - | 2 | 1 | 2 | 6 |
| Total | 6 | 13 | 11 | 10 | 6 | 13 | 6 | 65 |

Contents of others were as follows:

- Well water is better. Tap water is not good in water guality and expensive for installation.
- I will transfer to the new house.

Contents of the unknown were as follows:

- No comment. (two persons)
- I cannot decide it alone. It depends on the neighbor (two persons)
- It depends on the installation cost.
- It depends on the authority.

Most people who were unwilling to connect to the municipal system thought that well water was enough or clean. The wells were very close and indispensable to their living.

Table A4-2-1 SUMMARY OF QUESTIONNAIR IN PHUKET (RESIDENTIAL)

| Block No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|
| No. of Samples | 20 | 30 | 30 | 20 | 26 | 23 | 17 | 166 | |
| 1. General | | | | | | | | | |
| 1.1 Address | | | | | | | | | |
| 1.2 Type of House | | | | | | | | | |
| Residential | 17 | 16 | 26 | 11 | 20 | 18 | 8 | 116 | 69.9 |
| Commercial | 2 | 14 | 4 | 9 | 5 | 5 | 9 | 48 | 38.9 |
| Residential/Commercial | - | - | - | - | - | - | - | - | - |
| Unknown | 1 | - | - | - | 1 | - | - | 2 | 1.2 |
| 1.3 No.of Persons in Family | 105 | 132 | 175 | 108 | 151 | 144 | 89 | 904 | |
| Unknown (No. of Samples) | - | - | - | - | - | - | - | - | |
| 1.4 No.of Employees | 44 | 75 | 66 | 64 | 74 | 56 | 52 | 431 | |
| Unknown (No. of Samples) | - | - | - | - | - | - | - | - | |
| 1.5 Ave. Monthly Income Baht | | | | | | | | | |
| up to 2,000 | 7 | 1 | 5 | 5 | 5 | 2 | 1 | 26 | 15.7 |
| 2,001-3,000 | 6 | 4 | 11 | 3 | 7 | 8 | 3 | 42 | 25.3 |
| 3,001-4,500 | 2 | 6 | 5 | 3 | 3 | 1 | 4 | 24 | 14.5 |
| 4,501-6,000 | 1 | 8 | 4 | 3 | 2 | 3 | 3 | 24 | 14.5 |
| 6,001-7,500 | - | 6 | 2 | 1 | 2 | 2 | 1 | 14 | 8.4 |
| 7,501-10,000 | - | 4 | 1 | 1 | 4 | 5 | - | 15 | 9.0 |
| 10,001-15,000 | 3 | 1 | 2 | 3 | 3 | 2 | 3 | 17 | 10.2 |
| 15,001-50,000 | 1 | - | - | 1 | - | - | 2 | 4 | 2.4 |
| Over 50,000 | - | - | - | - | - | - | - | - | - |
| Unknown | - | - | - | - | - | - | - | - | - |
| 1.6 Ave. Monthly Medical Expense Baht | | | | | | | | | |
| up to 50 | 10 | 10 | 8 | 5 | 5 | 2 | 5 | 45 | 27.1 |
| 51-100 | 6 | 4 | 5 | 3 | 4 | 2 | 1 | 25 | 15.1 |
| 101-200 | 1 | 3 | 6 | 3 | 8 | 9 | 2 | 32 | 19.3 |
| 201-500 | 3 | 6 | 6 | 5 | 5 | 9 | 6 | 40 | 24.1 |
| 501-1,000 | - | 6 | 5 | 3 | - | - | 1 | 15 | 9.0 |
| 1,001-2,000 | - | 1 | - | 1 | 1 | - | 1 | 4 | 2.4 |
| 2,001-5,000 | - | - | - | - | - | 1 | 1 | 2 | 1.2 |
| Over 5,000 | - | - | - | - | 1 | - | - | 1 | 0.6 |
| Unknown | - | - | - | - | 2 | - | - | 2 | 1.2 |
| 2. Type of Water Supply | | | | | | | | | |
| Municipal System | - | 3 | 2 | - | 4 | 1 | - | 10 | 6.0 |
| Combined | - | 11 | 10 | - | 10 | - | - | 31 | 18.7 |
| Other Sources | 20 | 16 | 18 | 20 | 12 | 22 | 17 | 125 | 75.3 |
| Unknown | - | - | - | - | - | - | - | - | |
| 3. Municipal System | | | | | | | | | |
| 3.1 Pressure | | | | | | | | | |
| Low | - | 13 | 3 | - | - | 1 | - | 17 | 41.5 |
| High | - | 1 | 9 | - | 14 | - | - | 24 | 58.5 |
| Unknown | - | - | - | - | - | - | - | - | - |
| 3.2 Quantity | | | | | | | | | |
| Sufficient | - | 4 | 10 | - | 14 | - | - | 28 | 68.3 |
| Not Sufficient | - | 9 | 2 | - | - | 1 | - | 12 | 29.3 |
| Unknown | - | 1 | - | - | - | - | - | 1 | 2.4 |

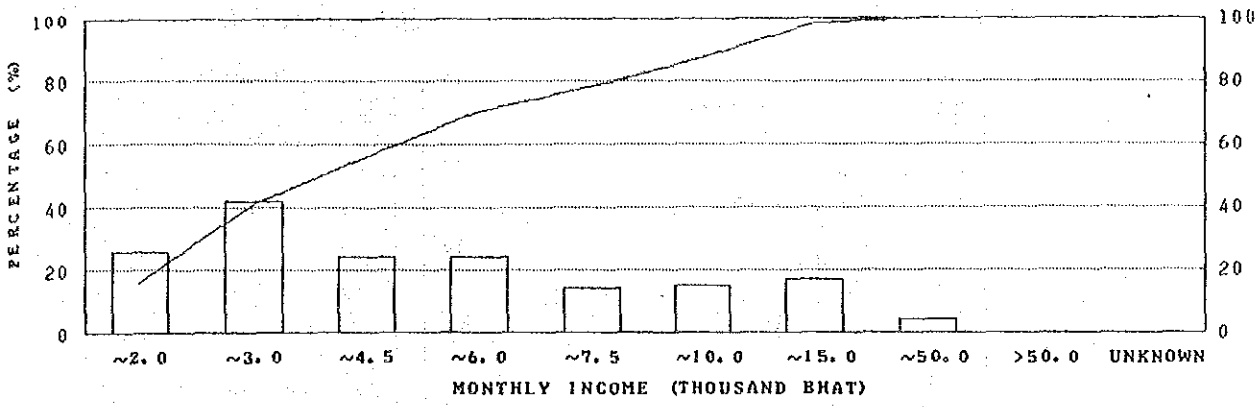
Table A4-2-1 SUMMARY OF QUESTIONNAIR IN PHUKET (RESIDENTIAL) (CONT'D)

| Block No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|
| 4. Other Sources | | | | | | | | | |
| Rain/River | 1 | 2 | - | - | 8 | 2 | 1 | 14 | |
| Pond/Reservoir | - | - | - | - | - | - | - | - | |
| Water Vendor | - | - | - | - | - | - | 1 | 1 | |
| Groundwater-Shallow Well | 20 | 27 | 28 | 20 | 19 | 22 | 17 | 153 | |
| -Deep Well | - | - | - | - | - | - | - | - | |
| Unknown | - | - | - | - | - | - | - | - | |
| 5. Potability | | | | | | | | | |
| Drinking | - | 15 | 2 | - | 5 | 8 | 1 | 31 | 18.7 |
| Not Drinking | 3 | 1 | 2 | 1 | 12 | 4 | 6 | 29 | 17.5 |
| Both | 17 | 13 | 25 | 19 | 8 | 11 | 10 | 103 | 62.0 |
| Unknown | - | 1 | 1 | - | 1 | - | - | 3 | 1.8 |
| 6. Water Quality (Municipal System) | | | | | | | | | |
| 6.1 Color | | | | | | | | | |
| Yes | - | 9 | 4 | - | 5 | 1 | - | 19 | 46.3 |
| No | - | 5 | 8 | - | 9 | - | - | 22 | 43.7 |
| Unknown | - | - | - | - | - | - | - | - | - |
| 6.2 Smell | | | | | | | | | |
| Yes | - | 8 | 1 | - | 11 | 1 | - | 21 | 51.2 |
| No | - | 6 | 11 | - | 3 | - | - | 20 | 48.8 |
| Unknown | - | - | - | - | - | - | - | - | - |
| 6.3 Turbidity | | | | | | | | | |
| Yes | - | 9 | 3 | - | 6 | 1 | - | 19 | 46.3 |
| No | - | 5 | 9 | - | 8 | - | - | 22 | 53.7 |
| Unknown | - | - | - | - | - | - | - | - | - |
| 7. Ave. Monthly Water Consumption | | | | | | | | | |
| Up to 15 cu m | - | 2 | 4 | - | 4 | - | - | 10 | 24.4 |
| 16-30 cu m | - | 5 | 2 | - | 6 | - | - | 13 | 31.7 |
| 31-50 cu m | - | 4 | 4 | - | 1 | - | - | 9 | 22.0 |
| 51-75 cu m | - | 2 | - | - | 2 | 1 | - | 5 | 12.2 |
| 76-100 cu m | - | - | - | - | 1 | - | - | 1 | 2.4 |
| 101-150 cu m | - | - | - | - | - | - | - | - | - |
| 151-200 cu m | - | - | - | - | - | - | - | - | - |
| 201-300 cu m | - | - | - | - | - | - | - | - | - |
| Over 300 cu m | - | - | - | - | - | - | - | - | - |
| Unknown | - | 1 | 2 | - | - | - | - | 3 | 7.3 |
| 8. Ave. Monthly Water Charge Baht | | | | | | | | | |
| Up to 50 | - | 9 | 8 | - | 5 | - | - | 22 | 53.6 |
| 51-100 | - | 4 | 2 | - | 4 | - | - | 10 | 24.4 |
| 101-150 | - | - | - | - | 2 | - | - | 2 | 4.9 |
| 151-200 | - | - | - | - | 1 | 1 | - | 2 | 4.9 |
| 201-300 | - | - | - | - | 2 | - | - | 2 | 4.9 |
| 301-500 | - | - | - | - | - | - | - | - | - |
| 501-1,000 | - | - | - | - | - | - | - | - | - |
| Over 1,000 | - | - | - | - | - | - | - | - | - |
| Unknown | - | 1 | 2 | - | - | - | - | 3 | 7.3 |

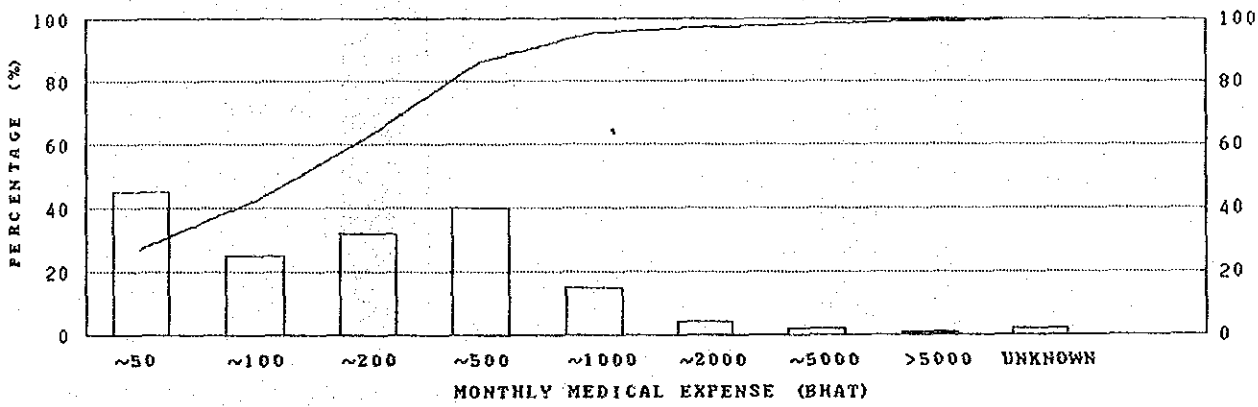
Table A4-2-1 SUMMARY OF QUESTIONNAIR IN PHUKET (RESIDENTIAL) (CONT'D)

| Block No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|
| 9. Willingness to Pay | | | | | | | | | |
| Baht | | | | | | | | | |
| Up to 50 | - | 10 | 6 | - | 6 | - | - | 22 | 53.7 |
| 51-100 | - | 4 | 5 | - | 5 | 1 | - | 15 | 36.6 |
| 101-200 | - | - | - | - | 1 | - | - | 1 | 2.4 |
| 201-500 | - | - | - | - | 2 | - | - | 2 | 4.9 |
| 501-1,000 | - | - | - | - | - | - | - | - | - |
| Over 1,000 | - | - | - | - | - | - | - | - | - |
| Unknown | - | - | 1 | - | - | - | - | 1 | 2.4 |
| 10. Water Quality (Other Source) | | | | | | | | | |
| 10.1 Color | | | | | | | | | |
| Yes | 2 | 2 | - | - | 1 | 2 | 1 | 8 | 5.1 |
| No | 18 | 25 | 27 | 20 | 21 | 20 | 16 | 147 | 94.2 |
| Unknown | - | - | 1 | - | - | - | - | 1 | 0.7 |
| 10.2 Smell | | | | | | | | | |
| Yes | 3 | 1 | - | - | 2 | 3 | 2 | 11 | 7.1 |
| No | 17 | 26 | 27 | 20 | 20 | 19 | 15 | 144 | 92.3 |
| Unknown | - | - | 1 | - | - | - | - | 1 | 0.6 |
| 10.3 Turbidity | | | | | | | | | |
| Yes | 6 | 1 | - | - | 2 | 5 | 2 | 16 | 10.3 |
| No | 14 | 26 | 27 | 20 | 20 | 17 | 15 | 139 | 89.1 |
| Unknown | - | - | 1 | - | - | - | - | 1 | 0.6 |
| 11. Willingness to Connect | | | | | | | | | |
| Yes | 14 | 3 | 7 | 10 | 6 | 9 | 11 | 60 | 48.0 |
| No | 6 | 13 | 11 | 10 | 4 | 12 | 5 | 61 | 48.8 |
| Unknown | - | - | - | - | 2 | 1 | 1 | 4 | 3.2 |
| 12. Willingness to Pay for Connection Fee | | | | | | | | | |
| Baht | | | | | | | | | |
| Up to 1,000 | 7 | - | 2 | 3 | 2 | - | 3 | 17 | 28.4 |
| 1,001-2,000 | 5 | 3 | 4 | - | 1 | 2 | 5 | 20 | 33.3 |
| 2,001-2,500 | 2 | - | - | 7 | 2 | 7 | 2 | 20 | 33.3 |
| 2,501-3,000 | - | - | 1 | - | 1 | - | - | 2 | 3.3 |
| 3,001-4,000 | - | - | - | - | - | - | - | - | - |
| 4,001-5,000 | - | - | - | - | - | - | - | - | - |
| 5,001-6,000 | - | - | - | - | - | - | - | - | - |
| Over 6,000 | - | - | - | - | - | - | - | - | - |
| Unknown | - | - | - | - | - | - | 1 | 1 | 1.7 |
| 13. Willingness to Pay for Water Charge | | | | | | | | | |
| Baht | | | | | | | | | |
| Up to 50 | 8 | 3 | 2 | 2 | 3 | - | 1 | 19 | 31.7 |
| 51-100 | 3 | - | 4 | 4 | 2 | 3 | 6 | 22 | 36.7 |
| 101-200 | 2 | - | 1 | 2 | - | 4 | 1 | 10 | 16.7 |
| 201-500 | - | - | - | 1 | - | - | 2 | 3 | 5.0 |
| 501-1,000 | - | - | - | 1 | - | 1 | - | 2 | 3.2 |
| Over 1,000 | - | - | - | - | - | - | - | - | - |
| Unknown | 1 | - | - | - | 1 | 1 | 1 | 4 | 6.7 |

## MONTHLY INCOME DISTRIBUTION




## MONTHLY MEDICAL EXPENSE DISTRIBUTION




## TYPE OF WATER SOURCE & WILLINGNESS-TO-CONNECT

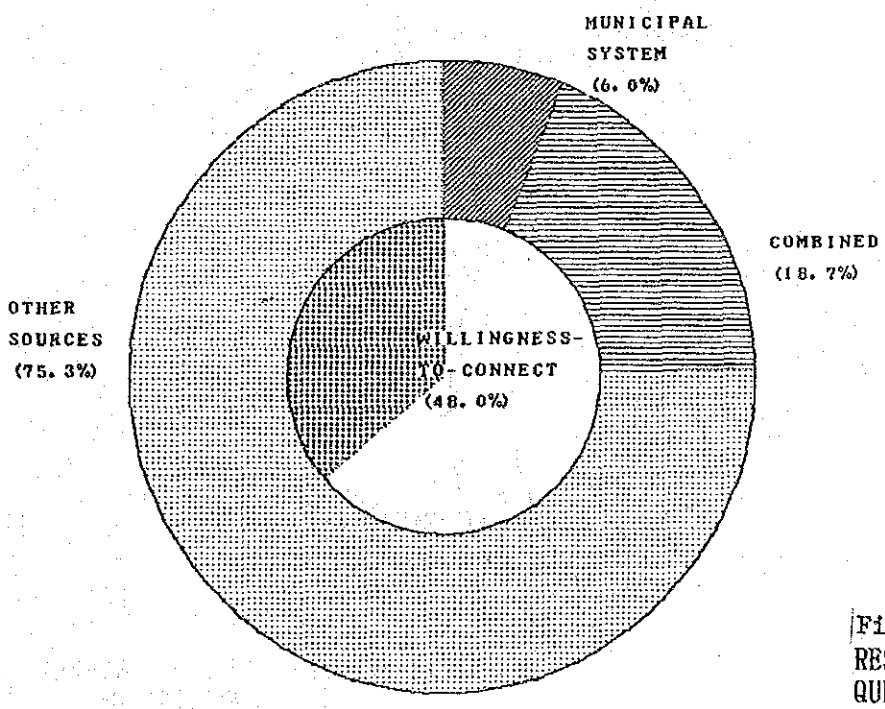
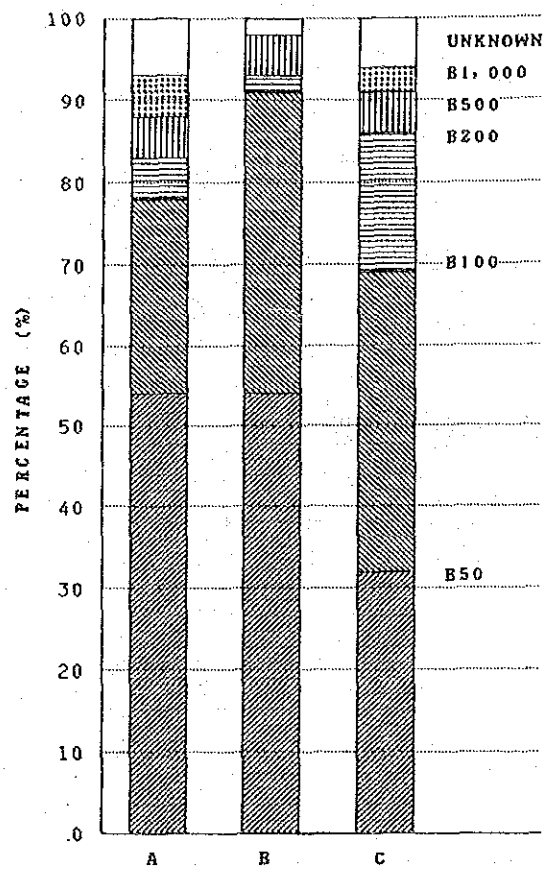


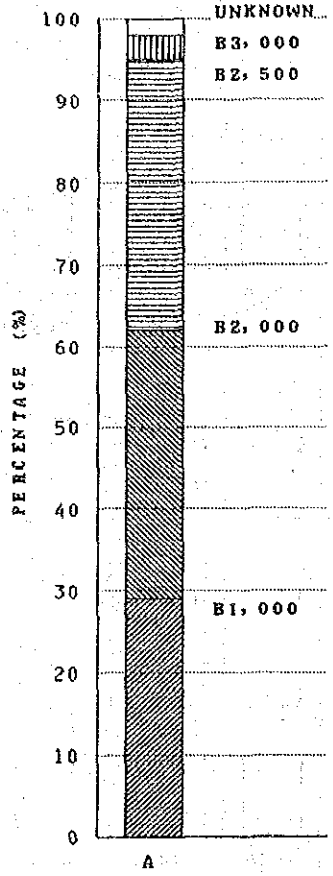

Figure A4-2-2
RESULTS OF
QUESTIONNAIRE SURVEY (1)
(PHUKET)

## WILLINGNESS-TO-PAY

### WATER CHARGE




### CONNECTION FEE




A : ACTUAL PAYMENT BY EXISTING USERS
B : EXPECTANT PAYMENT BY EXISTING USERS
C : EXPECTANT PAYMENT BY POSSIBLE USERS

## COMPLAINTS OF RESPONDENTS

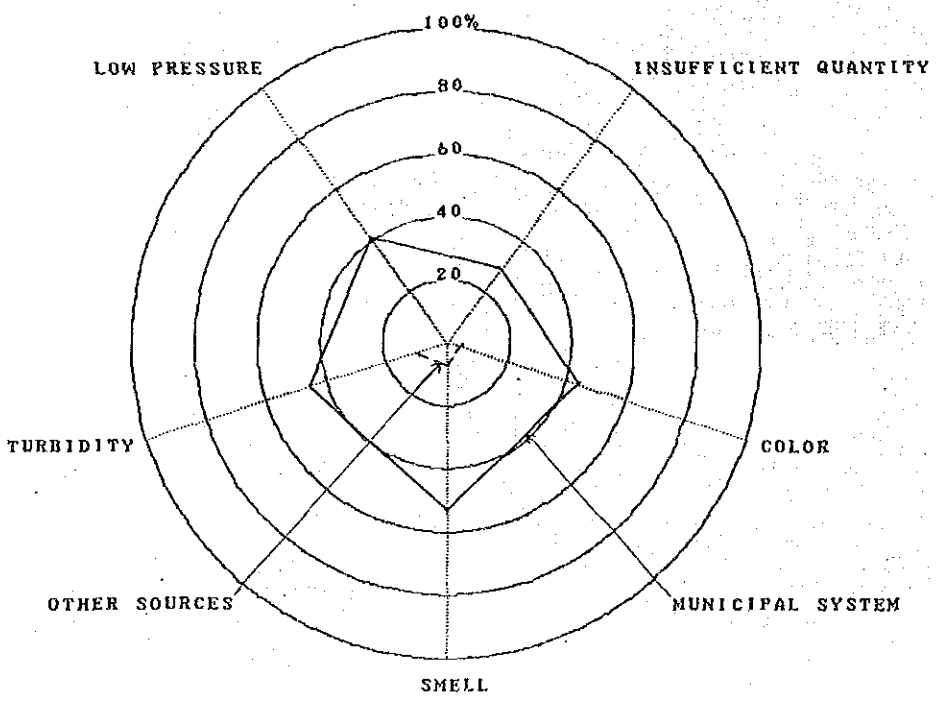



Figure A4-2-2
RESULTS OF
QUESTIONNAIRE SURVEY (2)
(PHUKET)

APPENDIX A-4-3

Questionnaire Survey for Hotels

## 1 Objective

The door-to-door questionnaire survey was conducted to obtain the basic information on the hotelS' usage condition, water use patterns, responses to the municipal system and/or their own water sources and willingness for house-connection supply, and covered the area served or unserved by the municipal water supply system aside from that for the residents.

## 2 Survey Area

Ten (10) areas were selected for the questionnaire survey taking into account the location of hotels as shown in Figure A1-2-1. All areas other than Patong and Deep Sea Port are at present unserved by the municipal system.

## 3 Survey Item

The form used for the questionnaire survey was originally written by Thai and included the following items.

1. General
   - 1.1 Name of Hotel
   - 1.2 Address
   - 1.3 Average of Occupancy Rate
2. Facilities
   - 2.1 No. of Rooms
   - 2.2 Average Room Rate
   - 2.3 Swimming Pool
   - 2.4 Restaurant and Others
3. Type of Water Supply
4. Water Consumption by Water Source
5. Average Monthly Water Charge
6. Conditions in case of Municipal System
   - 6.1 Pressure
   - 6.2 Quantity
7. Other Sources than Municipal System
   - 7.1 Type of Source
   - 7.2 Conditions in case of Groundwater
8. Potability

9. Water Quality

   9.1 Municipal System
   9.2 Other Source

10. Willingness to Connect to the Municipal System

11. Willingness to Pay for Connection Fee

12. Willingness to Pay for Water Charge

.4 Survey Method

The college students were employed as interviewers and engaged in the questionnaire survey after the guidance by the PWA Head Office staff. The survey was conducted to 96 hotels located in Nai Yang, Surin, Patong, Karon-Kata, Nai Harn, Ra Wai, Lame Ka, Mittrapab, Chalong and Deep Sea Port on August 27 and 28, 1988.

.5 Survey Results

The results of the questionnaire survey are summarized in Table A1-5-1.

1) General

The average of the occupancy rate weighted by the number of rooms were 62.1% in Patong, 58.8% in Karon-Kata and 62.0% in the whole. Those in the low season were 37.5% in Patong, 39.8% in Karon-Kata and 36.8% in the whole while those in the high season were 83.6% in Patong, 79.8% in Karon-Kata and 83.4% in the whole.

2) Facilities

The total number of rooms in 96 hotels answered was 5.588 rooms out of which 4,104 rooms (73.4%) were air-conditioned. The average number of rooms per hotel was 58 rooms.

The distribution of the room charges are shown below:

| Area Name | Room Charge (Baht) <200 | >200 <500 | >500 >1000 | >1000 <2000 | >2000 | Un-known | Total |
|---|---|---|---|---|---|---|---|
| Nai Yang | - | - | - | - | 1 | - | 1 |
| Surin | - | - | - | 1 | - | - | 1 |
| Patong | 12 | 12 | 16 | 6 | | 8 | 54 |
| Karon-Kata | 9 | 9 | 2 | 4 | 1 | 3 | 28 |
| Nai Harn | 2 | - | - | - | 1 | 1 | 4 |
| Ra Wai | 1 | - | - | - | - | - | 1 |
| Lame Ka | 1 | - | - | - | - | 1 | 2 |
| Mittrapab | 2 | - | 1 | - | - | - | 3 |
| Chalong | 1 | - | - | - | - | - | 1 |
| Deep Sea Port | - | - | - | - | 1 | - | 1 |
| Total | 28 | 21 | 19 | 11 | 4 | 13 | 96 |

32 hotels had 41 swimming pools with an average volume of 400 cu m and there are 104 restaurants and others at 78 hotels.

3) Type of Water Supply

Only 10.4% used the municipal system, 80.2% other sources than the municipal system and 8.3% the combined system of the municipal system and other sources.

In other sources, 95.3% was groundwater including the combination with others as shown below.

| Area Name | North Beach | Patong | Karon-Kata | Nai Harn | South Beach | Total |
|---|---|---|---|---|---|---|
| Municipal System Only | - | 9 | - | - | 1 | 10 |
| Plus Well | - | 8 | - | - | - | 8 |
| Well Only | 1 | 34 | 20 | 3 | 5 | 63 |
| Plus Pond/ Reservoir | - | 1 | - | - | - | 1 |
| Plus Water Vendor | - | - | 8 | - | 2 | 10 |
| Pond/Reservoir Only | - | 1 | - | - | - | 1 |
| Water Vendor Only | - | - | - | 1 | - | 1 |
| Plus Pond/ Reservoir | 1 | - | - | - | - | 1 |
| Unknown | - | 1 | - | - | - | 1 |
| Total | 2 | 54 | 28 | 4 | 8 | 96 |

4) Monthly Water Consumption by Water Source

Only 10 hotels gave the data on the monthly water consumption by the municipal system and 5 hotels by the other source. The water consumption by the municipal system were in the range of 1 and 8,000 cu m/mo and the average of the per room water consumption was 23.7 cu m/mo.

5) Monthly Water Charge

15 hotels gave the data on the monthly water charge and the average of the per room water charge was 197 Baht/mo.

6) Condition in case of Municipal System

Out of 18 hotels using the municipal system in Patong and Deep Sea Port, 66.7% had a complaint of low pressure, 61.1% of insufficient water, 27.8% of color, 50.0% of smell and 50.0% of turbidity.

7) Conditions in Case of Other Sources

As mentioned above, almost hotels used groundwater. 15.3% complained of color, 11.8% of smell and 11.8% of turbidity. As compared with tap water, the complaints of water quality was less in other sources.

8) Potability

The majority of hotels surveyed or 80% used water for not-drinking. the doubt what kind of water they used for drinking is left.

9) Willingness to Connect

The rate of the willingness-to-connect was 46.7% in the 77 hotels. These hotels wanted that the connection fee would be less than 5,000 Baht (58.3%) and the water charge less than 10,000 Baht (50.0). However, it should be noted that 27.8% and 41.7% answered unknown regarding the connection fee and water charge, respective and some hotels accepted the connection fee of over 20,000 Baht and the water charge of over 100,000 Baht.

Table A4-3-1 Summary of Questionnaire Survey in Phuket (Hotels)

| AREA / ITEM | Nai Yang | Surin | Patong | Karon-Kata | Nai Harn | Ra Wai | Lame Ka | Mittrapab | Chalong | Deep S.P | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.General | | | | | | | | | | | | |
| 1.1 Name of Hotel | | | | | | | | | | | | |
| 1.2 Address | | | | | | | | | | | | |
| 1.3 Occupancy Rate (%) | | | | | | | | | | | | |
| Average | 90 | 60 | 62.1 | 58.8 | - | - | 70 | 70 | - | 58 | 62 | |
| Low Season | 40 | 30 | 37.5 | 39.8 | 17.5 | 20 | 29.5 | 37.6 | 30 | 30 | 36.8 | |
| High Season | 100 | 90 | 83.6 | 79.8 | 97.5 | 100 | 79.5 | 85.3 | 80-100 | 85 | 83.4 | |
| 2. Facilities | | | | | | | | | | | | |
| 2.1 No. of Rooms | | | | | | | | | | | | |
| Total | 177 | 110 | 2922 | 1599 | 236 | 8 | 315 | 75 | 20 | 126 | 5588/95 | |
| W/ Air-Con | 177 | 100 | 2168 | 1066 | 132 | - | 300 | 25 | - | 126 | 4104/96 | |
| 2.2 Ave. Room Rate (Baht) | 3560 | 2000 | | | | 150-180 | | | 100 | 1900-4500 | | |
| 2.3 No. of Swimming Pools | 1 | 1 | 25 | 9 | 1 | - | 2 | 1 | - | 1 | 41 | |
| Volume (cu m) | 750 | 189 | 6935/16 | 288/2 | 300 | | - | 346 | - | - | 8808/22 | |
| 2.4 No. of Restaurant and | 4 | 2 | 57 | 24 | 5 | 1 | 4 | 2 | 1 | 4 | 104 | |
| Others | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 3. Type of Water Supply | | | | | | | | | | | | |
| 3.1 Municipal System | - | - | 9 | - | - | - | - | - | - | 1 | 10 | 10.4 |
| 3.2 Combined | - | - | 8 | - | - | - | - | - | - | - | 8 | 8.3 |
| 3.3 Other Sources | 1 | 1 | 36 | 28 | 4 | 1 | 2 | 3 | 1 | - | 77 | 80.2 |
| 3.4 Unknown | - | - | - | - | - | - | - | - | - | - | 1 | 1.1 |
| | | | | | | | | | | | | |
| 4. Water Consumption | | | | | | | | | | | | |
| 4.1 Municipal System | | | | | | | | | | | | |
| 4.2 Other Sources | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 5. Monthly Water Charge | | | | | | | | | | 26000 | | |

Table A4-3-1 Summary of Questionnaire Survey in Phuket (Hotels) (Cont'd)

| AREA / ITEM | Nai Yang | Surin | Patong | Karon-Kata | Nai Harn | Ra Wai | Laem Ka | Mittrapab | Chalong | Deep S.P | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6. Municipal System | | | | | | | | | | | | |
| 6.1 Pressure | | | | | | | | | | | | |
| Low | - | - | 12 | - | - | - | - | - | - | - | 12 | 66.7 |
| High | - | - | 4 | - | - | - | - | - | - | 1 | 5 | 27.8 |
| Unknown | - | - | 1 | - | - | - | - | - | - | - | 1 | 5.5 |
| 6.2 Quantity | | | | | | | | | | | | |
| Sufficient | - | - | 6 | - | - | - | - | - | - | 1 | 7 | 38.9 |
| Not Sufficient | - | - | 11 | - | - | - | - | - | - | - | 11 | 61.1 |
| Unknown | - | - | - | - | - | - | - | - | - | - | - | - |
| 7. Other Sources | | | | | | | | | | | | |
| 7.1 Rain/River | | | | | | | | | | | | |
| 7.2 Pond/Reservoir | | 1 | 2 | | | | | | | | 3 | |
| 7.3 Water Vendor | | 1 | | 8 | 1 | | | 2 | | | 12 | |
| 7.4 Groundwater | | | 43 | 28 | 3 | 1 | 2 | 3 | 1 | | 81 | |
| 8. Potability | | | | | | | | | | | | |
| Drinking | - | - | 3 | 2 | - | - | - | - | - | 1 | 6 | 6.2 |
| Not Drinking | - | 1 | 46 | 26 | - | - | 1 | 2 | 1 | - | 77 | 80.2 |
| Both | 1 | - | 2 | - | 3 | 1 | 1 | 1 | - | - | 9 | 9.4 |
| Unknown | - | - | 3 | - | 1 | - | - | - | - | - | 4 | 4.2 |
| 9. Water Quality (Municipal System) | | | | | | | | | | | | |
| 9.1 Color | | | | | | | | | | | | |
| Yes | - | - | 5 | - | - | - | - | - | - | - | 5 | 27.8 |
| No | - | - | 12 | - | - | - | - | - | - | 1 | 13 | 72.2 |
| Unknown | - | - | - | - | - | - | - | - | - | - | - | - |
| 9.2 Smell | | | | | | | | | | | | |
| Yes | - | - | 9 | - | - | - | - | - | - | - | 9 | 50 |
| No | - | - | 7 | - | - | - | - | - | - | 1 | 8 | 44.4 |
| Unknown | - | - | 1 | - | - | - | - | - | - | - | 1 | 5.6 |
| 9.3 Turbidity | | | | | | | | | | | | |
| Yes | - | - | 9 | - | - | - | - | - | - | - | 9 | 50 |
| No | - | - | 8 | - | - | - | - | - | - | 1 | 8 | 44.4 |
| Unknown | - | - | - | - | - | - | - | - | - | - | 1 | 5.5 |

Table A4-3-1 Summary of Questionnaire Survey in Phuket (Hotels) (Cont'd)

| AREA / ITEM | Nai Yang | Surin | Patong | Karon-Kata | Nai Harn | Ra Wai | Laem Ka | Mittrapab | Chalong | Deep S.P | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10. Water Quality (Other Sources) | | | | | | | | | | | | |
| 10.1 Color | | | | | | | | | | | | |
| Yes | - | - | 7 | 4 | - | - | 1 | 1 | - | - | 13 | 15.3 |
| No | 1 | 1 | 33 | 23 | 3 | 1 | 1 | 2 | 1 | - | 66 | 77.6 |
| Unknown | - | - | 4 | 1 | 1 | - | - | - | - | - | 6 | 7.1 |
| 10.2 Smell | | | | | | | | | | | | |
| Yes | 1 | - | 5 | 2 | - | - | 1 | 1 | - | - | 10 | 11.8 |
| No | - | 1 | 35 | 26 | 3 | 1 | 1 | 2 | 1 | - | 70 | 82.3 |
| Unknown | - | - | 4 | - | 1 | - | - | - | - | - | 5 | 5.9 |
| 10.3 Turbidity | | | | | | | | | | | | |
| Yes | 1 | - | 3 | 4 | 1 | - | 1 | - | - | - | 10 | 11.8 |
| No | - | 1 | 37 | 23 | 2 | 1 | 1 | 2 | 1 | - | 68 | 80 |
| Unknown | - | - | 4 | 1 | 1 | - | - | 1 | - | - | 7 | 8.2 |
| 11. Willingness to Connect | | | | | | | | | | | | |
| Yes | - | - | 17 | 14 | 3 | - | 1 | 1 | - | - | 36 | 46.7 |
| No | 1 | - | 14 | 9 | 1 | 1 | - | 1 | 1 | - | 28 | 36.4 |
| Unknown | - | 1 | 5 | 5 | - | - | 1 | 1 | - | - | 13 | 16.9 |
| 12. Willingness to Pay for Connection Fee | | | | | | | | | | | | |
| < 2,000 (Baht) | - | - | 5 | 6 | - | - | - | - | - | - | 11 | 30.5 |
| 2,001 - 3,000 | - | - | 6 | 2 | - | - | - | - | - | - | 8 | 22.2 |
| 3,001 - 5,000 | - | - | 1 | - | - | - | - | 1 | - | - | 2 | 5.6 |
| 5,001 - 7,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 7,001 - 10,000 | - | - | - | 2 | - | - | - | - | - | - | 2 | 5.6 |
| 10,001 - 15,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 15,001 - 20,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 20,000 < | - | - | 3 | - | - | - | - | - | - | - | 3 | 8.3 |
| Unknown | - | - | 2 | 4 | 3 | - | 1 | - | - | - | 10 | 27.8 |

Table A4-3-I Summary of Questionnaire Survey in Phuket (Hotels) (Cont'd)

| AREA / ITEM | Nai Yang | Surin | Patong | Karon-Kata | Nai Harn | Ra Wai | Lame Ka | Mittrapab | Chalong | Deep S.P | Total | Rate (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13. Willingness to Pay for Water Charge | | | | | | | | | | | | |
| < 1,000 (Baht/m) | - | - | 7 | 4 | - | - | - | - | - | - | 11 | 30.6 |
| 1,001 - 2,000 | - | - | 1 | 2 | 1 | - | - | - | - | - | 4 | 11.1 |
| 2,001 - 5,000 | - | - | - | 1 | - | - | - | - | - | - | 1 | 2.8 |
| 5,001 - 10,000 | - | - | - | 2 | - | - | - | - | - | - | 2 | 5.5 |
| 10,001 - 15,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 15,001 - 20,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 20,001 - 30,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 30,001 - 50,000 | - | - | - | - | - | - | - | 1 | - | - | 1 | 2.8 |
| 50,001 -100,000 | - | - | - | - | - | - | - | - | - | - | - | - |
| 100,000 < | - | - | 2 | - | - | - | - | - | - | - | 2 | 5.5 |
| Unknown | - | - | 7 | 5 | 2 | - | 1 | - | - | - | 15 | 41.7 |

# APPENDIX A-6-1

## Construction Unit Cost

Unit Cost

| Item | Material | Fitting | Labor | SubTotal | Transprt (<800km) | Profit etc.(21%) | Total 1 (w/10%cont) | Pavement | Total 2 |
|---|---|---|---|---|---|---|---|---|---|
| Pipeline | | | | | | | | | |
| | <********** | | | P W A 's | Unit Rate (1987) | | ********** | | > |
| a. A/C Pipe(Normal Tytpe) | | (25%) | | | | | | | |
| 100 mm | 85 | 21 | 56 | 162 | 6 | 35 | 224 | 140 | 364 |
| 150 mm | 142 | 36 | 77 | 255 | 11 | 56 | 353 | 154 | 507 |
| 200 mm | 255 | 64 | 90 | 409 | 19 | 90 | 569 | 166 | 735 |
| 250 mm | 352 | 88 | 126 | 566 | 29 | 125 | 792 | 179 | 971 |
| 300 mm | 507 | 127 | 167 | 801 | 40 | 177 | 1119 | 223 | 1342 |
| 400 mm | 970 | 243 | 248 | 1461 | 80 | 324 | 2050 | 248 | 2298 |
| 500 mm | 1362 | 341 | 278 | 1981 | 132 | 444 | 2812 | 283 | 3095 |
| 600 mm | 1761 | 440 | 354 | 2555 | 161 | 570 | 3615 | 319 | 3934 |
| b. Steel Pipe | | (35%) | | | | | | | |
| 150 mm | 545 | 191 | 99 | 835 | 12 | 178 | 1127 | 140 | 1267 |
| 200 mm | 720 | 252 | 111 | 1083 | 22 | 232 | 1471 | 154 | 1625 |
| 250 mm | 1080 | 378 | 153 | 1611 | 38 | 346 | 2195 | 166 | 2361 |
| 300 mm | 1330 | 465 | 202 | 1998 | 58 | 432 | 2736 | 179 | 2915 |
| 400 mm | 1420 | 497 | 250 | 2167 | 80 | 472 | 2991 | 223 | 3214 |
| 500 mm | 1785 | 625 | 361 | 2771 | 160 | 615 | 3901 | 248 | 4149 |
| 600 mm | 2140 | 749 | 468 | 3357 | 264 | 760 | 4820 | 283 | 5103 |
| 700 mm | 2495 | 873 | 582 | 3950 | 322 | 897 | 5686 | 319 | 6005 |

Unit Cost

For Transmission Pipeline (Transportation < 800 km)

| Item | Material | Fitting (10%) | Labor | SubTotal | Transprt (<800km) | Profit etc.(21%) | Total 1 (w/10%cont) | Pavement | Total 2 | PNA Price (1987) | Ratio | Adopted (1988) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (###### Unit Rate Based on Pipe Material Cost as of December,1988 | | | | | | | | (#######) | | | |
| a. A/C Pipe (Class 20 Normal type) | | (10 %) | | | | | | | | | | |
| 100 mm | 115 | 12 | 63 | 190 | 7 | 41 | 261 | 153 | 414 | 364 | 1.14 | 410 |
| 150 mm | 189 | 19 | 87 | 295 | 12 | 64 | 408 | 168 | 577 | 507 | 1.14 | 580 |
| 200 mm | 328 | 33 | 101 | 462 | 21 | 101 | 643 | 181 | 824 | 735 | 1.12 | 820 |
| 250 mm | 454 | 45 | 142 | 641 | 32 | 141 | 895 | 196 | 1091 | 971 | 1.12 | 1,090 |
| 300 mm | 643 | 64 | 188 | 895 | 44 | 197 | 1249 | 244 | 1493 | 1342 | 1.11 | 1,490 |
| 400 mm | 1217 | 122 | 279 | 1618 | 87 | 358 | 2270 | 271 | 2541 | 2298 | 1.11 | 2,540 |
| 500 mm | 1699 | 170 | 313 | 2182 | 144 | 488 | 3096 | 309 | 3405 | 3095 | 1.10 | 3,410 |
| 600 mm | 2187 | 219 | 398 | 2804 | 176 | 626 | 3967 | 349 | 4315 | 3934 | 1.10 | 4,320 |
| b. Steel Pipe | | (15 %) | | | | | | | | | | |
| 150 mm | 550 | 83 | 111 | 744 | 13 | 159 | 1008 | 168 | 1176 | 1267 | 0.93 | 1,270 |
| 200 mm | 908 | 136 | 125 | 1168 | 24 | 250 | 1587 | 181 | 1769 | 1625 | 1.09 | 1,770 |
| 250 mm | 1210 | 182 | 172 | 1564 | 42 | 337 | 2136 | 196 | 2332 | 2361 | 0.99 | 2,360 |
| 300 mm | 1507 | 226 | 227 | 1960 | 63 | 425 | 2693 | 244 | 2937 | 2915 | 1.01 | 2,940 |
| 400 mm | 1887 | 283 | 281 | 2451 | 87 | 533 | 3378 | 271 | 3649 | 3214 | 1.14 | 3,650 |
| 500 mm | 2261 | 339 | 406 | 3006 | 175 | 668 | 4233 | 309 | 4542 | 4149 | 1.09 | 4,540 |
| 600 mm | 2723 | 408 | 526 | 3657 | 288 | 829 | 5252 | 349 | 5600 | 5103 | 1.10 | 5,600 |
| 700 mm | 3179 | 477 | 655 | 4311 | 352 | 979 | 6206 | 407 | 6612 | 6005 | 1.10 | 6,610 |
| 800 mm | 4527 | 679 | 932 | 6138 | 460 | 1385 | 8781 | 465 | 9246 | | | 9,250 |
| 900 mm | 5104 | 766 | 1051 | 6921 | 582 | 1575 | 9986 | 523 | 10508 | | | 10,510 |
| 1000 mm | 6804 | 1021 | 1401 | 9225 | 718 | 2088 | 13234 | 581 | 13815 | | | 13,820 |
| 1100 mm | 7926 | 1189 | 1632 | 10746 | 869 | 2439 | 15460 | 639 | 16099 | | | 16,100 |
| 1200 mm | 9048 | 1357 | 1863 | 12268 | 1034 | 2793 | 17705 | 697 | 18402 | | | 18,400 |
| 1350 mm | 11000 | 1650 | 2265 | 14915 | 1309 | 3407 | 21594 | 784 | 22378 | | | 22,380 |
| 1500 mm | 12953 | 1943 | 2667 | 17563 | 1616 | 4027 | 25526 | 871 | 26398 | | | 26,400 |

### Note: Pipe material prices are estimated from the contractor's purchasing price as of Dec.1988

Unit Cost

For Distribution Pipeline (Transportation < 800 km)

| Item | Material | Fitting | Labor | SubTotal | Transprt (<800km) | Profit etc.(21%) | Total 1 | Pavement (w/10%cont) | Total 2 | PWA Price (1987) | Ratio | Adopted (1988) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (****** Unit Rate Based on Pipe Material Cost as of December,1988 | | | | | | | | ******) | | | |
| a. A/C Pipe (Class 20 Normal type) | | (25 %) | | | | | | | | | | |
| 100 mm | 115 | 29 | 63 | 207 | 7 | 45 | 284 | 153 | 437 | 364 | 1.20 | 440 |
| 150 mm | 189 | 47 | 87 | 323 | 12 | 70 | 446 | 168 | 614 | 507 | 1.21 | 610 |
| 200 mm | 328 | 82 | 101 | 511 | 21 | 112 | 708 | 181 | 890 | 735 | 1.21 | 890 |
| 250 mm | 454 | 113 | 142 | 709 | 32 | 155 | 986 | 196 | 1181 | 971 | 1.22 | 1,180 |
| 300 mm | 643 | 161 | 188 | 991 | 44 | 217 | 1378 | 244 | 1621 | 1342 | 1.21 | 1,620 |
| 400 mm | 1217 | 304 | 279 | 1801 | 87 | 397 | 2513 | 271 | 2784 | 2298 | 1.21 | 2,780 |
| 500 mm | 1699 | 425 | 313 | 2437 | 144 | 542 | 3435 | 309 | 3744 | 3095 | 1.21 | 3,740 |
| 600 mm | 2187 | 547 | 398 | 3132 | 176 | 695 | 4403 | 349 | 4752 | 3934 | 1.21 | 4,750 |
| b. Steel Pipe | | (35 %) | | | | | | | | | | |
| 150 mm | 550 | 193 | 111 | 854 | 13 | 182 | 1154 | 168 | 1322 | 1267 | 1.04 | 1,320 |
| 200 mm | 908 | 318 | 125 | 1350 | 24 | 289 | 1829 | 181 | 2010 | 1625 | 1.24 | 2,010 |
| 250 mm | 1210 | 424 | 172 | 1806 | 42 | 388 | 2459 | 196 | 2654 | 2361 | 1.12 | 2,650 |
| 300 mm | 1507 | 527 | 227 | 2262 | 63 | 488 | 3095 | 244 | 3338 | 2915 | 1.15 | 3,340 |
| 400 mm | 1887 | 660 | 281 | 2828 | 87 | 612 | 3880 | 271 | 4151 | 3214 | 1.29 | 4,150 |
| 500 mm | 2261 | 791 | 406 | 3458 | 175 | 763 | 4835 | 309 | 5144 | 4149 | 1.24 | 5,140 |
| 600 mm | 2723 | 953 | 526 | 4202 | 288 | 943 | 5977 | 349 | 6325 | 5103 | 1.24 | 6,330 |
| 700 mm | 3179 | 1113 | 655 | 4946 | 352 | 1113 | 7052 | 407 | 7459 | 6005 | 1.24 | 7,460 |
| 800 mm | 4527 | 1584 | 932 | 7043 | 460 | 1576 | 9986 | 465 | 10451 | | | 10,450 |
| 900 mm | 5104 | 1786 | 1051 | 7941 | 582 | 1790 | 11344 | 523 | 11867 | | | 11,870 |
| 1000 mm | 6804 | 2381 | 1401 | 10586 | 718 | 2374 | 15045 | 581 | 15626 | | | 15,630 |
| 1100 mm | 7926 | 2774 | 1632 | 12332 | 869 | 2772 | 17570 | 639 | 18209 | | | 18,210 |
| 1200 mm | 9048 | 3167 | 1863 | 14077 | 1034 | 3173 | 20113 | 697 | 20810 | | | 20,810 |
| 1350 mm | 11000 | 3850 | 2265 | 17115 | 1309 | 3869 | 24522 | 784 | 25307 | | | 25,310 |
| 1500 mm | 12953 | 4533 | 2667 | 20153 | 1616 | 4571 | 28974 | 871 | 29846 | | | 29,850 |

*** Note: Pipe material prices are estimated from the contractor's purchasing price as of Dec.1988

Unit Cost

For Transmission Pipeline (Transportation >= 800 km)

| Item | Material | Fitting (10%) | Labor | SubTotal | Transprt (>=800km) | Profit etc.(21%) | Total 1 (w/10%cont) | Pavement | Total 2 | | | Adopted (1988) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (****** Unit Rate Based on Pipe Material Cost as of December,1988 ******) | | | | | | | | | | | | |
| a. A/C Pipe (Class 20 Normal type) | | (10 %) | | | | | | | | | | |
| 100 mm | 115 | 12 | 63 | 190 | 13 | 43 | 270 | 153 | 423 | 364 | 1.16 | 420 |
| 150 mm | 189 | 19 | 87 | 295 | 24 | 67 | 424 | 168 | 593 | 507 | 1.17 | 590 |
| 200 mm | 328 | 33 | 101 | 462 | 42 | 106 | 670 | 181 | 852 | 735 | 1.16 | 850 |
| 250 mm | 454 | 45 | 142 | 641 | 63 | 148 | 937 | 196 | 1133 | 971 | 1.17 | 1,130 |
| 300 mm | 643 | 64 | 188 | 895 | 87 | 206 | 1308 | 244 | 1551 | 1342 | 1.16 | 1,550 |
| 400 mm | 1217 | 122 | 279 | 1618 | 175 | 377 | 2387 | 271 | 2658 | 2298 | 1.16 | 2,660 |
| 500 mm | 1699 | 170 | 313 | 2182 | 288 | 519 | 3288 | 309 | 3597 | 3095 | 1.16 | 3,600 |
| 600 mm | 2187 | 219 | 398 | 2804 | 352 | 663 | 4201 | 349 | 4549 | 3934 | 1.16 | 4,550 |
| b. Steel Pipe | | (15 %) | | | | | | | | | | |
| 150 mm | 550 | 83 | 111 | 744 | 26 | 162 | 1025 | 168 | 1193 | 1267 | 0.94 | 1,270 |
| 200 mm | 908 | 136 | 125 | 1168 | 48 | 255 | 1619 | 181 | 1801 | 1625 | 1.11 | 1,800 |
| 250 mm | 1210 | 182 | 172 | 1564 | 83 | 346 | 2192 | 196 | 2387 | 2361 | 1.01 | 2,390 |
| 300 mm | 1507 | 226 | 227 | 1960 | 127 | 438 | 2778 | 244 | 3022 | 2915 | 1.04 | 3,020 |
| 400 mm | 1887 | 283 | 281 | 2451 | 175 | 551 | 3495 | 271 | 3766 | 3214 | 1.17 | 3,770 |
| 500 mm | 2261 | 339 | 406 | 3006 | 350 | 705 | 4466 | 309 | 4775 | 4149 | 1.15 | 4,780 |
| 600 mm | 2723 | 408 | 526 | 3657 | 577 | 889 | 5636 | 349 | 5984 | 5103 | 1.17 | 5,980 |
| 700 mm | 3179 | 477 | 655 | 4311 | 704 | 1053 | 6674 | 407 | 7081 | 6005 | 1.18 | 7,080 |
| 800 mm | 4527 | 679 | 932 | 6138 | 919 | 1482 | 9393 | 465 | 9857 | | | 9,860 |
| 900 mm | 5104 | 766 | 1051 | 6921 | 1163 | 1698 | 10760 | 523 | 11283 | | | 11,280 |
| 1000 mm | 6804 | 1021 | 1401 | 9225 | 1436 | 2239 | 14190 | 581 | 14771 | | | 14,770 |
| 1100 mm | 7926 | 1189 | 1632 | 10746 | 1738 | 2622 | 16616 | 639 | 17256 | | | 17,260 |
| 1200 mm | 9048 | 1357 | 1863 | 12268 | 2068 | 3011 | 19081 | 697 | 19778 | | | 19,780 |
| 1350 mm | 11000 | 1650 | 2265 | 14915 | 2617 | 3682 | 23336 | 784 | 24120 | | | 24,120 |
| 1500 mm | 12953 | 1943 | 2667 | 17563 | 3231 | 4367 | 27677 | 871 | 28548 | | | 28,550 |

### Note: Pipe material prices are estimated from the contractor's purchasing price as of Dec.1988

Unit Cost

For Distribution Pipeline (Transportation >= 800 km)

| Item | Material | Fitting | Labor | SubTotal | Transprt (>=800km) | Profit etc.(21%) | Total 1 (w/10%cont) | Pavement | Total 2 | | | Adopted (1988) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (###### Unit Rate Based on Pipe Material Cost as of December,1988 ########) | | | | | | | | | | | | |
| a. A/C Pipe (Class 20 Normal type) | | (25 %) | | | | | | | | | | |
| 100 mm | 115 | 29 | 63 | 207 | 13 | 46 | 293 | 153 | 446 | 364 | 1.23 | 450 |
| 150 mm | 189 | 47 | 87 | 323 | 24 | 73 | 462 | 168 | 630 | 507 | 1.24 | 630 |
| 200 mm | 328 | 82 | 101 | 511 | 42 | 116 | 736 | 181 | 917 | 735 | 1.25 | 920 |
| 250 mm | 454 | 113 | 142 | 709 | 63 | 162 | 1028 | 196 | 1223 | 971 | 1.26 | 1,220 |
| 300 mm | 643 | 161 | 188 | 991 | 87 | 227 | 1436 | 244 | 1680 | 1342 | 1.25 | 1,680 |
| 400 mm | 1217 | 304 | 279 | 1801 | 175 | 415 | 2630 | 271 | 2901 | 2298 | 1.26 | 2,900 |
| 500 mm | 1699 | 425 | 313 | 2437 | 288 | 572 | 3622 | 309 | 3936 | 3095 | 1.27 | 3,940 |
| 600 mm | 2187 | 547 | 398 | 3132 | 352 | 732 | 4637 | 349 | 4986 | 3934 | 1.27 | 4,990 |
| b. Steel Pipe | | (35 %) | | | | | | | | | | |
| 150 mm | 550 | 193 | 111 | 854 | 26 | 185 | 1171 | 168 | 1340 | 1267 | 1.06 | 1,340 |
| 200 mm | 908 | 318 | 125 | 1350 | 48 | 294 | 1861 | 181 | 2042 | 1625 | 1.26 | 2,040 |
| 250 mm | 1210 | 424 | 172 | 1806 | 83 | 397 | 2514 | 196 | 2709 | 2361 | 1.15 | 2,710 |
| 300 mm | 1507 | 527 | 227 | 2262 | 127 | 502 | 3179 | 244 | 3423 | 2915 | 1.17 | 3,420 |
| 400 mm | 1887 | 660 | 281 | 2828 | 175 | 631 | 3997 | 271 | 4268 | 3214 | 1.33 | 4,270 |
| 500 mm | 2261 | 791 | 406 | 3458 | 350 | 800 | 5068 | 309 | 5377 | 4149 | 1.30 | 5,380 |
| 600 mm | 2723 | 953 | 526 | 4202 | 577 | 1004 | 6361 | 349 | 6709 | 5103 | 1.31 | 6,710 |
| 700 mm | 3179 | 1113 | 655 | 4946 | 704 | 1187 | 7520 | 407 | 7927 | 6005 | 1.32 | 7,930 |
| 800 mm | 4527 | 1584 | 932 | 7043 | 919 | 1672 | 10598 | 465 | 11062 | | | 11,060 |
| 900 mm | 5104 | 1786 | 1051 | 7941 | 1163 | 1912 | 12118 | 523 | 12641 | | | 12,640 |
| 1000 mm | 6804 | 2381 | 1401 | 10586 | 1436 | 2525 | 16001 | 581 | 16582 | | | 16,580 |
| 1100 mm | 7926 | 2774 | 1632 | 12332 | 1738 | 2955 | 18726 | 639 | 19365 | | | 19,370 |
| 1200 mm | 9048 | 3167 | 1863 | 14077 | 2068 | 3391 | 21490 | 697 | 22187 | | | 22,190 |
| 1350 mm | 11000 | 3850 | 2265 | 17115 | 2617 | 4144 | 26264 | 784 | 27049 | | | 27,050 |
| 1500 mm | 12953 | 4533 | 2667 | 20153 | 3231 | 4911 | 31125 | 871 | 31996 | | | 32,000 |

### Note: Pipe material prices are estimated from the contractor's purchasing price as of Dec.1988

Unit Cost

| Construction Works | | Price in 3 Lowest Tenders (1988) (A) | | Estimated Cost (A)*1.35 | PWA's Unit Cost (for 1987) | Adopted Cost (1988) |
|---|---|---|---|---|---|---|
| Concrete Work (incl.Form Work,Scafolding) | Baht | 2,200 /cu m | Baht | 2,970 /cu m | - | |
| Re-Bar | Baht | 18 /kg | Baht | 24 /kg | - | |
| Unit Concrete Cost (incl.Form Work,Scafolding, Re-Bar(100kg/cu m concrete)) | | | Baht | 5,370 /cu m | - | 5,400 |
| Earth Work | | | | | | |
| Excavation (with Backfill) | | 55 /cu m | | 79 /cu m | - | 80 |
| Soil Fill | | 53 /cu m | | 76 | | 120 (From PWA Cost) |
| Architectural Works | | | | | | |
| Administration Bldg. | | 4,516 /sq m | | 6,451 /sq m | | |
| Head Quarter Bldg. | | 3,612 | | 5,160 | | 5,000 |
| Chlorination House | Baht | 2,830 /sq m | Baht | 4,043 /sq m | 3610 - 4300 | 3,800 |
| Pump House (excl.pump pit) | Baht | 1,860 /sq m | Baht | 2,657 /sq m | 3540 - 4200 | 3,600 |

Unit Cost

| Construction Works | PWA's Cost (for 1987) (Baht 1000) | Unit Cost (Baht/cu m/h) (A) | Estimated Cost (for 1989) (A)*1.30 | Adopted Cost (1988) |
|---|---|---|---|---|
| Treatment Facilities | | | Unit Cost (Baht/cu m/h) | Unit Cost (Baht/cu m/h) |
| Sedimentation Basin | | | | |
| 50 cu m/hr | 1,310 | 26,200 | 34,100 | 34,000 |
| 100 cu m/hr | 1,633 | 16,330 | 21,200 | 21,000 |
| 200 cu m/hr | 3,136 | 15,680 | 20,400 | 20,000 |
| 250 cu m/hr | 5,133 | 20,532 | 26,700 | 27,000 |
| 500 cu m/hr | 7,708 | 15,416 | 20,000 | 20,000 |
| 1000 cu m/hr | 17,723 | 17,723 | 23,000 | 23,000 |
| Filters | | | | |
| 50 cu m/hr | 588 | 11,760 | 15,300 | 15,000 |
| 100 cu m/hr | 1,044 | 10,440 | 13,600 | 14,000 |
| 200 cu m/hr | 2,227 | 11,135 | 14,500 | 15,000 |
| 250 cu m/hr | 2,337 | 9,348 | 12,200 | 12,000 |
| 500 cu m/hr | 4,674 | 9,348 | 12,200 | 12,000 |
| 1000 cu m/hr | 11,356 | 11,356 | 14,800 | 15,000 |
| Clear Water Reservoir | | | Unit Cost (Baht/cu m) | Unit Cost (Baht/cu m) |
| 500 cu m | 887 | 1,774 | 2,300 | 2,300 |
| 1000 cu m | 1,628 | 1,628 | 2,100 | 2,100 |
| 1500 cu m | 2,699 | 1,799 | 2,300 | 2,300 |
| 2000 cu m | 2,803 | 1,402 | 1,800 | 1,800 |
| 2250 cu m | 3,282 | 1,459 | 1,900 | 1,900 |
| 3000 cu m | 6,633 | 2,211 | 2,900 | 2,900 |
| 3300 cu m | 6,603 | 2,001 | 2,600 | 2,600 |
| 4000 cu m | 7,730 | 1,933 | 2,500 | 2,500 |
| 5800 cu m | 10,809 | 1,864 | 2,400 | 2,400 |
| Elevated Tank | | | Cost (Baht 1000) | Cost (Baht 1000) |
| 50 cu m | 722 | | 940 | 900 |
| 120 cu m | 1,146 | | 1,490 | 1,500 |
| 250 cu m | 1,394 | | 1,810 | 1,800 |

APPENDIX A-8-1

Design Criteria for Dams

(1) Geological assecment

The enigineering geological assesment for dam construction is described in the following chapter with respect to the geological members of overburden and bedrock respectively.

(a) Overburden

At the thought of dam construction, the most severe problem in all dam sites are very deep Recent river bed and terrace deposit.

The overburden, in general, can be classified into three facies as following tab. 6-1-1 from the engineering properties inclusive of topographycal situation, lithological change, permeability and bearing capacity.

Tab. 6-1-1 Classification of Overburden

| Practical Classification | Generalized Lithology | average of N-value | Maximum Thickness (m) B.N. | C.T.R. | K.K. *1 |
|---|---|---|---|---|---|
| Top soil/River bed | Lateritic soil, Sand and gravel with clay | 10 | 2 | 2 | 2 |
| Terrace Deposit | Sand and gravel | 15 | 10 | 7 | 10 |
| Clay/Peat | Clayey deposit with sandy intercalations. | 1 | 7 | 7 | 3 |
| Wethering zone of Bedrock | laterization saprolite | 50 | 17 | 15 | 6 |

*1 B.N.:Bang Nei Site C.T.R.: Che tra Site K.K.:Khlong Katha Site

Base on the engineering geological chracteristics, at least overburden including the lowest member of clayey deposit shall be excavated off throughout the dam foundation, because it is too loose to be a dam foundation. Even if the dam scale is smaller than 30 metres high, the bearing capacity of clayey deposit is so week that all of overbuden menbers have to be taken out. When the higher dam will be planned, the excavation line shall be put on the deeper horizon which is correlative with the weathering zone of badrock. For both abutment of all site and the low terrrace hill seeing at Che tra site, the overburden are thin so that the stripping off can be reduced to only top soil.

While at an impervious core trench, the oberburden should be excavated off completely, because it has high permeability in contrast to bedrok especially at sandy and gravel layer, and there is a doubt for a toughness as a foundation of dam, even small scale dam, in a part of loose clayey deposit.

(b) Bedrock

The bed rock in the site consists of granite and sandstone. Among five proposed dam site, four sites comprising The Khlong loyung, The Bang Neo, Khlong katha and Bang the sung site are observed granite and only Che Tra site is formed of sandstone. they are lithologically quite differnt but the engineering characteristic is similar in parts, example for the bearing capacity and permerbility is indicated as sevarally strong and low for both rock facies. Consequently, there are no problem for bearing capacity as a foundation of fill type dam if the oberburden and highly weathered rock have been excavated off. In the case of a large scaled dam more than 50 m in height such as Khlong katha ,Bang The Sung and Khlong Lo Yung site, the main part of foundation should be based on the fresh bedrock as a role.

Permeability of foundation is generally iow ,however, the value shows the slightly higher than 2 Lugeon which is a target value for grouting work. Accordingly, the grouting work shall be required up to impervious zone of bed rock. The depth reaching out the impervious horizon is supposed to be 10 to 15 metres from the surface of foundation and the grouting curtain shall be planed to this level. The high permeability of grouting zone is mainly due to the crack and/or joints opened under the influence of weathering, a cement grouting is available for an impervious curtain treatment.

At any rate, grouting work is required to all of propose sites even through the quantity of work is not so much.

(c) embankment materials

There is no information for embankment materials except for that of field reconnaissance and existing study at Khlong Katha.

All of sites are composed of hard rock which is locally crop out on the side slope in the vicinity of dam site, in veiw of these geological condition, the riprap and rock zone materials are available to be readly obtained from the surrounding area.

The weathering zone is thick especilly in the Palaeozic layer where is spreaded out in the Che Tra site, the down stream of the Khlong Lo yung, Bang Nie and Bang the Sung site. These weathring facies shows a favorable properties for core zone or random materials. The quantities of materials is also enough for embankment volume of proposed dam at above mentioned four sites but The Khlong Katha. Since the bedrock of site is formed of granite at all, futhermore, the adjacent area of site is not also underlain by Palaeozoic facies, the Khlong Katha site may be pointed out a difficulty in procurement for the core zone materials. However, It would be expected that a coming study for a wider area than this time or a carefull consideration for dam types will solve the problem in the future.

(2) Design Criteria for Dam

Design for the proposed dams are basically based on the design of the Bangwad reservoir.

a) Dam Type

According to the geological condition of dam foundation, the dams with a heigth of less than 40m should be eath-fill type and the dams with a height of more than 40m should be rock fill type. For all dams embankment slope is 1:3.0 for upstream and 1:2.5 for downstream.

b) Flood Discharge

Specific flood dischage is estimated from that of the Bang wad reservoir, namely

16.1 m3/s - 4.9 km2 = 3.3 m3/s/km2

c) Overflow Depth for Spillway

Overflow depth for spillway is set at 1.0 m.

d) Sediment Volume

Specific sediment is estimated from that of the Bangwad reservoir, namely

230,000 m3 - 4.9 km2 - 100 years = 470 m3/km2/year

e) Type of Intake Facility

Intake facility is drop inlet type with spillway founction.

(3) Dam Dimension

Table A8-1-2 Summary of Dam Dimension

Location ; Ban The Sung

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 4.3 |
| | Inflow Amount | MCM | 4.085 |
| Reservoir | Total Strage | MCM | 5 |
| | Effective Strage | MCM | 4.8 |
| | Sediment Volume | MCM | 0.2 |
| | Flood Water Level | m | 63 |
| | High Water Level | m | 62 |
| | Sediment Level | m | 34 |
| | High Water Area | Km2 | 0.26 |
| | Effective Water Depth | m | 28 |
| Embankment | Height | m | 58 |
| | Elevation of the Top | m | 66 |
| | Foundation Level | m | 8 |
| | Width of the Top | m | 8 |
| | Length | m | 630 |
| | Volume | m3 | 2567000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet |
| | Flood Discharge | m3/s | 14.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 7 |
| Intake | Type | | Drop Inlet |
| | Intake Amount | m3/s | Max=0.13 |
| | " " | " | Min=0.10 |

Table A8-1-3 Summary of Dam Dimension

Location ; Khlong Katha

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 5.2 |
| | Inflow Amount | MCM | 4.9 |
| Reservoir | Total Strage | MCM | 5 |
| | Effective Strage | MCM | 4.7 |
| | Sediment Volume | MCM | 0.3 |
| | Flood Water Level | m | 52 |
| | High Water Level | m | 51 |
| | Sediment Level | m | 27 |
| | High Water Area | Km2 | 0.32 |
| | Effective Water Depth | m | 24 |
| Embankment | Height | m | 52 |
| | Elevation of the Top | m | 55 |
| | Foundation Level | m | 3 |
| | Width of the Top | m | 8 |
| | Length | m | 780 |
| | Volume | m3 | 2250000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 2 |
| | Flood Discharge | m3/s | 17.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 9 |
| Intake | Type | | Drop Inlet * 2 |
| | Intake Amount | m3/s | Max=0.15 |
| | " " | " | Min=0.11 |

Table A8-1-4 Summary of Dam Dimension

Location ; Bang Nie

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 5.2 |
| | Inflow Amount | MCM | 4.9 |
| Reservoir | Total Strage | MCM | 3.1 |
| | Effective Strage | MCM | 2.8 |
| | Sediment Volume | MCM | 0.3 |
| | Flood Water Level | m | 37 |
| | High Water Level | m | 36 |
| | Sediment Level | m | 23 |
| | High Water Area | Km2 | 0.37 |
| | Effective Water Depth | m | 13 |
| Embankment | Height | m | 37 |
| | Elevation of the Top | m | 40 |
| | Foundation Level | m | 3 |
| | Width of the Top | m | 8 |
| | Length | m | 830 |
| | Volume | m3 | 1127000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 1 |
| | Flood Discharge | m3/s | 17.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 9 |
| Intake | Type | | Drop Inlet * 1 |
| | Intake Amount | m3/s | Max=0.17 |
| | " " | " | Min=0.09 |

Table A8-1-5 Summary of Dam Dimension

Location ; Khao Che Tra

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 4.3 |
| | Inflow Amount | MCM | 4.09 |
| Reservoir | Total Strage | MCM | 3 |
| | Effective Strage | MCM | 2.8 |
| | Sediment Volume | MCM | 0.2 |
| | Flood Water Level | m | 44 |
| | High Water Level | m | 43 |
| | Sediment Level | m | 33 |
| | High Water Area | Km2 | 0.44 |
| | Effective Water Depth | m | 10 |
| Embankment | Height | m | 29 |
| | Elevation of the Top | m | 47 |
| | Foundation Level | m | 18 |
| | Width of the Top | m | 8 |
| | Length | m | 727 |
| | Volume | m3 | 798500 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 1 |
| | Flood Discharge | m3/s | 14.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 7 |
| Intake | Type | | Drop Inlet * 1 |
| | Intake Amount | m3/s | Max=0.11 |
| | " " | " | Min=0.08 |

Table A8-1-6 Summary of Dam Dimension

Location ; Khlong Lo Young

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 7 |
| | Inflow Amount | MCM | 8.399 |
| Reservoir | Total Strage | MCM | 11.5 |
| | Effective Strage | MCM | 11.2 |
| | Sediment Volume | MCM | 0.3 |
| | Flood Water Level | m | 47 |
| | High Water Level | m | 46 |
| | Sediment Level | m | 32 |
| | High Water Area | Km2 | 1.1 |
| | Effective Water Depth | m | 14 |
| Embankment | Height | m | 46 |
| | Elevation of the Top | m | 50 |
| | Foundation Level | m | 4 |
| | Width of the Top | m | 8 |
| | Length | m | 845 |
| | Volume | m3 | 1872000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 2 |
| | Flood Discharge | m3/s | 23.1 |
| | Overflow Depth | m | 1 |
| | Length | m | 6 |
| Intake | Type | | Drop Inlet * 2 |
| | Intake Amount | m3/s | Max=0.29 |
| | " " | " | Min=0.22 |

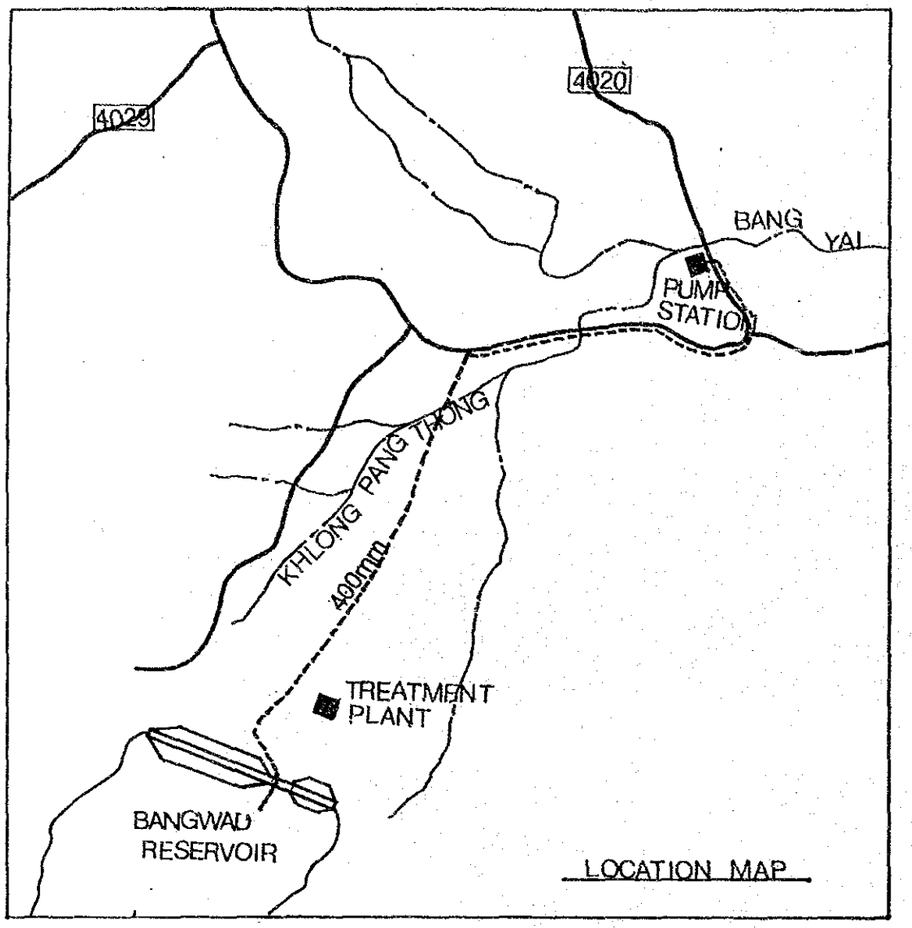
Table A8-1-7 Summary of Dam Dimension

Location ; Na Faek

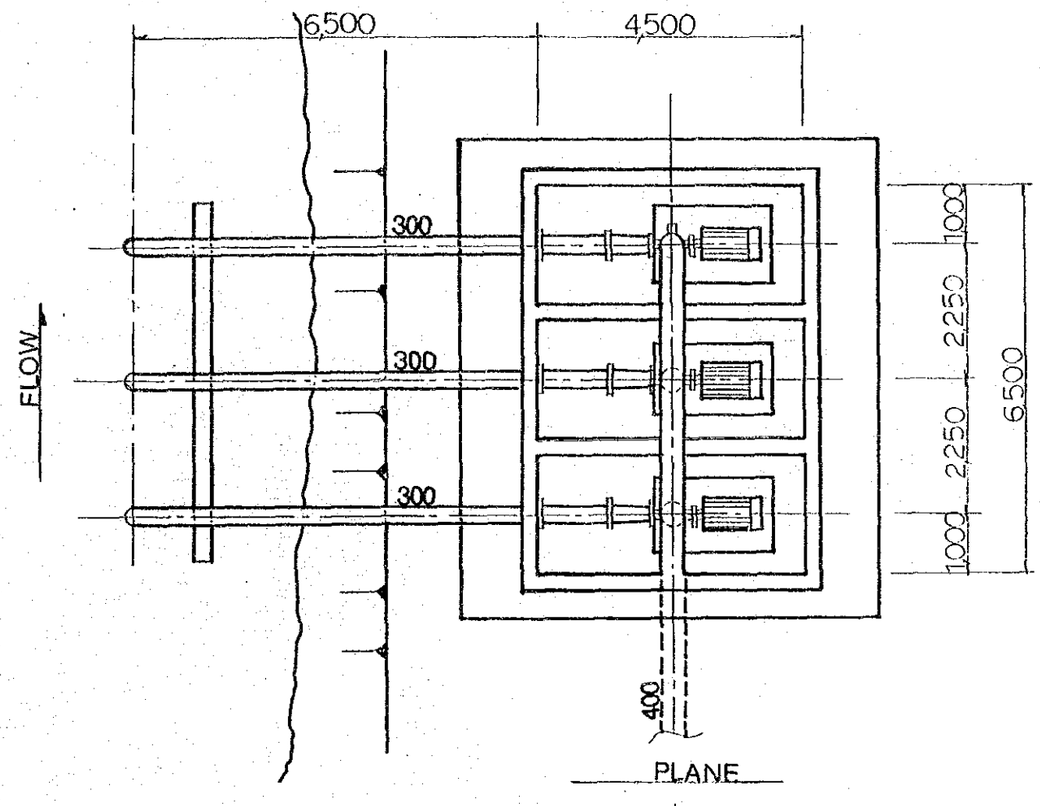
| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 14.4 |
| | Inflow Amount | MCM | 17.28 |
| | Total Strage | MCM | 12 |
| | Effective Strage | MCM | 11.3 |
| | Sediment Volume | MCM | 0.7 |
| Reservoir | Flood Water Level | m | 39 |
| | High Water Level | m | 38 |
| | Sediment Level | m | 23 |
| | High Water Area | Km2 | 1.35 |
| | Effective Water Depth | m | 15 |
| | Height | m | 38 |
| | Elevation of the Top | m | 42 |
| | Foundation Level | m | 4 |
| Embankment | Width of the Top | m | 8 |
| | Length | m | 1000 |
| | Volume | m3 | 2500000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| | Type | | Drop Inlet * 2 |
| Spillway | Flood Discharge | m3/s | 47.6 |
| | Overflow Depth | m | 1 |
| | Length | m | 10 |
| | Type | | Drop Inlet * 2 |
| Intake | Intake Amount | m3/s | Max=0.47 |
| | " " | | Min=0.35 |

APPENDIX A-8-2

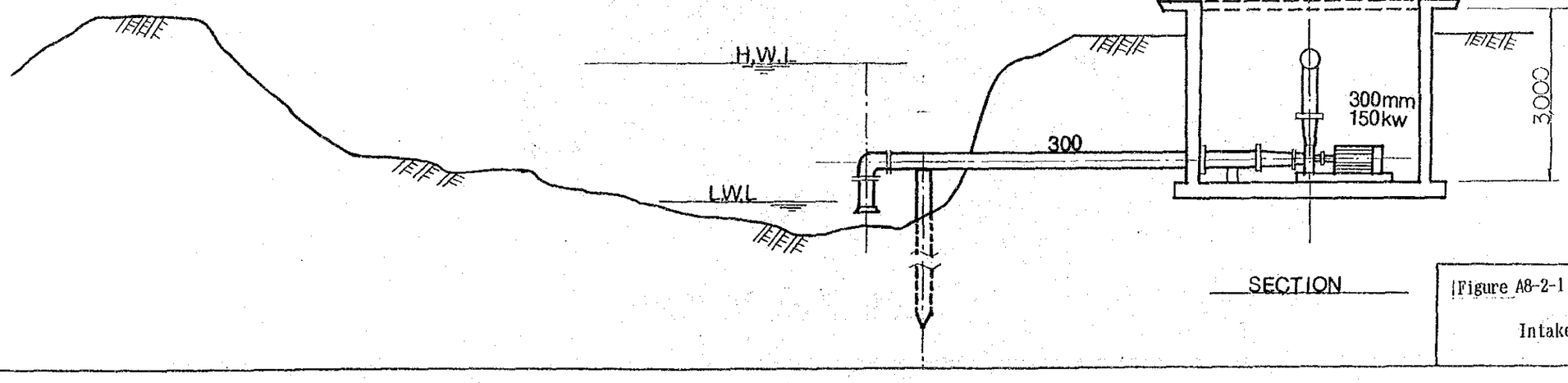
Drawings of Water Source Facilities




LOCATION MAP



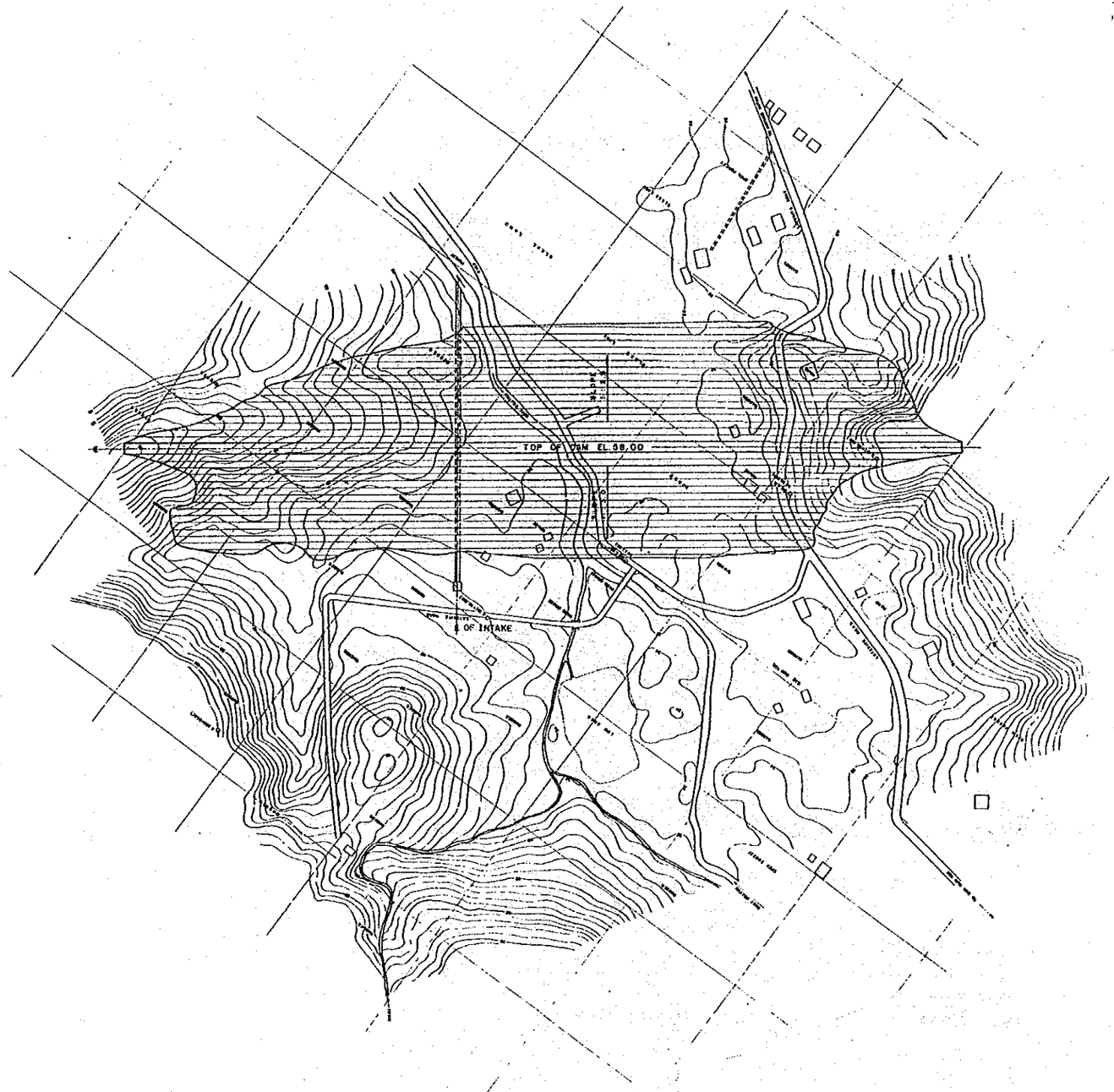

PLANE




SECTION

Figure A8-2-1

Intake Pump Station

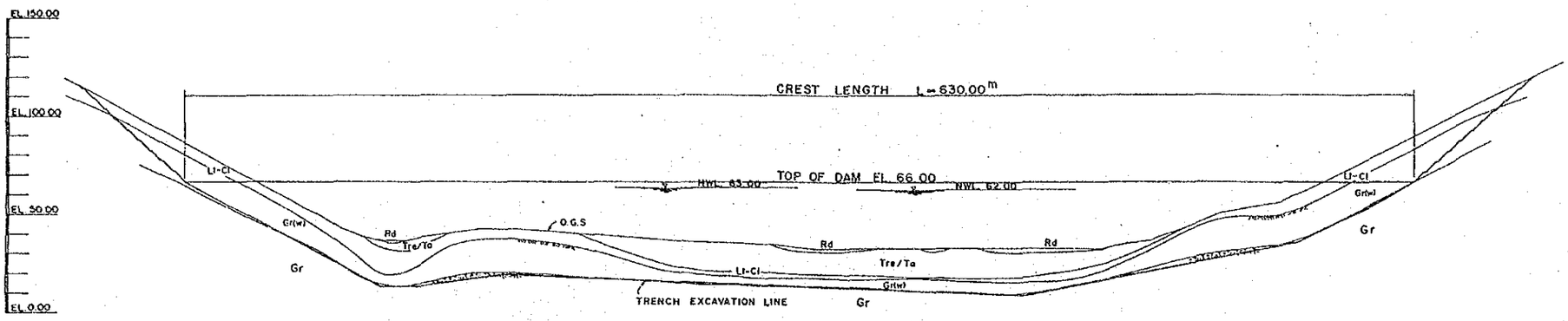



GENERAL PLAN MAP

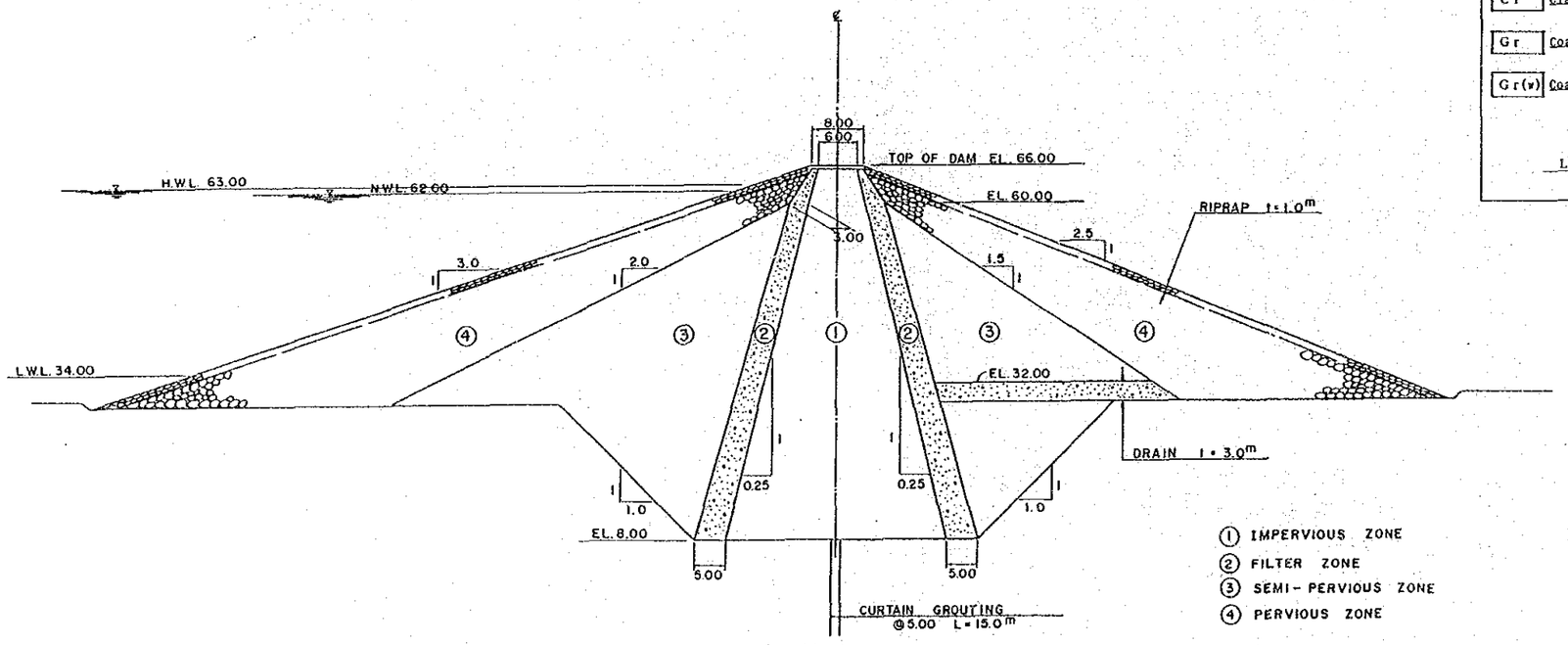
Location ; Ban The Sung

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 4.3 |
| | Inflow Amount | MCM | 4.085 |
| | Total Strage | MCM | 5 |
| | Effective Strage | MCM | 4.8 |
| | Sediment Volume | MCM | 0.2 |
| Reservoir | Flood Water Level | m | 63 |
| | High Water Level | m | 62 |
| | Sediment Level | m | 34 |
| | High Water Area | Km2 | 0.26 |
| | Effective Water Depth | m | 28 |
| | Height | m | 58 |
| | Elevation of the Top | m | 66 |
| | Foundation Level | m | 8 |
| | Width of the Top | m | 8 |
| Embankment | Length | m | 630 |
| | Voluae | m3 | 2567000 |
| | Slope Gradient | | Upstream : 1:3 |
| | " " | | Down " ;1:2.5 |
| | Type | | Drop Inlet |
| Spillway | Flood Discharge | m3/s | 14.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 7 |
| | Type | | Drop Inlet |
| Intake | Intake Amount | m3/s | Max=0.13 |
| | " " | " | Max=0.10 |

Figure A8-2-2
Dam Section (Bang Tho Sung)




LONGITUDINAL AND GEOLOGICAL PROFILE ALONG THE DAM AXIS




MAX. CROSS SECTION

| | | | |
|---|---|---|---|
| Rd | Alluvium | : Recent river deposite consisting of sand, gravel and silt, Swamp sediment of sand to clay | OVER BORDEN |
| Tre / Trl | Erosional Terrace or Lower Terrace | : Recent river terrace wade up of gravel, sand and silt<br>: Terrace deposit mainly coaposed of sand and gravel with thin clay layer | OVER BORDEN |
| Cl | Clay | : Very soft clay showing N value less than 5 blows | |
| Gr | Coarse Granite | : Coarse grained biotite-porphyritic granite | BED ROCK |
| Gr(w) | Coarse Granite | : Weathered Coarse Granite, the materials mainly consist of medium to very dense sandy deposite showing N value over 30 blows | BED ROCK |

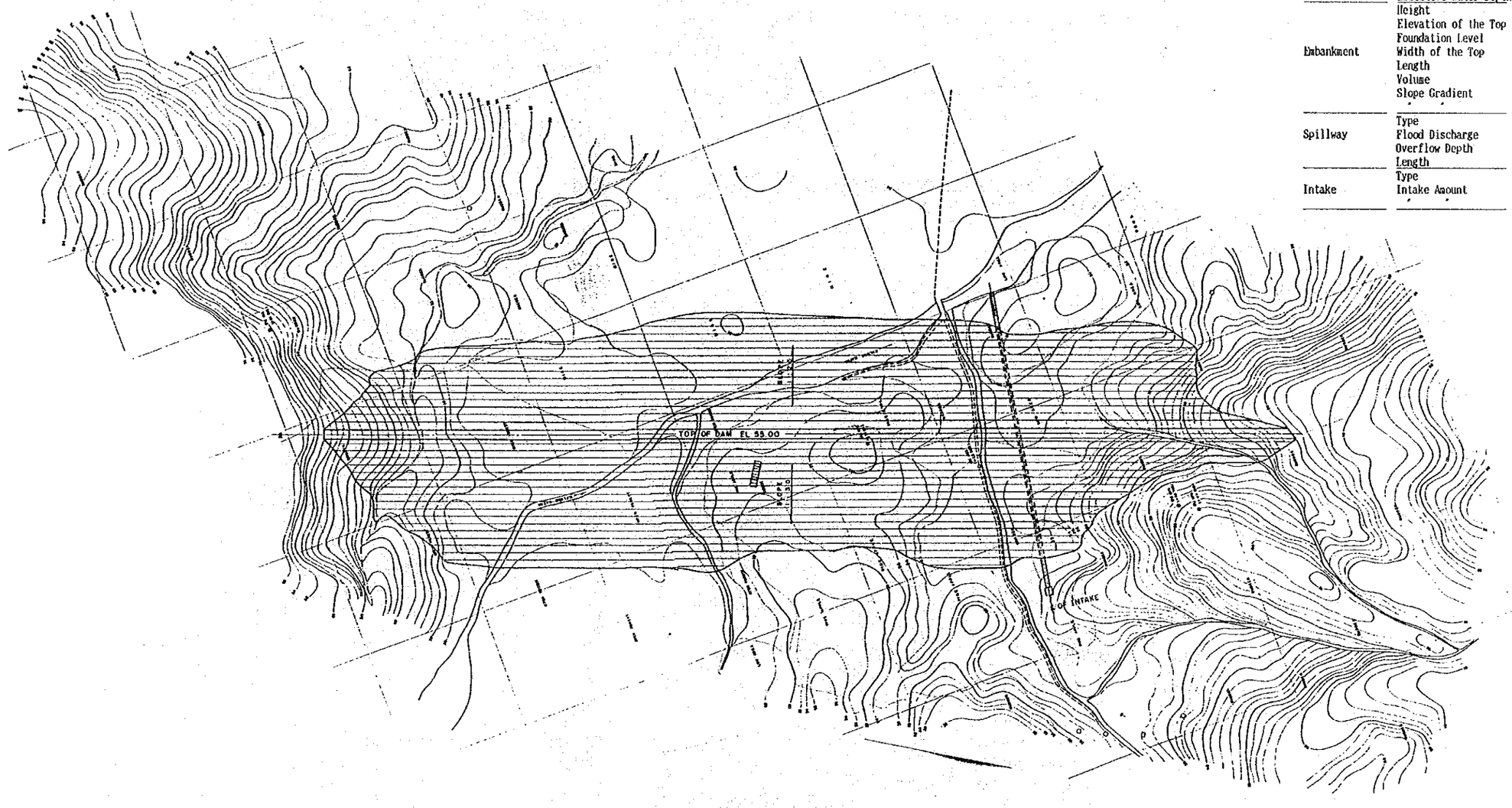
LEGEND FOR CROSS SECTION

Figure A8-2-3

Dam Section (Bang Tho Sung)

Location ; Khlong Katha

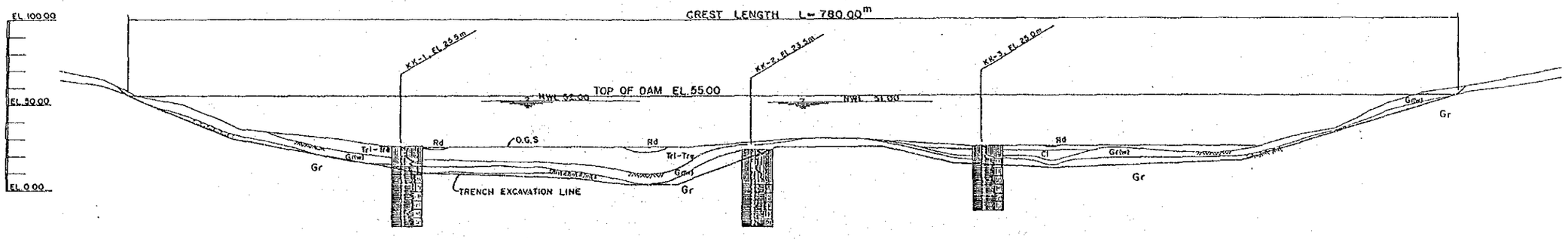
| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 5.2 |
| | Inflow Amount | MCM | 4.9 |
| | Total Strage | MCM | 5 |
| | Effective Strage | MCM | 4.7 |
| | Sediment Volume | MCM | 0.3 |
| Reservoir | Flood Water Level | m | 52 |
| | High Water Level | m | 51 |
| | Sediment Level | m | 27 |
| | High Water Area | Km2 | 0.32 |
| | Effective Water Depth | m | 24 |
| | Height | m | 52 |
| | Elevation of the Top | m | 55 |
| | Foundation Level | m | 3 |
| Embankment | Width of the Top | m | 8 |
| | Length | m | 780 |
| | Volume | m3 | 2250000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " | " | Down " ;1:2.5 |
| | Type | | Drop Inlet * 2 |
| Spillway | Flood Discharge | m3/s | 17.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 9 |
| | Type | | Drop Inlet * 2 |
| Intake | Intake Amount | m3/s | Max=0.15 |
| | " | " | Min=0.11 |



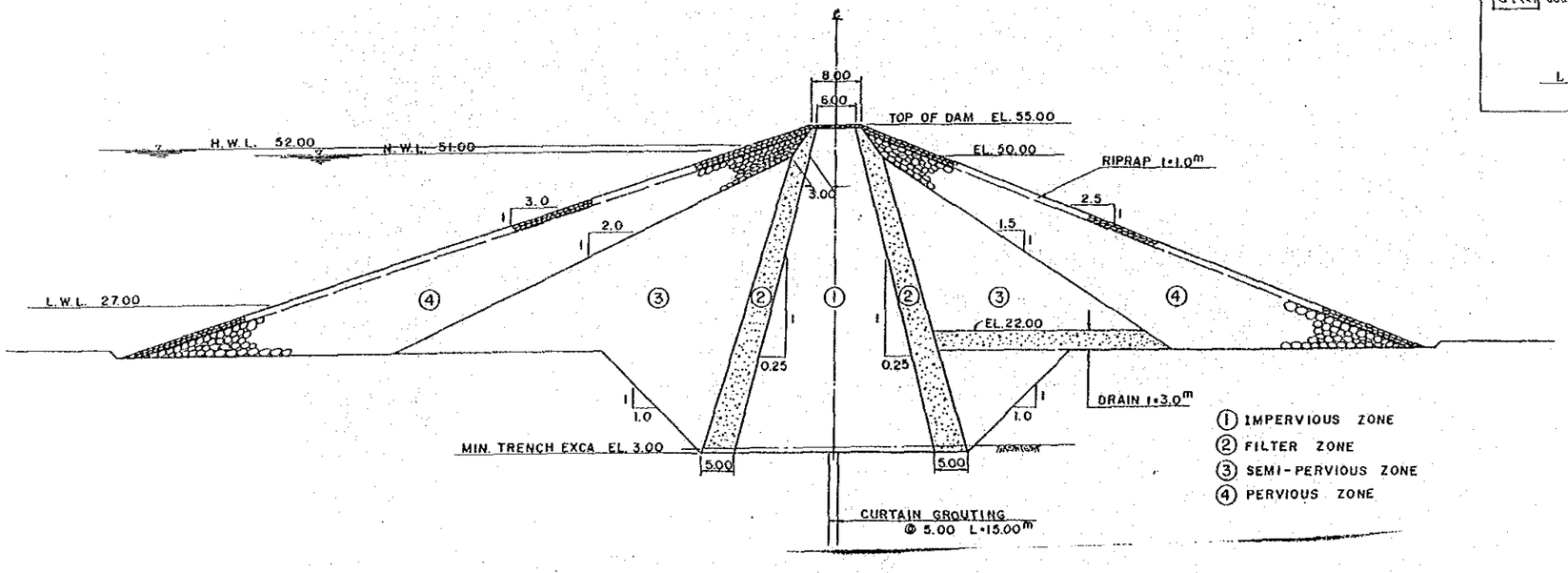

GENERAL PLAN MAP

Figure A8-2-4

Dam Section (Khlong Katha)




LONGITUDINAL AND GEOLOGICAL PROFILE ALONG THE DAM AXIS



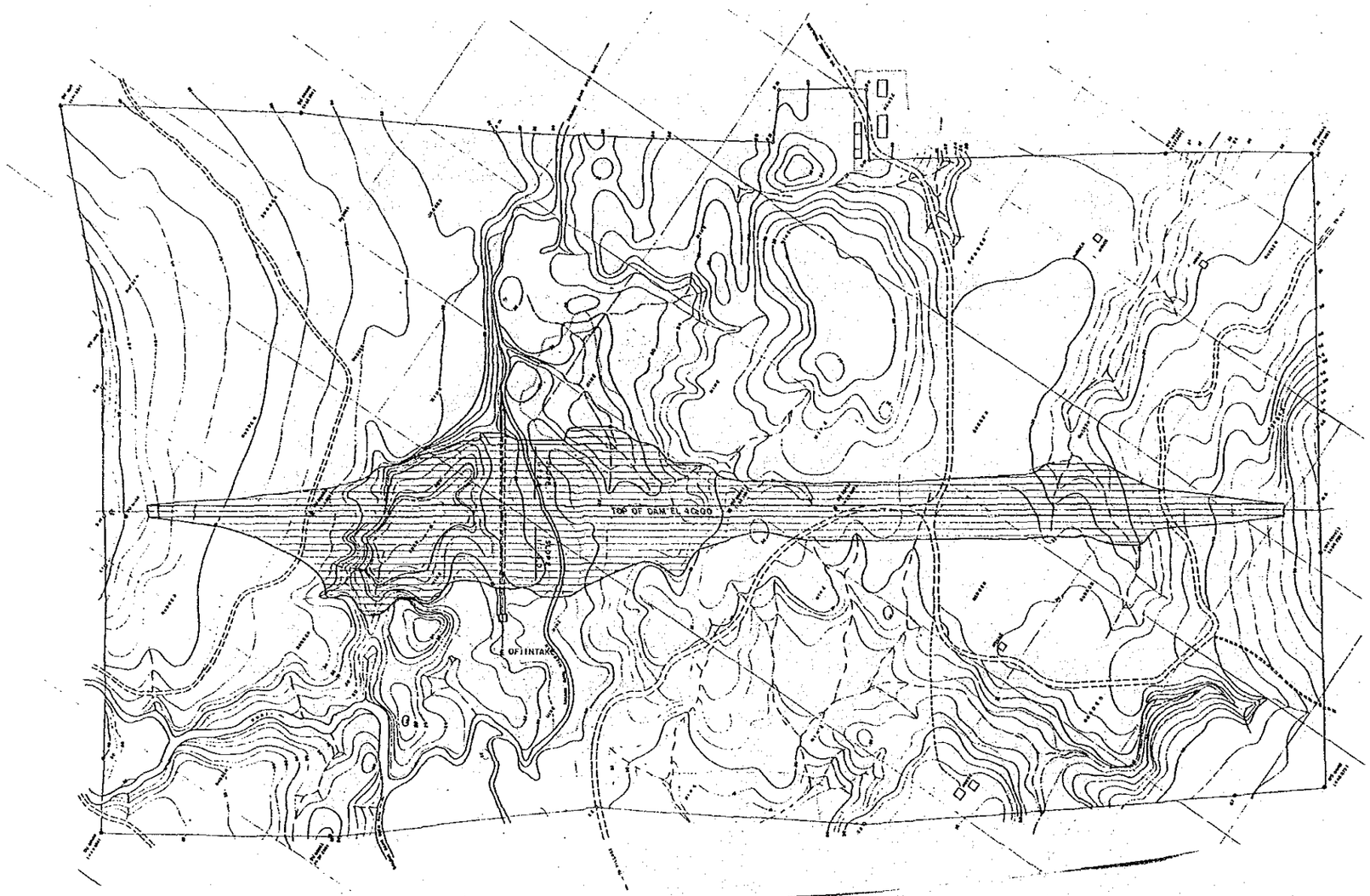

MAX. CROSS SECTION

| | | | |
|---|---|---|---|
| Rd | Alluvium | : Recent river deposite consisting of sand, gravel and silt. Swamp sediment of sand to clay | OVER BORDEN |
| Tre | Erosional Terrace | : Recent river terrace made up of gravel, sand and silt | |
| Tr1 | Lower Terrace | : Terrace deposit mainly composed of sand and gravel with thin clay layer | |
| Gr | Coarse Granite | : Coarse grained biotite-porphyritic granite | BED ROCK |
| Gr(w) | Coarse Granite | : Weathered Coarse Granite, the materials mainly consist of medium to very dense sandy deposite showing N value over 30 blows | |

LEGEND FOR CROSS SECTION

Figure A8-2-5

Dam Section (Khlong Katha)

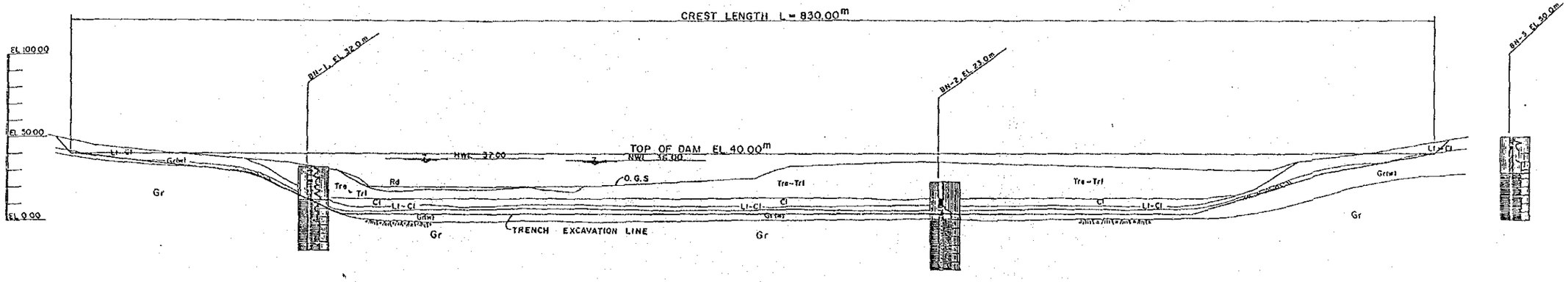



Location ; Bang Nie

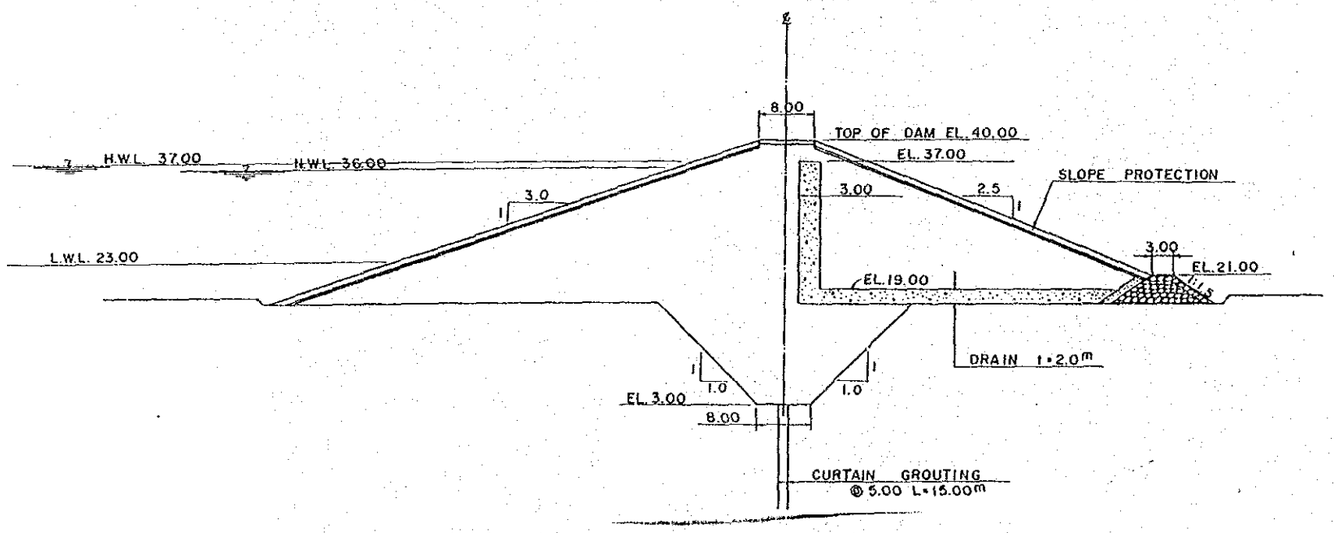
| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 5.2 |
| | Inflow Amount | MCM | 4.9 |
| | Total Strage | MCM | 3.1 |
| | Effective Strage | MCM | 2.8 |
| | Sediment Volume | MCM | 0.3 |
| Reservoir | Flood Water Level | m | 37 |
| | High Water Level | m | 36 |
| | Sediment Level | m | 23 |
| | High Water Area | Km2 | 0.37 |
| | Effective Water Depth | m | 13 |
| | Height | m | 37 |
| | Elevation of the Top | m | 40 |
| | Foundation Level | m | 3 |
| Embankment | Width of the Top | m | 8 |
| | Length | m | 830 |
| | Volume | m3 | 1127000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| | Type | | Drop Inlet * 1 |
| Spillway | Flood Discharge | m3/s | 17.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 9 |
| | Type | | |
| Intake | Intake Amount | m3/s | Max=0.17 |
| | " " | " | Min=0.09 |

GENERAL PLAN MAP

Figure A8-2-6
Plane of Dam (Bang Nieo)




LONGITUDINAL AND GEOLOGICAL PROFILE ALONG THE DAM AXIS



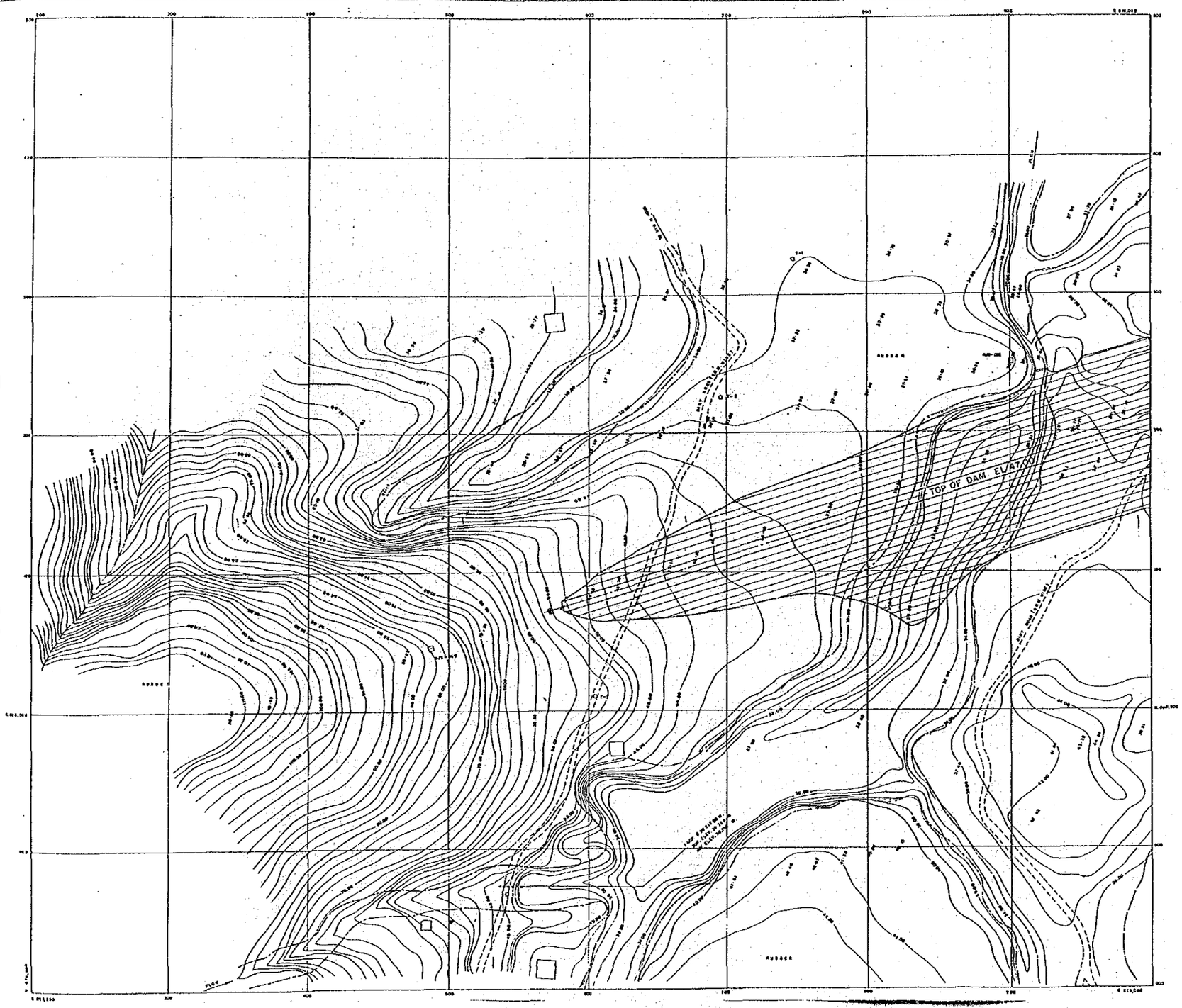

MAX. CROSS SECTION

| | | | |
|---|---|---|---|
| Rd | Alluvium | : Recent river deposite consisting of sand, gravel and silt. Swamp sediment of sand to clay | OVER BORDEN |
| Tre / Trl | Erosional Terrace / or / Lower Terrace | : Recent river terrace made up of gravel, sand and silt<br>: Terrace deposit mainly coaposed of sand and gravel with thin clay layer | |
| Cl | Clay | : Very soft clay showing N value less than 5 blows | |
| Lt / or / Cl | Laterite / or / Clay | : Lateritic soil with sandy particles<br>: Very soft clay showing N value less than 5 blows | |
| Gr | Coarse Granite | : Coarse grained biotite-porphyritic granite | BED ROCK |
| Gr(w) | Coarse Granite | : Weathered Coarse Granite, the materials mainly consist of medium to very dense sandy deposite showing N value over 30 blows | |

LEGEND FOR CROSS SECTION

Figure A8-2-7

Dam Section (Bang Nieo)

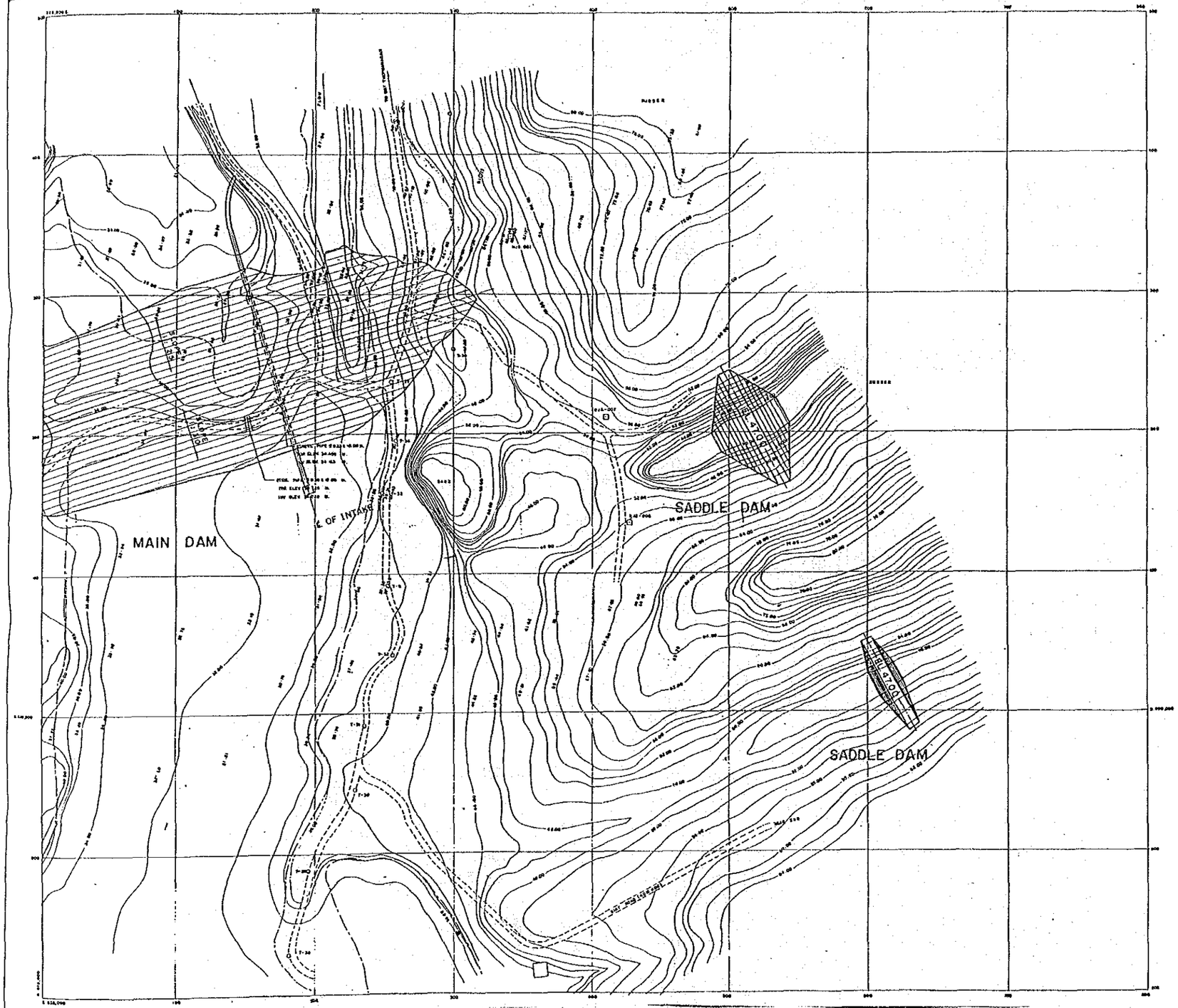



Location ; Khao Che Tra

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 4.3 |
| | Inflow Amount | MCM | 4.09 |
| Reservoir | Total Strage | MCM | 3 |
| | Effective Strage | MCM | 2.8 |
| | Sediment Volume | MCM | 0.2 |
| | Flood Water Level | m | 44 |
| | High Water Level | m | 43 |
| | Sediment Level | m | 33 |
| | High Water Area | Km2 | 0.44 |
| | Effective Water Depth | m | 10 |
| Embankment | Height | m | 28 |
| | Elevation of the Top | m | 47 |
| | Foundation Level | m | 18 |
| | Width of the Top | m | 8 |
| | Length | m | 727 |
| | Volume | m3 | 798500 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 1 |
| | Flood Discharge | m3/s | 14.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 7 |
| Intake | Type | | Drop Inlet * 1 |
| | Intake Amount | m3/s | Max=0.11 |
| | " " | " | Min=0.08 |

Figure A8-2-8

Plane of Dam (Khao Che Tra)

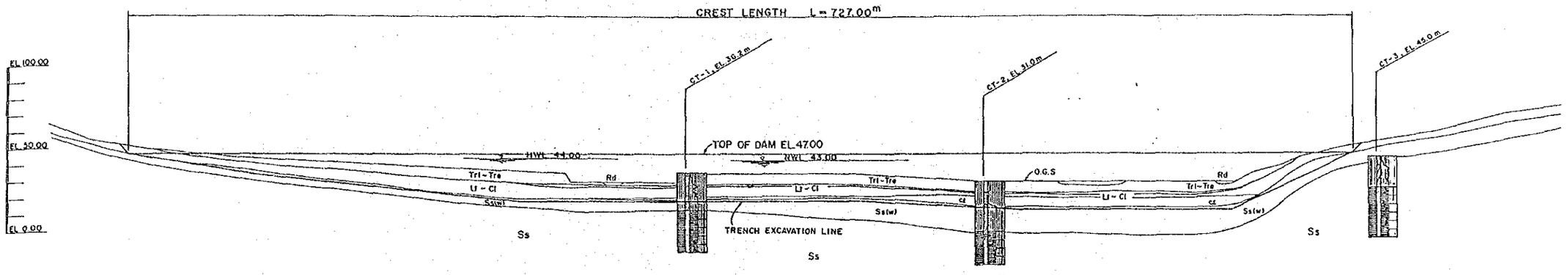



Location ; Khao Che Tra

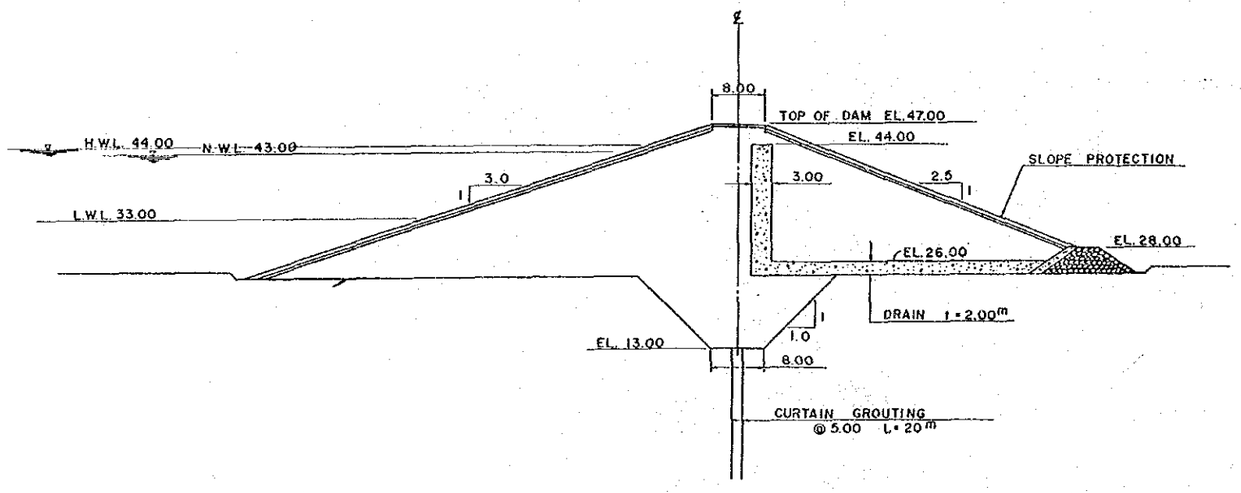
| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 4.3 |
| | Inflow Amount | MCM | 4.09 |
| Reservoir | Total Strage | MCM | 3 |
| | Effective Strage | MCM | 2.6 |
| | Sediment Volume | MCM | 0.2 |
| | Flood Water Level | m | 44 |
| | High Water Level | m | 43 |
| | Sediment Level | m | 33 |
| | High Water Area | Km2 | 0.44 |
| | Effective Water Depth | m | 10 |
| Embankment | Height | m | 28 |
| | Elevation of the Top | m | 47 |
| | Foundation Level | m | 18 |
| | Width of the Top | m | 8 |
| | Length | m | 727 |
| | Volume | m3 | 798500 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 1 |
| | Flood Discharge | m3/s | 14.2 |
| | Overflow Depth | m | 1 |
| | Length | m | 7 |
| Intake | Type | | Drop Inlet * 1 |
| | Intake Amount | m3/s | Max=0.11 |
| | " " | " | Min=0.08 |

Figure A8-2-9

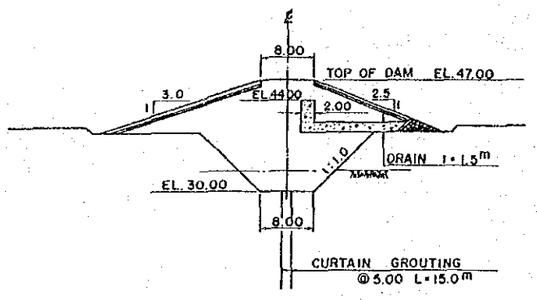
Plane of Dam (Khao Che Tra)




LONGITUDINAL AND GEOLOGICAL PROFILE ALONG THE DAM AXIS




MAX. CROSS SECTION (MAIN DAM)



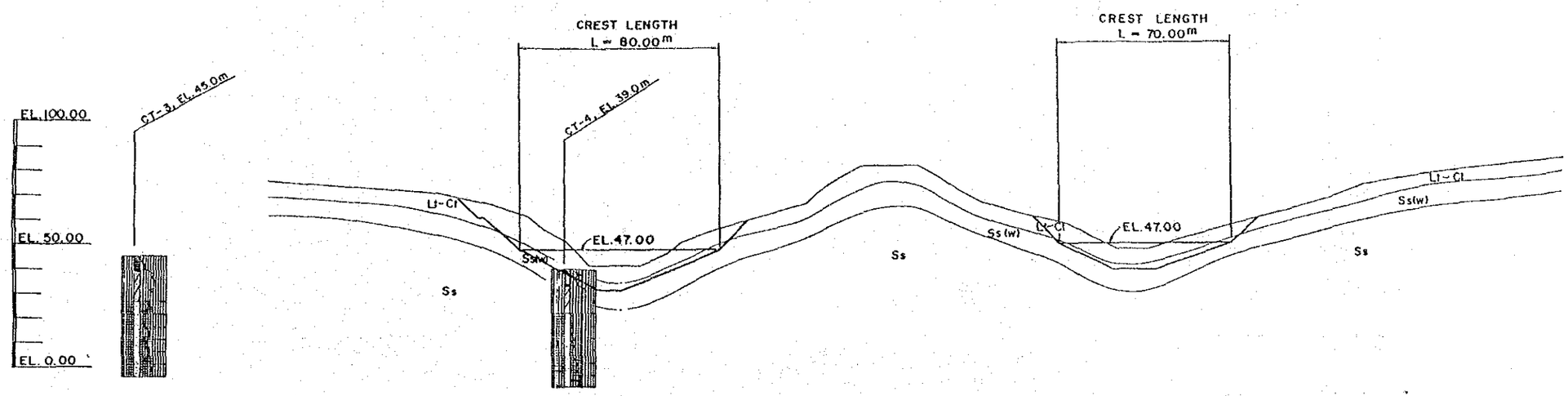

MAX. CROSS SECTION (SADDLE DAM)

| | | | |
|---|---|---|---|
| Rd | Alluvium | : Recent river deposite consisting of sand, gravel and silt, Swamp sediment of sand to clay | OVER BORDEN |
| Tro ~ Trl | Erosional Terrace or Lower Terrace | : Recent river terrace made up of gravel, sand and silt<br>: Terrace deposit mainly composed of sand and gravel with thin clay layer | |
| Lt ~ Cl | Laterite or Clay | : Lateritic soil with sandy particles<br>: Very soft clay showing N value less than 5 blows | |
| Ss | Sandstone | : Palaeozonic sandstone, beded metamorphosed sandstone with chert and slate layer | BED ROCK |
| Ss(w) | Sandstone | : Weathered sandstone, the materials mainly consist of medium to very dense sandy deposite showing N value over 30 blows | |

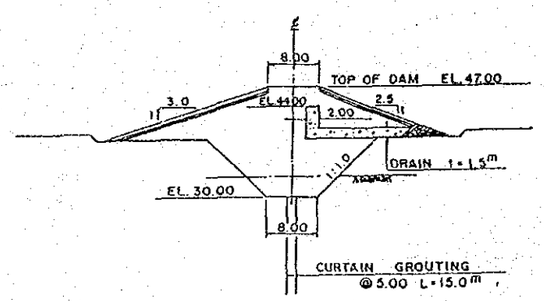
LEGEND FOR CROSS SECTION

Figure A8-2-10

Dam Section (Khao Che Tra)




LONGITUDINAL AND GEOLOGICAL PROFILE ALONG THE DAM AXIS (SADDLE DAM)




MAX. CROSS SECTION (SADDLE DAM)

| | | | |
|---|---|---|---|
| Rd | Alluvium | : Recent river deposite consisting of sand, gravel and silt, Swamp sediment of sand to clay | OVER BORDEN |
| Tre or Trl | Erosional Terrace or Lower Terrace | : Recent river terrace made up of gravel, sand and silt<br>: Terrace deposit mainly composed of sand and gravel with thin clay layer | OVER BORDEN |
| Lt or Cl | Laterite or Clay | : Lateritic soil with sandy particles<br>: Very soft clay showing N value less than 5 blows | |
| Ss | Sandstone | : Palaeozonic sandstone, beded metamorphosed sandstone with chert and slate layer | BED ROCK |
| Ss(w) | Sandstone | : Weathered sandstone, the materials mainly consist of medium to very dense sandy deposite showing N value over 30 blows | BED ROCK |

LEGEND FOR CROSS SECTION

Figure A8-2-11

Dam Section (Khao Che Tra)

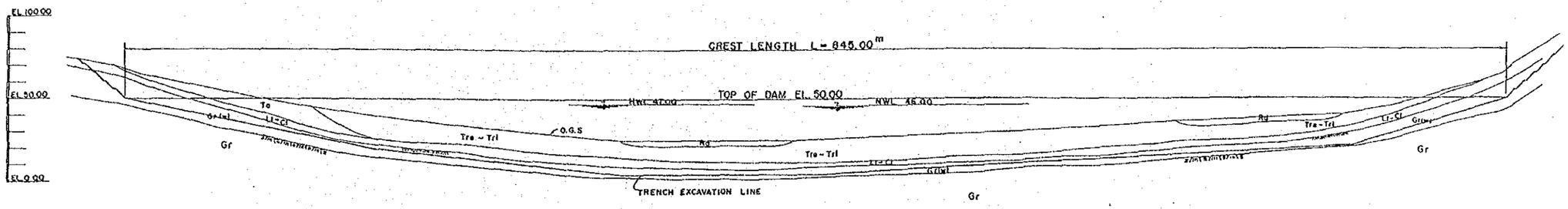
Location : Khlong Lo Young

| Item | Discription | Unit | Dimension |
|---|---|---|---|
| Catchment | Catchment Area | Km2 | 7 |
| | Inflow Amount | MCM | 8.399 |
| Reservoir | Total Strage | MCM | 11.5 |
| | Effective Strage | MCM | 11.2 |
| | Sediment Volume | MCM | 0.3 |
| | Flood Water Level | m | 47 |
| | High Water Level | m | 46 |
| | Sediment Level | m | 32 |
| | High Water Area | Km2 | 1.1 |
| | Effective Water Depth | m | 14 |
| Embankment | Height | m | 46 |
| | Elevation of the Top | m | 50 |
| | Foundation Level | m | 4 |
| | Width of the Top | m | 8 |
| | Length | m | 845 |
| | Voluse | m3 | 1672000 |
| | Slope Gradient | | Upstream ; 1:3 |
| | " " | | Down " ;1:2.5 |
| Spillway | Type | | Drop Inlet * 2 |
| | Flood Discharge | m3/s | 23.1 |
| | Overflow Depth | m | 1 |
| | Length | m | 6 |
| Intake | Type | | Drop Inlet * 2 |
| | Intake Amount | m3/s | Max=0.29 |
| | " " | " | Min=0.22 |

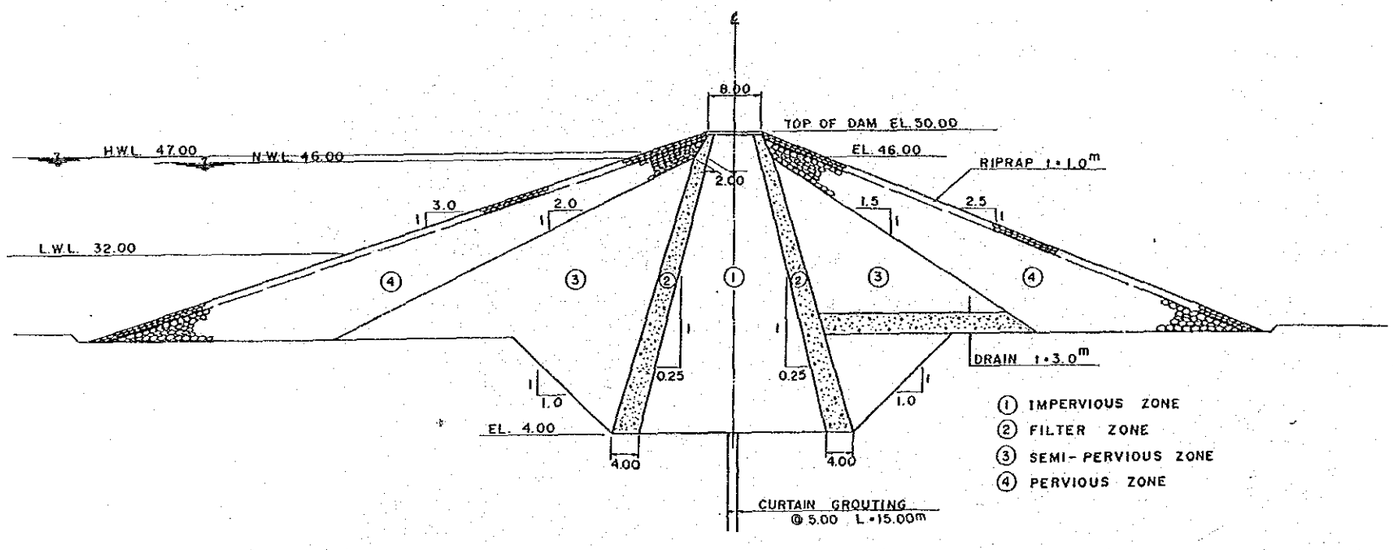

GENERAL PLAN MAP

Figure A8-2-12

Plane of Dam (Khlong Lo Young)




LONGITUDINAL AND GEOLOGICAL PROFILE ALONG THE DAM AXIS




MAX. CROSS SECTION

| | | | |
|---|---|---|---|
| Rd | Alluvium | : Recent river deposite consisting of sand, gravel and silt, Swamp sediment of sand to clay | OVER BORDEN |
| Tre ~ Trl | Erosional Terrace or Lower Terrace | : Recent river terrace made up of gravel, sand and silt<br>: Terrace deposit mainly composed of sand and gravel with thin clay layer | |
| Lt ~ Cl | Laterite or Clay | : Lateritic soil with sandy particles<br>: Very soft clay showing N value less than 5 blows | |
| Ta | Talus | : Talus and colluvial deposite consisting of various size materials | |
| Gr | Coarse Granite | : Coarse grained biotite-porphyritic granite | BED ROCK |
| Gr(v) | Coarse Granite | : Weathered Coarse Granite, the materials mainly consist of medium to very dense sandy deposite showing N value over 30 blows | |

LEGEND FOR CROSS SECTION

Figure A8-2-13

Dam Section (Khlong Lo Young)

APPENDIX A-8-3

# Estimation on the Available Water Supply from Mining Pits

(1) General

The study on the availability of the mining pits is made on the following conditions;

- The total storage capacity is estimated during the field survey.
- The effective storage capacity is 70% of the total
- Evaporation and seepage loss is 20% of the effective storage capacity.
- No inflow is considered during the period of four months from January to April according to rainfall pattern in Phuket.
- Sufficient inflow is considered during the remainder of the year,then the pits are full of water by the end of December.

(i) Khao Na Bon (Figure A8-1-1)

1,650,000 x 0.7 x (1-0.2) = 920,000 m3
920,000 / (30 x 4) = 7,600 m3/d

(ii) Ban Tan Muang (Figure A8-1-2)

1,400,000 x 0.7 x (1-0.2) = 780,000 m3
780,000 / (30 x 4) = 6,500 m3/d

(2) Tentative Water Source Development Plan

(a) Zone-wise water demand

Zone-wise water demand is as follows;

(i) Zone 9
Zone 9 will be served from Khao Na Bon

| | 1997 | 1998 | 2001 | 2011 |
|---|---|---|---|---|
| - Daily Maximum (m3/d) | 5,866 | 6,156 | 7,033 | 7,410 |
| - Intake Capacity (m3/d) | | 7,600 | | |

(ii) Zone 1,8,9

Zone 1,8,9 will be served from Ban Tan Muang

| | 1997 | 1998 | 2001 | 2011 |
|---|---|---|---|---|
| - Daily Maximum (m3/d) | | | | |
| Zone 1 | 605 | 644 | 774 | 1,433 |
| Zone 8 | 2,321 | 2,441 | 2,808 | 3,219 |
| Zone 9 | 1,106 | 1,133 | 1,218 | 1,384 |
| Total | 4,032 | 4,218 | 4,800 | 6,036 |
| - Intake Capacity | | 6,500 | | |

(b) Expected Inflow to Mining Pits

(i) Khao Na Bon

In normal year
2,500mm x 3.0km2 x 0.38 = 2.85MCM > 2.77MCM

(ii) Bang Tan Muang

In normal year
2,300mm x 5.0km2 x 0.38 = 4.37MCM > 2.37MCM

Therefore, the above-mentioned mining pits are available for water supply by the year of 1998.

(c) Facility Required

(i) Khao Na Bon

Q = 7,600 m3/d = 5.3 m3/min
H = 10 m
L = 12.0 km

- Pump Station ; Pumps dia. 150 x 3
  Motor 15kw x 2
- Pipe Asbestos dia. 350mm x 12.0 km

(ii) Bang Tan Muang

Q = 6,500 m3/d = 4.6 m3/min
H = 30 m
L = 3.0 km

- Pump Station ; Pumps dia. 150 x 3
  Motor 30kw x 2
- Pipe Ductile Iron dia. 350mm x 3.0km

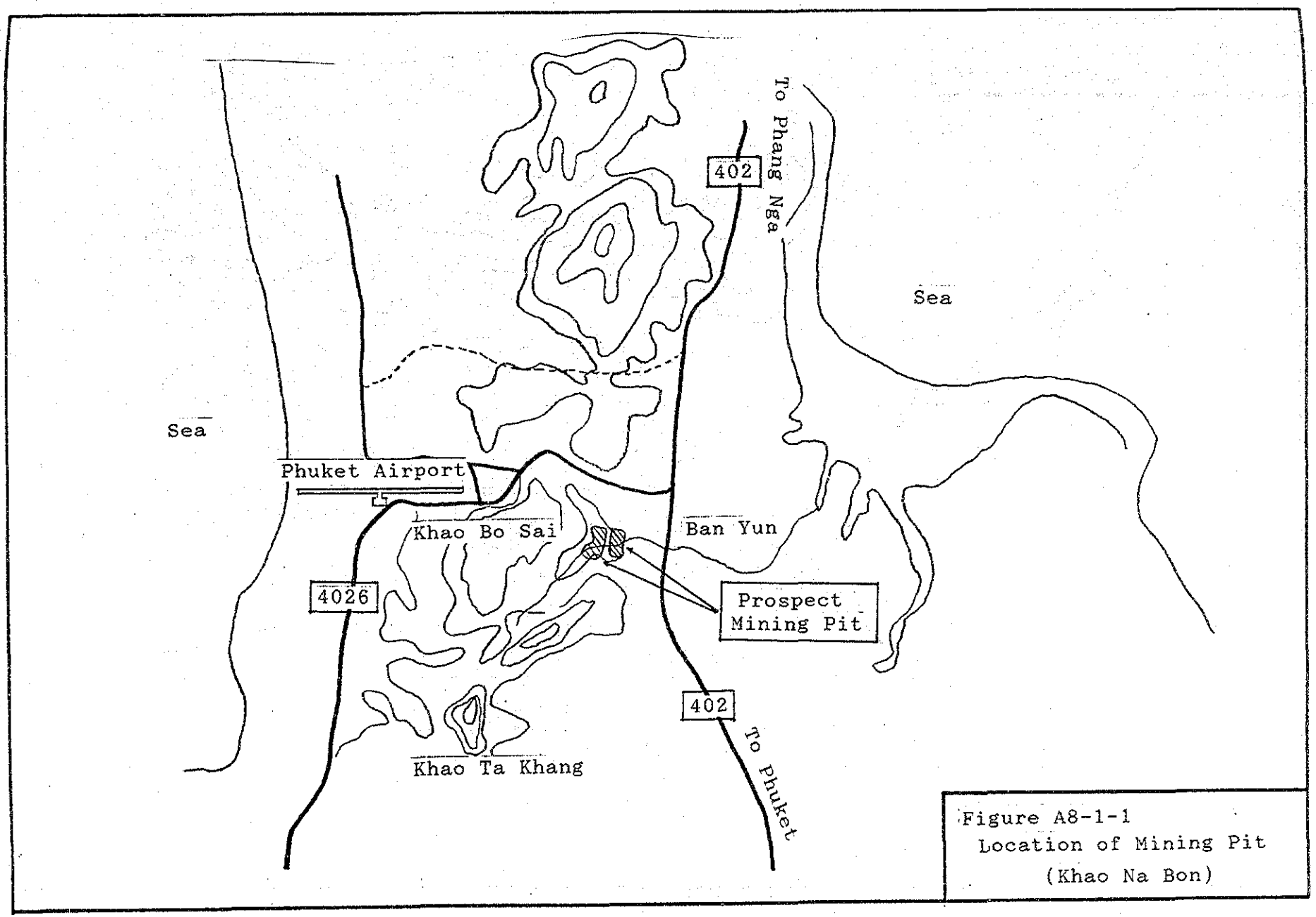



Figure A8-1-1
Location of Mining Pit
(Khao Na Bon)

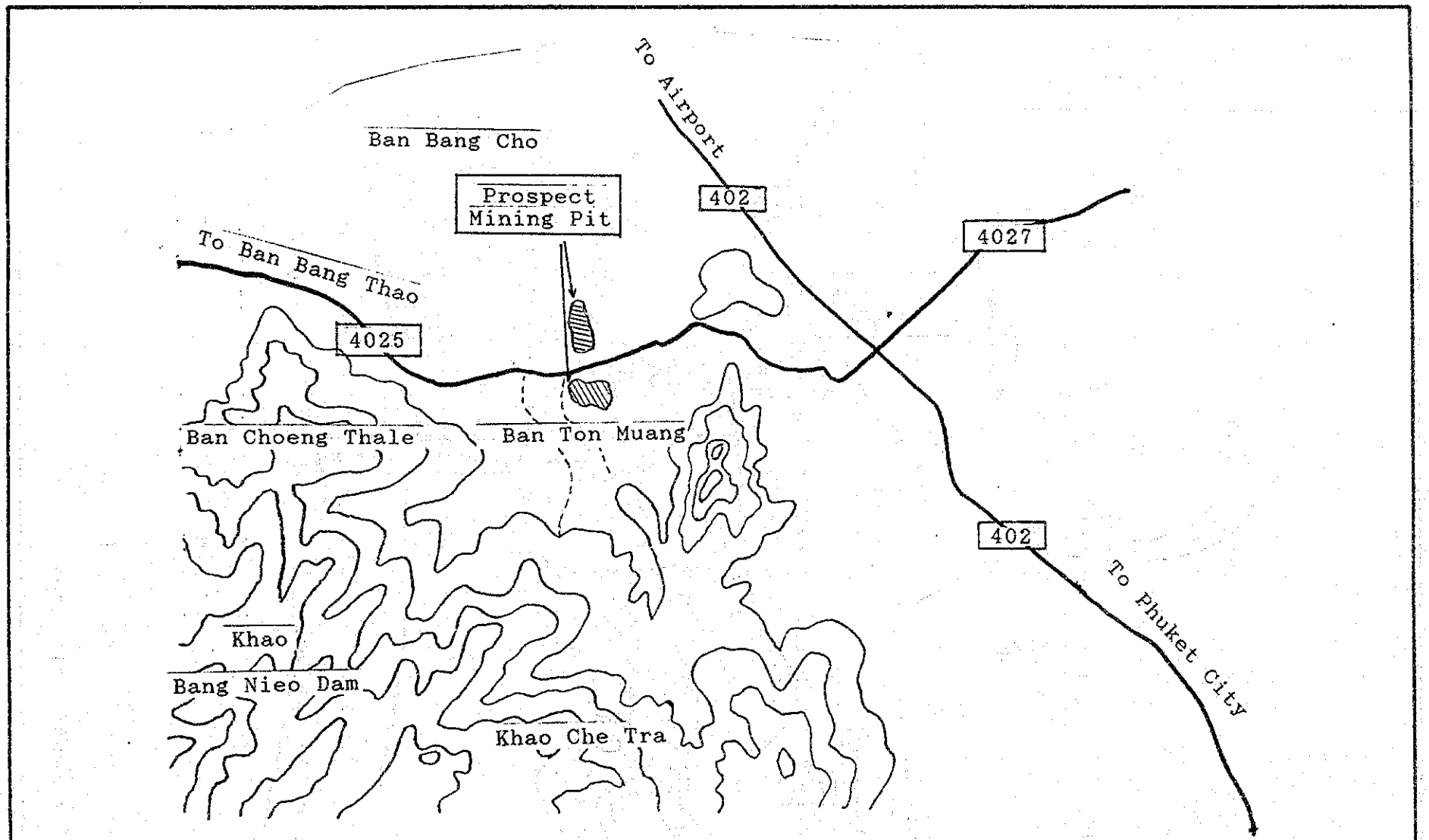



Figure A8-1-2
Location of Mining Pit
(Ban Ton Muang)

APPENDIX A-8-4

# Detailed Calculation of Water Demand by Zone

## Prediction of Served Population and Water Demand

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Population Prediction in Phuket Island** | | | | | | | | | | | | | | | | | | | | | | |
| Amphor Tambon | | | | | | | | | | | | | | | | | | | | | | |
| 1 Muang | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 5,016 | 5,102 | 5,188 | 5,274 | 5,361 | 5,447 | 5,533 | 5,605 | 5,677 | 5,749 | 5,821 | 5,893 | 5,955 | 6,017 | 6,080 | 6,142 | 6,204 | 6,252 | 6,300 | 6,348 | 6,396 | 6,444 |
| 2 | 9,451 | 9,613 | 9,775 | 9,938 | 10,100 | 10,263 | 10,425 | 10,561 | 10,696 | 10,832 | 10,967 | 11,103 | 11,220 | 11,337 | 11,455 | 11,572 | 11,689 | 11,779 | 11,870 | 11,960 | 12,051 | 12,141 |
| 3 | 10,520 | 10,700 | 10,880 | 11,060 | 11,240 | 11,420 | 11,600 | 11,740 | 11,880 | 12,020 | 12,160 | 12,300 | 12,420 | 12,540 | 12,660 | 12,780 | 12,900 | 13,020 | 13,140 | 13,260 | 13,380 | 13,500 |
| 4 | 6,595 | 6,708 | 6,821 | 6,934 | 7,046 | 7,159 | 7,272 | 7,364 | 7,456 | 7,548 | 7,640 | 7,732 | 7,814 | 7,896 | 7,978 | 8,060 | 8,142 | 8,214 | 8,286 | 8,357 | 8,429 | 8,501 |
| 5 | 6,285 | 6,392 | 6,499 | 6,606 | 6,714 | 6,821 | 6,928 | 7,016 | 7,104 | 7,192 | 7,280 | 7,368 | 7,446 | 7,524 | 7,602 | 7,680 | 7,758 | 7,826 | 7,894 | 7,963 | 8,031 | 8,099 |
| 6 | 2,587 | 2,631 | 2,675 | 2,719 | 2,762 | 2,806 | 2,850 | 2,887 | 2,923 | 2,960 | 2,996 | 3,033 | 3,070 | 3,106 | 3,143 | 3,179 | 3,216 | 3,238 | 3,260 | 3,281 | 3,303 | 3,325 |
| 2 Thalang | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 12,967 | 13,191 | 13,415 | 13,638 | 13,862 | 14,085 | 14,309 | 14,488 | 14,667 | 14,845 | 15,024 | 15,203 | 15,364 | 15,525 | 15,686 | 15,847 | 16,008 | 16,133 | 16,258 | 16,384 | 16,509 | 16,634 |
| 2 | 8,971 | 9,126 | 9,281 | 9,436 | 9,590 | 9,745 | 9,900 | 10,024 | 10,147 | 10,271 | 10,394 | 10,518 | 10,629 | 10,741 | 10,852 | 10,964 | 11,075 | 11,162 | 11,248 | 11,335 | 11,421 | 11,508 |
| 3 | 9,768 | 9,946 | 10,124 | 10,302 | 10,481 | 10,659 | 10,837 | 10,971 | 11,104 | 11,238 | 11,371 | 11,505 | 11,639 | 11,772 | 11,906 | 12,039 | 12,173 | 12,262 | 12,351 | 12,440 | 12,529 | 12,618 |
| 4 | 7,061 | 7,183 | 7,305 | 7,426 | 7,548 | 7,669 | 7,791 | 7,888 | 7,986 | 8,083 | 8,181 | 8,278 | 8,366 | 8,454 | 8,541 | 8,629 | 8,717 | 8,785 | 8,853 | 8,921 | 8,989 | 9,057 |
| 5 | 8,024 | 8,157 | 8,290 | 8,424 | 8,557 | 8,691 | 8,824 | 8,943 | 9,061 | 9,180 | 9,298 | 9,417 | 9,506 | 9,595 | 9,684 | 9,773 | 9,862 | 9,951 | 10,040 | 10,129 | 10,218 | 10,307 |
| 6 | 2,796 | 2,843 | 2,890 | 2,936 | 2,983 | 3,029 | 3,076 | 3,117 | 3,159 | 3,200 | 3,242 | 3,283 | 3,314 | 3,345 | 3,376 | 3,407 | 3,438 | 3,469 | 3,500 | 3,531 | 3,562 | 3,593 |
| 3 Kathu | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 6,474 | 6,585 | 6,696 | 6,808 | 6,919 | 7,031 | 7,142 | 7,235 | 7,327 | 7,420 | 7,512 | 7,605 | 7,685 | 7,766 | 7,846 | 7,927 | 8,007 | 8,069 | 8,131 | 8,192 | 8,254 | 8,316 |
| 2 | 4,493 | 4,569 | 4,645 | 4,721 | 4,798 | 4,874 | 4,950 | 5,013 | 5,077 | 5,140 | 5,204 | 5,267 | 5,330 | 5,394 | 5,457 | 5,521 | 5,584 | 5,622 | 5,660 | 5,699 | 5,737 | 5,775 |
| 3 | 3,392 | 3,454 | 3,516 | 3,578 | 3,639 | 3,701 | 3,763 | 3,809 | 3,856 | 3,902 | 3,949 | 3,995 | 4,041 | 4,088 | 4,134 | 4,181 | 4,227 | 4,258 | 4,289 | 4,320 | 4,351 | 4,382 |
| 4 Municipality(Zone 5) | 59,540 | 60,400 | 61,260 | 62,120 | 62,980 | 63,840 | 64,700 | 65,620 | 66,540 | 67,460 | 68,380 | 69,300 | 70,300 | 71,300 | 72,300 | 73,300 | 74,300 | 75,340 | 76,380 | 77,420 | 78,460 | 79,500 |
| Total | 163,940 | 166,600 | 169,260 | 171,920 | 174,580 | 177,240 | 179,900 | 182,280 | 184,660 | 187,040 | 189,420 | 191,800 | 194,100 | 196,400 | 198,700 | 201,000 | 203,300 | 205,380 | 207,460 | 209,540 | 211,620 | 213,700 |

## Population in Service Area by Tambon

| Amphor | Tambon | Class | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Muang | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 1 | (exis serv) | 1,505 | 1,531 | 1,557 | 1,583 | 1,608 | 1,634 | 1,660 | 1,682 | 1,703 | 1,725 | 1,746 | 1,768 | 1,787 | 1,805 | 1,824 | 1,842 | 1,861 | 1,875 | 1,890 | 1,904 | 1,919 | 1,933 |
| Zone 2 | 2 | (tour spot) | 4,726 | 4,807 | 4,888 | 4,969 | 5,051 | 5,132 | 5,213 | 5,281 | 5,349 | 5,416 | 5,484 | 5,552 | 5,611 | 5,669 | 5,728 | 5,786 | 5,845 | 5,890 | 5,935 | 5,981 | 6,025 | 6,071 |
| Zone 3 | 3 | (tour spot) | 7,364 | 7,490 | 7,616 | 7,742 | 7,868 | 7,994 | 8,120 | 8,218 | 8,316 | 8,414 | 8,512 | 8,610 | 8,694 | 8,778 | 8,862 | 8,946 | 9,030 | 9,114 | 9,198 | 9,282 | 9,366 | 9,450 |
| Zone 4 | 4 | | 3,957 | 4,025 | 4,093 | 4,160 | 4,228 | 4,295 | 4,363 | 4,418 | 4,473 | 4,529 | 4,584 | 4,639 | 4,688 | 4,737 | 4,787 | 4,836 | 4,885 | 4,928 | 4,971 | 5,015 | 5,058 | 5,101 |
| Zone 4 | 5 | | 3,771 | 3,835 | 3,899 | 3,964 | 4,028 | 4,093 | 4,157 | 4,210 | 4,263 | 4,315 | 4,368 | 4,421 | 4,468 | 4,515 | 4,561 | 4,608 | 4,655 | 4,696 | 4,737 | 4,777 | 4,818 | 4,859 |
| Zone 11 | 6 | (tour spot) | 1,553 | 1,579 | 1,605 | 1,631 | 1,658 | 1,684 | 1,710 | 1,732 | 1,754 | 1,776 | 1,798 | 1,820 | 1,842 | 1,864 | 1,886 | 1,908 | 1,930 | 1,943 | 1,956 | 1,969 | 1,982 | 1,995 |
| 2 Thalang | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 1 | (exis serv) | 5,186 | 5,276 | 5,366 | 5,455 | 5,545 | 5,634 | 5,724 | 5,795 | 5,867 | 5,938 | 6,010 | 6,081 | 6,145 | 6,210 | 6,274 | 6,339 | 6,403 | 6,453 | 6,503 | 6,554 | 6,604 | 6,654 |
| Zone 1 | 2 | | 2,692 | 2,738 | 2,784 | 2,831 | 2,877 | 2,924 | 2,970 | 3,007 | 3,044 | 3,081 | 3,118 | 3,155 | 3,189 | 3,222 | 3,256 | 3,289 | 3,323 | 3,349 | 3,375 | 3,400 | 3,426 | 3,452 |
| Zone 8 | 3 | (exis serv) | 5,861 | 5,968 | 6,075 | 6,182 | 6,288 | 6,395 | 6,502 | 6,582 | 6,662 | 6,743 | 6,823 | 6,903 | 6,983 | 7,063 | 7,144 | 7,224 | 7,304 | 7,357 | 7,411 | 7,464 | 7,518 | 7,571 |
| Zone 7 | 5 | | 4,012 | 4,079 | 4,146 | 4,212 | 4,279 | 4,345 | 4,412 | 4,471 | 4,531 | 4,590 | 4,650 | 4,709 | 4,753 | 4,798 | 4,842 | 4,887 | 4,931 | 4,976 | 5,020 | 5,065 | 5,109 | 5,154 |
| Zone 7 | 6 | | 1,399 | 1,422 | 1,445 | 1,468 | 1,492 | 1,515 | 1,538 | 1,559 | 1,580 | 1,600 | 1,621 | 1,642 | 1,657 | 1,673 | 1,688 | 1,704 | 1,719 | 1,735 | 1,750 | 1,766 | 1,781 | 1,797 |
| 3 Kathu | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 6 | 1 | (tour spot) | 4,532 | 4,610 | 4,688 | 4,766 | 4,843 | 4,921 | 4,999 | 5,064 | 5,129 | 5,194 | 5,259 | 5,324 | 5,380 | 5,436 | 5,493 | 5,549 | 5,605 | 5,648 | 5,691 | 5,735 | 5,778 | 5,821 |
| Zone 10 | 2 | (tour spot) | 3,145 | 3,198 | 3,251 | 3,305 | 3,358 | 3,412 | 3,465 | 3,509 | 3,554 | 3,598 | 3,643 | 3,687 | 3,731 | 3,776 | 3,820 | 3,865 | 3,909 | 3,936 | 3,963 | 3,989 | 4,016 | 4,043 |
| Zone 9 | 3 | | 2,375 | 2,418 | 2,461 | 2,504 | 2,548 | 2,591 | 2,634 | 2,667 | 2,699 | 2,732 | 2,764 | 2,797 | 2,829 | 2,862 | 2,894 | 2,927 | 2,959 | 2,981 | 3,002 | 3,024 | 3,045 | 3,067 |
| 4 Municipality(Zone 5) | | | 59,540 | 60,400 | 61,260 | 62,120 | 62,980 | 63,840 | 64,700 | 65,620 | 66,540 | 67,460 | 68,380 | 69,300 | 70,300 | 71,300 | 72,300 | 73,300 | 74,300 | 75,340 | 76,380 | 77,420 | 78,460 | 79,500 |
| Total | | | 111,618 | 113,376 | 115,134 | 116,892 | 118,651 | 120,409 | 122,167 | 123,815 | 125,463 | 127,112 | 128,760 | 130,408 | 132,058 | 133,708 | 135,359 | 137,009 | 138,659 | 140,221 | 141,783 | 143,344 | 144,906 | 146,468 |

Prediction of Served Population and Water Demand

| Item | | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service Ratio (%) | | | | | | | | | | | | | | | | | | | | | | | | |
| Amphor | Tambon | | | | | | | | | | | | | | | | | | | | | | | |
| 1 Muang | | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 1 | (exis serv) | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 2 | 2 | (tour spot) | 0 | 15 | 18 | 21 | 24 | 27 | 30 | 32 | 34 | 36 | 38 | 40 | 43 | 46 | 49 | 52 | 55 | 58 | 61 | 64 | 67 | 70 |
| Zone 3 | 3 | (tour spot) | 10 | 15 | 18 | 21 | 24 | 27 | 30 | 32 | 34 | 36 | 38 | 40 | 43 | 46 | 49 | 52 | 55 | 58 | 61 | 64 | 67 | 70 |
| Zone 4 | 4 | | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 4 | 5 | | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 11 | 6 | (tour spot) | 0 | 15 | 18 | 21 | 24 | 27 | 30 | 32 | 34 | 36 | 38 | 40 | 43 | 46 | 49 | 52 | 55 | 58 | 61 | 64 | 67 | 70 |
| 2 Thalang | | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 1 | (exis serv) | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 1 | 2 | | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 8 | 3 | (exis serv) | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 7 | 5 | | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| Zone 7 | 6 | | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| 3 Kathu | | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 6 | 1 | (tour spot) | 15 | 15 | 18 | 21 | 24 | 27 | 30 | 32 | 34 | 36 | 38 | 40 | 43 | 46 | 49 | 52 | 55 | 58 | 61 | 64 | 67 | 70 |
| Zone 10 | 2 | (tour spot) | 15 | 15 | 18 | 21 | 24 | 27 | 30 | 32 | 34 | 36 | 38 | 40 | 43 | 46 | 49 | 52 | 55 | 58 | 61 | 64 | 67 | 70 |
| Zone 9 | 3 | | 0 | 0 | 3 | 6 | 9 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 28 | 31 | 34 | 37 | 40 | 42 | 44 | 46 | 48 | 50 |
| 4 Municipality(Zone 5) | | | 55 | 57 | 59 | 60 | 62 | 63 | 65 | 67 | 68 | 70 | 71 | 73 | 75 | 77 | 78 | 80 | 82 | 84 | 85 | 87 | 88 | 90 |
| Served Population by Tambon | | | | | | | | | | | | | | | | | | | | | | | | |
| Amphor | Tambon | | | | | | | | | | | | | | | | | | | | | | | |
| 1 Muang | | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 1 | (exis serv) | 0 | 0 | 47 | 95 | 145 | 196 | 249 | 286 | 324 | 362 | 402 | 442 | 500 | 560 | 620 | 682 | 744 | 788 | 832 | 876 | 921 | 967 |
| Zone 2 | 2 | (tour spot) | 0 | 721 | 880 | 1,044 | 1,212 | 1,386 | 1,564 | 1,690 | 1,819 | 1,950 | 2,084 | 2,221 | 2,413 | 2,608 | 2,807 | 3,009 | 3,215 | 3,417 | 3,621 | 3,828 | 4,038 | 4,250 |
| Zone 3 | 3 | (tour spot) | 736 | 1,124 | 1,371 | 1,626 | 1,883 | 2,158 | 2,436 | 2,630 | 2,827 | 3,029 | 3,235 | 3,444 | 3,738 | 4,038 | 4,342 | 4,652 | 4,967 | 5,286 | 5,611 | 5,949 | 6,275 | 6,615 |
| Zone 4 | 4 | | 0 | 0 | 123 | 250 | 381 | 515 | 654 | 751 | 850 | 951 | 1,054 | 1,160 | 1,313 | 1,469 | 1,628 | 1,789 | 1,954 | 2,070 | 2,188 | 2,307 | 2,428 | 2,551 |
| Zone 4 | 5 | | 0 | 0 | 117 | 238 | 363 | 491 | 624 | 716 | 810 | 906 | 1,005 | 1,105 | 1,251 | 1,400 | 1,551 | 1,705 | 1,862 | 1,972 | 2,084 | 2,198 | 2,313 | 2,430 |
| Zone 11 | 6 | (tour spot) | 0 | 237 | 289 | 343 | 398 | 455 | 513 | 554 | 596 | 639 | 683 | 728 | 792 | 857 | 924 | 992 | 1,062 | 1,127 | 1,193 | 1,260 | 1,328 | 1,397 |
| 2 Thalang | | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 1 | (exis serv) | 0 | 0 | 161 | 327 | 499 | 676 | 859 | 985 | 1,115 | 1,247 | 1,382 | 1,520 | 1,721 | 1,925 | 2,133 | 2,345 | 2,561 | 2,710 | 2,861 | 3,015 | 3,170 | 3,327 |
| Zone 1 | 2 | | 0 | 0 | 84 | 170 | 259 | 351 | 446 | 511 | 578 | 647 | 717 | 789 | 893 | 999 | 1,107 | 1,217 | 1,329 | 1,406 | 1,485 | 1,564 | 1,645 | 1,726 |
| Zone 8 | 3 | (exis serv) | 0 | 0 | 182 | 371 | 566 | 767 | 975 | 1,119 | 1,266 | 1,416 | 1,569 | 1,726 | 1,955 | 2,190 | 2,429 | 2,673 | 2,922 | 3,090 | 3,261 | 3,434 | 3,608 | 3,786 |
| Zone 7 | 5 | | 0 | 0 | 124 | 253 | 385 | 521 | 662 | 760 | 861 | 964 | 1,069 | 1,177 | 1,331 | 1,487 | 1,646 | 1,808 | 1,972 | 2,090 | 2,209 | 2,330 | 2,453 | 2,577 |
| Zone 7 | 6 | | 0 | 0 | 43 | 88 | 134 | 182 | 231 | 265 | 300 | 336 | 373 | 411 | 464 | 519 | 574 | 630 | 688 | 729 | 770 | 812 | 855 | 899 |
| 3 Kathu | | | | | | | | | | | | | | | | | | | | | | | | |
| Zone 6 | 1 | (tour spot) | 680 | 692 | 844 | 1,001 | 1,163 | 1,329 | 1,500 | 1,620 | 1,744 | 1,870 | 1,998 | 2,130 | 2,313 | 2,501 | 2,691 | 2,885 | 3,083 | 3,276 | 3,472 | 3,670 | 3,871 | 4,075 |
| Zone 10 | 2 | (tour spot) | 472 | 480 | 585 | 694 | 806 | 921 | 1,040 | 1,123 | 1,208 | 1,295 | 1,384 | 1,475 | 1,605 | 1,737 | 1,872 | 2,010 | 2,150 | 2,283 | 2,417 | 2,553 | 2,691 | 2,830 |
| Zone 9 | 3 | | 0 | 0 | 74 | 150 | 229 | 311 | 395 | 453 | 513 | 574 | 636 | 699 | 792 | 887 | 984 | 1,083 | 1,184 | 1,252 | 1,321 | 1,391 | 1,462 | 1,534 |
| 4 Municipality(Zone 5) | | | 32,985 | 34,428 | 35,898 | 37,396 | 38,922 | 40,475 | 42,055 | 43,703 | 45,380 | 47,087 | 48,823 | 50,589 | 52,584 | 54,616 | 56,683 | 58,787 | 60,926 | 62,984 | 65,076 | 67,201 | 69,359 | 71,550 |
| Total | | | 34,873 | 37,682 | 40,823 | 44,065 | 47,349 | 50,734 | 54,201 | 57,167 | 60,191 | 63,274 | 66,415 | 69,615 | 73,666 | 77,791 | 81,992 | 86,267 | 90,618 | 94,480 | 98,400 | 102,379 | 106,416 | 110,511 |
| Average Service Ratio(%) | | | 31.2 | 33.2 | 35.5 | 37.7 | 39.9 | 42.1 | 44.4 | 46.2 | 48.0 | 49.8 | 51.6 | 53.4 | 55.8 | 58.2 | 60.6 | 63.0 | 65.4 | 67.4 | 69.4 | 71.4 | 73.4 | 75.5 |

Prediction of Served Population and Water Demand

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Served Population by Zone | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 291 | 592 | 903 | 1,223 | 1,553 | 1,782 | 2,017 | 2,256 | 2,501 | 2,751 | 3,114 | 3,484 | 3,860 | 4,244 | 4,635 | 4,985 | 5,178 | 5,455 | 5,735 | 6,020 |
| Zone 2 | 0 | 721 | 889 | 1,044 | 1,212 | 1,386 | 1,564 | 1,690 | 1,819 | 1,950 | 2,084 | 2,221 | 2,413 | 2,608 | 2,807 | 3,009 | 3,215 | 3,417 | 3,621 | 3,828 | 4,038 | 4,250 |
| Zone 3 | 736 | 1,124 | 1,371 | 1,626 | 1,889 | 2,158 | 2,436 | 2,630 | 2,827 | 3,029 | 3,235 | 3,444 | 3,738 | 4,038 | 4,342 | 4,652 | 4,967 | 5,286 | 5,611 | 5,940 | 6,275 | 6,615 |
| Zone 4 | 0 | 0 | 240 | 487 | 743 | 1,007 | 1,278 | 1,467 | 1,660 | 1,857 | 2,059 | 2,265 | 2,564 | 2,868 | 3,178 | 3,494 | 3,816 | 4,042 | 4,272 | 4,505 | 4,741 | 4,981 |
| Zone 5 | 32,985 | 34,428 | 35,898 | 37,396 | 38,922 | 40,475 | 42,055 | 43,703 | 45,380 | 47,087 | 48,823 | 50,589 | 52,584 | 54,616 | 56,683 | 58,787 | 60,926 | 62,984 | 65,076 | 67,201 | 69,359 | 71,550 |
| Zone 6 | 680 | 692 | 844 | 1,001 | 1,163 | 1,329 | 1,500 | 1,620 | 1,744 | 1,870 | 1,998 | 2,130 | 2,313 | 2,501 | 2,691 | 2,885 | 3,083 | 3,276 | 3,472 | 3,670 | 3,871 | 4,075 |
| Zone 7 | 0 | 0 | 168 | 341 | 519 | 703 | 893 | 1,025 | 1,161 | 1,300 | 1,442 | 1,588 | 1,795 | 2,006 | 2,220 | 2,438 | 2,660 | 2,812 | 2,979 | 3,142 | 3,308 | 3,476 |
| Zone 8 | 0 | 0 | 182 | 371 | 566 | 767 | 975 | 1,119 | 1,266 | 1,416 | 1,569 | 1,726 | 1,955 | 2,190 | 2,429 | 2,673 | 2,922 | 3,090 | 3,261 | 3,434 | 3,608 | 3,786 |
| Zone 9 | 0 | 0 | 74 | 150 | 229 | 311 | 395 | 453 | 513 | 574 | 636 | 699 | 792 | 887 | 984 | 1,083 | 1,184 | 1,252 | 1,321 | 1,391 | 1,462 | 1,534 |
| Zone 10 | 472 | 480 | 585 | 694 | 806 | 921 | 1,040 | 1,123 | 1,208 | 1,295 | 1,384 | 1,475 | 1,605 | 1,737 | 1,872 | 2,010 | 2,150 | 2,283 | 2,417 | 2,553 | 2,691 | 2,830 |
| Zone 11 | 0 | 237 | 289 | 343 | 398 | 455 | 513 | 554 | 596 | 639 | 683 | 728 | 792 | 857 | 924 | 992 | 1,062 | 1,127 | 1,193 | 1,260 | 1,328 | 1,397 |
| Total | 34,873 | 37,682 | 40,823 | 44,045 | 47,349 | 50,734 | 54,201 | 57,167 | 60,191 | 63,274 | 66,415 | 69,615 | 73,666 | 77,796 | 81,992 | 86,267 | 90,618 | 94,480 | 98,409 | 102,379 | 106,416 | 110,511 |
| Unit Water Consumption (lpcd) | | | | | | | | | | | | | | | | | | | | | | |
| Municipality | 292 | 293 | 293 | 294 | 294 | 295 | 295 | 296 | 296 | 297 | 297 | 298 | 298 | 299 | 299 | 300 | 300 | 301 | 301 | 302 | 302 | 303 |
| Tourist Spot | 97 | 100 | 103 | 105 | 108 | 110 | 113 | 115 | 118 | 120 | 123 | 125 | 128 | 130 | 133 | 135 | 138 | 140 | 143 | 145 | 148 | 150 |
| Other Area | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 | 86 | 88 | 90 | 92 | 94 | 96 | 98 | 100 |
| Domestic Water Consumption by Zone | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 20 | 41 | 63 | 86 | 109 | 128 | 149 | 171 | 195 | 220 | 255 | 293 | 332 | 373 | 417 | 451 | 487 | 524 | 562 | 602 |
| Zone 2 | 0 | 72 | 90 | 110 | 131 | 153 | 177 | 195 | 214 | 234 | 255 | 278 | 308 | 340 | 373 | 407 | 444 | 480 | 517 | 556 | 595 | 635 |
| Zone 3 | 72 | 112 | 141 | 171 | 204 | 238 | 275 | 303 | 333 | 364 | 397 | 431 | 477 | 526 | 577 | 630 | 685 | 742 | 801 | 863 | 926 | 992 |
| Zone 4 | 0 | 0 | 17 | 34 | 52 | 70 | 89 | 106 | 123 | 141 | 161 | 181 | 210 | 241 | 273 | 308 | 343 | 372 | 402 | 432 | 465 | 499 |
| Zone 5 | 13,126 | 13,564 | 14,012 | 14,470 | 14,937 | 15,414 | 15,908 | 16,408 | 16,927 | 17,455 | 17,995 | 18,544 | 19,164 | 19,797 | 20,442 | 21,101 | 21,772 | 22,421 | 23,082 | 23,755 | 24,440 | 25,139 |
| Zone 6 | 66 | 69 | 87 | 105 | 125 | 147 | 169 | 187 | 205 | 225 | 245 | 266 | 295 | 326 | 357 | 391 | 425 | 460 | 496 | 533 | 571 | 611 |
| Zone 7 | 0 | 0 | 12 | 24 | 36 | 49 | 62 | 74 | 86 | 99 | 112 | 127 | 147 | 168 | 191 | 215 | 239 | 259 | 280 | 302 | 324 | 348 |
| Zone 8 | 0 | 0 | 13 | 26 | 40 | 54 | 68 | 81 | 94 | 108 | 122 | 138 | 160 | 184 | 209 | 235 | 263 | 284 | 307 | 330 | 354 | 379 |
| Zone 9 | 0 | 0 | 5 | 11 | 16 | 22 | 28 | 33 | 38 | 44 | 50 | 56 | 65 | 75 | 85 | 95 | 107 | 115 | 124 | 134 | 143 | 153 |
| Zone 10 | 46 | 48 | 60 | 73 | 87 | 102 | 117 | 130 | 142 | 156 | 170 | 184 | 205 | 226 | 249 | 272 | 297 | 321 | 345 | 371 | 397 | 425 |
| Zone 11 | 0 | 24 | 30 | 36 | 43 | 50 | 58 | 64 | 70 | 77 | 84 | 91 | 101 | 112 | 123 | 134 | 146 | 158 | 170 | 183 | 196 | 210 |
| Total | 13,310 | 13,890 | 14,486 | 15,101 | 15,734 | 16,384 | 17,054 | 17,708 | 18,381 | 19,074 | 19,785 | 20,516 | 21,388 | 22,266 | 23,210 | 24,161 | 25,139 | 26,063 | 27,010 | 27,981 | 28,975 | 29,992 |

Prediction of Served Population and Water Demand

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Consumption for Gov/Inst/Commercial (based on Population Ratio by Zone) | | | | | | | | | | | | | | | | | | | | | | |
| A. Government ( unit consumption = 10 l/day/pop in service area) | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 97 | 99 | 100 | 102 | 104 | 105 | 106 | 107 | 109 | 110 | 111 | 112 | 114 | 115 | 116 | 117 | 118 | 119 | 119 | 120 |
| Zone 2 | 0 | 48 | 49 | 50 | 51 | 51 | 52 | 53 | 53 | 54 | 55 | 56 | 56 | 57 | 57 | 58 | 58 | 59 | 59 | 60 | 60 | 61 |
| Zone 3 | 74 | 75 | 76 | 77 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
| Zone 4 | 0 | 0 | 80 | 81 | 83 | 84 | 85 | 86 | 87 | 88 | 90 | 91 | 92 | 93 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| Zone 5 | 595 | 604 | 613 | 621 | 630 | 638 | 647 | 656 | 665 | 675 | 684 | 693 | 703 | 713 | 723 | 733 | 743 | 753 | 764 | 774 | 785 | 795 |
| Zone 6 | 45 | 46 | 47 | 48 | 48 | 49 | 50 | 51 | 51 | 52 | 53 | 53 | 54 | 54 | 55 | 55 | 56 | 56 | 57 | 57 | 58 | 58 |
| Zone 7 | 0 | 0 | 56 | 57 | 58 | 59 | 60 | 60 | 61 | 62 | 63 | 64 | 64 | 65 | 65 | 66 | 67 | 67 | 68 | 68 | 69 | 70 |
| Zone 8 | 0 | 0 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 71 | 71 | 72 | 73 | 74 | 74 | 75 | 75 | 76 |
| Zone 9 | 0 | 0 | 25 | 25 | 25 | 26 | 26 | 27 | 27 | 27 | 28 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 31 |
| Zone 10 | 31 | 32 | 33 | 33 | 34 | 34 | 35 | 35 | 36 | 36 | 36 | 37 | 37 | 38 | 38 | 39 | 39 | 39 | 40 | 40 | 40 | 40 |
| Zone 11 | 0 | 16 | 16 | 16 | 17 | 17 | 17 | 17 | 18 | 18 | 18 | 18 | 18 | 19 | 19 | 19 | 19 | 19 | 20 | 20 | 20 | 20 |
| Sub-Total | 746 | 821 | 1,151 | 1,169 | 1,187 | 1,204 | 1,222 | 1,238 | 1,255 | 1,271 | 1,288 | 1,304 | 1,321 | 1,337 | 1,354 | 1,370 | 1,387 | 1,402 | 1,418 | 1,433 | 1,449 | 1,465 |
| B. School ( Number of student = 35 % of population in the service area) | | | | | | | | | | | | | | | | | | | | | | |
| B-1 Number of student | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 3,397 | 3,454 | 3,511 | 3,567 | 3,624 | 3,669 | 3,715 | 3,760 | 3,805 | 3,851 | 3,892 | 3,933 | 3,974 | 4,015 | 4,055 | 4,027 | 4,119 | 4,150 | 4,182 | 4,214 |
| Zone 2 | 0 | 1,682 | 1,711 | 1,739 | 1,768 | 1,796 | 1,825 | 1,848 | 1,872 | 1,896 | 1,919 | 1,943 | 1,964 | 1,984 | 2,005 | 2,025 | 2,046 | 2,062 | 2,077 | 2,093 | 2,109 | 2,125 |
| Zone 3 | 2,577 | 2,622 | 2,666 | 2,710 | 2,754 | 2,798 | 2,842 | 2,876 | 2,911 | 2,945 | 2,979 | 3,014 | 3,043 | 3,072 | 3,102 | 3,131 | 3,161 | 3,190 | 3,219 | 3,249 | 3,278 | 3,308 |
| Zone 4 | 0 | 0 | 2,797 | 2,843 | 2,890 | 2,936 | 2,982 | 3,020 | 3,058 | 3,095 | 3,133 | 3,171 | 3,205 | 3,238 | 3,272 | 3,305 | 3,339 | 3,368 | 3,398 | 3,427 | 3,457 | 3,486 |
| Zone 5 | 20,839 | 21,140 | 21,441 | 21,742 | 22,043 | 22,344 | 22,645 | 22,967 | 23,289 | 23,611 | 23,933 | 24,255 | 24,605 | 24,955 | 25,305 | 25,655 | 26,005 | 26,369 | 26,733 | 27,097 | 27,461 | 27,825 |
| Zone 6 | 1,586 | 1,614 | 1,641 | 1,668 | 1,695 | 1,722 | 1,750 | 1,772 | 1,795 | 1,818 | 1,841 | 1,863 | 1,883 | 1,903 | 1,922 | 1,942 | 1,962 | 1,977 | 1,992 | 2,007 | 2,022 | 2,037 |
| Zone 7 | 0 | 0 | 1,957 | 1,988 | 2,020 | 2,051 | 2,083 | 2,111 | 2,139 | 2,167 | 2,195 | 2,223 | 2,244 | 2,265 | 2,286 | 2,307 | 2,328 | 2,349 | 2,370 | 2,391 | 2,412 | 2,433 |
| Zone 8 | 0 | 0 | 2,126 | 2,164 | 2,201 | 2,238 | 2,276 | 2,304 | 2,332 | 2,360 | 2,388 | 2,416 | 2,444 | 2,472 | 2,500 | 2,528 | 2,556 | 2,575 | 2,594 | 2,612 | 2,631 | 2,650 |
| Zone 9 | 0 | 0 | 861 | 877 | 892 | 907 | 922 | 933 | 945 | 956 | 968 | 979 | 990 | 1,002 | 1,013 | 1,024 | 1,036 | 1,043 | 1,051 | 1,058 | 1,066 | 1,073 |
| Zone 10 | 1,101 | 1,119 | 1,138 | 1,157 | 1,175 | 1,194 | 1,213 | 1,228 | 1,244 | 1,259 | 1,275 | 1,290 | 1,306 | 1,322 | 1,337 | 1,353 | 1,368 | 1,378 | 1,387 | 1,396 | 1,406 | 1,415 |
| Zone 11 | 0 | 553 | 562 | 571 | 580 | 589 | 599 | 606 | 614 | 622 | 629 | 637 | 645 | 652 | 660 | 668 | 676 | 680 | 685 | 689 | 694 | 698 |
| Total | 26,103 | 28,729 | 40,297 | 40,912 | 41,528 | 42,143 | 42,758 | 43,335 | 43,912 | 44,489 | 45,066 | 45,643 | 46,220 | 46,798 | 47,376 | 47,953 | 48,531 | 49,077 | 49,624 | 50,171 | 50,717 | 51,264 |
| B-2 Water Consumption ( unit consumption = 12 l/day/student) | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 41 | 41 | 42 | 43 | 43 | 44 | 45 | 45 | 46 | 46 | 47 | 47 | 48 | 48 | 49 | 49 | 49 | 50 | 50 | 51 |
| Zone 2 | 0 | 20 | 21 | 21 | 21 | 22 | 22 | 22 | 22 | 23 | 23 | 23 | 24 | 24 | 24 | 24 | 25 | 25 | 25 | 25 | 25 | 25 |
| Zone 3 | 31 | 31 | 32 | 33 | 33 | 34 | 34 | 35 | 35 | 35 | 36 | 36 | 37 | 37 | 37 | 38 | 38 | 38 | 39 | 39 | 39 | 40 |
| Zone 4 | 0 | 0 | 34 | 34 | 35 | 35 | 36 | 36 | 37 | 37 | 38 | 38 | 38 | 39 | 39 | 40 | 40 | 40 | 41 | 41 | 41 | 42 |
| Zone 5 | 250 | 254 | 257 | 261 | 265 | 268 | 272 | 276 | 279 | 283 | 287 | 291 | 295 | 299 | 304 | 308 | 312 | 316 | 321 | 325 | 330 | 334 |
| Zone 6 | 19 | 19 | 20 | 20 | 20 | 21 | 21 | 21 | 22 | 22 | 22 | 22 | 23 | 23 | 23 | 23 | 24 | 24 | 24 | 24 | 24 | 24 |
| Zone 7 | 0 | 0 | 23 | 24 | 24 | 25 | 25 | 25 | 26 | 26 | 26 | 27 | 27 | 27 | 27 | 28 | 28 | 28 | 28 | 29 | 29 | 29 |
| Zone 8 | 0 | 0 | 26 | 26 | 26 | 27 | 27 | 28 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 30 | 31 | 31 | 31 | 31 | 32 | 32 |
| Zone 9 | 0 | 0 | 10 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 13 | 13 | 13 | 13 | 13 |
| Zone 10 | 13 | 13 | 14 | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 16 | 16 | 16 | 16 | 16 | 17 | 17 | 17 | 17 | 17 |
| Zone 11 | 0 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Sub-Total | 313 | 345 | 484 | 491 | 498 | 506 | 513 | 520 | 527 | 534 | 541 | 548 | 555 | 562 | 569 | 575 | 582 | 589 | 595 | 602 | 609 | 615 |

Prediction of Served Population and Water Demand

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C. Hospital Use ( unit consumption = 1.5 cu m/d/bed) | | | | | | | | | | | | | | | | | | | | | | |
| ( Population per bed = 600 person/bed, to add the existing hospital's bed No. 149) | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 88 | 89 | 91 | 92 | 94 | 95 | 96 | 97 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 107 | 108 | 109 |
| Zone 2 | 0 | 24 | 24 | 25 | 25 | 26 | 26 | 26 | 27 | 27 | 27 | 28 | 28 | 28 | 29 | 29 | 29 | 29 | 30 | 30 | 30 | 30 |
| Zone 3 | 26 | 27 | 27 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 30 | 31 | 31 | 31 | 32 | 32 | 32 | 33 | 33 | 33 | 33 | 34 |
| Zone 4 | 0 | 0 | 33 | 34 | 34 | 35 | 36 | 36 | 36 | 37 | 37 | 38 | 38 | 39 | 39 | 39 | 40 | 40 | 40 | 41 | 41 | 42 |
| Zone 5 | 372 | 375 | 377 | 379 | 381 | 383 | 385 | 388 | 390 | 392 | 394 | 397 | 399 | 402 | 404 | 407 | 409 | 412 | 414 | 417 | 420 | 422 |
| Zone 6 | 16 | 16 | 17 | 17 | 17 | 18 | 18 | 18 | 18 | 19 | 19 | 19 | 19 | 19 | 20 | 20 | 20 | 20 | 20 | 20 | 21 | 21 |
| Zone 7 | 0 | 0 | 28 | 28 | 29 | 29 | 30 | 30 | 31 | 31 | 31 | 32 | 32 | 32 | 33 | 33 | 33 | 34 | 34 | 34 | 34 | 35 |
| Zone 8 | 0 | 0 | 25 | 26 | 26 | 27 | 27 | 27 | 28 | 28 | 28 | 29 | 29 | 29 | 30 | 30 | 30 | 31 | 31 | 31 | 31 | 32 |
| Zone 9 | 0 | 0 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 11 |
| Zone 10 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |
| Zone 11 | 0 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Sub-Total | 426 | 460 | 647 | 653 | 660 | 667 | 673 | 679 | 685 | 691 | 697 | 703 | 709 | 715 | 720 | 726 | 732 | 737 | 742 | 747 | 753 | 758 |
| A+B+C Total of Governental/Institutional Consumpton | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 226 | 230 | 233 | 237 | 241 | 244 | 247 | 250 | 253 | 256 | 259 | 261 | 264 | 267 | 270 | 272 | 274 | 276 | 278 | 280 |
| Zone 2 | 0 | 92 | 94 | 95 | 97 | 99 | 100 | 101 | 103 | 104 | 105 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 |
| Zone 3 | 131 | 133 | 135 | 138 | 140 | 142 | 144 | 146 | 148 | 150 | 151 | 153 | 155 | 156 | 157 | 159 | 160 | 162 | 163 | 165 | 166 | 168 |
| Zone 4 | 0 | 0 | 147 | 149 | 152 | 154 | 156 | 158 | 160 | 162 | 164 | 166 | 168 | 170 | 172 | 173 | 175 | 177 | 178 | 180 | 181 | 183 |
| Zone 5 | 1,218 | 1,232 | 1,247 | 1,261 | 1,275 | 1,290 | 1,304 | 1,319 | 1,335 | 1,350 | 1,365 | 1,381 | 1,398 | 1,414 | 1,431 | 1,448 | 1,464 | 1,482 | 1,499 | 1,516 | 1,534 | 1,551 |
| Zone 6 | 81 | 82 | 83 | 85 | 86 | 87 | 89 | 90 | 91 | 92 | 93 | 95 | 96 | 97 | 98 | 99 | 100 | 100 | 101 | 102 | 103 | 103 |
| Zone 7 | 0 | 0 | 107 | 109 | 111 | 113 | 114 | 116 | 117 | 119 | 120 | 122 | 123 | 124 | 125 | 127 | 128 | 129 | 130 | 131 | 132 | 133 |
| Zone 8 | 0 | 0 | 112 | 114 | 115 | 117 | 119 | 121 | 122 | 124 | 125 | 127 | 128 | 130 | 131 | 133 | 134 | 135 | 136 | 137 | 138 | 139 |
| Zone 9 | 0 | 0 | 44 | 45 | 45 | 46 | 47 | 47 | 48 | 49 | 49 | 50 | 50 | 51 | 51 | 52 | 53 | 53 | 53 | 54 | 54 | 55 |
| Zone 10 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 62 | 63 | 64 | 65 | 66 | 66 | 67 | 68 | 69 | 69 | 70 | 70 | 71 | 72 | 72 |
| Zone 11 | 0 | 29 | 29 | 30 | 30 | 31 | 31 | 32 | 32 | 33 | 33 | 33 | 34 | 34 | 35 | 35 | 35 | 36 | 36 | 36 | 36 | 37 |
| Total | 1,485 | 1,625 | 2,282 | 2,313 | 2,345 | 2,376 | 2,408 | 2,437 | 2,467 | 2,496 | 2,525 | 2,555 | 2,584 | 2,613 | 2,642 | 2,672 | 2,701 | 2,728 | 2,755 | 2,783 | 2,810 | 2,838 |

Prediction of Served Population and Water Demand

| Item | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Consumption by Tourist | | | | | | | | | | | | | | | | | | | | | | | |
| Total No. of Hotel Room | | | | | | | | | | | | | | | | | | | | | | | |
| North | High | 1,599 | 2,078 | 2,557 | 3,036 | 3,514 | 3,993 | 4,472 | 4,701 | 4,930 | 5,160 | 5,389 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 | 5,618 |
| | Low | 0 | 11 | 60 | 109 | 157 | 206 | 255 | 264 | 273 | 282 | 291 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| South | High | 6,647 | 6,770 | 6,893 | 7,017 | 7,140 | 7,264 | 7,387 | 7,516 | 7,646 | 7,775 | 7,905 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 | 8,034 |
| | Low | 3,777 | 3,824 | 3,871 | 3,918 | 3,964 | 4,011 | 4,058 | 4,140 | 4,222 | 4,305 | 4,387 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 | 4,469 |
| Total(Municipality) | | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |

| Ratio of Hotel Room No. | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 6 | Zone 7 | Zone 8 | Zone 9 | Zone 10 | Zone 11 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North | | | | | | | 0.736 | 0.264 | | | | 1.000 |
| South | | | | 0.060 | | | | | 0.059 | 0.672 | 0.209 | 1.000 |

| A. No. of Hotel Room | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 1 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 2 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 3 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 4 | High | 399 | 406 | 414 | 421 | 428 | 436 | 443 | 451 | 459 | 467 | 474 | 482 | 482 | 482 | 482 | 482 | 482 | 482 | 482 | 482 | 482 | 482 |
| | Low | 227 | 229 | 232 | 235 | 238 | 241 | 243 | 248 | 253 | 258 | 263 | 268 | 268 | 268 | 268 | 268 | 268 | 268 | 268 | 268 | 268 | 268 |
| Zone 5(Municipality) | | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 | 3,500 |
| Zone 6 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 7 | High | 1,177 | 1,529 | 1,882 | 2,234 | 2,587 | 2,939 | 3,291 | 3,460 | 3,629 | 3,797 | 3,966 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 | 4,135 |
| | Low | 0 | 8 | 44 | 80 | 116 | 152 | 188 | 194 | 201 | 208 | 214 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 | 221 |
| Zone 8 | High | 422 | 549 | 675 | 801 | 928 | 1,054 | 1,181 | 1,241 | 1,302 | 1,362 | 1,423 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 | 1,483 |
| | Low | 0 | 3 | 16 | 29 | 42 | 54 | 67 | 70 | 72 | 74 | 77 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 |
| Zone 9 | High | 392 | 399 | 407 | 414 | 421 | 429 | 436 | 443 | 451 | 459 | 466 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 | 474 |
| | Low | 223 | 226 | 228 | 231 | 234 | 237 | 239 | 244 | 249 | 254 | 259 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 | 264 |
| Zone 10 | High | 4,467 | 4,549 | 4,632 | 4,715 | 4,798 | 4,881 | 4,964 | 5,051 | 5,138 | 5,225 | 5,312 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 | 5,399 |
| | Low | 2,538 | 2,570 | 2,601 | 2,633 | 2,664 | 2,696 | 2,727 | 2,782 | 2,837 | 2,893 | 2,948 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 | 3,003 |
| Zone 11 | High | 1,389 | 1,415 | 1,441 | 1,467 | 1,492 | 1,518 | 1,544 | 1,571 | 1,598 | 1,625 | 1,652 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 | 1,679 |
| | Low | 789 | 799 | 809 | 819 | 829 | 839 | 848 | 865 | 882 | 900 | 917 | 934 | 934 | 934 | 934 | 934 | 934 | 934 | 934 | 934 | 934 | 934 |

Prediction of Served Population and Water Demand

| Item | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B. No. of Tourist | (Ave. 1.8 tourists in 1 room, Occupancy = 60 %) | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 2 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 3 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 4 | High | 431 | 439 | 447 | 455 | 463 | 471 | 479 | 487 | 495 | 504 | 512 | 521 | 521 | 521 | 521 | 521 | 521 | 521 | 521 | 521 | 521 | 521 |
| | Low | 245 | 248 | 253 | 254 | 257 | 260 | 263 | 268 | 274 | 279 | 284 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 |
| Zone 5(Munici-pality) | | (Tourism consumption of the Municipality is calculated from the No. of rooms) | | | | | | | | | | | | | | | | | | | | | |
| Zone 6 | High | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Low | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 7 | High | 1,271 | 1,652 | 2,032 | 2,413 | 2,794 | 3,174 | 3,555 | 3,737 | 3,919 | 4,101 | 4,283 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 | 4,466 |
| | Low | 0 | 9 | 48 | 86 | 125 | 164 | 203 | 210 | 217 | 224 | 231 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 |
| Zone 8 | High | 456 | 592 | 729 | 866 | 1,002 | 1,139 | 1,275 | 1,340 | 1,406 | 1,471 | 1,536 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 | 1,602 |
| | Low | 0 | 3 | 17 | 31 | 45 | 59 | 73 | 75 | 78 | 80 | 83 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 |
| Zone 9 | High | 424 | 431 | 439 | 447 | 455 | 463 | 471 | 479 | 487 | 495 | 504 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 |
| | Low | 241 | 244 | 247 | 250 | 253 | 256 | 259 | 264 | 269 | 274 | 280 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 | 285 |
| Zone 10 | High | 4,824 | 4,913 | 5,003 | 5,093 | 5,182 | 5,272 | 5,361 | 5,455 | 5,549 | 5,643 | 5,737 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 | 5,831 |
| | Low | 2,741 | 2,775 | 2,809 | 2,843 | 2,877 | 2,911 | 2,945 | 3,005 | 3,064 | 3,124 | 3,184 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 | 3,243 |
| Zone 11 | High | 1,500 | 1,528 | 1,556 | 1,584 | 1,612 | 1,640 | 1,667 | 1,697 | 1,726 | 1,755 | 1,784 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 | 1,813 |
| | Low | 853 | 863 | 874 | 884 | 895 | 905 | 916 | 935 | 953 | 972 | 990 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 | 1,009 |

C. Tourism Consumption

Unit consumption per tourist = 640 lpcd for high class hotel
500 lpcd for low class hotel
1.2 cu m/room/day for the Municipality

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 4 | 0 | 0 | 411 | 418 | 425 | 431 | 438 | 446 | 454 | 462 | 470 | 478 | 478 | 478 | 478 | 478 | 478 | 478 | 478 | 478 | 478 | 478 | 478 |
| Zone 5 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 |
| Zone 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 7 | 0 | 0 | 1,324 | 1,587 | 1,850 | 2,113 | 2,376 | 2,497 | 2,617 | 2,737 | 2,857 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 | 2,977 |
| Zone 8 | 0 | 0 | 475 | 569 | 664 | 758 | 852 | 895 | 939 | 982 | 1,025 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 | 1,068 |
| Zone 9 | 0 | 0 | 404 | 411 | 417 | 424 | 431 | 438 | 446 | 454 | 462 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 |
| Zone 10 | 4,458 | 4,532 | 4,607 | 4,681 | 4,755 | 4,829 | 4,904 | 4,994 | 5,084 | 5,174 | 5,263 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 | 5,353 |
| Zone 11 | 0 | 1,410 | 1,433 | 1,456 | 1,479 | 1,502 | 1,525 | 1,553 | 1,581 | 1,609 | 1,637 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 | 1,665 |
| Total | 8,658 | 10,142 | 12,855 | 13,322 | 13,790 | 14,258 | 14,726 | 15,023 | 15,320 | 15,617 | 15,914 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 | 16,212 |

Prediction of Served Population and Water Demand

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commercial Water Consumption | | | | | | | | | | | | | | | | | | | | | | |
| Unit consumption | | | | | | | | | | | | | | | | | | | | | | |
| for Municipality | 5 % of the domestic water consumption | | | | | | | | | | | | | | | | | | | | | |
| for Other areas | 37 % of tourism consumption | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 4 | 0 | 0 | 152 | 155 | 157 | 160 | 162 | 165 | 168 | 171 | 174 | 177 | 177 | 177 | 177 | 177 | 177 | 177 | 177 | 177 | 177 | 177 |
| Zone 5 | 656 | 678 | 701 | 723 | 747 | 771 | 795 | 820 | 846 | 873 | 900 | 927 | 958 | 990 | 1,022 | 1,055 | 1,089 | 1,121 | 1,154 | 1,188 | 1,222 | 1,257 |
| Zone 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zone 7 | 0 | 0 | 490 | 587 | 685 | 782 | 879 | 924 | 968 | 1,013 | 1,057 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 | 1,102 |
| Zone 8 | 0 | 0 | 176 | 211 | 246 | 280 | 315 | 331 | 347 | 363 | 379 | 395 | 395 | 395 | 395 | 395 | 395 | 395 | 395 | 395 | 395 | 395 |
| Zone 9 | 0 | 0 | 150 | 152 | 154 | 157 | 159 | 162 | 165 | 168 | 171 | 174 | 174 | 174 | 174 | 174 | 174 | 174 | 174 | 174 | 174 | 174 |
| Zone 10 | 1,649 | 1,677 | 1,704 | 1,732 | 1,759 | 1,787 | 1,814 | 1,848 | 1,881 | 1,914 | 1,947 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 | 1,981 |
| Zone 11 | 0 | 522 | 530 | 539 | 547 | 556 | 564 | 575 | 585 | 595 | 606 | 616 | 616 | 616 | 616 | 616 | 616 | 616 | 616 | 616 | 616 | 616 |
| Total | 2,306 | 2,877 | 3,903 | 4,099 | 4,295 | 4,492 | 4,690 | 4,825 | 4,961 | 5,097 | 5,234 | 5,371 | 5,402 | 5,434 | 5,466 | 5,499 | 5,533 | 5,565 | 5,598 | 5,632 | 5,666 | 5,701 |
| Industrial Water Consumption | | | | | | | | | | | | | | | | | | | | | | |
| Zone 3 (D.S.P) | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Zone 5 (Municipality) | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 | 684 |
| Total | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 | 1,684 |

Prediction of Served Population and Water Demand

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total Daily Average Consumption by Zone (cu m/d)** | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 246 | 271 | 297 | 323 | 350 | 372 | 396 | 421 | 448 | 476 | 514 | 554 | 596 | 640 | 687 | 723 | 760 | 800 | 840 | 882 |
| Zone 2 | 0 | 164 | 184 | 205 | 228 | 251 | 277 | 296 | 317 | 338 | 361 | 384 | 416 | 448 | 483 | 519 | 556 | 593 | 631 | 671 | 712 | 754 |
| Zone 3 | 1,203 | 1,246 | 1,276 | 1,309 | 1,343 | 1,380 | 1,420 | 1,450 | 1,481 | 1,514 | 1,548 | 1,584 | 1,632 | 1,682 | 1,734 | 1,789 | 1,846 | 1,904 | 1,965 | 2,028 | 2,093 | 2,160 |
| Zone 4 | 0 | 0 | 727 | 756 | 785 | 815 | 846 | 875 | 905 | 936 | 969 | 1,002 | 1,033 | 1,066 | 1,100 | 1,136 | 1,173 | 1,203 | 1,235 | 1,267 | 1,301 | 1,336 |
| Zone 5 | 19,884 | 20,359 | 20,843 | 21,338 | 21,843 | 22,358 | 22,883 | 23,432 | 23,992 | 24,562 | 25,144 | 25,736 | 26,404 | 27,085 | 27,779 | 28,487 | 29,209 | 29,907 | 30,619 | 31,343 | 32,080 | 32,830 |
| Zone 6 | 147 | 151 | 170 | 190 | 211 | 234 | 258 | 277 | 297 | 317 | 338 | 361 | 391 | 422 | 455 | 489 | 525 | 560 | 597 | 635 | 674 | 715 |
| Zone 7 | 0 | 0 | 1,934 | 2,308 | 2,682 | 3,057 | 3,432 | 3,610 | 3,788 | 3,967 | 4,147 | 4,328 | 4,349 | 4,372 | 4,395 | 4,420 | 4,446 | 4,467 | 4,489 | 4,512 | 4,535 | 4,560 |
| Zone 8 | 0 | 0 | 775 | 920 | 1,068 | 1,210 | 1,355 | 1,428 | 1,502 | 1,576 | 1,652 | 1,728 | 1,752 | 1,777 | 1,803 | 1,831 | 1,860 | 1,882 | 1,906 | 1,930 | 1,955 | 1,981 |
| Zone 9 | 0 | 0 | 603 | 618 | 633 | 649 | 664 | 681 | 697 | 714 | 732 | 750 | 759 | 769 | 780 | 791 | 803 | 812 | 821 | 831 | 841 | 852 |
| Zone 10 | 6,209 | 6,314 | 6,429 | 6,544 | 6,661 | 6,779 | 6,897 | 7,033 | 7,170 | 7,307 | 7,445 | 7,584 | 7,605 | 7,627 | 7,651 | 7,675 | 7,700 | 7,725 | 7,750 | 7,776 | 7,803 | 7,831 |
| Zone 11 | 0 | 1,984 | 2,022 | 2,060 | 2,099 | 2,139 | 2,179 | 2,224 | 2,269 | 2,314 | 2,359 | 2,405 | 2,416 | 2,427 | 2,438 | 2,450 | 2,463 | 2,475 | 2,487 | 2,500 | 2,513 | 2,527 |
| Total | 27,442 | 30,217 | 35,209 | 36,519 | 37,848 | 39,195 | 40,561 | 41,678 | 42,813 | 43,968 | 45,143 | 46,338 | 47,270 | 48,229 | 49,214 | 50,227 | 51,268 | 52,252 | 53,250 | 54,291 | 55,347 | 56,457 |
| **Unaccounted-for Water Ratio (%)** | | | | | | | | | | | | | | | | | | | | | | |
| For Zones 6 & 10 only | 38 | 37 | 36 | 35 | 35 | 34 | 33 | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 26 | 25 | 24 | 23 | 22 | 22 | 21 | 20 |
| For Other Zones | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| **Total Daily Average Demand by Zone (cu m/d)** | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 308 | 339 | 371 | 403 | 437 | 465 | 495 | 527 | 560 | 595 | 643 | 693 | 745 | 800 | 858 | 904 | 951 | 999 | 1,050 | 1,102 |
| Zone 2 | 0 | 205 | 230 | 256 | 285 | 314 | 346 | 370 | 396 | 423 | 451 | 480 | 519 | 560 | 603 | 648 | 695 | 741 | 789 | 836 | 890 | 943 |
| Zone 3 | 1,503 | 1,557 | 1,595 | 1,636 | 1,679 | 1,725 | 1,774 | 1,812 | 1,851 | 1,892 | 1,935 | 1,979 | 2,039 | 2,102 | 2,168 | 2,236 | 2,307 | 2,380 | 2,456 | 2,534 | 2,616 | 2,700 |
| Zone 4 | 0 | 0 | 909 | 945 | 982 | 1,019 | 1,057 | 1,094 | 1,131 | 1,171 | 1,211 | 1,253 | 1,292 | 1,332 | 1,375 | 1,420 | 1,467 | 1,504 | 1,543 | 1,584 | 1,625 | 1,670 |
| Zone 5 | 24,855 | 25,448 | 26,054 | 26,673 | 27,304 | 27,948 | 28,604 | 29,290 | 29,990 | 30,703 | 31,430 | 32,170 | 33,005 | 33,856 | 34,724 | 35,609 | 36,511 | 37,384 | 38,274 | 39,179 | 40,100 | 41,037 |
| Zone 6 | 236 | 240 | 266 | 296 | 323 | 354 | 386 | 407 | 430 | 453 | 477 | 501 | 537 | 574 | 612 | 651 | 691 | 730 | 769 | 810 | 851 | 893 |
| Zone 7 | 0 | 0 | 2,417 | 2,885 | 3,353 | 3,821 | 4,290 | 4,512 | 4,735 | 4,959 | 5,184 | 5,410 | 5,436 | 5,464 | 5,494 | 5,525 | 5,557 | 5,584 | 5,611 | 5,640 | 5,669 | 5,700 |
| Zone 8 | 0 | 0 | 969 | 1,149 | 1,331 | 1,512 | 1,694 | 1,785 | 1,877 | 1,970 | 2,065 | 2,160 | 2,190 | 2,221 | 2,254 | 2,289 | 2,325 | 2,353 | 2,382 | 2,412 | 2,443 | 2,476 |
| Zone 9 | 0 | 0 | 754 | 773 | 792 | 811 | 830 | 851 | 872 | 893 | 915 | 937 | 949 | 962 | 975 | 989 | 1,004 | 1,015 | 1,027 | 1,039 | 1,052 | 1,065 |
| Zone 10 | 9,983 | 10,022 | 10,076 | 10,131 | 10,185 | 10,240 | 10,294 | 10,343 | 10,391 | 10,439 | 10,486 | 10,533 | 10,647 | 10,363 | 10,283 | 10,206 | 10,132 | 10,058 | 9,987 | 9,918 | 9,852 | 9,788 |
| Zone 11 | 0 | 2,480 | 2,527 | 2,576 | 2,624 | 2,674 | 2,723 | 2,779 | 2,836 | 2,892 | 2,949 | 3,007 | 3,020 | 3,034 | 3,048 | 3,063 | 3,079 | 3,094 | 3,109 | 3,125 | 3,142 | 3,159 |
| Total | 36,577 | 39,952 | 46,106 | 47,656 | 49,228 | 50,821 | 52,437 | 53,710 | 55,004 | 56,322 | 57,662 | 59,026 | 60,076 | 61,161 | 62,281 | 63,436 | 64,626 | 65,747 | 66,897 | 68,075 | 69,291 | 70,533 |
| **Total Daily Maximum Demand by Zone (cu m/d)** | | | | | | | | | | | | | | | | | | | | | | |
| Peak Factor = 1.10 | | | | | | | | | | | | | | | | | | | | | | |
| Zone 1 | 0 | 0 | 400 | 440 | 482 | 524 | 568 | 605 | 644 | 685 | 728 | 774 | 835 | 900 | 969 | 1,041 | 1,116 | 1,175 | 1,236 | 1,299 | 1,365 | 1,433 |
| Zone 2 | 0 | 267 | 299 | 333 | 370 | 409 | 450 | 482 | 515 | 550 | 586 | 624 | 675 | 729 | 784 | 843 | 903 | 963 | 1,025 | 1,090 | 1,156 | 1,225 |
| Zone 3 | 1,954 | 2,024 | 2,074 | 2,127 | 2,183 | 2,243 | 2,307 | 2,355 | 2,406 | 2,460 | 2,515 | 2,573 | 2,651 | 2,733 | 2,818 | 2,907 | 3,000 | 3,094 | 3,193 | 3,295 | 3,401 | 3,510 |
| Zone 4 | 0 | 0 | 1,181 | 1,228 | 1,276 | 1,325 | 1,374 | 1,422 | 1,471 | 1,522 | 1,574 | 1,629 | 1,679 | 1,732 | 1,787 | 1,846 | 1,907 | 1,956 | 2,006 | 2,059 | 2,114 | 2,171 |
| Zone 5 | 32,311 | 33,083 | 33,870 | 34,675 | 35,495 | 36,332 | 37,185 | 38,077 | 38,986 | 39,914 | 40,859 | 41,821 | 42,906 | 44,013 | 45,141 | 46,292 | 47,464 | 48,600 | 49,756 | 50,933 | 52,130 | 53,342 |
| Zone 6 | 307 | 312 | 346 | 382 | 420 | 460 | 501 | 530 | 559 | 589 | 620 | 651 | 698 | 746 | 795 | 846 | 898 | 948 | 1,000 | 1,053 | 1,106 | 1,161 |
| Zone 7 | 0 | 0 | 3,142 | 3,750 | 4,359 | 4,968 | 5,578 | 5,866 | 6,156 | 6,447 | 6,739 | 7,033 | 7,067 | 7,104 | 7,142 | 7,182 | 7,225 | 7,259 | 7,294 | 7,331 | 7,370 | 7,410 |
| Zone 8 | 0 | 0 | 1,260 | 1,494 | 1,730 | 1,966 | 2,203 | 2,321 | 2,441 | 2,562 | 2,684 | 2,808 | 2,846 | 2,887 | 2,930 | 2,975 | 3,023 | 3,059 | 3,097 | 3,136 | 3,176 | 3,219 |
| Zone 9 | 0 | 0 | 980 | 1,004 | 1,029 | 1,054 | 1,079 | 1,106 | 1,133 | 1,161 | 1,189 | 1,218 | 1,234 | 1,250 | 1,267 | 1,286 | 1,305 | 1,320 | 1,335 | 1,351 | 1,367 | 1,384 |
| Zone 10 | 12,977 | 13,029 | 13,099 | 13,170 | 13,241 | 13,312 | 13,383 | 13,446 | 13,509 | 13,571 | 13,632 | 13,693 | 13,581 | 13,472 | 13,368 | 13,268 | 13,172 | 13,075 | 12,983 | 12,894 | 12,807 | 12,725 |
| Zone 11 | 0 | 3,224 | 3,286 | 3,348 | 3,412 | 3,476 | 3,541 | 3,613 | 3,686 | 3,760 | 3,834 | 3,909 | 3,926 | 3,944 | 3,962 | 3,982 | 4,002 | 4,022 | 4,042 | 4,063 | 4,084 | 4,107 |
| Total | 47,549 | 51,938 | 59,938 | 61,953 | 63,996 | 66,068 | 68,168 | 69,822 | 71,506 | 73,218 | 74,961 | 76,734 | 78,099 | 79,509 | 80,965 | 82,466 | 84,014 | 85,671 | 86,967 | 88,502 | 90,078 | 91,693 |
| **Total Treatment Plant Capacity (cu m/day)** | Starting in 1995 (********>>>> | | | | | | | | | | | | | | | | | | | | | |
| | Total Capacity | 68,000 | 70,200 | 73,900 | 73,700 | 75,600 | 77,900 | 79,000 | 80,600 | 81,900 | 83,500 | 84,900 | 85,500 | 88,000 | 89,600 | 91,300 | 93,300 | 95,100 | | | | |