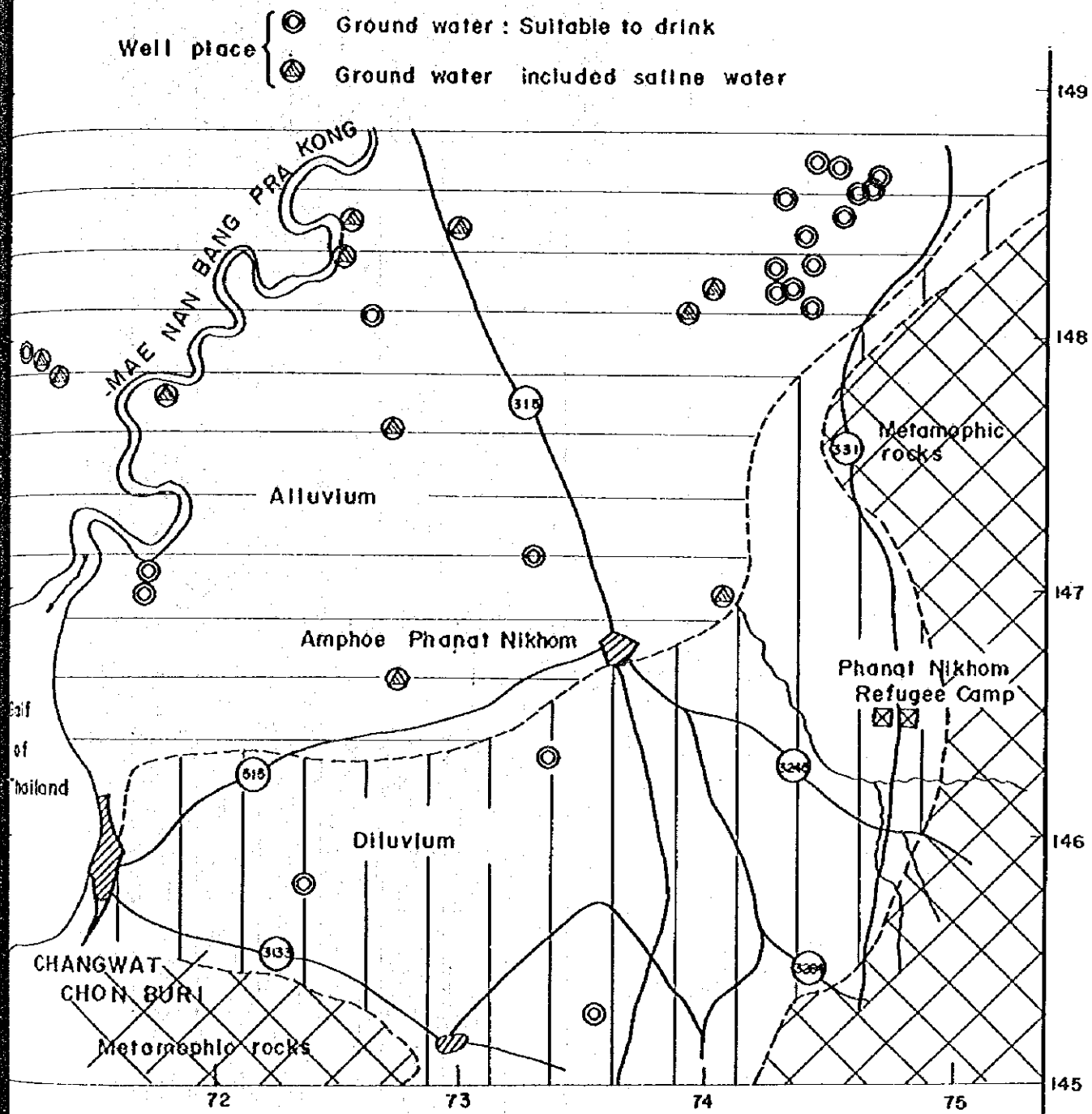


LIST OF TABLES AND FIGURES IN THE CHAPTER 7

<u>FIGURES</u>	<u>page</u>
Fig. 7-2-1 Location Map of Deep Wells	VII-TF-1
Fig. 7-2-2 Conjectual Geological Profile of Phanat Nikhom Area	VII-TF-2
Fig. 7-2-3 Location Map of Phanat Nikhom Refugee Camp	VII-TF-3

Fig. 7-2-1 Location Map of Deep Wells



Data: By "A Study on Water Supply Potential for Phanat Nikhom Refugee Camp, 1981"

Fig. 7-2-2 Conjectural Geological Profile of Phanat Nikhom Area

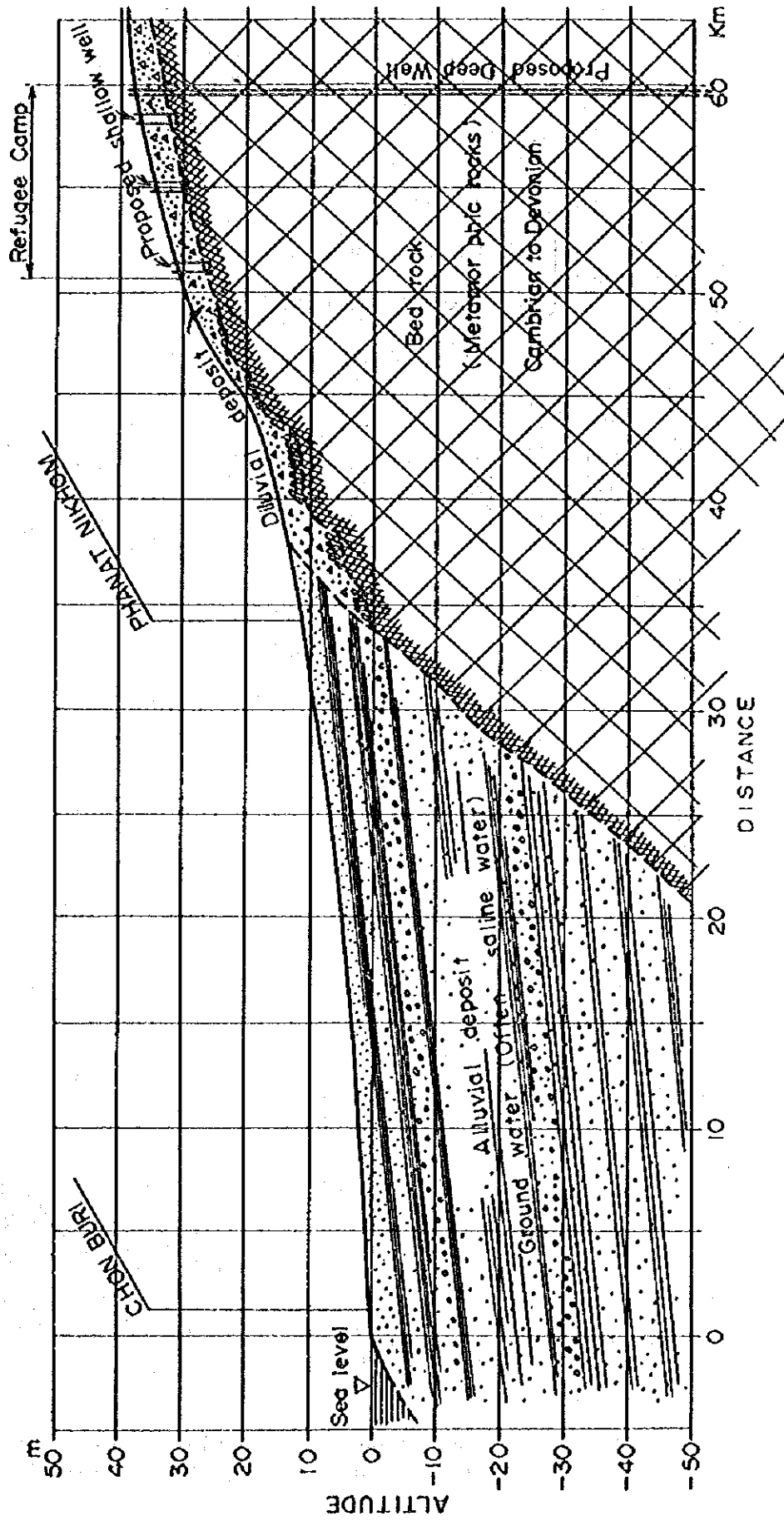
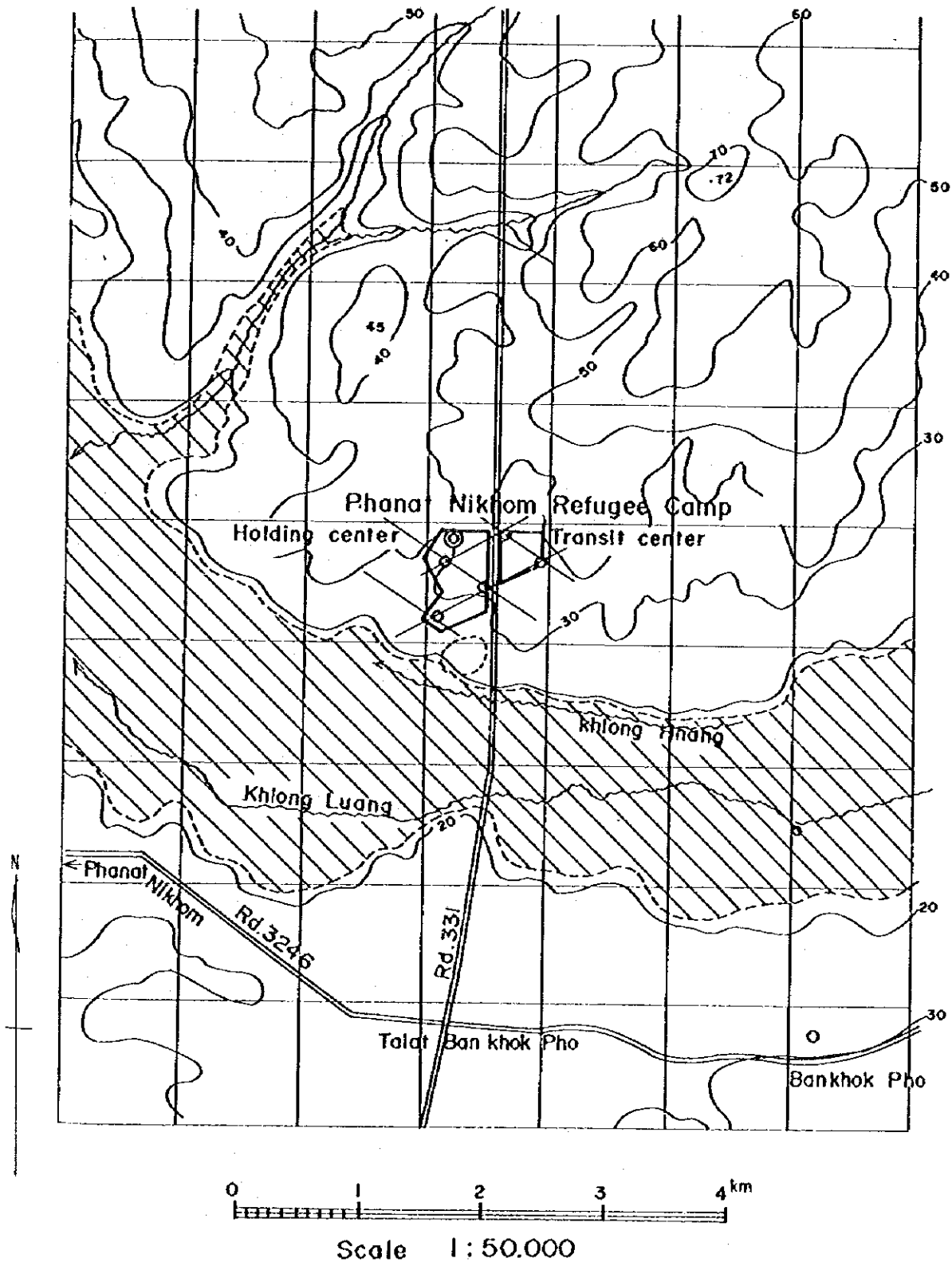
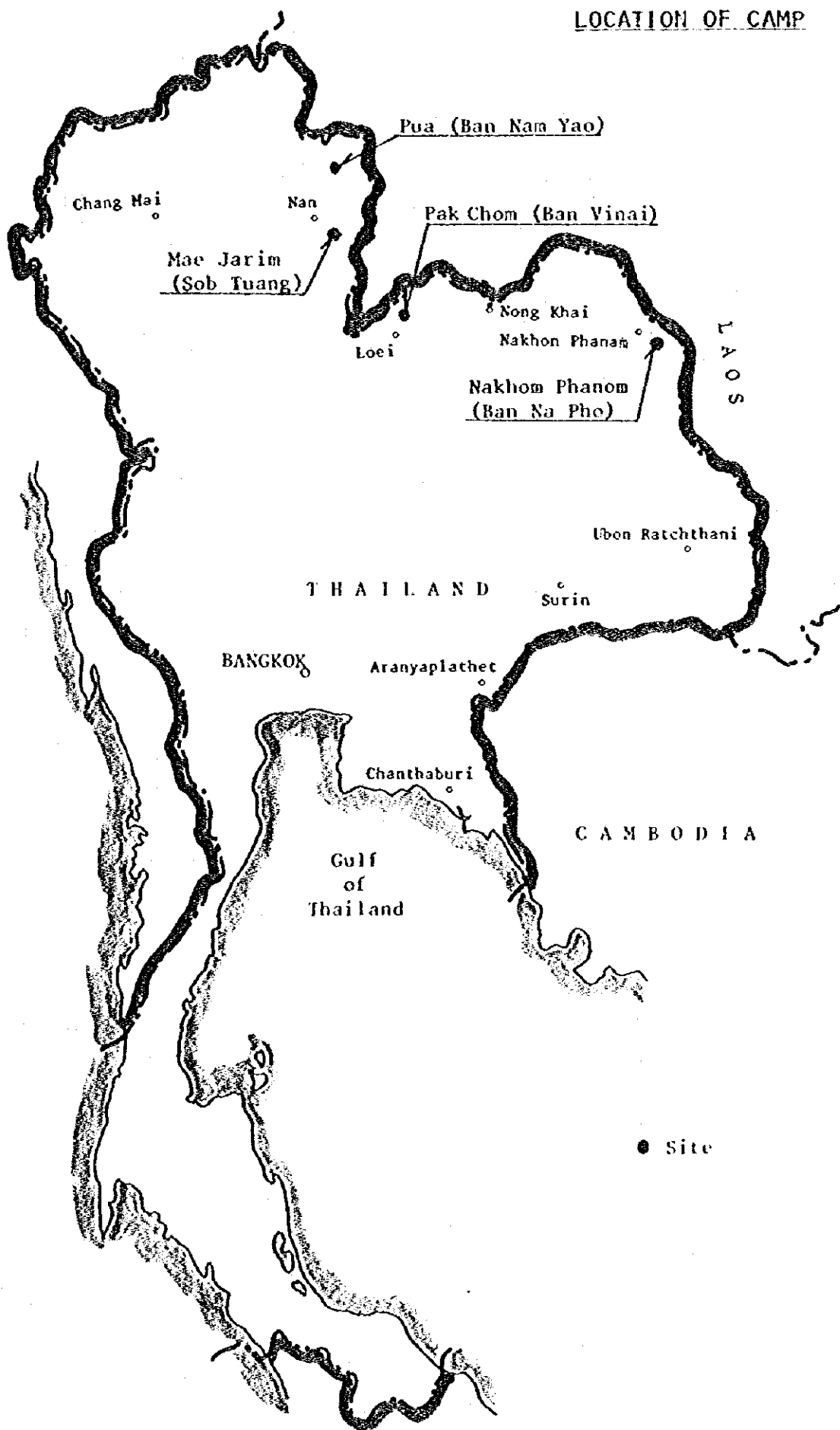


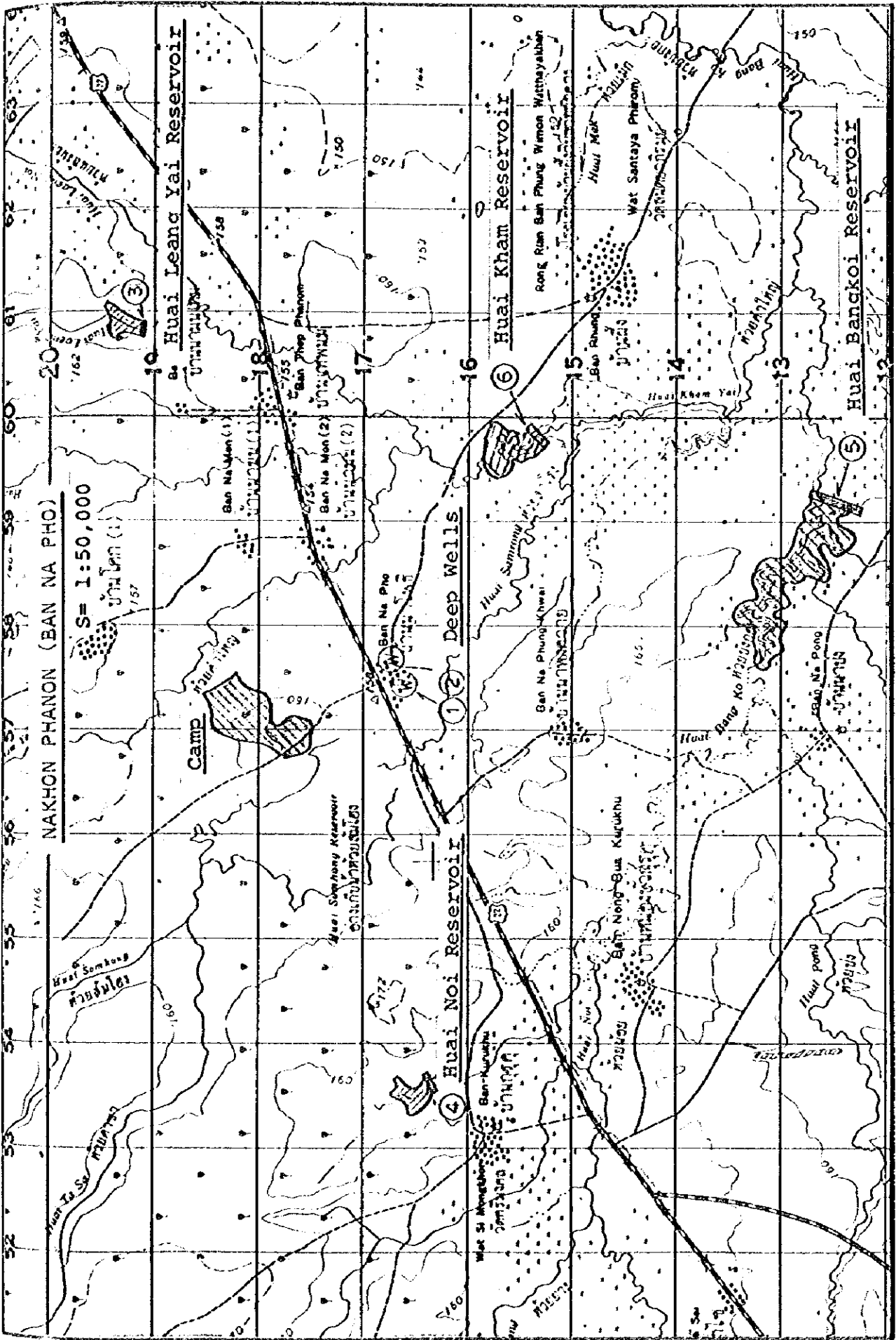
Fig. 7-2-3 Location Map of Phanat Nikhom Refugee Camp

⊙ Deep well } Proposed Site
○ Shallow well }



LOCATION OF CAMP





NAKHON PHANON (BAN NA PHO)

S = 1:50,000

Huai Leang Yai Reservoir

Huai Noi Reservoir

Huai Kham Reservoir

Huai Bangkoi Reservoir

1 2 Deep Wells

Huai Somphou

Huai Somphou Reservoir

Wat Si Mangkhon

Rong Ran Ban Phung Wimon Wittayabhan

Ban Nong-Sua Kurukhu

Wat Santaya Phomay

Huai pond

Huai Bang Ko Phomay

Ban Na Pong

Huai To Sa

Huai Loen

Ban Na Mon (1)

Ban Na Mon (2)

Ban Na Pho

Ban Nong

Ban Nong-Sua Kurukhu

Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong

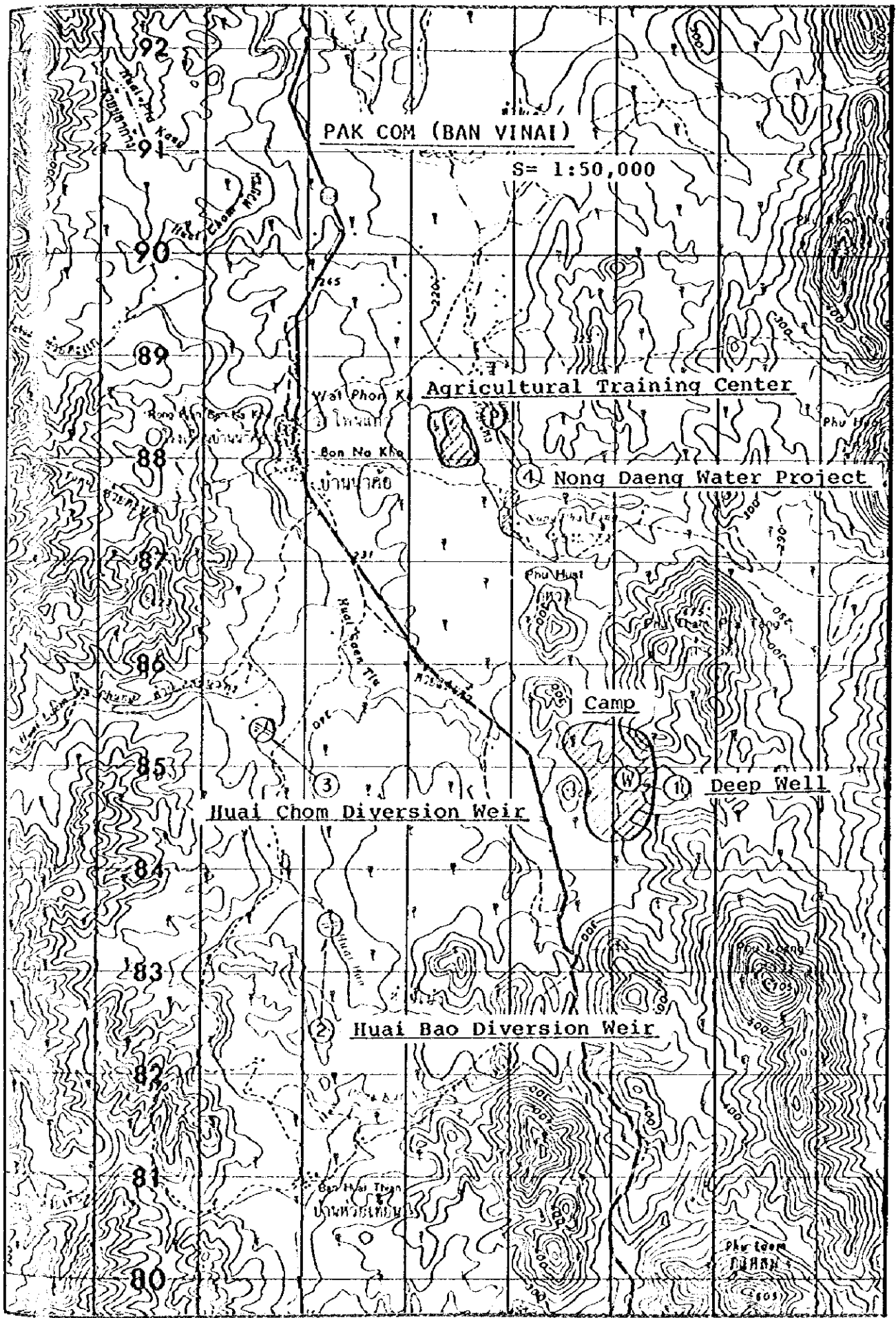
Ban Nong

Ban Nong

Ban Nong

Ban Nong

Ban Nong



PAK COM (BAN VINAI)

S= 1:50,000

Agricultural Training Center

④ Nong Daeng Water Project

Camp

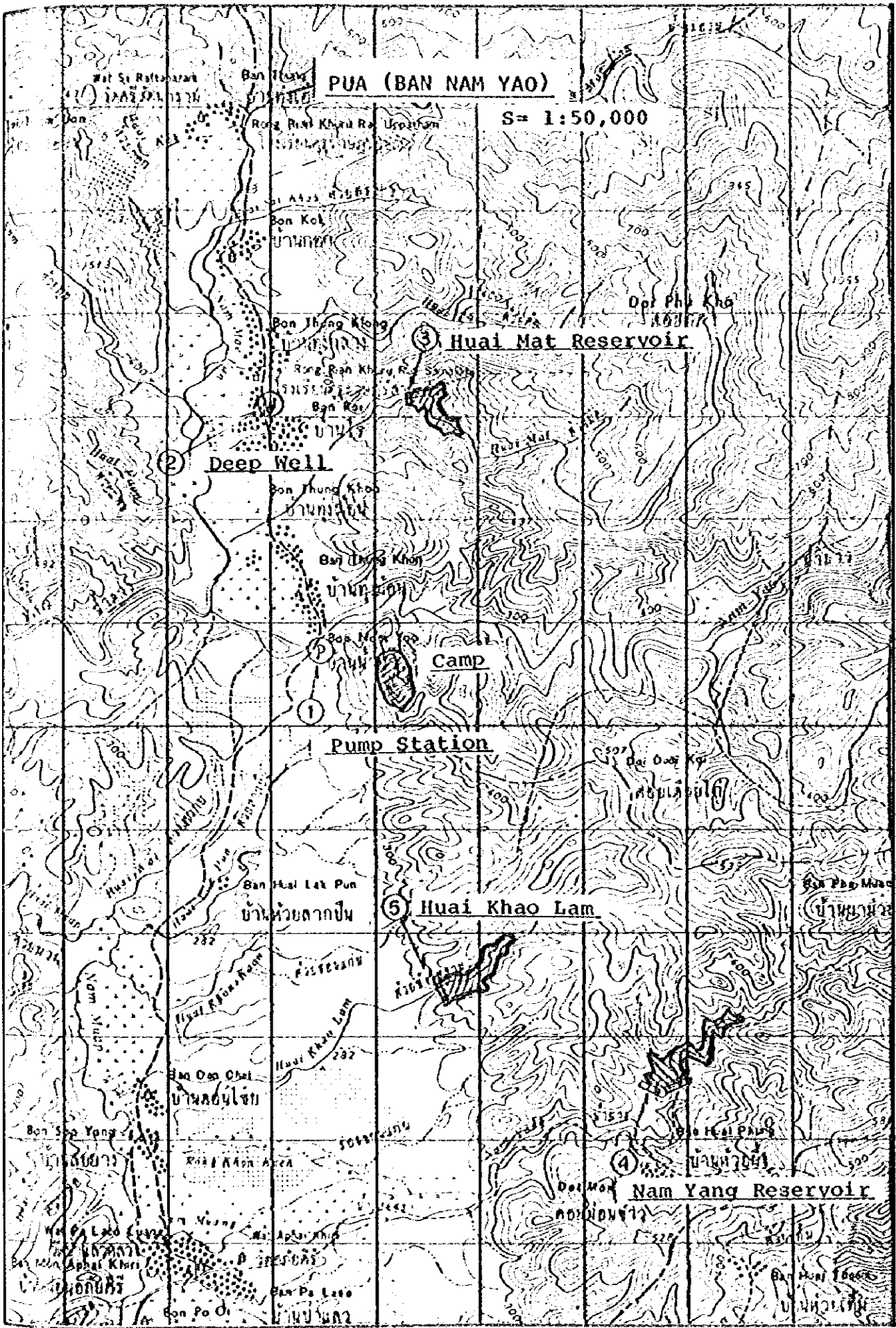
① Deep Well

③ Huai Chom Diversion Weir

② Huai Bao Diversion Weir

PUA (BAN NAM YAO)

S= 1:50,000



② **Deep Well**

③ **Huai Mat Reservoir**

Camp

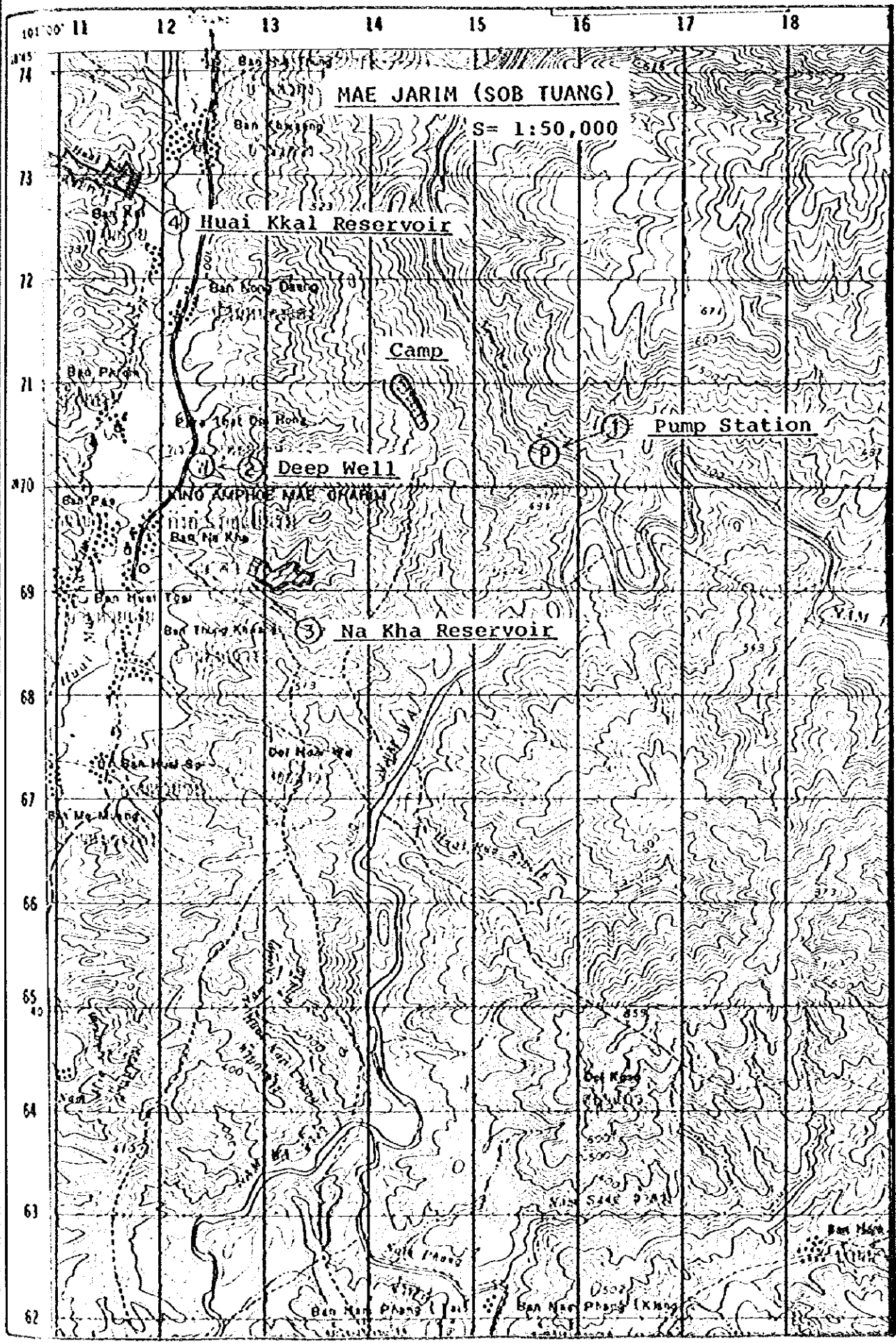
①

Pump Station

⑤ **Huai Khao Lam**

④

Nam Yang Reservoir



CHAPTER 8 PROJECT FINDING SURVEY FOR WATER SUPPLY TO LAOTIANS

8.1 General Information of Laotian Refugee Camps

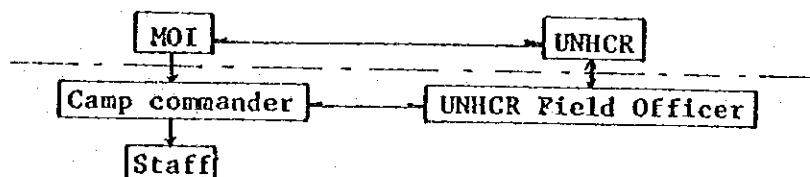
There are 8 camps accommodating the Laotian refugees in Thailand as shown below:

<u>Name of Laotian Camp and Population</u>		
<u>Camp</u>	<u>Province</u>	<u>Population</u>
1. Chieng Khong	Chiengrai	4,948
2. Chieng Kham	Phayao	3,744
3. Pua (Ban Nam Yao)	Nan	9,884
4. Mae Jarim (Sob Tuang)	Nan	8,114
5. Nong Khai	Nong Khai	19,842
6. Pak Chom (Ban Vinai)	Loei	31,077
7. Ubon	Ubon Rachatani	20,962
8. Nakhon Phanom Detention Center (Ban Na Pho)	Nakhon Phanom	1,763

These populations of refugees were recognized as of early July, 1981 but they rise and fall month by month.

The Government of Thailand would have an intention of diminishing from 8 camps to 3, or less.

The Laotian refugee camps now are under administration of MOI and their operation is done by both MOI and UNHCR. This cooperative organization can be charted as follows:



Before the Team's trip to the field regarding project findings, and formation, the Team got such information from MOI officers as emergency on water supply would be ranked as follows:

- 1) Nakhon Phanom Detention Center
- 2) Pak Chom (Ban Vinai)
- 3) Ubon
- 4) Pua (Ban Nam Yao)
- 5) Mae Jarim (Sob Tuang)

Out of these 5 camps Ubon was neglected from the scope of this finding survey, since it was already planned to take up as shallow well works in the project, and then the other 4 camps would be stood as candidates.

For the Team's reference on the study, the Team had an occasion of interview on water supply condition in the Nong Khai Camp on the way of the survey trip.

8.2 Survey Report

8.2.1 Survey Period

The Team conducted its survey for 8 days from July 12, 1981.

8.2.2 Target Camps

The Team focused its survey target as the following camps:

- 1) Nakhon Phanom Detention Center (Ban Na Pho)
- 2) Pak Chom (Ban Vinai)
- 3) Pua (Ban Nam Yao)
- 4) Mae Jarim (Sob Tuang)

8.2.3 Results of the Survey

(1) Nakhon Phanom Detention Center (Ban Na Pho)

1) Outline of the Camp

The Camp established in 1977 is situated at the near the mile

stone of 219 km of National Highway No.22 and for about 20 km west from City of Nakhon Phanom.

The center is located on the gentle hilly area keeping about 600 m above sea level in the north from the National Highway and about 10 m higher than surrounding farm land.

The Som Hong Reservoir (storage capacity 2,400,000 m³) in the west of the Camp is used for irrigation in the rainy season but only for subsistence water in the dry season.

The drainage from the Detention Center flows down into the paddy fields causing pollution to the subsistence water of the nearby people.

The refugees admitted to the center would increase their number from 1,763 to 5,000 by the end of July by shifting from the Nong Khai Camp.

The accommodations for the new comers were almost built, but a building lot for the final goal of 20,000 persons by the end of this year has not been built.

2) Water Supply Condition

At present there is only one deep well (pumpage 145 lit/min, depth 36 m) which could supply water to the refugees at a relatively large amount of 40 lit/day per person at the beginning of July, but the water would fall short at the end of July at the time of attaining to 5,000 persons.

The 3 shallow wells (depth 6-8m) in addition to the deep well, installed at construction period the Detention Center are operated by hand pump for miscellaneous purposes.

3) Measures for Water Supply

a) Deep Well

According to the geologists of the Government of Thailand, this area would be blessed with abundant ground water resources for the geological viewpoint which can be lifted by use of a deep well.

In the well construction scheme in the camp, 12 deep wells shall be proposed for increasing population of 20,000 in the future. But in the case of a population of 5,000, it is considered to set 4 wells.

Therefore, it is necessary to make 4 new wells urgently in order to avoid the extreme water shortage in the coming dry season. And it will be necessary to make 8 more by September, 1982.

b) Reservoir

Thus, construction of deep wells is deemed suitable as a source of additional water supply to the Center.

In the case of water supply by wells being insufficient, the existing reservoir near the Center may contribute to supply water there, but it was clarified impossible to get consent from the villagers as user through the Team's investigations.

As substitution of this reservoir, it would be considered to embank several small dams within about 10 km from the Center. Besides this idea, the nearby villagers request the following 4 dams:

1. Huai Leang Yai Reservoir
2. Huai Noi Reservoir
3. Huai Bang Koi Reservoir
4. Huai Kham Reservoir

All these reservoirs, shall be used for both the Center and irrigation.

c) Other Countermeasure for the Villagers

There is a request from Ban Na Pho village located in the downstream from the Center for providing 2 new wells as a countermeasure against water pollution in the canal.

(2) Pak Chom (Ban Vinai)

1) Outline of the Camp

The camp established in 1975 with the land area of 113 ha is located at the steep slope side of the hilly area with up and down as if sticking there.

The camp is situated at about 300 m from the Provincial Road No.2108 and at about 11 km from Pak Chom.

At present the refugee population in the Camp about 31,000 and it will continue to accommodate with the program of the maximum population of 50,000 in the future.

As any sanitary facilities are not provided in the Camp, the filth are left flowing downhill and there-by the nearby villagers strongly demand construction of sewage facilities.

When the refugee population reaches 50,000 in the future, this problem will grow so serious that the existence of the camp would be questionable.

There is an agricultural training center with about 100 ha land about 11 km away from the camp where the refugees and the nearby villagers are trained up to farming.

2) Water Supply Condition

At present there are 11 deep wells: 4 ones (42 m deep) out of them were made at the opening time of the camp and 7 others (20 m deep) were made 3 years ago. Several years passing after construction, the wells are in unsatisfactory condition due to frequent troubles of the pumps.

One of the pumps is completely damaged and another one is under the condition of out of order, and the 9 others tending to malfunction produce each yielding 38 - 57 lit/min under operation for 16 hours in a day. The estimated total daily water output from them in the rainy season is about 350 - 450 m³ which corresponds to consumption of 11 - 15 lit/day/capita.

Such amount would not be expected in the dry season by the fact that the refugees appeal their sufferings from no surplus water for bathing during the season.

The shallow wells (4-5 m deep) numbering about 400 are in service only during the rainy season for miscellaneous uses.

Besides, there are 2 reservoirs, of which a diversion dam in the stream is damaged in storing function due to a large amount of deposit sand.

The other one having enough facilities and no residential area in the upper stream stores uncontaminated water (storage about 10,000 m³), and it is used in the dry season too.

The water of this reservoir is carried by people themselves. Recently, in a conference participated by the representatives of the refugees and the camp, there was a request from the refugees side to build 9 deep wells.

3) Measures for Water Supply

a) Deep Well

Judging from the present pumping condition from the deep wells, it seems that there would be some more ground water sources, so a few more deep wells may be possibly installed. 3 or 4 more deep wells may contribute to do with unequal condition on water supply corresponding to the refugees' request.

b) Intake Weir

1. Huai Bao Intake Weir

It was learned from field interviews that the Huai Bao river located about 3 km from the camp was enough for its flow in quality and quantity for drink as a perennial stream. The topographical features there indicate suitability for damming up the flow.

So the water diverted by the proposed intake weir could be conveyed through a pipeline to the camp and partly drawn as subsistence water for inhabitants in the downstream area.

The minimum amount of intaken water even in the dry season from the stream is said to be 0.05 - 0.1 m³/sec. and the observed discharge at the time of survey by the team was about 0.5 m³/sec.

2. Huai Chom Intake Weir

For the villages located in the downstream from the camp such as Ban Na Kha (200 households), Pak Chom (400 households) and residences sparsely scattered in the vicinity (70 households), the proposed measure for solving the water pollution problem is to provide an intake weir in the upper bends of the stream before the contaminants flowing in, so clean water can be distributed by pipeline to the villages. (The construction cost of a sewage disposal plant in the camp requires a huge budget).

Even though the exact site of the intake weir has to be determined after topographical survey, the proposed alignment of the pipeline to the furthest village of Pak Chom would reach to approximately 11 km.

c) Pumping

As a related facility to the camp, there is the Nong Daeng Agricultural Training Center for giving agricultural guidance and training to refugees and nearby farmers, whose buildings and reservoir have already been completed.

The Agricultural Training Center has a deep well, but it does not yield the required amount of 300 m³/day. So a plan was made to supply what is short by pumping from Huai Chom River, for which a technical report entitled "Nong

Daeng Water Project (Phase 1)" was written by Khon Kaen University under the entrustment from World Vision Foundation in March 1981.

MOI and WVF request urgent assistance to the construction works proposed in the report.

d) Other Requests from the Locality

The district officer requested construction of additional deep wells and small reservoirs (L = 100 m, W = 80 m, D = 2 m) in each village.

The Roi Provincial officer proposed construction of 5 small dams.

(3) Pua (Ban Nam Yao)

1) Outline of the Camp

The camp is located at about 3.8 km north-east from the city of Nan about 600 m from Ban Nam Yao and fairly close to the Provincial Highway No.1169.

The elevation of the camp on a hillside is 100 - 150 m higher than that of the surrounding farm land. The houses of the camp are located on the steep slope.

The current population in the camp is 9,884 and its variation is small since the refugees here are not scheduled to go to the other country.

After the fire accident last year, the refugees have temporarily stayed out of the camp premises, but they will be able to return to the original place shortly after completion of the facilities under reconstruction.

2) Water Supply Condition

Two pumping stations built on the Nam Yao River flowing towards the north of the Camp are pumping up underground flow from the river and supply it through a simple filter plant.

The older one of them (pipe dia. 40 mm) is used for a hospital and the other (80 mm) built last year under the aid by Australia is used for the Camp.

The pump undergoing frequent disorder, cannot give sufficient yield, thereby some part of the shortage is covered by tank lorries (truck with a water tank) which bring water from the river to the place at the distance of 1.5 km.

The river, with abundant flow runs throughout the year. Besides there is a well with a windmill for pumping, but it is not in service now due to insufficient yield.

Another source of water is one shallow well which is in service during the rainy season.

3) Measures for Water Supply

a) Settlement of Pumping Plants

Since the nearby river has an abundant flow as has been stated, so there would not be found any difficulties on keeping the source of water.

Both the pumps and the engines equipped seems to be in relative insufficiency of their capacities that cause of frequent overloading and consequent mechanical troubles.

Therefore, the required amount of water will be secured if they are replaced by engine and pumps of suitable capacities (required the high head of 200 - 250 m).

Even though, there was a request for making one deep well, it may not be necessary in the light of the facts that the underground geological features of the area are not clarified and the river water is available.

b) Reservoir

The request for the following cases was made to the team with a view to securing water for the refugees in emergency and for providing the subsistence and irrigation water to the nearby people.

1. Huai Mat Reservoir
2. Huai Khao Lam Reservoir
3. Nam Yang Reservoir

The locations of these reservoir in request are all within 4 km distance from the Camp.

c) Deep Well

The deep well, proposed for supply to the nearby villagers (494 households), might be used for the Camp in emergency.

(4) Mae Jarim (Sob Tuang)

1) Outline of the Camp

The Camp built on the top of a mountain top is located 3.8 km eastward from the City of Nan and can be reached by 3 km approach road from the Provincial Highway No.1168. The unpaved road from the Provincial Highway to the Camp takes a course of steep slope, which requires immediate improvement.

The present refugee population of the Camp is 8,114 and its fluctuation is small as the same of the Camp in Pua.

The huts of refugees built on the top of the mountain give an impression of a big difference compared with the other Camps.

2) Water Supply Condition

Until the end of last year people would carry water on their shoulders away from Nam Tuang River located 500 - 600 m and about 250 m lower in elevation from the Camp.

But an intake and pumping facility were built on the Nam Tuang River in January this year by the financial aid of UNHCR and some countries and under the technical guidance of YMCA from which water was conveyed through a pipeline of 1,800 m to the Camp by 2 pumps for 4 hours operation in a day.

But recently, the overheating tendency of the engines limited the operating time of each to one hour a day resulting in shortage of water.

While the repair of the pumping facility was considered to be urgent, the big flood on July 6 rendered it unserviceable when it was submerged in the water. So, technical and financial assistance is requested by those concerned.

Now in the rainy season, the water requirements are depended largely on the rainfall and the lacking one is brought manually from the river, but the problems will grow seriously worse in the dry season.

3) Measures for Water Supply

a) Improvement of Pumping Station

The flood water level of the Nam Tuang River tends to rise every year (forestry development of the valley) causing the submergence of the pumping station installed over the maximum high water level recorded.

So, the proposed pumping station on the river shall be paid due attention in designing on allowable clearance against the high water.

The actual head of the submerged pump would be about 280 m, but determination of its tupe and capacity in a proposed project shall require hydrological analysis.

The facilities include the following: Pump and engine (with accessories) 2 sets, intake work on the river intake basin and pump house.

Water supply to the refugees will be achieved by the establishment of the pump station.

b) Reservoir

Even though the above mentioned pumping facility is theoretically sufficient for water supply to the refugees, it must be taken into consideration that there could occur troubles in the pump plants and pipeline. So there was request for following reservoirs near the camp for supplying

water to the refugees and to the nearby villagers as the water of subsistence, irrigation and domestic animals as well as fish production.

1. Na Kha Reservoir
2. Huai Khal Reservoir

There is a request for making a deep well for inhabitants in the downstream area for 688 households. The above results of the survey and the provisional plans whose project costs are estimated as shown in table 8-2-1.

8.3 Recommendation on Project Formation

Through interviews and discussions with the officials of the Government of Thailand such as the Deputy Governors, the district officers and the managing staffs of the Camps during the Team's field survey period, the assistance in the Government level was eagerly requested under one accord among them as summarized to the following.

- There exists a gap in living conditions between the refugees in the camps and the nearby villagers suffering from their destitution.
- Such the villagers' handicap caused by the refugees shall be eliminated immediately under the same assistance as given to the refugees.

As for the refugees camps to be selected for assistance, the following ones which will continue to run the refugee camps permanently under the refugee relief plan by the Government of Thailand should be given high priorities.

1. Nakhon Phanom Detention Centre (Ban Na Po)
2. Pak Chom (Ban Vinai)

However, it is also considered necessary to make assistance to the following camps for which, actually suffering from scarcity in subsistence water, even though they may not be permanent ones.

3. Pua (Ban Nam Yao)
4. Nae Jarim (Sob Tuang)

Request for plural cases of assistance was made for each refugee camps, but the priority was determined on the basis of the following criteria:

1. Urgency.
2. Degree of water shortage in refugee camps.
3. Degree of sufferings of the villagers affected by the refugees' settlement.
4. Evaluation on economic effectiveness to the nearby villagers.

To elaborate the above, the first criterion is the urgency for water supply to the refugee camps where the water shortage is in extreme (supplying water less than 15 lit per person per day).

Secondly, some countermeasures should be taken for relieving the affected nearby Thai people from the problems of worsening of water quality and living environment as well as their undesirable conversion of the existing water sources to the refugee camps and so on.

Thirdly, the existing gap in livelihood between the refugees and the nearby Thai people should be removed in order to induce the atmosphere of harmony between the two parties and, at the same time, it is necessary to prevent emergent water shortage in the refugee camp.

The above consideration was taken in preparing a table of survey results (Table II) in which ranking of priority for assistance is indicated.

It is considered necessarily to take up at least 3 projects at each of the refugee camps as an assistance project.

As a special case of request for assistance, it will be expected to discuss that the Pak Chom (Ban Vinai) Camp has a plan of establishing a pumping facility and a pipeline for supplying water to the agricultural training center for both the refugees and the nearby villagers for use in daily life, irrigation and animal husbandry.

LIST OF TABLES AND FIGURES IN THE CHAPTER 8

TABLE

page

Table 8-2-1 Project Formation for Laotian Refugees

VIII-TF-1

Table 8-2-1 Project Formation for Laotian Refugee (Part - I)

Name of Camp	Province	Refugee Population		Water Supply Conditions	Proposed Project				Priority	Proposed Date of Completion	
		July 10, 1981	Future		Project Name	Purpose	Works Planned	Construction Cost in Rough Estimation			
Nakhon Phanom (Ban Na Pho)	Nakhon Phanom	1,763	20,000 as of the end of 1982	1 deep well (pumped volume 145 l/min., depth 36 m) 3 shallow well (hand pump, for miscel-laneous usage) deep wells urgently re-quired to meet increase number of persons reaching 5,000 at the end of July.	① Deep Well	for refugees	4 deep wells for the population levels of 5,000, as of the end of July, 1981		urgent	end of September, 1981	
					② Deep Well	drinking water for people in the lower streams	8 more deep wells for the population level of 20,000 as of the end of 1982		1	end of 1982	
					③ Huai Leang Yai Reservoir	for nearby people and refugees	2 deep wells for 200 households (1,600 people) in Ban Na Pho		2	December, 1982	
					④ Huai Noi Reservoir	ditto	copographical survey already done by RID beneficiaries 300 households irrigated area 300 ha H = 10 m, L = 250 m, V = 1,000,000 m ³		3	June, 1983	
					⑤ Huai Bangkok Reservoir	ditto	P/D yet to be done beneficiaries 400 households, irrigated area 500 ha H = 10 m, L = 400 m V = 1,500,000 m ³		4	June, 1983	
					⑥ Huai Kham Reservoir	ditto	P/D yet to be done beneficiaries 200 households irrigated area 300 ha H = 8 m, L = 600 m V = 1,000,000 m ³		5		
										6	

Project Formation for Laotian Refugee (Part - II)

Name of Camp	Province	Refugee Population		Water Supply Conditions	Proposed Project				Priority	Proposed Date of Completion
		July 10, 1981	Future		Project Name	Purpose	Works Planned	Construction Cost in Rough Estimation		
Pak Chom (Van Vinnai)	Loei	31,077	50,000	11 deep wells of 3-6 years old, of which 1 is damaged and another one in mechanical disorder. The remaining 9 in occasional trouble lowering total pumping capacity. (deep wells 30 - 40 m) pumped volume for a deep well: 0.04 - 0.05 m ³ /min. pumping time 16 hours a day. Total pumping up volume: 350 - 450 m ³ /day daily consumption per one person: 11 - 15 liter. 2 reservoirs in the refugee camp, of which 1 is damaged and the other with storage capacity of 10,000 m ³ is used in the dry season. Water-shortage is found even now in the rainy season, so refugee representatives assembly requests 9 new deep wells.	① Deep Well	for refugees	4 deep wells 3-4 more deep wells required for supplying 20 l/capita/day for the present refugee population of 3,1000		urgent	December, 1981
					② Huai Bao Diversion Weir	for nearby people and refugees	P/D yet to be done deep wells insufficient for future refugee population of 5,000 beneficiaries 50 households, concrete intake weir H = 1 m L = 15 m pipeline 3.5 km		2	June, 1983
					③ Huai Chom Diversion Weir	for people in the lower streams	P/D yet to be done beneficiaries 670 households, concrete intake weir H = 1.5 m L = 30 m pipeline 11 km		1	June, 1983
					④ Agri-cultural Training Center Nong Daeng Water Project	for nearby people and refugees	P/D by World Vision Pumping station for conveyance by a pipeline pump Q = 2 - 1 m ³ /min H = 48 m pipeline L = 1240 m D = 150 mm		Special	December, 1981

Project Formation for Laotian Refugee (Part - III)

Name of Camp	Province	Refugee Population		Water Supply Conditions	Proposed Project				Proposed Date of Completion
		July 10, 1981	Future		Project Name	Purpose	Works Planned	Construction Cost in Rough Estimation	
Pua (Ban Nom Yao)	Nan	9,884		<p>2 pumping stations in running take the underground flow from Nam Yao River.</p> <p>2 pumping stations of which the older ones for a hospital and the new ones made in 1981 (6 the aid of Australia) are serving the refugees.</p> <p>The pumps are repeatedly in troubles, making unsatisfied necessary quantity of water.</p> <p>Lack of the required water is covered by tank-lorry in dry season, reaching about 12 m³/day.</p>	<p>① Pump and Machine</p> <p>for refugees</p>	<p>1 pumps in current operation deteriorated to be replaced with new ones.</p> <p>and pump houses to be repaired pump with engine</p> <p>2 sets 2 = 0.7 m³/m</p> <p>D = 80 mm H = 210 m</p>		1 (or urgent)	end of 1982 (December 1981)
					<p>② Deep Well</p> <p>for people in lower streams and for refugees</p>	<p>Providing drinking water to 494 households of people on the lower streams and for refugees at the time of shortage</p>		4	end of 1982
					<p>③ Huai Mat Reservoir</p> <p>for nearby people and refugees</p>	<p>P/D yet to be done beneficiaries 573 households irrigated area 380 ha</p> <p>H = 20 m L = 200 m</p> <p>V = 2,700,000 m³</p>		2	June, 1983
					<p>④ Nam Yang Reservoir</p> <p>ditto</p>	<p>P/D yet to be done beneficiaries 616 households irrigated area 460 ha</p> <p>H = 18 m L = 200 m</p> <p>V = 2,500,000 m³</p>		3	June, 1983
					<p>⑤ Huai Khao Lam Reservoir</p> <p>ditto</p>	<p>P/D yet to be done beneficiaries 324 households irrigated area 460 ha</p> <p>H = 18 m L = 200 m</p> <p>V = 850,000</p>		5	

Project Formation for Laotian Refugee (Part - IV)

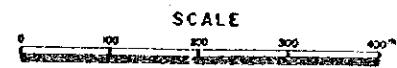
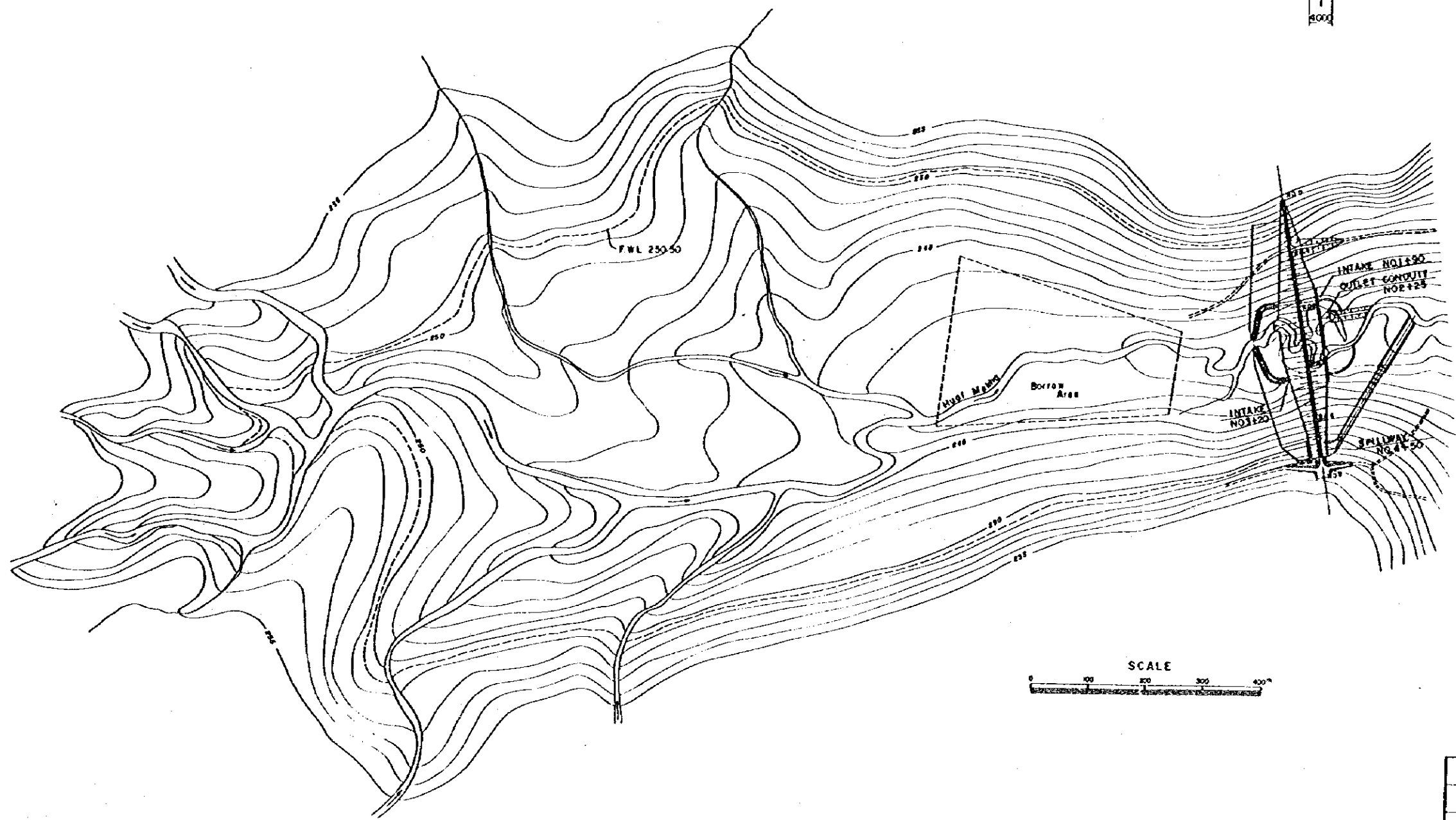
Name of Camp	Province	Refugee Population		Water Supply Conditions	Proposed Project				Priority	Proposed Date of Completion
		July 10, 1981	Future		Project Name	Purpose	Works Planned	Construction Cost in Rough Estimation		
Mae Jarle (Sob Tuang)	Nan	8,114		<p>Until the end of 1980, water conveyance depends on human from Nam Tuang River for about 600 m. and lower 250 m. from the camp.</p> <p>Water is conveyed from the river to the camp through pipeline of 1,800 m. originated from the pumping station on the Nam Tuang River built in January, 1981.</p> <p>The pumping station was submerged and damaged by the big flood on July 6, 1981.</p> <p>In this rainy season, subsistence water mainly depended upon rainfall, adding manual conveyance from the river.</p> <p>Serious water shortage would occur in the coming dry season, an urgent need is repairing the pumping station.</p>	<p>① Pumping station Improvement Pump and other Facilities</p> <p>② Deep Well</p> <p>③ Na Kha Reservoir</p> <p>④ Hwai Khal Reservoir</p>	<p>for refugees</p> <p>for people in lower streams and refugees</p> <p>for nearby people and refugees</p> <p>ditto</p>	<p>pumping machinery pump with engine 2 secs Q = 0.38 m³/m D = 50 mm H = 215 m</p> <p>intake facility</p> <p>for drinking water for 688 households of people on the lower streams and for refugees at the time of shortage 1 deep well</p> <p>P/D yet to be done beneficiaries 552 households irrigated area 290 ha H = 18 m L = 150 m V = 800,000</p> <p>P/D yet to be done beneficiaries 688 households. irrigated area 320 ha H = 20 m L = 250 m V = 3,500,000 m³</p>		urgent	December, 1981
								2	end of 1982	
								1	June, 1983	
								3	June, 1983	

DRAWINGS

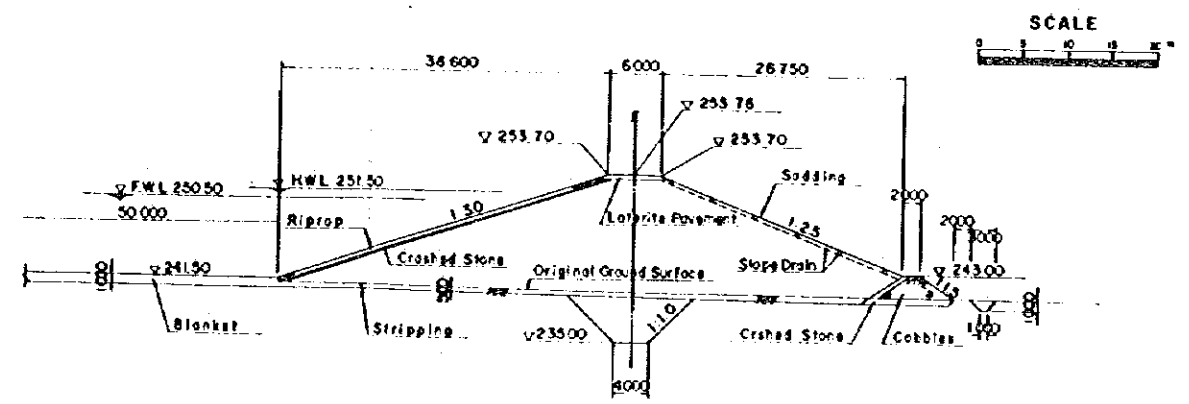
<u>Drawing No.</u>	<u>Title</u>	<u>Page</u>
Meh Kah Dam		
1	General Plan	D-1
2	Plan	D-2
3	Profile	D-3
4	Typical Section	D-4
5, 6	Spillway	D-5, D-6
7, 8	Intake	D-7, D-8
9, 10	Outlet Conduit	D-9, D-10
Ta Kao Dam		
1	General Plan	D-11
2	Plan	D-12
3	Profile	D-13
4	Typical Section	D-14
5, 6	Spillway	D-15, D-16
7, 8	Intake	D-17, D-18
9, 10	Outlet Conduit	D-19, D-20
Huei Yang Dam		
1	Plan	D-21
2	Profile	D-22
3	Typical Section	D-23
4	Spillway	D-24
5	Intake	D-25



MEH KAH DAM GENERAL PLAN

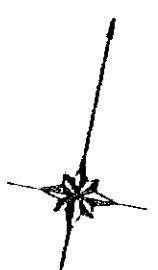
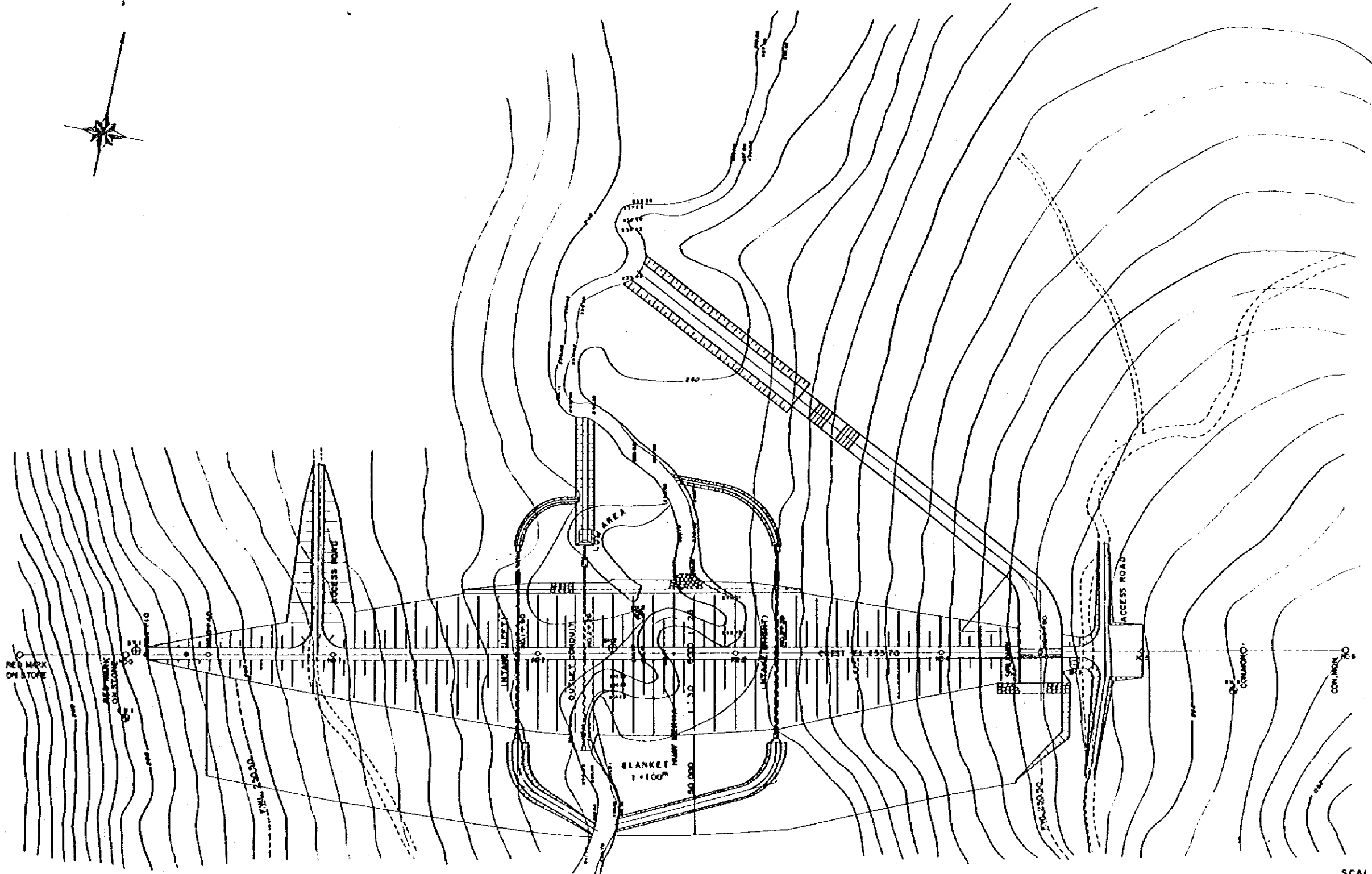


TYPICAL DAM SECTION



THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM GENERAL PLAN	
Date OCTOBER 1 1981	DWG No. 1/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

MEH KAH DAM PLAN



SCALE 1:1000

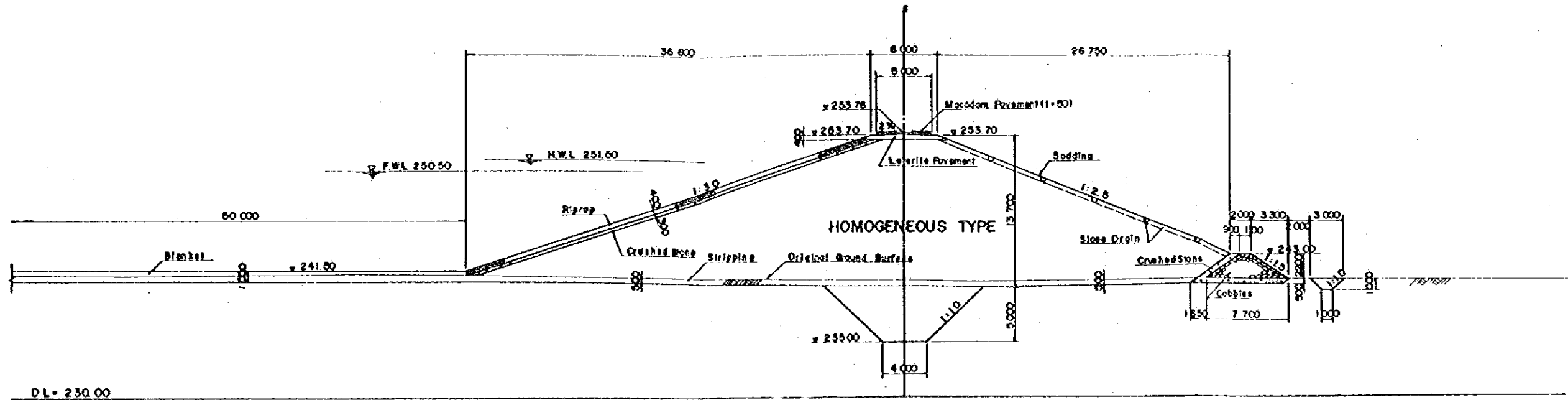
BM. 1 Red mark on stone EL+257014^m

BM. 2 Bolt on roof of tree EL+241360^m

BM. 3 Bolt on roof of tree EL+256293^m

THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM PLAN	
Date OCTOBER.1981	DWG. No. 2/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

MEH KAH DAM TYPICAL SECTION

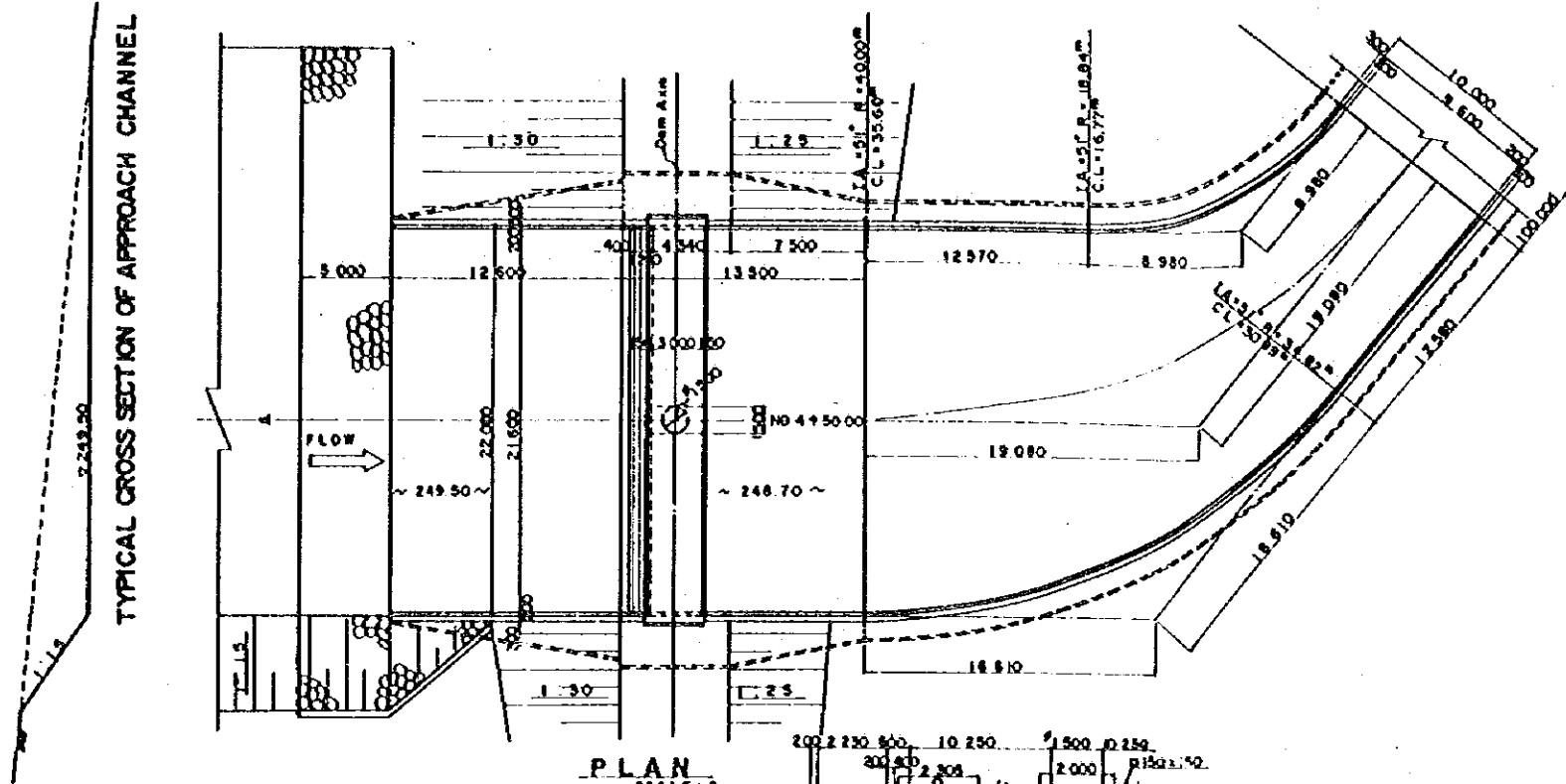


DL = 230.00

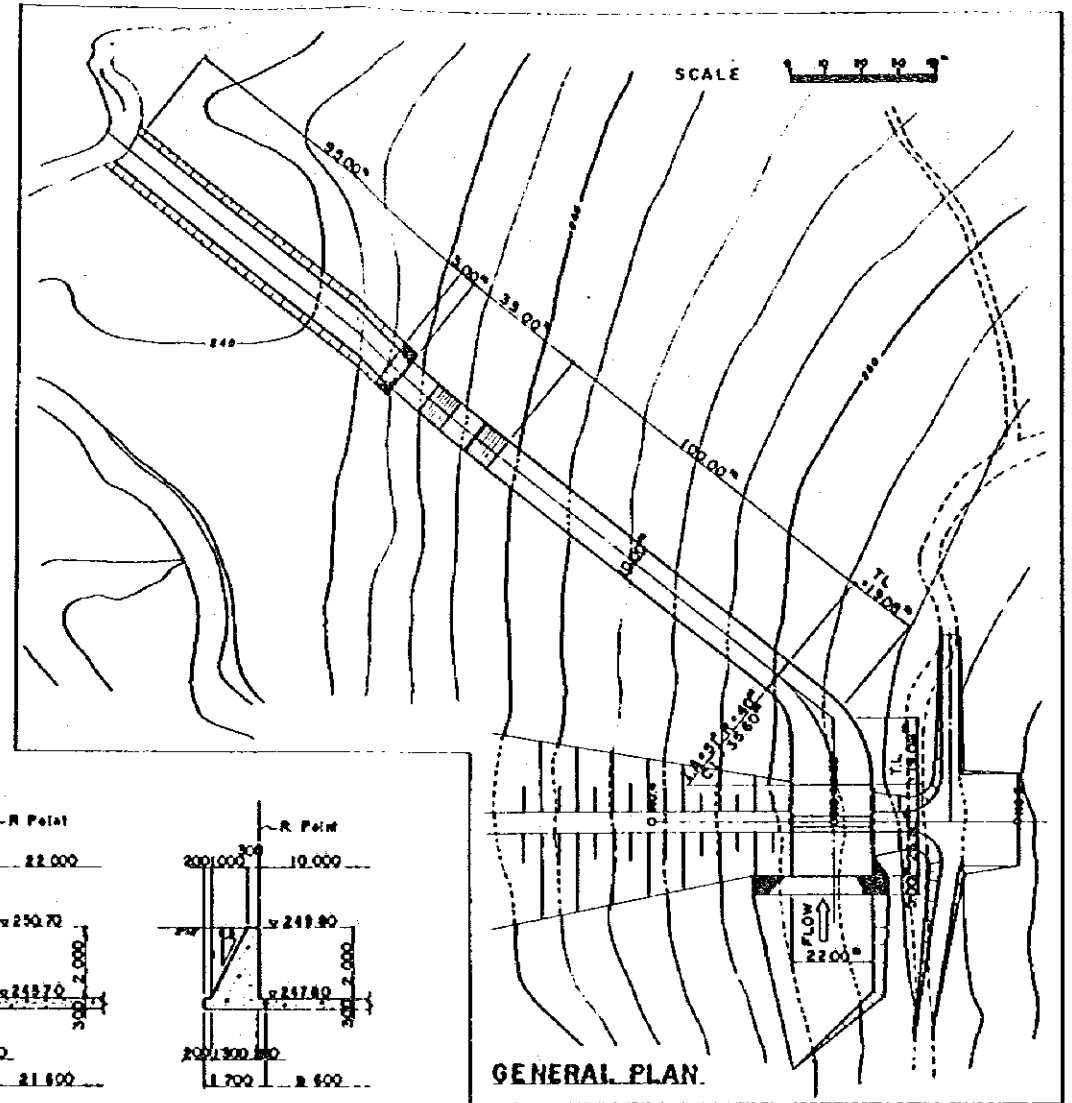
SCALE

THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM TYPICAL SECTION	
Date OCTOBER, 1981	DWG. No. 4/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

MEH KAH DAM SPILLWAY (1/2)

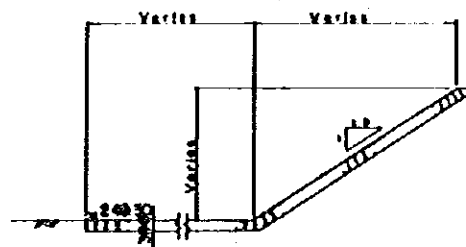


TYPICAL CROSS SECTION OF APPROACH CHANNEL

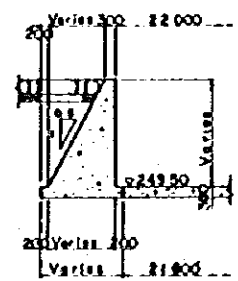


GENERAL PLAN

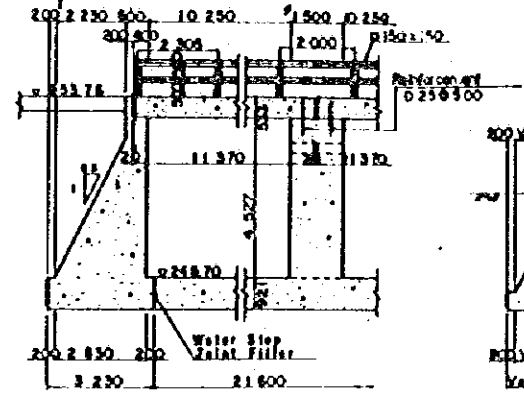
PLAN SCALE: A



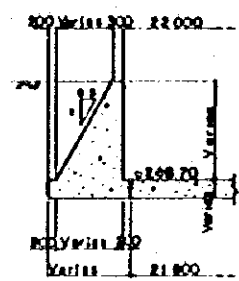
SECTION A - A SCALE: B



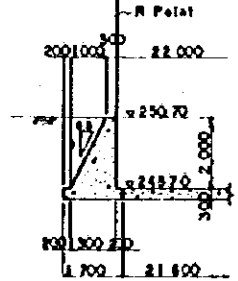
SECTION B - B SCALE: B



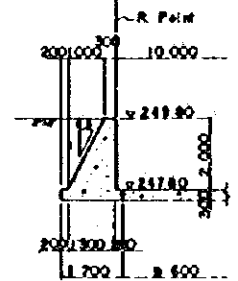
SECTION C - C SCALE: B



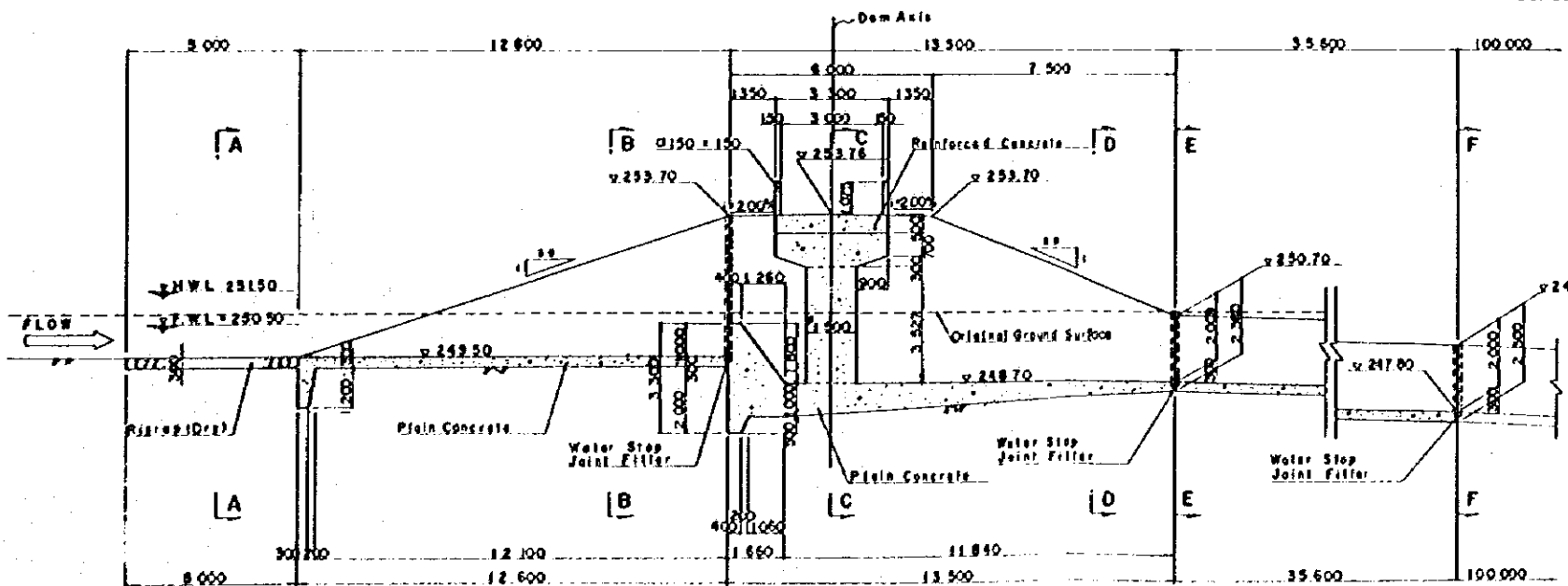
SECTION D - D SCALE: B



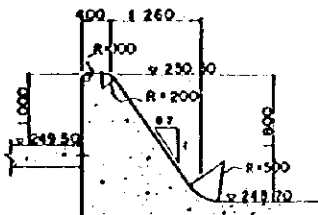
SECTION E - E SCALE: B



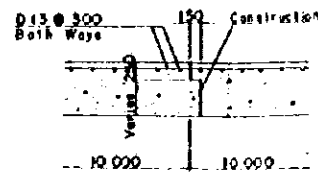
SECTION F - F SCALE: B



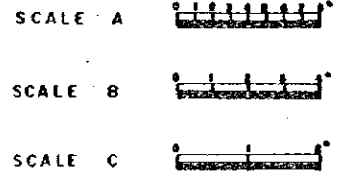
PROFILE SCALE: B



DETAIL OF OVERFLOW SECTION SCALE: C



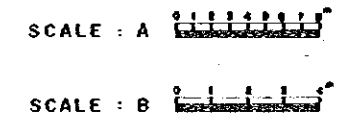
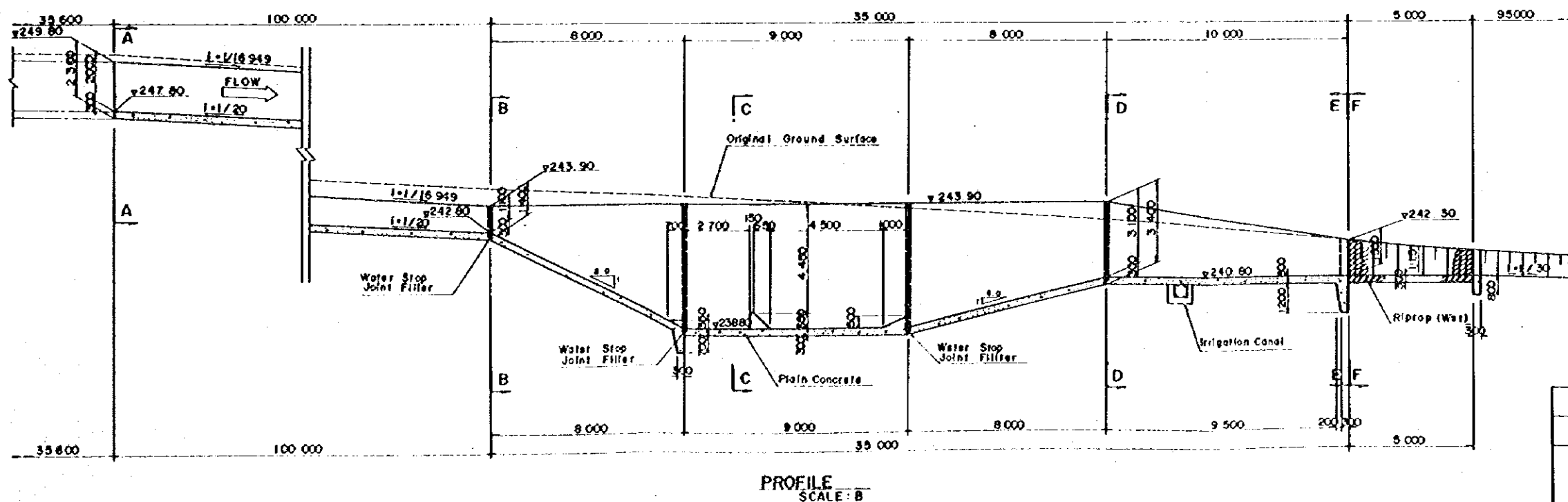
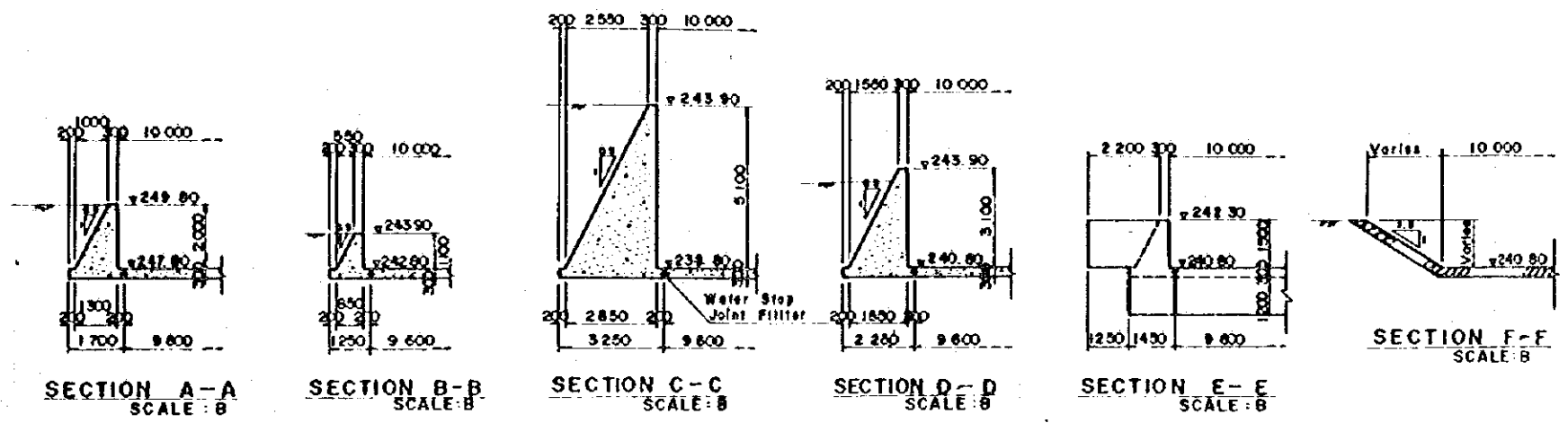
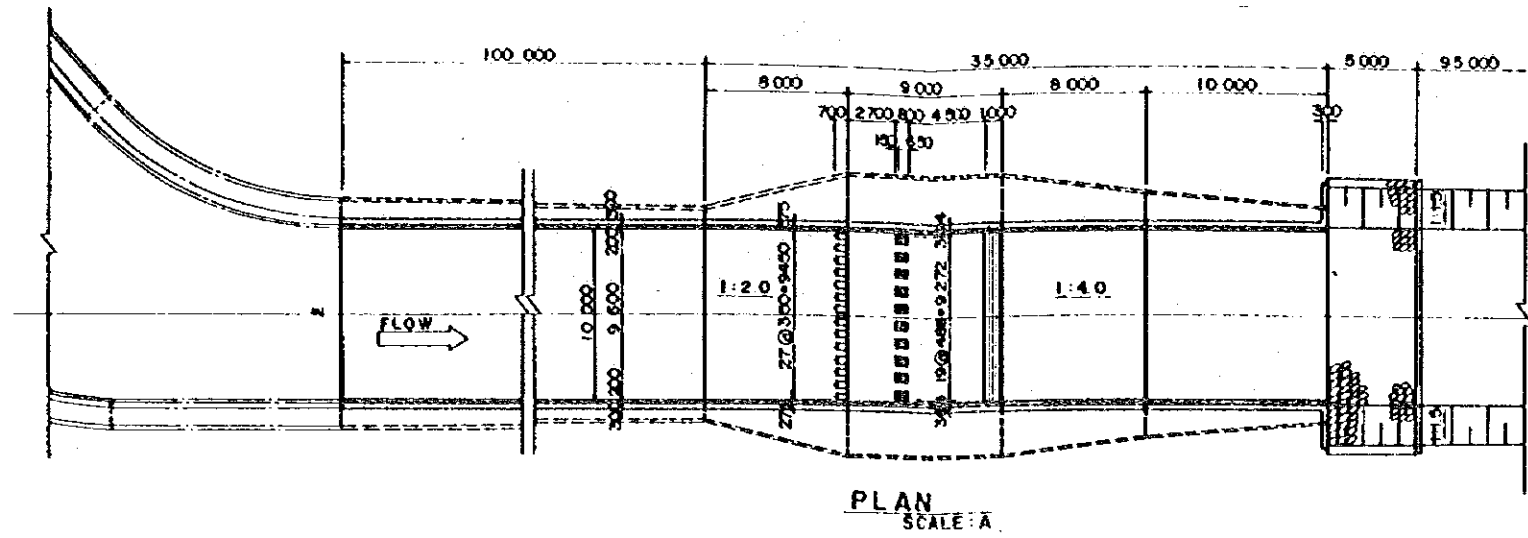
TYPICAL DETAIL OF SLAB SCALE: C



THE WATER SUPPLY PROJECT
FOR THE REFUGEES
THE KINGDOM OF THAILAND

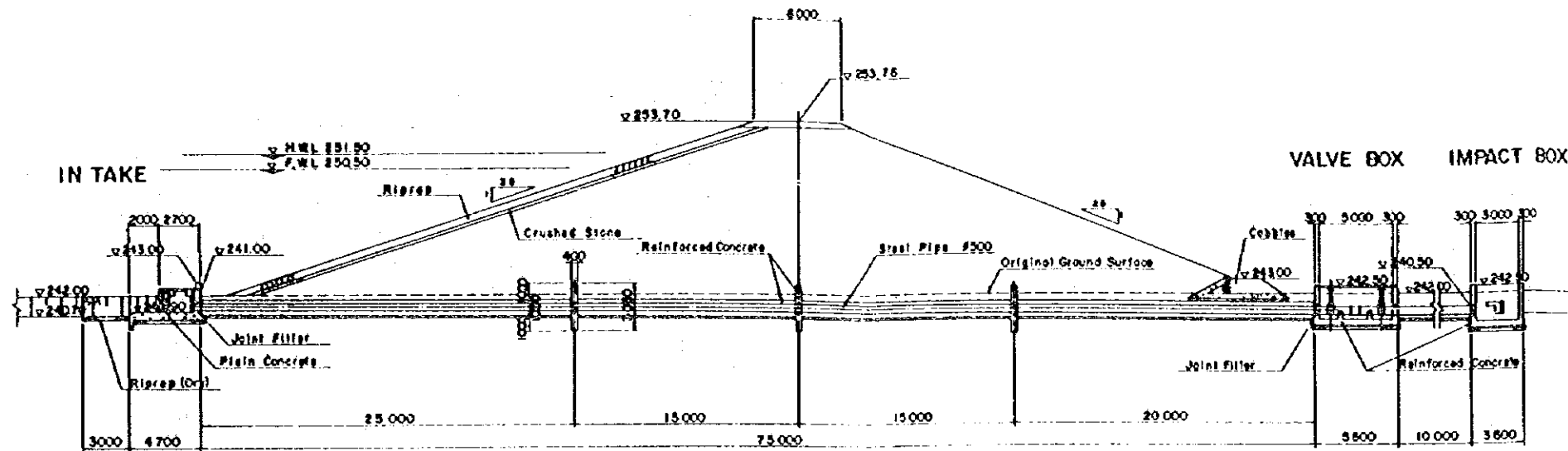
MEH KAH DAM
SPILLWAY(1/2)
Date OCTOBER, 1981 DWG. No. 5/0
JAPAN INTERNATIONAL COOPERATION AGENCY

MEH KAH DAM SPILLWAY (2/2)

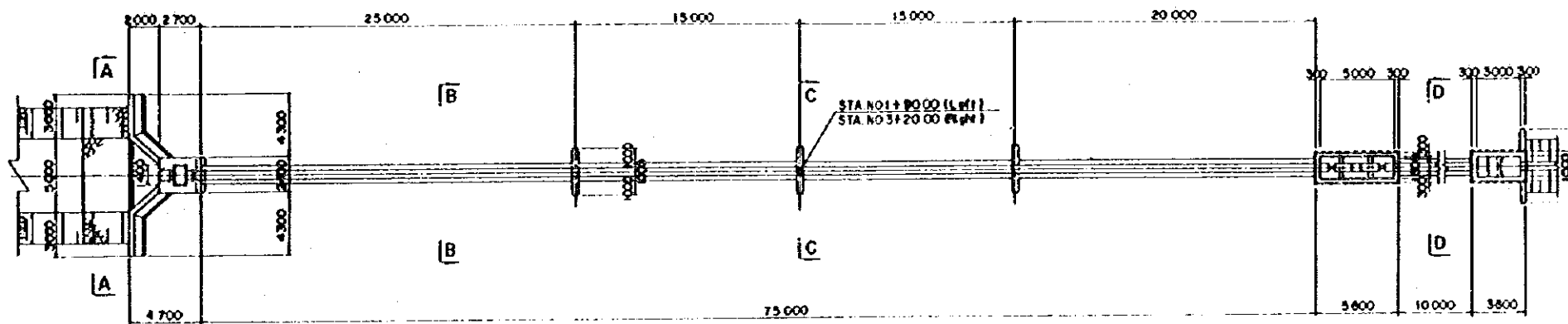


THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM SPILLWAY (2/2)	
Date OCTOBER, 1981	DWG. No. 6/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

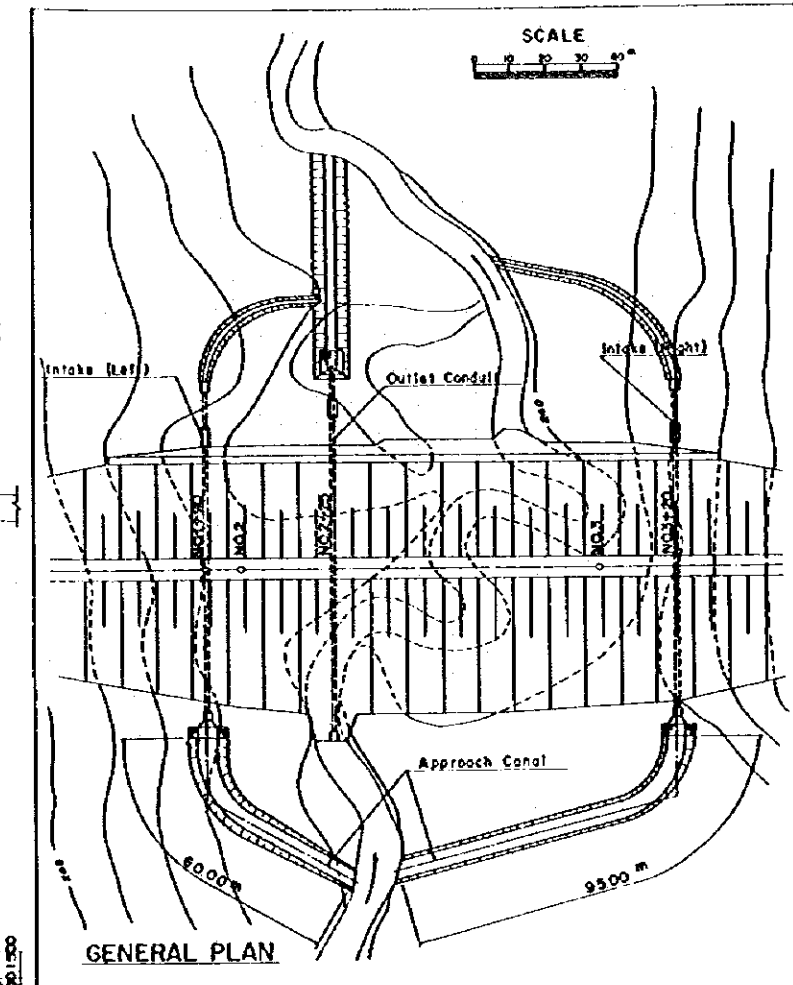
MEH KAH DAM INTAKE (1/2)



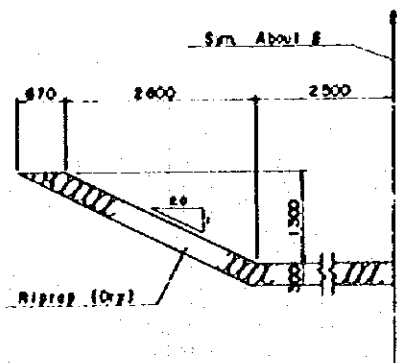
PROFILE
SCALE: A



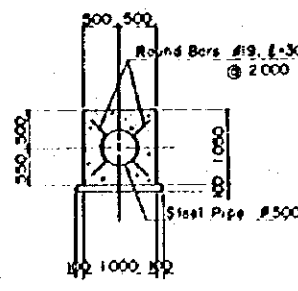
PLAN
SCALE: A



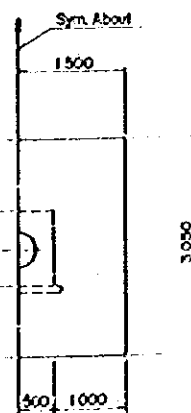
GENERAL PLAN



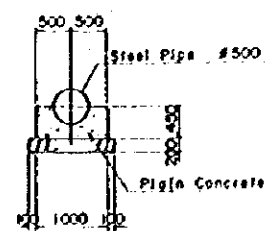
SECTION A-A
SCALE: B



SECTION B-B
SCALE: B



SECTION C-C
SCALE: B



SECTION D-D
SCALE: B

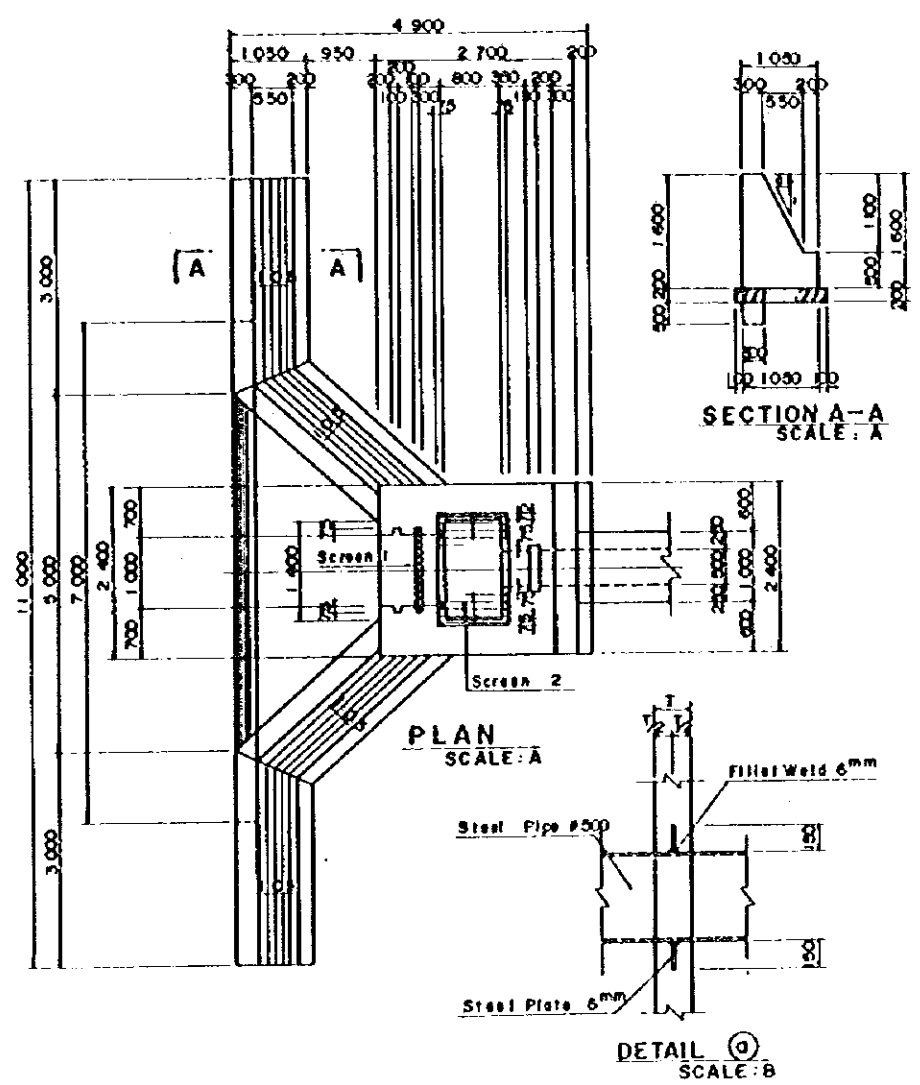
SCALE: A

SCALE: B

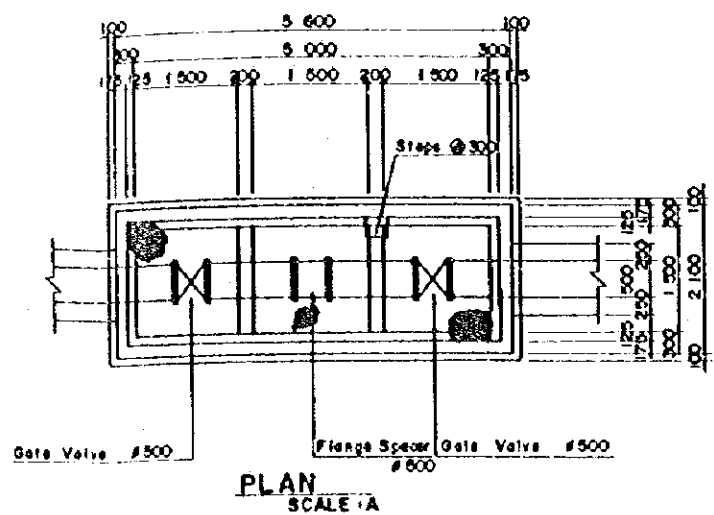
THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM INTAKE (1/2)	
Date OCTOBER, 1981	D.W.G. No. 7/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

MEH KAH DAM INTAKE (2 / 2)

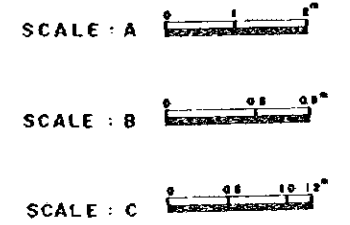
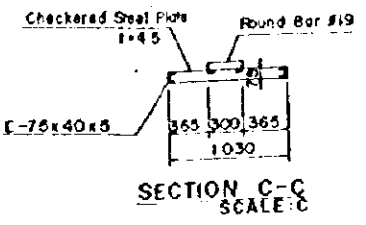
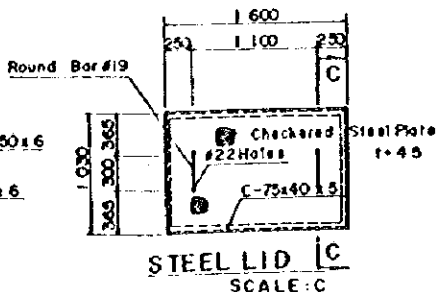
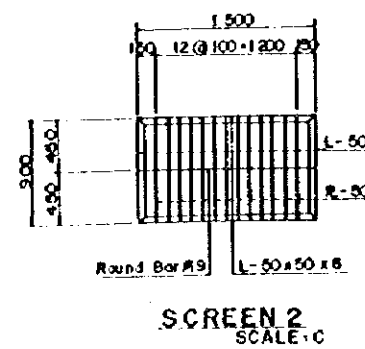
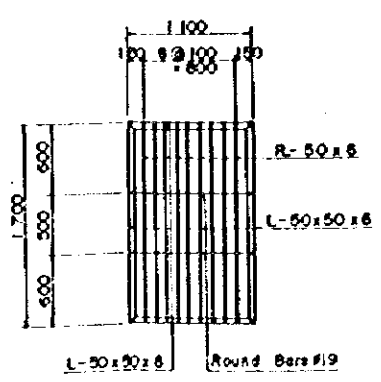
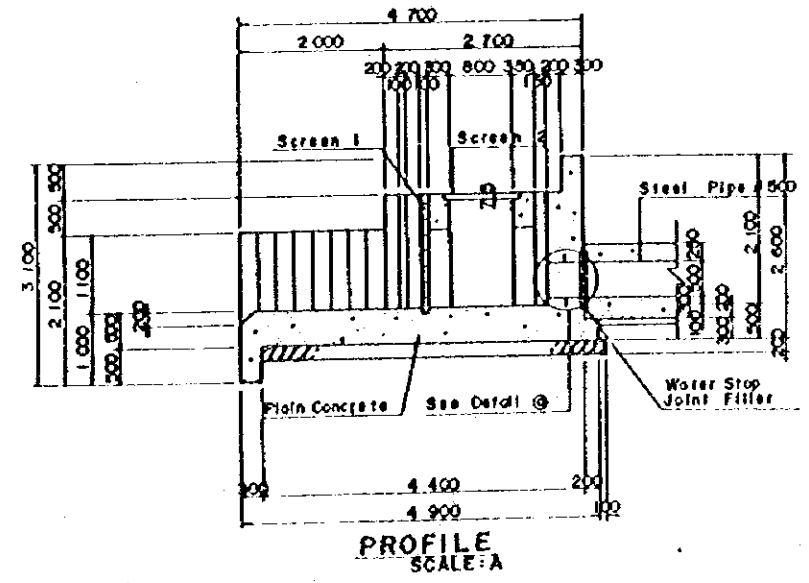
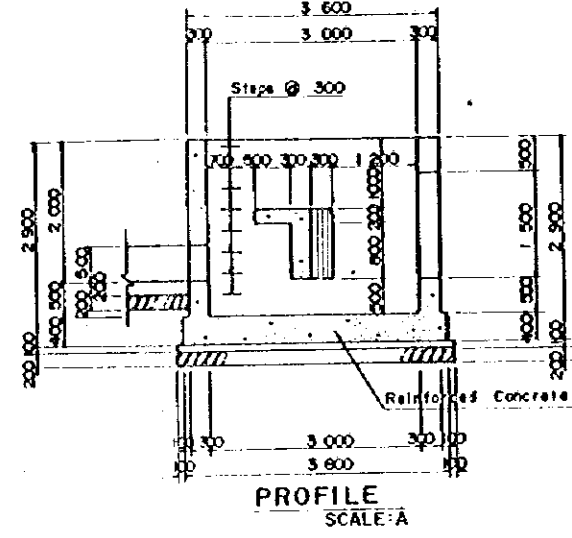
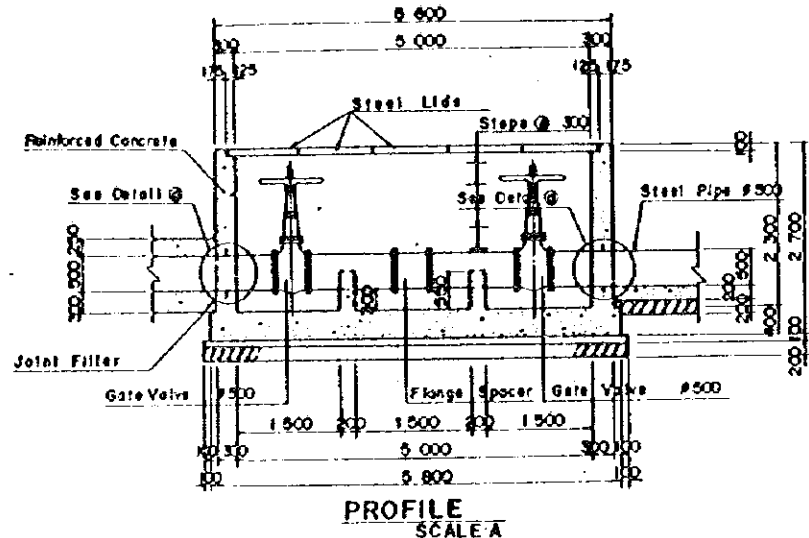
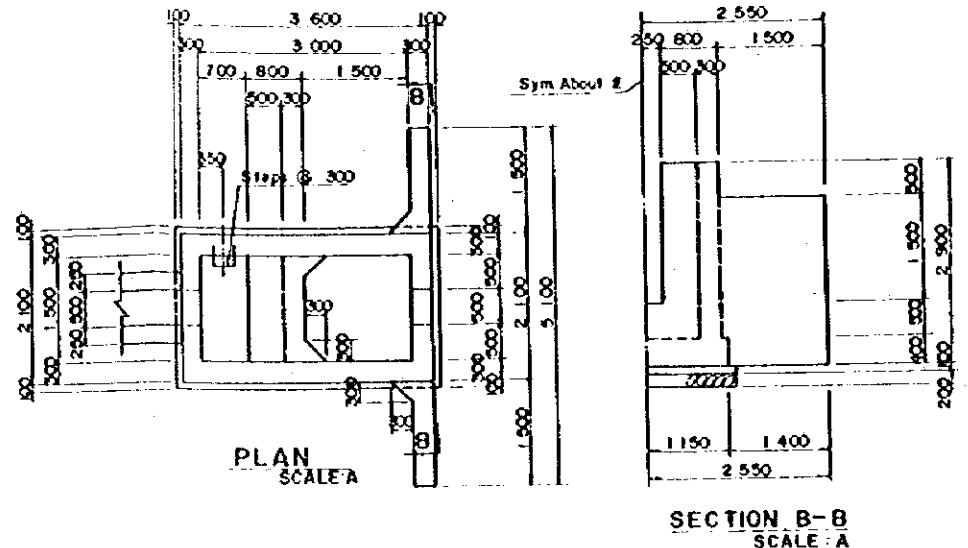
DETAIL OF INTAKE



DETAIL OF VALVE BOX

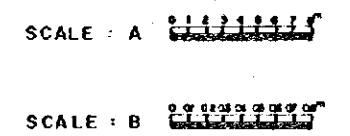
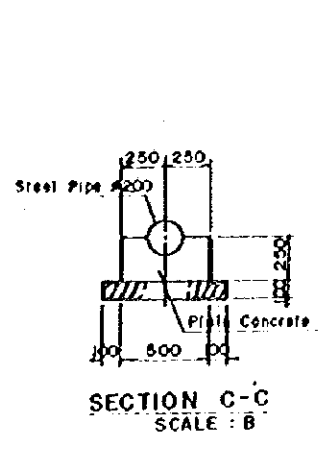
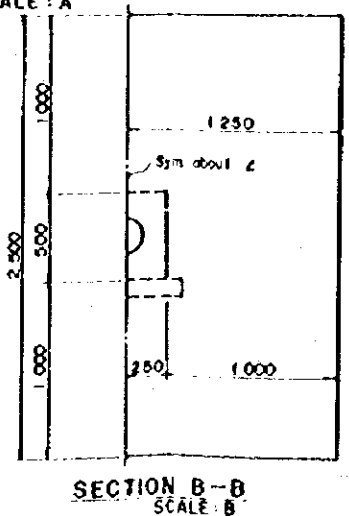
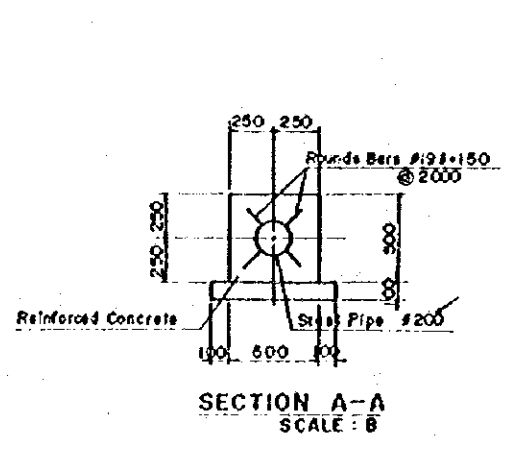
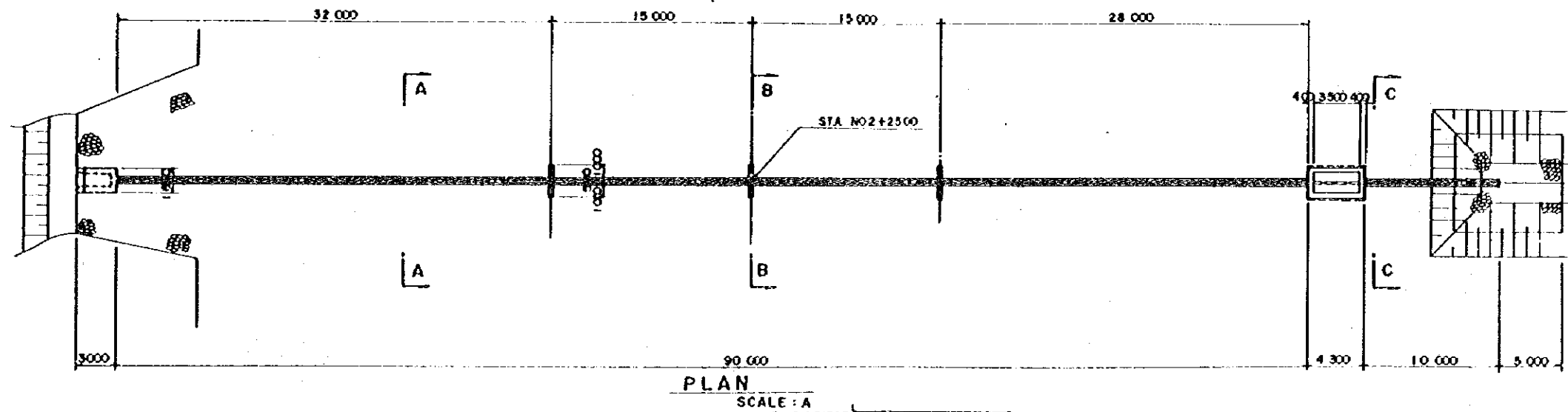
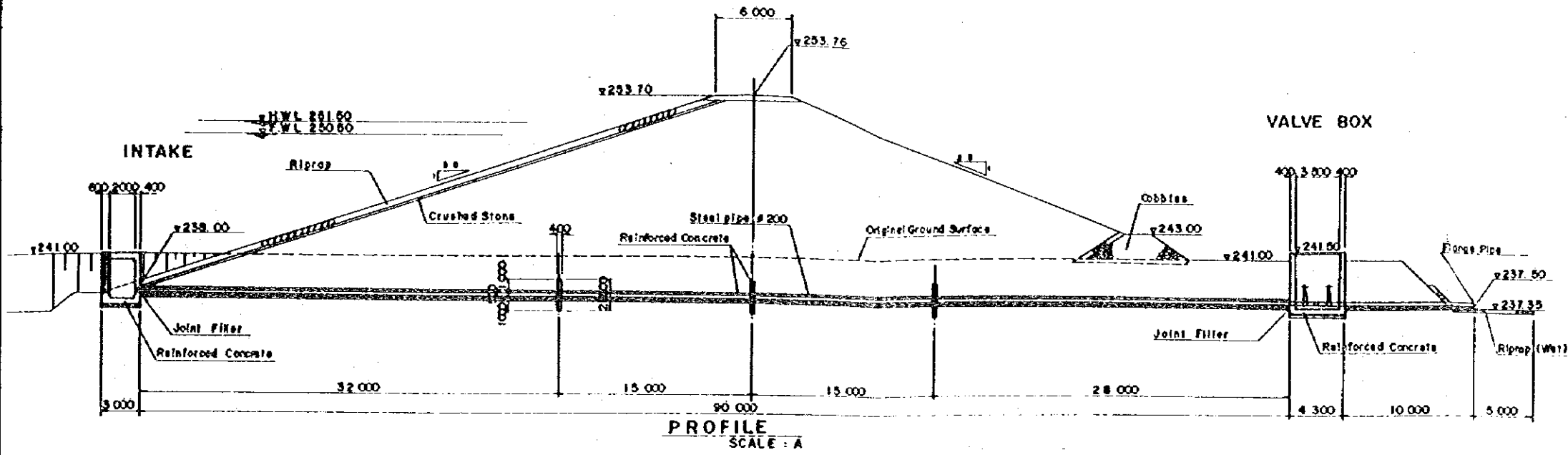


DETAIL OF IMPACT BOX



THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM INTAKE (2/2)	
Date OCTOBER, 1981	DWG. No. 8/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

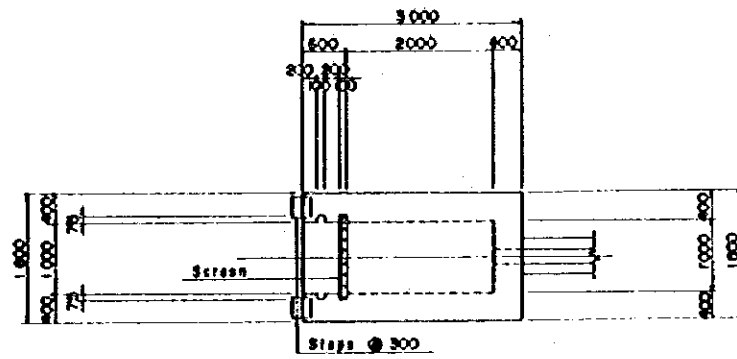
MEH KAH DAM OUTLET CONDUIT (1/2)



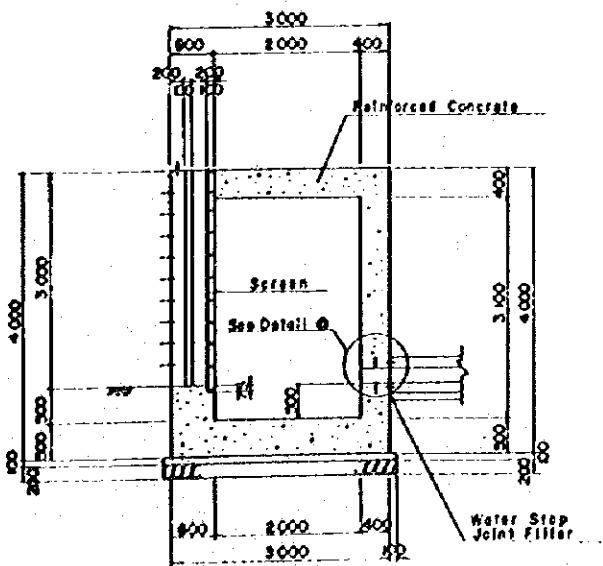
THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
MEH KAH DAM OUTLET CONDUIT (1/2)	
Date OCTOBER, 1981	DWG. No. 9/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

MEH KAH DAM OUTLET CONDUIT (2/2)

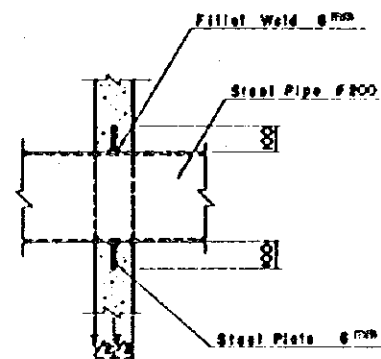
DETAIL OF IN TAKE



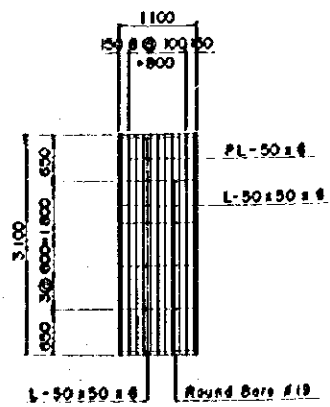
PLAN
SCALE: A



PROFILE
SCALE: A

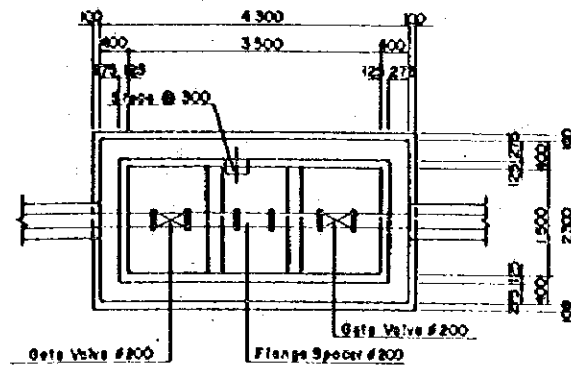


DETAIL ©
SCALE: B

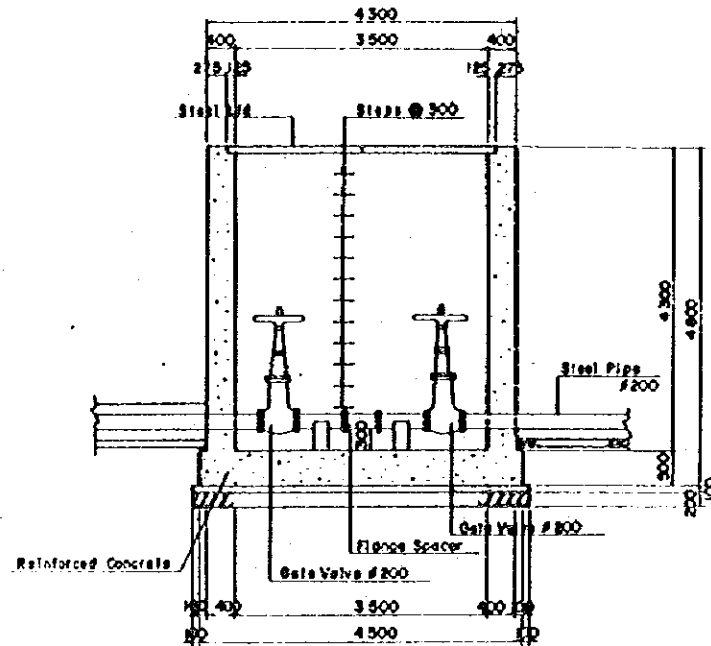


SCREEN
SCALE: A

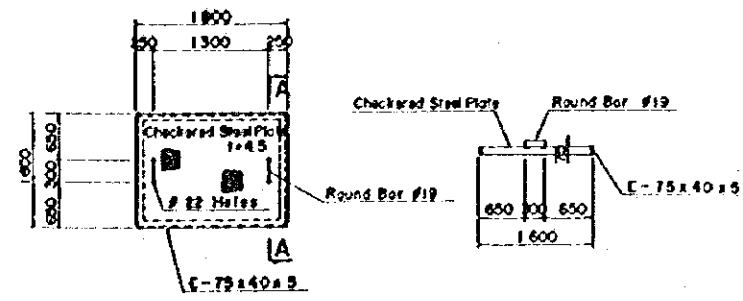
DETAIL OF VALVE BOX



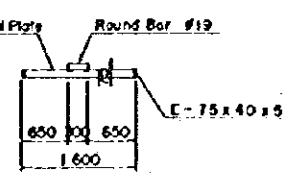
PLAN
SCALE: A



PROFILE
SCALE: A



STEEL LID
SCALE: A



SECTION A-A
SCALE: A

SCALE: A

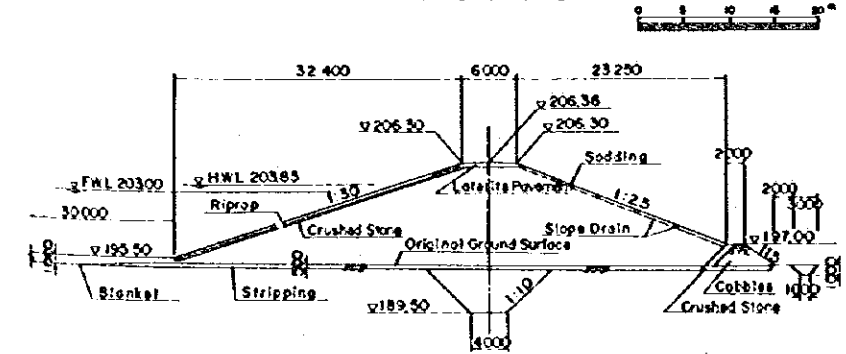
SCALE: B

THE WATER SUPPLY PROJECT FOR THE REFUGEES THE KINGDOM OF THAILAND	
MEH KAH DAM OUTLET CONDUIT (2/2)	
Date OCTOBER, 1981	D.W.G. No. 10/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

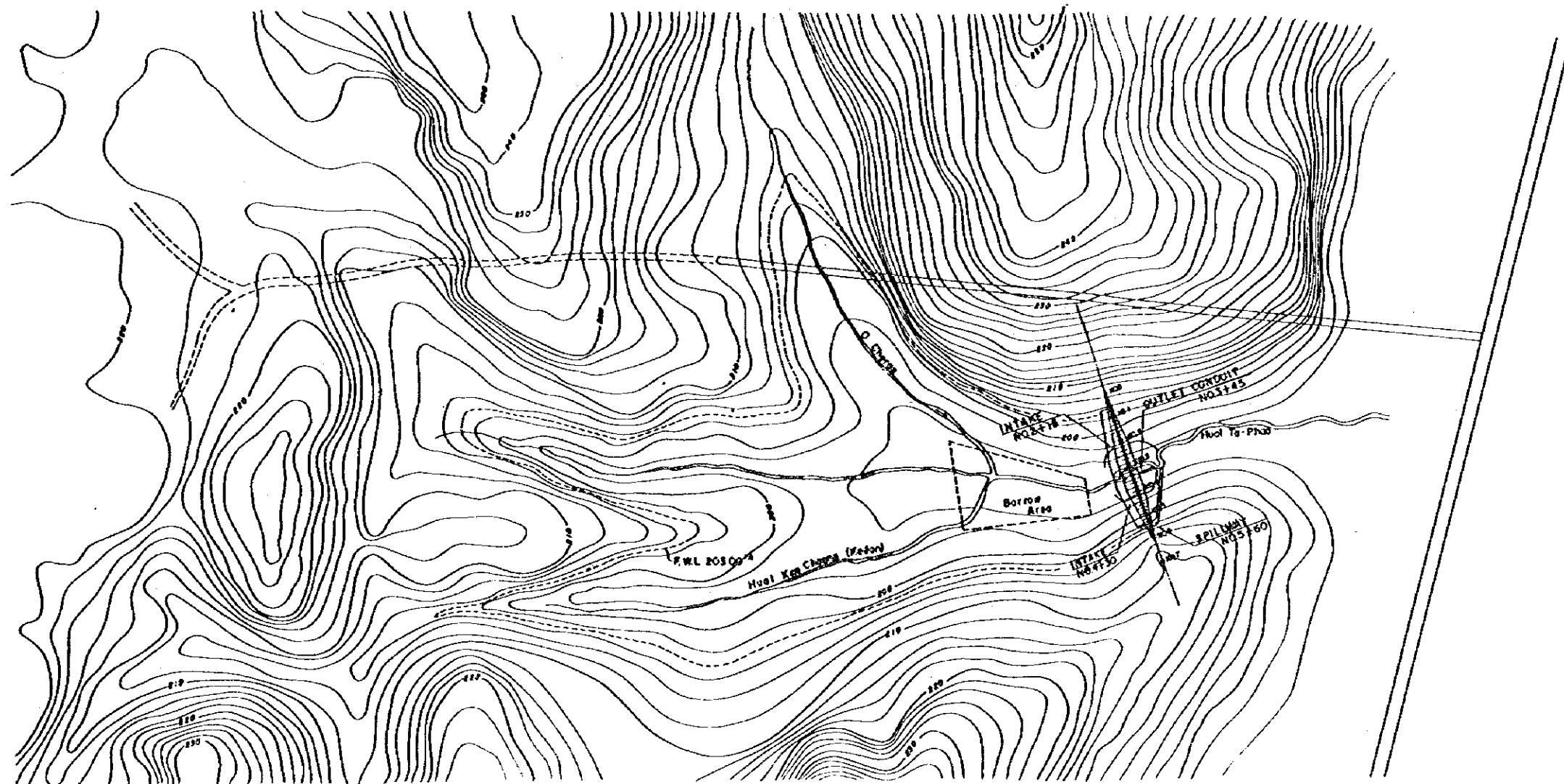


TYPICAL DAM SECTION

SCALE



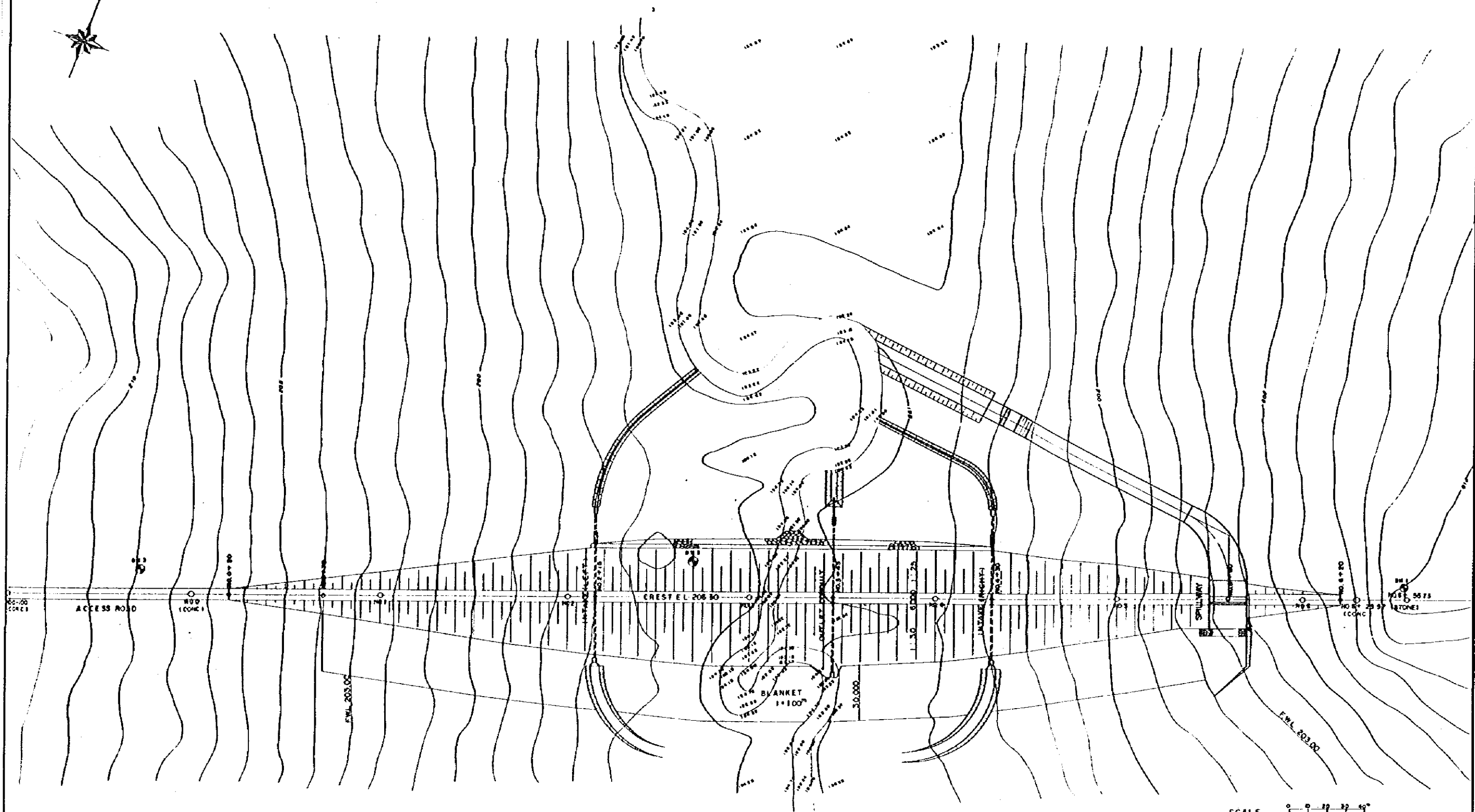
TA KAO DAM GENERAL PLAN



SCALE

THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM GENERAL PLAN	
Date OCTOBER, 1981	DWG. No. 1/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

TAKAO DAM PLAN



BM 3 Ball on root of Tree
EL = 208.70M

BM 2 Ball on root of Tree
EL = 195.69M

BM 1 Red Mark on the stone
EL = 210.874M

SCALE 0 10 20 30 40

THE WATER SUPPLY PROJECT
FOR THE REFUGEES
THE KINGDOM OF THAILAND

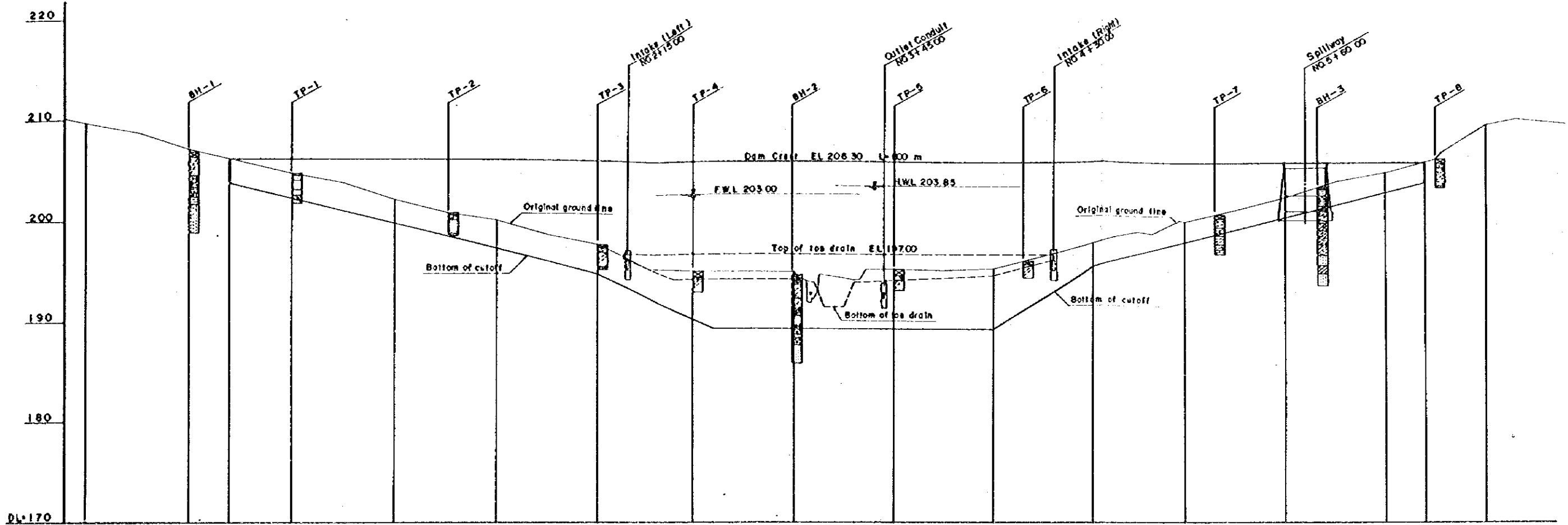
TA KAO DAM
PLAN

Date OCTOBER, 1981 DWG No 2/10

D - 12

JAPAN INTERNATIONAL COOPERATION AGENCY

TA KAO DAM PROFILE



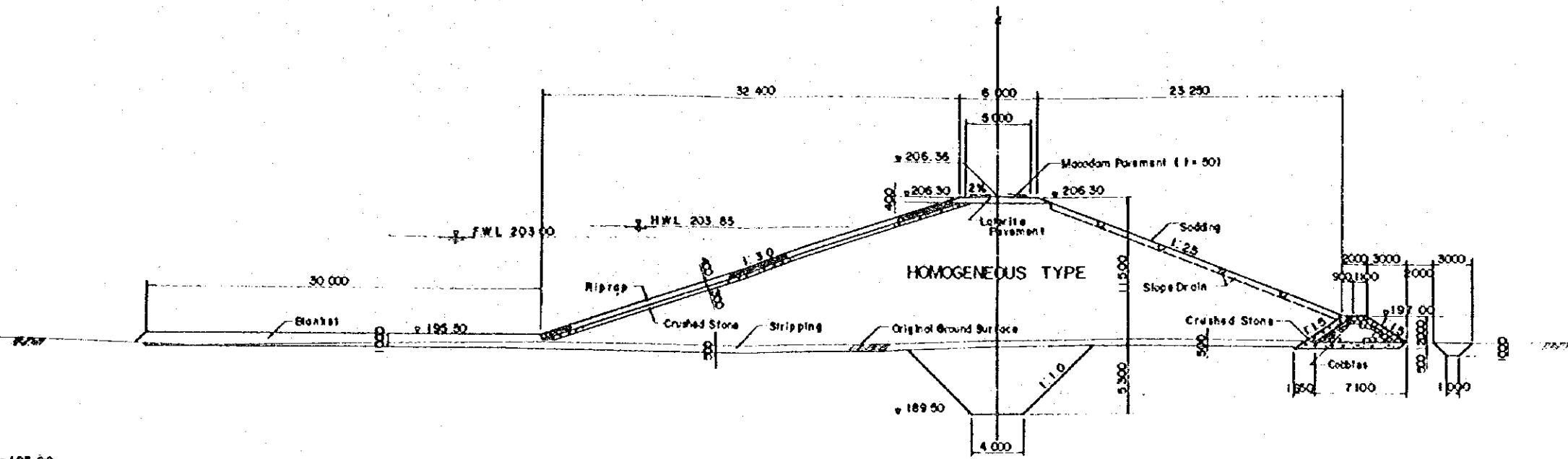
WIDTH OF CUTOFF	W=2.00-3.00m		W=3.00m		W=3.00-4.00m		W=4.00m		W=4.00-3.00m		W=3.00m		W=3.00-2.00m	
BOTTOM OF TOE DRAIN														
BOTTOM OF CUTOFF			203.90	202.40	199.90	197.40	194.90	193.70	193.50	194.30	194.50	194.50	194.50	194.50
GROUND ELEVATION	208.82	208.92	207.34	206.13	203.00	201.09	200.21	198.83	197.90	195.79	195.50	194.30	194.30	194.30
ACCUMULATIVE DISTANCE	0.00	0.00	20.00	50.00	100.00	150.00	200.00	240.00	280.00	312.00	315.00	340.00	370.00	400.00
DISTANCE	0.00	20.00	0.00	20.00	30.00	50.00	10.00	25.00	10.00	2.00	3.00	5.00	5.00	5.00
STATION	+00.00	+200.00	NO. 0	+200.00	+500.00	NO. 1	+500.00	+500.00	+500.00	+500.00	+500.00	NO. 2	+500.00	+500.00

SCALE (H)

SCALE (V)

THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM PROFILE	
Date OCTOBER 1981	DWG. No. 3/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

TA KAO DAM TYPICAL SECTION



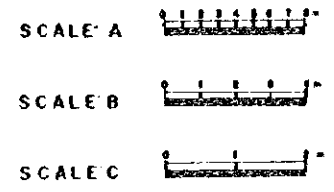
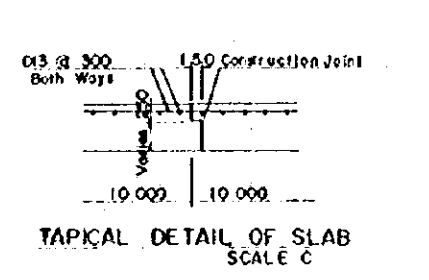
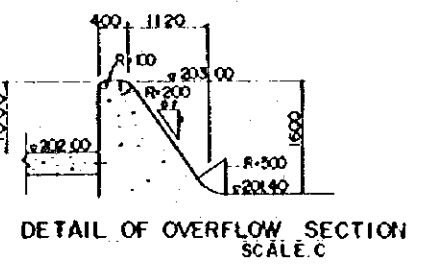
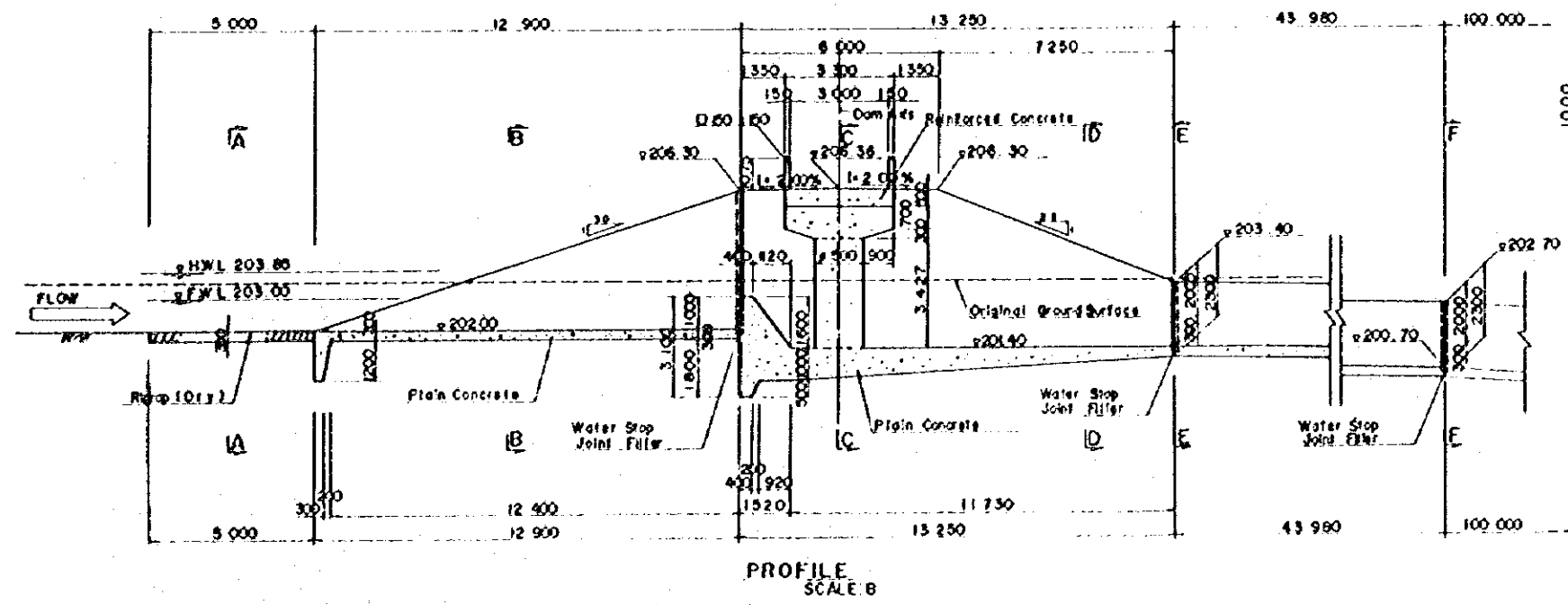
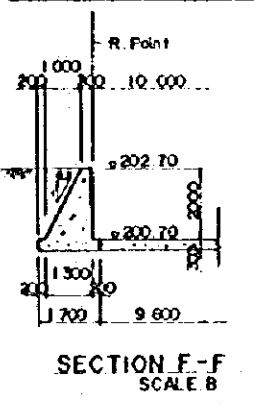
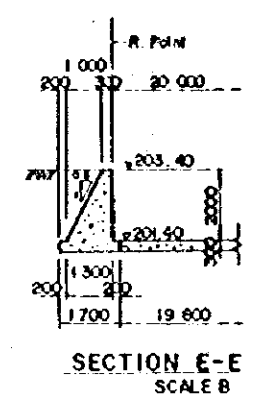
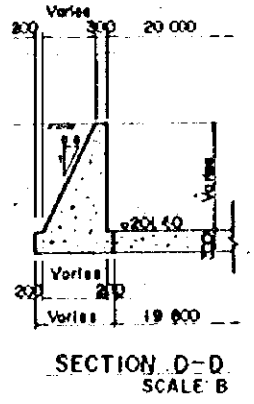
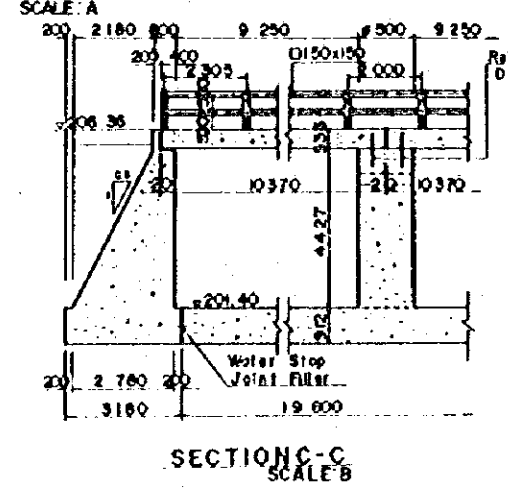
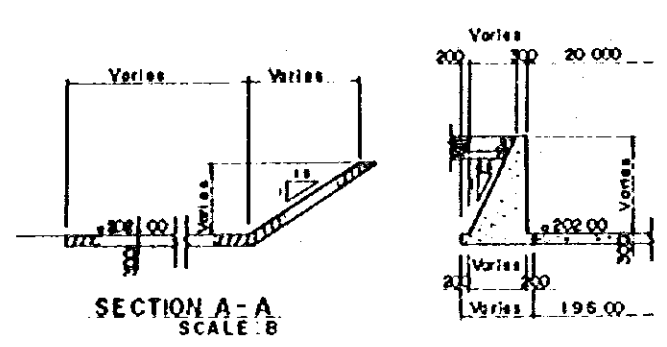
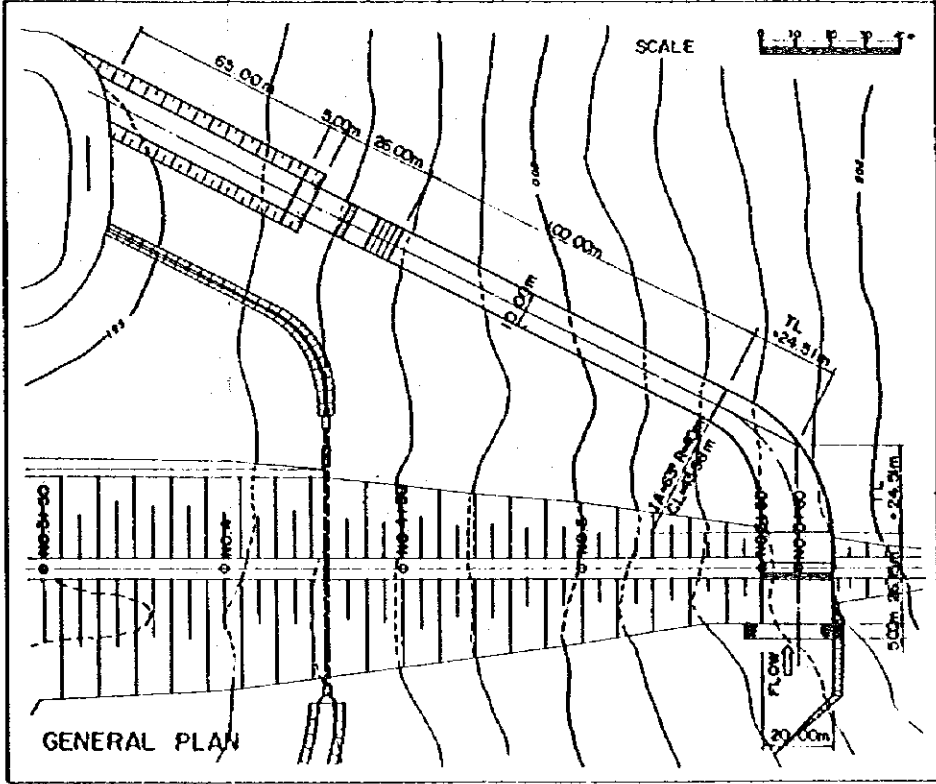
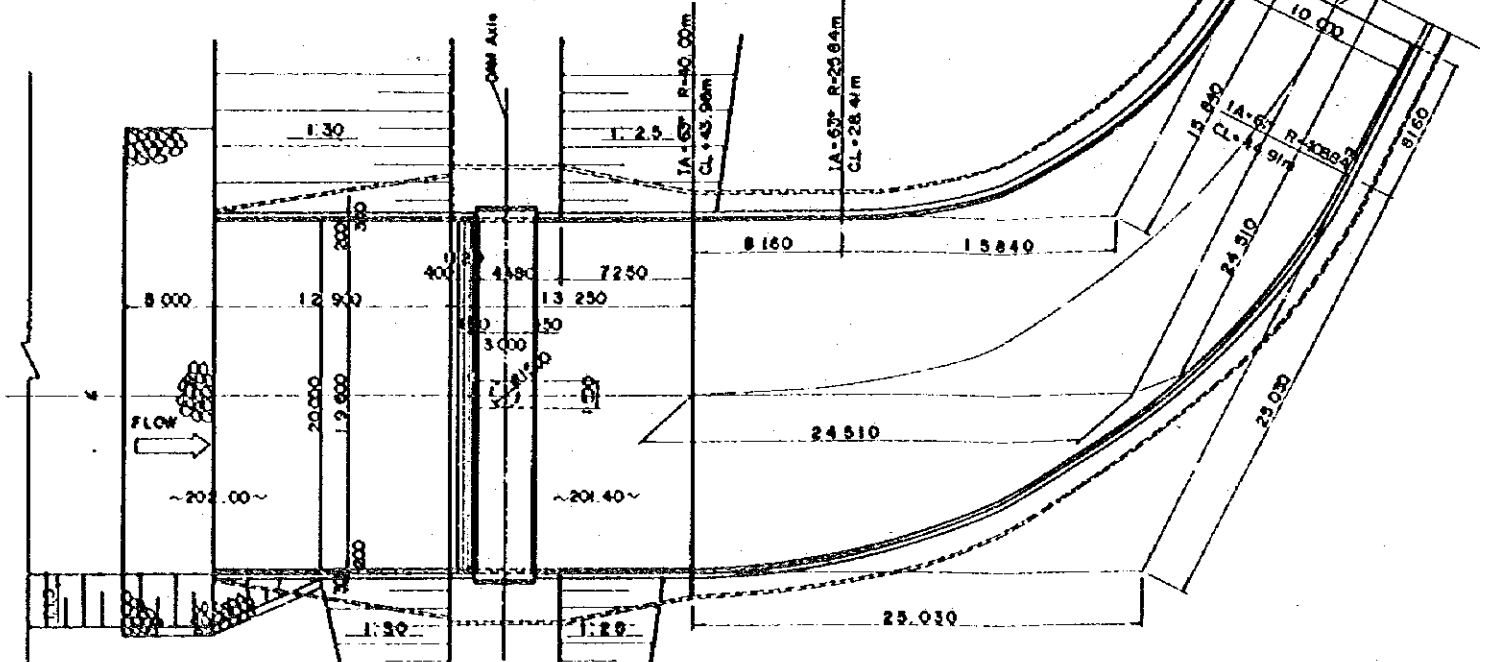
DL - 185.00

SCALE

THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM TYPICAL SECTION	
Date OCTOBER 1981	DWG. No. 4/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

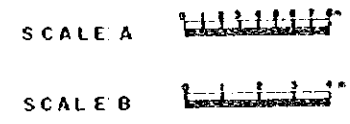
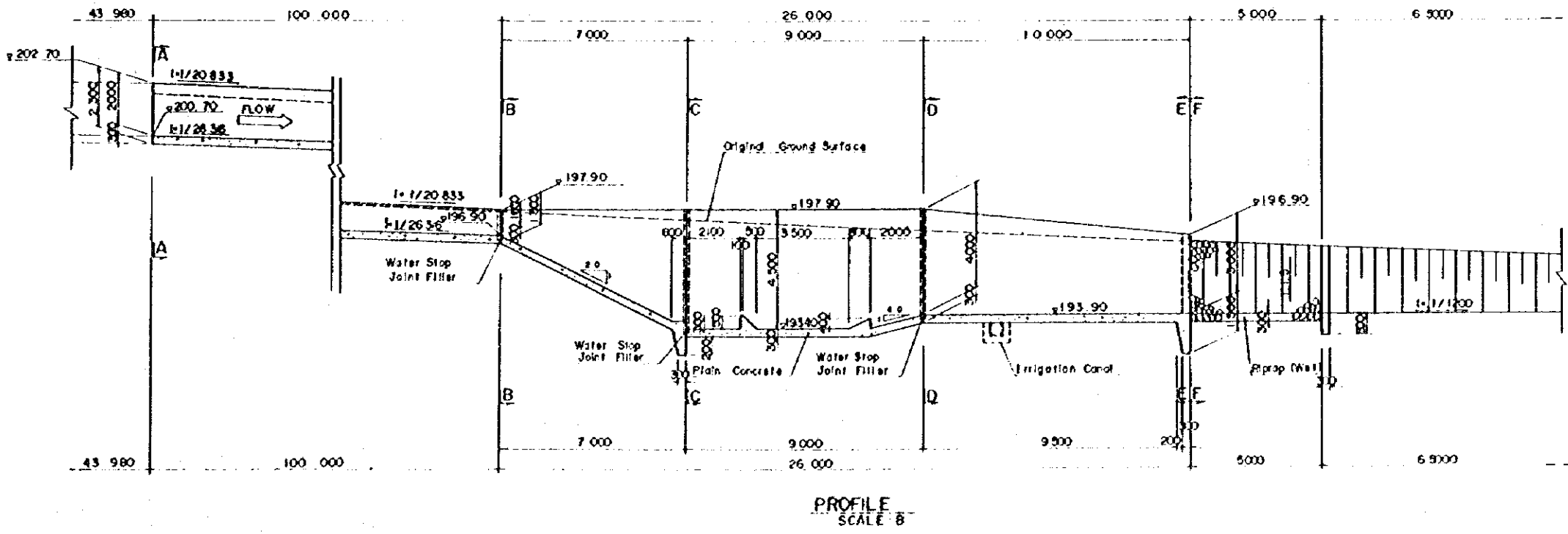
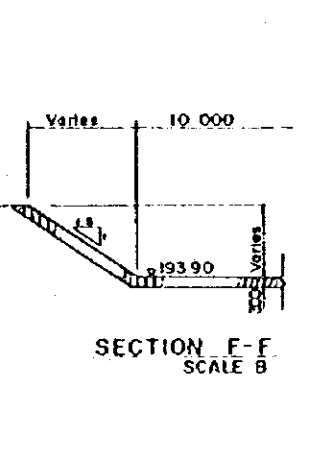
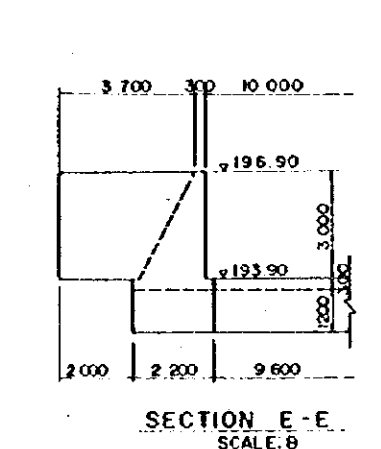
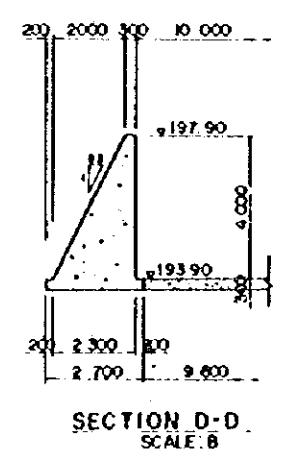
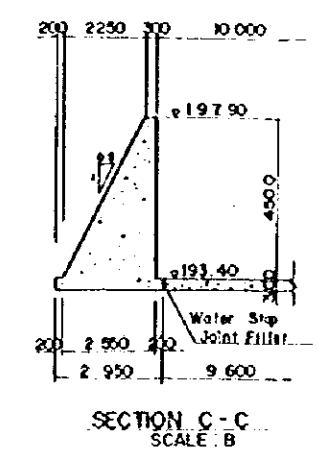
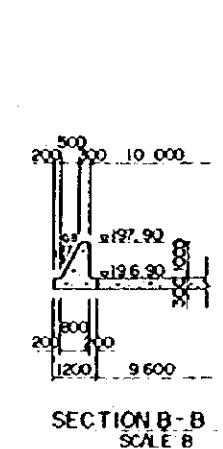
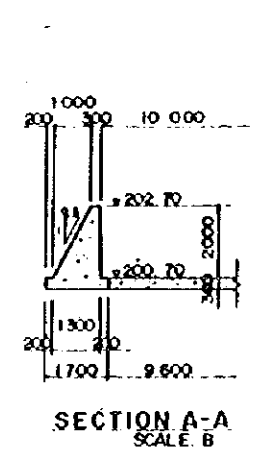
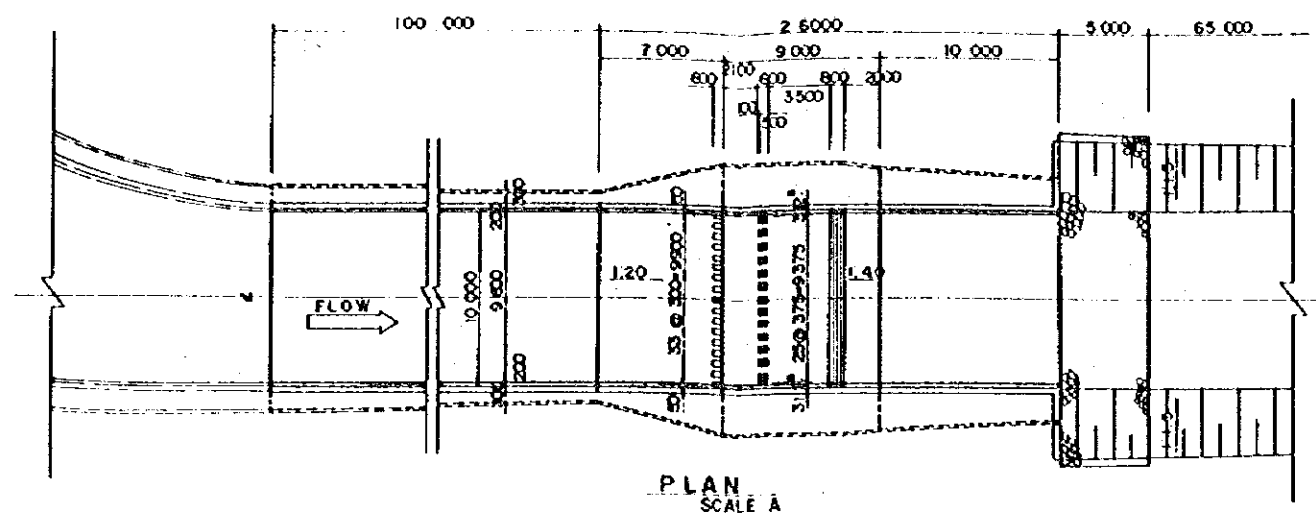
TA KAO DAM SPILLWAY (1/2)

TYPICAL CROSS SECTION OF APPROACH CHANNEL



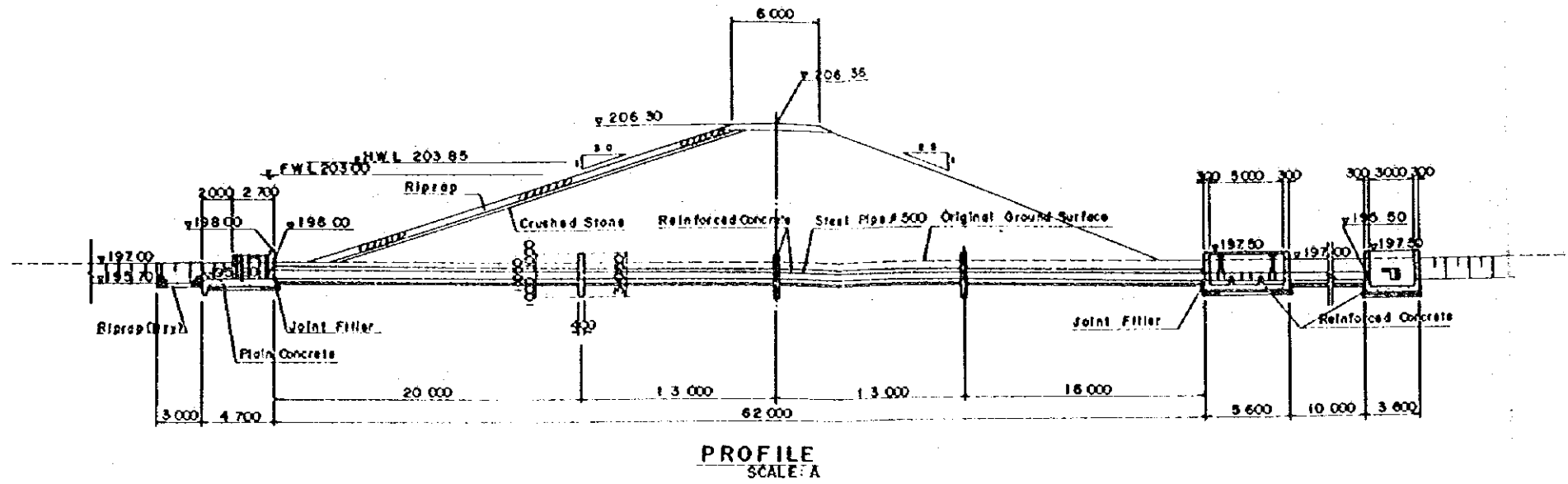
THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM SPILLWAY (1/2)	
Date OCTOBER, 1981	DWG No 5/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

TA KAO DAM SPILLWAY (2/2)

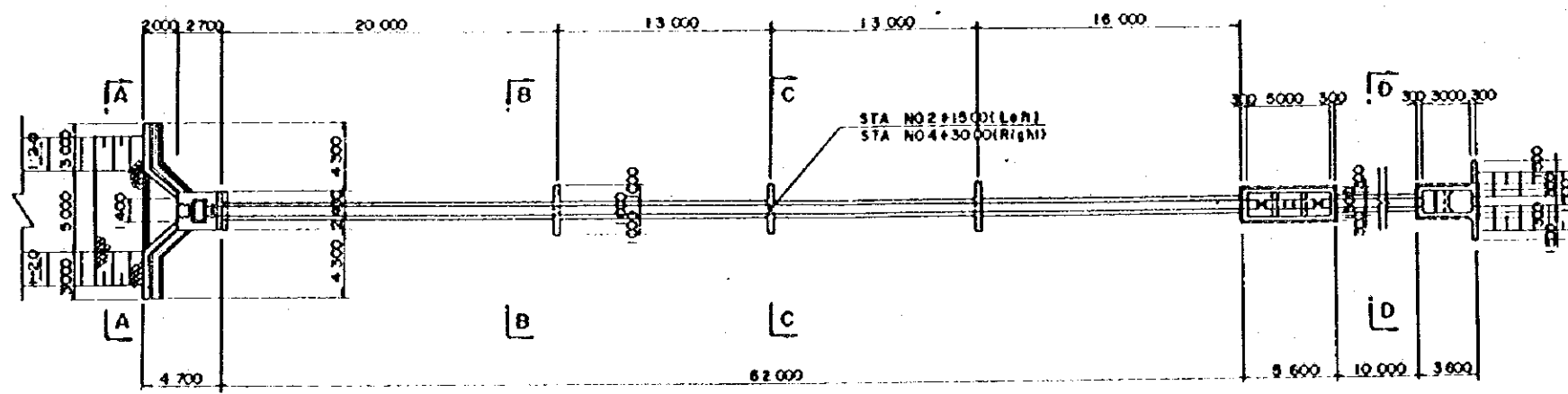


THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM SPILLWAY (2 / 2)	
Date OCTOBER, 1981	DWG. No 6/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

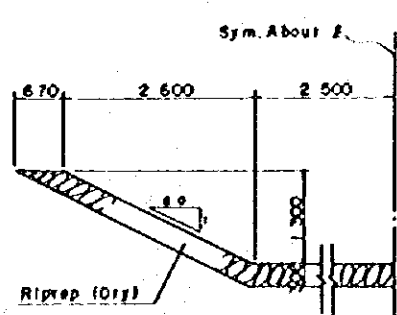
TA KAO DAM INTAKE (1/2)



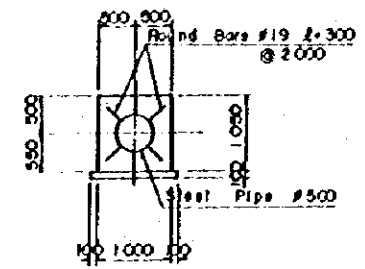
PROFILE
SCALE: A



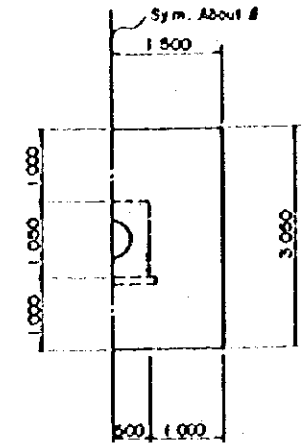
PLAN
SCALE: A



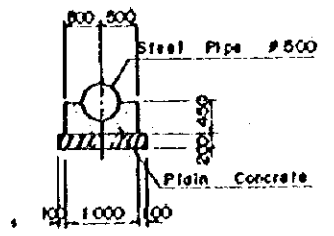
SECTION A-A
SCALE: B



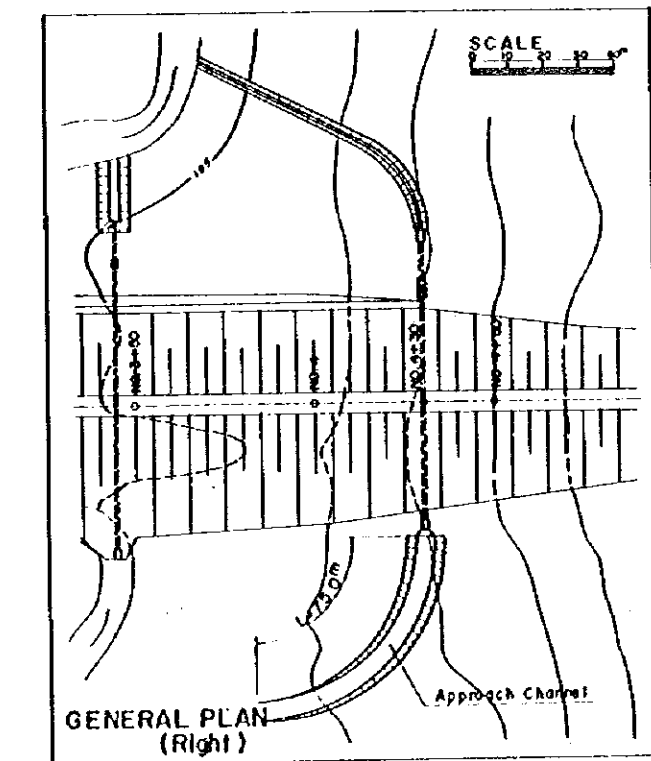
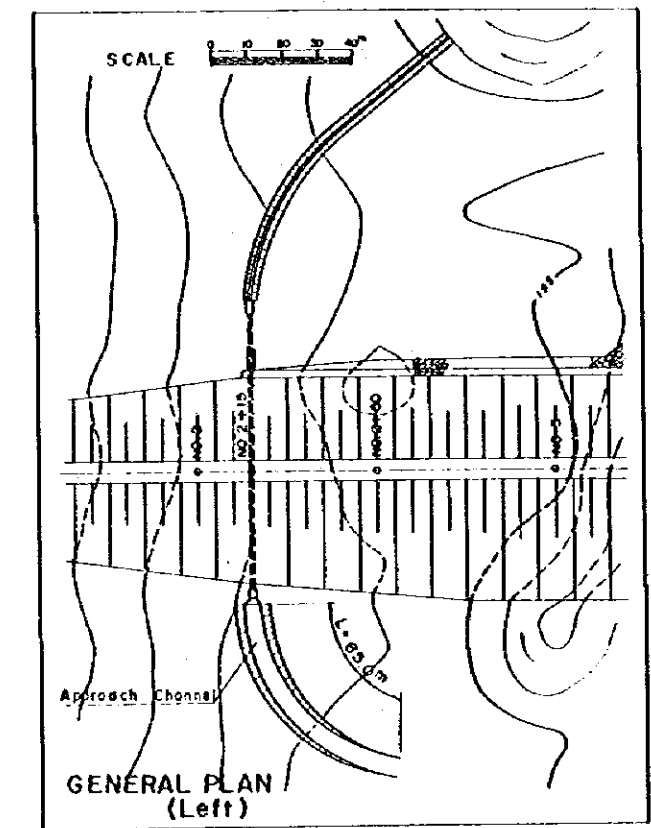
SECTION B-B
SCALE: B



SECTION C-C
SCALE: B



SECTION D-D
SCALE: B



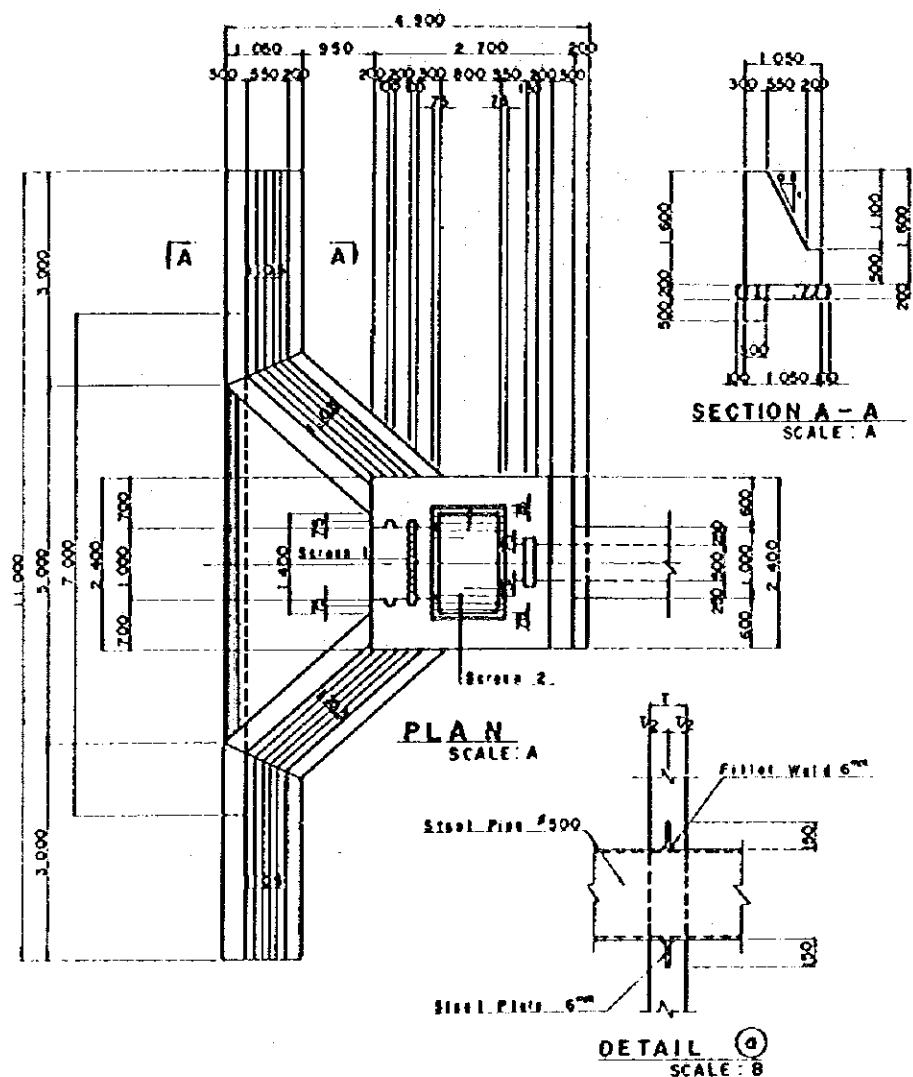
SCALE: A

SCALE: B

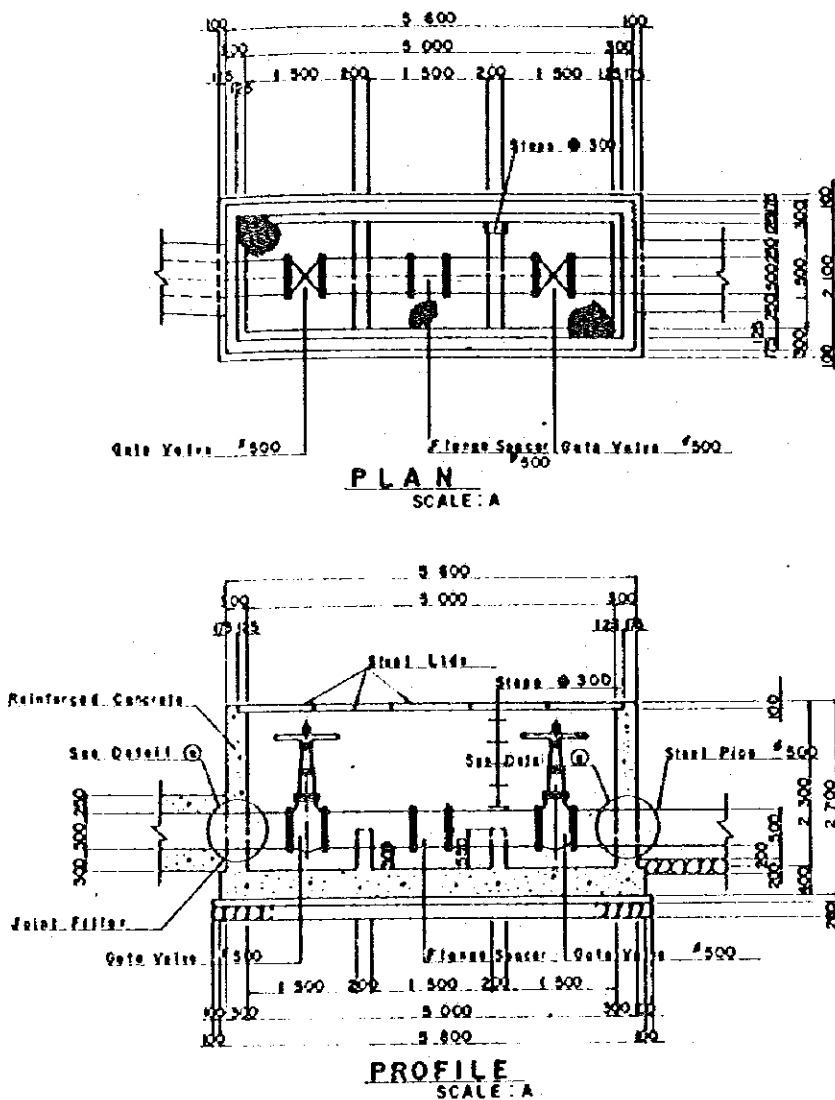
THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM INTAKE (1/2)	
Date OCTOBER 1981	DWG. No. 7/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

TA KAO DAM INTAKE (2/2)

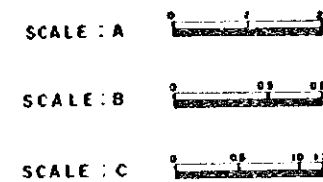
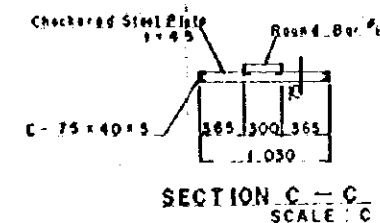
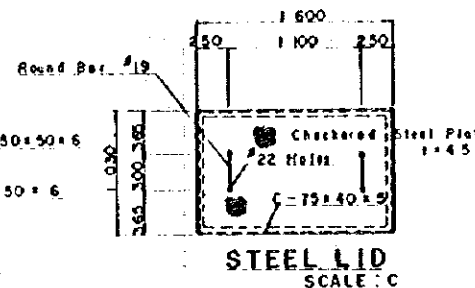
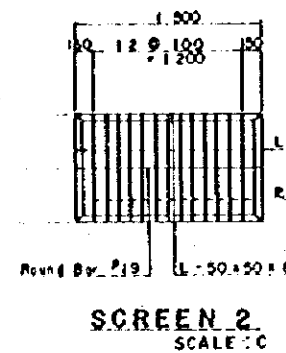
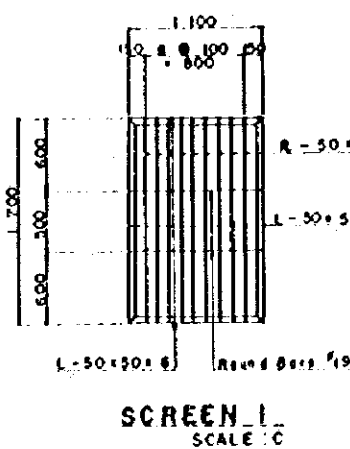
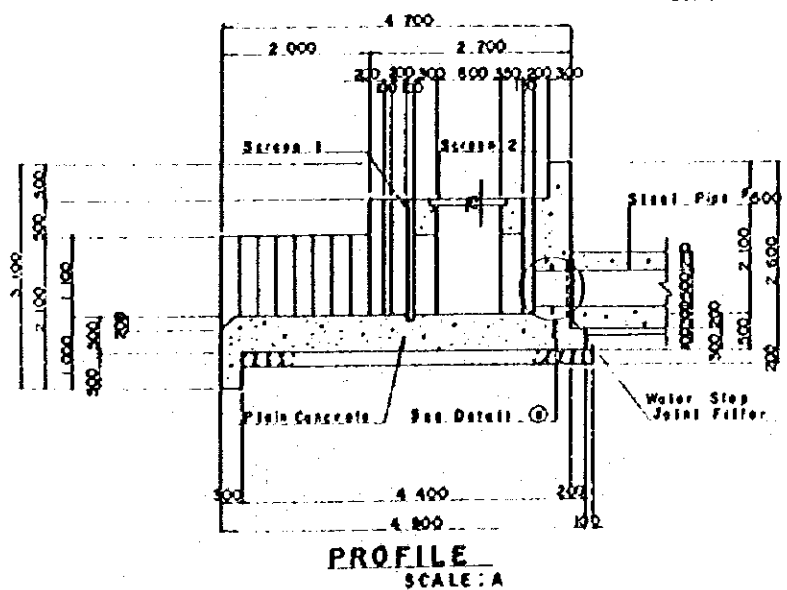
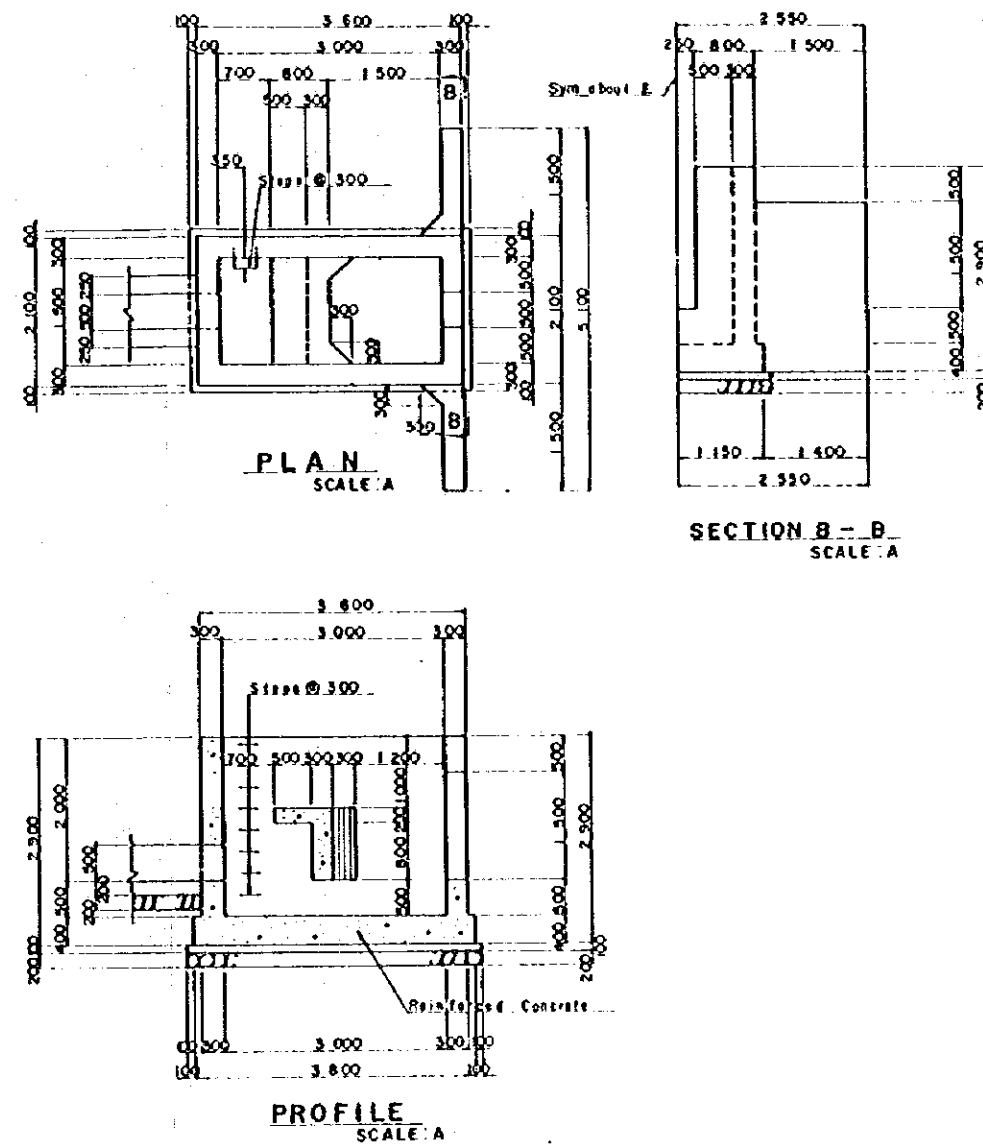
DETAIL OF INTAKE



DETAIL OF VALVE BOX



DETAIL OF IMPACT BOX



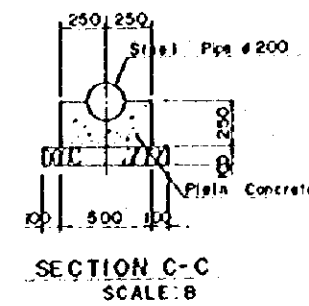
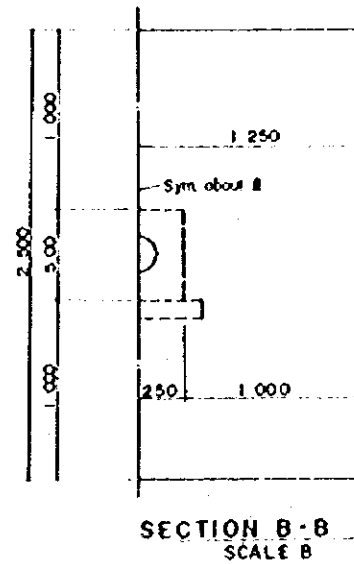
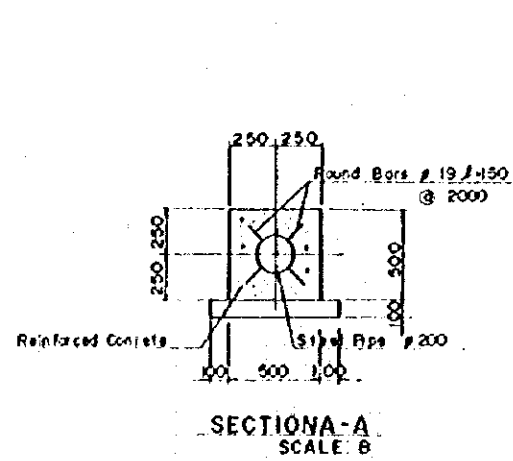
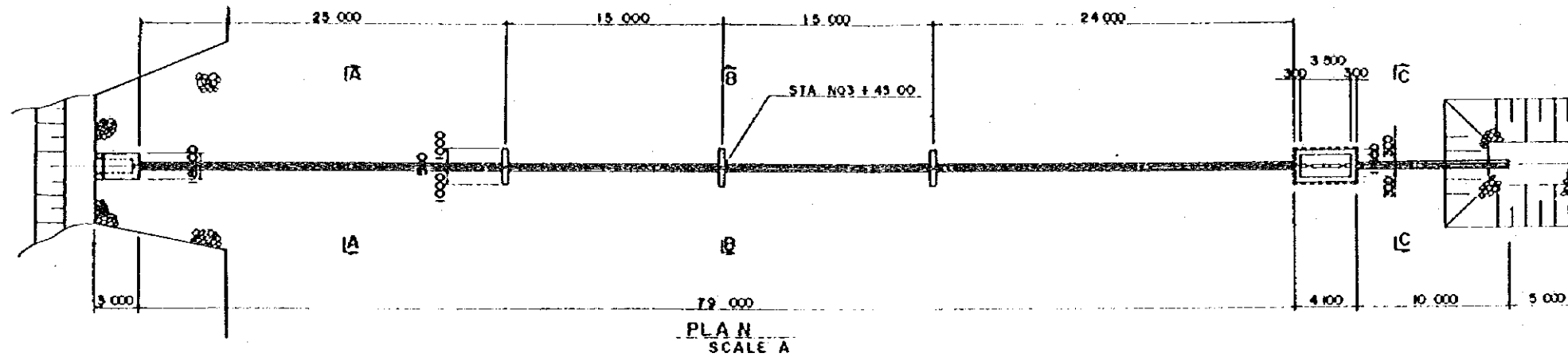
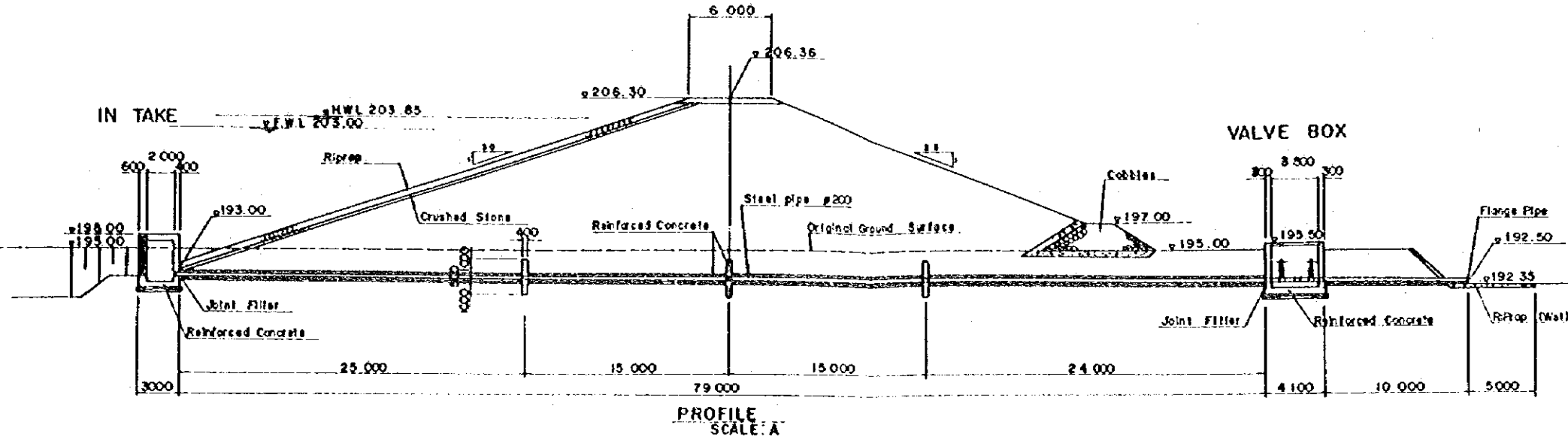
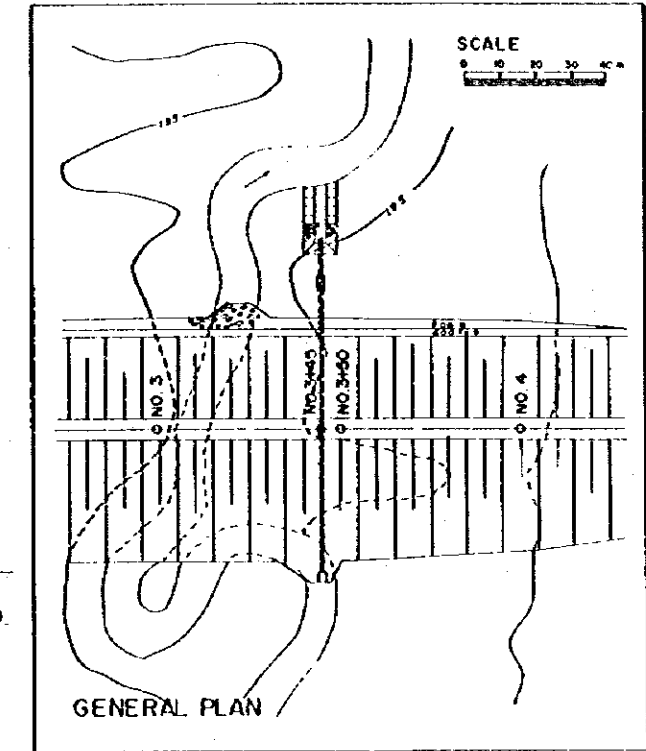
THE WATER SUPPLY PROJECT
FOR THE REFUGEES
THE KINGDOM OF THAILAND

TA KAO DAM
INTAKE (2/2)

Date OCTOBER 1981 DWG. No B/10

JAPAN INTERNATIONAL COOPERATION AGENCY

TA KAO DAM OUTLET CONDUIT (1/2)



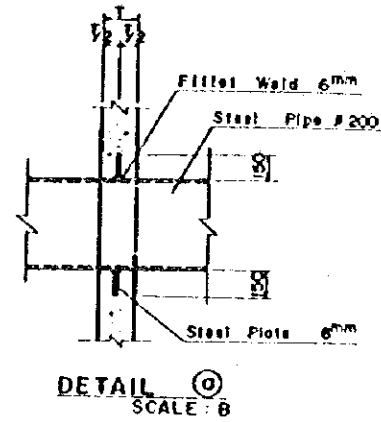
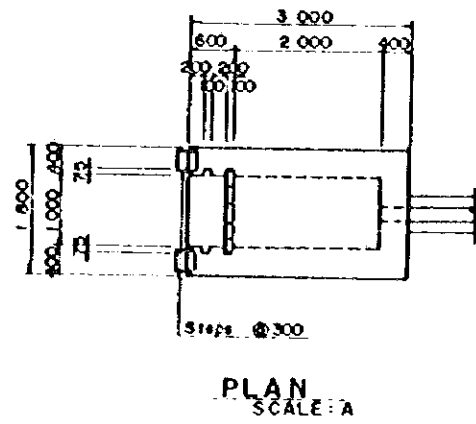
SCALE A 0 10 20 30 40 m

SCALE B 0 1 2 3 4 5 6 7 8 9 10 m

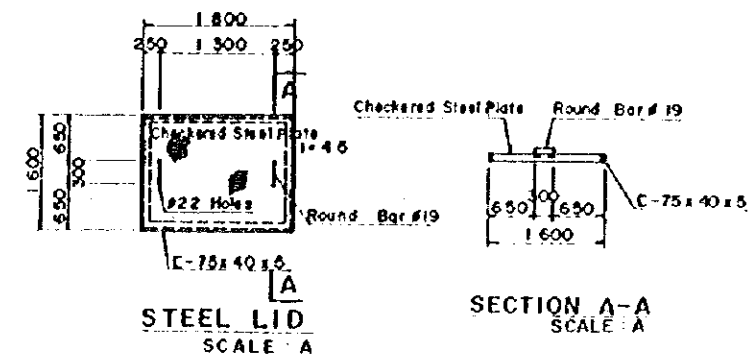
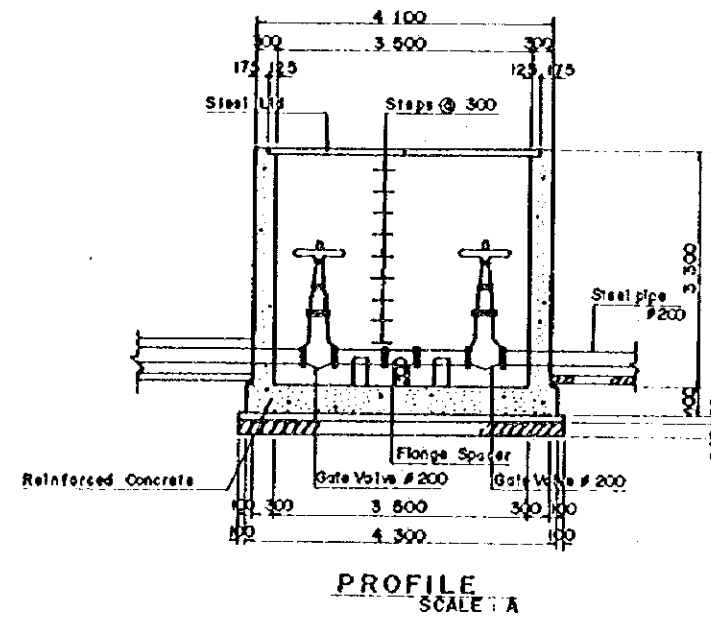
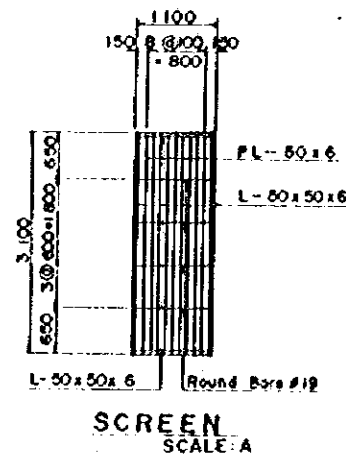
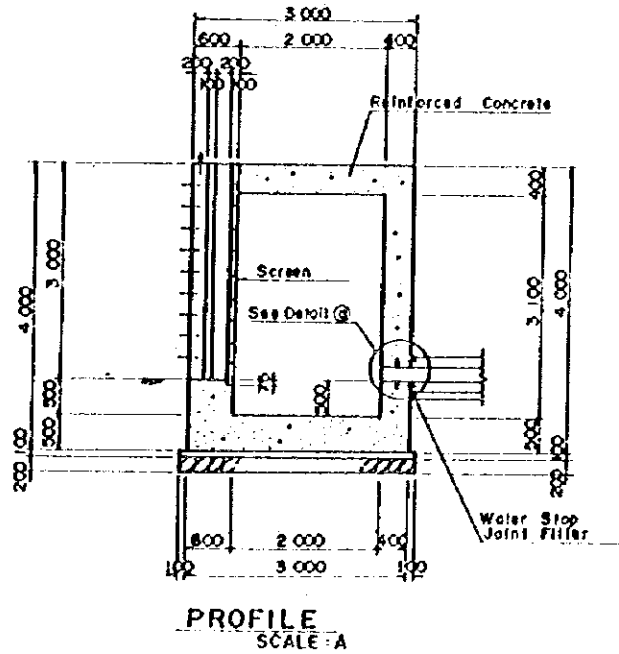
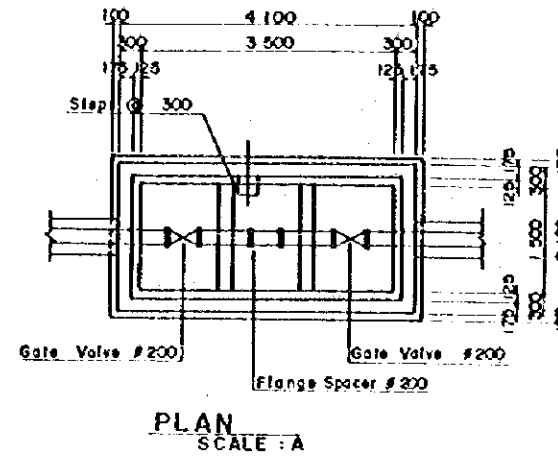
THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
TA KAO DAM OUTLET CONDUIT (1/2)	
Date OCTOBER 1981	DWG. No. 9/10
JAPAN INTERNATIONAL COOPERATION AGENCY	

TAKAO DAM OUTLET CONDUIT (2/2)

DETAIL OF INTAKE



DETAIL OF VALVE BOX



SCALE: A

SCALE: B

THE WATER SUPPLY PROJECT
FOR THE REFUGEES

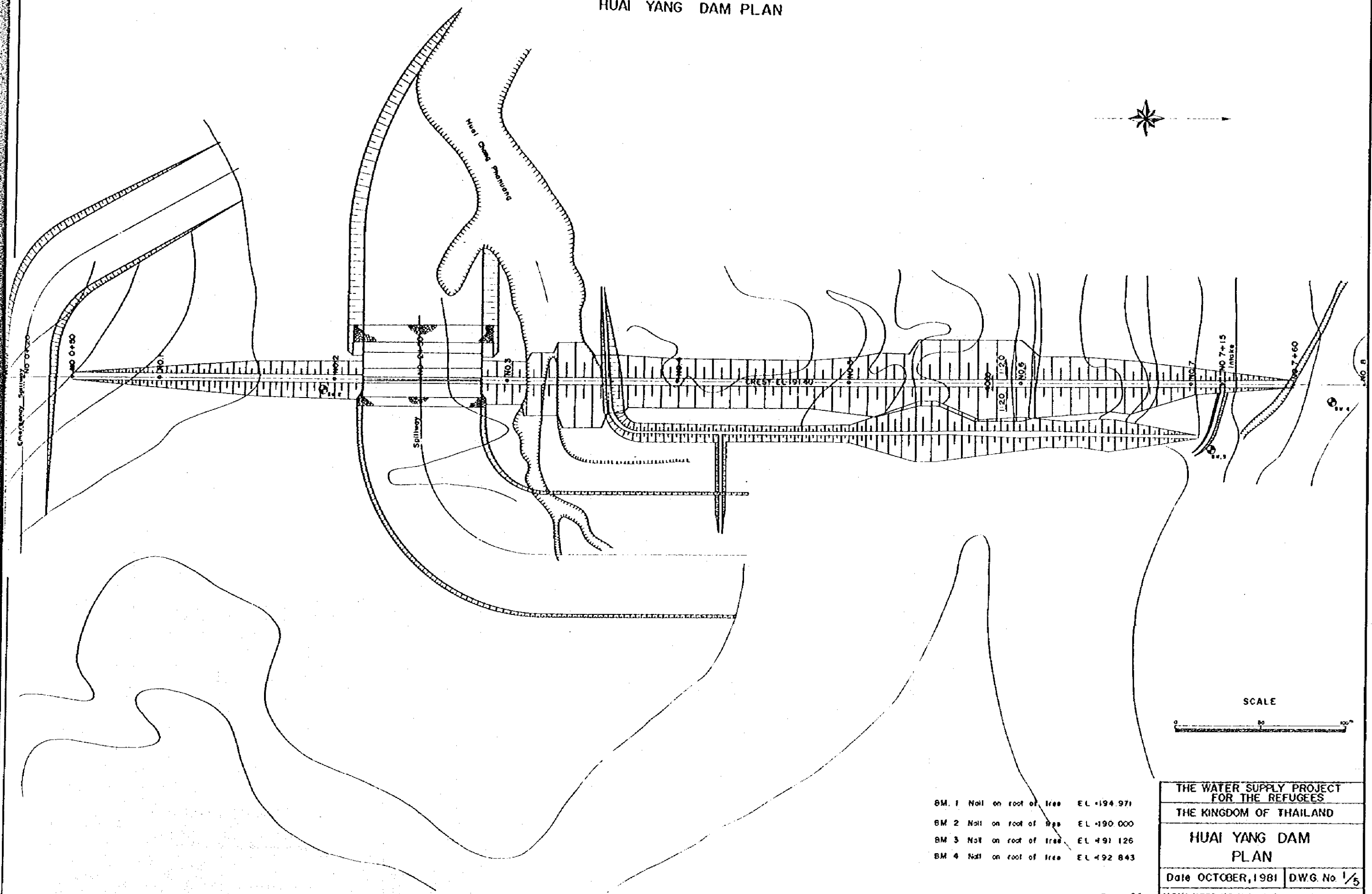
THE KINGDOM OF THAILAND

TAKAO DAM
OUTLET CONDUIT(2/2)

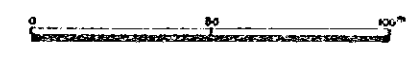
Date OCTOBER 1981 DWG No 10/10

JAPAN INTERNATIONAL COOPERATION AGENCY

HUAI YANG DAM PLAN



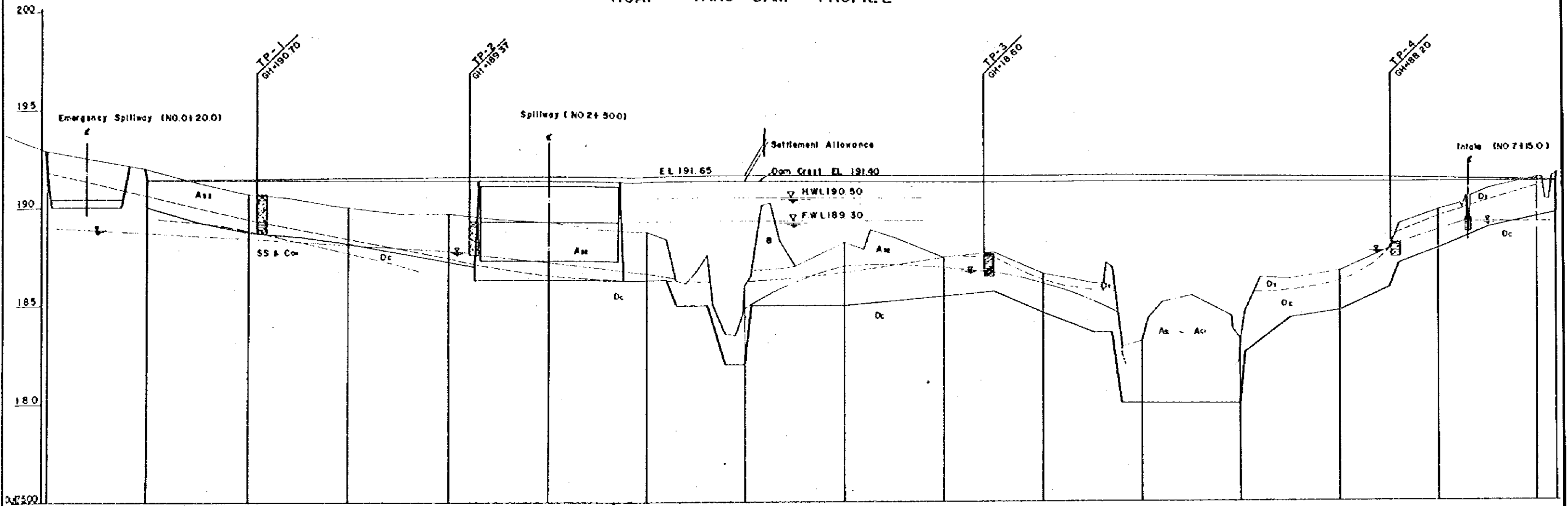
SCALE



- BM. 1 Nail on roof of tree EL. +194.971
- BM. 2 Nail on roof of tree EL. +190.000
- BM. 3 Nail on roof of tree EL. +91.126
- BM. 4 Nail on roof of tree EL. +92.843

THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
HUAI YANG DAM PLAN	
Date OCTOBER, 1981	DWG. No. 1/5
JAPAN INTERNATIONAL COOPERATION AGENCY	

HUAI YANG DAM PROFILE



SETTLEMENT ALLOWANCE	CREST ELEVATION	CUTOFF ELEVATION	GROUND ELEVATION	CUMULATIVE DISTANCE	DISTANCE	STATION NO.
0.00	191.40	190.00	192.40	0.00	0.00	+00
0.05		188.70	191.98	50.00	50.00	NO. 1
0.10		188.50	191.25	100.00	100.00	+50
0.15		187.20	190.70	150.00	150.00	NO. 2
0.20		186.30	189.69	200.00	200.00	+50
0.25		185.00	189.38	250.00	250.00	NO. 3
0.25		185.00	188.77	300.00	300.00	+50
0.25		185.00	188.43	350.00	350.00	NO. 4
0.25		185.43	187.73	400.00	400.00	+50
0.25		185.43	187.73	450.00	450.00	NO. 5
0.25		184.62	186.62	500.00	500.00	+50
0.25		184.12	185.12	550.00	550.00	NO. 6
0.25		184.12	185.12	600.00	600.00	+50
0.25		184.37	184.37	650.00	650.00	NO. 7
0.211		184.76	183.76	700.00	700.00	+50
0.192		187.93	187.93	750.00	750.00	NO. 8
0.133		185.91	185.91	800.00	800.00	+50
0.094		187.18	187.18	850.00	850.00	NO. 9
0.014		189.57	189.57	900.00	900.00	+50
0.00		191.40	191.40	950.00	950.00	NO. 10

SCALE (H) 1 2 3 4 5 6 7 8 9 10

SCALE (V) 1 2 3 4 5 6 7 8 9 10

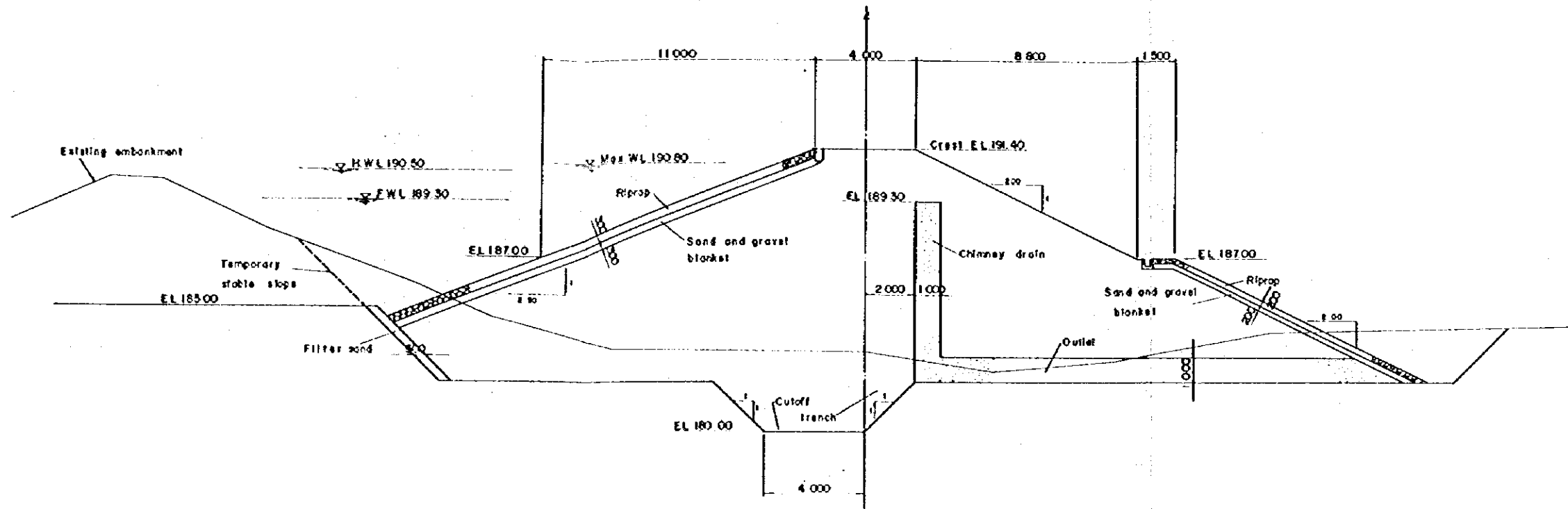
THE WATER SUPPLY PROJECT
FOR THE REFUGEES
THE KINGDOM OF THAILAND

**HUAI YANG DAM
PROFILE**

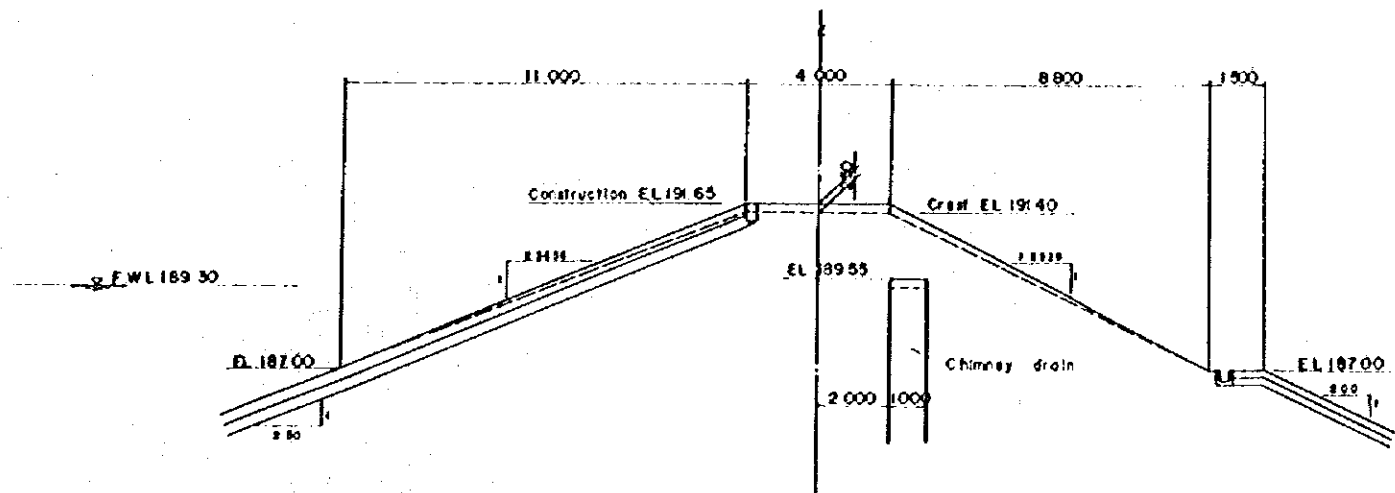
Date OCTOBER 1981 | DWG No 2/6

JAPAN INTERNATIONAL COOPERATION AGENCY

TYPICAL CROSS SECTION

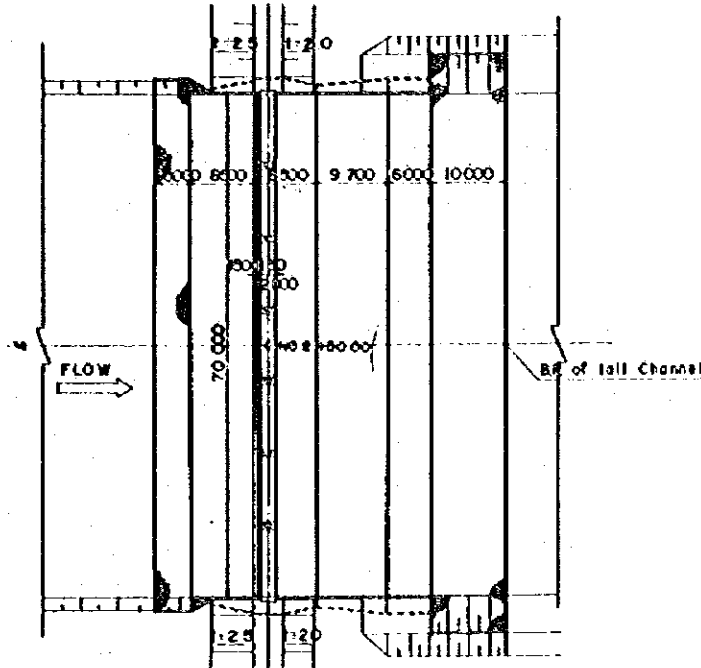


DETAILS OF SETTLEMENT ALLOWANCE

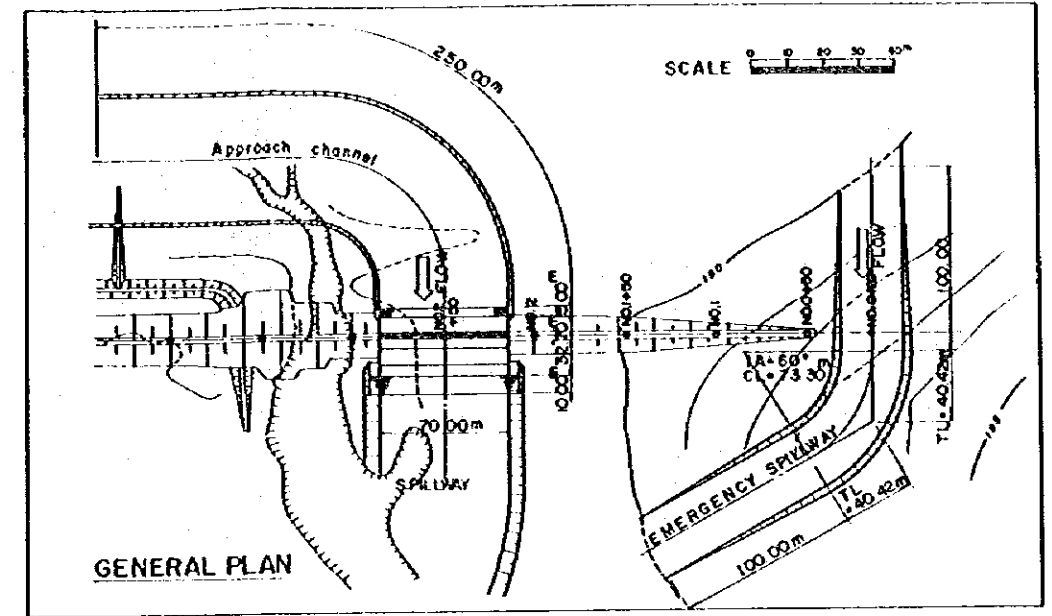
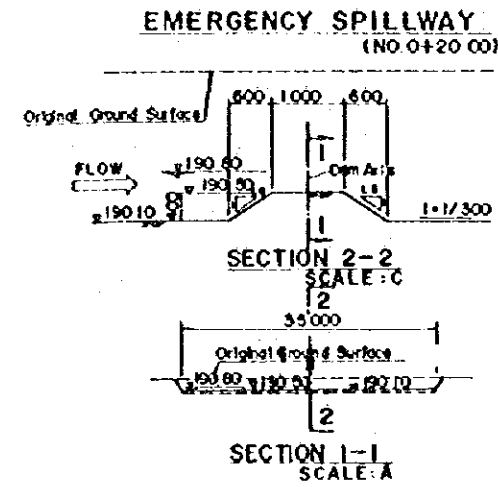


THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
HUAIYANG DAM TYPICAL SECTION	
Date OCTOBER, 1981	DWG. No 3/5
JAPAN INTERNATIONAL COOPERATION AGENCY	

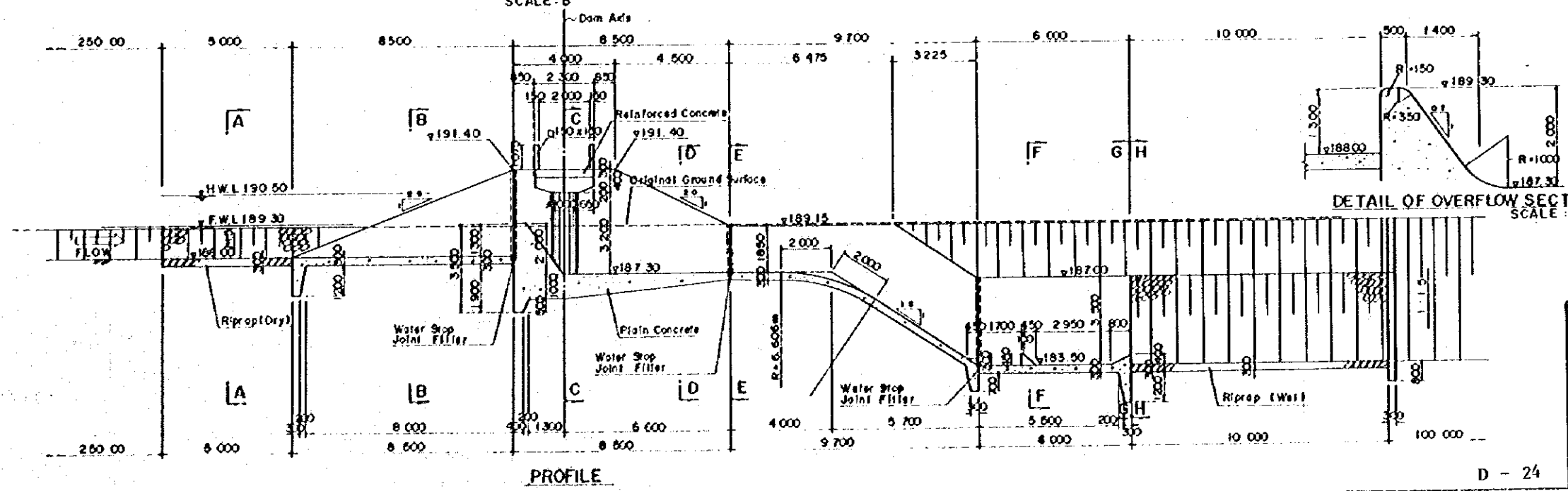
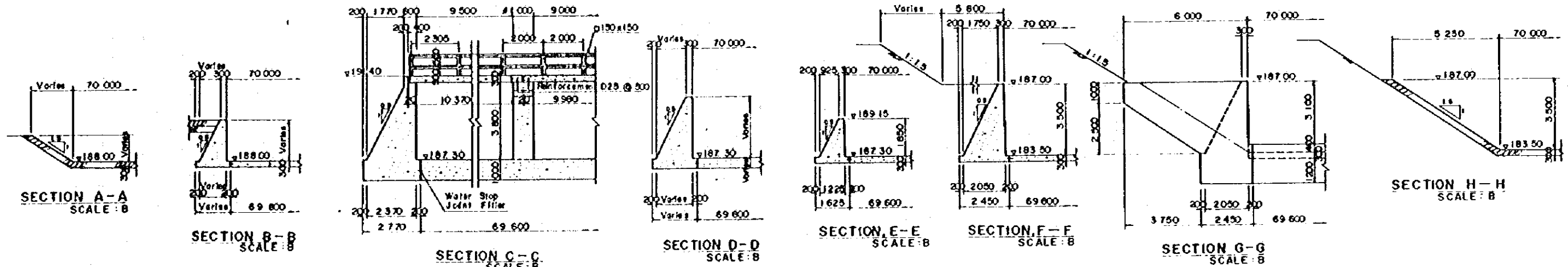
TYPICAL CROSS SECTION OF APPROACH CHANNEL



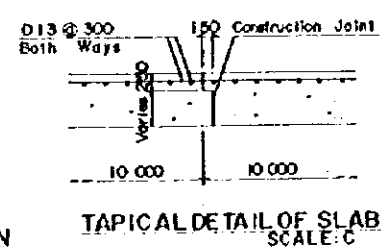
SECTION AT BEGINNING POINT OF TAIL CHANNEL



PLAN SCALE: A

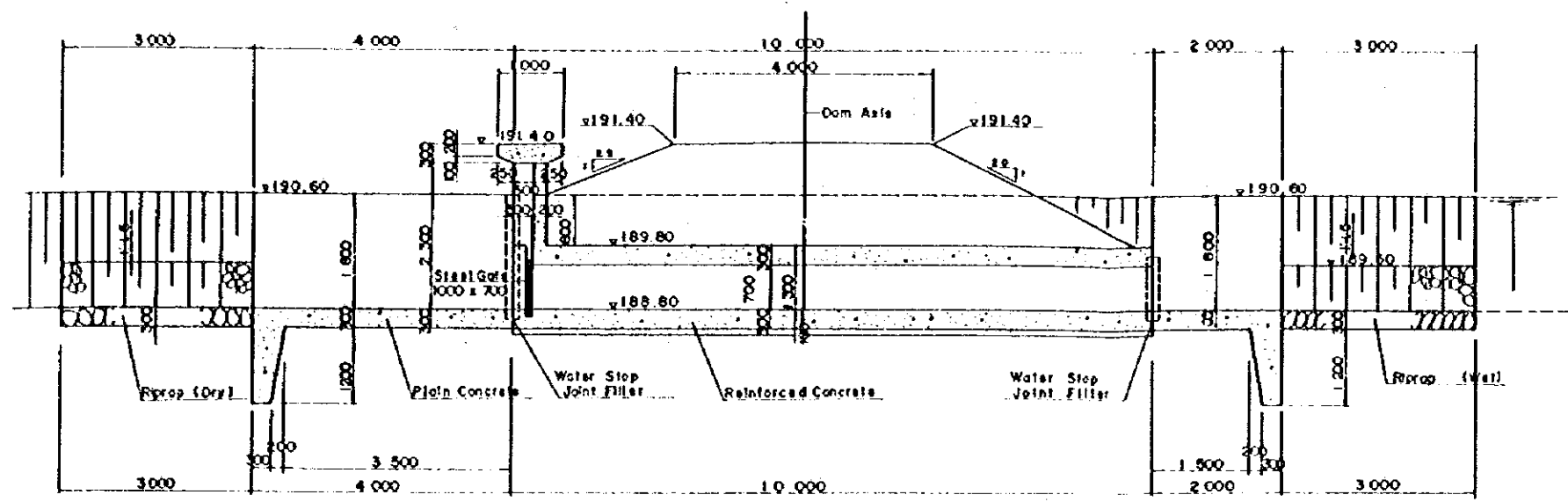


PROFILE

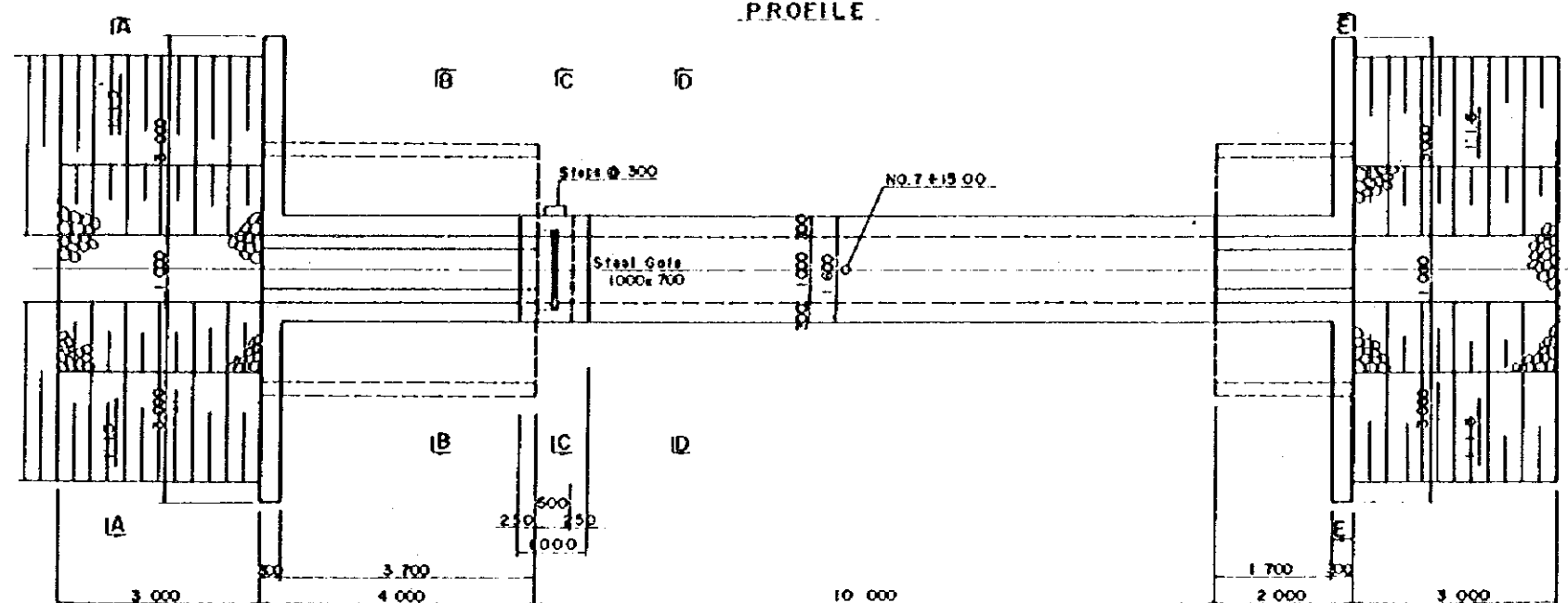


SCALE: A
SCALE: B
SCALE: C

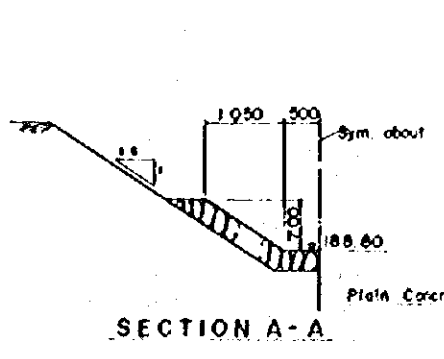
THE WATER SUPPLY PROJECT
FOR THE REFUGEES
THE KINGDOM OF THAILAND
**HUAI YANG DAM
SPILLWAY**
Date OCTOBER 1981 DWG. No. 4/5
JAPAN INTERNATIONAL COOPERATION AGENCY



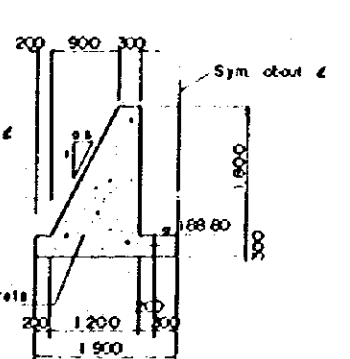
PROFILLE



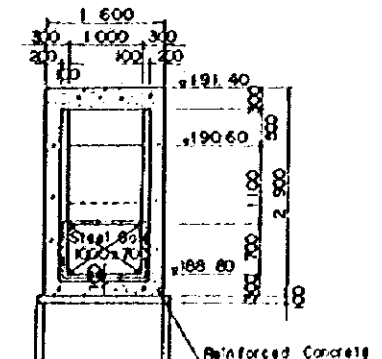
PLAN



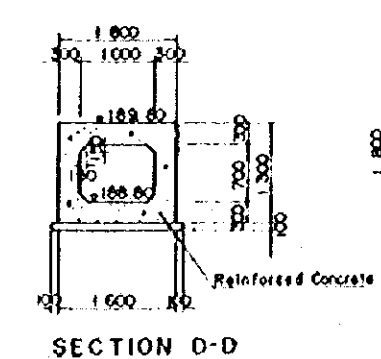
SECTION A-A



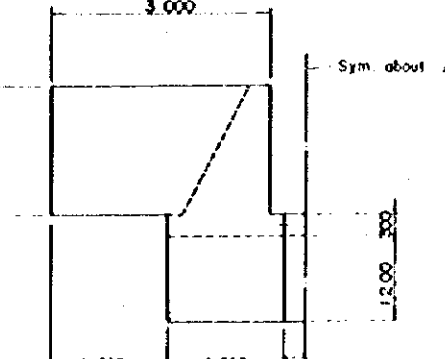
SECTION B-B



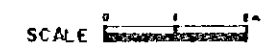
SECTION C-C



SECTION D-D



SECTION E-E



THE WATER SUPPLY PROJECT FOR THE REFUGEES	
THE KINGDOM OF THAILAND	
HUI YANG DAM INTAKE	
Date OCTOBER, 1981	DWG No 5/6
JAPAN INTERNATIONAL COOPERATION AGENCY	

JICA