#### 4. Team Leader's Letter

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#### JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

#### DETAILED DESIGN SURVEY TEAM FOR

#### THE AGRICULTURAL DEVELOPMENT RESEARCH PROJECT PHASE II

IN

NORTHEAST THAILAND

December 7, 1989

Permanent Secretary Office of the Permanent Secretary Ministry of Agriculture and Cooperatives Rajadamnern Ave., Bangkok 10200

Dear Sir,

Re : The Pilot Infrastructure Improvement Works for the Agricultural Development Research Project-Phase II

The Detailed Design Survey Team has been organized by Japan International Cooperation Agency (JICA) for the purpose of formulating detailed plan on the Pilot Infrastructure Improvement Works for the Agricultural Development Research Project Phase II.

The Team has, so far, made a series of site reconnaissances and discussions with your staff concerned in order to determine the location and scale of the Demonstration Farm for Proper Land Use (hereinafter referred to as "the Farm") and its facilities. As the result, we would like to submit to you the tentative idea for designing of the Farm as per the attached.

Two team members, Mr. Ishiyama and Mr. Kondo, will proceed with your staff to conduct further field surveys and investigations at the site and make the detailed design on the basis of the result of those surveys. After the completion of the detailed design and assessment of its cost estimation, you will be informed of its result through the JICA Thailand Office.

For the timely commencement of the construction of the Farm, we would like to ask you to take the necessary formalities in due consultation with the JICA Thailand Office.

Lastly, we would like to express our appreciation for the kind cooperation of your staff during our stay.

Sincerely Yours,

Satoshi ISHIDA Team Leader Detailed Design Survey Team Japan International Cooperation Agency

	· ·	
	cc :	Director General
		Department of Agriculture
		MOAC
		(Att : Dr. Thanongjit Wongsiri)
	cc :	Deputy Director General
		Department of Land Development
		NOAC providence of the first of
	· · ·	(Att : Mr. Boonyarak Seubsiri)
	cc 🤤	Dean, Faculty of Agriculture
		Khon Kaen University
		(Att : Dr. Taweesuk Saentaweesuk)
	cc :	Chief of Japan Sub-Division
•••		Department of Technical and Economic Cooperation
		(A++ Concert Control and Econoline Cooperation
		(Att : Mr. A-cha-ri Yooktanan)
	CC :	Embassy of Japan
-		

#### 1, <u>Objective</u>

This survey is to carry out the detailed design on the Demonstration Farm for Proper Land Use (the Farm) which is to

- undertake the experiment/trials to check the techniques, which were developed so far, on their adaptability to local conditions and .
- 2) develop and demonstrate proper land use system to improve soil productivity under the conditions of typical topography of the Northeast.

The Farm, therefore, will play the important role for research and technology transfer to the farmers as a project activity of the technical cooperation.

The Farm will be managed by the Agriculture Development Research Center (ADRC), and composed of irrigation, soil erosion survey and land use demonstration fields which involve the construction of land consolidation, irrigation system, drainage canals, farm roads, pump station, water tank, reservoir and runoff plots, etc.

The Farm will also equip those facilities such as field laboratory, machinery store-house, survey and storage house and dry yard.

In light of the above, the Team conducted the surveys on selection of site, scale of farm, condition of power and domestic water supply and water right, and had preliminary discussions on the framework of the Farm.

#### 2. Location and Scale

(1) The location of the Farm is planned in consideration of following conditions :

- (a) soil type,
  - (b) rainfall,
  - (c) topographic' features,
  - (d) efficiency for demonstration.

Considering the above, the Farm is selected at the area in Khao Suan Kwang, about 40 kilometers north of Khon Kasn City, as shown in Fig.1.

(2) The area of the Farm is about 25 ha including the facility yard as shown in Fig.2.

#### 3. Components of the Farm

3.1 Farm Fields

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The Farm consists of the following fields and related constructions.

(1) Field

The area of the experimental and demonstration fields will be about 19 ha. The Farm consists of the following three kinds of field.

e f<sup>ree</sup>

1) Irrigation field

The irrigation field will be 6 plots (about 5.6 ha). This field will be used for experimental activities related to irrigation.

2) Soil erosion survey field

The soil erosion survey field will be 1 plot (about 0.5 ha). This field will equip runoff plots for measuring soil loss and runoff water.

3) Land use demonstration field

This field will be about 13 ha. In the field, the technology developed by the Project will be systematized for demonstration to the farmers.

(2) Runoff plots for measuring soil loss and runoff water

Eighteen (18) runoff plots for measuring soil loss and runoff water will be constructed in the soil erosion survey field. Size of the runoff plot will be 5 m width and about 20 m lenght.

(3) Irrigation water supply system (1,500 m)

Vinyl chloride or polyethylene pipe will be adopted for the water distributing pipeline. Valves will be installed in the pipeline system in order to regulate discharge and pressure of the irrigation water.

(4) Drainage canal (1,400 m)

Drainage canal will be constructed as the earth canal. Gabionates will be placed in the drainage canal to prevent the canal from scouring.

#### (5) Farm road (580 m)

Farm road will be constructed in the Farm for easy approach by machinery and for maintenance work. Main and sloping portion of the farm road will be paved with laterite.

• 3

(6) Reservoir (about 30,000 m )

In addition to the existing pond capacity, the reservoir will be newly constructed in order to increase the storage capacity for the irrigation on the Farm.

#### (7) Pump and Pump station

Pump station will be installed on the site which will be suitable to intake the low water in the reservoir. Electricity will be considered as power for pump (submersible pump; ¢80 mm)

(8) Water tank (50 m )

Water tank will be cylindrical tank made of reinforced concrete, and installed on the highest portion of the Farm.

(9) Water supply pipeline (620 m)

Stee) pipe will be adopted for the water supply pipeline connecting the pump station and the water tank. Valves will be installed in the pipeline in order to operate and maintain the water supply pipeline safely.

3.2 Farm Facilities

In order to conduct the experiment and the demonstration activities in the Farm, the following facilities will be constructed.

(1) Field laboratory (144 m.)

Field laboratory will equip those such as

- (i) laboratory for farming researches,
- (ii) laboratory for soil researches and
- (jiji) equipment room.

The laboratory will be constructed with concrete block wall and slate roof.

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(2) Machinery store-house (72 m)

The machinery store-house will store agricultural machinery such as tractor, etc.

The house will be constructed with concrete pillar and slate roof, but without wall.

(3) Survey and storage house (192 m )

The survey and storage house will equip those such as 

- (i) preliminary survey room,
- (ii) fertilizer and chemical storage and (iii) products storage.

The house will be constructed with concrete block wall and slate roof. • en fan een de Taringeren een

(4) Dry yard (216 m )

In order to dry the products such as cassava, cow pea, maize, mung bean, etc., the dry yard will be facilitated.

4. Necessary measures taken by Thai side

For the establishment of the Farm, following measures should be taken by Thai side.

- 1) Provision of land for the Farm
- 2) Management of the Farm
  - a) Establishment of management system
  - b) Assignment of farm manager and at least two assistants
  - c) Budget allocation of the salaries for the employees and other expenses for management of the Farm

3) Supplementary construction works

- a) Gate and fence
- b) Electricity and domestic water supply up to the Farm

#### 5, Others

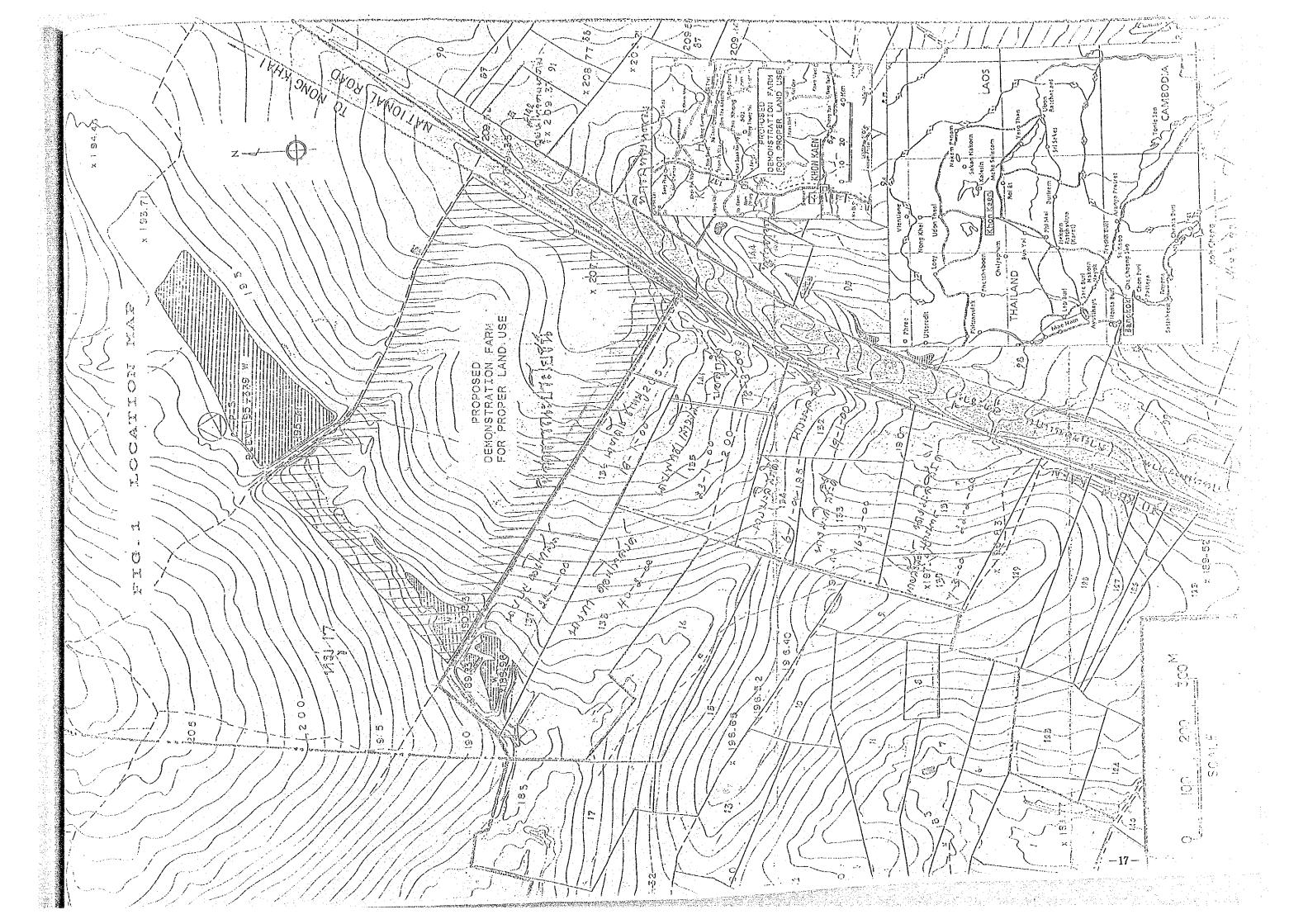
The tentative schedule and procedure for the construction work of the Farm is shown in Table 1.

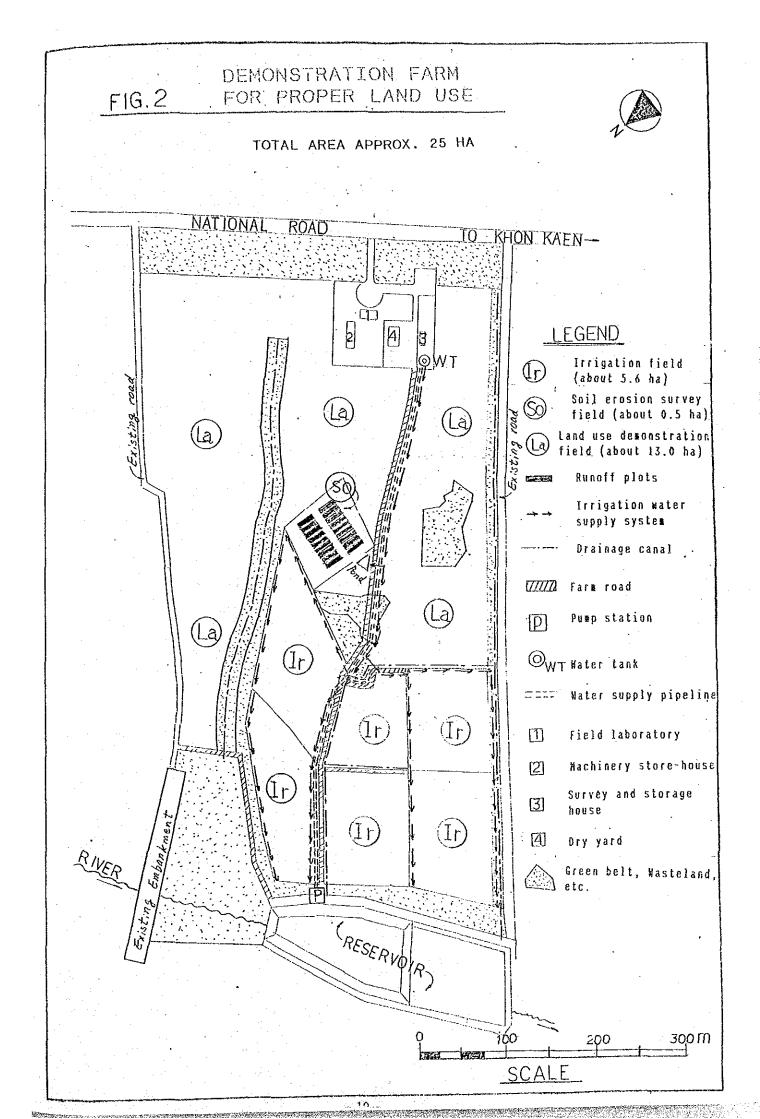
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Table-1 ,

#### OUTLINE OF THE TENTATIVE SCHEDULE ON THE PILOT INFRASTRUCTURE IMPROVEMENT WORK

	<u>Japanese Side</u>	<u>Thai Side</u>
1989 Nov.	Detailed design survey Nov. 28 to Jan. 11, 1990	To provide land for the Farm
Dec. 1990 Jan.	Detailed design work in Japan	<b>9</b>
Feb.		
Mar.	Submission of final report	<b>b</b>
Apr.	•	Request of construction work for the Farm (to JICA Thailand Office)
May	JICĂ HDQ	Submission of A1 form for supervising expert (to the Embassy of Japan)
	Signing of Suppler on the Record of I	ientary Note
Jun.		
Jul.		
Aug.	Exchange of Note	verbale
Sep.	Dispatch of supervising expert Remittance of budget Contract for construction	
Oct.	Start of construction work	





### 5. Field Report

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# JAPAN INTERNATIONAL COOPERATION AGENCY

23-

JANUARY 1990

FIELD REPORT

IN NORTHEAST THAILAND

PHASE II

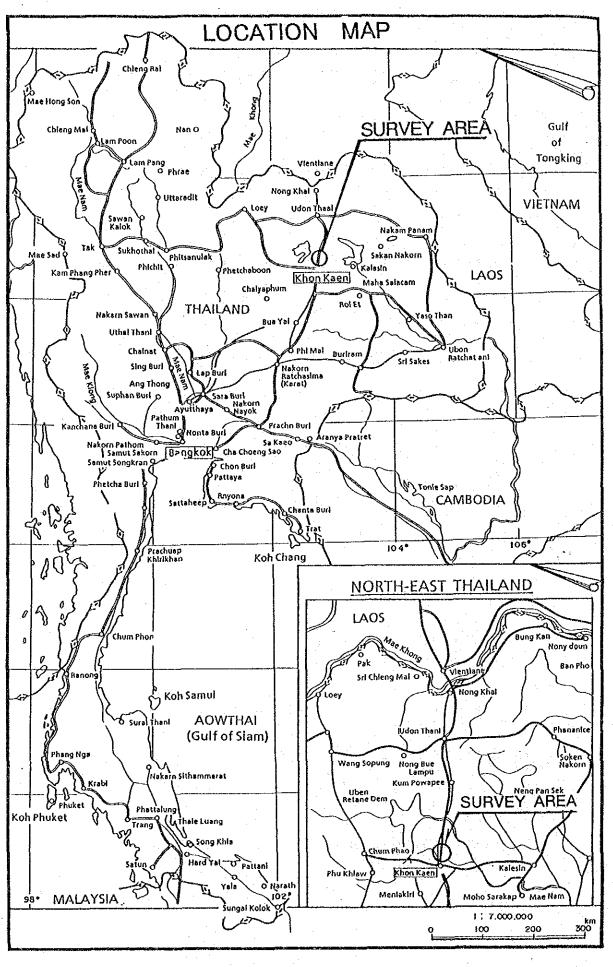
THE AGRICULTURAL DEVELOPMENT RESEARCH PROJECT

FOR

DETAILED DESIGN SURVEY

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THE KINGDOM OF THAILAND



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#### 1. General

#### 1.1 Background

The Agricultural Development Research Project in Northeast Thailand as the Japanese Technical Cooperation had been commenced based on the Record of Discussions signed on December 20, 1983 and completed on December 1988, after a cooperation period of five (5) years.

This project was intended to strengthen the research activities which was directed towards the development of agricultural technology adaptable to the Northeast Thailand, and to propel the development of the Northeast Thailand. The main subjects were i) assessment of natural environment and natural resources, ii) improvement of crop performance and iii) soil conditions and its improvement. The research activities were performed at the Agricultural Development Research Center (ADRC) and its Annex and at the Khon kaen Field Crop Research Center (FCRC).

For promoting the further agricultural development suitable for Northeast Thailand with its characteristics environment, the Agricultural Development Research Project Phase II in Northeast Thailand has started based on the Record of Discussions signed on December 16, 1988 for a cooperation period of five (5) years until December 1993. The Tentative Schedule of Implementation for the Phase II was signed on August 17, 1989 containing research and cooperation of i) classification of agro-ecological zones and land use planning, ii) development of farm management system and iii) development of low-input technology.

In the course of the Phase II, the Royal Thail Government (RTG) planned the Demonstration Farm for Proper Land Use (the Farm) and requested the Government of Japan (GOJ) to provide the cooperation for the plan. In response to the request, the GOJ has decided to implement the Farm by the Pilot Infrastructure Improvement Works and conduct the Detailed Design Survey (the Survey).

#### 1.2 Objective of the Survey

The objective of the Survey is to execute the Detailed Design Survey for the construction of the Farm, including land consolidation, irrigation and drainage facilities, farm roads, reservoir, farm facilities, etc. The Survey is to perform the data collection and field survey necessary to the planning, detailed design and cost estimation during the stay in Thailand, and to work up the planning and detailed design etc. into reports and prepare the tentative contract documents at the home office in Japan.

1.3	Members	of	the	Survey	
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(1) JICA Survey Team

	· · · · ·	
Name	Speciality	Organization
Mr. Satoshi ISHIDA	Team Leader	Deputy Director, Project Planning Division, Agricultural Structure Improvement Bureau, MAFF
Mr. Kazuo NAGAI	Coordinator	Deputy Director, Technical Cooperation Div., Agricultural Development Cooperation Dept., JICA
Mr. Shigeki ISHIYAMA	Land Consolidation Plan	Nippon Giken Inc.
Mr. Ken-ichiro KONDO	Facility Design	Nippon Giken Inc.

(2) Counterparts

Name	Speciality	Organization		
Mr. Chaiporn Vachirakornwatana	Irrigation	Engineering Div., DLD		
Mr. Wanchai Wongsa	Agriculture	Engineering Div., DLD		
Mr. Chartchai Poonpanich	Mechanics	Engineering Div., DLD		

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#### 1.4 Work Schedule in Thailand

The Survey in Thailand was conducted for 45 days from November 28, 1939 to January 11, 1990.

No.	Date	Day	Member	City	Work Schedule
1.	11/28	Tue.	4	Bangkok	Departure from Japan
2.	29	Wed.	4	Bangkok	Courtesy call at JICA,
			• • •		Embassy of Japan and MOAC
3.	30	Thu.	4	Khon Kaen	Field reconnaissance and
					discussion meeting at ADRC
4.	12/1	Fri.	4	Khon Kaen	
5.	2	Sat.	4	Khon Kaen	
		- 1 			team leader
6.	3	Sun.	4	Khon Kaen	-do-
7.	4	Mon.	4	Khon Kaen	Discussion meeting at ADRC
8.	5	Tue.	3	Bangkok	Preparation for letter of team leader
		÷	1	Khon Kaen	-do-
9.	6	Wed.	3	Bangkok	Discussion meeting at DLD
			- 1	Khon Kaen	Preparation for Survey
10.	7	Thu.	3	Bangkok	Submission of letter,
1.				· · · · · · · · · · · · · · · · · · ·	reporting to JICA and
	: .	:			Embassy of Japan
	-		1	Khon Kaen	Preparation for survey
11.	8	Fri.	2		Lv. Bangkok
		•	2 2 2 2	Khon Kaen	Preparation for survey
12.	9	Sat.	2		Ar. Tokyo
				Khon Kaen	Preparation for survey
13.	10	Sun.	2	Khon Kaen	
14.	11	Mon.	2	Khon Kaen	Investigation of present conditions
15.	12	Tue.	2	Khon Kaen	-do-
16.	13	Wed.	2	Khon Kaen	-do-
17.	14	Thu.	2	Khon Kaen	-do-
18.	15	Fri.	2	Khon Kaen	−do-
19.	16	Sat.		Khon Kaen	~do-
20.	17	Sun.	2	Khon Kaen	-00-
21.	18	Mon.	2	Khon Kaen	-do-
22.	19	Tue.	2	Khon Kaen	-do-
23,	20	Wed.	2	Khon Kaen	-do-
24.	21	Thu.	2	Khon Kaen	do
25.	22	Fri.	2	Khon Kaen	-do-
26.	23	Sat.	2	Khon Kaen	do∼ do da
27.	24	Sun.	2	Khon Kaen	Data arrangement
28.	25	Mon.	2	Khon Kaen	Planning and detailed design
29.	26	Tue.	2	Khon Kaen	-do-
30.	27	Wed.	2	Khon Kaen	-do-

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NO.	Date	Day	Member	City	Work Schedule
31.	28	Thu.	2	Khon Kaen	do-
32 .	29	Fri.	2	Khon Kaen	-do-
33	30	Sat.	2	Khon Kaen	-do-
34	31	Sun.	2	Khon Kaen	Data arrangement
35.	1/1	Mon.	2	Khon Kaen	-do-
36.	2	Tue.	2	Khon Kaen	Preparation of field report
37	3	Wed.	2	Khon Kaen	-do-
88	4	Thu.	2	Khon Kaen	Reporting to ADRC
39.	5	Fri.	2	Khon Kaen	Data arrangement
0.	6	Sat.	2	Bangkok	Office closing, etc.
11.	7	Sun.	2 h. i	Bangkok	Data arrangement
12.		Mon.	2 <sup>1</sup>	Bangkok	Reporting to MOAC
13.	.9	Tue.	2	Bangkok	Additional data collection
4	10	Wed.	2	Bangkok	Reporting to JICA and Embassy of Japan
45,	11	Thu.	2		Lv. Bangkok

#### Location and Scale of the Farm 2.

The Farm site is located immediately to the west of the Khon Kaen-Udon Thani Highway, about 40 km north of Khon Kaen. The Farm lies within Changwat Khon Kaen, Amphur Khao Suan Kwang, Tambon Khao Suan Kwang administratively.

The scale of the Farm is about 25 ha including the facility yard.

3. Major Works Performed in the Survey Period

3.1 Topographic Survey

Topographic survey at the Farm site was performed on the following items, based on the existing topographic map of 1/1000 scale;

(i) traverse surveying along the boundary of the Farm,

(ii) drainage canal route surveying,

(iii)farm road route surveying,

(iv) profile and cross sectional leveling at the reservoir site, and

(v) contour line check surveying, etc.

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#### 3.2 Water Quality Survey

Water quality was investigated on the following three (3) test items;

(i) electrical conductivity (EC),

(ii) pH, and

(iii)total dissolved solid (TDS).

Two (2) water samples from existing reservoir and test pit (TP.1) were analysed.

3.3 Soil Survey

Soil survey was carried out by excavating two (2) test pits (STP.1 and STP.2). Soil profile and soil analysis were executed.

3.4 Soil Mechanics and Foundation Survey

Soil mechanics and foundation survey was carried out as a basis of the design and construction plan of the reservoir. This survey was performed as follows;

(i) Three (3) test pitting (TP.1, Tp.2 and TP.3) and (ii) seven (7) auger boring (AH.1 to AH.7).

Foundation profile, underground water table measurement and soil sampling were executed.

#### 3.5 Intake Rate Survey

Intake rates were measured using the double ring infiltrometer on the Farm site. The measurements were executed on the four (4) points (IR.1 to IR.4).

#### 3.6 Data Collection

Data collection on soil, geology, meteorology and hydrology, etc. was carried out. Major collected data list is attached in ANNEX-2.

#### 3.7 Construction Cost Survey

Data and information on the construction materials, equipments and labour, etc. were collected in the field survey period.

#### 3.8 General Layout of the Farm

General layout of the Farm was designed during the field survey period. This layout had been drawn up based on the due consideration of locations and sizes of all facilities.

#### 3.9 Land Consolidation Plan

Proposed area of the Farm is gentle slope with gradient of 2° to 3°. The Farm fields consist of three (3) kinds of field, such as (i) irrigation field, (ii) soil erosion survey field, and (iii) land use demonstration field. Land consolidation plan of these fields are as follows;

(1) Irrigation field

Irrigation field has been designed to uniform gradient within each plot.

(2) Soil erosion survey field

This field equip runoff plots for measuring soil loss and runoff water. Gradient of these runoff plots has been designed to 3° and 5°.

(3) Land use demonstration field

In this field, contour bands have been designed.

#### 3.10 Irrigation Facilities Plan

(1) Irrigation area

Irrigation area consists of (i) irrigation field, (ii) runoff plots and (iii) a part of land use demonstration field. Total irrigation area will be about 6.8 ha.

#### (2) Reservoir

Storage capacity of existing reservoir has been surveyed to be about 6,000 c.m. Additional storage capacity from the excavation has been estimated at about 21,000 c.m. Therefore, the reservoir will have a capacity of 27,000 c.m. This capacity is not enough to irrigate whole irrigation area during the dry season.

(3) Water supply system

Pumping system has been planned, because the reservoir is located at the lowest portion of the Farm area. In this system, installation of water tank is desirable, especially for the upland irrigation. With this consideration, the water tank has been planned on the highest portion of the Farm.

(4) Water distributing system.

In order to utilize the pumped irrigation water and

water head effectively, the closed type pipeline system has been planned.

#### (5) Irrigation method

Perforated pipe irrigation method would be suitable. taking account of effective head and operation and maintenance.

#### Home Office Work 4.

Home Office Work will be undertaken by the Detailed Design Survey Team for about one month in succession for the field survey. The contents of the Home Office Work are described in this chapter.

#### 4.1 Detailed Design and Drawings

Major items of detailed design and drawings will be as follows:

- General layout of the Farm (containing locations of all (1)facilities)
- (2)Layout of land consolidation
- Estimation of water requirement (3)
- Reservoir designing (4)
- (5)Pump and pupm station designing
- (6)
- Water tank designing Water supply and distributing pipeline designing (7)
- Drainage canal designing (8)
- (9) Farm road designing
- Field loboratory, survey and storage house and machinery (10)store-house designing
- Dry yard designing (11)
- Runoff plots for measuring soil loss and runoff water (12) designing.
- 4.2 Construction Plan and Cost Estimation

Appropriate construction plan will be formulated in accordance with the site conditions based on the Survey. Construction cost estimation will be carried out based on the unit cost of labour, materials and machinery applicable to the site, being clarified through the Survey. Final construction cost will be decided by the JICA.

#### 4.3 Tentative Contract Documents

Following tentative contract documents will be prepared in English as a basis of placing the order:

- FORM OF CONTRACT (1)
- TERMS AND CONDITIONS OF CONTRACT  $(2)^{2}$
- (3)TECHNICAL SPECIFICATIONS

#### (4) BILL OF QUANTITIES

# 4.4 Report

The draft final report will be explained to the JICA at the end of the Home Office Work, the middle decade of March, 1990.

The Final Report will be submitted within 20 days after the explanation of the draft final report, the last decade of March, 1990.

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#### ANNEX-2

#### COLLECTED DATA

#### 1. Soil

- 1.1 "Outline of Soils of the Northeast Plateau Thailand", Technical Paper No.1, ADRC, December 1986.
  - 1.2 "Upland Soil of Thailand, Their Characterization and Capability Evaluation", ADRC, March 1986.
  - 1.3 "Compilation Report on Soil Fertility in Northeast Thailand", Technical Paper No.2, ADRC, April 1987.
  - 1.4 "Improvement of the Soil Moisture Regime for the Stabilization of Field Crop Production in Thailand", Tropical Agriculture Research Center, MAFF and Department of Agriculture, MOAC, February 1983.

#### 2. Geology

2.1 "Geological Map of Thailand 1:500,000", Northeastern Sheet, 1983 Edition.

#### 3. Meteorology

- 3.1 "Climatological Data of Thailand, 30-year Period (1956-1985)", Meteorological Department, Ministry of Communications.
- 3.2 "Meteorological Data of Khon Kaen Meteorological Stations", Meteorological Department, Ministry of Communications, 1983-1988.
- 3.3 "Monthly Report of Weather Station", ADRC, 1985-1989.
- 3.4 Monthly Rainfall, Nam Pong, 1976-1987.

#### 4. Hydrology

- 4.1 "Study on Soil Erodibility by Using Rainfall Simulator", Report of Short Term Expert (15), ADRC, October 1987.
- 4.2 Hydrological Characteristics in Klong Yang Watershed, Nakhonratchasima Province.

#### 5. Others

- 5.1 "The Study on Agricultural Land Conservation for Integrated Rural Development in the East, Progress Report (No.2)", JICA, March 1988.
- 5.2 "Rainfed Agriculture Pilot Project", August 1981.
- 5.3 "Agricultural Development Research Center in Northeast Thailand (ADRC)-Activities and Research Highlights 1984-1988", ADRC.
- 5,4 "Exploitation of Promising Crops in Northeast Thailand", ADRC, December 1987.

6. Technical Data

- (1) Soils
- (2) Soil Mechanics and Foundation
- (3) Climate and Hydrology
- (4) Intake Rate
- (5) Bill of Quantity and Unit Cost

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## (1) Soils

# LIST OF TABLESTABLE S-1SOIL PROFILE SURVEY (STP.1)TABLE S-2SOIL PROFILE SURVEY (STP.2)TABLE S-3RESULTS OF SOIL ANALYSIS

NO. Date SOIL SURVEY Soils of the area can be divided into four main groups Very dup loany soils. occur on the top of the underlating terrain where the They slopes range from 1-3 /. the A havingon is about 5-20 cm. with randy has texture over lying the argillic B horizon which the is strong brown to rethinish red. or red. texture is sandy clay loam, no ironstone within lso cm, 2. Moderately deep and deep loamy soils with sandy loam and for loamy sand surface texture, They occur on the upper part of the side slopes of undulating terrain. , slopes range from 3-5 % they have loams sand and or sandy loam surface layer but the depth of the barry sand is not more than 50 cm. from the surface the B horizon has a.

No. Date tenture with ironstone more than sandy clay loam between the defth of so - 150 cm. . the color Volumn strin brown to red. 3. Sandy overloamy moderately deep to deep soils. They occur on the lower past of underlating torrain and have sand or loaning sand texture between the defth of 50 - 80 cm. lower lying by the sandy clay loam texture with ironstone between the defth of so - 150 cm. and for shallow soils Skeletal They occur on side slopes of Undulating terrain especially where the more enosion take place. The soils have ironstone bed rock of some stone within so cm. of the surface

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No. Date 1 D Ð Ð . ٠. Ì 4 3 5.0 Ŕ A 1 Laterite layor 0 600 • Ð 0 o HL 儿 ·Sils. along topogr that aveq Figi T OCCUT ..... 20 3 0  $\widehat{\mathbb{O}}$ . 65 C<sub>m</sub> (m) Cras sl, Is. 5,19 <u>اء</u> • . 5 •7 2000 2000 2000 Ŝø 30 50 sQ scl. sel. . 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Ð sl, 50 120 100 юõ" 100 0°00 Ò Jand 1 620 150 00,000 or ironstor 150 150 150. 0 0000 four main soil groups Diggram. I Fie showing sand > 8.mm (s = sandy lonin; Is = loamy sand ; S z -42-

1 TABLE S-1 SOIL PROFILE SURVEY (STP.1) 11 Name II Nersellon - June Civer wind Find Smool - V-9-on 11 Name II Nersellon - June Remember Friden 1 Anna Vinne Scinbur Friden Use June 11 North for X, Ban Xhun Scinbur France June Vinne Changenal Riden Kun 11 Shaat Name of Topography Map Angline New San Kune	Crem Les 15, 1969 [Air Pholo Mission	Honton Deptin (cm.) $P_{a}$	No. 13/00-420 Dark grayish brown (10y442) and hyd brown (7.5%6/42) larmy sond , areak give sclangular blocks structure treaching No. 15 sind. grans ; nonstely , nonstely , nonstely , nonstely , nonstely , problem and (field pH 610); gradend smooth boundary : to -5%63 day controls in pores; few dime roots; structure, nonstely , nonstely , nonstely , this Eur to -5%63 day controls in pores; few dime roots; structure (field pH 5.5); clear, usay boundary.	Btc, stop - 70 yours set (syns/k) very gravely sandy clay lonm; feur this clay cutings in pores; very feur the rads; stop yours compased of quartitic and involve disneker about >0.2 - 2 cm and have about to it by valuer; strongly quid (dield pH 3.5); graded, using coundary. This - the Red (=15 yes/s) very gravely clay been value coundary.	ting of the above
man and by	Date Classification (National Classification (National Physiography 11 Draimige Lit Flooding: Depth 1 Climate Type 1: I uturual Vegetation or L	Direction of Honese		84 44	<b>4</b>

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STP.2	I Coord. 702 621 Nar Ald allurium N 200 m.	22 m. 	Dark brown (10yk =/2) sardy lown; weak dire subaronkar blocky structure breaking to single grains; frikke; nonsticky, nonphastic; many fine roots; strengly and (field pH s.s); gradand, smuth loundery.	JAYK brown (1942312) and yellowsh brown (19494) sandy loam, went fine subaryular lack, brenking to sigh grains; fridde, nousticle, myhastre; commen fine ructs; though acril (field pH 55); gradud, smooth boundury. Stron brown (7:5458) bundy clay loam; weak fine subaryular blocky structure ; friede, slighthe strok slightta floatic; fer fine socts; very storych acril (field pH 55); gradual, smooth boundury.	Yellouish red (synsps) coarse sandy clay lam; moderate fine and medium subany whis blacky structure. Friedde, straky, plantic; patchy thin clay contings on ped frace and in pases; they pline root; very strongly acid ( yield pH 5.0); clear, many boundary. Red ( sisynsps) very gravelly clay bam; connon noderately thick clay contingo in poses; ten fine root; gravels are quartate ( dramater ~ 1-2 cm) and ironstone about ro-so; by rolume, very strongly will
FROFILE CODE No. FIELD No. Kilon KAEN	No. 5542 I Stip. Parent Maternal Elevation N	Ground Waler Depth Frequency Mean Temperalure	sandy lown; weak dive siberrouker blocky structure breaking to single groups hastic, many fine roots, strendy acid (field pH s.s), grudual smarth b	JAYK brown (10y23/2) and yellouish brown (10y59/2) sandy loan; weak fine subaryuha lack, b to sight grains; fridde, nouslick, maphastic; commen fine, ructs; itongly acid (field pHJ55); gradud, smooth boundary: String brown (7:5458) sirrely clay form; weak fine subaryuhar blocky structure; friedd, slighth_ Slightly plastic; for fine socts; wery storgely acid (field pH 55); gradual, smooth boundary.	coarse sandy chan loam; nochente fine and medium subany who blacky structure, i patchy thin clay coatings on ped finels and in pases; then fine nock. into \$44 5.01; clear, musy beundary. gravelly clay ban, conmon inderately thick clay contings in poses; then fine dramater a recons and ironatione about 70-201. by volume, way strongly au
1 1 Tambon Changwat	State.		Description. weak dire subargonar fire roots, strendy a	brewn ( 1045 cfu) sandy myblastic ; commen f bam ; wrak fine subg	Yellouish red (syrsts) coarse sandy cluy lam, moderate fine triadel sticky, plantic, patchy thin clay contings on ped for very strongh acid ( field pH 5.0); clear, many boundary. Red ( sisyas/s) very gravelly clay ban, soninon indentify mavels are quartifie ( dramater ~ 1-2 cm) and irongtone abo
SURVEY ( Field Symo Erield Juan Sombol	the Andrea	Permoability medicadi Duration Annual Raintali 1176.7	yner ( strong row , y	brown (royzaje) and yellowsch he grains ; fridde, nonsticles smorth boundary . brown (7.5455/6) handy clay plastic ; Jew fine socts ; w	
Har - gravely phaze Anna ADA Har, K - Anna ADA	Air Pr	el drained. Hen Avr cld chann field	•	E6-34 Jark Orown (10, 26-34 Jain grain gradual smarth String brown (7 6-47 Starth plastic)	97-54/20 Friedle Stely, Hante Very strongly acid (4 Very strongly acid (4 Ssfro-120 fred (215455/8) very (Gield pH 5.0)
Soul Name 1 1 210 ABLE S-2 Soul Name 1 2010 Arn - 970 vely Described by Juntholan, K	Date   12/14/ 89 Classification (National)   Physiography   higher	Diamage Frooding: Depth Climate Type (dature! Vegetation or Land Use Other:	Lab. No. Horizon Copin (cm.) AF	23 24 24 24 24 24 24 24 24 24 24 24 24 24	21- 47- 84c 59/10
۲۵ (۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱۹۹۵ - ۱ ۱۹۹۵ - ۱۹۹۵			-44-		

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;		 <b>* 1</b> ·	

								•		
TABLE S-3				<u></u>					- <u></u> .	
RESULTS OF SOIL ANALYSIS		<u>ผลการวิ</u>	the second s					<u>-</u> -	•••	
สาบวิเกรา:	ะห์กิน	Concernance of Frankling		ที่กินเขต	5					
<u>โลงที่รอย่าง รู้</u>	,	1	อโกรง	U 14				10.00	• • • •••	• • • •
จรินานดีวอย่างไม้				/ จังหวั	· · · · ·	lao	2 ELEUL	KW0	(ng (V)	· · ·
Soil Series		···· 1	ate R	eporte	d	• • • • • • •	S	TP.2		····· [·
	10.000	12.00		24.22	19.1.9.2	0 1. 2 1	2115	1.4.1	2.4.17	2428
Lab. No. 32 Sender's Code No. KONDO	10-15/	15/10 -	10-	59/63-	78/200	0-11	24-36	36-47	1	51/70-
Depth / Horizon (cm).	30	1.0		178/200					59/70	12.0
and a second			1:	<b></b>		[		1	<u>i</u>	·····
pH (1-1, H <sub>2</sub> O)	5.95	5.70	5.30	5.15	5.00	5.90	5:60	5.45	4.95	5.10
cH (1:1'1N'KCL)					ينب من		·			
EC (1:1) ((mmho/cm) EC (1:5) ((mmho/cm)		<b> </b> -	ļ.,			<b></b> ,			· · · · · · · · · · · · · · · · · · ·	
cc 25° C (mnho/cm)										
Line Requirement (Kı/rai)										
rganic Matter (%)			0.11	0.18	0.20	0.59	0.39	0,21	0.29	0.23
Phosphorus (P.), Bray-II. (ppm)	0.85			4 4					5,19	6.94
K (ppm)	2									
Ca (ppn)				\ 	 					
	[	{ 	· · · ·							•.
Alt++ (me/100g).	0.049	0.049	0.195	0.976	2:14	0.196	0.488	0.183	2.15	3.02
Na <sup>+</sup> (me/100g)	0.031	0.035	0.129	0.041	0.043	0.043	0.051	0.038	0.039	0.042
$w^+$ (ma/100m)	3.052	0.175	0 071	0.012	0.154	0.074	0.052	0.170	0.097	0.236
Ca <sup>++</sup> (me/100g)	1.28		F 1	0.55		2.			•	0.48
Ny <sup>++</sup> (me/100g)	0.31	0.25	0.14	0.34	0.37,	o. 81	9.28	0.33	0.31	0.37
EC by NH OAC IN pH 7.0 (me/100g)	2109	1.20	1.05	2.09	4 19	1.54	1 54	1.05	3.42	6.21
ase Saturation Percentage			{			· · · · · · · · · · · · · · · · · · ·				·   ·
eturation:Percentage				- -		,		un da Aria	<u></u>	
/N ratios					[ 	<b>53</b> 00	70 00	WA EN	18.99	57.01
Sand & 2.00-0.05 mm (%)           article         Silt & 0.05-0.002 mm (%)           ize         Clay & <0.002 mm (%)	83,41	82.46	78.40	15.08	8-45	11,73	16.11	13.78	8.02	57.01
ize 11 Clay \$ <0.002 mm (%)	3.21	4 08	5.89	17.08	29.80	4.39	4,80	11.72		36.80
extural class	12	25	15	SL	SCL	LS	LS	<u>SL</u>	SCL	SCL
Disturo () 1/16 bar (%) etention 1/3 bar (%)			; ; ; i							
3 bit free			-1.399 ger 1.599 ger		·····					·····
15 tar (%)									·····	
ermechility Coefficient (K) cc/hr										
、「「」」にLABA(AA) Martin Angeland Angeland Angeland 「Aan Angeland Angeland Angeland Angeland Angeland Angeland Angeland Angeland 「Angeland Angeland An					بىرىيىير بىرىيىير	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			
					· · · · ·					
							<b></b>		•	i I
- 「「」 たん おひとれてんけらん やや	'		,		• ÷				· • •	

#### (2) Soil Mechanics and Foundation

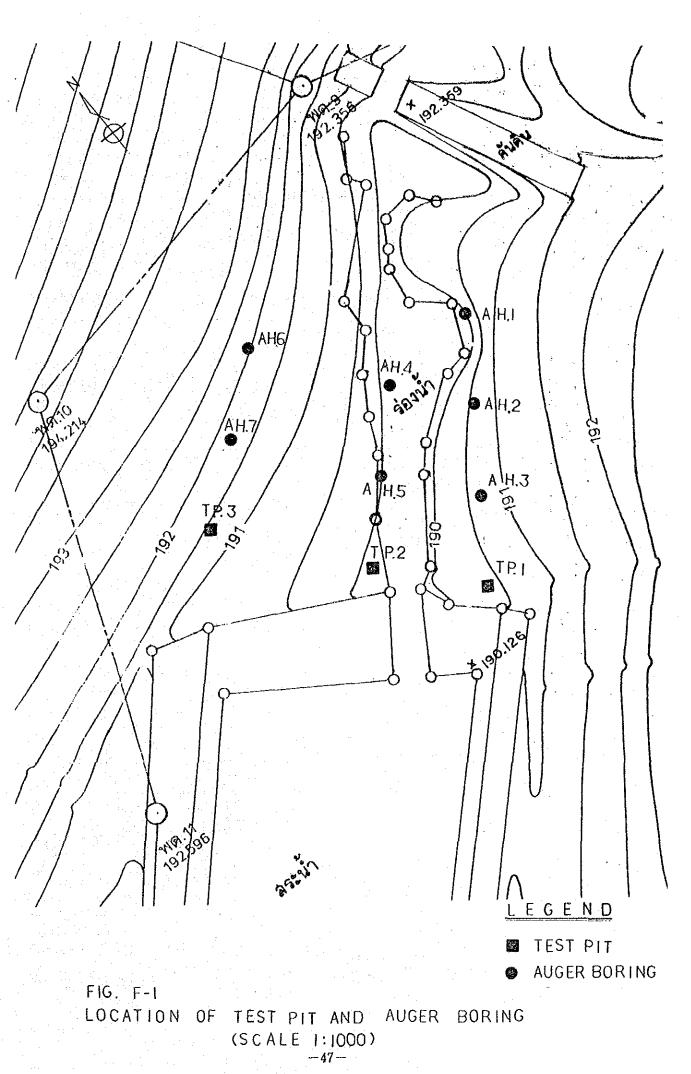
### LIST OF FIGURES

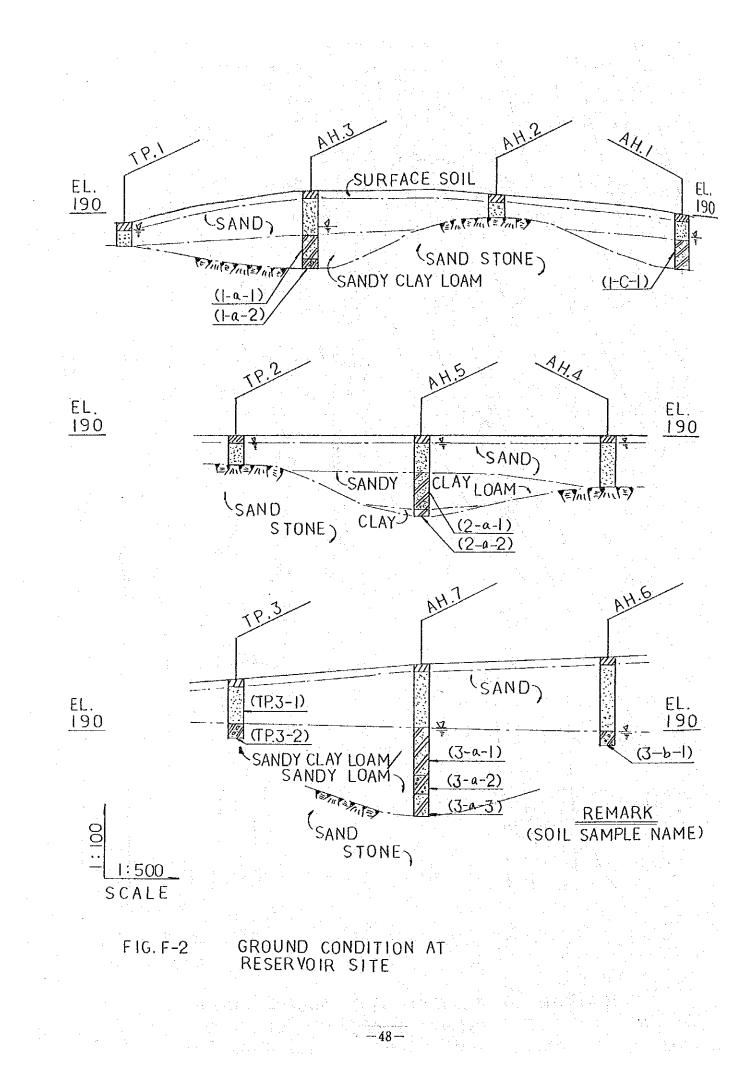
# FIG. F-1LOCATION OF TEST PIT AND AUGER BORINGFIG. F-2GROUND CONDITION AT RESERVOIR SITE

#### LIST OF TABLE

#### TABLE F-1 RESULTS OF MECHANICAL ANALYSIS

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ABLE F-			<u>เลการวิ</u>								
NALYSIS	F MECHANICAL <u>ฝ่ายวิเกราะ</u>	หกน เ		มพุฒนาท อโกรงก	กินเชต วร	5			, 		
ผู้ส่งตัวอย่าง จำนวนตัวอย่า	N	••••	ุส	ถานที่ /	จังหวัด	Ķ	so S	uan	Kura	ng	
Soil Seri€		••••			ported		• • • • • •	••••		•••••	••••
Lab. No.		32 2408	1409	1410	2411	2412	\$413	2414	1415	24Hb	2417
Sender s C	code No. KONDO	1-a-(1)	1-2-12)	1-\$-0>	1-a-(1)	R-a-11)	TP 3-(1)	<u>19.3-W</u>	3-2-(1)	3-a-u)	3-4-(3)
Depth / Ho	orizon (cm)										
	K (ppn)		•••••	1	·····					•••••••••••••••••••••••••••••••••••••••	
Extractabl	e by Ca (ppm)			1 (s.) 	· · · · · · · · · · · · · · · · · · ·					iin an the	
NH4OAC IN	pH 7.0 Mg (ppm)						<u> </u>			· · ·	•
	S (ppm)			1							
	Na <sup>+</sup> (me/100g)						n				
Exchangeat Cations	$K^{+}$ (me/100g)										
Cattons	Ca <sup>++</sup> (me/100g)						l 				
	Mg <sup>++</sup> (me/100g)		- -	· · · · · · · · · · · · · · · · · · ·		·····	<u>.</u>		•	1	
CEC by NH	OAC 1N pH 7.0 (me/100g)			,		1. 					
	ation Percentage										· • • • • • • •
Seturation	Percentage										
Soluble	$\frac{\text{Na}^{\dagger}}{\text{K}^{\dagger}}  (\text{me/l})$							•	·····		······ •
Cations	······							·····			••••••
	Ca <sup>14</sup> (me/1) Mg <sup>14</sup> (me/1)				······		••••••		,		
					· · · · · · · · · · · · · · · · · · ·						
and the second	ole Sodium Percentage (ESE		··· ·····		·					ļ,	ļ
Excitation	C1 (me/1)							1			<b>]</b>
Soluble	NO5 (me/1)									<b>.</b>	
Anion	HCO <sub>2</sub> (me/1)						]		Į	ļ	
•	CO <sup>=</sup> (me/1)							· • • • • • • • • • • • • • •			
	$SO_{A}^{=}$ (me/1)										
	(sand+sill+clay) in total (y	\$ 81.51	74,51	94.80	99.86	96.10	90.39	55.95		49.17	96.15
Particle	Sand \$ 2.00-0.09 mm (% Silt \$ 0.09-0.002 mm (%	66.50	6 70	70.6	11.95	18,83	11:98	79.16			
Size	Clay $\phi < 0.002$ mm (%)	17.25	21.27	12.31	21.94	30.6	2.81	8,25		25.75	
ەنو. <i>دىنى دەنىدىنى دەنىيە دەنى</i> بەتر	Gravel in total (1.)	*****	\$5.118	510	0.14	3,90	9.61	Λμ.05	1.43	\$0.13	1.15
Moisture	1/10 bar (%) 1/3 - bar (%)										
Retention	1/3 - bar (%) 3 bar (%)										,
	15 bar (%)	,					و. مەربىيە بىلىمى مەربىيە بىلىمى	, :	-		
	ity Coefficient (K) cc/h	r A Jor			2.65		2.64	2.64	2.64	2,63	8.63
Speerfie gn	tust (1-by weight)	2.65	2.64 15.5	18.7	10.1	12.7	A.4	A.2	12.0	10.5	12.3
	[ Gravel Brameter (Mm)	2,1	7 10,1	5 10, 17	2,6	10,11	2,10	18,4	10 8, 13	10,20	7,4
CIR ALEMEN C					!	 	<b>)</b>		÷	<b>1</b>	

		· · · · · · · · · · · · · · · · · · ·	ายังาน	ผลการวิ	ใเกราะ	ห์คืน					·	
		ฝ่ายวิเคราะ					5		•			
	ผู้ส่งตัวอย่าง				อโกรง		* * * * * *			,		• • •
	จำนวมตัวอย่าง			ñ	เก่านที่	/ จังหวั	์ ๆ					
	Soil Series				1.	leporte					*****	•••
•					. ] -{		·	Ì	<u>}</u>		<u></u>	<u> </u>
	Lab. No.		<u> 25414</u>	·····	<u> </u>	· · · ·		. 	 	<u> </u>		 
·	Sender's Code No.		3-6-(1)		:	<u> </u>	{ 				 ]=======	<u> </u>
	Depth / Horizon (cm)				1		 	. 	 		 	<u> </u>
ani '	K	(ppm)			1						1	1
i .	Extractable by Ca				· · · · · · ·	1 1						
		(ppm)										].
		(ppm)	••••••			• • • • • • • • • • •						1
			···· · · · · · ·	<u>.</u> .,								. <b> </b>
:	EXCHANGEDIC	(me/100g)	··,.,,						{ 			<u>.</u>
· ` i	UNETONS	(me/100g)										
		(me/100g)					<b>.</b>					· ,.
		me/100g)					ļ.,					. <b> </b>
	CEC by NH4OAC IN pH 7.0 (	(me/100g)		····;·····							·	, <b> </b> ,i
]	Base Saturation Percentag	je			[] 					· · ·	{ 	, [
	Seturation Percentage											
	$Na^+$ (me/1)	)					· · · ·		 			ļ
	Soluble K <sup>+</sup> (me/1)											
	Ca <sup>++</sup> (me/1)	)										
	Mg <sup>++</sup> (me/1)			·			· ·		·			
;	Sodium Adsorption Ratio (	(SAI:)			i .			  ,	•		ļ.,	. <b> </b>
- )	Exchangeable Sodium Perce	entage (ESP	)		ļ					<b>[</b>		, <b>[</b>
	Cl (me/1)			, 	<u>.</u>				1.			. <b> </b>
	Soluble NO3 (me/l)			·			L		)	·		
•	HCO <sub>3</sub> (me/1)				. 		 					<b>.</b> [.'
	CO <sup>≕</sup> (me/l)						]		,			ļ
	$SO_4^{=}$ (me/1)			• • • •								
••••	Sand+silt+clay	) in total (1)	83.70	1	1.11							·
·····	Sand ø 2.00-0	).05 mm (%)	83.42	1								. <b>.</b>
	Particle Silt $\phi$ 0.03=0 Size Clay $\phi < 0.002$	2 mm (%)	12.36	····· ···· · · · · · · · · · · · · · ·	1							
••••			•••••				h			1		1
·····	Moisture 1/10 bar (?		16.30		(†							<b>.</b>
	Retention1/3 bar (?	6)										.]
	<u>3 bar (?</u> 15 bar (?					<b>.</b>	<b>.</b>		ļ			<b> </b>
•••••	Permecbility Coefficient		·····	••••••••••						1		1
	Specific gravity		£.60			•	·}				1	
	Moisture confort ( % by neight)	,,	5.9	анатрады. В	<u>.</u>							
	in a state of the second s				1 			)	Į			
	Moroimun of Gravel drame	тон 	14 <u>34</u>	· · · · · · · ·		ł	ļ	·		····	t	
••••		· ····· · · · · · · · · ·			11 ····		-	; -	· · ·		·	<del></del> .
				7							• •	

#### (3) Climate and Hydrology

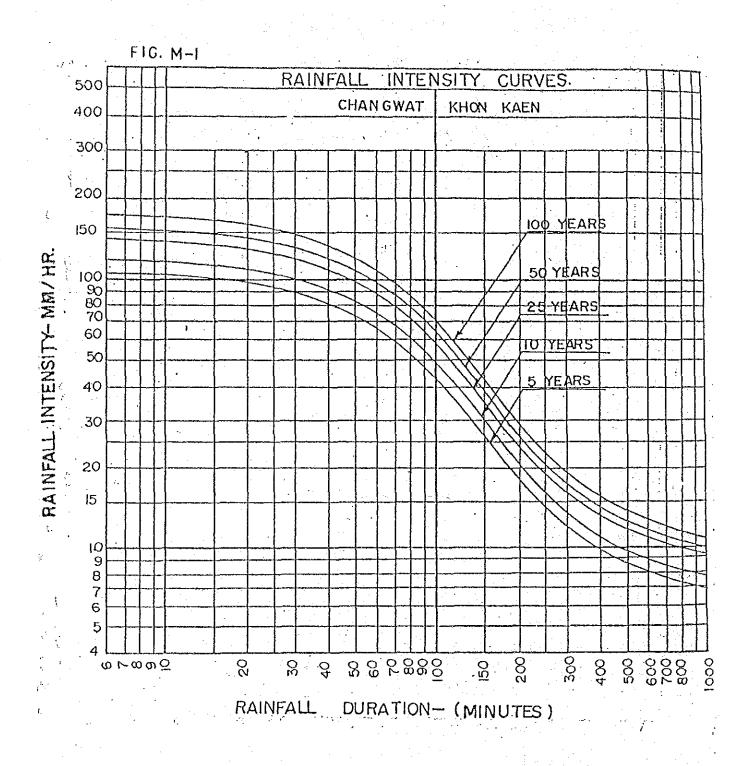
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#### FIG. M-1 RAINFALL INTENSITY CURVES (KHON KAEN)

#### FIG. M-2 RAINFALL INTENSITY CURVES (UDON THANI)

#### LIST OF TABLE

# TABLE M-1CLIMATOLOGICAL DATA FOR THE PERIOD1956 - 1985 (KHON KAEN)



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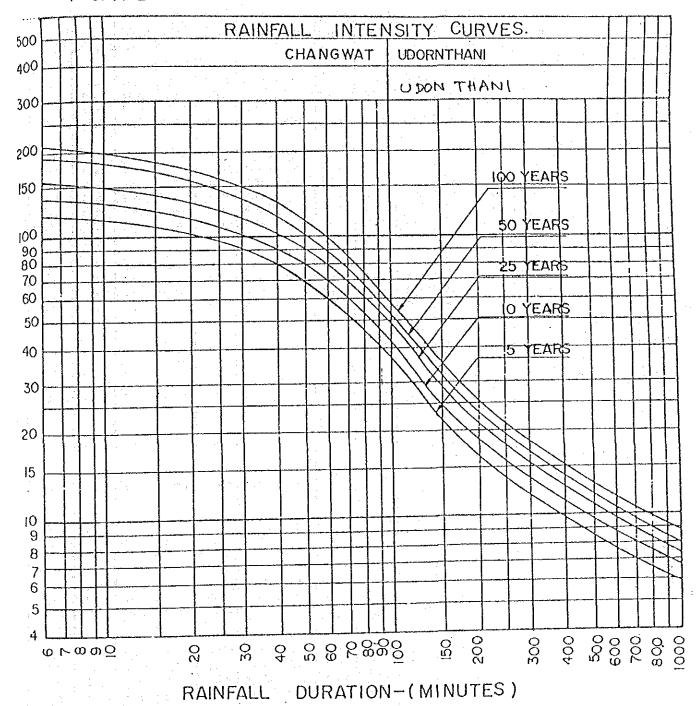


FIG. M-2

TABLE M-1

t

CLIMATOLOGICAL DATA FOR THE PERIOD 1956 - 1985

Т

Station KNON KAEN Index Station 48381 Latitude 16°26°N. Longitude 102°50°E.

Т

Elevation of station above MSL165Height of barometer above MSL166Height of thermometer above ground1.25Height of wind vane above ground10.55Height of raingauge1.00

465meters166meters1.25meters0.55meters1.00meters

		1 :		}	· · .	1 - a 1							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Pressure (+1000 or 90	0 mbs.)										····		
Boan	14,10	11.68	09,72	07.97	06,48	05.21	05.17	05.14	07.23	10,68	13.28	14.52	09.27
Ext. Max.	28,13	24.72	21.74	21.68	14,90	13.70	12,62	13.92	15.46	19.70	23.77	25.08	28,13
Ext. Un.	02.55	00,36	99.98	97.40	97.40	94.92	95.05	95.58	99.52	01.87	04.18	05.44	94.52
Usan daily range	3,57	5.93	5.97	5,68	3.12	4.23	4.04	4.11	4.56	4.71	4.78	5.11	4.98
Temperature ( <sup>0</sup> C)													
liean	22,8	25.6	28.7	30.1	29.2	28.6	28.0	27.6	27.0	26.5	24.8	22.8	26.8
Boan Bax.	30.3	32.7	55.5	36.5	34.8	33.3	32.6	32.0	31.5	31.3	30.8	29.9	52.6
lioan Lin.	15.7	19.1	22.2	24.4	24.7	24.7	24.2	24.1	23.6	22.3	19.3	16.3	21.7
Ext. llax.	37.2	41.0	41.8	42.8	41.2	39.4	38.0	38.0	35.9	35.4	35,4	35.8	42,8
Ext. Illn.	5.7	10,4	10,3	16.4	19.8	20.7	20.2	20.8	19.3	14.0	9.4	5.6	5.6
Relative Humidity					{					1.1			
HOTACTAC HUMITUTC									1	· · ·	a an Ann		
liean	63.9	62,4	59.3	63.0	72.0	· 75.4	77.4	79.7	62.0	77.1	70.5	66.5	. 70.8
Hean Hax.	85.9	82.9	80,4	82.2	88.0	89.1	90.4	91.6	93.5	91,4	8.8	87.3	87.6
llean bin.	41.4	40.8	38.6	42.5	52.8	58.7	61.1	64.0	65.6	58.8	49.4	44.1	51,5
Ext. lin.	1110	10.0	10.0	14.0	26.0	33.0	34.0	37,0	45.0	26.0	21.0	15.0	10.0
Dew Point (°C)			]		ļ., .								
Bean	19.0	17.0	19,•1	21.5	23.0	23.6	23.5	23.6	24.3	21.9	18.6	15.7	20.6
Evaporation (mm.)	<u>)</u>										а. 1.1		
llean - Pan	154.2	<b>161</b> ₅4	211.7	216.6	196.5	171.4	165.5	150.0	137.0	152.3	151.0	152.4	2020.0
Cloudiness(0-10)			Î									 -	
Bean	3,0	3,4	3.6	5.0	6.9	8.0	8.0	8.5	7.8	5.7	4.2	3.5	5.6
Sunshine Duration	$hr_{\bullet}$		1	1			· .						
liesn	285,3	252.8	255.2	82.5	244.6	185.1	162,4	159.5	163.2	256.6	262,3	283,3	2766,0
Visibility (km.)											an a		
0700 L.S.T.	5,3	5.0	5.0	6.6	8.3	8.9	9.0	6.7	8.4	8,8	7.5	6.4	7.3
llean	7.1	8,4	6.1	7.5	9.1	6.9	9.7	9.4	9.3	9.4	9.0	8.1	8.6
Wind (knots)									1.7				
Prevoiling wind	NB .				-	SW	_						
Baan wind speed	2.0	. NE 2,1	918 2,4	-SV 2.4	5W 2.4	2.7	51 2.8	51	NZ 1,8	112 2,1	2.4	2,4	-
Nax. wind speed	33 NZ		AO HE	46 T	47 58,	49 8,	55 8	40 8	35 R.NE			75 RE	55 ¥
Rainfall (mm.)	<i>,,</i> ,,	33 N.S SW,M			TAT	sse,m			S7,1				
llean	4.6	13.2	31.1	60.7	167:7	176.9	163.4	192.7	262.0	87.2	13.9	3.3	1176.7
Econ rainy days	0,9	2.6	3.8	6.9	13,6	14.4	15.7	17.7	18.2	9.3	1.7	0.7	105.5
Greetest in 24 hr.	29.2	63.4	51.8	63.7	87.7	133.4	92.8	134.8	146.6	124.5	81.0	26.6	146.6
Day/Year	24/69	3/66	2/82	6/65	5/71	26/83	26/63	12/78	7/82	26/69	10/74	20/71	7/82
llumber of days w	•	,,		0,05				1.4110	1702	,.,	104.14	20,71	
Kaze	22.5	23.5	26.5	18,3	2.4	0,0	0.1	0.0	0.2	2.1	7.0	14.3	116.9
Fog	0,3	0.4	0,2	0.1	0.0	0.0	0.0	0.1	0.0	0.4	0.1	0.4	2.0
llail	0,0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Thunderstorm	0,2	1.7	4.8	11.8	18.6	14.7	14.0	13.1	14.4	6.3	0.5	0.1	100.2
Squal 1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,1
	╘────┐┍╼╼	4	\$					سعد ربن ا		k.,		J	**************************************

Remark :

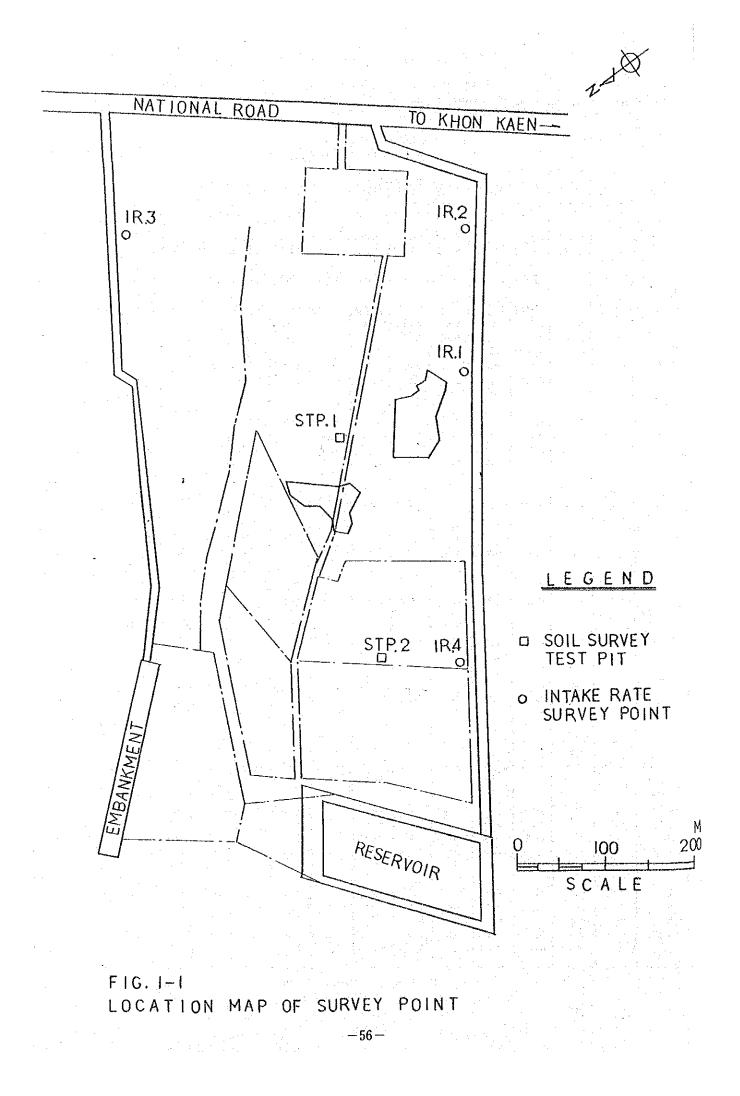
Sunshine Duration
 Evaporation

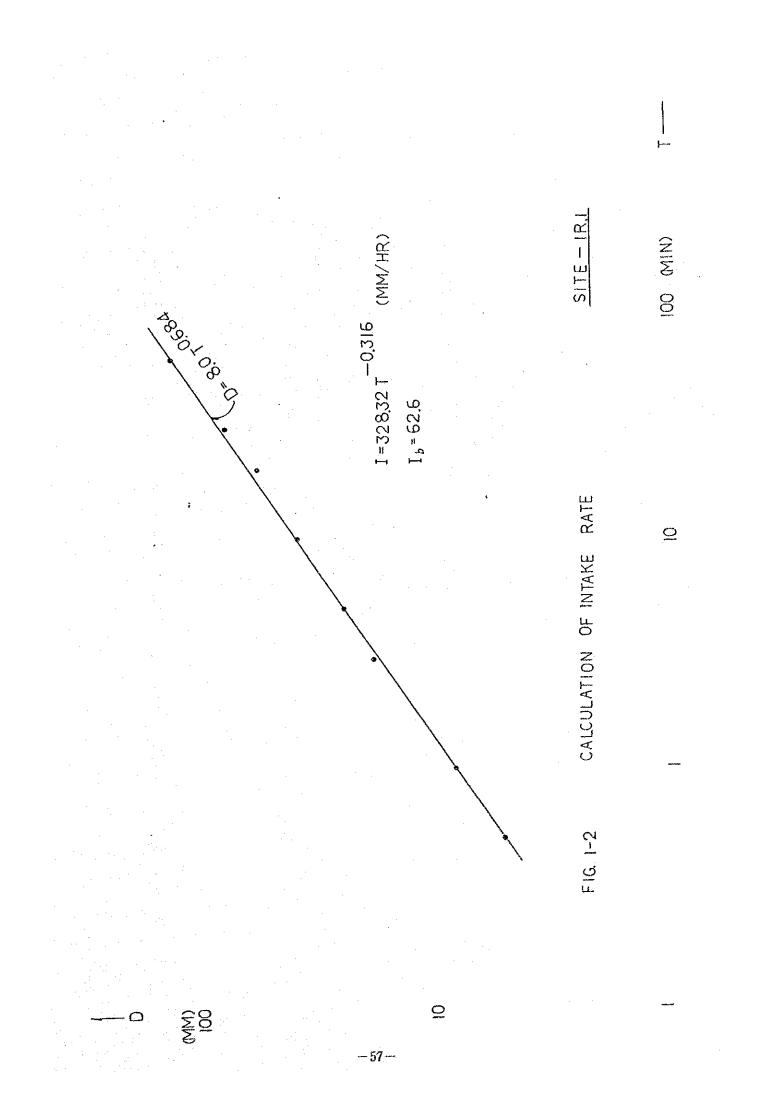
1957 - 1985

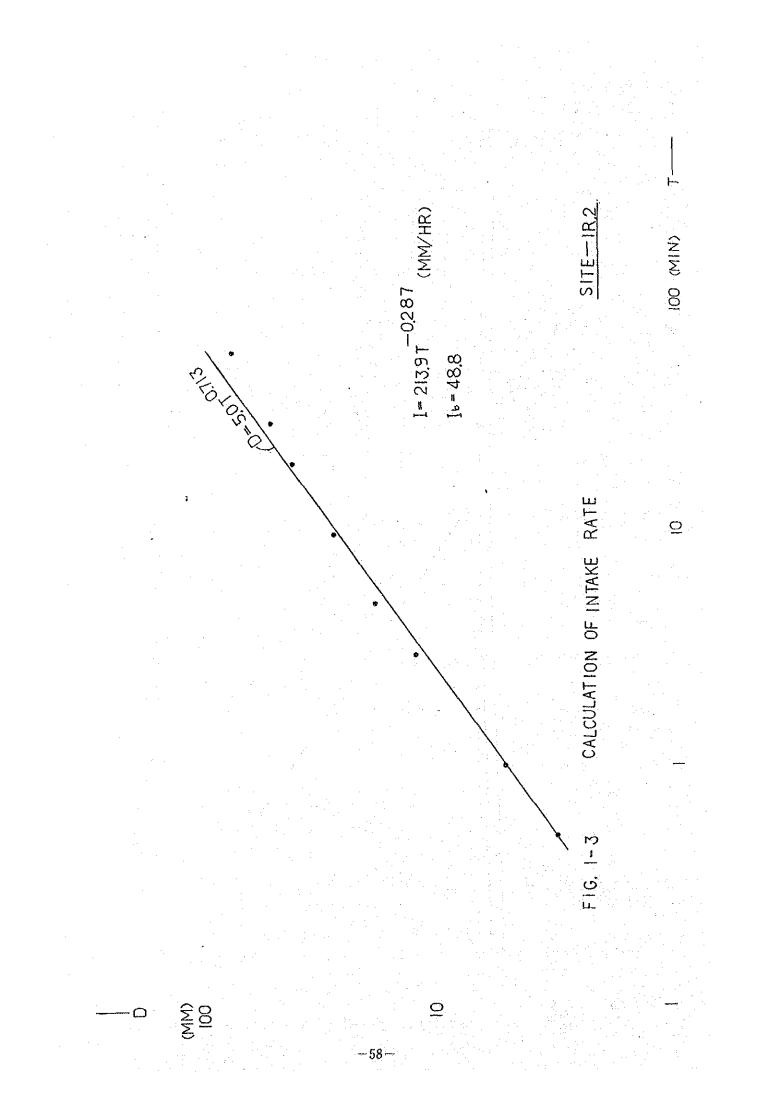
4) Intake Rate

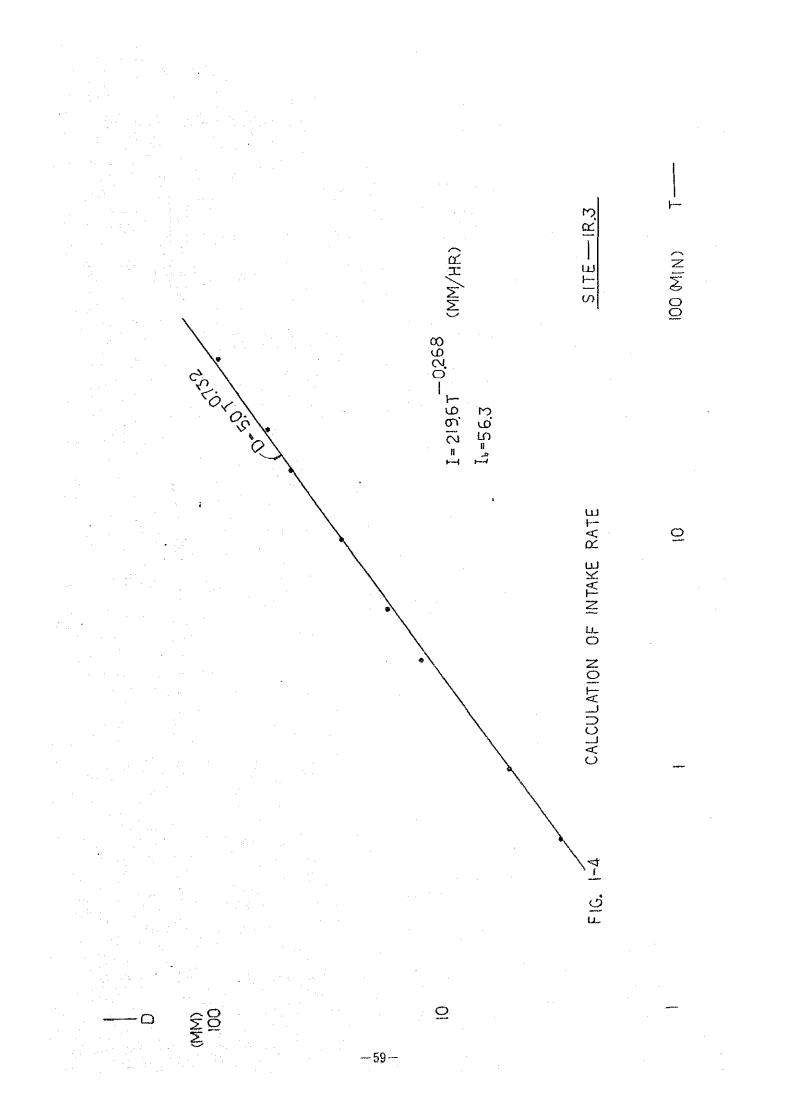
#### LIST OF FIGURES

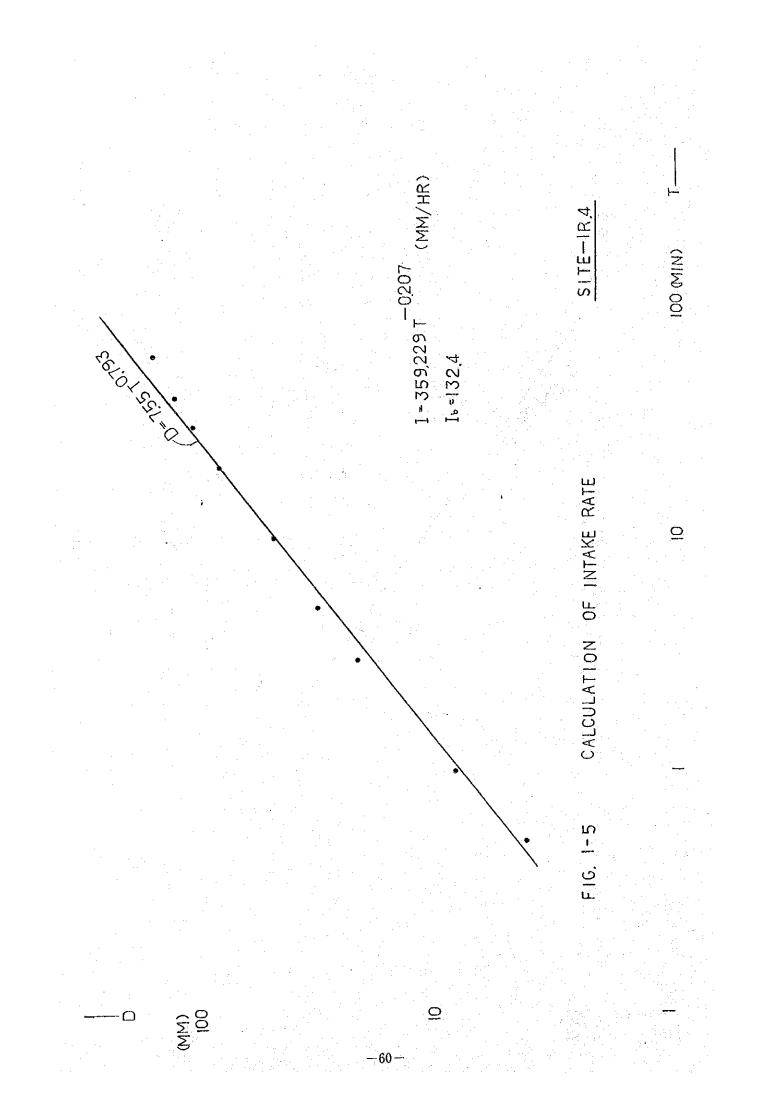
FIG. I-1	LOCATION MAP OF SURVEY POINT
FIG. I-2	CALCULATION OF INTAKE RATE (IR.1)
FIG. I-3	CALCULATION OF INTAKE RATE (IR.2)
FIG. I-4	CALCULATION OF INTAKE RATE (IR.3)
FIG. I-5	CALCULATION OF INTAKE RATE (IR.4)











# (5) Bill of Quantity and Unit Cost

61-

Description	Unit	Quantity	Unit Price	Price B	Remark
Reservoir					
Excavation and Transportation			*. . *		
Excavating and Pushing (Sandy soil)	cum	2,770	32.1	88,917	by Bulldozer
<ul> <li>control</li> <li>Cathering Loading and Transnorting</li> </ul>	uno min	2,500	38.5 50.4	96,250 151 200	- ditto $-$ D = 150 m
(Sandy Soil)		222		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
1-4 Excavating, Loading and Transporting	cum	4,000	38.3	153,200	D = 150 m
Cutty)	cum	3,118	41.8	130,332	D = 550  m
<ul> <li>Excavating and Loading (Rock)</li> </ul>	cum	4,109	35.1	144,226	
Transporting	unn	5,870	22.9	134,423	D = 550  m
Spreading in Spoil-bank	cum	19,497	م م	175,473	
Sub-total	•.			1,074,021	
Dam Works	÷.				· .
l Banking Work	cum	1,726.8	Ţ	14 - <b>*</b> . 1 - 14 -	Contain in Item 1
2-2 Compacting	cum	1,726.8	12.3	21,240	
Protecting Face of Slope Upper side Down side	ups sqm	570 468	12.7 50.9	7,239 23,821	
Sub-total			÷	52,300	

.

<ul> <li>3. Spillway</li> <li>3. Spillway</li> <li>3. Concrete</li> <li>3. Concrete</li> <li>3. Concrete</li> <li>3. Concrete</li> <li>3. Vooden Form</li> <li>3. Sim Bar</li> <li>3. Sim Bar</li> <li>3. Steel Channel</li> <li>3. Wire Box for Gabionade (Type I)</li> <li>3. Steel Channel</li> <li>3. Wire Box for Gabionade (Type I)</li> <li>3. Steel Channel</li> <li>3. Main Canal (B-Line)</li> <li>1. Main Canal (B-Line)</li> <li>1. Main Canal (B-Line)</li> <li>1. Main Canal (B-Line)</li> <li>1. Main Canal (Channel)</li> <li>1. Main Canal (Chanel)</li> <li>1. Main Canal (Chanel)</li></ul>	Description	Unit	Quantity	Unit Price	Price B	Remark
Corm     146     1,235.9     180,441       red     kg     7,300     266.3     72,966       mel     kg     7,300     20.6     150,380       p     cum     16     20.6     5,440       p     nn     2936     715       p     nn     2936     715       p     cum     16     200     5,440       p     nn     20     294.8     8,544       niage     Sub-total     n     29     1,974.9     57,272       al (B-Line)     pc     29     1,974.9     57,272       al (B-Line)     n     1974.9     57,272     953       al (B-Line)     Total     1     1,603,015     1,603,015       avation     (by Machine)     cum     110.6     19.5     2,157       octing Face of Slope     sqm     221.2     4,2     953       othing Face of Slope     sqm     231.2     1,974.9     60,548       Sub-total     110.6     19.5     2,157       of     total     12.8     7,126       sqm     280.9     1,974.9     49,373       of     sqm     25     1,974.9       of     Sub-total     pc     <						
anel       kg       46.8       20       936         for Gabionade (Type I)       pc       29       1,974.9       57,272         inage       Sub-total       16       340       5,440       57,272         inage       Sub-total       pc       29       1,974.9       57,272       8,544         al (B-Line)       pc       29       1,974.9       57,272       8,544         al (B-Line)       Total       1,974.9       57,272       8,544         al (B-Line)       rotal       10.603,015       1,5603,015         al (B-Line)       rotal       110.6       19.5       2,157         al (B-Line)       cum       110.6       19.5       2,157         al (B-Line)       cum       110.6       19.5       2,157         al (B-Line)       cum       110.6       19.5       2,157         arvation       (by Machine)       cum       110.6       19.5       2,157         to -       (by Manpower)       cum       12.8       7,52       963         to -       (by Manpower)       cum       12.8       7,52       963         to -       (by Manpower)       cum       12.8       7,52		cum kg	146 274 7,300	1,235.9 266.3 20.6	180,441 72,966 150,380	
Total       Total       1,603,         al (B-Line)       al (B-Line)       1,603,         e, L 70 m       e, L 70 m       avation       (by Machine)         e, L 70 m       (by Manpower)       cum       110.6       19.5       2,         avation       (by Manpower)       cum       110.6       19.5       2,         to -       (by Manpower)       cum       12.8       75.2       4,2         to -       sqm       221.2       4.2       7,         bothing Face of Slope       sqm       221.2       4.2       7,         eBox for Gabionade (Type I)       pc       25       1,974.9       60,	Steel Channel Water Stop Wire Box for Gabionade ( Pump Drainage	kg day n k	46.8 16 30 30	20,20 20 1,974.9 284.8	936 5,440 57,272 8,544 476,694	9.36kg/m x 5 m
al (B-Line) e, L 70 m e, L 70 m avation (by Machine) to - (by Manpower) to - (by	Total			· .	1,603,015	
cum 110.6 19.5 2, cum 12.8 75.2 2, sqm 221.2 4.2 sqm 140 50.9 7, pc 25 1,974.9 49,	Drainage Canal Main Canal (B-Line) 1 B-1 Line, L 70 m					
	Excavation (by Machine) - ditto - (by Manpower) Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade (Type I) Sub-total	bc sqm sqm	110.6 12.8 221.2 140 25	19.5 75.2 4.2 50.9 1,974.9	2,157 963 929 7,126 49,373 60,548	

RUI OF OUANTITES

Remark 14,011 1,339 2,986 15,270 47,398 53,474 134,478 340,036 22,343 1,940 3,156 17,306 100,265 145,010 Price B 995 7,635 9,424 19.5 75.2 4.2 50.9 1,974.9 2,228.1 Unit Price 75.2 4.2 50.9 2,228.1 - 4.2 50.9 19.5 19.5 e 718.5 17.8 711.0 300 24 24 25.8 751.4 340 45 50.0 ,145.8 Quantity 150 ł cum. sqm sqm cum sqm pc b p sqm Unit cum cum cum : (Type I) (Type II) (by Machine) (by Manpower) (by Machine) (by Manpower) (by Machine) (by Manpower) Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade (Type II) Sub-total Middle-total Sub-total Sub-total Branch Drainage Canal (D-Line) Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade 2-1 D-1 Gentle Slope, L 75 m Description Line, L 170 m. B-3 Line, L 150 m Excavation Excavation Excavation ditto -- ditto -- ditto ditto-B-2 1-2 ų. d

BILL OF QUANTITIES

BILL OF QUANTITIES       Description     Unit Price     Price B       D-1     Chute, I. 26 m     Unit Price     Price B       D-1     Chute, I. 26 m     Unit Price     Price B       - ditto:     Excavation     (by Machine)     cum     14.8     19.5     289       - ditto:     Excavation     (by Machine)     cum     14.8     19.5     206       - ditto:     Smoothing Face of Slope     sqm     49.1     75.2     368       - ditto:     Smoothing Face of Slope     sqm     49.1     50.2     2.647       D-2     L 85 m     1,974.9     19.509     2.647       D-2     L 85 m     3.1     75.2     368       Smoothing Face of Slope     sqm     133.6     4.2     382       Smoothing Face of Slope     sqm     133.6     4.2     381       Smoothing Face of Slope     sqm     133.6     4.2     381       Smoothing Face of Slope     sqm     133.6     4.2     3815       Smoothing Face of Slope     sqm     133.6     4.2     3815       Smoothing Face of Slope     sqm     133.6     4.2     3815       Smoothing Face of Slope     sqm     137.9     20.340		Кетатк			·								
BILL OF QUANTITIES       D-1     Description     Unit Price     F       D-1     Chute, I. 26 m     Description     Unit Price     F       D-1     Chute, I. 26 m     Excavation     (by Machine)     cum     14.8     19.5       Excavation     (by Machine)     cum     14.8     19.5       Forecting Face of Slope     sqm     4.9     1     4.2       Smoothing Face of Slope     sqm     4.9     4.2     4.2       Nice Box for Gabionade (Type I)     pc     8     1,974.9     1       D-2     L 83 m     Sub-total     cum     54.5     19.5       Nice Box for Gabionade (Type I)     pc     sqm     3.1     51.5       Nice Box for Gabionade (Type I)     pc     m     1.974.9     1       D-2     L 83 m     13.1     54.5     19.5       Sub-total     gqm     3.1     51.5     50.9       Wire Box for Gabionade (Type I)     pc     sqm     1.974.9     2       Mite Box for Gabionade (Type I)     pc     5     1.974.9     2       Mite Box for Gabionade (Type I)     pc     5     1.974.9     2       Mite Box for Gabionade (Type I)     pc     5     1.974.9       Mite Box for Gabionade (	, c	Ke			·								
BILL OF QUANTITIES       Description     Unit     Quantity       D-1     Chute, L 26 m     Unit     Quantity       D-1     Chute, L 26 m     Unit     Quantity       D-1     Chute, L 26 m     Unit     Quantity       D-1     Excavation     (by Machine)     cum     4.9       Frotecting Face of Slope     Sub-total     sqm     4.9       Smoothing Face of Slope     Sub-total     54.5       Wire Box for Gabionade (Type I)     pc     54.5       D-2     L 85 m     atto-     54.5       Morthing Face of Slope     sqm     138.6       Sub-total     brocking Face of Slope     sqm     137.5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     5     5       Mire Box for Gabionade (Type I)     pc     <		rnce B	289 . 368	2,647 15,799 10,300		1,063 233 233	134 134 0 875	20,540			2,028 639 1,141 10,282	31,598 45,688	
DescriptionD-1Chute, L 26 mD-1Chute, L 26 mExcavation(by Machine)- ditto-(by Manpower)Smoothing Face of SlopeProtecting Face of SlopeProtecting Face of SlopeWire Box for Gabionade (Type I)Sub-totalD-2L 85 mD-2L 85 mBranch(by Machine)- ditto-(By Manpower)Smoothing Face of Slope (Gentle Slope)Smoothing Face of Slope (Gentle Slope)Protecting Face of Slope (Chute)Protecting Face of Slope (Chute)Protecting Face of Slope (Chute)Protecting Face of SlopeProtecting Face of SlopeWire Box for Gabionade (Type I)Sub-totalA-1L 101 mExcavation(by Manpower)Smoothing Face of SlopeProtecting Face of SlopeWire Box for Gabionade (Type I)Sub-totalWire Box for Gabionade (Type I)Sub-totalWire Box for Gabionade (Type I)Sub-totalSub-totalProtecting Face of SlopeProtecting Face of Slope <td< td=""><td>· .</td><td>Unit Frice</td><td>19.5</td><td>4.2 50.9 1,974.9</td><td></td><td>19.5 75.2</td><td>4.2 50.9 1 974 9</td><td>···· · / · ·</td><td></td><td></td><td>19.5 75.2 50.9</td><td>1,974.9</td><td></td></td<>	· .	Unit Frice	19.5	4.2 50.9 1,974.9		19.5 75.2	4.2 50.9 1 974 9	···· · / · ·			19.5 75.2 50.9	1,974.9	
DescriptionD-1Chute, L 26 mD-1Chute, L 26 mExcavation(by Machine)- ditto-(by Manpower)Smoothing Face of SlopeProtecting Face of SlopeProtecting Face of SlopeWire Box for Gabionade (Type I)Sub-totalD-2L 85 mD-2L 85 mBranch(by Machine)- ditto-(By Manpower)Sub-totalD-2L 85 mBranch Drainage Face of Slope (Gentle Slope)Smoothing Face of Slope (Chute)Protecting Face of SlopeNire Box for Gabionade (Type I)Sub-totalA-1L 101 mExcavation(by Manpower)Smoothing Face of SlopeWire Box for Gabionade (Type I)Sub-totalBranch Drainage Canal, A-LineA-1L 101 mExcavation(by Manpower)Smoothing Face of SlopeWire Box for Gabionade (Type I)Sub-totalWire Box for Gabionade (Type I)Sub-totalWire Box for Gabionade (Type I)Sub-totalWire Box for Gabionade (Type I)Sub-totalSub-total	QUANTIFIES	Quantity	14.8 4.9	49.1 8		54.5 3.1	31.9 31.9 170	3			104 8.5 271.7 202	16	•
D-1 D-1 D-1 A-1	BILL OF	1 E C	cum	sqm s		Cum	un mps	3,			sqm cum s	. <u>ଝ</u>	
			Excavation (by Machine) - ditto- (by Manpower)	Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade (Type I)	L 85 m	Excavation (by Machine) - ditto - (By Manpower)	Smoothing Face of Slope (Chute) Protecting Face of Slope Wire Roy for Gabionade (Tyme I)	Sub-total	Branch Drainage Canal, A-Line	·1 A-1 L 101 m	Excavation (by Machine) - ditto - (by Manpower) Smoothing Face of Slope Protecting Face of Slope	Wire Box for Gabionade (Type I) Sub-total	

	Description	Unit	Quantity	Unit Price	Price B	Remark
3-2 A-2	3-2 A-2 L64m					
	Excavation (by Machine) - ditto - (by Manpower)	cum	92.2 6.9	19.5 75.2	1,798 519	
	Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade (Type I) Sub-total	bc bc	212.5 128 13	4.2 50.9 1,974.9	893 6,515 25,674 35,399	
4. Bra	Branch Drainage Canal, E-Line					
4-1 E-1	4-1 E-1 L95m					
	Excavation (by Machine)	cum	64.6	19.5	1,260	
	Smoothing Face of Slope Protecting Face of Slope	aqm sqm	239.4 190	4.2 50.9	1,005 9,671	
• .	Wire Box for Gabionade Sub-total		•		11,936	
4-2 E-2	E-2 L 90 m			:		
	Excavation (by Machine) - ditto - (by Mannower)	cum	57.9 3.1	19.5	1,129 233	
	Smoothing Face of Slope (Gentle Slope) - ditto - (Chute)	mps	151.2 56.7	4 4 2	238	
	Protecting Face of Slope Wire Box for Gabionade (Type I) Sub-total	mps Sq	180 5	50.9 1,974.9	9,162 9,875 21,272	

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<ol> <li>Branch Drainage Canal, So-Line L 155 m</li> <li>Branch Drainage Canal, So-Line L 155 m</li> <li>Exzevation (by Machine) cum 111.6 19.5 2.176</li> <li>Jino - ditto - Stope Sub-total Sub-total Sub-total Middle-total (Branch D.C.)</li> <li>West Side Drainage Canal, C.Line Sub-total Middle-total (Branch D.C.)</li> <li>West Side Drainage Canal, C.Line 190.6 19.5 3,717</li> <li>West Side Drainage Canal, C.Line 13.2 75.2 2,099</li> <li>Broweting Face of Slope squin 497.7 4.2 2,099</li> <li>Wire Box for Gabionade (Type 1) pc 23 1,974.9 15,833</li> <li>Wire Box for Gabionade (Type 1) pc 23 1,974.9 35,548</li> <li>Wire Box for Gabionade (Type 1) pc 23 1,974.9 35,548</li> <li>Wire Box for Gabionade (Type 1) pc 23 1,974.9 35,548</li> <li>Wire Box for Gabionade (Type 1) pc 23 1,974.9 35,548</li> </ol>		Description	Unit	Quantity	Unit Price	Price B	Remark
Excavation(by Machine)cum111.619.5- ditto -(by Manpower)sqn390.64.2Smoothing Face of SlopeSub-totalSub-total31050.9Write Box for GabionadeSub-totalSub-total31050.9Write Box for GabionadeSub-totalSub-total190.64.2West Side Drainage Canal, C-LineC-1L 185 m192.275.2To the function of by Machine)cum190.619.575.2- ditto-(by Manpower)sqm497.750.9Protecting Face of Slopesqm37050.950.9Protecting Face of Slopesqm37050.950.9Write Box for Gabionade (Type I)pc231,974.950.9Write Box for Gabionade (Type I)pc231,974.950.9Write Box for Gabionade (Type I)pc231,974.950.9Write Box for Gabionade (Type I)pc181,974.950.9Write Box for Gabionade (Type I)pc181,974.950.9Write Box for Gabionade (Type I)pc181,974.950.9Write Box for Gabionade (Type I)pc181,974.9Write Box for Gabionade (T	Br	anch Drainage Canal, So-Line L 155 m					
SubstanceSegme390.64.2FunctionalSub-totalSub-total310.650.9Wire Box for GabionadeSub-totalSub-total50.9Wire Box for GabionadeSub-totalSub-total50.9West Side Drainage Canal, C-LineC-1L 185 m190.619.5C-1L 185 mCum190.619.575.2Box for Gabionade (Type I)Sup manyower)Sum497.74.2Smoothing Face of SlopeSam497.74.2Protecting Face of SlopeSam497.775.2Protecting Face of SlopeSam497.775.2Protecting Face of SlopeSam9.575.2Protecting Face of SlopeSam9.5<	щ	tion	cum	111.6	19.5	2,176	
West Side Drainage Canal, C-LineC.1L 185 mC.1L 185 mBercavation(by Machine)- ditto-(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)Vire Box for Gabionade (Type I)C-2L 115 mC-2L 115 mExcavation(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)Smoothing Face of Slope9.5Yvire Box for Gabionade (Type I)protecting Face of SlopeWire Box for Gabionade (Type I)pc181.974.9	Pra NPra NPra	nto - (oy interpower) hoothing Face of Slope btecting Face of Slope re Box for Gabionade Sub-total Middle-total (Branch D.C.)	aqm sqm	390.6 310	4.2 50.9	1,641 15,779 19,596 183,164	
C-1L 185 mExcavation(by Machine)- ditto-(by Manpower)- ditto-(by Manpower)- ditto-(by Manpower)Smoothing Face of SlopeProtecting Face of SlopeProtecting Face of SlopeProtecting Face of SlopeWire Box for Gabionade (Type I)Wire Box for Gabionade (Type I)Vire Box for Gabionade (Type I)C-2L 115 mC-2Excavation(by Manpower)cum- ditto ditto ditto-Protecting Face of SlopeSub-total0:5Fixeavation(by Manpower)cum381.8A4.2Sinoothing Face of SlopeProtecting Face of SlopeWire Box for Gabionade (Type I)pc181,974.9Vire Box for Gabionade (Type I)pc181,974.9Sub-totalSub-totalSub-totalProtecting Face of SlopeSub-totalSub-totalProtecting Face of SlopeSub-totalSub-totalSub-totalSub-totalProtecting Face of SlopeProtecting Face of SlopeProtecting Face of SlopeSub-totalSub-totalSub-totalSub-totalSub-totalSub-totalSub-totalSub-totalSub-total	Ŵ	est Side Drainage Canal, C-Line					
- ditto-(by Manpower)cum12.273.2Smoothing Face of Slopesqm497.74.2Protecting Face of Slopesqm37050.9Wire Box for Gabionade (Type I)pc231,974.9Wire Box for Gabionade (Type I)pc231,974.9C-2L 115 m165.619.575.2Excavation(by Machine)cum9.575.2Itto-(by Manpower)sqm381.84.2Protecting Face of Slopesqm23050.9Wire Box for Gabionade (Type I)pc181,974.9		uo	cum	190.6	19.5	3,717	
WIE DOX IOI CADIONAGE (1 ype 1)pc231,914.3C-2L 115 mSub-totalby Machine)cum165.619.5Excavation(by Manpower)cum9.575.2- ditto-(by Manpower)cum381.84.2Smoothing Face of Slopesqm23050.9Protecting Face of Slopesqm23050.9Wire Box for Gabionade (Type I)pc181,974.9		- ditto- Smoothing Face of Slope Protecting Face of Slope	sqm Sqm	497.7 370 32	4.2 50.9 970 1	71/ 2,090 18,833	
C-2 L 115 m Excavation (by Machine) cum 165.6 19.5 - ditto- (by Manpower) cum 9.5 75.2 Smoothing Face of Slope sqm 381.8 4.2 Protecting Face of Slope Sqm 230 50.9 1 Wire Box for Gabionade (Type I) pc 18 1,974.9 5 Sub-total		Wire box tor Gautonaue (1ype 1) Sub-total	Ъс	C7	L,714.7	70,980	
(Type I) pc 18, 4.2 sqm 230 230 50.9 total		uo	cum	165.6 9.5	19.5	3,229 714	
		Smoothing Face of Slope Protecting Face of Slope Wire Box for Gabionade (Type I)	sqm sqm	381.8 230 18	4.2 50.9 1,974.9	1,604 11,707 35,548	
		Sub-total				52,802	
	-d						

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Remark 1,993 3,416 8,780 2,340 2,346 17,075 12,114 47,398 66,132 189,914 Price B 955 7,921 11,352 32,550 11,284 2,430 65,537 3,851 713,114 Unit Price 19.5 75.2 50.9 1,974.9 14.6 2.9 100 0.7 14.6 2.9 100 0.7 BILL OF QUANTITIES 197.5 12.7 238 24 542.5 3,914.7 325.5 2,821 3,472 136.5 1,177.8 87.8 585 780 Quantity Unit bc dm bc ups sqm sqm sqm sqm Middle-total (West Side Line) Excavation (by Machine) - ditto- (by Manpower) Smoothing Face of Slope Wire Box for Gabionade (Type I) Sub-total Branch Road D-Line, L 195 m, W 4 m Main Road A-Line, L 434 m, W 5 m Sub-total Arrangement of Road Face Banking by Machine Arrangement of Road Face Spreading of Laterite Compacting of Road-bed Compacting of Road-bed Description Spreading of Laterite Banking by Machine L 119 m Total Laterite Laterite Farm Road с С 6-3 d E

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Sub-total

	Description	Unit	Quantity	Unit Price	Price B	Remark
З. В	Branch Road E-Line, L 190 m, W 4 m					
8419.	Banking by Machine Arrangement of Road Face Laterite Spreading of Laterite	uns sqm cum	133 1,147.6 85.5 570	14.6 2.9 4	1,942 3,328 8,550 2,280	
	Compacting of Road-bed Sub-total	sqm	760	0.7	532 16,632	
4. B	Branch Road F-Line, L 135 m, W 4 m					
BALNO.	Banking by Machine Arrangement of Road Face Laterite Spreading of Laterite Compacting of Road-bed Sub-total	cum sqm cum sqm	94.5 815.4 60.8 540 540	14.6 2.9 4 0.7	1,380 2,365 6,080 1,620 11,823	
5. B	Branch Road G-Line, L 115 m, W 4 m					
AAHNO MAHNO	Banking by Machine Arrangement of Road Face Laterite Spreading of Laterite Compacting of Road-bed Sub-total	cum sqm sqm	80.5 694.6 51.8 345 460	14.6 2.9 4 0.7	1,175 2,014 5,180 1,380 322 10,071	
· ·						

6.Branch Road H-Line, L 400 m, W 4 m537.5 $14.6$ $7,848$ Banking by Machinecum $537.5$ $14.6$ $7,848$ Banking by Machinesqm $2,896$ $2.9$ $8,3398$ Arrangement of Road Facecum $180$ $100$ $8,3398$ LateriteSpreading of Lateritesqm $1,200$ $4$ $4,8000$ Spreading of Road-bedSub-totalsqm $1,200$ $4$ $4,8000$ 7.West Side Branch Road C-Line, $1,600$ $0.7$ $1,1200$ $40,166$ 7.West Side Branch Road C-Line, $1,058$ $14.6$ $1,347$ 7.West Side Branch Road C-Line, $1,058$ $14.6$ $1,5447$ 7.West Side Branch Road C-Line, $2,632$ $0.7$ $1,1920$ 8.Compacting of Road-bedsqm $2,632$ $0.7$ $1,842$ 9.Sub-totalSam $2,632$ $0.7$ $1,842$ 9.Nire Box for Gabionade (Type I)sqm $2,632$ $0.7$ $1,974.9$ $29,624$ 8.Crossover of Canal, 5 placessqm $2,632$ $0.7$ $1,974.9$ $29,523.1$ 8.Crossover of Canal, 5 placescum $17.2$ $1,011.3$ $17,394$ 9.Concrete (Lean mixed)cum $69.1$ $2,228.1$ $8,912$ 9.Wire Box for Gabiostores for BedCum $17.2$ $1,7394$ $2,923.37,473$ 9.Cobbistores for BedTope Laterite $17.2$ $1,7394$ $2,923.37,473$ 9. <th>Description</th> <th>Unit Quantity</th> <th>Unit Price</th> <th>Price B</th> <th>Remark</th>	Description	Unit Quantity	Unit Price	Price B	Remark
Banking by Machinecum537.514.6Arrangement of Road Facesqm2,8962.9Lateritesqm1,6000.7Spreading of Lateritesqm1,6004Spreading of Lateritesub-totalsqm1,6004West Side Branch Road -bedsub-total0.70.7West Side Branch Road C-Line,1,658 m, W4 m1,05814.6West Side Branch Road C-Line,1,05814.6Marangement of Road Facecum1,05814.6Arrangement of Road Facecum1,05814.6Arrangement of Road Facesqm3,6832.9Compacting of Iateritesqm2,6320.7Nire Box for Gabionade (Type I)pc1,974.9Concrete (Lean mixed)cum17.21,011.3Concrete (Lean mixed)cum69.15,42.3Wire Box for Gabionade (Type II)pc42,228.1	Line, L 400 m, W 4 m				
Arrangement of Road Facesqm2,8962.9LateriteSpreading of Lateritesqm1,2004Spreading of LateriteSub-totalsqm1,6000.7Spreading of Road-bedSub-totalSub-total9.079.07West Side Branch Road C-Line, L 658 m, W 4 mL6,58 m, W 4 m3,6832.9West Side Branch Road Facecum1,05814,6Daning by MachineRemode Road Facecum1,05814,6Arrangement of Road Facecum3,6832.92.9Compacting of Lateritesqm2,6320.79.7Sub-totalwite Box for Gabionade (Type I)pc1,974.92.9Consorver of Canal, 5 placescum17.21,011.32.28.1Concrete (Lean mixed)cum69.15,423.32.28.1Wire Box for Gabionade (Type II)pc42,228.1			14.6	7,848	÷ .
Laterite       cum       100       100       100         Spreading of Laterite       Sub-total       sqm       1,500       4         Spreading of Laterite       Sub-total       sqm       1,600       0.7         West Side Branch Road C-Line,       L 658 m, W 4 m       0.7       4         West Side Branch Road C-Line,       L 658 m, W 4 m       2.9       2.9         Banking by Machine       cum       1,058       14.6         Arrangement of Road Face       cum       1,058       14.6         Arrangement of Road Face       cum       2,632       0.7         Spreading of Laterite       sqm       2,632       0.7         Sub-total       wire Box for Gabionade (Type I)       pc       1,574.9         Wire Box for Gabionade (Type I)       pc       1,574.9       2,632         Wire Box for Gabionade (Type II)       pc       1,574.9       2,632         Wire Box for Gabionade (Type II)       pc       1,72       1,011.3       2,228.1         Wire Box for Gabionade (Type II)       pc       4       2,228.1       2,228.1			2.9	8,398	
Compacting of Road-bedsqin1,6000.7West Side Branch Road C-Line, L 658 m, W 4 mSub-totalsqin1,6000.7West Side Branch Road C-Line, L 658 m, W 4 mEatoncum1,05814.6Wire Banking by MachineArrangement of Road Facecum1,05814.6Banking by MachineArrangement of Road Facecum1,05814.6Arrangement of Road Facecum1,05814.6Arrangement of Road Facecum2,6320.7Nire Box for Gabionade (Type I) Sub-totalpc1,51,974.9Middle-totalmiddle-total2,6320.7Conserver of Canal, 5 placescum17.21,011.3Concrete (Lean mixed)cum69.15,42.3Wire Box for Gabionade (Type II)pc42,228.1			001	4.800	
West Side Branch Road C-Line, L 658 m, W 4 mL 658 m, W 4 mBanking by MachineE 0058Banking by MachineSamArrangement of Road FacecumLateritesqmSpreading of LateritesqmSpreading of LateritesqmSpreading of LateritesqmSpreading of LateritesqmSpreading of LateritesqmSpreading of LateritesqmSpreading of LateritesqmSub-totalpcWire Box for Gabionade (Type I)Sub-totalpcMiddle-totalfor Canal, 5 placesConcrete (Lean mixed)cumConcrete (Lean mixed)cumCoblestones for BedpcWire Box for Gabionade (Type II)pcforforConcrete (Lean mixed)cumConcrete (Lean mixed)cumforforConcrete (Lean mixed)forforforConcrete (Lean mixed)for	bed Sub-total		0.7	1,120 40,166	
Banking by Machine Banking by Machine Arrangement of Road Face Laterite Spreading of Laterite Spreading of Laterite Compacting of Road-bed Wire Box for Gabionade (Type I) Sub-total Middle-total Crossover of Canal, 5 places Concrete (Lean mixed) Concrete (Lean mixed) Concrete (Lean mixed) Wire Box for Gabionade (Type II) Concrete (Lean mixed) Concrete	ch Road C-Line, 8 m, W 4 m				
Arrangement of Road Face sqm 3,683 2.9 Laterite Cum - cum - cum - cum - sqm 2,632 0.7 Spreading of Laterite sqm 2,632 0.7 Wire Box for Gabionade (Type I) pc 1,974.9 Sub-total Middle-total Niddle-total - cum 1,974.9 Crossover of Canal, 5 places - cum 17.2 1,011.3 Concrete (Lean mixed) cum 69.1 542.3 Wire Box for Gabionade (Type II) pc 4 2,228.1			14.6	15.447	
Latente Latente Spreading of Laterite Spreading of Road-bed Wire Box for Gabionade (Type I) Sub-total Middle-total Crossover of Canal, 5 places Concrete (Lean mixed) Concrete (Lean mixed) Wire Box for Gabionade (Type II) Wire Box for Gabionade (Type II) Pc 2,632 0.7 Pc 1,974.9 Pc 1,974.9 P			2.9	10,681	
Compacting of Road-bed Wire Box for Gabionade (Type I) Sub-total Middle-total Crossover of Canal, 5 places Concrete (Lean mixed) Wire Box for Bed Wire Box for Gabionade (Type II) Concrete (Lean mixed) Concrete (Lean mixe					
Wire Box for Gabionade (Type I)pc151,974.9Sub-total Middle-totalSub-total Middle-total22Crossover of Canal, 5 placescum17.21,011.3Concrete (Lean mixed)cum69.1542.3Wire Box for Gabionade (Type II)pc42,228.1			0.7	1,842	
Middle-totalCrossover of Canal, 5 placesConcrete (Lean mixed)Concrete (Lean mixed)Cobblestones for BedWire Box for Gabionade (Type II)pc42,228.1			1,974.9	29,624 57,594	
Crossover of Canal, 5 places Concrete (Lean mixed) cum 17.2 1,011.3 Cobblestones for Bed wire Box for Gabionade (Type II) pc 4 2,228.1	Middle-total			218,898	
) cum 17.2 1,011.3 cum 69.1 542.3 ide (Type II) pc 4 2,228.1	anal, 5 places				
ide (Type II) pc 4 2,228.1			1,011.3	17,394	
	ade (Type II) Sub-total		2,228.1	63,779	
Total 282	Total			282.677	

sqm         60,000         1.9         114,000           n         26.3         250         6,575           n         556.5         1,540/6         1,42,835           pc         300         300         30,000           pc         300         300         1,080           pc         1         1,000         1,472/4         57,960           n         157.5         1,472/4         57,960           n         11,000         1,472/4         57,960           pc         1         1,000         181,390           pc         1         1,000         126.0         1,472/4           pc         1         1,000         121,000         12000           pc         1         1,000         120,000         120,000           pc         1         80         11,000         121,000           pc         1         1000         121,000         121,000           pc         1         1000         121,000         121,000           pc         1         1000         121,436         855/4           pc         1         1000         120,191         855/4 <td< th=""><th>Description</th><th>Unit</th><th>Quantity</th><th>Unit Price</th><th>Price B</th><th>Remark</th></td<>	Description	Unit	Quantity	Unit Price	Price B	Remark
Irigation Facilities       I:       Pipe Arrangement         1.       Pipe Arrangement         1-1       Pumping up Line $\&80$ $1-1$ Pumping up Line $\&80$ $1-1$ Pumping up Line $\&80$ $1-1$ Pumping up Line $\$80$ $1-1$ Distributing Line, PVC Pipe $m$ $56.3$ $1-2$ Distributing Line, PVC Pipe $m$ $157.5$ $1-2$ Distributing Line, PVC Pipe $1125.5 - 50$ $pc$		sqm	60,000	1.9	114,000	
Pipe $e80$ $e80$ $e80$ m $26.3$ $556.5$ $250$ $556.5$ $6.575$ $1.540/6$ $a80$ $a80$ $a80$ $a80$ $pc$ $356.5$ $300$ $1.000$ $3000$ $30,000$ $30,000$ $a80$ $a80$ $pc$ $a80$ $300$ $300$ $30,000$ $30,000$ $30,000$ $30,000$ $PVCPipe$ $a125$ $1.540/6$ $300$ $1.42,835$ $300$ $1.000$ $1.000$ $1.4724$ $1.700$ $57,960$ $1.4724$ $PVCPipe$ $a125$ $1.57.5$ $a125$ $1.4724$ $1.700$ $57,960$ $1.4724$ $1.46,368$ $1.4724$ $PVCPipe$ $a125$ $1.57.5$ $a125$ $1.4724$ $1.700$ $57,960$ $1.4724$ $1.46,368$ $1.6004$ $PVCPipe$ $a125$ $1.57.5$ $a125$ $1.4724$ $1.6000$ $57,960$ $1.6004$ $1.46,368$ $1.6000$ $PVCPipe$ $a125$ $1.57.5$ $a126$ $1.4724$ $1.6000$ $57,960$ $1.6004$ $1.46,368$ $1.6000$ $PVCPipe$ $a125$ $1.26.0$ $1.26 - 755$ $1.4724$ $1.6000$ $57,960$ $1.26$ $1.4724$ $1.6000$ $57,960$ $1.0000$ $PVCPipe$ $a10001.26.01.26 - 100001.21,4631.2000000000000000000000000000000000000$						
Pipe $\$80$ m $26.3$ $250$ $6,575$ $\$80$ , steelmm $556.5$ $1,540/6$ $142,835$ $\$80$ $\$80$ pc300 $30,000$ $\$80$ pc300 $30,000$ $\$80$ pc300 $30,000$ $\$80$ pc $100$ $1472/4$ $57,960$ $\$75$ m $157.5$ $1,472/4$ $57,960$ $\$75$ m $157.5$ $1,472/4$ $46,368$ $\$75$ m $125$ m $126,00$ $\$125$ m $126.0$ $1,472/4$ $46,368$ $\$75$ pc1 $1000$ $1,000$ $125 - 75$ pc1 $1000$ $1,000$ $\$75$ pc1 $800$ $121,463$ $\$75$ pc1 $800$ $121,463$ $\$75$ pc1 $800$ $121,463$ $\$75$ pc1 $1200$ $121,463$ $\$75$ pc1 $1200$ $121,463$ $\$75$ $125 - 100$ pc1 $1200$ $\$7,100$ $125$ $1000$ $121,463$ $\$7,100$ $125$ $1000$ $121,463$ $\$7,100$ $125$ $1000$ $121,463$ $\$7,100$ $125$ $1000$ $121,463$ <td>1. Pipe Arrangement</td> <td></td> <td></td> <td>•</td> <td></td> <td></td>	1. Pipe Arrangement			•		
$ \begin{array}{cccccc} 100 & 500 & 57,900 \\ 10-total & & & & & & & & & & & & & & & & & & &$	Pipe	EES	26.3 556.5 3	250 1,540/6 360	6,575 142,835 1.080	25 m x 1.05 530 m x 1.05
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	ଯା	2 2 2	100	300	30,000 900 181,390	
- aitto - $a_{125}$ $a_{120}$ $a_{120}$ $a_{120}$ $a_{125}$ $a_{100}$ $a_{125}$ $a_{121}$ <td>1-2 Distributing Line, PVC Pipe 1) Distributing pipe, @125</td> <td>Ш</td> <td>157.5</td> <td>1,472/4</td> <td>57,960</td> <td>X X E I</td>	1-2 Distributing Line, PVC Pipe 1) Distributing pipe, @125	Ш	157.5	1,472/4	57,960	X X E I
Tee $125 - 50$ pc11,0001,000- ditto - $125 - 75$ pc111,0001,000Bend $0125 - 75$ pc1110001,000Bend $0125 - 75$ pc11180180- ditto - $075$ pc11180180- ditto - $050$ pc118080Water-supply District, D - ENuter-supply Pipe $0100$ 121965/429,191Reducer $125 - 100$ pc1350350350Bend $0100$ pc1850857,571Water-supply Valvepc1350350350Bend $81,571$ 511,436 $57,180$		88	94.5	1,4/2/4 600/4	40,200	$\sim$
Bend $@125$ pc1700700- ditto - $@75$ $pc$ 1180180- ditto - $@50$ $pc$ 1180180- ditto - $b50$ $pc$ 18080- ditto - $b50$ $pc$ 18080Nater-supply Pipe $b100$ $pc$ 18080Reducer $125 \rightarrow 100$ $pc$ 1850850Bend $b100$ $pc$ 1850850Water-supply Valve $pt$ $5$ 11,43657,180Sub-total $pt$ $5$ 11,436 $87,571$	- 125 + 125 +	<u>ર</u> ્સ દ	<del></del>	1,000	1,000	t-1 t-2
- ditto - $650$ $pc$ 1 $80$ $80$ Sub-total       Sub-total $pc$ 1 $80$ $80$ Water-supply District, D - E       Water-supply Pipe $965/4$ $29,191$ Water-supply Pipe $9100$ $pc$ 1 $850$ $850$ Bend $0100$ $pc$ 1 $850$ $850$ $850$ Water-supply Valve $pt$ $5$ $11,436$ $57,180$ $87,571$		<u>ಜ</u> ಜ		700 180	180	b-2 b-3
Water-supply District, D - Em121 $965/4$ $29,191$ Water-supply Pipe $\vartheta 100$ m121 $965/4$ $29,191$ Water-supply Pipe $\vartheta 100$ pc1 $850$ $850$ Bend $\vartheta 100$ pc1 $350$ $350$ Water-supply Valvept $5$ $11,436$ $57,180$ Sub-total $87,571$	  	2	<b>y</b>	80	80 121,463	<b>b-</b> 6
125 → 100     pc     1     850     850       ∞100     pc     1     350     350       wpply Valve     pt     5     11,436     57,180       Sub-total     pt     5     87,571		ш	121	965/4	29.191	110 m x 1.1
upply Valve 21,436 57, Sub-total 87,	125 + 125 +	1 Q Q		850 350	850 350	1-1
	upply Valve	<u>ረ ኳ</u>	ŝ	, <del>, ,</del> , , , , , , , , , , , , , , , ,	57,180 87,571	

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Remark	90 m x 1.1 r-2 30 m x 1.05	155 m x 1.1 b-5	85 m x 1.1 r-3 30 m x 1.05	160 m x 1.1 30 m x 1.05
Price B	14,850 500 29,812 4,725 7,153 57,040	25,575 180 52,171 77,926	10,051 300 3,386 6,023 47,076	11,44043,1552,0484,82361,466 $633,932$
Unit Price	600/4 500 7,453 600/4 7,153	600/4 180 7,453	430/4 300 6,829 430/4 6,023	260/4 4,795 4,823 4,823
Quantity	99 1 31.5	170.5 1 7	93.5 1 31.5 1	176 9 31.5
Unit	田吹け田は	E 2 I	田の政府は	明が明ば
Description	Water-supply District, E - F Water-supply Pipe $0.75$ Reducer 100 $- 75$ Water-supply Valve $0.75$ Sand-flash Pipe $0.75$ Sand-flash Valve Sub-total	Water-supply District, A - B Water-supply Pipe Ø75 Bend Ø75 Water-supply Valve Sub-total	Water-supply District, B - C Water-supply Pipe ∞65 Reducer 75 → 65 Water-supply Valve Sand-flash Pipe ∞65 Sand-flash Valve Sub-total	Water-supply District, K - L Water-supply Pipe ø50 Water-supply Valve Sand-flash Pipe ø50 Sand-flash Valve Sub-total Middle-total
	3	4)	2	(9
	Unit Quantity Unit Price Price B	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Unit Quantity Unit Price Price B To per 1 500 F-2 500 F-2 m 31.5 $600/4$ 14,850 90 m x pt 31.5 $600/4$ 4,725 30 m x pt 1 7,153 7,153 7,153 30 m x m 170.5 $600/4$ 25,575 155 m y pt 7,453 52,171 pt 7,453 52,171 pt 7,453 52,171	DescriptionUnitQuantityUnit PricePrice BWater-supply District, E - Fm99 $600/4$ $14,850$ $90 \text{ m x}$ Water-supply Pripe $e75$ m $99$ $600/4$ $14,850$ $90 \text{ m x}$ Water-supply Pripe $e75$ pc $1$ $7,153$ $29,812$ $72$ Water-supply Valve $e75$ m $31.5$ $600/4$ $14,850$ $90 \text{ m x}$ Water-supply Valve $e75$ pc $1$ $7,153$ $29,812$ $72,704$ Water-supply Valve $e75$ m $31.5$ $600/4$ $4,725$ $30 \text{ m x}$ Water-supply District, A - Bm $170.5$ $600/4$ $25,575$ $155 \text{ m}$ Water-supply Pripe $e75$ m $170.5$ $600/4$ $25,575$ $155 \text{ m}$ Water-supply Pripe $e75$ pc $1$ $7,153$ $57,040$ $57,040$ Water-supply Valve $e75$ pc $1$ $7,453$ $52,775$ $155 \text{ m}$ Water-supply Valve $655$ pc $1$ $7,453$ $52,775$ $155 \text{ m}$ Water-supply Valve $655$ pc $1$ $7,453$ $52,775$ $155 \text{ m}$ Water-supply Valve $655$ pc $1$ $7,453$ $52,775$ $155 \text{ m}$ Water-supply Valve $655$ pc $1$ $7,453$ $52,775$ $155 \text{ m}$ Water-supply Valve $75 - 65$ pc $1$ $7,453$ $27,316$ $50.053$ Water-supply Valve $5023$ $6023$ <

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	Description		Unit	Quantity	Unit Price	Price B	Remark
<b>5</b>	Pipe Setting, L 1,580 m Excavation by Machine Back Hilling - ditto - Setting - ditto -	(by Machine) (by Manpower) (Steel) (PVC) Sub-total	а сит сит сит	1,011.2 809 202.2 530 1,050	19.5 10.5 50.3 29.3 11	19,718 8,495 10,171 15,529 11,550 65,463	0.64 m <sup>3</sup> x 1,580 1,011.2 x 0.8 1,011.2 x 0.2
ŝ	Other Facilities				•		
3-1	Water Tank Concrete Cobble Stones for Bed Iron Bar Wooden Form Su	Bed Sub-total	m <sup>3</sup> kg sqm	29.9 6 1,494.9 128.8	1,235.9 542.3 20.6 266.3	36,953 3,254 30,795 34,299 105,301	
4 4 4 4 7	Pump House Water Pump	Sub-total Total	set	<b> </b>		56,000 200,000 361,301 1,060,696	
[6] Ru	Run-off Plot		. *		- 	- - -	
 	Foundation Work Land Grading Run-off Plot		cum set	800 6,400 18	14.6 1.9 10,202	11,680 12,160 183,636	20 x 0.5 ÷ 2 x 160 160 x 40 ref. Unit Cost No. 21
		Total				207,476	

	Description	Unit	Quantity	Unit Price	Price B	Remark
Bui	[7] Buildings					
- ciri	Field Laboratory Survey and Storage House Machinery Store House Sub-total	set set		· · ·	$\begin{array}{c} 1,063,000\\ 1,189,000\\ 154,000\\ 2,406,000\end{array}$	
4	Dry Yard Concrete Iron Bar ø6 m/m, 12 m x 90 - ditto - 18 m x 90 Cobble Stones for Bed Sub-total	cum kg cum	21.6 251.7 251.7 21.6	1,235.9 20.6 20.6 542.3	26,695 5,185 5,185 11,714 48,779	
	Total				2,454,779	

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## UNIT COST of LABOUR

### December, 1989

No.	Item	Unit	Perdiem
			Bah
1.	Labour	md	90
2.	Foreman	md	300
3.	Operator (Heavy Equipment)	md	280
4.	Assistant of Operator	md	200
5.	Steel Worker	md	250
6.	Mechanician	md	250
7.	Carpenter	md	250
8.	Masonry	md	250
9.	Driver	md	220

#### UNIT COST of MATERIALS

December, 1989

No.	Item	Unit	Cost	Remark
			(Baht)	
1.	Aggregate			
	Sand	m <sup>3</sup>	350	
	Gravel	m <sup>3</sup>	300	
2.	Cobble-stone	m <sup>3</sup>	300	
3.	Cement	bag	90	1 bag = 50 kg
4.	Iron Bar	kg	15	
5.	Wire for Binding	kg	20	
6.	Nail	kg	20	
. 7.	Laterite	m <sup>3</sup>	100	
8.	Fuel			
	Gasoline	liter	8.80	
	Diesel	liter	6.50	
9.	Block			
	(90 x 190 x 390)	PC	5.50	
	(70 x 190 x 390)	PC	3.50	
10.	Brick	PC	0.40	
11.	Lumber	m <sup>3</sup>	7,800	for frame
12.	Timber	m <sup>3</sup>	12,400	
13.	Plywood	m <sup>2</sup>	240	thickness 6 mm
14.	Log	m <sup>3</sup>	6,500	
15.	Wire Mesh	m <sup>2</sup>	120	space 2", #11
16.	Concrete pipe (\$300)	PC a	160	lit. = 1.0 m
17.	Concrete pipe (\$500)	PC	300	lit. = 1.0 m
18.	Steel pipe (\$800)	'n	1,540/6	
19.	PVC pipe (φ125)	m	1,472/4	
20.	PVC pipe (φ100)	m	965/4	
21.	PVC pipe (\$75)	m	600/4	
22.	PVC pipe (\$65)	m	430/4	
23.	PVC pipe (φ50)	m	260/4	

Explanation	4											
75.2 B/m <sup>3</sup>	Calculated by 1 m <sup>3</sup>	Remarks										
		Cost		50.4	18	68.4	6.8	75.2				
	ver	Unit Cost		60	300				 	 		
UNIT COST OF	by Manpov (th Gravel)	Unit		pm	pm	<u>.</u>	%		 		<u></u>	
, NND	Excavation by Manpower (Sand with Gravel)	Quantity		0.56	0.06		01		 	 		
No. 1		Item	1. Workers	Labour	Foreman	Sub-total	2. Temporary Works and Others	Total				

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	Explanation	· · · · · · · · · · · · · · · · · · ·			ß	-								
33.8 B/m <sup>3</sup>		Calculated by 10 m <sup>3</sup>	Remarks		Not include compacting					· . · .				
			Cost		229.5	78	307.5	30.8	338.3	33.8			· · · · · · · · · · · · · · · · · · ·	
			Unit Cost		60	300				1 m <sup>3</sup> =				
UNIT COST	ц	Manpower	Unit		pur	pm		%				•		
UNIT	0	Banking by Manpower	Quantity	· · ·	2.55	0.26		10						· · ·
No. 2			Item	1. Workers	Labour	Foreman	Sub-total	2. Temporary Works and Others						

Rwlanstion				- -								
12.7 <b>B</b> /m <sup>2</sup>	Calculated by $10 \text{ m}^2$	Remarks		Include tamping								
		Cost		85.5	30.0	115.5	11.6	127.1			- -	
	<u>ې</u>	Unit Cost		60	300			1 m <sup>2</sup> =	· · · · · · · · · · · · · · · · · · ·	**************************************		
COST	tce of Slope) ag Slope)	Unit		pm	md		%					
UNIT COST OF	Smoothing Face of Slope (For Banking Slope)	Quantity		0.95	0.1		10					
No. 3		ltem	1. Workers	Labour	Foreman	Sub-total	2. Temporary Works and Others	Total				

. 10.00 March 10.00

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	Explanation				·			· ·			•	· · · · · · · · · · · · · · · · · · ·			
	4.2 B/m <sup>2</sup>	Calculated by $10 \text{ m}^2$	Remarks										· · · · · · · · · · · · · · · · · · ·		
		· ·	Cost		29.3	6	38.3	3.8	47 1	4.2			 		
		ð	Unit Cost		6	300		 		1 m <sup>2</sup> =			 		
EU CO	OF OF	Smoothing Face of Slope (For Cutting Slope)	Unit		pur	pm		%				· · ·	· · ·		
	INNO	moothing I (For Cutti	Quantity	· · · ·	0.325	0.03		01							·
	No. 3-1	õ	Itern	1. Workers	Labour	Foreman	Sub-total	2. Temporary Works and Others	Total Total						

	Explanation		· · · · · · · · · · · · · · · · · · ·	· · ·							
2.9 B/m <sup>2</sup>	Calculated by 100 m <sup>2</sup>	Remarks			· · · · · · · · · · · · · · · · · · ·						
		Cost		202.5	60	262.5	26.3	288.8	2.9		<u> </u>
	S. C.	Unit Cost		06	300	· · · · · · · · · · · · · · · · · · ·			1 m <sup>2</sup> =	- - - - - - -	
UNIT COST	of Road Face	Unit		mđ	pm	-	%				
TINU	Arrangement of Roa	Quantity		2.25	0.2		10				
No. 4		ltem	1. Workers	Labour	Foreman	Sub-total	2. Temporary Works and Others	Total			

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Explanation				•		• • •				· · · · · · · · · · · · · · · · · · ·			
4.0 B/m <sup>2</sup>	Calculated by $100 \text{ m}^2$	Remarks		· · ·									
	U	Cost		270	06	360	36	396	4.0		• <u>••••••</u> ••	<u> </u>	
	ч	Unit Cost		90	300		· · · · · · · · · · · · · · · · · · ·		1 m <sup>2</sup> =			· · · · · · · · · · · · · · · · · · ·	
UNIT COST OF	Spreading by Manpower (for Ballasting)	Unit		md	pm		%						
	Spreading b (for Ba	Quantity		3.0	0.3	· .	10						
No. 4-1		Ítem	1. Workers	Labour	Foreman	Sub-total	2. Temporary Works and Others	Total					

Explanation Calculated by  $10 \text{ m}^3$ 50.3 B/m<sup>3</sup> Remarks 337.5 120.-457.5 45.8 503.3 50.3 Cost Unit Cost  $1 m^{3} =$ 06 300 Back Hilling by Manpower Unit pm рш UNIT COST OF % 3.75 0.4 Quantity 10 2. Temporary Works and Others دىەد. Foreman Sub-total Item Labour 1. Workers Total No. 5

	Explanation	4						<u> </u>		•			· · · · · · · · · · · · · · · · · · ·				
·			- <u>1-</u> 1									· · · · · · · · · · · · · · · · · · ·		•	-		
	50.9 B/m <sup>2</sup>	Calculated by $10 \text{ m}^2$	Remarks	· · · · · · · · · · · · · · · · · · ·		· .									· · ·		
			Cost		153	.09	213			250	C 74	40.0	509.3	50.9			
			Unit Cost		6	300				25				1 m <sup>2</sup> =			
	COST	acing	Unit		md	md				$m^2$	č	8					
	UNIT COST OF	Sod Facing	Quantity		1.7	0.2				10	< 	2		****			•
			n				otal					l emporary works and Umers	· · · · · · · · · · · · · · · · · · ·				
	No. 6		Item	1. Workers	Labour	Foreman	Sub-total		2. Materials	Sođ		J. I emporary W	Total				

Explanation								5 lit/day x 0.15			200 B/day					
22.5 B/m <sup>3</sup>	Calculated by 10 m <sup>3</sup>	Remarks											· · · · · · · · · · · · · · · · · · ·			
		Cost	66	30	129	· · ·	37.5	6.6	1.0	45.1	30.0	20.4		224.5	22.5	
	Cer	Unit Cost	6	300			250	8.8			200				1 m <sup>3</sup> =	
T COST OF	y Manpow or 90 kg)	Unit	 pm	pm		•	md	liter	%		ď	%				
ONIT UNIT	Compacting by Manpower (Compactor 90 kg)	Quantity		0.1			0.15	0.75	0.15		0.15	10				
<b>No.</b> 7	<b>U</b>	Item	1. Workers Labour	Foreman	Sub-total	2. Operation Cost	Operator	Fuel	Others	Sub-total	3. Depreciation	4. Temporary Works and Others		Total		
		<u>L -                                   </u>			<u>.</u>											

					•		· .	
Explanation				2 				
	l = 60 m	Remarks	per m <sup>3</sup>	per m <sup>3</sup>	per m <sup>3</sup>	per m <sup>3</sup>	per ton	
		Cost	39.6	48.6	48.6	18.9	23.4	
		Unit Cost	06	06	06	06	06	
COST	Manpower	Unit	pm	pm	pm	pur	'nď	
UNIT COST OF	Hauling by Manpower	Quantity	0.44	0.54	0.54	0.21	0.26	
				· · ·	· · · · · · · · · · · · · · · · · · ·			
No. 8		Item	l. Sand	2. Gravel	3. Cobble Stone	4. Wood	5. Cement and Others	

Explanation		· · · · · · · · · · · · · · · · · · ·												
1,235.9 B/m <sup>3</sup>	Calculated by 10 m <sup>3</sup>	Remarks												
		Cost	- - -	5,850 76.1	1,050	118.8	1,830	296.5 9,221.4	· .	351 120	1,071	29.0	20 X 20 X	0.0
	ic ixer)	Unit Cost		90 23.4	350	39.6	300	48.6		000 200 200 200 200 200 200 200 200 200	007	8. 8	8.8 8.8	
UNIT COST OF	Reinforced Concrete ixed by Portable Mix	Unit		bag t			с Н	m3		p m m		liter	liter %	<u>R</u> .
C	Reinforced Concret (Mixed by Portable Mi	Quantity		65 3.25	<i>ო</i>		6.1	6.1			t 1	3.3	50 S0	~~
No. 9		Item	1. Materials	Cement (325 kg/m <sup>3</sup> ) Hauling cost	Sand	Hauling cost	Aggregate	Hauling cost Sub-total	2. Workers		Mecuanician Sub-total	3. Operation Cost Fuel (Mixer)	Others Fuel (Vibrator)	Outers Sub-forts

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$										
UNIT COST UNIT COST Reinforced Concrete (Mixed by Portable Mixer) (Mixed by Portable Mixer) (Mixer) (Mixed by Portable Mixer) (Mixe				· · · · · · · · · · · · · · · · · · ·					Explanation	
UNIT COST OF Reinforced Concrete (Mixed by Portable Mixer) (Mixed by Portable Mixer) (Mixed by Portable Mixer) 0.89 d 540 0.89 d 540 112 12 12					(1+2+3+4) x 0.15		Remarks	Calculated by 10 m <sup>3</sup>	1,235.9 B/m <sup>3</sup>	. •
UNIT COST OF OF Mixed by Portable Mixer (Mixed by Portable Mixer 0.89 d 0.89 d			1,235.9	12,359.3	1,612.1	356.4 60.5 416.9	Cost			
and Others	 		1 m <sup>3</sup> =			540 68	Unit Cost	<b>rt</b> )		
and Others				• • • •		סיסי	Unit	l Concrete rtable Mixe	COST	
and Others		- m	-			0.66 0.89	Quantity	Reinforced Mixed by Po	LINU	
No. 9 (continued) 4. Depreciation C Mixer Vibrator S. Temporary Wc Total				Total	5. Temporary Works and Others	<ul> <li>4. Depreciation Cost Mixer Vibrator Sub-total</li> </ul>	Item		No. 9 (continued)	

Explanation													<b>-</b>					
1,143.1 B/m <sup>3</sup>	Calculated by $10 \text{ m}^3$	Remarks									Refer to No. 9.	*			· .			
- - -		Cost		4,950	64.4	1,050	118.8	1,920	311.0	8,414.2	1,071	37.9	416.9	1,491	11,431	1,143.1		
	Ĵ	Unit Cost		06	23.4	350	39.6	300	48.6				<u> </u>			1 m <sup>3</sup> =		
cost	oncrete ttable Mixer)	Unit		bag	ه	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>					%				
UNIT COST OF	Plain Concrete (Mixed by Portable M	Quantity		55	2.75	ŝ	ŝ	6.4	6.4			· ·		15				
No. 10	<b>7</b>	Ìtem	1. Materials	Cement (275 kg/m <sup>3</sup> )	Hauling cost	Sand	Hauling cost	Aggregate	Hauling cost	Sub-total	2. Workers		4. Depreciation Cost	5. Temporary Works and Others	Total			

Explanation	<b>1</b>			:													
1,011.3 B/m <sup>3</sup>	Calculated by 10 m <sup>3</sup>	Remarks								Doforto No 0	NGIGL 10 100. 7.	2					
	*.	Cost		3,600	46.8	1,155	130.7	2,010	325.6	7,268.1	37.9	416.9	1,319.1	10,113.0	1,011.3		
• •	<b>(1</b>	Unit Cost		90	23.4	350	39.6	300	48.6						1 m <sup>3</sup> =		
UNIT COST OF	Lean-mix Concrete xed by Portable Mixe	Unit		bag	•••	m3	m <sup>3</sup>	8	B3				%				
LINU	Lean-mix Concrete (Mixed by Portable Mixer)	Quantity		40	2.0	3.3	3.3	6.7	6.7		~		15			-	
No. 11	5	Item	1. Materials	Cement (200 kg/m <sup>3</sup> )	Hauling cost	Sand	Hauling cost	Aggregate	Hauling cost		2. WULKELS 3. Operation Cost	4. Depreciation Cost	5. Temporary Works and Others	Total			

	LXplanation				· · ·										
1,719.8 B/m <sup>3</sup>	Calculated by 1 m <sup>3</sup>	Remarks								· · ·					
	n an	Cost		954	12.4	367.5	41.6	1,375.5		60	30	120	224.3	1,719.8	
		Unit Cost		1,800	23.4	350	39.6			06	300				
ISOS	(1:3) fanpower	Unit		ton	ton	m <sup>3</sup>	m <sup>3</sup>			md	Ind		%		
UNIT COST OF	Mortar (1:3) (Mixed by Manpower)	Quantity		0.53	0.53	1.05	1.05			1.0	0.1		15		
No. 12		Item	1. Materials	Cement	Hauling cost	Sand	Hauling cost	Sub-total	2. Workers	Labour	Foreman	Sub-total	3. Temporary Works and Others	Total	

UNIT COST 20.6 B/kg Explanation	Processing and Assembling of Reinforced Iron Bar Calculated by 1 ton	tity Unit Unit Cost Cost Remarks		1.03 ton 15,000 15,450		15,590		5.9 md 250 1,475	5.9 md 90 531		2,366	2,693.4	20,649.4	1 kg =	
No. 13 U	Processing Reinf	Item	1. Materiais	rced I.B.	Wire for binding	Sub-total	2. Processing and Assembling	···. ······	Labour	Foreman	Sub-total	3. Temporary Works and Others 15	Total		

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	G							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Explanation				(1+2) x 0.03			
UNTT COST       UNTT COST       Wooden Form       Main       0.113       me       0.113       main       0.154       main       0.154       main       0.154       main       2.2       Main       1.5       96       90       15       90       16       17       18       19       10       10       11       12       13   <	266.3 B/m <sup>2</sup> Calculated by 10 m <sup>2</sup>	Remarks	1,274 x 27% 734.5 x 27%	2,644.2 x 16% 1,001 x 16%		3		
UNIT COST         UNIT COST       UNIT COST         OF       OF         Wooden Form       Wooden Form         me       0.196       m <sup>3</sup> al       0.113       m <sup>3</sup> al       0.154       m <sup>3</sup> al       3       %         al       3       %         al       3       %         al       3       %         al       3       %       %         al       3       %       %         tks and Others       15       %       %		Cost	344 198.3 60 702.3	423.1 160.2 22 16 75	696.3 42.0	560 186.3 129 875.3 347.4	2,663.3	766 3
CUNTFCC       UNITFCC       UNITFCC       OF       O       O       Is       1.1       0.133       0.133       0.133       0.133       Is       1.5       1.5       1.5		Unit Cost	6,500 6,500 20	7,800 6,500 20 50		250 300 300		12 =
tiks and Others	F F orm n Form	Unit	kg n 3	kg n <sup>3</sup> liter	%	рш рш %		*
m late rame total lo orks and Others	UNIT O Woode	Quantity	0.196 0.113 3	0.339 0.154 1.1 0.8 1.5	m	2.24 2.07 0.43 15		
No. 14 No. 14 Iter Iter Nooden f Nooden f Iron nail Nooden f Iron nail Sub- Square tin Sub- Sub- Sub- Sub- Sub- Sub- Sub- Sub-	14	Item	She	Square timber Log Nail Wire Oil		Ten Ten	Total	

Wire Box for Cabionade (Type I)         Calculated by 1 set           Term         Quantity         Unit         Unit         Cost         Calculated by 1 set           Term         Quantity         Unit         Unit         Cost         Calculated by 1 set           Term         Quantity         Unit         Unit         Unit         Cost         Remarks           Term         Quantity         Unit         Unit         Oast         Cost         Remarks           mesh $0.3$ md         300         234.9         90         234.9         Area of wire mesh           mesh $0.3$ md         300         234.9         Space 2" #3.05 (#11)         Capacity of wire b           destore $0.3$ md         300         234.9         Space 2" #3.05 (#11)         Capacity of wire b           destore $0.73$ m3         300         219.7         Space 2" #3.05 (#11)         Capacity of wire b           mesh $0.73$ m3         300         219.7         Space 2" #3.05 (#11)         Capacity of wire b           destore $0.73$ m3         48.6         35.5         \$234.5         Oabio (ab) = a         Oabio (ab) = a	No. 15	UNIT COST OF	COST F			1,974.9 Bset	Frmlanation
ItemItemQuantityUnitUnitUnit CostCostRemarksWorkers1261md90234.90.45 x.0.9 x.2 =Workers2.61md90234.90.45 x.0.9 x.2 =Workers0.3md300324.90.45 x.0.9 x.2 =Sub-total0.3md300234.90.45 x.0.9 x.2 =Materials0.3md300234.90.45 x.0.9 x.2 =Materials0.3md3002190.45 x.0.9 x.2 =Materials0.73m33002190.45 x.0.9 x.2 =Sub-sub-total0.73m33002190.45 x.0.9 x.2 =Sub-sub-total0.73m348.6254.5802.5 L = 1.2Sub-sub-total3piece70210810.71.45 x.0.9 sc.2 =Nortar0.028m31,719.848.20.1 x.1 + 4 x 1.2x3ConstructingSub-sub-total3318.20.1 x 0.1 X med x 1.2x3Scrifting0.81 x 0.9 =Nortar0.028m31,719.848.20.1 x 0.1 5ScriftingSub-sub-total3332.41,374.91.374.4Scrifting storesTotal1.392.41.392.41.392.4Scrifting storesSub-total15%257.6(1+2) x 0.15Scrifting storesTotal1.374.91.374.9Scrifting storesScrifting stores		Wire Box fo (Typ	r Gabionad ee I)	Ø		Calculated by 1 set	
Workers         Workers         Area of wire mesh 0.45 x 0.9 x 2.0 x 2 = 0.9 x 2.0 x 2 = 0.45 x 0.9 x 2 = 0.01 m bar           Materials         6.21 m2 0.73 m3 0.73 m3 0.73 m3 0.73 m3 0.73 m3 0.73 m3 0.73 m3 0.73 m3 0.745 0.745 x 0.9 x 2 = 0.45 x 0.9 x 2 = 0.81 x 0.9 = 0.81 x 0.1 x = 4 x 1.2 x 3 0.81 x 0.9 = 0.81 x 0.1 x = 4 x 1.2 x 3 0.81 m bar           Total         1,719.8 m3 0.028 m3	Item	Quantity	Unit	Unit Cost	Cost	Remarks	
Total         2.61         md         90         234.9         0.45 x.0.9 x.2 = 0.95 x.2.0 x.2 = 0.45 x.0	1 M/Autors						
rotentati Sub-total         0.45 x 2.0 x 2 = Total         70 cmain         0.45 x 2.0 x 2 = Total         Total           Materials         6.21 $m^2$ 120         74.5         Space 2" #3.05 (#11)         0.45 x 0.9 x 2.0         Total           Wite mesh         6.21 $m^2$ 120         74.5         Space 2" #3.05 (#11)         0.45 x 0.9 x 2.0 $\pi$ Wite mesh         6.21 $m^2$ 120         74.5         Space 2" #3.05 (#11)         0.45 x 0.9 x 2.0 $\pi$ <	I. Wolnets Labour	2.61	pu	06	234.9		
Materials         Materials $6.21$ $m^2$ $120$ $745.2$ Space 2" $@3.05$ (#11)         Capacity of wire bo 0.45 x 0.9 x 2.0           Wire mesh $6.21$ $m^2$ $120$ $745.2$ Space 2" $@3.05$ (#11)         Capacity of wire bo 0.45 x 0.9 x 2.0           Sub-sub-total $0.73$ $m^3$ $300$ $219$ $74.5$ $819.7$ $-45.5 \times 0.9 \times 2.0$ Cobble stone $0.73$ $m^3$ $300$ $219$ $74.5$ $819.7$ $-45.5 \times 0.9 \times 2.0$ Cobble stone $0.73$ $m^3$ $48.6$ $35.5$ $819.7$ $0.45 \times 0.9 \times 2.0$ Total $0.73$ $m^3$ $48.6$ $35.5$ $825, L = 1.2$ $0.81 \times 0.9 =$ Flou bar $3$ $piece$ $20$ $60$ $810.0$ $L = 0.5$ $0.81 \times 0.9$ Mortar $0.028$ $m^3$ $1,719.8$ $48.2$ $0.1 \times 0.1 \times 1.2 \times 3$ $0.9 \times 1.2 \times 3$ Sub-sub-total $5.5$ $0.1 \times 0.1 \times 1.2 \times 3$ $0.1 \times 0.1 \times 1.2 \times 3$ $0.1 \times 0.1 \times 5$ $0.1 \times 0.1 \times 5$ Total	roreman Sub-total	<u>,</u>		000	324.9		
Wire mesh $6.21$ $m^2$ $120$ $74.5.2$ Space 2" $a3.05$ (#11)Capacity of wire by $0.45 \times 0.9 \times 2.0$ Selvedge and binding wire $10$ $\%$ $120$ $74.5$ Space 2" $a3.05$ (#11)Capacity of wire by $0.45 \times 0.9 \times 2.0$ Sub-sub-total $0.73$ $m^3$ $300$ $219$ $0.45 \times 0.9 \times 2.0$ Cobble stone $0.73$ $m^3$ $300$ $219$ $0.45 \times 0.9 \times 2.0$ Hauling cost $0.73$ $m^3$ $48.6$ $35.5$ $0.45 \times 0.9 \times 2.0$ Iron bar $0.73$ $m^3$ $48.6$ $35.5$ $a25, L = 1.2$ $0.81 \times 0.9 =$ Not br $5ub-sub-total$ $3$ piece $70$ $210$ $a25, L = 1.2$ $0.81 \times 0.9 =$ Not br $5ub-sub-total$ $3$ piece $20$ $60$ $a100, L = 0.5$ $0.81 \times 0.9 =$ Not tar $0.028$ $m^3$ $1,719.8$ $48.2$ $0.100, L = 0.5$ $0.100, L = 0.5$ Sub-sub-total $1.392.4$ $1.392.4$ $1.392.4$ $1.392.4$ $0.100, L = 0.5$ Sub-sub-total $1.392.4$ $1.392.4$ $0.100, L = 0.5$ $0.100, L = 0.5$ Sub-sub-total $0.028$ $m^3$ $1.719.8$ $48.2$ $0.100, L = 0.5$ Sub-sub-total $1.779.8$ $257.6$ $(1+2) \times 0.15$ $70.13$ Total $1.974.9$ $1.974.9$ $1.974.9$ $70.15$			• .				17 17.0 IDIG
Servedge and ontoming write       10       70 $14.7$ $19.7$ $19.7$ $0.45 \times 0.9 \times 2.0$ Sub-sub-total $0.73$ $m^3$ $300$ $219$ $0.45 \times 0.9 \times 2.0$ Cobble stone $0.73$ $m^3$ $48.6$ $35.5$ $0.73$ $m^3$ Cobble stone $0.73$ $m^3$ $48.6$ $35.5$ $0.81 \times 0.9 =$ Fron bar $3$ piece $70$ $210$ $254.5$ $2254.5$ $0.81 \times 0.9 =$ Fron bar $3$ piece $70$ $210$ $254.5$ $0.81 \times 0.9 =$ Nortar $0.028$ $m^3$ $1,719.8$ $48.2$ $0.1 \times 0.1 \times 1-2 \times 3$ Constructing         Nortar $0.028$ $m^3$ $1,719.8$ $48.2$ $0.1 \times 0.1 \times 1-2 \times 3$ Constructing         Sub-total $0.028$ $m^3$ $1,719.8$ $48.2$ $0.1 \times 0.1 \times 1-2 \times 3$ Constructing         Sub-total       Sub-total $1,392.4$ $1,392.4$ $1,392.4$ $0.1 \times 0.1 \times 1-2 \times 3$ Constructing         Temporary Works and Others $15$ $\%$ $257.6$ $(1+2) \times 0.15$		6.21	ы <sup>2</sup>	120	745.2	Space 2" ø3.05 (#11)	Capacity of wire box
Cobble stone $0.73$ $m^3$ $300$ $219$ $N$ Hauling cost $0.73$ $m^3$ $48.6$ $35.5$ $35.5$ $Volume of cobbleSub-sub-total0.73m^348.635.535.5Volume of cobbleSub-sub-total3piece70210224.5a25, L = 1.20.81 \times 0.9 =Iron bar3piece70210a25, L = 1.20.81 \times 0.9 =Nortar0.028m^31,719.848.20.1 \times 0.1 \times \pi \div 4 \times 1.2 \times 3ConstructingSub-total0.028m^31,719.848.20.1 \times 0.1 \times \pi \div 4 \times 1.2 \times 3ConstructingSub-total0.028m^31,719.848.20.1 \times 0.1 \times \pi \div 4 \times 1.2 \times 3ConstructingSub-total1,392.41,392.41,392.40.1 \times 0.1 \times 5 \times 0.15Packing stonesTotal1,974.91.974.91.974.90.1 \times 0.15Packing stones$	Selvedge and binding wire Sub-sub-total	D T	°		819.7		0.45 x 0.9 x 2.0
Hauling cost $0.73$ $m^3$ $48.6$ $35.5$ Volume of cobbleSub-sub-total $3$ $254.5$ $254.5$ $260$ $825$ , L = 1.2Norbar $3$ piece $70$ $210$ $825$ , L = 1.2 $0.81 \times 0.9 =$ PVC pipe $3$ piece $20$ $60$ $8100$ , L = $0.5$ $0.81 \times 0.9 =$ Mortar $0.028$ $m^3$ $1,719.8$ $48.2$ $0.1 \times 0.1 \times \pi \div 4 \times 1.2 \times 3$ ConstructingSub-sub-total $0.028$ $m^3$ $1,719.8$ $48.2$ $0.1 \times 0.1 \times \pi \div 4 \times 1.2 \times 3$ constructingSub-total $1,392.4$ $1,392.4$ $1,392.4$ $0.1 \times 0.1 \times \pi \div 4 \times 1.2 \times 3$ constructingTemporary Works and Others $15$ $\%$ $257.6$ $(1+2) \times 0.15$ Packing stonesTotal $1.974.9$ $1.974.9$ $1.974.9$ $1.974.9$ $1.974.9$	င်ရှိ	0.73	m <sup>3</sup>	300	219		= 0.81 m
Iron bar3piece70 $210$ $a25$ , L = 1.2 $0.81 \times 0.9 =$ PVC pipe3piece20 $60$ $a100$ , L = 0.5 $0.81 \times 0.9 =$ Nortar0.028m <sup>3</sup> 1,719.8 $48.2$ $0.1 \times 0.1 \times 7.4 \times 1.2 \times 3$ ConstructingSub-sub-total0.028m <sup>3</sup> 1,719.8 $48.2$ $0.1 \times 0.1 \times 7.4 \times 1.2 \times 3$ ConstructingSub-sub-total1,392.41,392.41,392.4for wire boxSettingTemporary Works and Others15%257.6 $(1+2) \times 0.15$ Packing stonesTotal1.974.91.974.91.974.9Total	Hauling cost	0.73	m3	48.6	35.5		bble
PVC pipe         3         piece         20         60 $@100$ , L = 0.5           Mortar         0.028         m <sup>3</sup> 1,719.8         48.2         0.1x 0.1 xm÷4 x 1.2x3         Constructing of wire box           Sub-total         0.028         m <sup>3</sup> 1,719.8         48.2         0.1x 0.1 xm÷4 x 1.2x3         Constructing of wire box           Sub-total         1,392.4         1,392.4         56tting stones         70.15         76ting stones           Total         1,392.4         1,974.9         1.974.9         70.15         70.15	Iror	, ,	piece	10	210	ø25, L = 1.2	$0.81 \times 0.9 = 0.73  \mathrm{m}^3$
Mortar         0.028         m <sup>3</sup> 1,719.8         48.2         0.1x 0.1 xT÷4 x 1.2x3         Constructing           Sub-sub-total         318.2         0.1x 0.1 xT÷4 x 1.2x3         Constructing         of wire box           Sub-total         1,392.4         1,392.4         Setting         Setting           Temporary Works and Others         15         %         257.6         (1+2) x 0.15         Packing stones           Total         1.974.9         1.974.9         1.974.9         1.974.9         Total	• •	ςς,	piece	<u>50</u>	60	B = 0.5	
Sub-sub-total518.4of wire boxSub-total1,392.4SettingTemporary Works and Others15%257.6Total1.974.91.974.9	Mortar	0.028	m <sup>3</sup>	1,719.8	48.2	0.1x 0.1 хт÷4 х 1.2x3	50
Temporary Works and Othens 15 % 257.6 (1+2) x 0.15 Packing stones Total Total	Sub-total Sub-total				518.2 1.392.4		Xod
Total		Y	20		757 6	(1±3) ~ 0.15	stones
		<u>;</u>	8		0.107	(1	
	Total			· · · · · · · · · · · · · · · · · · ·	1,974.9		

	Exmlanation			Area of wire mesh $0.45 \times 0.9 \times 2 = 0.81$ $0.9 \times 2.4 \times 2 = 4.32$ $0.45 \times 2.4 \times 2 = 2.16$ $0.45 \times 2.4 \times 2 = 2.16$ Total 7.29 m <sup>2</sup>	Capacity of wire box $0.45 \times 0.9 \times 2.4$ = 0.972	Volume of cobble stone $0.972 \times 0.9 = 0.87 \text{ m}^3$	Constructing of wire box Setting			
	2,228.1 B/set	Calculated by I set	Remarks		Space 2", ø3.05 (# 11)		<pre></pre>		(1+2) x 0.15	
			Cost	263.7 90 353.7	874.8 87.5 87.3	261 42.3 303.3	2100 60 48.2	318.2 1,583.8	290.6	2,228.1
		ep	Unit Cost	300 300	120	300 48.6	70 20 1.719.8			
· • • •	COST DF	r Gabiona e II)	Unit	ра Ца	m2 %	m <sup>3</sup>	piece piece m <sup>3</sup>		%	
	UNIT O	Wire Box for Gabionade (Type II)	Quantity	2.93 0.3	7.29 10	0.87 0.87	3 3 0.028		15	
	No. 16		Item	1. Workers Labour Foreman Sub-total	<ol> <li>Materials</li> <li>2-1 Wire mesh</li> <li>Selvedge and binding wire Sub-sub-total</li> </ol>	2-2 Cobble stone Hauling cost	2-3 Iron bar PVC pipe Mortar	Sub-sub-total Sub-total	3. Temporary Works and Others	Total
			<u>.</u>				· · · · ·			

• • • •	Explanation	4		<b>1</b>																•
	542.3 B/m <sup>3</sup>	•	Calculated by 1 m <sup>3</sup>	Remarks					· · · · · · · · · · · · · · · · · · ·								· ·		· · · · · · · · · · · · · · · · · · ·	•
 				Cost		56.7	18	74.7	· · ·	300	60	58.3	418.3	49.3	( (	542.3			·	
·		•		Unit Cost		6	300			300	300	48.6								
	UNIT COST OF	Cobblestones for Bed		Unit		md	mđ			m <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>		%						
	CONT	Cobblestor		Quantity		0.63	0.06	- - - -			0.2	1.2	-	10						
	No. 17			Item	1. Workers	Labour	Foreman	Sub-total	2. Materials	Cobblestone	Gravel	Hauling cost	Sub-total	3. Temporary Works and Others						

.

Explanation	4												
11 B/m	Calculated by 10 pieces (40 m)	Remarks		·				·					
	culated by			 o	157.5		7.5		82.5	40	. 0	Parid Parid	
	Cal			10	( Y 	····	31		00	4	440		
		Unit Cost		250	60	300			150			۳ ۳	
TSOS	VC.Pipe	Unit		pm	pm	pm			kg	%			ar para a manga a manga a manga a
UNIT COST OF	Setting PVC Pipe	Quantity		0.4	1.75	0.2			0.55	01			
No. 18		ltem	I. Workers	Piping man	Labour	Foreman	Sub-total	2. Materials	Adhesives	3. Temporary Works and Others	Total		

Explanation	۰. ۰.					•					· ·	· · · · · · · · · · · · · · · · · · ·					•
29.3 B/m	Calculated by 10 pieces (40 m)	Remarks							· · · · · · · · · · · · · · · · · · ·								
:	Calculate	Cost		257.5	583.2	225	1,065.7	7 701	0.001	1,172.3		29.3					
		Unit Cost		250	06	300		<u> </u>				" B			· · · · · · · · · · · · · · · · · · ·		
COST F	teel Pipe	Unit	۰ ۱۰ ۱۰	pm	pu	pm		Ś	%	•						'	
UNIT COST OF	Setting Steel Pipe	Quantity		1.03	6.48	0.75		<u>-</u>	Ŋ						•		÷.
No. 19		Item	1. Workers	Piping man	Labour	Foreman	Sub-total		2. I emporary works and Unters	Total							

	Explanation				<b></b>	- - -							- -	:		
72.6 B/m <sup>2</sup>			Calculated by 10 m <sup>2</sup>	Remarks												
				Cost		150	360	150	660	 66	726	72.6				
 				Unit Cost		250	6	300				1 m <sup>2</sup> =				
COST		h	· , · .'	Unit		pm	pm	pm		 %						
UNIT COST	5	Masonry		Quantity		0.6	শ	0.5		10				 		
No. 20				and the second of them a second of the	1. Workers	Mason	Labour	Foreman	Sub-total	2. Temporary Works and Others	Total	\$				

Item Materials Block (70 x 190 x 390) - ditto - (90 x190 x390) Brick Concrete Coblestones for Bed Mortar Iron Bar	UNIT COST OF Run-off Plot Run-off Plot 100 pc 175 " 64 " 2.76 curr 2.76 curr 2.76 curr 2.75 kg	F COST F Dot pc bc kg	Unit Cost 3.5 5.5 4.0/10 1,143.1 542.3 1,719.8 1,719.8 20.6		10,202 B/set Calculated by per 1 set Remarks	Explanation
Sub-total Labour Banking Masonry	20 23.7	cum sdm	33.8 72.6	6,880.1 676 1,805.4		
Finishing by Mortar Sub-total Total	58	<b>\$</b>	<del>ب</del> ه ۱۰	840 3,321.4 10,201.5 10,202		

Explanation															
4,795 B/pt		Remarks					•	-							
	· · · · ·	Cost		80	61	20	152	4,200	12		270		4,795		
	25)	Unit Cost		160	1,011.3	101/4	152	4,200	150		06				
ISO	Valve (ф 2	Unit		E	B <sup>3</sup>	Ħ	þc	Å.	kg		pm	1 .			
UNIT COST OF	Water Supply Valve (ф 25)	Quantity		0.5	0.06	0.8	•	*4	0.082		æ		· · · · · · ·		
No. 22-1	M	Item	1. Materials	Concrete Pipe $\phi$ 300	Concrete	Vertical Pipe \$25	Tee	Angle Valve	Adhesive	2 Workers	Labour		Total		
					· · · · ·									<b>.</b>	

Water Supply Valve (\$\$ 50)ItemWater Supply Valve (\$\$ 50)ItemItemUnitUnitItemQuantityUnitUnitConcrete Pipe \$\$ 3000.5-m160Concrete Pipe \$\$ 3000.5-m160Concrete Pipe \$\$ 3000.66m³1,011.3Vertical Pipe \$\$ 500.8m260/4Tee1pc950Angle Valve1pc5,400Angle Valve0.107kg150Orkers30.107kg90TotalTotal3md90
---

7.453 B/ot	Explanation	· · · · · ·	Kemarks	-									 <u></u>	
			Cost		80	61	86	408	6,530	18		270	7,453	
	· .	2)			160	1,011.3	430/4	408	6,530	150		06		
OST		Valve (ф 6:	Chit		E	m <sup>3</sup>	ũ	Å	bc	kg		md		
UNIT	OF	Water Supply Valve (ф 65)	Kuantity		0.5	0.06	0.8	<b>,</b>		0.123		£		
No. 22-3			liem	1. Materials	Concrete Pipe \$300	Concrete	Vertical Pipe d 65	Tee	Angle Valve	Adhesive	2. Workers	Labour	Total	

	Explanation						• .	· · · ·				· · ·			
<b>`</b> .				l											
	11,436 B/pt		Remarks		· · · · ·										
			Cost		80	61	120	880	10,000	25		270	11,436		
		6	Unit Cost		160	1,011.3	600/4	880	10,000	150		06			
	cost	Valve (ф 8	Unit		E	m <sup>3</sup>	E	bc	ጲ	ж Ю		pm		· · ·	
	UNIT COST OF	Water Supply Valve (ф 80)	Quantity		0.5	0.06	0.8	j	<b>r1</b>	0.164		ñ			
	No. 22-4		Item	1. Materials	Concrete Pipe \$300	Concrete	Vertical Pipe \$ 80	Tee	Angle Valve	Adhesive	2. Workers	Labour	Total		

Explanation														•	
B/pt			s						· · ·						·
4,823 B/pt			Kemarks												
		(	Cost		300	41	4,200	12			270		4,823		
			Unit Cost		300	1,011.3	4,200	150			66				
LSOC	alve (ф 50		Cnat	* .	H	: 133	þc	kg	•		pm	· ·			
UNIT COST OF	Sand-flash Valve (ф 50)		Quantity		<b>F</b>	0.04	, r	0.082			m				
No. 23-1			Item	1. Matenals	Concrete Pipe \$500	Concrete	Check Valve $\phi$ 50	Adhesive		2. Workers	Labour	· · · · · · · · · · · · · · · · · · ·	Total		

6,023 B/pt Explanation	st Remarks		300	41		12		20		23		
55)	Unit Cost Cost		300	1,011.3	5,400 5,400		 	90 270	· · · · · · · · ·	6,023		
UNIT COST OF Sand-flash Valve (ф 65	Quantity Unit		H	0.04 m <sup>3</sup>	bc	0.082 kg		3 md				- - - -
No. 23-2	Item	1. Materials	Concrete Pipe \$ 500	Concrete	Check Valve $\phi$ 65	Adhesive	2. Workers	Labour		Total		

Explanation 7,153 B/pt Remarks 270 7,153 300 6,530 12 Cost 4] 1,011.3 Unit Cost 6,530 150 90 300 Sand-flash Valve (ф 75) Unit mď Ë 8 X E UNIT COST OF 0.082 0.04 Quantity . \*\*\*\*\*( ო Concrete Pipe \$500 Item Total Concrete 1. Materials Labour 2. Workers No. 23-3

IT COST OF See by Pump see by Pump see by Pump acalculated by 1 day y Unit Unit Cost % 10 % 10 76.9 10 75 10 75 10 75 10 75 10 75 10 75 10 75 10 75 10 75 10 75 10 75 10 250 250 10 250 10 250 250 250 250 250 250 250 25	Unit Cost     Cost       8.8     66.9       8.8     66.9       76.9     76.9       250     75       102     75       250     75       250     27       250     27       250     27       250     25       80     80       25.9     25.9       25.9     25.9	Explanation					
Unit Cost 8.8 250 250 2 2	UNIT COST Drainage by Pump Drainage by Pump 7.6 lit Unit Cost C 7.6 lit 8.8 15 % 0.3 md 250 0.3 md 250 10 % 10 % 250 250	284.8 B/day calculated by 1 day	Remarks				
	UNIT COST OF Drainage by Pump 7.6 lit 15 % 0.3 md 0.3 md 0.3 md 10 %		Ŭ	76.9	 80	284.8	
		IT COST OF ge by Pump	Unit lit %		 day %		

Explanation			$Q = \frac{60q \text{ x f x E}}{Cm}$	60q = 80.64	$ \begin{array}{ll} f &= 1 \\ E &= 0.60 \mbox{ (Sandy soil)} \\ Cm &= 0.034 \mbox{ x} \mbox{ 20} + 0.25 \\ = 0.93 \end{array} $	$Q = \frac{80.64 \times 1 \times 0.6}{0.93}$ = 52.0 m <sup>3</sup> /nr		E = 0.5 (Clay)	$Q = \frac{80.64 \times 1 \times 0.2}{0.93}$ = 43.4 m <sup>3</sup> /hr		· · · · · · · · · · · · · · · · · · ·	
	D = 20 m	Remarks		· · · · · · · · · · · · · · · · · · ·		Production per day $52.0 \times 7 = 364 \text{ m}^3$	$43.4 \text{ x } 7 = 303.8 \text{ m}^3$					
		Cost	4,831.8	483.2	5,315.0	14.6	17.5		·. ·		·	
		Unit Cost			·			· · · · · · · · · · · · · · · · · · ·	;;	· · · · ·		
ISOC	y Bulldoze on)	Unit	đay.	%		L L L	mš			·		
UNIT COST OF	Excavation by Bulldozer (11 ton)	Quantity	F	10	<u>.</u>	<b>94</b>						
Eq No. 1-1		Item	1. Operation Cost	2. Temporary Works and Others	Total	Sandy soil	Clay				· · · ·	

	Explanation			$Q = \frac{60q \text{ x f x E}}{Cm}$	60q = 80.64	E = 0.60 (Sandy soil) $E = 0.034 x 60 + 0.25$ $= 2.29$	$O = \frac{80.64 \times 1 \times 0.6}{10.6}$		111 / 117 7 - 1 7		E = 0.5 (Clay)	$O = \frac{80.64 \times 1 \times 0.5}{2}$						
		D = 60 m	Remarks				Production per day	$21.1 \text{ x} 7 = 147.7 \text{ m}^3$	$17.6 \times 7 = 123.2 \mathrm{m}^3$	-								· .
-			Cost	4,831.8	483.2	5,315.0		36.0	43.1					-		· · · · ·		
-		er	Unit Cost					,							 	•	•	
	UNIT COST OF	by Bulldoz ton)	, Unit	day	%			m <sup>3</sup>	m <sup>3</sup>		·,	· · ·						
	UNIT O	Excavation by Bulldozer (11 ton)	Quantity		10			*-4					· · ·					·
	Eq No. 1-2		Itern	1. Operation Cost	2. Temporary Works and Others	Total		Sandy soil	Clay									

Explanation		<b>-</b>	$Q = \frac{60q \text{ x f x E}}{Cm}$	60q = 107.88		$Cm = 0.034 \times 20 + 0.25$	C.V.D =	Rock	$\begin{bmatrix} f = 0.7, E = 0.35 \\ 0.7, 88 \times 0.7 \times 0.35 \end{bmatrix}$	$Q = \frac{0.93}{0.93}$	111/111 +707 -	f = 1.0, $E = 0.60$	$Q = \frac{107.88 \times 1 \times 0.6}{0.02}$	$= 69.6 \mathrm{m^{3/hr}}$	Clav	f = 1.0, E = 0.5	$Q = \frac{107.88 \times 1 \times 0.5}{0.93}$	$=58\mathrm{m}^3/\mathrm{hr}$
	D = 20 m	Remarks			· · · · · · · · · · · · · · · · · · ·		- - - -	· · · · · · · · · · · · · · · · · · ·	Production per day	$69.6 \text{ x} 7 = 487.2 \text{ m}^3$		28.4  x 7 = 198.8 m <sup>3</sup>						
		Cost		1.101.0	578.2		6.359.9		2	13.1	15.7	32.0			:			
		Unit Cost			· ·					<u> </u>								
TSOC	y Bulldoze on)	Unit	7	Cay	%					ш <sup>3</sup>	m <sup>3</sup>	m <sup>3</sup>		÷				
UNIT COST OF	Excavation by Bulldoze (15 ton)	Quantity			10						yerne(	7-2-4	-					
Eq No. 1-3		Item		I. Operation Cost	2. Temporary Works and Others		Total			Sandy soil	Clay	Rock						

Explanation			$Q = \frac{60q \times f \times E}{Cm}$	60q = 107.88	$ \begin{array}{rcl} \Gamma &= 1.0 \\ Cm &= 0.034 \times 60 + 0.25 \\ = 2.29 \end{array} $	Sandy $E = 0.60$	107.88 x 1 x 0.6	$\sqrt{-2.29} = 28.3  \text{m}^{3/\text{hr}}$	Clay	$\mathbf{E} = 0.5$	$O = \frac{107.88 \times 1 \times 0.5}{3.30}$			
	D = 60 m	Remarks				Production per day	$28.3 \times 7 = 198.1 \mathrm{m}^3$	23.6  x 7 = 165.2 m <sup>3</sup>						
		Cost	5,781.7	578.2	6,339.9		32.1	38.5				· · · · · · · · · · · · · · · · · · ·		· · · ·
· · · · · · · · · · · · · · · · · · ·	ĸ	Unit Cost				, , , , , , , , , , , , , , , , ,								
 F Loop	y Bulldoze	Unit	day	%			m <sup>3</sup>	m <sup>3</sup>						
UNIT CUSI	Excavation by Bulldozer	Quantity	<b>F</b>	10		· · · · · · · · · · · · · · · · · · ·			 					
Eq No. 1-4		Item	1. Operation Cost	2. Temporary Works and Others	Total		Sandy soil	Clay						

	Excavation by Back Hoe (0.35 m <sup>3</sup> )	vation by Back Hc (0.35 m <sup>3</sup> )	2		
	Quantity	Unit	Unit Cost	Cost	Remarks
Operation Cost Temporary Works and Others Total	10 1	day %	A	3,769.9 377.0 4,146.9	
	ç—1	m <sup>3</sup>		19.5	Production per day $30.4 \text{ x} 7 = 212.8 \text{ m}^3$
. ,					

Eq No. 2-2	UNIT COST OF	COST				Explanation
Excavat	Excavation by Back Hoe (0	k Hoe (0.7	).75 m <sup>3)</sup>			4
						• • •
Item	Quantity	Unit	Unit Cost	Cost	Remarks	<b>, ,</b>
						$Q = \frac{3600 \text{ x q x f x E}}{Cm}$
		day		6,787.2		q = qo x K
2. Temporary Works and Others	10	%		678.7		$= 0.75 \times 0.9 = 0.675$ Cm = 0.054ø + 23
Total	<u></u>		<u></u>	7,465.9		$a90^{\circ} \rightarrow Cm 28 sec$
	<u></u>	-	······································			Rock
	<u></u>				Production per day	$\begin{bmatrix} 1 &= 0.7, \ E = 0.5 \\ 3600x0.675x0.7x0.5 \end{bmatrix}$
Sandy soil		m <sup>3</sup>		16.4	$65.1 \times 7 = 455.7$	Q =28
Clay	,	т3		18.9	56.4 x 7 = 394.8	$= 30.4 \mathrm{m^{3}/hr}$
Rock	·	m <sup>3</sup>		35.1	30.4  x 7 = 212.8	Sandy 6-1 5-076
	 -	. 7 * 				I = I, E = 0.73
			-	· · · · · · · · · · · · · · · · · · ·		Q = 28000000000000000000000000000000000000
						$= 65.1 \text{ m}^{3/\text{hr}}$
			<u>`</u>	· · ·		Clav
					- - - -	f = 1, E = 0.65
					-	0 _ 3600x0.675x1x0.65
		، بر الم		- -		K - 28

			- -			
			: :			
			<b>ر میں پر مند مسائل پر</b>			
= 84.8	•				_ <del></del>	
	84.8 x 7 = 593.6	5		m <sup>3</sup>	<b>,</b>	Cost per $m^3$ (D = 0.30)
D = 0.30	72.4 x 7 = 506.8	10.5		m <sup>3</sup>	<del></del>	Cost per $m^3$ (D = 0.15)
	Production per day					
≠ 72.4						
$Q = 10 \times 0.75(11\times0.15+8) = 72 375$		53150				Total
$\overline{D} = 0.15$		483.2		%	10	2. Temporary Works and Others
$\left\{ \mathbf{E} = 0.75 \right\}$		4,831.8		day	<b>F</b> -1	1. Operation Cost
	Remarks	Cost	Unit Cost	Unit	Quantity	Item
				y Bulldoze ton)	Spreading by Bulldozer (11 ton)	
Explanation				UNIT COST OF		Eq.No. 3-1

Explanation		Q = 10E (12D + 9)		$Q = 10 \times 0.75(12 \times 0.15+9)$ = 81 m <sup>3</sup> /hr	020	Q = 10x0.75 (12x0.3+9)							
		Remarks			Production per day	$81 \times 7 = 567$ 94.5 × 7 = 661.5							
		Cost	5,781.7 578.2	6,359.9		9.6		:		-		- -	
	H S	Unit Cost									· · ·		
UNIT COST OF	oy Bulldoze ton)	Unit	day %			о С Ш С Ц С Ц С Ц С Ц С Ц С Ц С Ц С Ц С С Ц С С Ц С С Ц С							
LINU O	Spreading by Bulldozer (15 ton)	Quantity	10			<b></b>	-					:	
Eq No. 3-2		Item	<ol> <li>Operation Cost</li> <li>Temporary Works and Others</li> </ol>	Total		Cost per $m^3$ (D = 0.15) Cost ner m <sup>3</sup> (D = 0.30)							

	Explanation			I. $Q = \frac{V x W x D x E}{N} (m^3/h)$ $V = 3,500 m/h$	W = 0.7 m D = 0.3 m R = 5.65 N = 5	$Q = \frac{3500 \times 0.7 \times 0.3 \times 0.65}{5}$ = 95.6 m <sup>3</sup> /h		11. A = $\frac{N}{N}$ = $\frac{3500 \times 0.7 \times 0.65}{5}$	= 318.5 m <sup>2</sup> /hr	
			Remarks			Production per day $95.6 \times 7 = 669.2$	318.5 x 7 = 2,229.5			
:			Cost	4,831.8 483.2	5,315.0	7.9	2.4			
		cer	Unit Cost			· · · · · · · · · · · · · · · · · · ·				
	UNIT COST OF	g by Bulldozer I ton)	Unit	day %		m3	m <sup>2</sup>			
	INU	Compacting by Bull (11 ton)	Quantity	10		<del>اسر</del>				
		- 	Item	Operation Cost Temporary Works and Others		m <sup>3</sup>	m²	- - -		
	Eq No. 4-1			<ol> <li>Operation Cost</li> <li>Temporary Wo</li> </ol>	Total	I. Cost per m <sup>3</sup>	II. Cost per m <sup>2</sup>			

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	Explanation	· · · · · · · · · · · · · · · · · · ·		I. $Q = \frac{VxWxDxE}{N}(m^{3}/h)$	V = 3,500  m/h	D = 0.3 m E = 0.65 N = 5	$O = \frac{3500 \times 0.8 \times 0.3 \times 0.65}{3500 \times 0.8 \times 0.3 \times 0.65}$			$\Pi = \frac{V \times W \times E}{V \times W \times E}$		5	= 364 m4/hr			
	- - -		Remarks				Production per day	109.2 x 7 = 764.4	364 x 7 = 2,548		-					· · ·
	·		Cost	5,781.7	578.2	6,359.9		8.3	2.5							·
		er	Unit Cost													
COST	OF	by Bulldoz ton)	Unit	day	%			m <sup>3</sup>	$m^2$					··· ···		
IINU	0	Compacting by Bulldozer (15 ton)	Quantity		10			<b>T</b>	<b>بہم</b>			· · · · · · · · · · · · · · · · · · ·				
Ea No. 4-2			Item	1. Operation Cost	2. Temporary Works and Others	Total	· · · · · · · · · · · · · · · · · · ·	I. Cost per m <sup>3</sup>	II. Cost per m <sup>2</sup>							

	Explanation	1	$S = So x E (m^2/hr)$	$S_0 = 520.2 \text{ x W}$		W = B - 0.30 = 2.40 0.20 = 2.10		E = 0.25	$S = 520.2 \times 3.10 \times 0.25$							
1.9 B/m <sup>2</sup>		Remarks							Production per day	$403.2x7 = 2,822.4 m^2$						
		Cost		4,831.8	483.2		5,314.0			1.9						
	dozer	Unit Cost						· · · · · · · · · · ·			 ····			 	-	
UNIT COST OF	ent by Bull ton)	Unit		day	%			- <u>, .</u>		m <sup>2</sup>	 					
UNIT	Field Arrangement by Bulldozer (11 ton)	Quantity			10							 		 	6	
Eq No. 5-1	Fie	Item		1. Operation Cost	2. Temporary Works and Others		Total			Cost per m <sup>2</sup>			· · · · · · · · · · · · · · · · · · ·			

-	UNIT COST	COST			2.1 B/m <sup>2</sup>	
	Ċ.	J.	-			Explanation
	Field Arrangement by Bulldozer (15 ton)	ent by Bulle ton)	dozer			
ltem	Quantity	Unit	Unit Cost	Cost	Remarks	
						$S = So x E (m^{2/hr})$
1. Operation Cost		day		5,781.7		So = 520.2  x W
2. Temporary Works and Others	10	%		578.2		
						W = B - 0.30
Total				6,359.9		E = 0.25
				· .	Production per day	S = 520.2  x 3.3  x 0.25
Cost per $m^2$		m <sup>2</sup>		2.1	$429.2x7 = 3,004.4 \text{ m}^2$	7.77+
		1. o				
						· · · · · · · · · · · · · · · · · · ·
			- - -			
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		-				
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		•				
			·	·		
	·	·				•

	Explanation		<b>1</b>	$Q = \frac{3600 \times q \times f \times E}{Cm}$	$q = q_0 \times K = 1.2 \times 0.73$		$Q = \frac{3600 \times 0.876 \times 0.55}{45}$ = 38.5 m <sup>3</sup> /hr		
	20.8 B/m <sup>3</sup>		Remarks				Production per day 38.5 x 7 = $269.5 \text{ m}^3$		
			Cost	4,385.9	438.6	4,824.5	17.9	• •	
•		/el	Unit Cost				· · · · · · · · · · · · · · · · · · ·	 	
	cost	actor Shov m <sup>3</sup> )	Unit	day	%		m <sup>3</sup>	· ·	
	UNIT COST OF	Loading by Tractor Shovel (1.2 m <sup>3</sup> )	Quantity	<b>F4</b>	10			 	
	Eq No. 6		Item	1. Operation Cost	2. Temporary Works and Others	Total	Cost per m <sup>3</sup>		

` **4** 

Explanation				$q = \overline{W} = \overline{1.6} = 5.0$	E = 1 Cm = 0.005L + 10.5 L = 150	Cm = 11.25	$Q = \frac{60 \times 5 \times 1 \times 1}{11.25}$	$= 26.7 \text{ m}^3/\text{hr}$		L = 550 Cm = 0.005 x 550 + 10.5 = 13.25	$O = \frac{60 \times 5 \times 1 \times 1}{2}$	. 11		
	Calculated by 150 m, 550 m	Remarks					Production per day	26.7 x 7 = 186.9	22.6 x 7 = 158.2					
	Calcula	Cost	3,288.9	328.9	3,617.8	: : :		19.4	22.9			•••••••••••••••••••••••••••••••••••••••	· · · · ·	
	<b>X</b>	Unit Cost			<u> </u>							· · · · · · · · · · · · · · · · · · ·		
UNIT COST OF	Hauling by Dump Truck	Unit	day	%	<u>`</u>			m <sup>3</sup>	m <sup>3</sup>					
UNIT O	Hauling by	Quantity	<b>1</b>	10					۲ ۲					· · · · · · · · · · · · · · · · · · ·
Eq No. 7		Item	1. Operation Cost	2. Temporary Works and Others	Total			Cost per $m^3$ (L = 150)	Cost per $m^3$ (L = 550)					

	INIT C	DST SO				
	OF					Explanation
Com	Compacting by Tire Rolle (8 - 20 t)	y Tire Roll 0 t)	EL			
Item	Quantity	Unit	Unit Cost	Cost	Remarks	· · · · · · · · · · · · · · · · · · ·
1. Operating Cost	 	dav		3.805.6		$I. A = \frac{W \times V \times E}{N}$
2. Temporary Works and Others	10	° %		380.6		W = 1.80. V = 4.200
Total		- - - - -		4,186.2		$E = E_1 \times E_2 = 1.00 \times 0.55 = 0.55 = 0.55 = 0.55$ $N = 5$
						$= 831.76 \text{ m}^{2}/\text{hr}$
I. For Area				· · ·	Production per day	
Cost per m <sup>2</sup> II. For Volume	<b></b> 4	m <sup>2</sup>		0.7	831.6 x 7 = 5,821.2	$II. Q = \frac{W \times V \times D \times E}{N}$
Cost per m <sup>3</sup>	r1	m <sup>3</sup>	·······	12.3	48.6 x 7 = 340.2	W = 1.80, V = 3,000
	<u></u>	· .				$D = 0.2$ $E = E_1 \times E_2$
						$= 1.0 \times 0.45 = 0.45$ $N = 10$
						$Q = \frac{1.8 \times 3000 \times 0.2 \times 0.45}{10}$
						$= 48.6 \text{ m}^{3}/\text{hr}$

Exnlanation		•••											· · · · · · · · · · · · · · · · · · ·			
[II]			:	6					· · · · ·				-			
4,831.8 B/day	per day	Remarks						0.105 x 108 x 7							· · · ·	
		Cost		280	100	380		516.1	103.2	619.3		3,832.5	4.831.8			
		Unit Cost		280	200	<u></u>	<u> </u>	6.5				547.5				
ON COST	11 ton Bulldozer	Unit		md	рш		·	liter	%			ų				
OPERATION C OF	11 ton F	Quantity		1.0	0.5			79.4	50		•	4				
	· · ·														:	
Op No. 1		Item	1. Workers	Operator	Assistant	Sub-total	2. Fuel and Others	Fuel	Others	Sub-total		3. Depreciation Cost	Total			
	<u></u>	L		<del></del>				<u></u>						<u>-</u>		

Explanation				-					· .					:			
5,781.7 B/day	per dav	Remarks			· · · · · · · · · · · · · · · · · · ·	· · ·		0.105 x 140 x 7			- <b></b>		· · · · · · · · · · · · · · · · · · ·				
		Cost		280	100	380		668.9	133.8	802.7		4,599	5,781.7				
		Unit Cost		280	200			6.5				657			 - - - - -		
ON COST	15 ton Bulldozer	Unit		pm	md			liter	%			ħr					
OPERATION COS	15 ton B	Quantity		1.0	0.5			102.9	20	·		2					
	- - - -			·	•				·			·		·			
Op No. 2		Item	1. Workers	Operator	Assistant	Sub-total	2. Fuel and Others	Fuel	Others	Sub-total		3. Depreciation Cost	Total				

Explanation													
3,769.9 B/day	per day	Remarks					 0.115 x 79 x 7						
		Cost		280	100	380	413.4	82.7	496.1	2,893.8	3,769.9		
		Unit Cost		280	200		 6.5			413.4			
(ON COST )F	Back-hoe (0.35 m <sup>3</sup> )	Unit		md	pm		liter	%		hr			
OPERATION COSI	Bacl (0.35	Quantity		1.0	0.5		 63.6	20					
	•							-			. *	· ·	
Op No. 3		Item	1. Workers	Operator	Assistant	Sub-total	 <ol> <li>ruei and Otners</li> <li>Fuel</li> </ol>	Others	Sub-total	3. Depreciation Cost	Total		

	Explanation				- - -													
	6,787.2 B/day	per day	Remarks							0.115 x 119 x 7								
			Cost		280	100	380	:	-	622.7	124.5	747.2		5,670	6 202 7	4.101,0		
· · · ·			Unit Cost		280	200	,/			6.5				810			-	
	ON COST	Back Hoe (0.75 m <sup>3</sup> )	Unit		md	pm				liter	%			hr				
	OPERATION COST OF	Back (0.75	Quantity		1.0	0.5			- -	95.8	20			2			 -	
	Op No. 4		Item	1. Workers	Operator	Assistant	Sub-total		2. Fuel and Others	Fuel	Others	Sub-total		3. Depreciation Cost	T	TOIGH		
	L		<b>ا</b> ا							• <u> </u>		<del></del>	· · ·	· · ·				

		Explanation								•						• •			• • •
	f														<u></u>				
	4,385.9 B/day			Remarks			-			0.115 x 93 x 7									
· ·				Cost		280	100	380		486.9	97.4	584.3		3,421.6		4,380.9			
				Unit Cost		280	200	· · · ·	- <b></b> - <b>**</b>	6.5	······································			488.8					· · · ·
	ON COST	Shovel	m <sup>3</sup> )	Unit		md	pm			liter	%			hr				· · · · ·	
	OPERATION COST OF	Tractor	(1.2 m <sup>3</sup> )	Quantity		1.0	0.5			74.9	20		·	<b>7</b>		-			· · ·
										com quy index			· · ·				:		
	Op No. 5			Item	1. Workers	Operator	Assistant	Sub-total	2. Fuel and Others		Others	Sub-total		3. Depreciation Cost		lotal			
																=			

	Explanation														
· · · · ·			- <del>}</del>  -											 	
	3,805.6 B/day		Remarks						0.056 x 89 x 7						
			Cost		280	r		-	226.9	22.7	249.6	3,276	3,805.6		
			Unit Cost		280				6.5	<u> </u>		468		 	
•	DN COST	oller 20 t)	Unit		pm	1		•	liter	%		hr		 	
	OPERATION COST OF	Tier Roller (8 - 20 t)	Quantity		0.1	1			34.9	20		۲-			
				·											
	Op No. 6		Item	1. Workers	Operator	Assistant	· · · · · · · · · · · · · · · · · · ·	2. Fuel and Others	Fuel	Others	Sub-total	3. Depreciation Cost	Total		

	Explanation	÷		.*						•										
	1													 						
3 288 9 R/Hav		per day	Remarks						0.035 x 240 x 7									· · ·		
			Cost		220	•			382.2	76.4	458.6		2,610.3	 3,288.9						
		:	Unit Cost	· · · · · · · · · · · · · · · · · · ·	220	1			6.5				372.9	 			 	•	. *	• •
TONCOST	OF OF	Dump Truck (8 ton)	Unit		pm	•	:		liter	%			hr			• * .  : •				
ODFR A7		Dum (8	Quantity		1.0				58.8	20			C	· · · · · ·						
												-			•					
Co No J			Item	1. Workers	Driver	Assistant		2. Fuel and Others	Fuel	Others	Sub-total		3. Depreciation Cost	Total		· · ·				
	2, )					: 														

