REPUBLIC OF THE PHILIPPINES

Detailed Design Survey
for
The Model Infrastructure Improvement Works
for
The Soil Research
and
Development Center Project

September, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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Preface

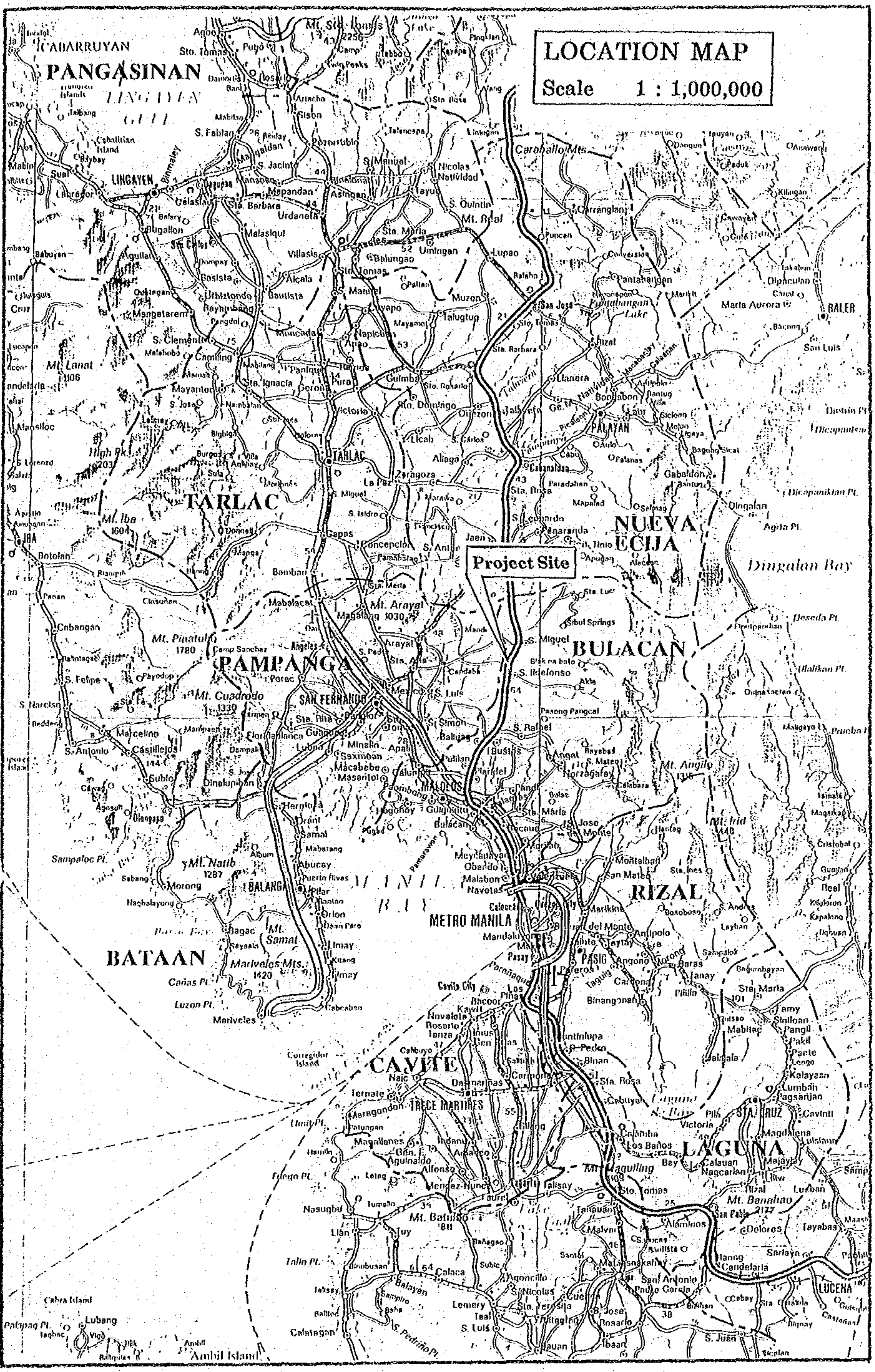
Since an experimental farm was a prerequisite for the experts' activity, the detailed design survey team headed by Mr. H. Inoue of the Ministry of Agriculture, Forestry and Fisheries was dispatched by JICA with the objective of improving the facility in the Central Research Institute of the Bureau of Soils and Water Management.

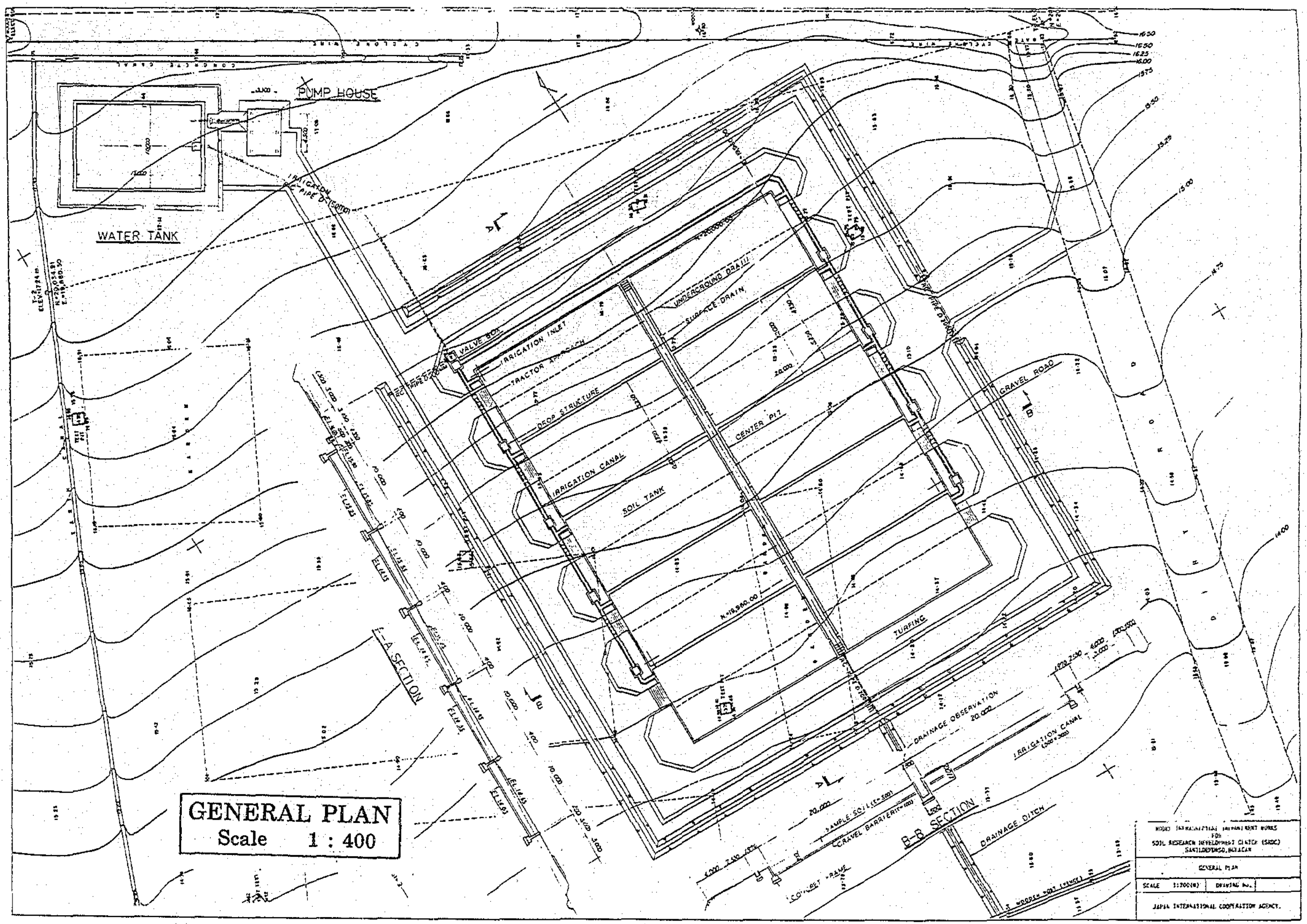
On the basis of the field work and subsequent home office work, this report was prepared to be utilized in the implementation of the proposed Model Infrastructure Improvement Works.

I would like to express my sincere thanks to the officials concerned for all their assistance and cooperation.

September, 1990

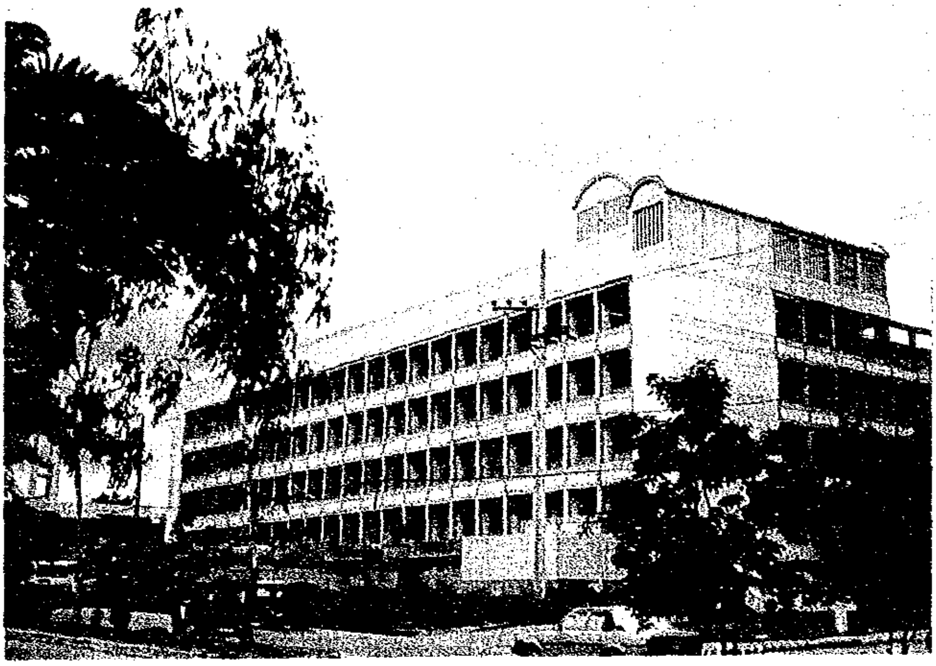
N. Sakino
Director
Agricultural Development
Cooperation Department
JICA


LOCATION MAP
Scale 1 : 1,000,000
Project Site
PANGASINAN
TARLAC
NUEVA ECIJA
PAMPANGA
BULACAN
BATAAN
RIZAL
METRO MANILA
CAVITE
LAGUNA
LINGAYEN
TARLAC
SAN FERNANDO
MALOLOS
BALANGA
PALAYAN
BALER
LUCENA
TRECE MARTIRES
Dingalan Bay
Mt. Arayat
Mt. Pinatubo
Caraballo Mts.

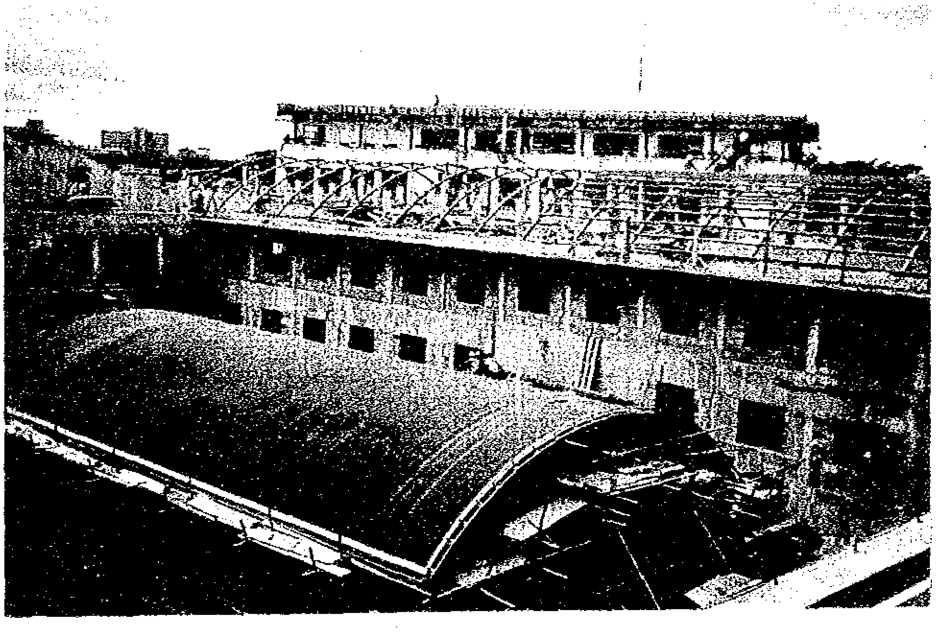


PUMP HOUSE
WATER TANK
VALVE BOX
IRRIGATION INLET
TRACTOR APPROACH
DROP STRUCTURE
IRRIGATION CANAL
SOIL TANK
CENTER PIT
UNDERGROUND DRAIN
SURFACE DRAIN
TURFING
GRAVEL ROAD
DRAINAGE OBSERVATION
DRAINAGE DITCH
A-A SECTION
B-B SECTION
GENERAL PLAN
Scale 1 : 400

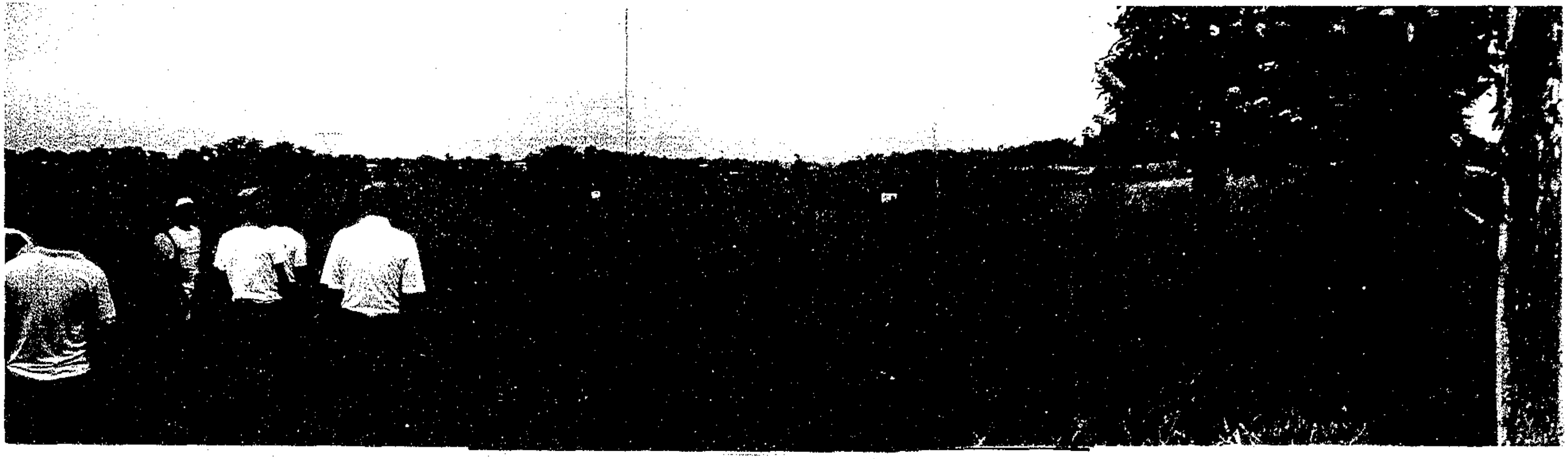
Condition of the Project Site



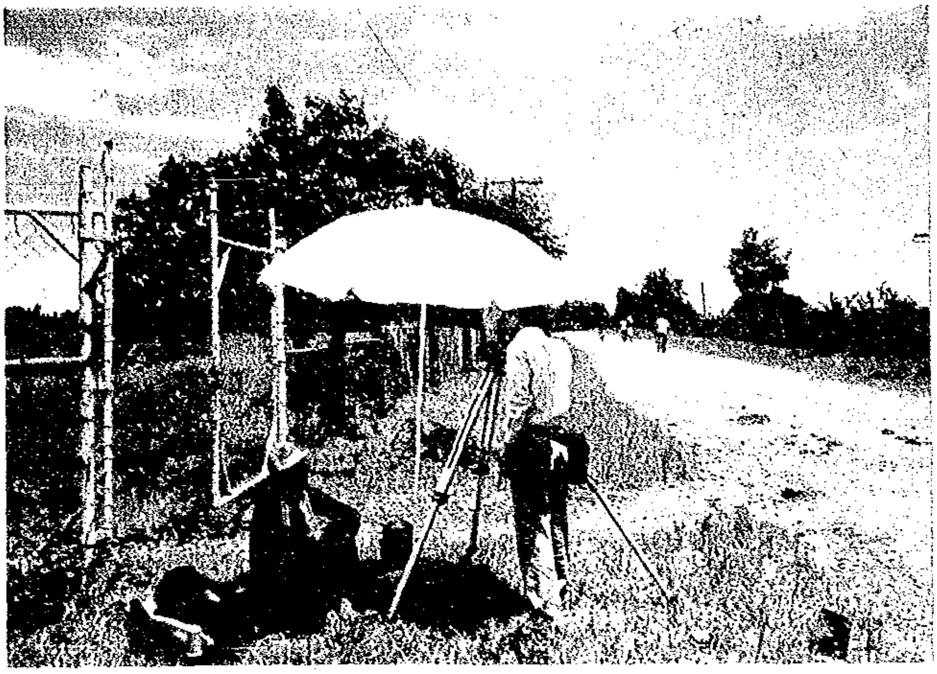
SRDC Building made by Phase Ⅰ Construction Works,
Quezon city in Manila



SRDC Building under Phase Ⅱ Construction Works,
Quezon City in Manila

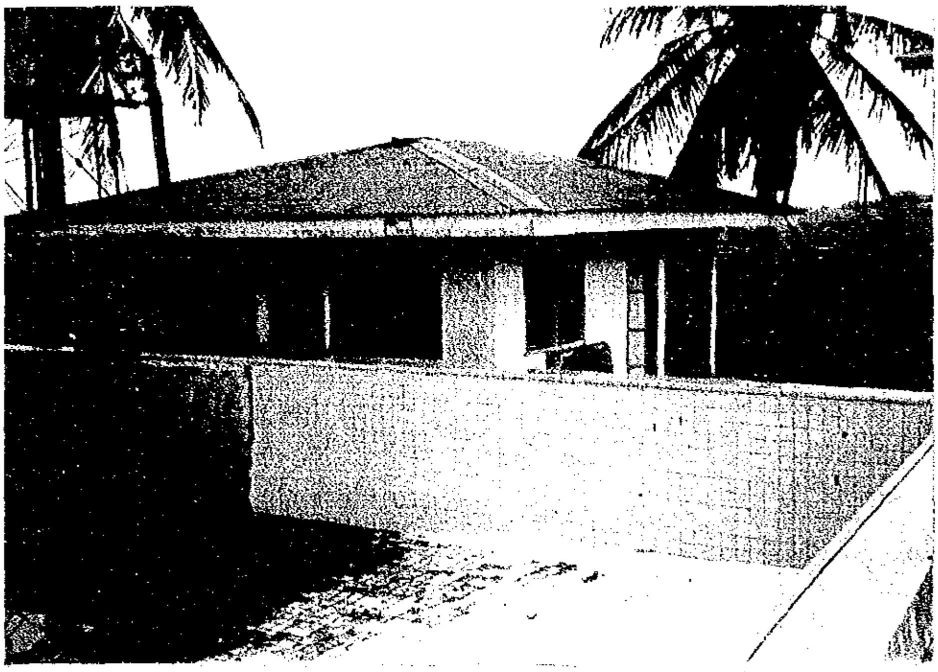


Proposed Site of the SRDC experiment plot,
in BSWM Central Research Station, San. Ildefonso, Bulacan

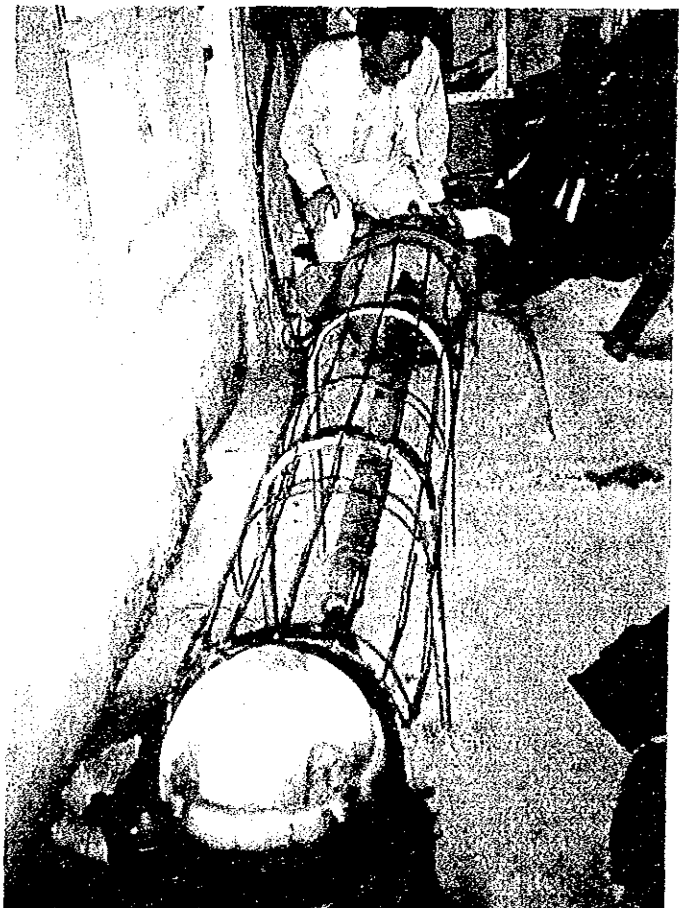


Topographic Survey

Electric Prospecting



Storage Tank and Pump House in the Central Research Station

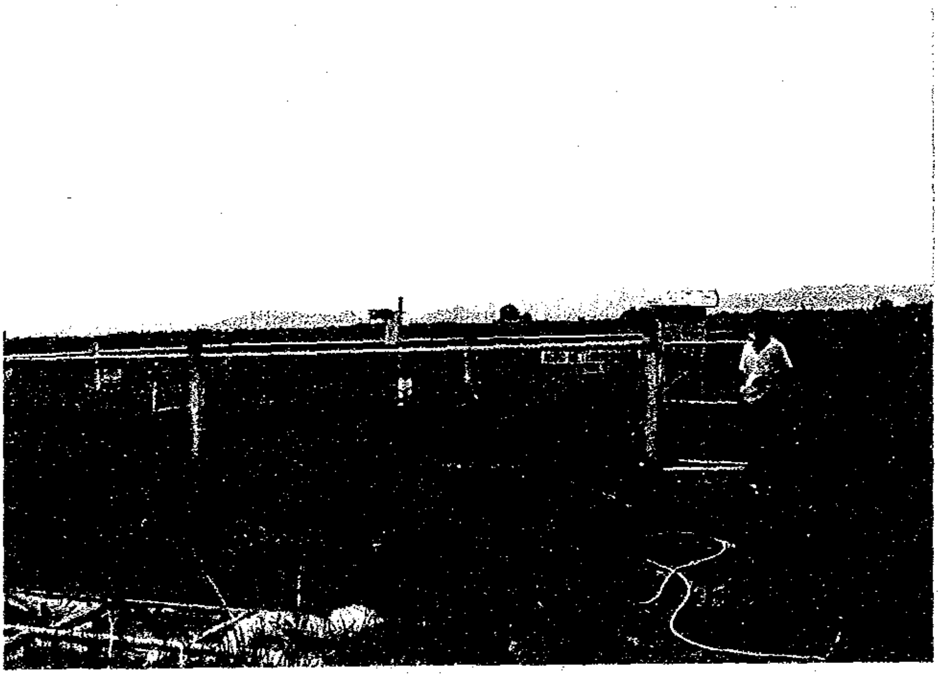


Pump and Motor

Test Pitting (No. 1 Pit)
Proposed Site for the Soil Tank

Test Pitting (Volcanic Ash Soil)

Existing Irrigation Canal in the Central Research Station



Meteorological Station in the Central Research Station

Existing Drainage Canal in the Central Research Station

Main Drainage Canal flows south to the Central Research Station

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Chapter 1

Dispatch of Survey Team

Chapter 1. Dispatch of Survey Team

1.1 Background and Objectives

(1) Background of Survey

The Bureau of Soils and Water Management (BSWM) has annually performed 7,000 soil tests and is endeavoring to accumulate test data for the purpose of drawing up various types of accurate land evaluation maps. Given the need to promote agrarian reform and crop diversification, to modernize agricultural management technics used by small farmers in mountainous areas, and to establish soil test methods, the improvement of the currently lagging survey and research facilities and the training of talented staff have become urgent problems.

Under these circumstances, the Philippine government has expanded its former facilities and developed a plan to establish a Soil Research and Development Center (hereinafter referred to as SRDC) with the objective of strengthening training, extension and information services. In August of 1987, they requested the government of Japan to extend grant aid and project-type technical cooperation.

In response to this request, JICA dispatched a preliminary survey mission in January 1988, and a basic design survey mission in April 1988 to the Philippines. Upon examination of the appropriate aid measures, it was determined to extend grant aid cooperation.

Currently, Phase I Construction Works have been completed in Quezon City. Phase II Construction Works are in progress and are planned to be completed at the end of December.

On the basis of the Record of Discussion (R/D) and the Tentative Schedule of Implementation (TSI) signed in April, 1989, the experts have been successively dispatched to the Philippines since July, 1989 to begin activities in accordance with the Columbo Plan.

This plan of technical cooperation contained five points: promotion of soil surveys, establishment of land evaluation systems, improvement of soil fertilizer application and agricultural extension services and training for farmers. It has been planned for seven long term experts to be assigned to do research for this Project.

The BSWN planned to improve the experimental plots of the Central Research Station, located in Bulacan Pravince, in order to succeed in these activities managed by experts.

Given this background, it was mutually agreed in the above-mentioned R/D (IV Sect.2), as well as in the TSI (Annex II Section IV), to carry out the infrastructure improvement of the experimental plots called for in the "Detailed Design Survey for the Model Infrastructure Improvement Works for the Soil Research and Development Center Project" (hereinafter referred to as the Works).

(2) The Purpose and Scope of the Survey

It has been planned for typical soils distributed in the Philipines to be collected and tested at the experimental plots (soil tanks) under a given meteorological condition in order to allow for a comparative study of the various soil characteristics. Based on experience in Japan, it was determined that the soil tanks should have a concrete base.

The purpose and scope of this survey for the infrastructure improvement of the experimental plots were as follows:

(a) Purpose of the Survey

To conduct the detailed design of 10 concrete frame soil tanks, having a width of 10m, a length of 20m and a depth of 0.7m, and for the irrigation and drainage facilities of these experimental plots. The soil samples are to be collected from 8 areas in the Philippines..

(b) Survey areas

BSWM Central Research Center, San Ildefonso, Bulacan Province, and proposed sampling sites of typical soils in the Philippines: Provinces of Pangasinan, Pampanga, Rizal, Cavite, and Batangas (see Location Map).

(c) Scope of the Survey

To prepare the detailed design of the concrete frame soil tanks (experimental plots) and the tender documents for the construction (draft).

(3) Survey Team Staff

The Survey Team staff members are as listed hereunder:

Name	Assignment	Present Position
Hisayoshi Inoue	Team Leader	Sr. Research Official, Agricultural Engineering Research Institute, Ministry of Agriculture, Fishery and Forestry
Takafumi Suzuki	Irrigation Engr.	Sr. Irrigation Engr., Overseas Department, Kokusai Kogyo Co., Ltd.

1.2 Participant in the Philippines

The participants in the Philippines are as follows:

(1) Department of Agriculture (DA)

Mrs. Theresa V. Capellan	Asst. Secretary for Foreign-Assisted Projects, DA

(2) Bureau of Soils and Water Management(BSWM, DA)

Mr. Godofredo N. Alcasid Jr.	Director, BSWM cum Soil Research Development Center (SRDC)
Dr. Rogelio N. Conception	Project Manager, SRDC
Dr. Modesto Recel	Service Chief of Research and Survey, SRDC
Mr.Rodolfo M. Lucas	Chief, Water Resources Management Division, BSWM
Mr. Florencio C. Sta. Maria	Station Superintendent, Central Research Station, Bulacan, BSWM
Mr. Leonardo M. De Leon	Asst. Superintendent, Central Research Station, Bulacan, BSWM
Mr. Edgardo Reyes	Station In Charge, Superintendent, Central Research Station, Upland, Rizal, BSWM
Mr. Crisostomo Alcalde	Chief, Soil Scientist, SRDC

(3) Counterpart

Mr. Victorcito Babiera	Chief, Soil Scientist, SRDC

(4) SRDC Expert

Dr. Tatsuji Takahashi	Team Leader
Dr. Shoichi Tokudome	Soil Scientist
Dr. Hiroki Imai	Soil Scientist
Dr. Masao Yoshida	Soil Scientist
Mr. Masahiro Shishido	Coordinator

(5) Embassy of Japan

Mr. Naoki Hayashida	First Secretary

(6) Department of Agriculture

Mr. Shigetaka Saburi	Advisor

(7) Philippines Office, JICA

Mr. Moriya Miyamoto	Resident Representative
Mr. Kikuo Takeuchi	Deputy Resident Representative
Mr. Fumio Kikuchi	Asst. Resident Representative

1.3 Major Activities

Date	Major Activities
June 28	Courtesy call on Embassy of Japan and Philippines Office, JICA
June 29	Courtesy call on DA and BSWM, Meeting with SRDC Experts
June 30	Analysis of the collected data
July 1	- do -
July 2	Field Reconnaissance of Central Research Station (the Station) and Pangasinan
July 3	Test Pitting at the Station
July 4	Field reconnaissance of Tanay and Tagaytay

July	5	Plan formulation
July	6	Preparation of the field report
July	7	Presentation of the field report. Departure of Mr. Inoue, Team Leader, for Japan
July	8	Analysis of the collected data
July	9	Collection of topo-map and well data
July	10	Collection of well data and meteorological data
July	11	Collection of geological map
July	12	Preparation of the site survey
July	13	Test pitting in Batangas
July	14	Electric prospecting and test pitting at the Station
July	15	Analysis of collected data
July	16	Topographic survey at the Statio
July	17	Construction cost survey
July	18	- do -
July	19	Final site survey at the Station
July	20	Layout drawing
July	21	- do -
July	22	Rough cost estimation
July	23	Meeting with SRDC Expert to discuss additional construction costs, material, survey, etc.
July	24	- do -
July	25	Preparation of the wrap--up paper of the field survey
July	26	Presentation of the wrap-up paper at BSWM and Philippines. Office, JICA
July	27	Meeting with SRDC Expert, departure for Japan

Chapter 2

Formulation of Works

Chapter 2. Formulation of Works

2.1 Purpose and Results

SRDC project cooperation includes soil fertility surveys, soil tests, soil improvement and fertilizer application improvement. Given the accomplishments made in Japan using the soil tank test, valuable results are expected of the experimental plot and the demonstration and training site, where various typical soil types distributed in the Philippines are to be tested under the same conditions and compared for their characteristics. Furthermore, the plot can also be useful for remote sensing in land evaluation and land productivity classification. In consideration of the security restrictions associated with field surveys, urgent construction of the soil tank is strongly recommended.

2.2 Site Selection of Typical Soil Sampling

In the long term expert's report, the Central Research Station located in San Ildefonso, Bulacan, was proposed as the most suitable site for the SRDC experimental plot. The principle reasons for its selection were as follows.

(1) It is only an hour drive north from Quezon City (approximately 60 km), where the SRDC Building is located. There is sufficient area available at no cost, because it is government property.

(2) At the Central Research Station, a large number of very experienced staff can assist in the experimental activities.

(3) The soil at the station is one of the typical soil types, Vertisols.

(4) The Agro-Meterology Station, the office, the laboratory and the warehouse are completely equipped. The topographiy is comparatively favorable for the planning of the irrigation and drainage facilities.

(5) Security is not a problem.

As there are no lines of communication at the Station, such as telephones, it is desired that they be installed in the future.

2.3 Plan Formulation of Major Facilities

As the establishment of this type of experimental facility is a new venture for the Philippines, the following were selected as the major facilities, based on Japan's previous experience as well as the results of meetings with SRDC experts and the field-survey. (7/6/90 Field Report, APPENDIX I)

(1) Structure of Soil Tank

In order to isolate the soil of the experimental plot from the local soil, a bottomless type concrete frame soil tank has been selected because clayey soil available in the Station can effectively prevent inner or outer water leaks. In order to intercept the clay bottom and the sample soil, gravel 10cm thick is to be placed in between them. 10 tanks measuring 10m x 20m are to be constructed; a tractor approach shall be provided for each tank.

(2) Drainage Facilities

Surface and sub-surface drainage systems are needed to measure the inward and outward water flow because of water and fertilizer balance calculations.

(3) Irrigation Facilities

The following facilities are needed for the irrigation system.

(a) Water Reservoir

(b) Gravity flow irrigation canal for both upland crops and paddy cultivation.

(c) Portable type sprinkler system with a booster pump.

A test of upland crops during the rainy season could be performed even without the water resources facilities of a well and a pump. However, as it is conceivably possible to transfer soil improvement technology at the soil tanks in the early stages, these soil tanks will definitely be utilized later for future experiments to improve various identified types of problem soil used in irrigated paddy cultivation during the dry season. Therefore, the urgent provision of the soil tanks with an appropriate water source facility shall be studied together with their financing arrangement.

2.4 Collection of Typical Soil

During the field survey, the SRDC experts conducted the field reconnaissance survey for 6 typical soils at several proposed sampling sites and are presently carrying out further detailed surveys. During this fiscal year, it is planned for 8 typical soils to be selected and collected for 8 soil tanks in consideration of both budgetary conditions and transportation routes.

The two typical soils from more remote areas such as Palawan Island, will be collected for the remaining two soil tanks by the Phillipines side.

Chapter 3

Field Survey

Chapter 3. Field Survey

3.1 Outline of Field Survey

The field survey in the Philippines was conducted for one month from June 28 to July 27, 1990, focusing especially on the meteorology, topography, hydrogeology, soils, land use, present irrigation and drainage facilities, etc. at the proposed project site in the Central Soils and Water Resources, Research Station located in San Ildefonso, Bulacan (hereinafter referred to as "the Station") as well as on the collection of various data and information, such as the unit cost of the construction of the Works. Part of the results of the said field survey entitled the "Wrap-up Paper", dated July 26, 1990 and attached herein as Appendix-2, was presented at the end of the field survey. Further details of the present condition of the proposed site are presented hereunder.

3.2 Precipitation

The average annual precipitation reaches about 2,000 mm. Most precipitation, however, is concentrated during the period from May to November and there are some months when rainfall exceeds 500mm due to typhoons which come frequently during the period from June to October. On the other hand, dry weather generally continues from April through December.

An agro-meteorology observation station has been established in "the Station", where several types of data such as rainfall, sunshine, air & soil temperature, evaporation, evapotranspiration, soil percolation, etc. have been observed and recorded.

The average monthly rainfall for the last 9 years is as enumerated hereunder:

Unit (mm / month)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
8	16	27	47	182	309	369	433	207	261	160	23	2,005

3.3 Topography

The Pampamga River, which flows from the north to the south and between the Sierra Madre Range (east) and the Cabusilan Mountains, empties into Manila Bay, collecting numbers of tributaries and forms the Pamponga Delta, a vast alluvial plain. The project site is located at the area in between the Maasin River (south) and the Conlong River (north), both of which join the Pampanga River at 40km upstream from its estuary. Though the elevation of the area varies from 12 to 20 meters above mean sea level, it can be said to be a plain, more or less, with little undulation.

The topographic map covering the entire area of "the Station", has been prepared on the basis of a Temporary bench mark, i.e., EL 100 meters (refer to Fig.-3.6.1). Further, a topographic survey covering the proposed soil tank site was conducted during the field survey and a map was prepared at a scale of 1/200 with an elevation above mean sea level (refer to the general plan in the attached drawing). However, since this elevation was transferred from the original ground elevation of the LWUA project, 1 km north-west of the proposed site, it must be surveyed again during the construction stage to enhance the accuracy.

The survey results show that the slope of the proposed soil tank site is 3-5 percent.

3.4 Hydrogeology

(1) General Description of Geology

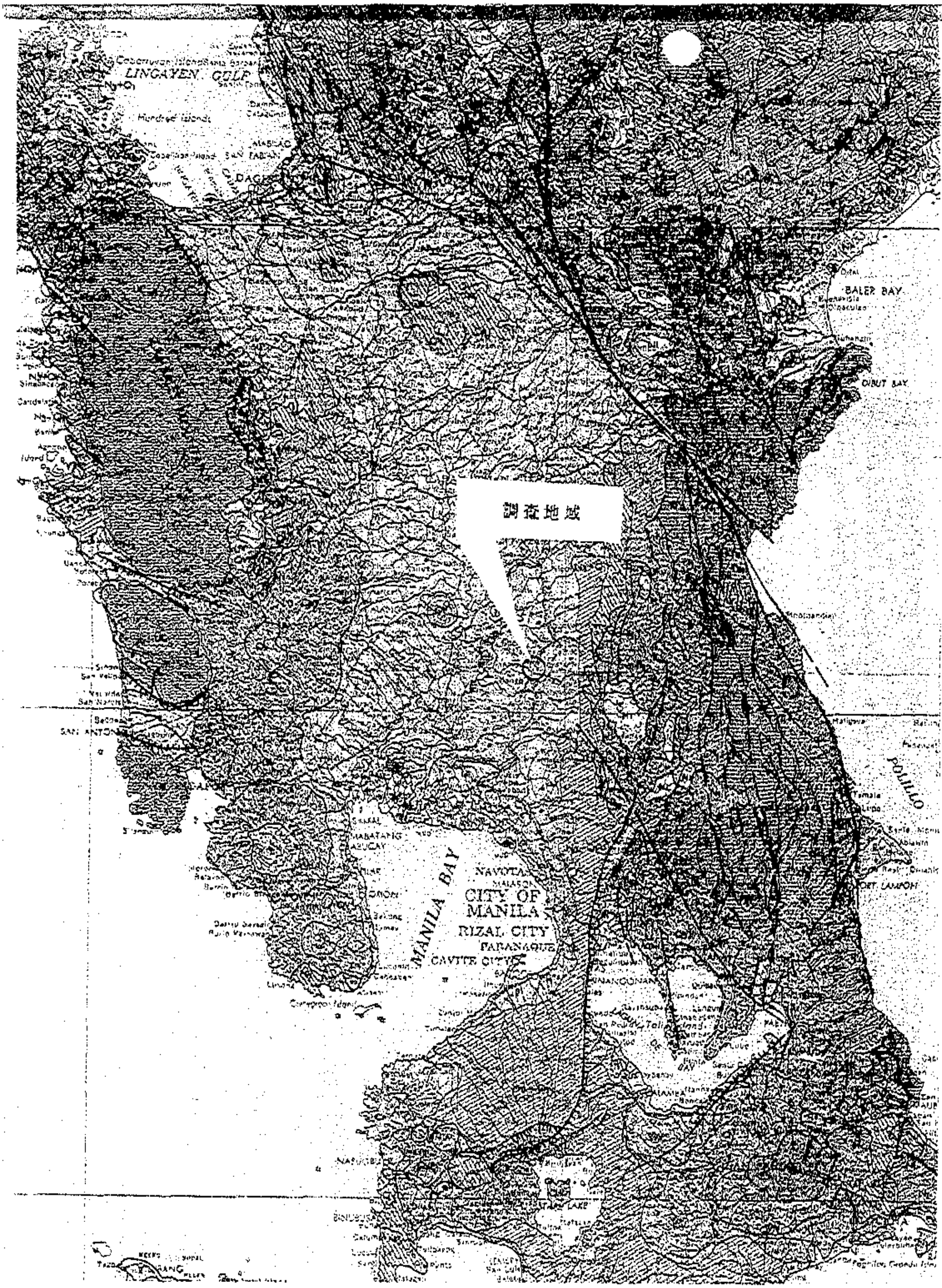
The proposed tank site is located in an alluvial deposit with an elevation of about 17 meters above mean sea level. To the east is the Sierra Madre Mountain range and hills, and to the west is an alluvial plain, which was formed extensively from north to south by the Pampomga River. Mt. Arayat is located north-west of the proposed site.

The geological formation of the Sierra Madre Mountain Range consists of pliocene sedimentary rocks and volcanic rocks, while the Guadalupe formation consisting of quarternary tuffacious sandstone and volucanic breccia is distributed in the hilly area which extends west of the proposed site.

Alternations of sand, gravel and clay form the alluvial lowland. The geological map and contour line drawing of the ground water level for the proposed site and the vicinity are presented in Fig. -3.4.1 and 3.4.2, respectively.

(2) Electric Prospecting

Vertical electric prospecting by means of the resistivity method was conducted using an McOHM Model 2115 in order to clarify the subsurface geology and the distribution of the groundwater aquifer. The



R	RECENT		Alluvium, fluviatile, lacustrine, paludal, and beach deposits; raised coral reefs, atolls, and beachrock.
$N_3 + Q_1$	PLIOCENE-PLEISTOCENE (g-h)		Marine and terrestrial sediments (molasse). Associated with extensive reef limestone in Bicol region, Visayas, and Mindanao; with pyroclastics in western and southern Central Basin and in northern Bicol Lowland. Predominantly marl and reworked tuff in places. Sporadic terrace gravel deposits in some coastal and fluvial tracts. Plateau red earths and/or laterites in some elevated flat land surfaces. Deformation limited to gentle warping and vertical dislocation.
N_2	UPPER MIOCENE-PLIOCENE (f_3-g)		Largely marine clastics (molasse) overlain by extensive, locally transgressive pyroclastics (chiefly tuff, tuffites) and tuffaceous sedimentary rocks. Associated with calcarenite and/or silty limestone in some parts of Luzon, central Visayas, and Mindanao. Reef limestone lenses intercalated with dacite and andesite flows in Zamboanga (western Mindanao). Chiefly arkose and arenite in Palawan. Local bog iron; laterite deposits in some elevated near-peneplaned surfaces.
N_1	OLIGOCENE-MIOCENE (e_1?-f_2)		Thick, extensive, transgressive mixed shelf marine deposits, largely wackes, shales, and reef limestone. Underlain by conglomerate and/or associated with paralic coal measures in places. Sometimes associated with basic to intermediate flows and pyroclastics within Luzon, Visayas, and Mindanao. Largely arkosic and quartzitic clastics (miogeosynclinal type?) in southern Mindoro and Palawan. Generally well indurated. Folded and locally intruded by quartz diorite. The epidermal cover of many folded mountains. In some places probably includes Oligocene (c-d).

IGNEOUS ROCKS

INTRUSIVE ROCKS

NI	NEOGENE		Largely intra-Miocene quartz diorite. Mostly batholiths and stocks, some laccoliths; also sills, dikes, and other minor bodies. Include granodiorite and diorite porphyry facies and late Miocene dacite. Pervasive in Paleogene and Mesozoic, less widespread in early Miocene rock sequences.
QV	PLIOCENE-QUATERNARY		Non-active cones (generally pyroxene andesite); also dacitic and/or andesitic plugs. Basaltic dikes in Binga, Mt Province, Luzon, and in Misamis Oriental, Mindanao.

SCALE 1:1,000,000 (APPROXIMATE)

10 5 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 Kilometers

LAMBERT CONFORMAL CONIC PROJECTION

ALL HEIGHTS REFERRED TO MEAN SEA LEVEL

ELEVATION IN METERS

Fig-3.4.1 Geological Map

Contour Line Map of Groundwater Level

Pampanga, Bulacan

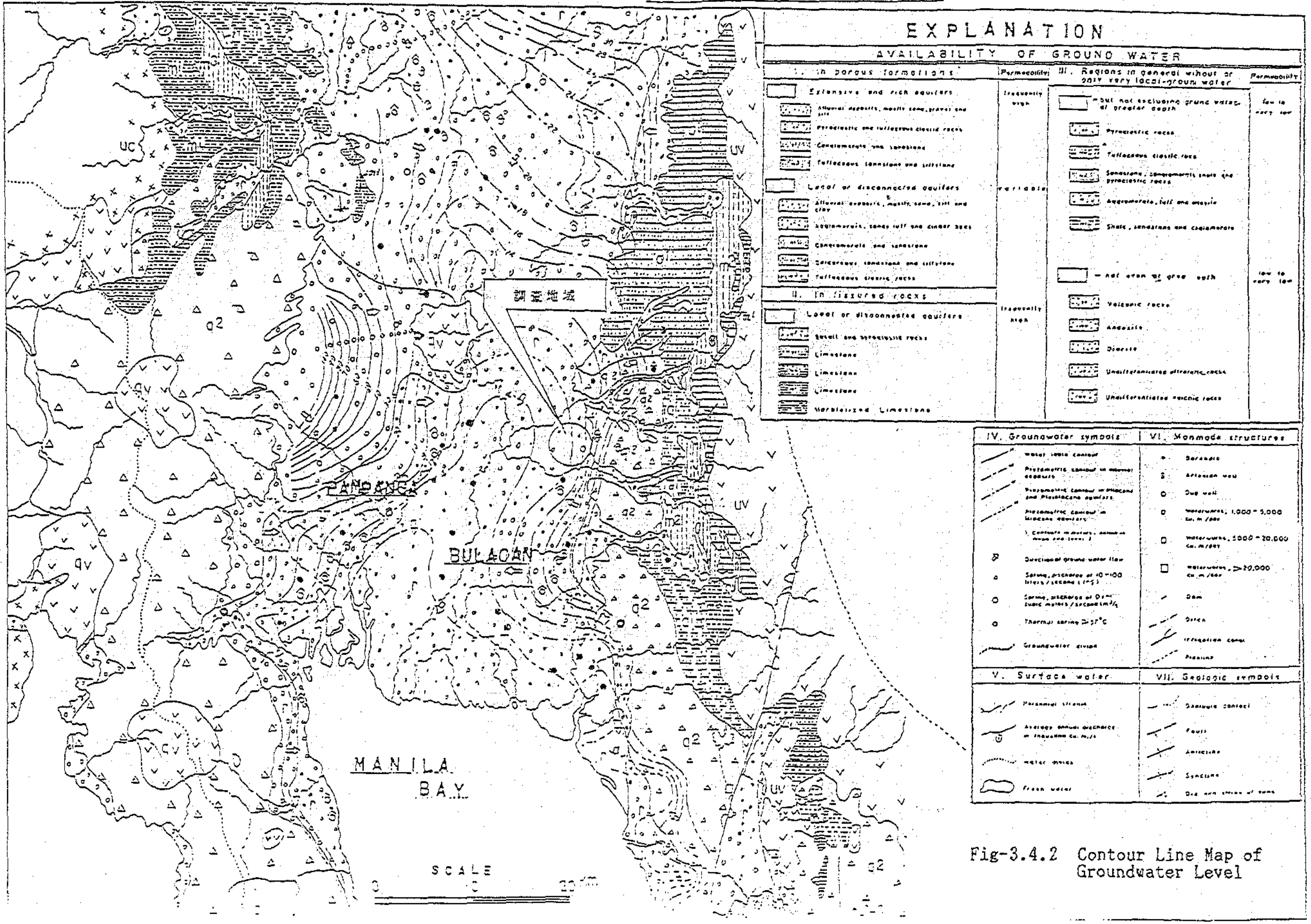


Fig-3.4.2 Contour Line Map of Groundwater Level

prospecting was conducted at 4 points, including the proposed well site, with a sounding depth of 200 meters.

The results of the prospecting were analyzed using Sandberg's Standard Curve and the sub-surface cross section was illustrated. The results represent a lower resistivity from several to several tens of ohm-meters and suggest that most of the formation consists of high water content alluvial strata, such as clay and silt. Of these, the strata which show a relatively higher value of resistivity of 10 to 20 ohm-meters, suggest the existence of either sand mixed with gravel or clay mixed with gravel.

These results are attached in Appendix - 2.

(3) Investigation of Existing Well and Aquifer Coefficient

The only available water source at the "the Station" is a deep well which was constructed 35 years ago (1955) under the cooperation of USAID. However, since it is old, no data was available in the master file of the wells in either the Department of Public Works and Highway (DPWH), the Local Water Utilities Administration (LWUA) or the National Water Resources Council (NWRC). According to the interview survey, the well is 90 or 120 meters deep and can supply 25 lps. without any major rehabilitation, even though it has been operating long after the period of life of its equipment.

Fortunately, there is one deep well which was recently constructed by LWUA about 1000 meters west of the proposed well site.

The geological log, the well design and the results of the electrical logging are as presented in Fig. -3.4.3. On the basis of the electrical logging, the screen of the LWUA well was installed at depths of 59-62, 92-98, 146-155 and 155-164 meters from the ground surface. Other principal well data are as enumerated hereunder:

a. Casing Diameter:

0 - 86 m deep	:	250 mm
86 - 170 m deep	:	150 mm

b. Natural Water Level : 4.3m

c. Drawdown : 42.0m

d. Pump discharge : 25.0 lps

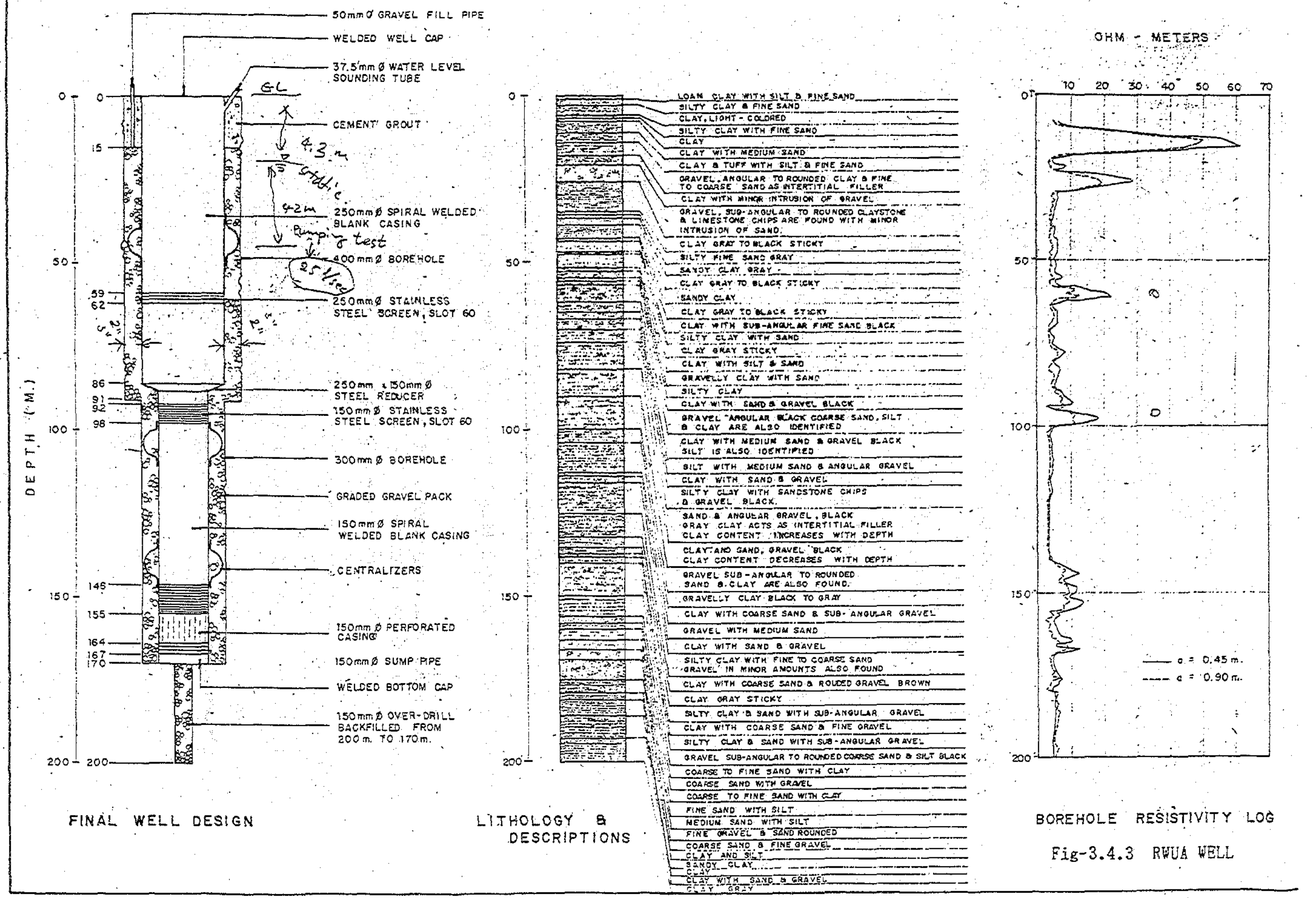


Fig-3.4.3 RWUA WELL

According to the above well data, the specific capacity (Sc) and the transmissivity can be estimated as follows:

$$Sc = 25 \times 86.4 / 42 \doteqdot 52\, m^2 / day / m$$

The transmissivity (T) can be approximately derived from the simplified relationship of $T \doteqdot 1.2\, Sc$, as follows:

$$T = 52 \times 1.2 = 62.4\, m^2 / day$$

Furthermore, the coefficient of permeability (k) can be obtained as follows from the relationship of

$T = k \cdot b$ when the entire screen length (27m) is adopted to the effective thickness of the aquifer:

$$k = 62.4 / 27 = 2.3\, m / day = 2.66 \times 10^{-3}\, cm/sec.$$

Thus, the above data of the LWUA clearly represents a moderate aquifer.

3.5 Soil

The soil survey during the field survey consisted of:

- reconnaissance survey and some test pitting at the proposed collection sites of the typical soils in the Philippines, and
- test pitting at the proposed soil tank site in "the Station".

(1) Reconnaissance Soil Survey at the proposed collection sites of typical soils.

Soil is classified by order, the largest category, group, family and then by series in the 7th approximation by USDA. The following are the typical order types of the soil in the Philippines and their major features:

Of these, 6 typical soil types at 8 sites were selected for the proposed collection site, and test pittings were conducted at 4 selected sites by the SRDC experts. The location of the sites and the observation results are shown in Appendix - 1 and 2.

Further test pitting and soil testing by the SRDC experts are still on-going.

Order	Characteristics
Molisols	Fertile soil
Vertisoils	Main clay deposit is montmorillonite.
Andisols	Volcanic ash soil. Main clay deposits are Allophen and Halloysite.
Oxisols	Poorly weathered
Ultisols	More weathered soil than the above
Alfisols	Even more weathered soil than the above
Entisols	Not mature
Histosols	Peat
Inceptisols	Common soil. Less weathered soil than Entisols.

(2) Soil Survey at Proposed Soil Tank Site

The soil map of "the Station" is as illustrated in Fig. - 3.5.1 (1). In the proposed soil tank site, soil was observed at 6 test pits.

Detailed analysis of the soil samples obtained from the pits is still on-going in SRDC. However, the description in Fig.- 3.5.1.(2) shows that the dominant types of soil at the site consist of Alfisols and Vertisols. The preliminary results of the test pitting also clearly indicate that the 30cm thick top soil is loamy soil mixed with sand, gravel and/or clay and the underlying soil is impermeable clayey soil. This clayey soil ensures that the soil tank can be constructed as planned without a bottom. Thus, only a concrete frame will be constructed to form the soil tank.

On the other hand, the bearing capacity of the foundation soil of the proposed soil tank are estimated at 5 to 10 tons/sq.m, according to the following guidelines employed in BSWM.

Soil	Allowable Bearing Capacity (ton/m^2)
Alluvial Soil	5
Soft Clay	10
Hard Clay	20

However, since the foundation soil is clay, slight settlement shall be taken into account in the designing and during the construction work.

3.6 Land Use

The present land use of the experimental activity in "the Station" was surveyed in order to understand the present condition of the proposed soil tank site. The results of the survey, attached in Appendix -2, show that a multi-cropping test (l ha) and an upland rice cultivation test (1 ha) are on-going. However, both of them are scheduled to be completed by December 1990.

(1) Land Use Plan

A master plan has been prepared for "the Station", which includes the proposed soil tank experimental plot. The outline of the plan is as illustrated in Fig. 3.6.1.

3.7 Irrigation and Drainage Survey

(1) Present Irrigation Facilities

As is described in section 3.4 Hydrogeology, the present water source of "the Station" is only one deep well constructed 35 years ago. Although the pumping capacity is as large as 25 lps, this discharge can only irrigate about half of the entire area of the Station(20 ha) because part of the pumped water is supplied for the domestic use of the Station.

The irrigation canal consists of concrete and earth canal and pipe lines as shown in Fig. - 3.6.1.

(2) Present Drainage Facilities

The present drainage network is still less developed. Due to the natural slope of the area from north to south, most of the rain water is collected into 4 farmponds and discharged gradually into the main drainage channel, which is a natural creek flowing from east to west along the south end of the Station. This drainage creek dries up during the dry season and seldom floods during the rainy season. Thus, the area for the proposed soil tank site will be free from inundation.

3.8 Construction Cost Survey

Based upon the analysis of the collected data for the cost estimation of the construction work, it was decided to employ the 1989 government unit rates, appropriately adjusted for inflation.

SOIL MAP

CENTRAL SOIL RESEARCH STATION
BUENAVISTA, SAN ILDEFONSO, BULACAN

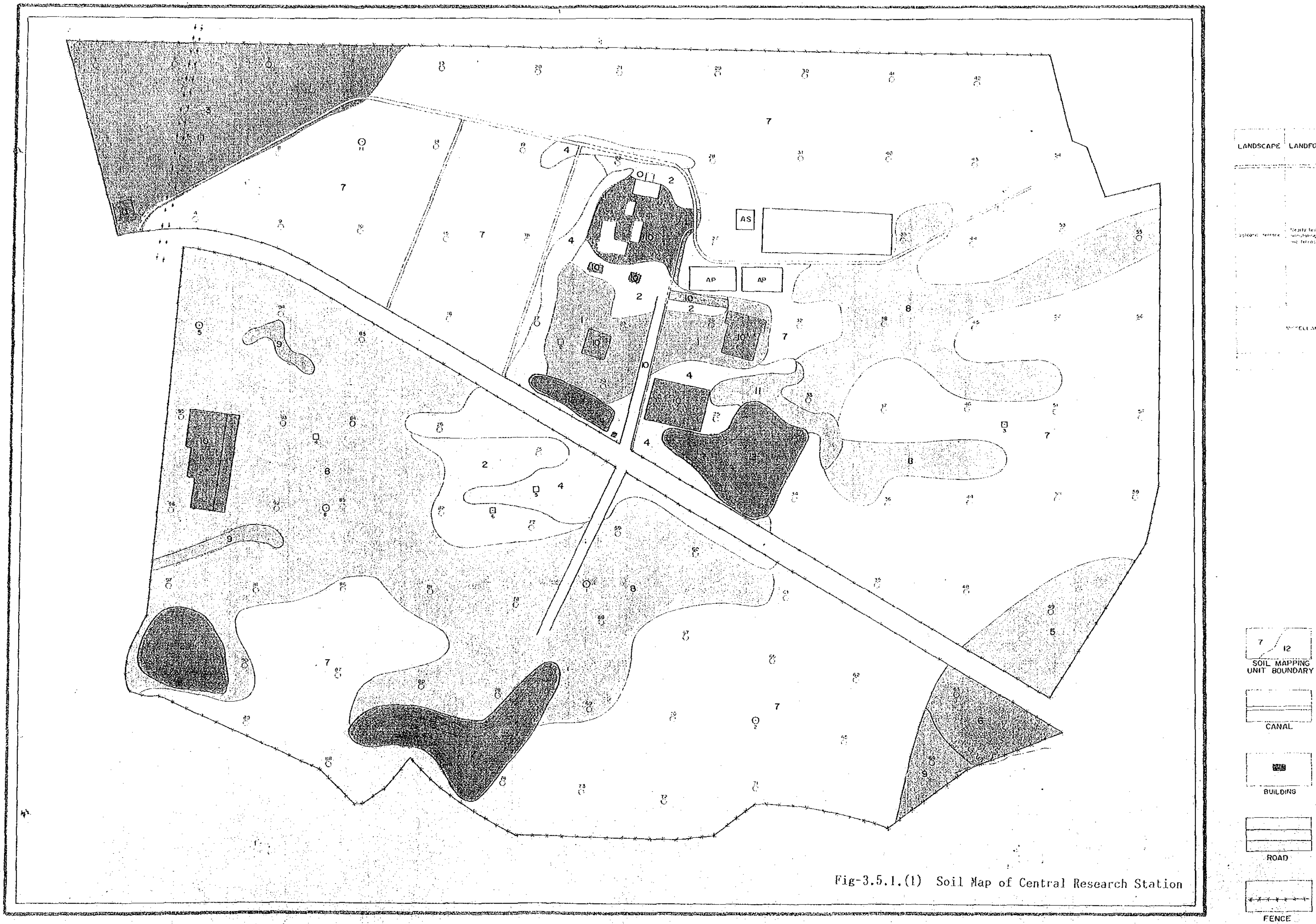


Fig-3.5.1.(1) Soil Map of Central Research Station

SCALE - 1:2,000

LEGEND

LANDSCAPE	LANDFORM	PARENT MATERIAL	SOIL TAXONOMIC MAP UNIT/MISC. LAND TYPE	TAXONOMIC MAP UNIT CODE	SOIL TAXONOMIC MAPPING UNIT CODE	AREA	
						Hectares	Percent
Volcanic terrace	Nearly level to undulating volcanic terrace	Volcanic tuff	AjtH / A	1	Alfisols, fine clay, Typic Hapludalfs, 0.0 to 2.0 percent slopes	0.4672	1.95
			AjtH / B1	2	Alfisols, fine clay, Typic Hapludalfs, 2.0 to 5.0 percent slopes, slightly eroded	0.4496	1.87
			AjtH / B2	3	Alfisols, fine clay, Typic Hapludalfs, 2.0 to 5.0 percent slopes, moderately eroded	1.1464	4.78
			AjtH / C2	4	Alfisols, fine clay, Typic Hapludalfs, 5.0 to 8.0 percent slopes, moderately eroded	0.9696	4.04
			IjlT / A	5	Inceptisols, fine clay, Lithic Tropaquepts 0.0 to 2.0 percent slopes	0.3792	1.58
			IjlT / B2	6	Inceptisols, fine clay, Lithic Tropaquepts, 2.0 to 5.0 percent slopes, moderately eroded	0.2448	1.02
			VjnR / A	7	Vertisols, fine clay, Aquentic Chromuderts, 0.0 to 2.0 percent slopes	12.3400	51.42
			VjnR / B	8	Vertisols, fine clay, Aquentic Chromuderts, 2.0 to 5.0 percent slopes	5.5896	23.29
			VjnR / C2	9	Vertisols, fine clay, Aquentic Chromuderts, 5.0 to 8.0 percent slopes, moderately eroded	0.2576	1.07
MISCELLANEOUS LAND TYPE			BA	10	Built-up Area	0.9912	4.13
			FA	11	Filled-up Area	0.1568	0.65
			Fp	12	Fish pond	1.0080	4.20
					TOTAL	24.00	100.00

EXPLANATION OF SOIL MAPPING SYMBOLS

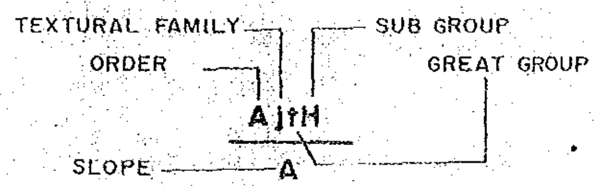


Fig-3.5.1.(2) Soil Map of Central Research Station

SOIL ORDERS	SYMBOL
Alfisols	A
Inceptisols	I
Vertisols	V

GREAT GROUPS	
Hapludalfs	H
Tropaquepts	T
Chromuderts	R

SUB GROUPS	
Lithic	l
Aquentic	n
Typic	t

TEXTURAL CLASS	SYMBOL
Fine clay	j

SLOPE CLASS
- 0-2 - Level to nearly level
- 2-5 - Nearly level to gently sloping
- 5-8 - Sloping to undulating

EROSION CLASS
- 1 - slightly eroded
- 2 - moderately eroded

TOPOGRAPHIC MAP
Central Soil Research Station
Buenavista, San Ildefonso, Bulacan

Food
JR., Director
Soil Research Div.
Superintendent

SURVEYED BY:
R. G. Palis, R. A. Monte, V. F. Naboa
V. G. Estoconing and R. P. Creencia
on April 1-4, 1986

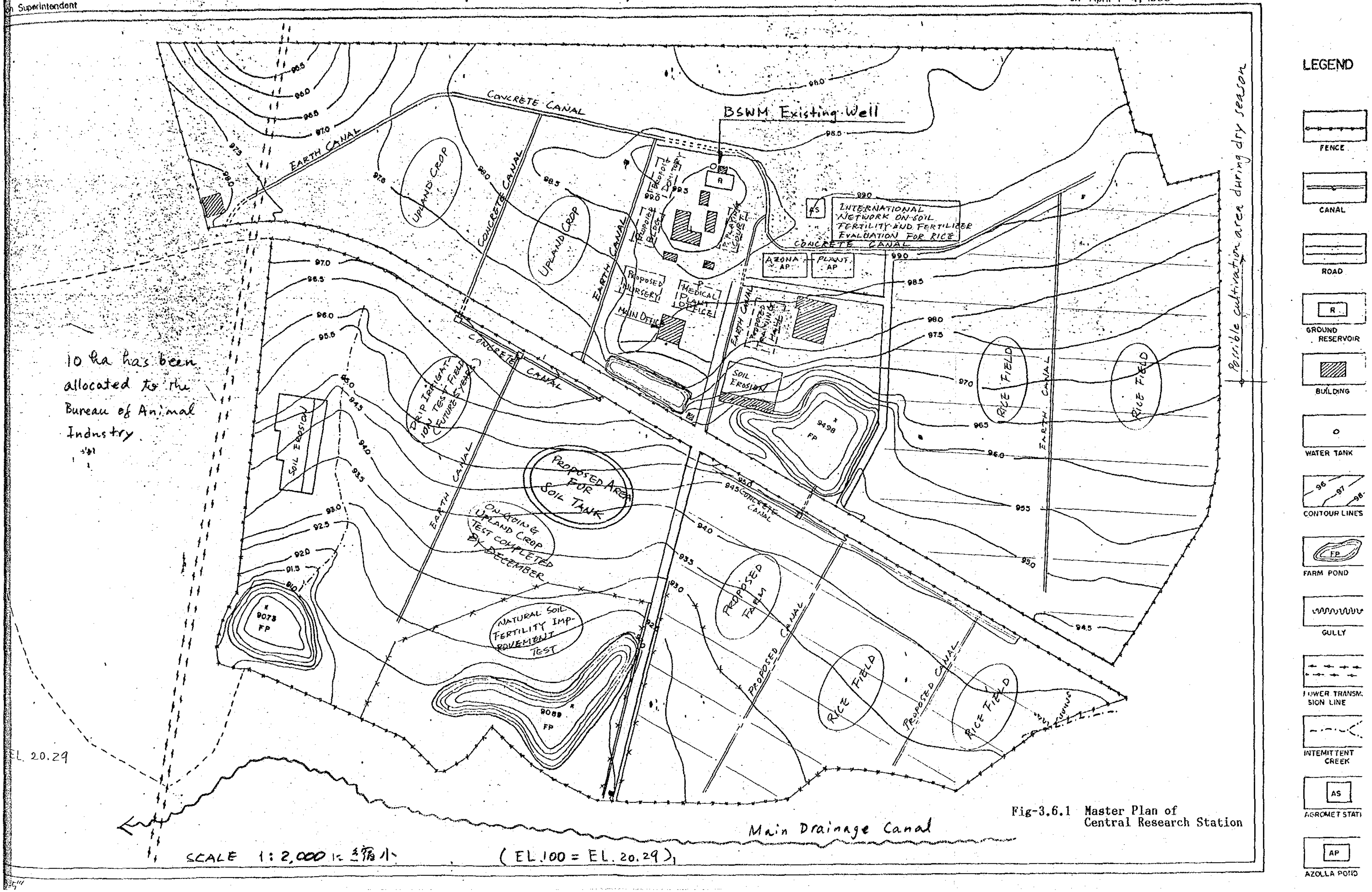


Fig-3.6.1 Master Plan of Central Research Station

The construction unit rate was relatively stable before 1988. However, reflecting the recent drastic increase in the price of construction activities , and materials materials such as fuel, cement, reinforcement bar, asphaltic material, metal products, lumber, structural steel and electrical & machinery fixtures increased 23.5 percent from March 1989 to February 1990. Furthermore, the minimum wage also recently increased 32 percent from 68 to 90 pesos.

Price increases of major construction materials from 1985 to February 1990 are listed in Appendix -2.

The trend of the exchange rate between Japanese yen, US dollars and Philippines pesos during the past half year is also listed in the same Appendix. The data shows that the exchange rate was 6.4 yen per 1 peso as of July 27, 1990.

Chapter 4

Plan and Design of Facilities

Chapter 4. Plan and Design of Facilities

4.1 Soil Tank

(1) Layout

Since a slope of 3-5 percent has been observed at the proposed soil tank site, a terrace type soil tank was determined to be the most advantageous layout for the following reasons:

a. To minimize construction costs as well as the area of the soil bank for the excess excavated soil, or

b. To avoid the creation of different ground water levels, which can occur when soil tanks are constructed on respective excavated and banked foundations.

c. To consider the well balanced slope between the surrounding area and the proposed soil tanks

Thus, the space between each terrace elevation was designed as 30 cm and 5 tanks were planned to be constructed on each side of the center pit.

This layout allows for a gravity flow of water for the irrigation and the drainage canals of these soil tanks.

(2) Size of Soil Tank

The size of soil tanks in Japan varies from 4 to 100 meters long to meet respective experimental requirements. However, 10 to 20 meter long tanks are most popular, due to the following commonly conducted experiment:

- Minimum size of a planting block for one crop is about 6 sq.m:, and

- In normal experiments, fertilizer is applied at 3 different stages to 3 varieties planted in 3 blocks.

The minimum area of 160 m^2 is thus obtained from 6 m^2 x 3 x 3 x 3 for one soil tank. It was finally planned for one tank to be 10 m x 20 m (200m^2), in consideration of the border effect which occurs along the concrete frame.

Further, since the soil tanks are supposed to provide basic data on land evaluation activity through the application of remote sensing, a 10 m x 20 m wide tank is considered to be the minimum possible dimension for remote sensing surveys.

With respect to the required number of soil tanks, 10 sets of soil tanks have been recommended and accepted, in consideration of the 10 types of soil available in the Philippines (refer to Section 3.5 Soil).

(3) Depth of Soil Tank

A minimum soil depth of 40 cm is required for testing, given the root zone of the crops. It is preferable to fill the soil tank with the test soil in the same density as the natural density at the collection site. However, it may not be practical to accomplish such a condition artificially. Therefore, natural compaction through water sprinkling is recommended.

Considering the various factors which may limit the accuracy of the construction work, it is planned for 50 cm thick test soil to be underlaid with 10 cm thick compacted gravel. The provision of the gravel aims not only to prevent the roots from penetrating downwards but also to expedite underground drainage. The height of the concrete frame is thus set at 70 cm, given a 10 cm high allowance above the surface of the test soil.

While the soil tank is used as an irrigated paddy field, 45 cm deep test soil and 15 cm deep free board are planned because shrinkage of soil generally occurs when soil is disturbed by land preparation works. Soil such as Vertisols, which contains montmorillonite, are exceptions as they are characterized by swelling properties.

With respect to the bottom of the soil tank, no water proof material is needed because it is expected that dominant clayey soil will be found following excavation of the top layer of soil, as discussed in Section 3.5 Soil. However, if permeable soil is observed after excavation, it must be removed and refilled with excavated clay.

(4) Structure

Since a 30 cm difference in elevation has been planned for each terrace, the height of the partition frame for each tank will be 1.0 meter, while the height of other frames will be 70 cm. Considering mechanical conditions of the soil, such as non-equilibrium earth pressure on the partition frame, earth pressure when the other side of the tank is empty, and bearing capacity, the adverse T type retaining structure has been adopted as the frame of the soil tank. In addition, since slight differential settlement is anticipated due to the clay foundation as mentioned in Section 3.5 Soil, it has been planned for reinforced concrete to be used with an expansion joint at every 5 to 10 m span of the structure.

The thickness of members of such structures was designed as 20 cm; however, a 40 cm wide space was designed on the top of the partition frame so as to allow daily inspection by foot.

4.2 Related Structure of Soil Tank

(1) Inspection / Farm Road

In consideration of tractor traffic and in order to prevent mixing of outside soil into the soil tank, a gravel road was designed at the area surrounding the soil tanks. The capacity (30 H.P.) and minimum turning radius (2.8 m) of the proposed tractor were taken into account.in the planning of this 3 meter wide road.

(2) Tractor Approach

A 20 cm difference in height was designed for the surface of the road and the soil tank in order to allow for gravity flow of the irrigation canal. A concrete tractor approach was thus designed for the outside of each soil tank. The width of the approach was to be 3 meters to protect structures from damage caused by tractor implements, such as plows.

(3) Turfing

In order to minimize the boarder effect, Turf facing was designed at the periphery of the soil tank.

(4) Hole for Bird Protection Pole

50 mm dia. and 200 mm deep holes are provided at 5 meters intervals on the top of the concrete frame.

(5) Countermeasure for Rats

An effective rat protection fence made of G.I. sheet and steel net, developed by the station, will be installed by the Station, when it is judged necessary. No moles have been observed at the proposed site.

4.3 Irrigation Plan and Design

(1) Irrigation Plan

It is planned for the proposed soil tank to be initially used to conduct an experiment on upland crops, such as maize. However, it will be utilized as the experimental plot for the irrigated paddy field in the future. Therefore, the above experiments shall serve the following dual purpose:

(a) Upland crop irrigation

Both sprinkler and furrow irrigation systems are to be applied. However, the sprinkler equipment is to be procured under a procurement schedule which is separate from that of the present Works.

(b) Paddy irrigation

Designs of common facilities for both flood irrigation for paddy and furrow irrigation for upland crops are required.

(2) Estimation of Irrigation Water Requirement

The method of estimating the irrigation water requirement for the soil tank is slightly different from the one used extensively for normal farm land mainly due to the fact that it is for experimental purposes, which require various water distribution conditions. The following criteria was thus established according to the plan of the SRDC experts:

Rotation of irrigation	:	5 days from Monday to Friday
Daily irrigation hour	:	8 hours / day
Field irrigation efficiency	:	85 percent
Sprinkling efficiency	:	60 percent (applicable only for upland crop)

The maximum evopotranspiration recorded in "the Station" from 1986 - 89 was 12 mm/day, which is relatively higher than the value for normal crops in Japan. The recorded maximum percolation in the paddy field during the same period was 13 mm /day, which is a considerably higher value than clayey soil.

However, the water requirement will be determined, to be on the safe side, at the time of land preparation for paddy cultivation as follows:

Where, Ts is the thickness of test soil (450 mm)

Tg is the thickness of gravel bed (100 mm)

a. Common Soil

void ratio of test soil (20%) × Ts	=	90 mm
void ratio of gravel (30%) × Tg	=	30 mm
depth of standing water	=	100 mm
Total		220 mm

b. Volcanic Ash

void ratio of test soil (60%) × Ts	=	270 mm
void ratio of gravel (30%) × Tg	=	30 mm
depth of standing water	=	100 mm
Total		400 mm

The design water requirement was thus determined as 400 mm which corresponds to 7 lps derived as follows:

where, two soil tanks filled with volcanic ash such as Allophen and Halloysite and irrigated in 8 hours under 85 percent of irrigation efficiency,

$$400\text{ mm} \times 20\text{m} \times 10.4 \times 2\text{ plots} \times \frac{1}{3600 \times 8\text{ (hr)}} \times \frac{1}{0.85}$$

$$= 6.8 \fallingdotseq 7\text{ lps}$$

(3) Design of Irrigation Facilities

A minimum reinforced concrete flume, 30 cm wide and 30 cm deep (including free board of 10 cm), was planned. A small stop log facility was provided for each soil tank to divert the water. Since the dimensions of the flume were small and short, it was constructed as a flat foundation with the water flowing with a water surface gradient instead of a bottom gradient.

The irrigation canal had a total length of approximately 215m and was composed of an open canal (163m) and a pipe line (52m).

4.4 Drainage Plan and Design

(1) Drainage Plan

The subsurface and surface in in each soil tank and the surface drainage in the vicinity of the soil tanks shall be planned.

With respect to subsurface drainage, discharge observation of both drainage water and fertilizer were required. Therefore, an underground drain having a downstream end was planned so as to allow for observation of the discharge volume.

The surface drainage of the soil tank shall be planned so as to satisfy the drainage conditions for both upland and paddy cultivation.

Additionally, a drainage facility must be provided along the periphery of the inspection road in order to drain water in the vicinity of the soil tank. This drainage canal shall be connected to the farm pond after it is joined with the drainage water from the soil tank.

The drainage water in the farm pond will be gradually discharged into the main drainage creek described in Section 3.7 Present Irrigation and Drainage Facilities.

(2) Design of Drainage Facilities

(a) Pipe Drainage

The layout and structure of the pipe drainage for the soil tank was designed according to experience gained in the Agricultural Engineering Research Institute, Japan, based on technological and economic considerations.

One pipe drain was thus designed for each soil tank. The pipe drain was to be located in the gravel bedding and the backfill material was to be composed of husk. Collection of the husk was requested of BSWM in the Wrap-up Paper (refer to Appendix - 2).

Since the net type pipe (Netoron or equivalent), the most effective material, is not available in the Philippines, the perforated PVC pipe was used in the design.

The downstream end of the pipe drain is connected to the center pit and equipped with a gate valve to enable management of the subsurface water in the tank. The total length of the pipe drainage was set at 200m.

(b) Center Pit and Surface Drainage of Tank

A reinforced concrete flume was designed for the dual purpose of discharging the surface water and observing the discharge. The inside section of the flume is 90 cm and 110 cm deep, in consideration of the observation space. At the center of the bottom slab, a small drainage section having a width of 20 cm and a depth of 5 cm was designed for the normal drainage. The total length of the center pit is 51.6m.

(c) Surface Drainage Along Periphery of Soil Tank

In order to prevent the surrounding area from receiving the discharge of the rainwater in the entire area of the soil tanks, a small earth canal (50 cm bottom width) was designed along the outside the slope of the inspection road.

Total length of this canal is 276m. Additionally, 26m of concrete drainage pipe are to be installed.

4.5 Water Source Plan and Well Construction Plan

(1) Water Source Plan

The existing well in the Station (constructed 35 years ago; normal equipment life is 25 years) still maintains a capacity of 25 lps. However, the volume of the water is only sufficient to irrigate half of the Station. Therefore, a new well is a prerequisite to conduct the proposed soil tank experiments. The minimum design capacity of the well was estimated at 8.5 lps, including a 20% allowance for the irrigation water requirement(7 lps).

Since the proposed well was designed on the basis of the results of the electric prospecting and the existing well data, the casing program and the final pump capacity shall be reviewed again on the basis of the step draw-down pumping test during the construction work.

(2) Well Design

The results of the electric prospecting and the existing well data reveal the viability of groundwater development at the proposed well site. The component of the proposed well was designed as enumerated hereunder:

1) Drilling depth : 120 meters

2) Aquifer : A stratum with a depth of 75 to 120 meters which consists of clay mixed with gravel was

selected as the main aquifer based on the results of the electric prospecting at the site of VES 1.

3) Casing dia. : 200 mm (8 inches)

4) Screen : minimum 20 m long stainless screen with a maximum slot size of 60 (1.5 mm).

5) Design Capacity :

The well depth and the screen length of the proposed well are shallower and shorter, respectively, then the LWUA well. Therefore, the specific capacity of the proposed well will also be smaller than the LWUA well.

Since the specific capacity is in proportion to the length of the screen in general, the specific capacity (Sc) of the proposed well can be obtained from the screen length of the existing well, as follows:

$$Sc = 52 \times 20/27 = 37 \ m^3/day/m$$

The design capacity of the proposed well (Q) is thus obtained on the basis of the design drawdown (20 m) as follows:

$$Q = 20 \times 37 = 740 \ m^3/day = 8.5 \ lps$$

(3) Assessment of Impact to Existing Well

The existing well, located about 160 m north of the proposed well, is the only water source of the Station. Therefore, an assessment of the impact which pumping at the newly constructed well will have on the existing well was made hereunder, on the basis of the following assumptions:

Assumption regarding the proposed well:

capacity	:	8.5 lps
pumping hours	:	8 hours
transmissibity	:	62.4 m^2/ day according to LWUA well
storage coefficient	:	0.001 (standard value for the confined water)

The lowering of the water level 160 m from the proposed well is thus derived from the following thesis's non-equilibrium formula:

Where; S : drawdown

$$S = \frac{Q}{4\pi T} W(u) \qquad \cdots\cdots\cdots\cdots\cdots \text{①}$$

$$U = \frac{r^2 S}{4tT} W(u) \qquad \cdots\cdots\cdots\cdots\cdots \text{②}$$

Q : Pumping discharge

W(u) : well function

T : transmissibity

r : distance from the proposed well

S : storage coefficient

Thus;

$Q = 8.5 \text{ lps} = 30.6 \text{ m}^3/\text{hour}$

$T = 62.4 \text{ m}^2/\text{day} = 2.6 \text{ m}^2/\text{hour}$

$r = 160 \text{ m}$

$S = 0.001$

$t = 8 \text{ hours}$

While;

$$u = \frac{160 \times 160 \times 0.001}{4 \times 8 \times 2.6} = 0.308$$

W(u) corresponding to u=0.308 can be obtained from the function table, thus

$W(u) = 0.89$

Drawdown can be derived from the above formula ① as follows:

$$S = \frac{30.6 \times 0.89}{4 \times 3.24 \times} = \frac{27.2}{32.7} = 0.83 \text{ m}$$

The drawdown at the existing well site in the Station (160 m from the proposed well site) was thus estimated at 0.83m. Since this value is small, the pump discharge of the existing well will be affected by no more than 1 to 2 percent, which is considered acceptable. The measuring device of the pumped water is the stuff gauge installed in the water tank.

(4) Recommendation

If the step pumping test reveals that the proposed well has a higher capacity, it is recommended that a large capacity pump, as opposed to a small pump, be installed. This would lower operation and maintenance requirements, in addition to preventing the following :

a. Lowered operation capacity of both the pump of the existing well and the new pump would have a lowered operating capacity,

b. A slight influence, although minimal, on the operating capacity of the existing well ,

c. If the existing old pump were to stop during the dry season due to mechanical problems, etc., the research activities at the Station would be greatly affected.

Further, it is also recommended that the existing and the proposed reservoirs be connected by a pipe in the future. This may also be a counter measure for the above problems.

4.6 Typical Soil Collection Plan

The typical soil to be filled in the proposed soil tanks shall be collected in accordance with the description in Section 2.4 and 3.5. The route map to each collection site is shown in Fig. - 4.6.1.

The volume of required soil in the soil tank is, as mentioned previously, 20 m $\times$ 10.4 m $\times$ 55 cm (including 10% loss), ie., 114.4 m^3.

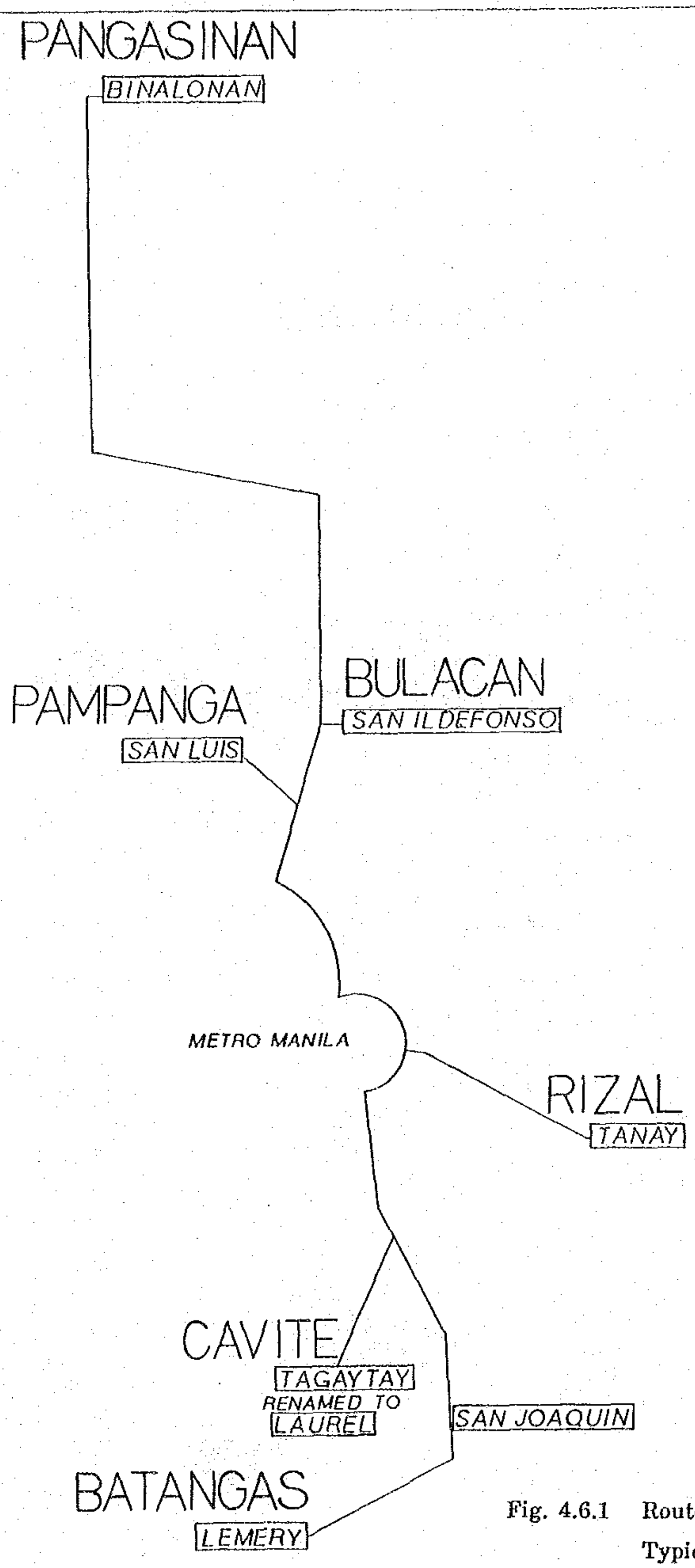


Fig. 4.6.1 Route Map of Typical Soil Site

Chapter 5

Construction Plan

Chapter 5. Construction Plan

5.1 General

The dry season in the proposed site normally starts from the middle of November and ends in the middle of May. However, since this Works is proposed to be completed in this Japanese fiscal year, it is recommended that the main construction work be completed by the middle of March, 1991.

The main construction work consists of earth work, concrete work, well construction work and collection of typical soil. Although the scale of these individual works is small, they each require attention to detail because these facilities are to be used for experimental purposes. The highly experienced resident engineer must, therefore, be under constant supervision in order to successfully execute the construction work.

5.2 Construction Plan

(1) Construction Work of Experimental Farm

Prior to the construction work, the topographic survey shall be conducted to establish bench marks and setting out. The works shall be done in the following order:

- stripping
- excavation
- foundation treatment
- concrete work for concrete frame and center pit
- preliminary backfill and compaction of the peripheral area of the soil tank
- spread and compaction of the gravel bed in the soil tanks, and
- installation of under drain

Special attention must be paid as follows:

a. In case high permeable soil other than clay is observed on the excavated surface of the proposed soil tank, such soil shall be removed and backfilled by clay in order to cut off the rapid ground water flow to or from the neighboring tank.

b. The said excavated surface shall be compacted by an 11 ton class bulldozer, and then completed with an accuracy of 5 cm.

c. The concrete work for the frame and the center pit shall be started from the downstream tank, in principle. However, due consideration and examination will be required for the concrete placing schedule and procedure in order to complete the work within the proposed schedule.

d. Clods of the typical soil shall be manually broken up into a size not exceeding 5 cm dia. and filled in the soil tank by sprinkling water. The remaining typical soil shall be neatly banked out side the soil tank , no higher than 1.5 meters, and the slope shall be finished.

(2) Collection of Typical Soil

The typical soil, filling an area of 20 m x 10.4 m at a depth of 55 cm, including a 5 cm allowance for loss, settlement and future additional embankment, shall be procured and excavated at the borrow pit. The top soil at the borrow pit, about 20 cm deep, shall be stripped and evenly spread after excavating the typical soil at the borrow pit.

The typical soil shall then be transported by a 11 ton class dump truck, if permitted by local conditions, and covered with a vinyl sheet in order to maintain the natural water content of the typical soil.

The hauled soil shall be temporarily deposited at the side of the soil tank, with great care being made to minimize the deposit and tank filling time.

(3) Irrigation Canal

Immediately after completion of the preliminary backfill and compaction of the outside area of the soil tank, the minimum area for the concrete canal shall be again excavated to the line, grade and dimension directed by the engineer. The construction accuracy of the canal shall be not more than 5 mm in elevation, while the allowable accuracy in the inspection shall be no more than 10 mm.

(4) Road Work

Immediately after completion of the canal work, the surrounding area of the soil tank shall be finished, trimmed and compacted to the line, grade, dimension and slope as shown on the drawing, and then sod facing and gravel paving shall be carried out.

(5) Well Construction

Since the construction work of the proposed deep well is essential, a well experienced well construction contractor shall be employed. The work procedure for the well construction is as follows but not limited to:

a. well drilling

b. electrical logging

c. determination of final casing and screen program

d. installation of casing and screen

e. gravel packing with grouting in upper portion

f. well development

g. pumping test

h. additional grouting

i. sealing of well

Immediately after completion of the well construction work, the submersible pump having the maximum capacity within the budget shall be installed. Construction of the pump house and electrical work shall be subsequently completed. Since the well construction work is to be carried out in parallel with the construction work of the water tank, due consideration must be paid to avoid interferance with the execution of the works and their respectiveschedules.

The initial pumping as well as the discharging test shall be carried out at the end of the entire construction work. If any defect or crucial leakage, etc. should be observed, such defects shall be repaired immediately as directed by the engineer.

5.3 Construction Schedule

The proposed period of the construction work is 4 months as shown in Fig. - 5.3.1.)

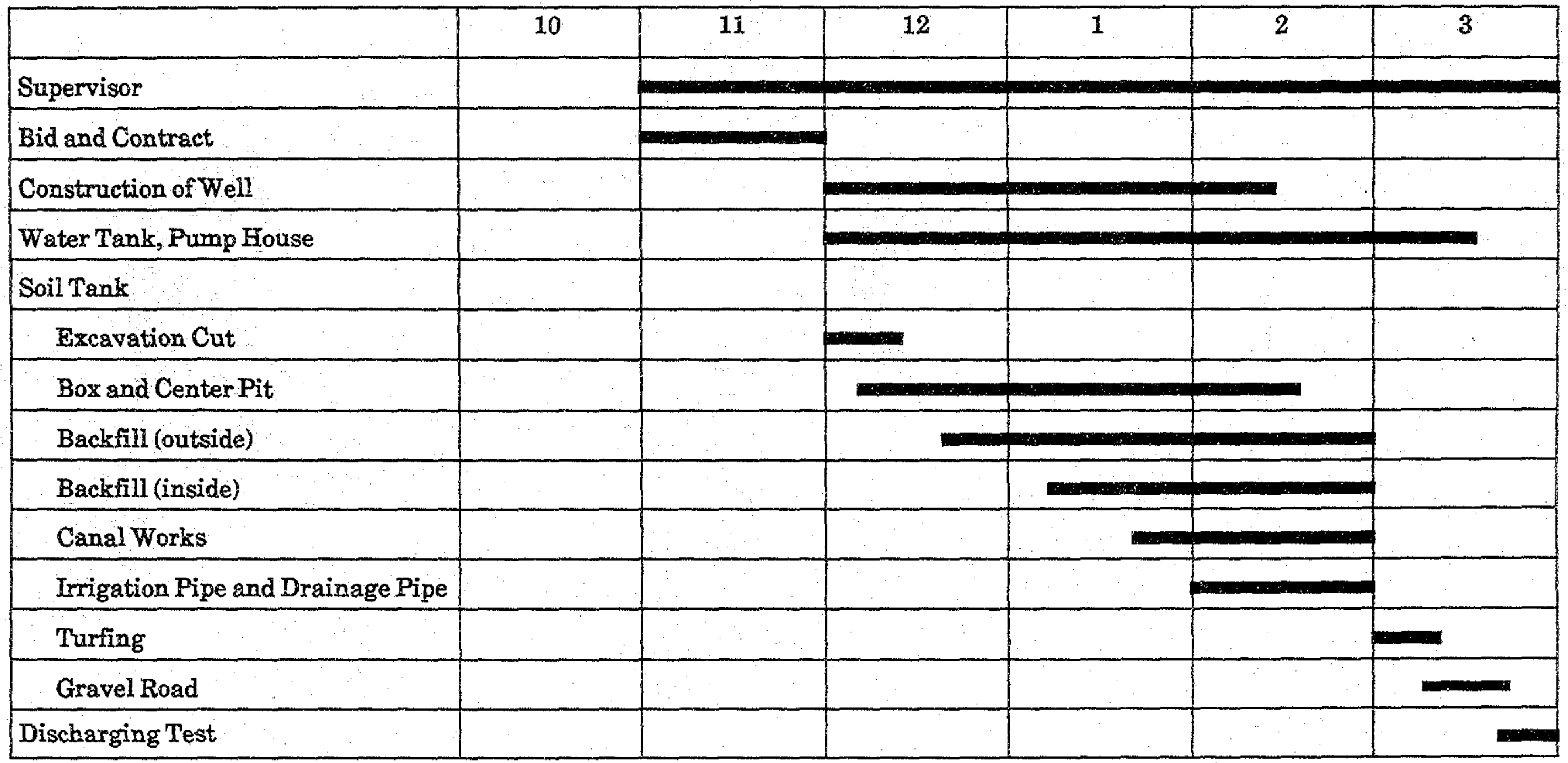


Fig. 5.3.1 Construction Schedule

Chapter 6

Cost Estimation

Chapter 6. Construction Cost Estimation

6.1 Unit Cost

The unit costs of the civil works are based on the costs of BSWM and the unit costs of the well construction works are based on the costs of LWUA, which were published in 1989. Furthermore, price increases were taken into consideration.

6.2 Over Head Cost

Since this construction works are executed by a construction company, 30% of the direct construction cost is estimated for the overhead cost as enumerated hereunder:

- Site management cost
- Site management and Insurance
- Benefit of Contractor
- Tax

6.3 Contingency

Contingency is prepared for the costs incurred by the difference between the estimated and actual construction time and any additional works done on the foundation of the experimental plot which were not confirmed during the survey.

This cost is estimated at 10% of the direct construction and overhead costs.

6.4 Total construction Cost

Break down of the construction cost is attached in next page. The total construction cost is 4,363,078 pesos (27,924,000 Yen).

The amount of 3,777,556 pesos (24,176,000 Yen), which is composed of direct construction costs and expenses, does not include the cost of the following machinery and construction materials.

1.) Casing Pipe	85,850
2.) Screen	231,000
3.) Submergible Pump	231,000
(Pesos)	567,850
	(¥ 3,506,000)

SUMMARY OF BILL OF QUANTITIES

		Pesos
1.	Construction of Soil Tank, Farm Road, Irrigation & Drainage Facilities, Pump House, Water Reservoir and Other Appurtenant Facilities.	1,785,812 (¥ 11,429,000)
2.	Construction of Well.	405,156 (¥ 2,593,000)
3.	Procurement and Backfilling of Test Soil.	714,844 (¥ 4,575,000)
4.	Expense ((1 + 2+ 3+) × 30%)	871,744 (¥ 5,579,000)
5.	Total	3,777,556 (¥ 24,176,000)
6.	Contingency (5× 10%)	377,756 (¥ 2,418,000)
7.	Total	4,155,312 (¥ 26,594,000)
8.	Construction Control (7× 5%)	207,766 (¥ 1,330,000)
9.	Grand Total	4,363,078 (¥ 27,924,000)

APPENDIX

BASIC PLAN

ON

MODEL INFRASTRUCTURE

IMPROVEMENT WORKS

FOR

THE SOIL RESEARCH

AND

DEVELOPMENT CENTER PROJECT

July 6, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY
DETAIL DESIGN SURVEY TEAM
FOR SOIL RESEARCH & DEVELOPMENT CENTER
Shinjuku Mitsui Bldg., 2-1-1, Nishi-Shinjuku, Tokyo 163, Japan
☎ 03-346-5311, Telex J22271

July 6, 1990

Mr. Godofredo N. Alcasid, Jr
Director,
Bureau of Soils and Water Management,
Department of Agriculture,
Republic of the Philippines

The Model Infrastructure Improvement Works
for the Soil Research and Development Center Project

Dear Sir,

The Detail Design Survey Team (hereinafter referred to as "The Team") has been organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") for the purpose of formulating detailed plan on the Model Infrastructure Improvement Works for the Soil Research and Development Center Project (hereinafter referred to as "The Project").

The Team has, so far, made a series of site reconnaissances and discussions with authorities concerned of Filipino as well as Japanese experts in order to determine the location and the scale of the facilities. As a result, we would like to submit to you the Basic Plan as per attached.

The Team will proceed with your staff to conduct further field surveys and investigations at the site and make the detailed design on the basis of results of those surveys. After completion of the detailed design and assessment of its cost estimated by JICA, you will be informed of its result through the JICA Philippines Office.

Last but not least, we would like to express our appreciation for the kind cooperation of you and your staff during our stay in the Philippines.

Sincerely yours,

H. Inoue

HISAYOSHI INOUE
Detailed Design Survey Team
for the Soil Research & Development Center Project

cc: Mr. Nobuyoshi Sakino
Director,
Agricultural Development Cooperation Department, JICA

BASIC PLAN
ON
MODEL INFRASTRUCTURE IMPROVEMENT WORKS
OF
SOIL RESEARCH AND DEVELOPMENT CENTER PROJECT

by

HISAYOSHI INOUE

JICA Detail Design Survey Team
for the Soil Research and Development Center Project
in the Philippines

July 6, 1990

I. OBJECTIVE

The Team aims at formulating detailed plan on the Model Infrastructure Improvement Works of the experimental farm in San. Ildefonso, Bulacan, for the Soil Research and Development Center Projcet.

This experimental farm will enable the Projct to implement comparison studies including crop cultivation, soil management, soil fertility among different types of Philippine soils under a certain meteorological condition.

In this aspect, the Team conducted surveys and discussions on a framework of the experimental farm.

II. OUTLINE OF THE EXPERIMENTAL FARM

Figure 1, 2 and 3 show the outline of the experimental farm.

The detailed design of the experimental farm will be completed by the Team by the early September 1990.

III. STRUCTURES

1. Bottom of the experimental farm

The soils of the experimental plots (concrete tanks) should be separated individually by concrete frames. On the field studies, furthermore, the soils in the plots must be isolated from the original soil of the site in order to avoid its possible effects, which would disturb measurements of data.

The orginal soil at the site has complicated profiles mixing sandy and clayey layers. To prevent irrigated water from leaking out through the bottom of the plots, the sandy soil should be displaced with the heavy clay soil that is available within the Bulacan Station area.

A gravel layer (about 10 cm thick), moreover, should be made on the clay bed, which prevent experimenting plant roots from penetrating into the original soil of the site, which could cause various unknown effects on measurement of data.

2. Drainage of the experimental farm

For upland crop cultivation, excess water should be removed effectively and rapidly from the plots. Therefore, the facilities for both surface and underground drainage must be installed in the experimental plots.

This is because the surface drainage will remove rapidly excess water on the surface, meanwhile, the underground drainage will remove effectively excess water in the soils, especially in the plowed layers, as well as the water left on the surface via the surface drainage.

This facility could be used for measuring leaching of fertilizers and water balance as well.

3. Water supply system

Because the water supply system working in the Bulacan Station cannot afford to satisfy requirements of this experimental farm, a new water supply system must be installed at the site.

In the new system, water should be pumped first to a reservior, and then should be supplied to the plots through possible two methods as follows.

1) To supply water pressured by a booster pump for sprinkler irrigation.

2) To supply water by natural water head which enables us to use the experimental farm for both paddy and upland field.

4. Soils of the experimental farm

Although typical soils in the Philippines should be collected to the experimental farm, the soils near the Bulacan Station could be favorable, considering the limitation of the budget and difficulty of transportation.

Candidates of the sites where the soils will be collected are as follows at the present. (See Figure 4)

Vertisol ---- Bulacan Station
Molisol ---- near Binalonan, Pangpanga
Hapleaqualf---- near Bugallon, Pangpanga
Ultisol ---- near Tanay, Rizal
Andisol (Allophane) ---- near Tagaytay, Cavite
Andisol (Halloysite) ---- near Lemery, Batangas
* Two more soils will be collected for the experimental farm.

5. Tractor approach of the experimental farm

It is necessary to make entrance paths at the each plots so as to protect the concrete frame from damages of machinary.

Considering the area of one experimental plot (10m x 20m), entrance path must be installed outside of the plots, thus the plots can be used effectively.

IV. TENTATIVE SCHEDULE

The tentative schedule and procedure of the construction works are shown in Table 1.

V. OTHERS

The Government of the Philippines should take full resposibilities on the following items on the execution of the Model Infrastructure Improvement Works.

1) To get agreements of land owners to excavate soils concerned.
2) To manage any problem which arises during and after the construction works.
3) To assign counterparts during the construction period.
4) To maintain the experimental farm properly with the advise of JICA Technical Cooperation experts after the completion of the construction.

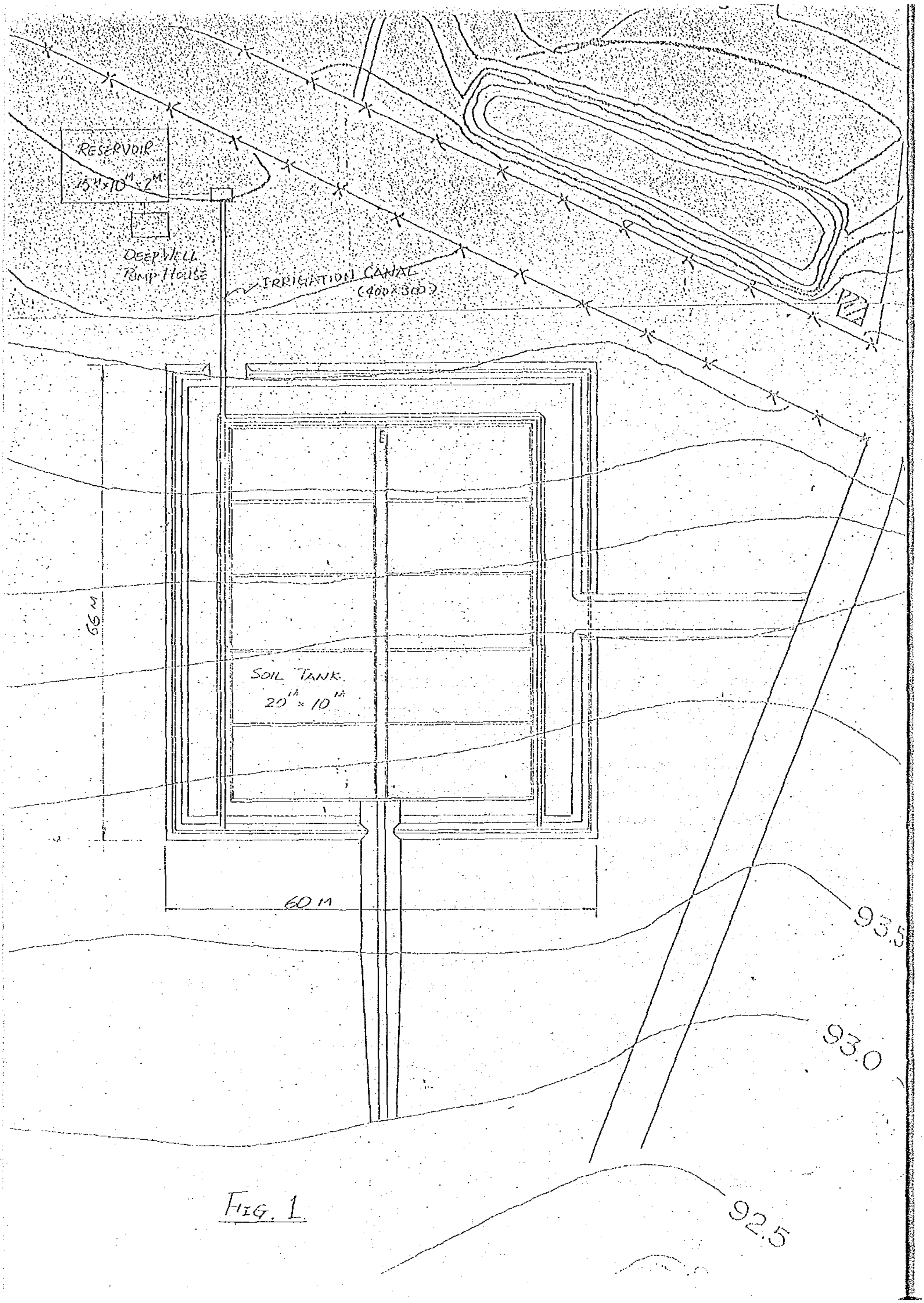
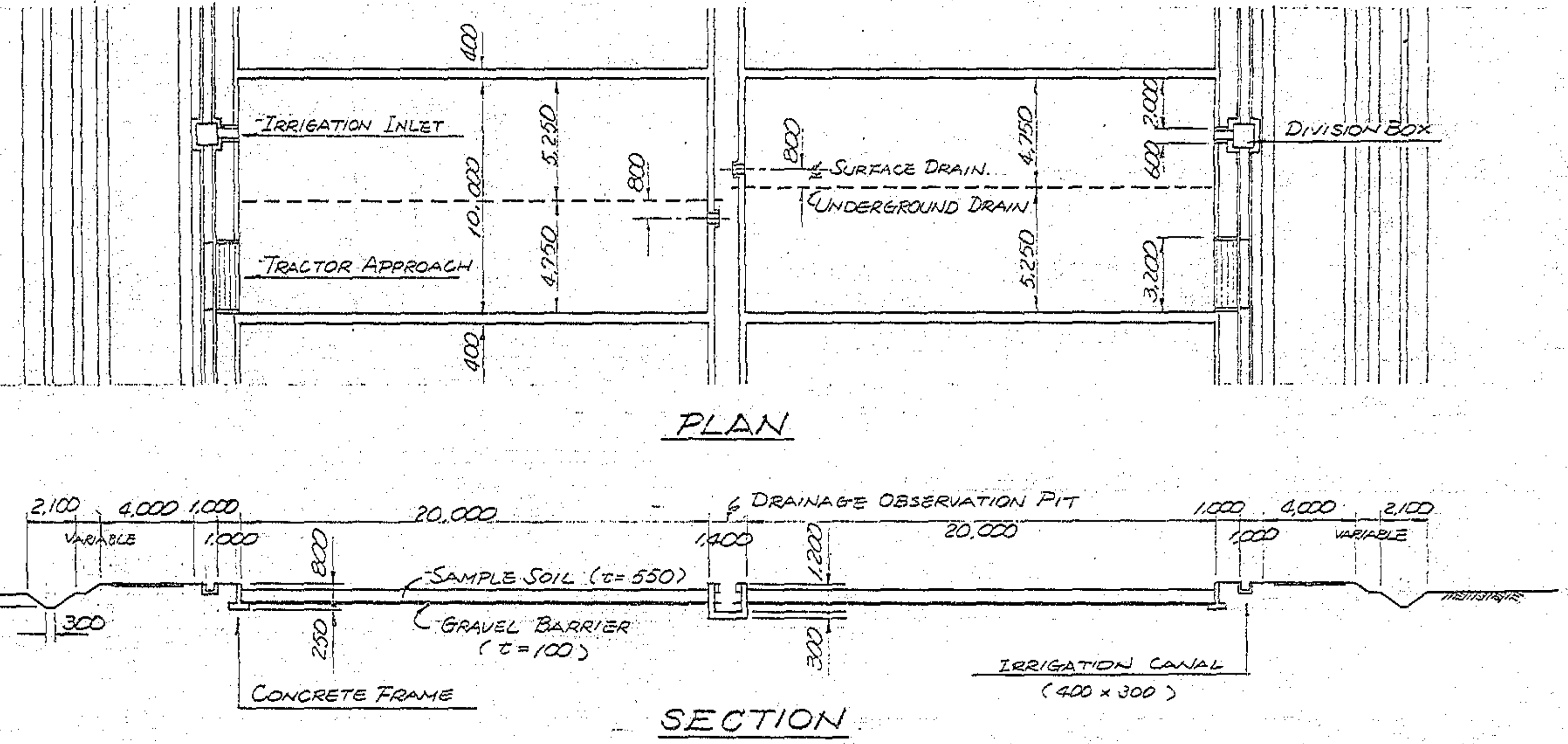
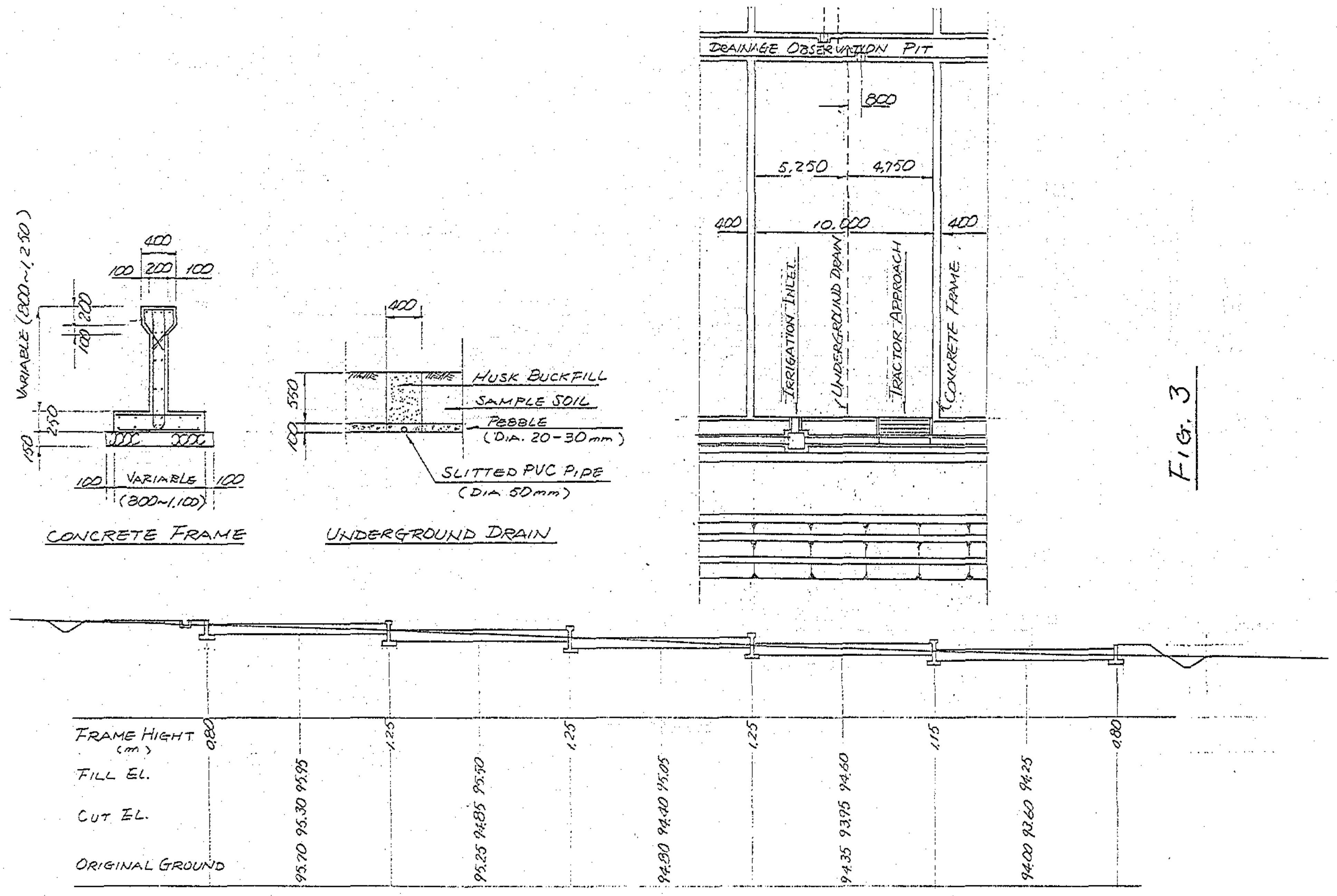

RESERVOIR
15M×10M×2M
DEEP WELL
PUMP HOUSE
IRRIGATION CANAL
(400×300)
SOIL TANK
20M×10M
66 M
60 M
93.5
93.0
92.5

Fig. 1

FIG. 2



NOTE : ALL DIMENSIONS ARE TENTATIVE AND IS FINALISED AFTER DETAIL TOPO SURVEY.



NOTE : ALL DIMENSIONS AND ELEVATION ARE TENTATIVE AND IS FINALISED AFTER DETAIL TOPO SURVEY.

PROFILE

FIG. 3

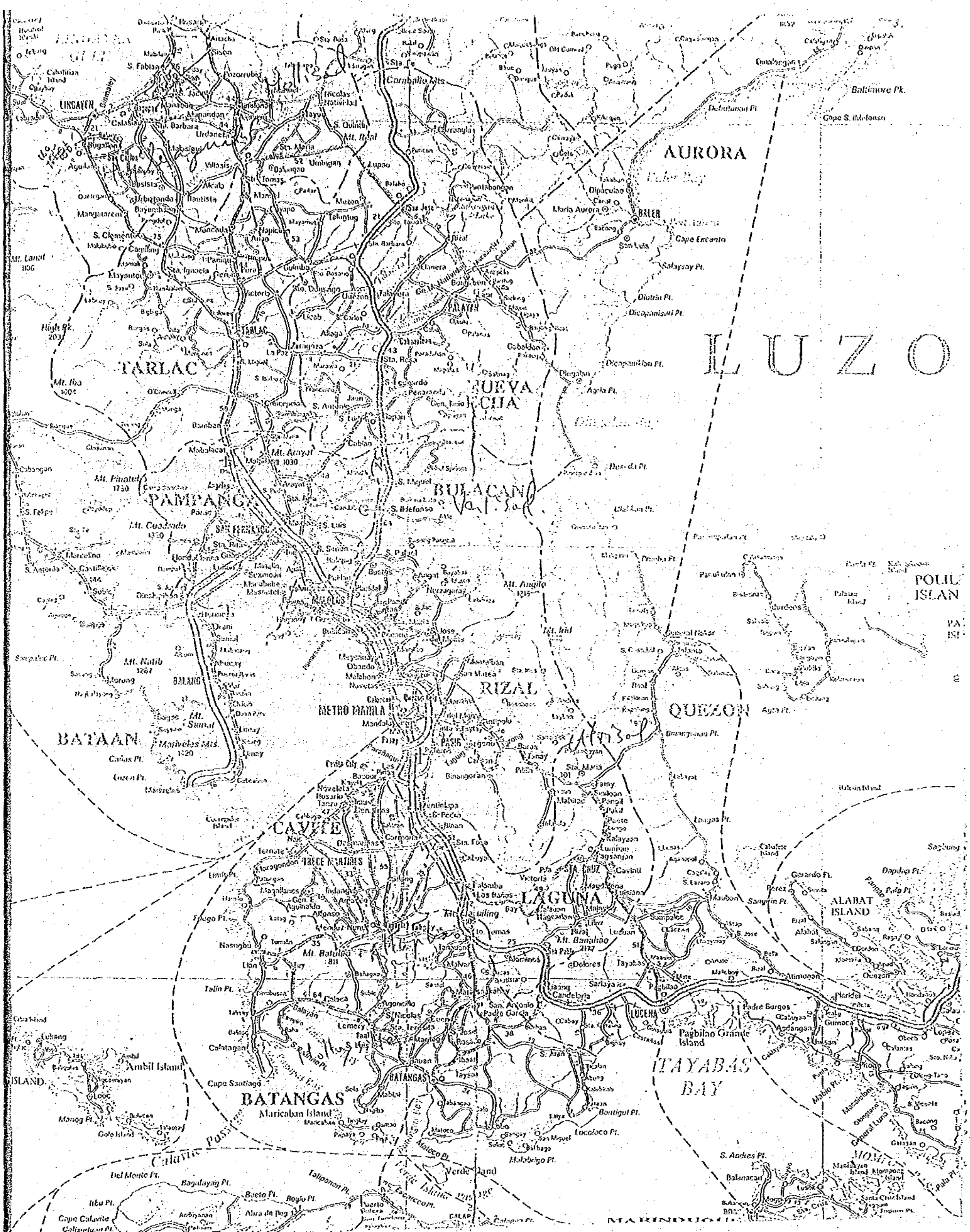

AURORA
LUZO
TARLAC
NUEVA ECIJA
PAMPANGA
BULACAN
RIZAL
QUEZON
METRO MANILA
BATAAN
CAVITE
LAGUNA
BATANGAS
TAYABAS BAY
ALABAT ISLAND
POLIL ISLAN
Maricaban Island
Ambil Island
Pagbilao Grande Island
Verde Island
Baler
Cape Encanto
Baltimore Pk.
Mt. Arayat
Mt. Natib
Mt. Banahao
Mt. Batulao
Lucena
Tayabas
Atimonan
Cape Santiago
Cape Calavite

FIG. 4

TABLE 1

OUTLINE OF THE TENTATIVE SCHEDULE
ON MODEL INFRASTRUCTURE IMPROVEMENT WORKS
OF SOIL RESEARCH AND DEVELOPMENT CENTER PROJECT

Month	Japanese side	Philippine side
1990		
June	-Detail Design Survey (Basic Plan of construction work)	
July	-Report of the Survey Team (Outline of construction work)	-Preparation of Form A1 for JICA expert on construction supervision
August	-Detail Designing in Japan	-Preparation of land -Negotiation with land owners
September	-Submitting Final Report -Consultation with Ministry of Foreign Affairs	-Receiving Final Report -Request of construction work (through JICA Philippines Office)
October	-Exchange of Note Verbal	
November	-Dispatching Expert on construction supervision	
December	-Remittance of the budget -Start of construction work	
1991		
March	-Completion of construction work	