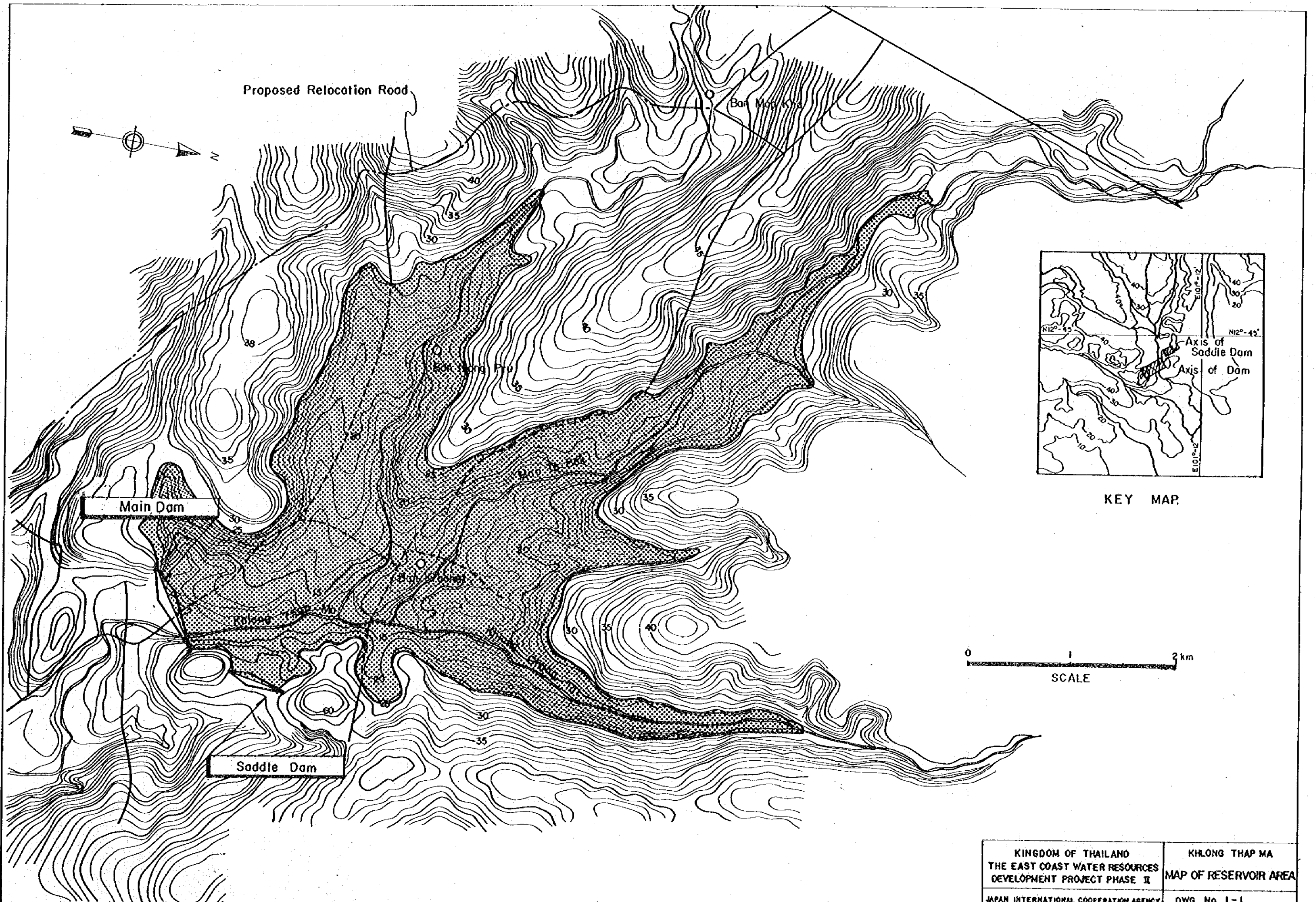
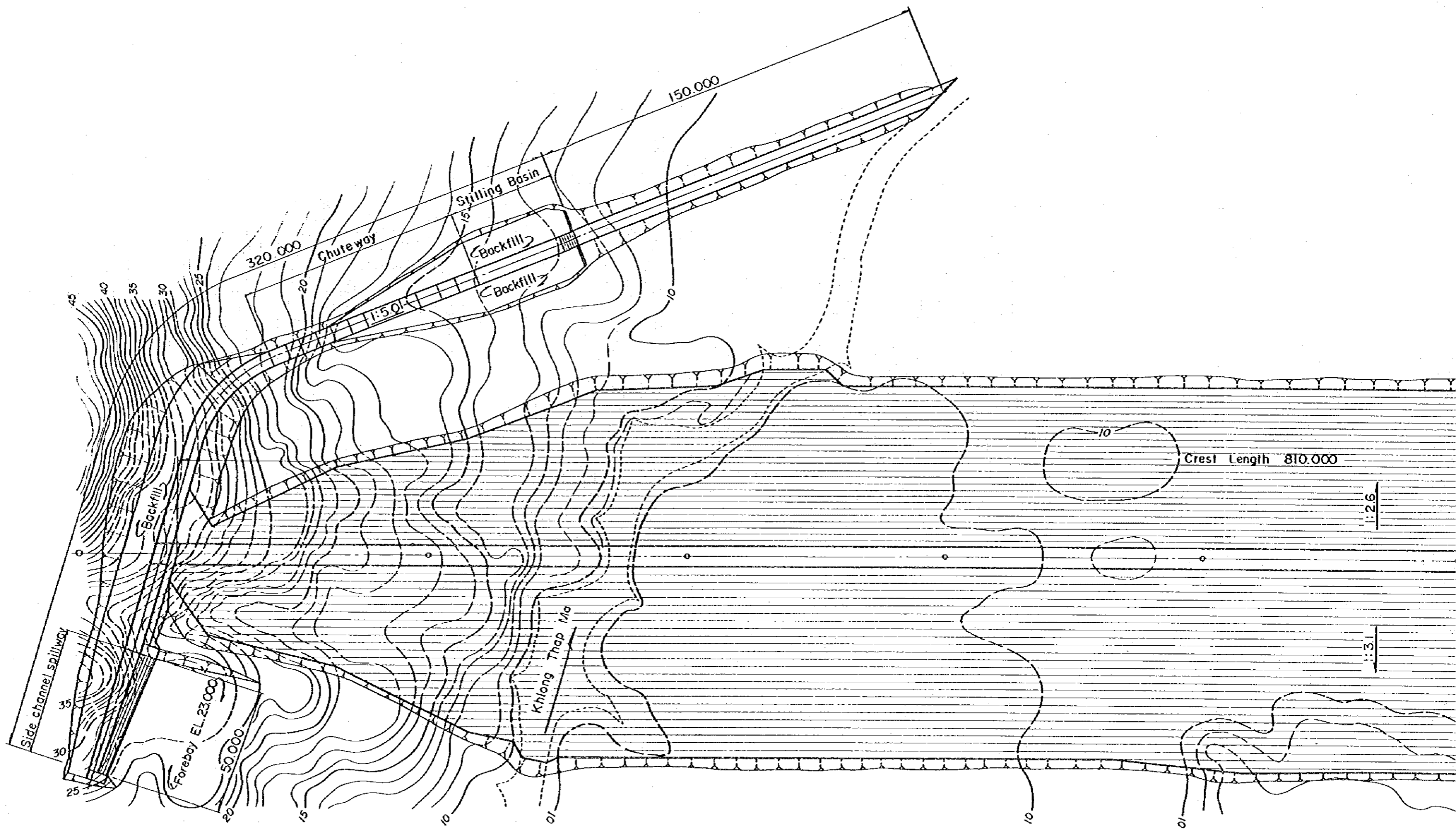
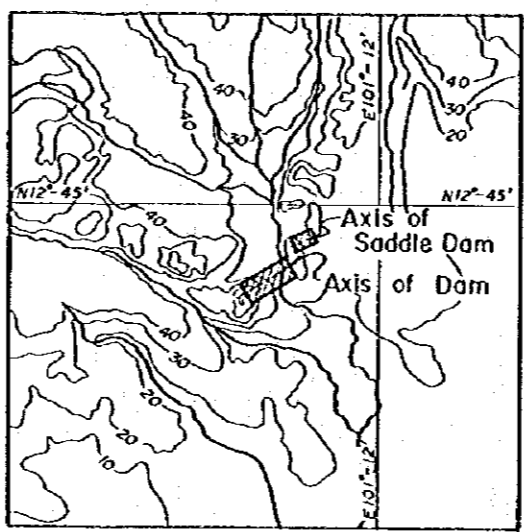
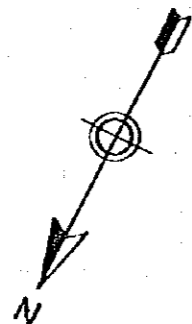


DRAWINGS

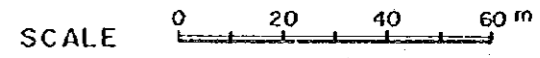
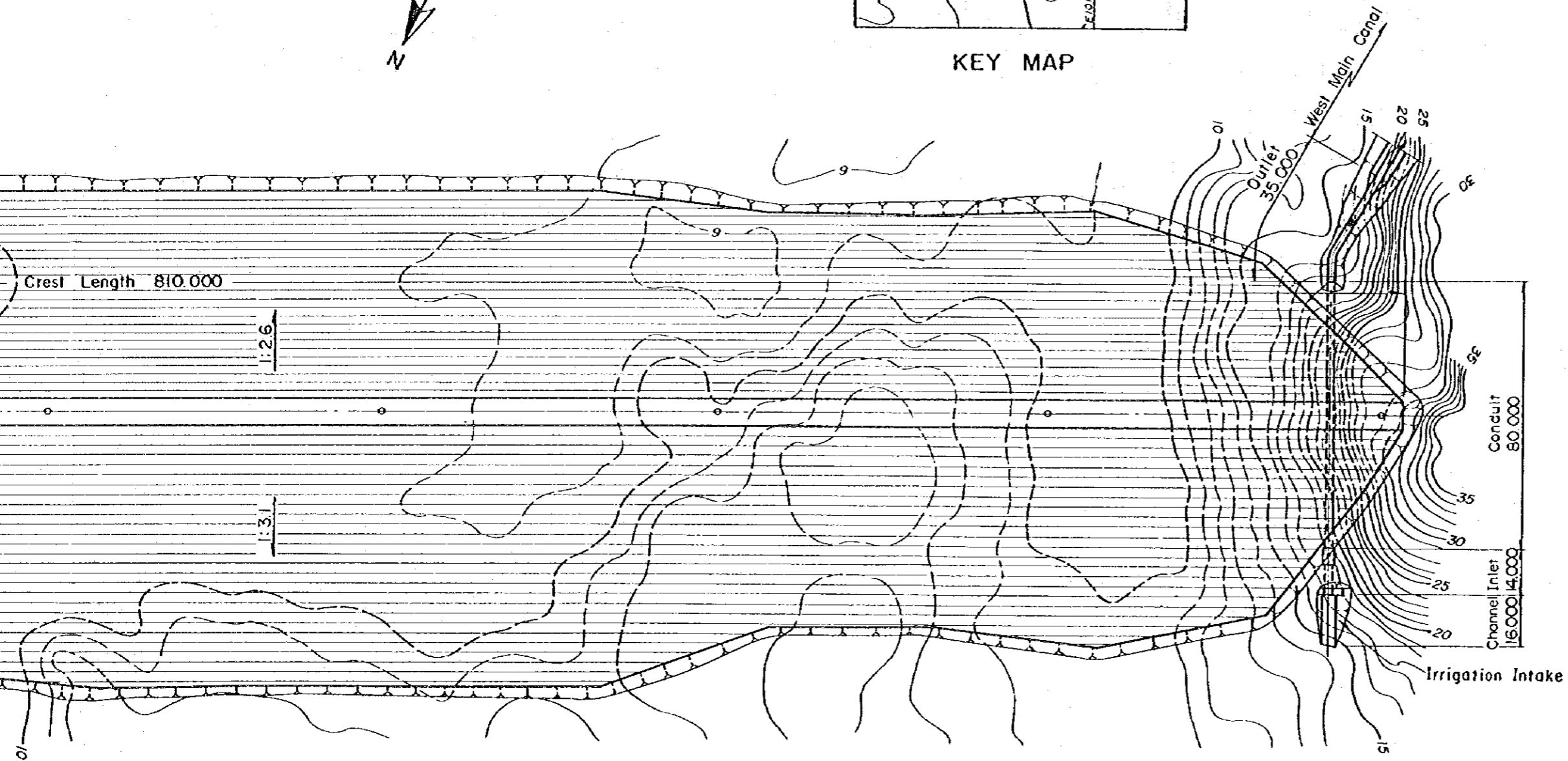




PLAN

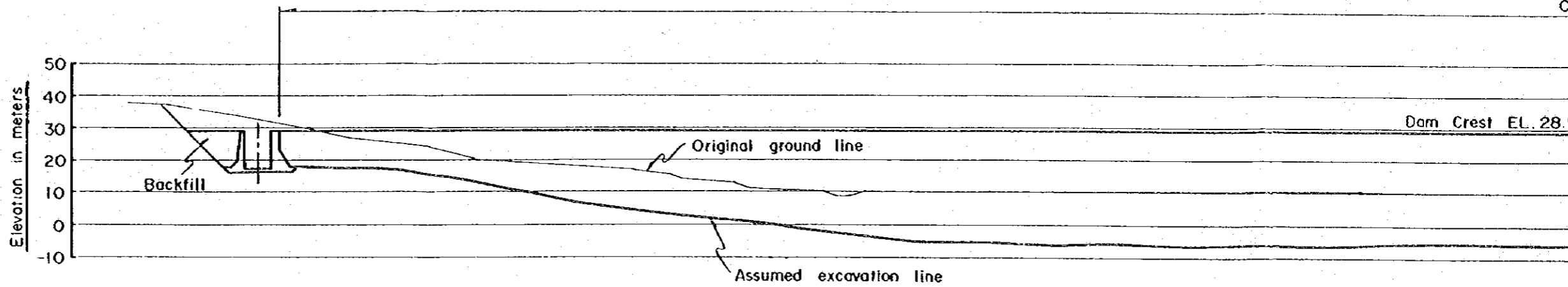


KEY MAP

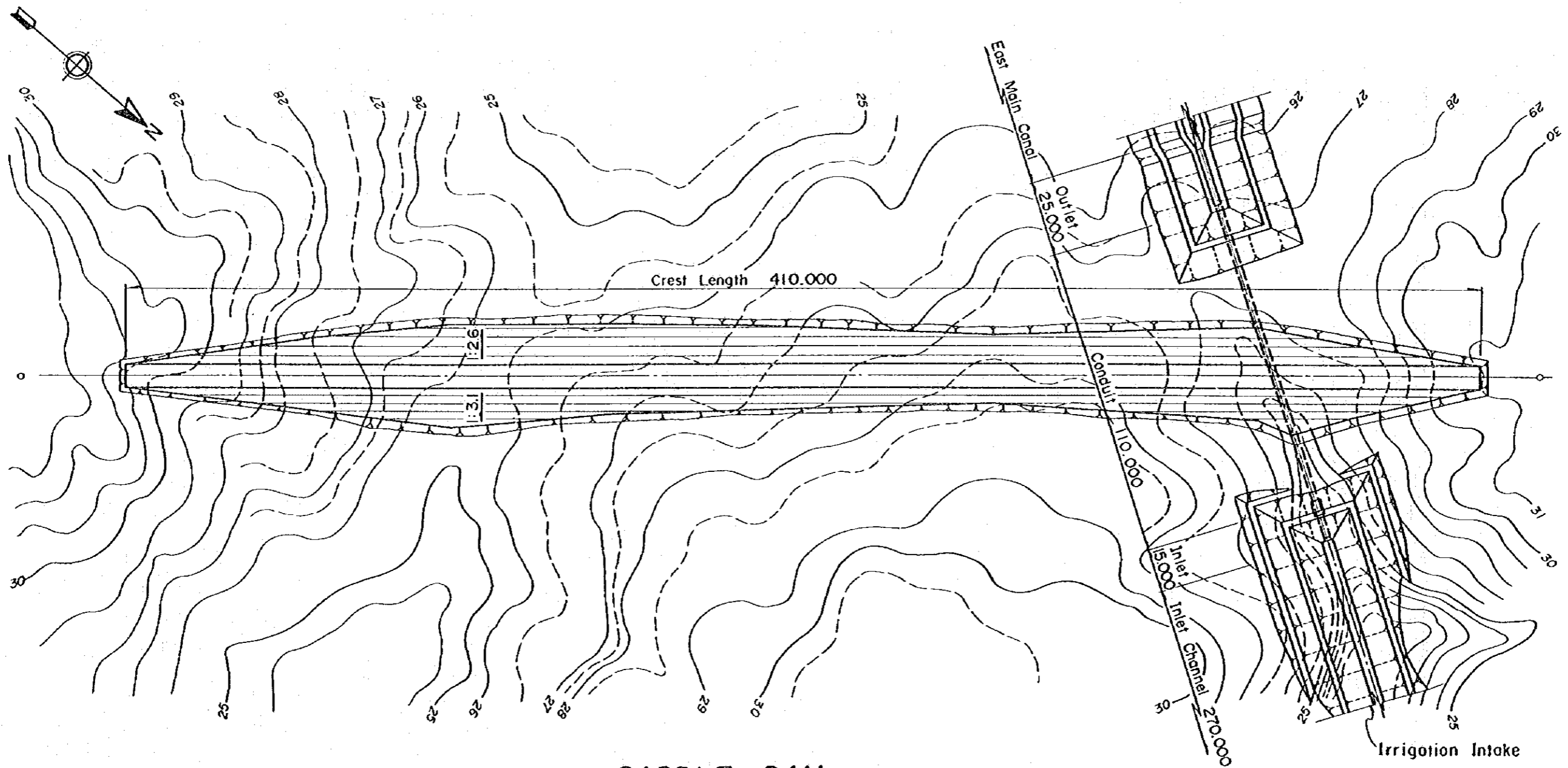


PLAN

KINGDOM OF THAILAND THE EAST COAST WATER RESOURCES DEVELOPMENT PROJECT PHASE II	KHLONG THAP MA DAM PLAN, PROFILE AND TYPICAL CROSS SECTION
JAPAN INTERNATIONAL COOPERATION AGENCY	DWG NO. 1 - 2



PROFILE OF



SADDLE DAM (SCALE A)

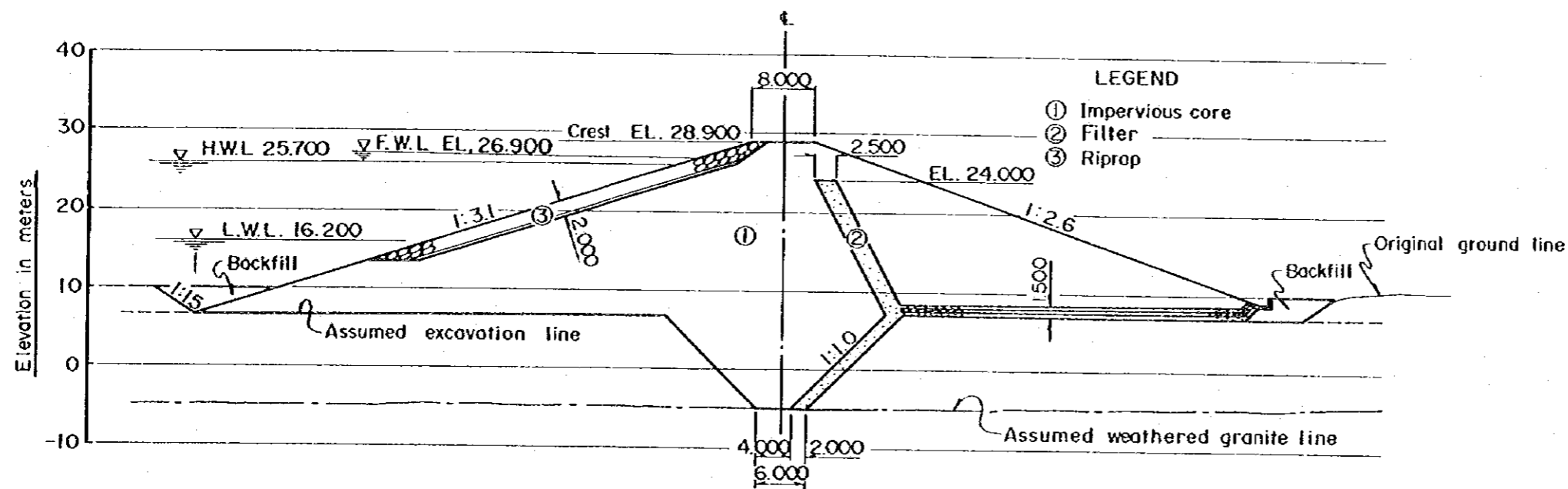
Crest Length 810.000

Dam Crest EL. 28.900

H.W.L. 25.700

L.W.L. 16.200

PROFILE OF MAIN DAM (SCALE A)



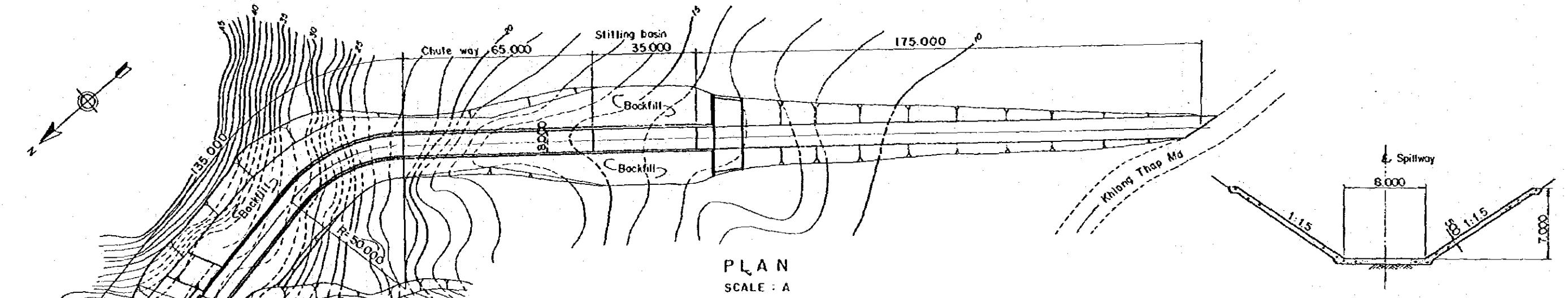
- LEGEND
- ① Impervious core
 - ② Filter
 - ③ Riprap

SCALE A 0 20 40 60 m

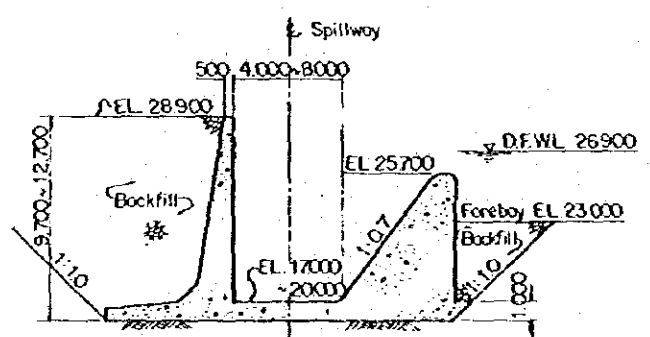
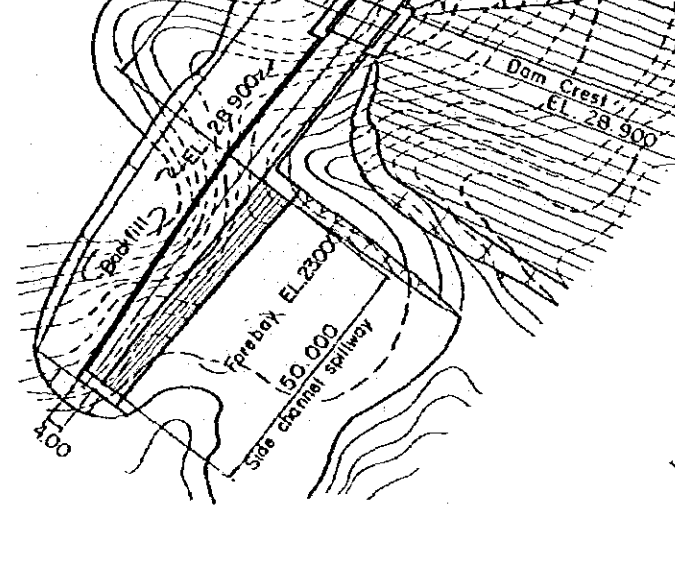
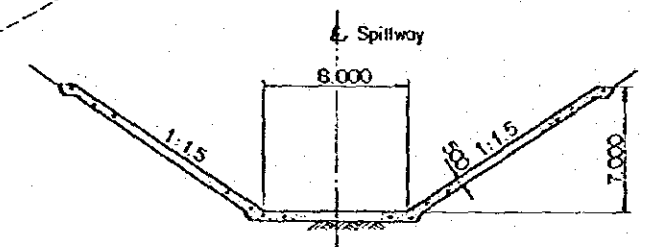
SCALE B 0 10 20 30 m

TYPICAL CROSS SECTION (SCALE B)

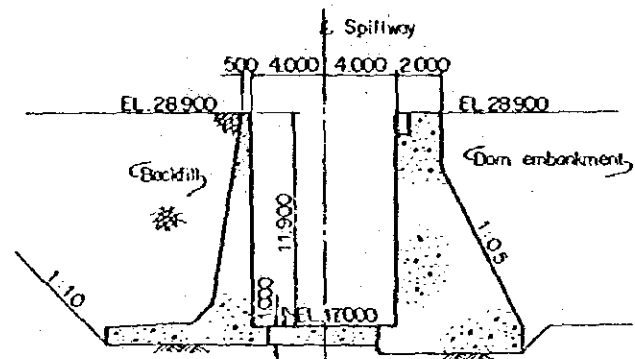
<p>KINGDOM OF THAILAND THE EAST COAST WATER RESOURCES DEVELOPMENT PROJECT PHASE II</p>	<p>KHLONG THAP MA DAM PLAN, PROFILE AND TYPICAL CROSS SECTION</p>
<p>JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>DWG NO. 1 - 3</p>



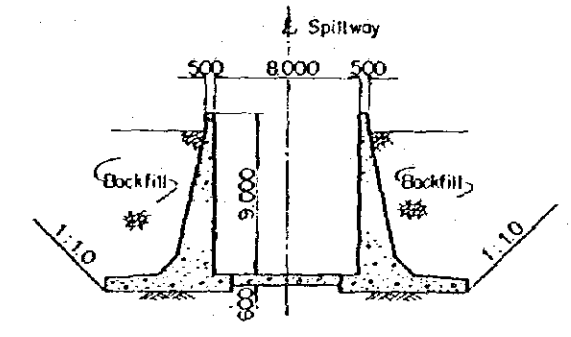
SECTION E-E
SCALE : B



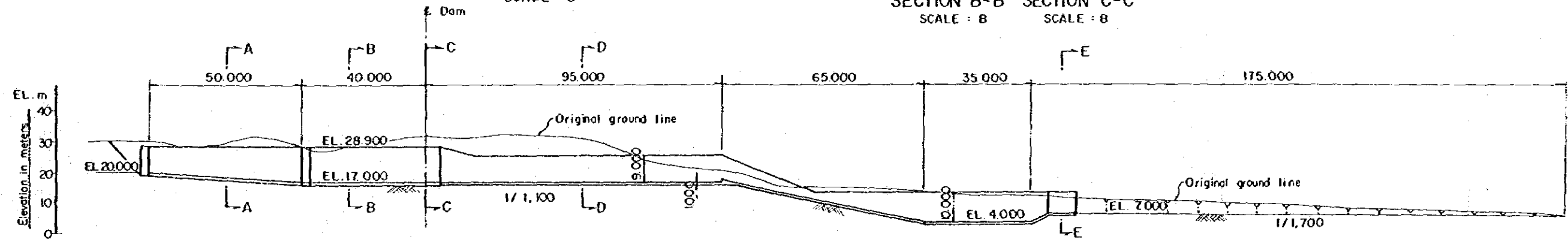
SECTION A-A
SCALE : B



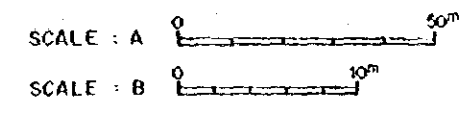
SECTION B-B SECTION C-C
SCALE : B



SECTION D-D
SCALE : B



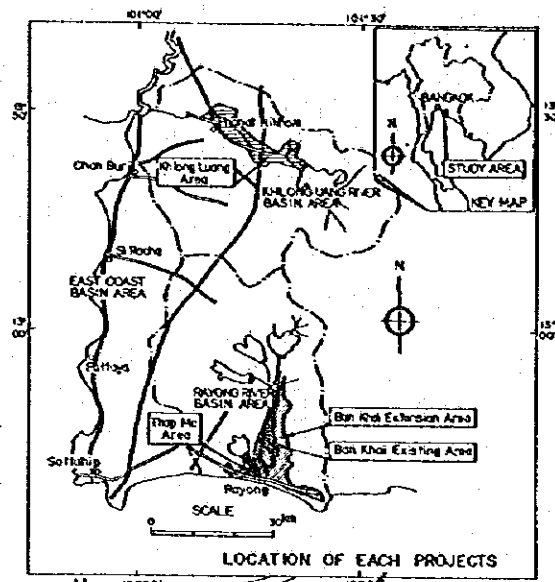
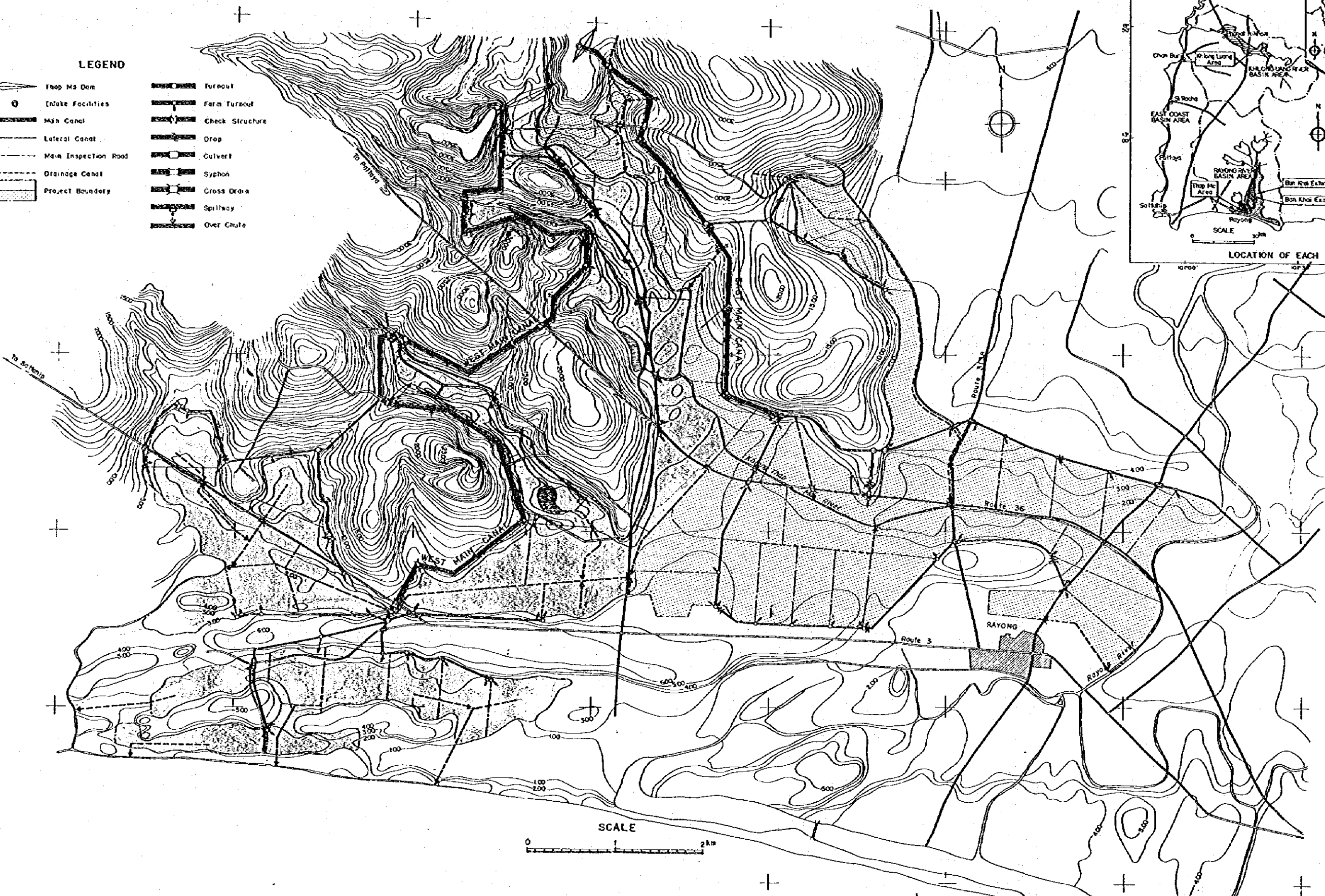
PROFILE
SCALE : A



KINGDOM OF THAILAND THE EAST COAST WATER RESOURCES DEVELOPMENT PROJECT PHASE II	KHLONG THAP MA SPILLWAY PLAN AND PROFILE
JAPAN INTERNATIONAL COOPERATION AGENCY	DWG NO. 1 - 4

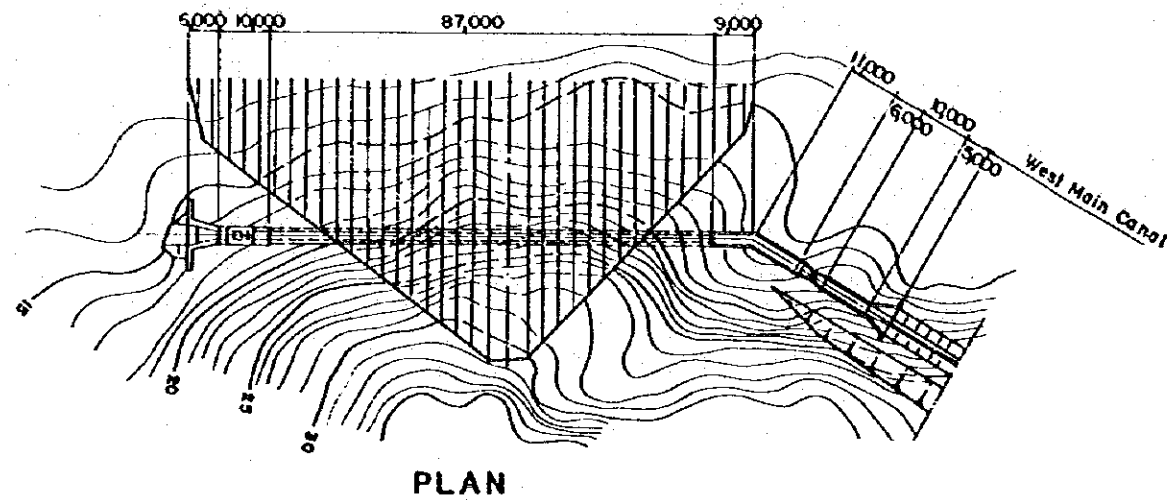
LEGEND

- | | | | |
|--|----------------------|--|-----------------|
| | Thap Ma Dam | | Turnout |
| | Intake Facilities | | Farm Turnout |
| | Main Canal | | Check Structure |
| | Lateral Canal | | Drop |
| | Main Inspection Road | | Culvert |
| | Drainage Canal | | Syphon |
| | Project Boundary | | Cross Drain |
| | | | Sprilway |
| | | | Over Chute |

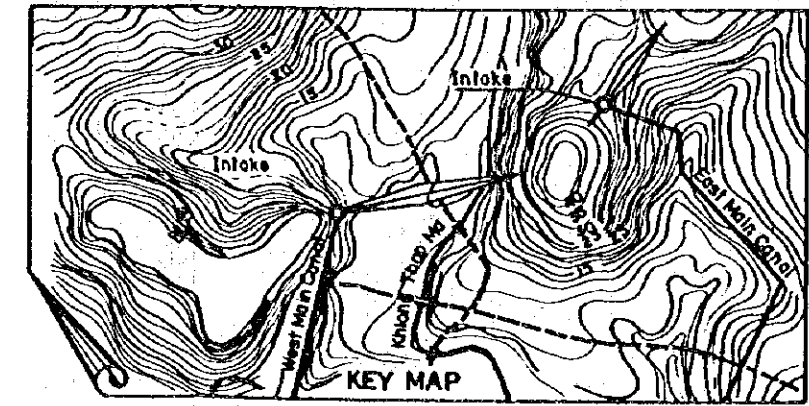


KINGDOM OF THAILAND THE EAST COAST WATER RESOURCES DEVELOPMENT PROJECT PHASE II	KHLONG THAP MA LAYOUT MAP OF IRRIGATION SCHEME
JAPAN INTERNATIONAL COOPERATION AGENCY	DWG NO. 2 - 1

Intake Facilities for West Main Canal

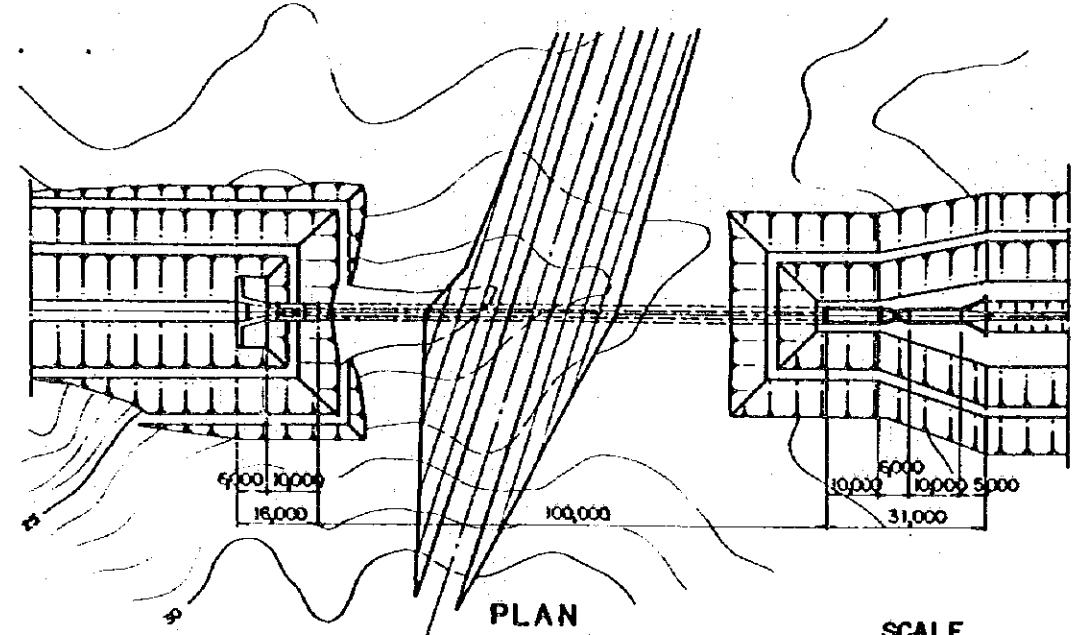


PLAN

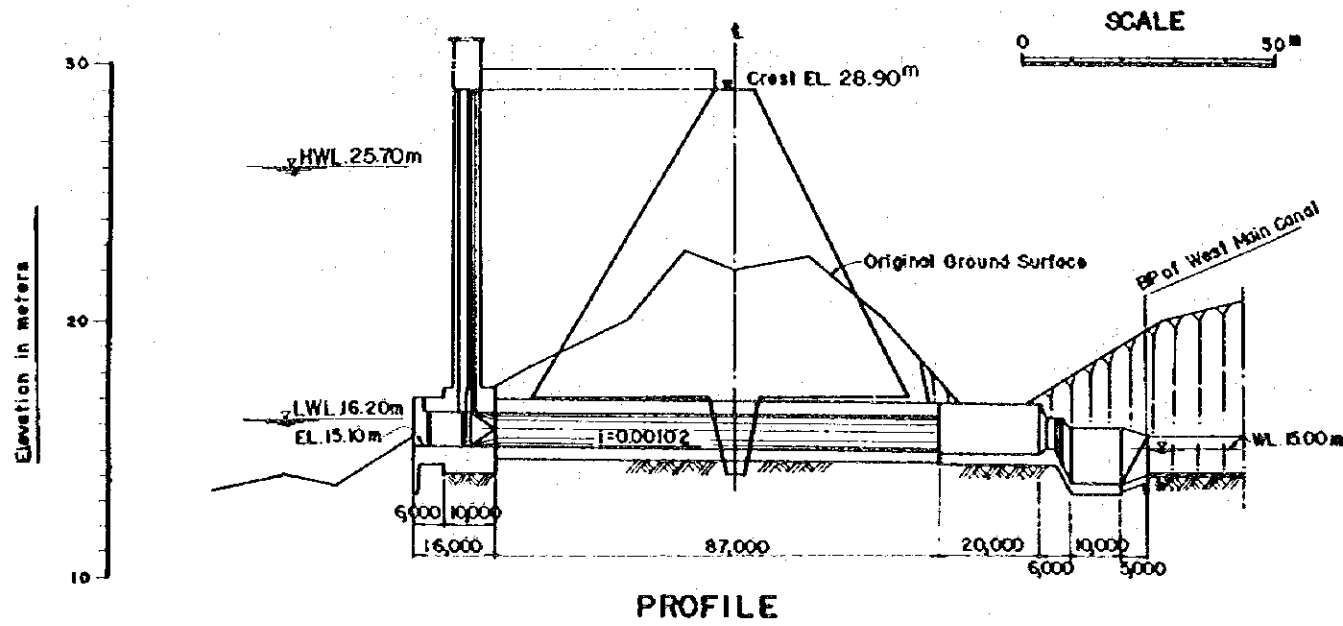


KEY MAP

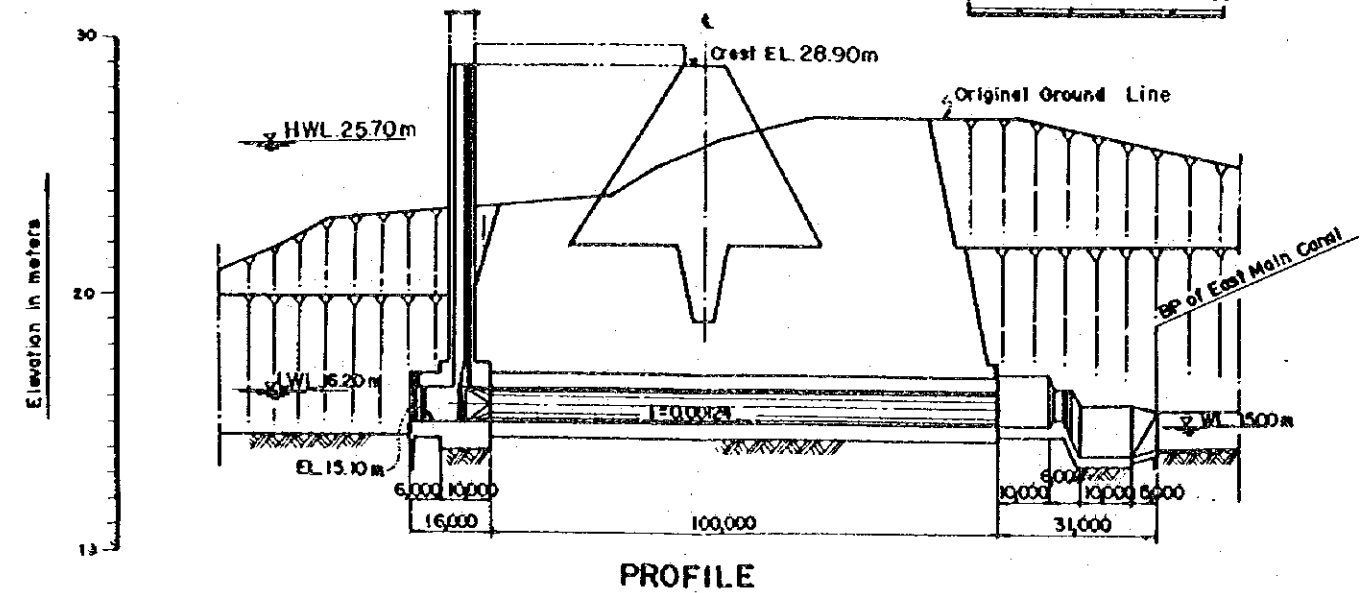
Intake Facilities for East Main Canal



PLAN



PROFILE



PROFILE

FEATURES OF INTAKE FACILITIES

1. West Main Canal

- 1) Intake Tower ————— 2.0 x 1.3 x 13.9 m
- Pressure Gate ————— 1.3 x 1.3 m
- Bed EL. ————— EL. 15.1 m
- Design Intake Discharge — 1.63 m³/sec

2) Conduit

- Type ————— Open Channel Type
- Length ————— 87.0 m
- Diameter ————— φ 1.3 m
- Gradient ————— i = 0.00102

3) Outlet

- Length ————— 41.0 m
- Parshall Flume ————— W = 4 ft Type
- Head WL of Main Canal — WL. 15.0 m

2. East Main Canal

- 1) Inlet
- Inlet Channel ————— 270 m
- Intake Tower ————— 2.0 x 1.3 x 13.9 m
- Pressure Gate ————— 1.3 x 1.3 m
- Bed EL. ————— EL. 15.1 m
- Design Intake Discharge — 1.80 m³/sec

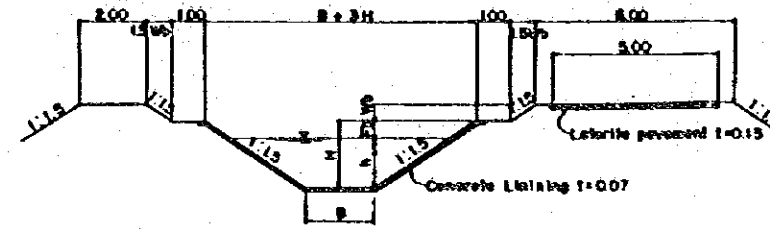
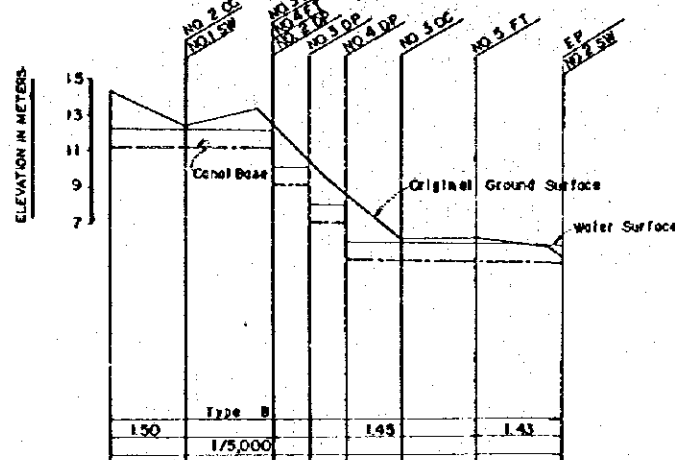
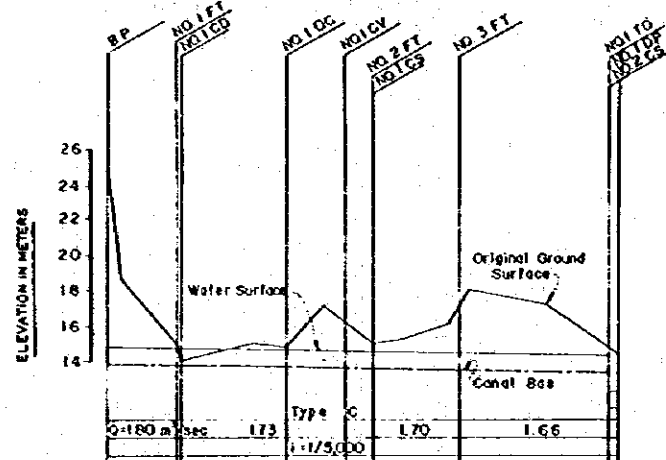
2) Conduit

- Type ————— Open Channel Type
- Length ————— 100 m
- Diameter ————— φ 1.3 m
- Gradient ————— i = 0.00124

3) Outlet

- Length ————— 31.0 m
- Parshall Flume ————— W = 4 ft Type
- Head WL of Main Canal — WL. 15.0 m

East Main Canal



MAIN CANAL & MAIN INSPECTION ROAD

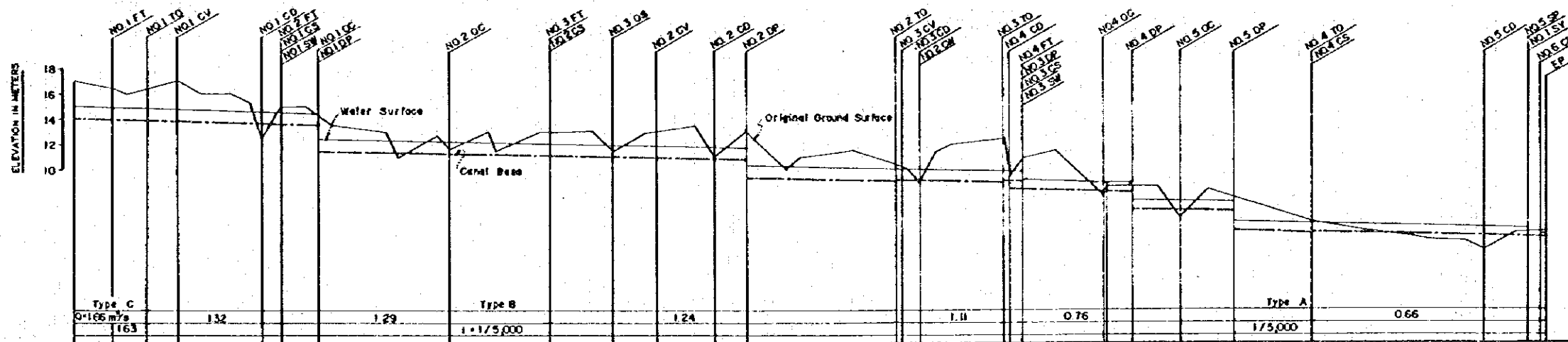
(Unit : m)

Canal Type	B	H	W ₀
A	1.0	1.0	0.2
B	1.0	1.2	0.2
C	1.5	1.5	0.3
D	1.5	1.8	0.3
E	2.0	1.8	0.3
F	2.0	2.0	0.5
G	2.5	2.5	0.5

CANAL BASE ELEVATION	WATER SURFACE ELEVATION	GROUND SURFACE ELEVATION	REDUCED DISTANCE	DISTANCE	STATION	HORIZONTAL CURVE
14.1	15.0	18.5	0	0	BP	
14.0	14.9	15.1	370	370	IP.1	
14.0	14.9	14.0	400	770	NO.1	
15.0	15.0	15.0	600	1370	NO.2	
14.8	14.8	14.8	880	2250	IP.3	
17.0	17.0	16.2	1200	3450	NO.3	
13.7	14.6	13.0	1460	4910	IP.4	
13.6	14.5	13.2	1800	6710	NO.4	
13.6	14.5	13.0	2000	8710	IP.5	
13.6	14.5	13.0	2400	11110	NO.5	
13.4	14.3	17.2	2750	13860	IP.6	
13.4	14.3	17.2	2800	14660	NO.6	
13.4	14.3	17.2	3200	17860	IP.7	
13.4	14.3	17.2	3270	21130	NO.7	

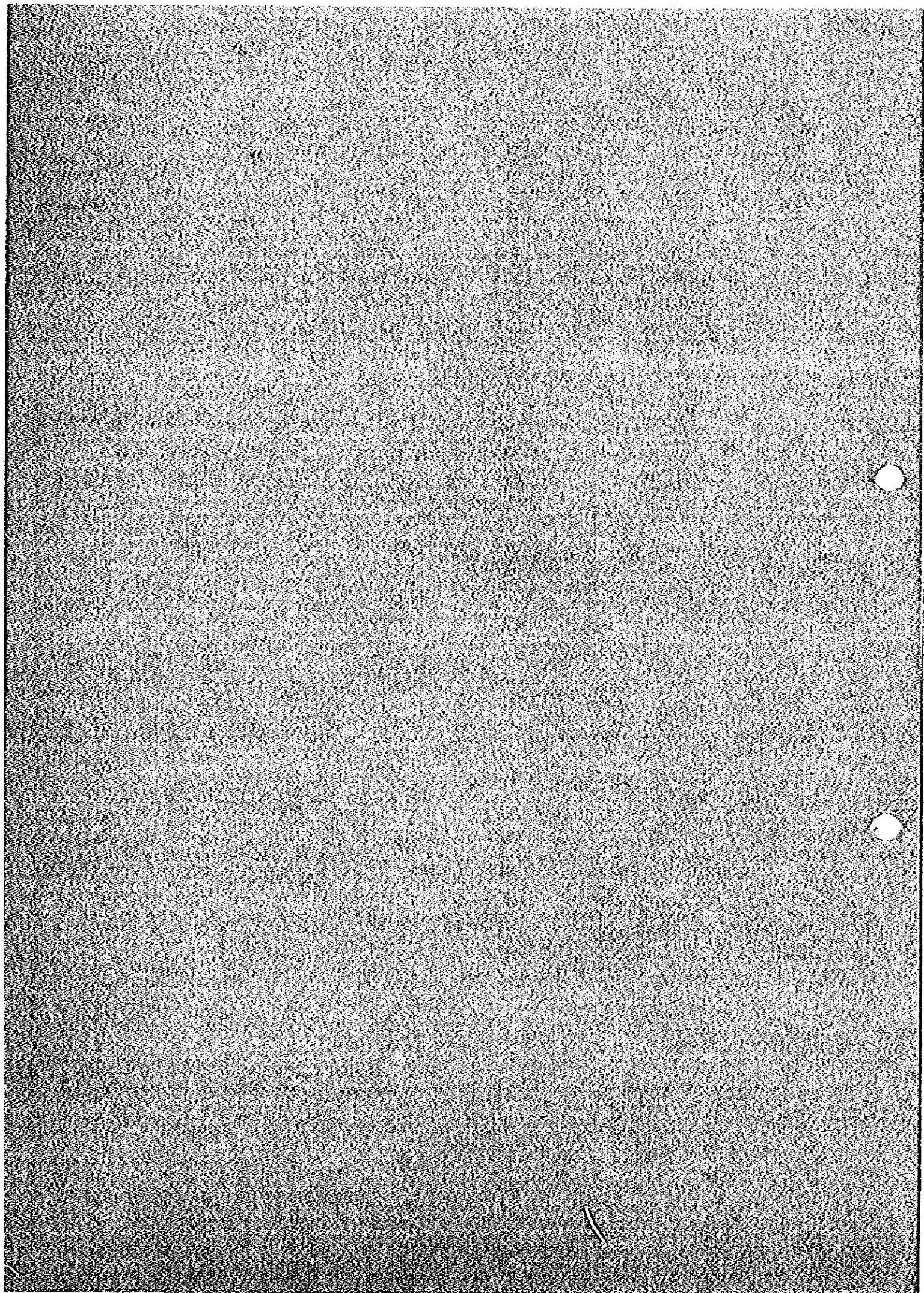
CANAL BASE ELEVATION	WATER SURFACE ELEVATION	GROUND SURFACE ELEVATION	REDUCED DISTANCE	DISTANCE	STATION	HORIZONTAL CURVE
11.3	12.3	14.4	0	0	NO.7	
12.4	12.4	12.4	3200	3200	IP.8	
11.1	12.1	13.3	3400	6600	NO.8	
9.1	10.1	12.4	3700	10300	IP.9	
9.0	10.0	10.4	3900	14200	NO.9	
8.0	9.0	9.3	4200	18400	IP.10	
6.9	7.9	8.5	4500	22900	NO.10	
4.8	5.8	6.0	4800	27700	IP.11	
4.7	5.7	6.0	5100	32800	NO.11	
4.6	5.6	5.9	5400	38200	IP.12	
4.6	5.6	5.9	5700	43900	NO.12	
4.6	5.6	5.9	6000	49900	IP.13	
4.6	5.6	5.9	6270	56170	NO.13	

West Main Canal



CANAL BASE ELEVATION	WATER SURFACE ELEVATION	GROUND SURFACE ELEVATION	REDUCED DISTANCE	DISTANCE	STATION	HORIZONTAL CURVE
14.1	15.0	12.0	0	0	BP	
14.0	14.9	16.5	300	300	NO.1	
13.9	14.8	16.0	400	700	NO.2	
13.9	14.8	16.4	500	1200	NO.3	
16.0	16.0	17.0	800	2000	IP.1	
16.0	16.0	16.0	950	2950	NO.4	
16.0	16.0	16.0	1200	4150	NO.5	
15.2	15.2	15.2	1300	5450	IP.2	
12.5	12.5	12.5	1400	6850	NO.6	
13.6	13.6	13.0	1600	8450	NO.7	
13.6	13.6	13.0	1800	10250	IP.3	
11.3	12.4	11.8	2000	12250	NO.8	
11.1	12.0	13.0	2400	14650	IP.4	
11.1	12.0	13.0	2800	17450	NO.9	
11.1	12.0	13.0	3200	20650	IP.5	
11.8	12.8	11.8	3300	23950	NO.10	
11.5	12.5	11.5	4150	28100	IP.6	
11.5	12.5	11.5	4500	32600	NO.11	
11.0	12.0	11.0	4900	37500	IP.7	
11.0	12.0	11.0	5300	42800	NO.12	
11.0	12.0	11.0	5800	48600	IP.8	
11.5	12.5	11.5	6000	54600	NO.13	
11.5	12.5	11.5	6350	60950	IP.9	
11.0	12.0	11.0	6700	67650	NO.14	
11.0	12.0	11.0	7100	74750	IP.10	
11.5	12.5	11.5	7400	82150	NO.15	
11.5	12.5	11.5	7800	89950	IP.11	
11.0	12.0	11.0	8200	98150	NO.16	
11.0	12.0	11.0	8600	106750	IP.12	
11.0	12.0	11.0	9000	115750	NO.17	
11.0	12.0	11.0	9400	125150	IP.13	
11.0	12.0	11.0	9800	134950	NO.18	
11.0	12.0	11.0	10200	145150	IP.14	
11.0	12.0	11.0	10600	155750	NO.19	
11.0	12.0	11.0	11000	166750	IP.15	
11.0	12.0	11.0	11400	178150	NO.20	
11.0	12.0	11.0	11800	190000	IP.16	
11.0	12.0	11.0	12200	202300	NO.21	
11.0	12.0	11.0	12600	215100	IP.17	
11.0	12.0	11.0	13000	228400	NO.22	
11.0	12.0	11.0	13400	242200	IP.18	
11.0	12.0	11.0	13800	256500	NO.23	
11.0	12.0	11.0	14200	271300	IP.19	
11.0	12.0	11.0	14600	286600	NO.24	
11.0	12.0	11.0	15000	302400	IP.20	
11.0	12.0	11.0	15400	318700	NO.25	
11.0	12.0	11.0	15800	335500	IP.21	
11.0	12.0	11.0	16200	352900	NO.26	
11.0	12.0	11.0	16600	370800	IP.22	
11.0	12.0	11.0	17000	389300	NO.27	
11.0	12.0	11.0	17400	408400	IP.23	
11.0	12.0	11.0	17800	428100	NO.28	
11.0	12.0	11.0	18200	448400	IP.24	
11.0	12.0	11.0	18600	469300	NO.29	
11.0	12.0	11.0	19000	490800	IP.25	
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11.0	12.0	11.0	20600	582800	IP.27	
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11.0	12.0	11.0	24200	824900	NO.36	
11.0	12.0	11.0	24600	854800	IP.32	
11.0	12.0	11.0	25000	885300	NO.37	
11.0	12.0	11.0	25400	916400	IP.33	
11.0	12.0	11.0	25800	948100	NO.38	
11.0	12.0	11.0	26200	980400	IP.34	
11.0	12.0	11.0	26600	1013300	NO.39	
11.0	12.0	11.0	27000	1046800	IP.35	
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11.0	12.0	11.0	28600	1186800	IP.37	
11.0	12.0	11.0	29000	1223300	NO.42	
11.0	12.0	11.0	29400	1260400	IP.38	
11.0	12.0	11.0	29800	1298100	NO.43	
11.0	12.0	11.0	30200	1336400	IP.39	
11.0	12.0	11.0	30600	1375300	NO.44	
11.0	12.0	11.0	31000	1414800	IP.40	
11.0	12.0	11.0	31400	1454900	NO.45	
11.0	12.0	11.0	31800	1495600	IP.41	
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11.0	12.0	11.0	38600	2279300	NO.50	
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11.0	12.0	11.0	39400	2382900	NO.55	
11.0	12.0	11.0	39800	2435600	IP.51	
11.0	12.0	11.0	40200	2488900	NO.50	
11.0	12.0	11.0	40600	2542800	IP.52	
11.0	12.0	11.0	41000	2597300	NO.55	
11.0	12.0	11.0	41400	2652400	IP.53	
11.0	12.0	11.0	41800	2708100	NO.50	
11.0	12.0	11.0	42200	2764400	IP.54	
11.0	12.0	11.0	42600	2821300	NO.55	
11.0	12.0	11.0	43000	2878800	IP.55	
11.0	12.0	11.0	43400	2936900	NO.50	
11.0	12.0	11.0	43800	2995600	IP.56	
11.0	12.0	11.0	44200	3054900	NO.55	
11.0	12.0	11.0	44600	3114800	IP.57	
11.0	12.0	11.0	45000	3175300	NO.50	
11.0	12.0	11.0	45400	3236400	IP.58	
11.0						

APPENDIX



APPENDIX I

KHLONG THAP MA DAM AND IRRIGATION SCHEME

DRAFT TERMS OF REFERENCE FOR ENGINEERING SERVICES

1. BACKGROUND AND OBJECTIVE

1.1 The Government of Kingdom of Thailand (the Government) is intending to implement the Khlong Thap Ma Dam and Irrigation Scheme (the Scheme), which is located in Rayong Province. The Scheme aims at constructing a multiple-purpose dam on the Khlong Thap Ma river and developing irrigation and drainage system for 2,400 ha (net) of lands. The Scheme includes the following components:

Multiple-purpose Dam

- (i) A main dam, an earth-fill type, 20.4 m high above the river bed, 810 m long and spillway.
- (ii) A saddle dam, an earth-fill type, 3.3 m high above the original ground surface, 420 m long.

Irrigation and Drainage System

- (i) Two intake structures.
- (ii) Two main canal systems, approximately 16.6 km in total length, including various appurtenant structures.
- (iii) Lateral canal systems, approximately 38 km in total length, including various canal structures.
- (iv) Approximately 39 km long drainage channel, including an improvement of existing small streams.
- (v) On-farm development over 2,400 ha of lands.

1.2 The Government will engage the Consultants for a period of approximately ____ months to prepare the detailed design, drawings and tender documents for the construction and implementation of the Scheme, including detailed surveys, field investigations and laboratory tests and whatever else is required to meet the objective.

2. EXECUTIVE AGENCY

2.1 The Government will appoint Royal Irrigation Department (RID) as an executive agency for the performance of the engineering services.

2.2 The Center for the Integrated Plan of Operation (the CIPO) of National Economic and Social Development Board will be appointed by the Government as a coordinator of all the other activities to be taken by the Eastern Seaboard Committee.

3. SCOPE OF WORKS

3.1 Review of Data and Report

The Consultant shall review the available reports and documents relevant to the Scheme, including evaluation on validity of the previous surveys and investigations, hydrological and other design studies. Based on the review, the Consultant shall prepare a detailed programme for the additional surveys and investigations required for the performance of the detailed design of the Scheme.

3.2 Detailed Surveys and Investigations

The detailed surveys and investigations may consist of, but not be limited to the following:

- (a) Geological investigation, including drilling, field permeability tests, standard penetration test, grouting and other field tests.
- (b) Soil and foundation investigations.
- (c) Investigation on quality and quantity of materials for embankment fill.
- (d) Investigations of materials for concrete aggregates, filter and rock riprap.
- (e) Topographical and geological surveys and mapping on the site of major structures.
- (f) Aerial-photo mapping covering the entire irrigation service area.
- (g) Hydrological investigation.
- (h) Investigations on environmental and ecological impacts.

3.3 Detailed Design

The Consultant shall prepare the detailed design of the various components of the Scheme.

- 3.3.1 The Consultant shall prepare several alternatives of the dam design based on the detailed surveys and investigations and recommend the best alternative for the detailed design considering both technical and economical aspects.

- 3.3.2 The detailed design of the dam and its appurtenant structures and irrigation and drainage facilities shall include complete and detailed drawings and design computations relating to hydraulics, structures and foundations.
- 3.3.3 The design drawing shall be prepared in necessary and sufficient details for international bidding.
- 3.3.4 The Consultant shall carry out the laboratory test of spillway and other major facilities deemed to be model-tested.
- 3.3.5 The Consultant shall prepare the bill of quantities for the respective component of the Scheme and shall thereafter estimate the construction cost, which shall be divided into foreign currency component and local currency component. The unit prices to be used should be supported by detailed analysis and based on competitive prices prevailing in the local and international market.

3.4 Report, Drawings and Tender Documents

3.4.1 The Consultant shall prepare the under-listed documents for each component of the Scheme:

- (a) Design Report
- (b) Detailed Design Drawings
- (c) Tender Documents, including:
 - Pre-qualification Document
 - Instruction to Tenderers
 - Form of Tender

- Form of Bid Bond
- General Conditions of Contract
- General Specifications
- Technical Specifications
- Bill of Quantities
- Form of Agreement
- Form of Performance Bond

The above report, drawings and documents shall be submitted by the Consultant in draft form for review by the RID.

- 3.4.2 The Consultant shall submit an Inception Report, summarizing the result on review of the previous studies and available documents and the plan of operation.
- 3.4.3 The Consultant shall submit quarterly progress report of his work to the RID throughout the period of the services.

4. REPORTING

4.1 Inception Report (20 copies)

Within ___ months after commencement of the services.

4.2 Draft Design Report, Draft Design Drawings and Draft Tender Documents (20 copies)

Within ___ months after the Inception Report.

4.3 Final Design Report, Final Design Drawing and Final Tender Documents (50 copies)

Within ___ months after receipt of comments on the draft documents by the RID.

4.4 Quarterly Progress Report (10 copies)

At the end of each three-month period after commencement of the services.

APPENDIX II

ADDITIONAL SURVEYS & INVESTIGATION

1. Future Survey and Investigation

The following survey and investigation are deemed necessary for the performance of detailed design of the respective scheme.

(1) Topographic Survey

Description	Unit	Quantity
(a) <u>Dam & Reservoir</u>		
Topo-mapping	106 m ²	300
(b) <u>Irrigation and Drainage System</u>		
Aerial-photo-mapping	km ²	100
Topo-mapping	km ²	1.5
Route alignment survey		
Main canal	km	53
Lateral canal	km	34
Drain	km	37

(2) Geological Investigation

Description	Unit	Quantity
(a) Core Drilling with S.P.T. and Permeability Test, @ 30 m, at Damsite		
	m	1,500
(b) Trench Cutting at Damsite		
	m	400

(3) Material Survey

Description	Quantity	
<u>(a) Borrow Area for Earth Embankment</u>		
Test Pit	5 m x 3 spots	(15 m)
Auger Boring (Core Drilling)	5 m x 15 spots (75 m)	(75 m)
Moisture Content	10 Nos. x 18 spots	(180 Nos.)
Specific Gravity	3 Nos. x 18 spots	(54 Nos.)
Gradation	- ditto -	
Atterberg's Limit	- ditto -	
Compaction	- ditto -	
Triaxial Comp. (\overline{CU})	- ditto -	
Permeability	- ditto -	
<u>(b) Borrow Area for Drain Material</u>		
Specific Gravity	3 Nos.	
Gradation	9 Nos.	
Relative Density	9 Nos.	
Triaxial Comp. (\overline{CU})	3 Nos.	
<u>(c) Foundation</u>		
Test Pit	5 m x 3 spots	(15 m)
Sampling	3 Nos. x 3 spots	(9 Nos.)
Moisture Content	5 Nos. x 3 spots	(15 Nos.)
Specific Gravity	5 Nos. x 3 spots	(15 Nos.)
Gradation	- ditto -	
Atterberg's	- ditto -	
Triaxial Comp. (\overline{CU})	- ditto -	
Triaxial Comp. (\overline{UU})	- ditto -	
Consolidation	- ditto -	

