

E. Sensitivity Analysis

Sensitivity analysis is the effective measures for testing the risk of the Project. The analysis was made for the following cases:

<u>IRR in Sensitivity Analysis</u>	
<u>Item</u>	<u>IRR (%)</u>
1. 10% increase in world market price of rice	14.5
2. 10% decrease in world market price of rice	13.3
3. 10% increase in project crop yields	14.8
4. 10% decrease in project crop yields	12.5
5. Taking 7 years to attain the target yield	13.6
6. 10% increase in crop prices	14.8
7. 10% decrease in crop prices	13.0
8. 10% increase in construction cost	12.9
9. 20% increase in construction cost	11.9
10. One year delay in start of construction	13.9
11. Three years delay in start of construction	13.8
12. Costing family labor	13.2
13. Costing (purchasing basis) construction equipment	12.1

F. Farm Budget Analysis

The farm budget for the average size of farm in the Phase II area at present is represented by the farmer having 1.1 hectare of farm field. According to the Agricultural Census, 1971, 46 percent of the total farm households has a farm field less than 1.0 hectare, and 47 percent having 1.0 to 3.0 hectares. Average farm size in the former class is 0.5 hectares and 1.6 hectares in the latter class. (see Appendix 6F-1).

The following table explains about farm budgets at present, without project and with project. Amortization owners and leaseholders at present take 4,543 pesos and 4,601 pesos of farm income, respectively. The farm incomes with and without project are shown in the following table.

Table 6 - 2 Farm Budgets (1.1 ha Farm)

Item	Unit	Present		Without Project		With Project	
		(Wet)	(Dry)	(Wet)	(Dry)	(Wet)	(Dry)
1) Cropping ^{2/}							
1. Paddy Rice, Irrigated	ha	0.36	0.06	0.36	0.06	1.10	0.44
2. Paddy Rice, Rainfed	ha	0.74	—	0.74	—	—	—
3. Tobacco	ha	—	0.20	—	0.20	—	0.19
4. Garlic	ha	—	0.33	—	0.33	—	0.38
5. Mungbeans	ha	—	0.09	—	0.09	—	0.18
6. Cotton	ha	—	—	—	—	—	0.09
Intensity	%	162		162		216	
2) Production							
1. Paddy Rice	tons	2.04		2.29		6.60	
2. Tobacco	tons	0.20		0.24		0.32	
3. Garlic	tons	0.45		0.52		0.99	
4. Mungbeans	tons	0.03		0.04		0.20	
5. Cotton	tons	—		—		0.23	
3) Gross Production Value	₱	8,073		12,747		30,909	
4) Production Cost (Included hired labor)	₱	2,602		2,995		5,714	
5) Net Production Value before Water Charge	₱	5,471		9,752		25,195	
6) Water Charge	₱	—		—		512 ^{3/}	
7) Net Agricultural Income							
7-1. Owner-farmer	₱	5,471		9,752		24,683	
7-2. Amortization Owner (Annual payment for land ^{4/})	₱	3,393		7,674		22,605	
7-3. Leaseholder (Annual payment for land ^{5/})	₱	(2,078)		(2,078)		(2,078)	
	₱	3,451		6,562		16,953	
	₱	(2,020)		(3,190)		(7,730)	
8) Other Net Income ^{1/}	₱	1,150		1,150		—	
9) Farm Income							
9-1. Owner-farmer	₱	6,621		10,902		24,683	
9-2. Amortization Owner	₱	4,543		8,824		22,605	
9-3. Leaseholder	₱	4,601		7,712		16,953	

Note: 1/ Based on the results of farm management survey conducted by LRED, NIA, February, 1978.

2/ Based on the farm management survey and cropping pattern of the project.

3/ 465 ₱/ha

4/ Based on amortizing owner with annual payment over 15 years at six percent on unpaid balance; based on price of land of 2.5 times present gross value of production (obtained from Appraisal Report of World Bank).

5/ Rent to landlord from share tenant amounts to 25 percent of total production in the Phase II area according to a disposition study of palay production in farm management survey, NIA.

G. Cost Recovery

The Ilocos Norte Province has eight national irrigation systems of which five are of gravity irrigation and three of pump irrigation. The authority concerned to collect irrigation fees from users of these irrigation systems in the Province is the irrigation super-intendent of the Provincial Irrigation Office located in the Laoag City.

Irrigation fees of the gravity systems are equivalent to two cavans of paddy per hectare in the wet season and three cavans in the dry season and those of pump systems are three cavans in the wet season and five cavans in the dry season. The fees in cash have been collected only since 1977.

According to the information of the Provincial Irrigation Office in Ilocos Norte, the irrigation fee collection rate was 70 percent as of 1978. The collection rate in 1979 excluding December was about 40 percent. It is said that such a low collection rate is due to the high cost of crop production and heavy burden in the expenses of repair for typhoon damages in the last August and September.

The irrigation fees of the Project would be estimated as an equivalent value to the operation and maintenance cost at the maximum rate. The operation and maintenance cost of US\$62.8 per hectare corresponds to 7.2 cavans per year of irrigation fees. This rate is almost equal to 7.9 cavans which were proposed by the World Bank to apply to the NISIP-I systems.

In determining the extent of cost recovery, a cost recovery index is used for the project. This index is measured at the ratio of incremental water charges paid by all project beneficiaries to incremental costs of project construction and operation and maintenance.

The water charge and the relevant costs are measured based on the present values discounted at 10 percent annual rate of interest over the 50-year life of the project. The proposed fees (7.2 cavans) would result in the cost recovery index of 3.4 percent.

In order to determine the extent of benefit recovery, a benefit recovery index is used. This index is measured at the ratio of incremental water charges paid by a typical farm family to incremental income accruing to the family before paying water charges.

As the typical farmer is issued in the previous farm budget study, the proposed fees would result in the benefit recovery index of 3.3 percent to an amortisation owner and 4.7 percent to a leaseholder.

In order to find the extent of rent recovery, a rent recovery index is used. This index is measured at the ratio of incremental water charges paid by a typical farm family to incremental project rent. The project rent is defined as the incremental income obtained from the net production value subtracting the value of family labor, management costs and allowances for uncertainty. The proposed fee would result in the rent recovery index of 5 percent to an owner farmer.

H. Socio-economic Impact

Besides the direct benefits mentioned above, the Project will create the indirect benefit and affect the socio-economic development through various impacts to both farm economy in the Project Area and its vicinity as well as national or provincial economy.

In view of farm economy, the following impacts are considered.

- i) The farmers can make their farm planning timely for marketing of commercial products after completion of the project works. This would contribute to a control of market price associating with promotion of agricultural cooperative activity.
- ii) The increase in farm income will improve the farmers' standard of living. This improvement would contribute to an increase in saving in farm economy, tax revenue for province, and a rise of education standard. A part of savings would be converted to formation of capital (see Figure 6H-1, Appendix 6H-1).

From viewpoint of national or provincial economy, the following items are to be considered.

- iii) Contribution of the self-sufficiency of staple food
The demand and supply of rice in the Ilocos Norte Province is still unstable. After completion of the project, Ilocos Norte will be able to obtain the surplus rice. And, this increment in rice production would contribute to the solution of the problems in such deficit-ridden provinces in rice supply as La Union and Benguet.

The government forecasted that the self-sufficiency of staple food would be attained in the next five years, 1978 - 1982. In fact, the Philippines has become a rice exporter since 1977. The incremental rice after completion of the Project would contribute to improvement of the international trade of the Philippines.

iv) Increase in employment

The raise of cropping intensity will increase a employment capacity of family labor and hired labor. According to the labor analysis, the farming labor demand was projected to increase from two million man-days without project to 3.4 with project. The demand of hired labor will increase from about 25 percent without project to about 45 percent with project in total labor demand.

v) Correction of income inequality

According to the farm budget analysis for 1.1 hectares farm size, per capita farm income of the leaseholders was estimated at 770 pesos at present and 2,820 pesos with project. The increase in cropping area due to the Project will be different by farm sizes. Cropping areas of tobacco and garlic per farm are limited because of labor concentration during labor peak. A smaller farmer would be able to cultivate commercial crops with a comparatively larger percent to farm field area than that of a larger farmer.

vi) Relief in energy

About 90 percent of the country's energy requirements depends upon imported petroleum. Construction of a hydropower station instead of an alternative oil thermal plant would reduce the import volume of petroleum in country's economic activities. The oil consumption volume corresponding to annual energy of 199.2 GWh is roughly estimated at 35,000 barrel of petroleum. The annual saving of foreign currency is estimated at about US\$945,000 (seven million pesos) in using 27 US\$ of unit price per barrel of crude oil arriving in the Philippines.

vii) Improvement of transportation networks

The operation and maintenance roads constructed by the Project would speed up in transporting the input and output materials.

viii) Income increase during construction period

Many farmers will be employed during the construction period of the Project. The required unskilled labor wages are estimated at about 16.3 million pesos at peak in 1986. This income is about 19 percent of total net production value without project.

ix) Inland Fisheries

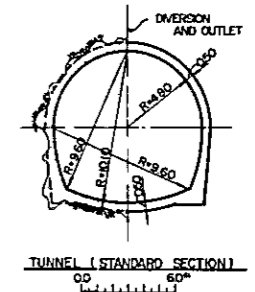
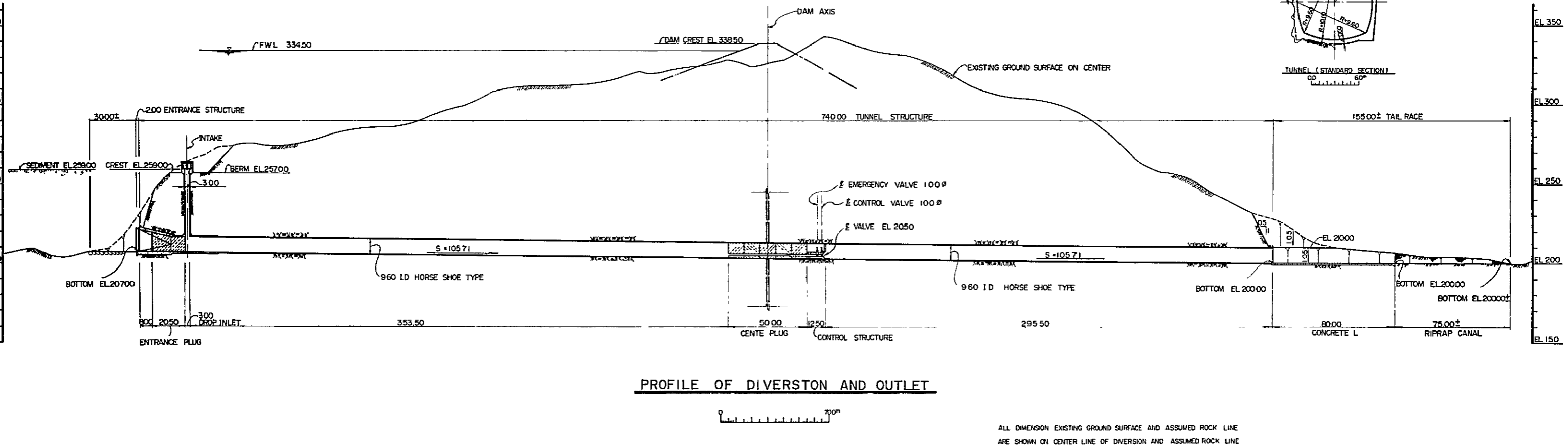
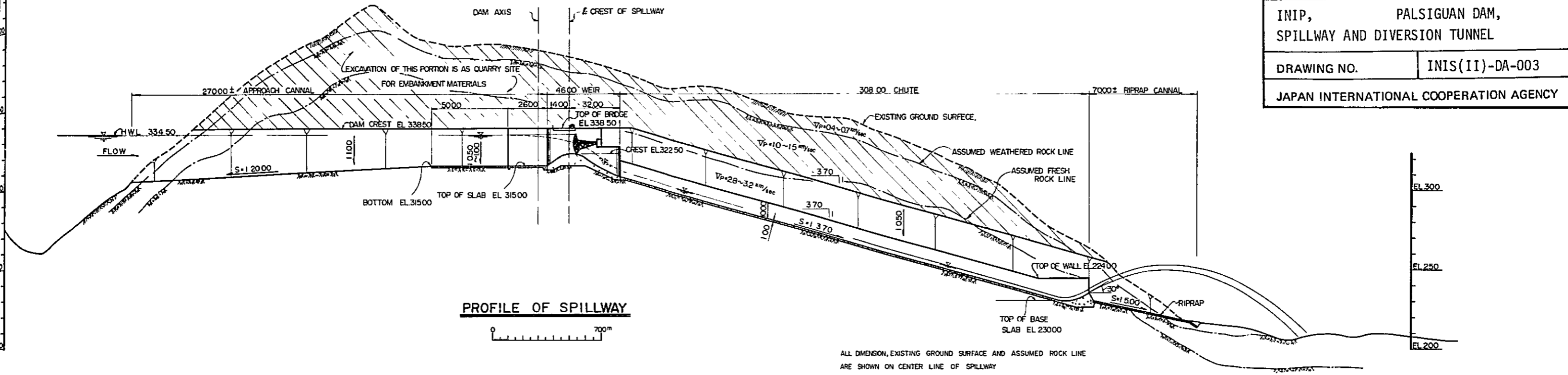
The annual production from the fish ponds in the Philippines occupies only eight percent of the total fish production in the nation, whereas the unit price of the fish cultivated in the ponds is higher than that of the fish produced by the method other than fish pond culture. The inland fishery in the Ilocos Norte, the annual production of which occupies about 45 percent of the total provincial fish production, is considered playing a vitally important role in the fishing industry of the Ilocos region. And the largest allotment of the budget has been made to the fish pond development plan in the five-year development plan for fisheries (1981 - 1985).

The both reservoirs at the Palsiguan and the Nueva Era dams will provide the useful water resources for running the inland water fishing, although further specific survey is required for determining the fish species to be liberated and cultivation method as well as fishing method, and studying the optimum scale of the fish culture and its profitability.

The Nueva Era reservoir will be constructed across the Bonga river about 2.5 km upstream of the Nueva Era village. This reservoir will allow to provide a stable environment for fish culture which will generate benefits as long as the stored water is supplied from the Palsiguan dam. Without water supply from the Palsiguan dam, the Nueva Era reservoir will not be able to store the water in its full capacity throughout the year, and hence, the benefit from the fisheries is not expected for the period of the Stage I. The details are described in Appendix 6I-1.

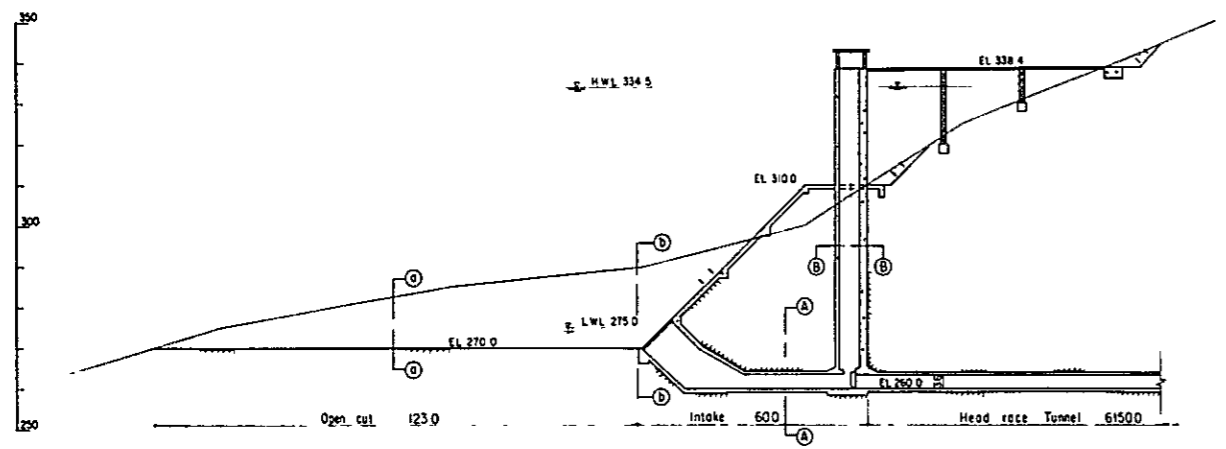
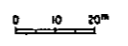
LIST OF DRAWINGS

1. PALSIGUAN DAM, GENERAL PLAN	INIS (II) - DA - 001
2. PALSIGUAN DAM, TYPICAL SECTION	INIS (II) - DA - 002
3. PALSIGUAN DAM, SPILLWAY AND DIVERSION TUNNEL	INIS (II) - DA - 003
4. HEADRACE TUNNEL AND SURGE TANK	INIS (II) - TP - 004
5. BONGA POWER STATION AND TAILRACE	INIS (II) - TP - 005
6. NUEVA ERA DAM AND POWER STATION	INIS (II) - TP - 006
7. NUEVA ERA DAM, GENERAL PLAN	INIS (II) - DA - 007
8. NUEVA ERA DAM, DAM UPSTREAM AND DOWNSTREAM VIEW	INIS (II) - DA - 008
9. NUEVA ERA DAM, TYPICAL SECTION	INIS (II) - DA - 009
10. MADUPAYAS DIVERSION DAM, GENERAL PLAN	INIS (II) - DD - 010
11. MADUPAYAS DIVERSION DAM, TYPICAL SECTION	INIS (II) - DD - 011
12. TIBANGRAN DIVERSION DAM, GENERAL PLAN	INIS (II) - DD - 012
13. TIBANGRAN DIVERSION DAM, TYPICAL SECTION	INIS (II) - DD - 013
14. LAYOUT OF CANAL ALIGNMENT, MAIN LINK, LINK CANAL-1, CURA AND NUEVA ERA (L.B)	INIS (II) - IC - 014
15. LAYOUT OF CANAL ALIGNMENT, LINK CANAL-2, -3, -4, MADUPAYAS AND BADOCSINAIT AREA	INIS (II) - IC - 015
16. LAYOUT OF CANAL ALIGNMENT, BATAc-PADAY-PINILI AREA	INIS (II) - IC - 016
17. PROFILE OF MAIN LINK CANAL AND LINK CANAL-1	INIS (II) - IC - 017
18. PROFILE OF LINK CANAL-2	INIS (II) - IC - 018
19. PROFILE OF LINK CANAL-3, -4	INIS (II) - IC - 019
20. PROFILE OF BATAc MAIN CANAL-1	INIS (II) - IC - 020
21. PROFILE OF BATAc MAIN CANAL-1	INIS (II) - IC - 021
22. PROFILE OF CURA MAIN CANAL AND BATAc MAIN CANAL-2	INIS (II) - IC - 022
23. PROFILE OF BADOc MAIN CANAL AND LATERAL CANAL BL-2	INIS (II) - IC - 023
24. TYPICAL SECTION OF IRRIGATION CANAL	INIS (II) - IC - 024
25. TYPICAL ROAD CROSSING WITH CHECK AND DROP	INIS (II) - IC - 025
26. TYPICAL RCP CROSSING	INIS (II) - IC - 026
27. TYPICAL BOX SIPHON WITH CROSSING	INIS (II) - IC - 027
28. TYPICAL RCP SIPHON WITH CROSSING	INIS (II) - IC - 028
29. TYPICAL CHECK AND VERTICAL DROP	INIS (II) - IC - 029
30. TYPICAL SUB-LATERAL DROP	INIS (II) - IC - 030
31. TYPICAL HEADGATE WITH BOX CULVERT	INIS (II) - IC - 031
32. TYPICAL HEADGATE WITH PIPE CULVERT	INIS (II) - IC - 032
33. TYPICAL PARSHALL FLUME	INIS (II) - IC - 033
34. TYPICAL DRAINAGE CULVERT	INIS (II) - IC - 034
35. TYPICAL DRAINAGE INLET	INIS (II) - IC - 035
36. TYPICAL DRAINAGE CANAL SECTION	INIS (II) - DC - 036
37. TYPICAL DRAINAGE DROP	INIS (II) - DC - 037
38. TYPICAL ROAD SECTION	INIS (II) - RW - 038
39. LAYOUT OF ON-FARM FACILITY (SAMPLE AREA No.1)	INIS (II) - OF - 039
40. LAYOUT OF ON-FARM FACILITY (SAMPLE AREA No.2)	INIS (II) - OF - 040
41. LAYOUT OF ON-FARM FACILITY (SAMPLE AREA No.3)	INIS (II) - OF - 041
42. TYPICAL TURNOUT	INIS (II) - OF - 042
43. TYPICAL FARM DITCH SECTION AND DIVERSION BOX	INIS (II) - OF - 043
44. LAYOUT OF CROSS STRUCTURE	INIS (II) - OF - 044

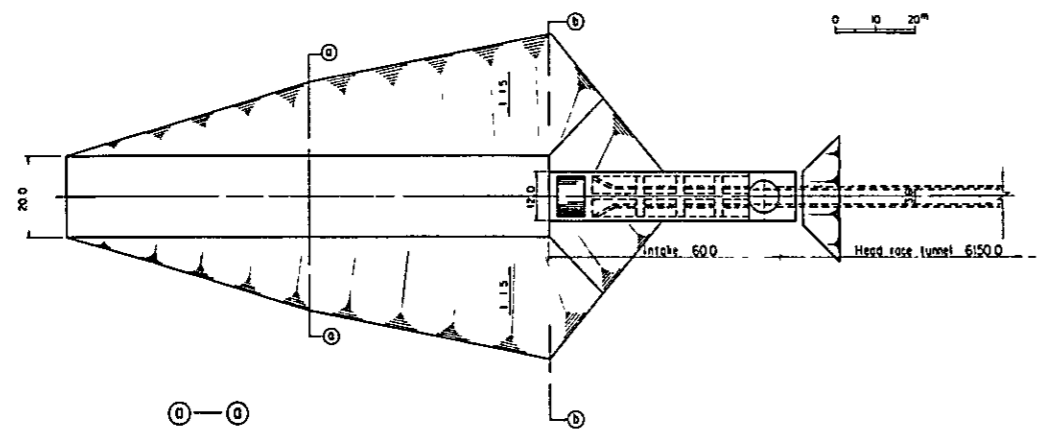
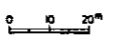


Intake

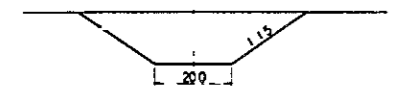
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Plan



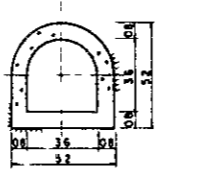
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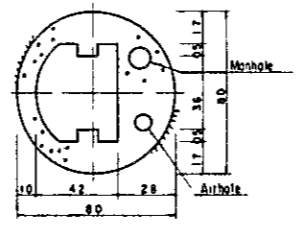
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A-A

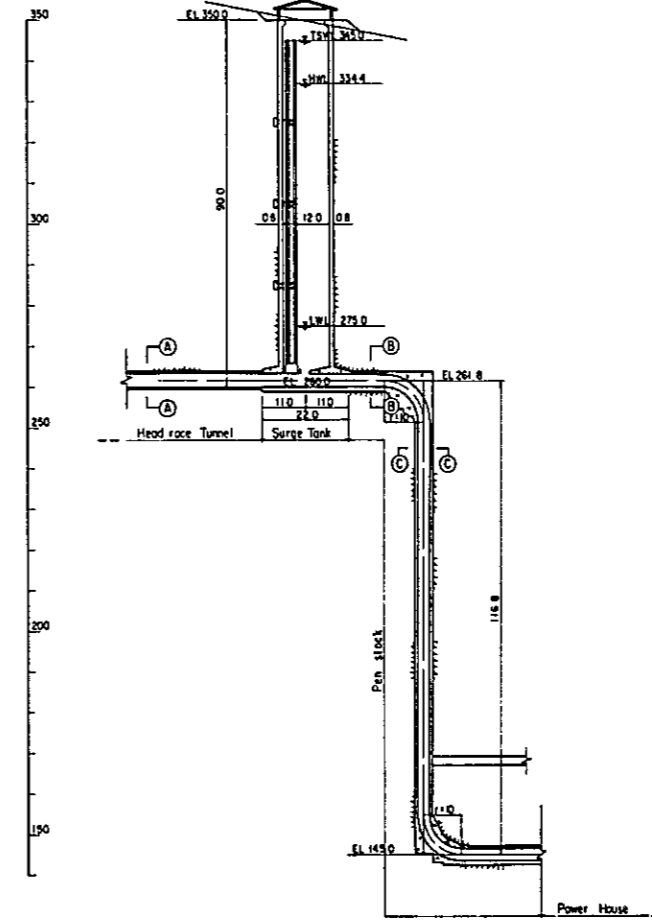
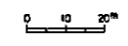


B-B

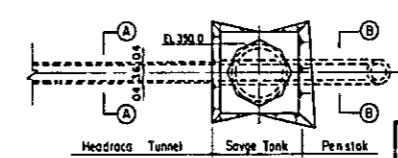
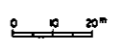


Surge tank

Profile

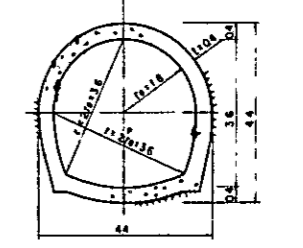


Plan

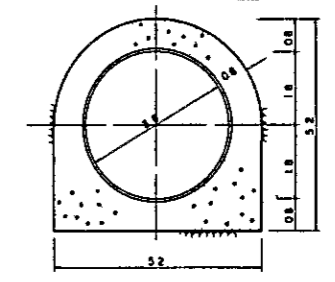


Head race

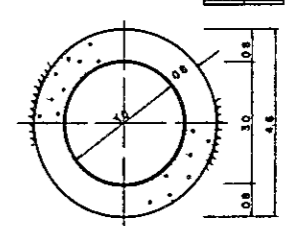
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B-B

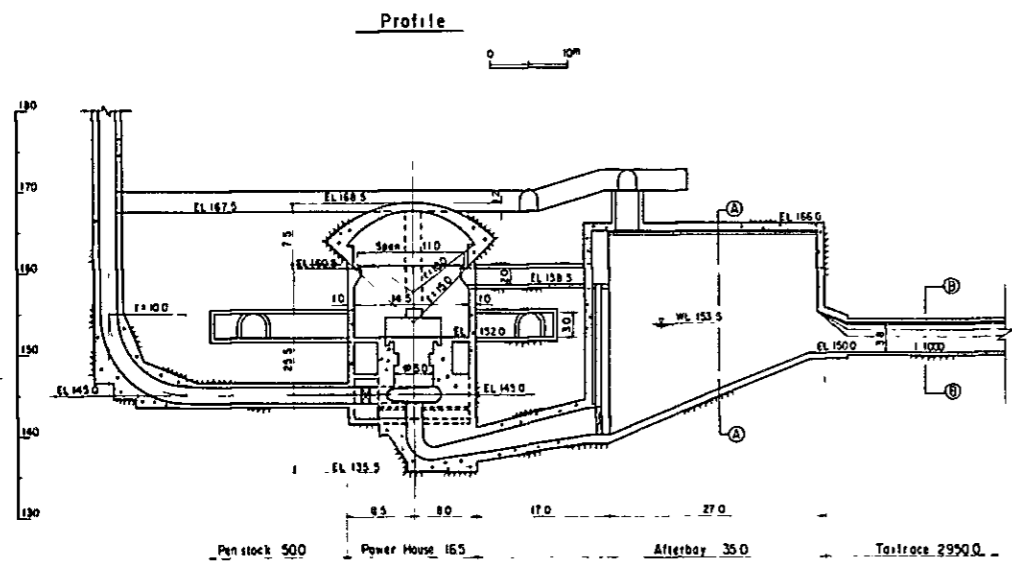
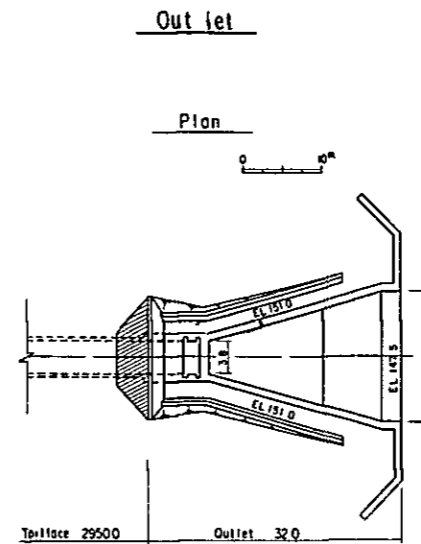
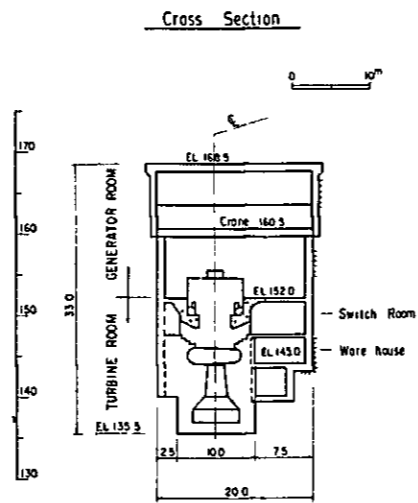
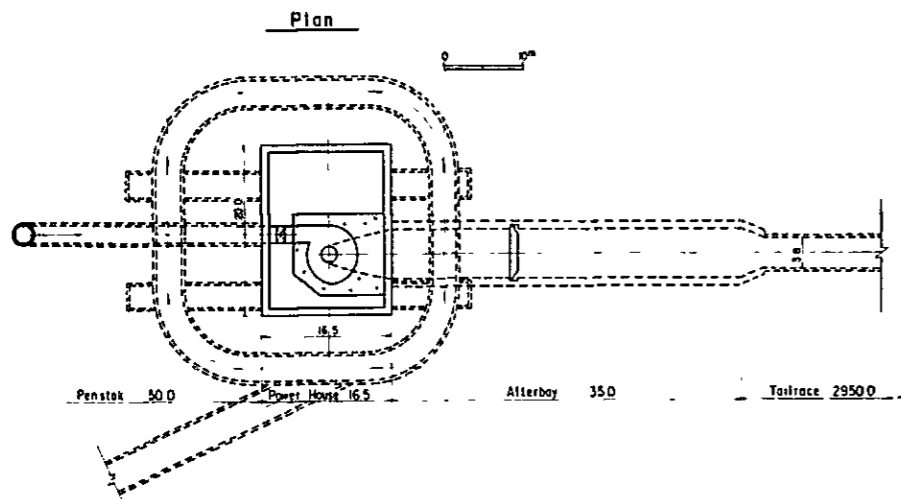


C-C



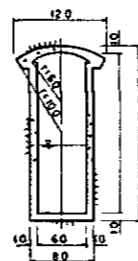
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INIP HEADRACE TUNNEL AND SURGE TANK	
DRAWING NO.	INIS(II)-TP-004
JAPAN INTERNATIONAL COOPERATION AGENCY	

Bonga Power Station



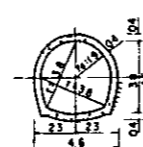
Afterbay

(A)-(A)

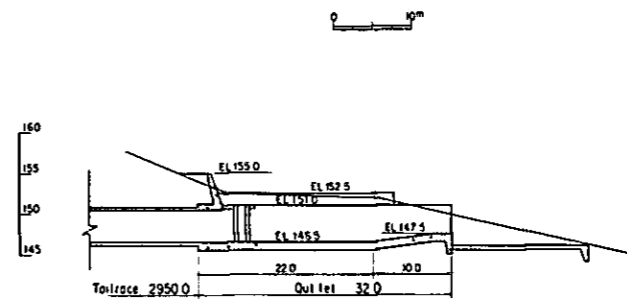


Tailrace

(B)-(B)

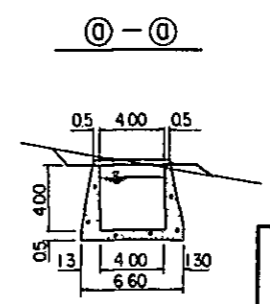
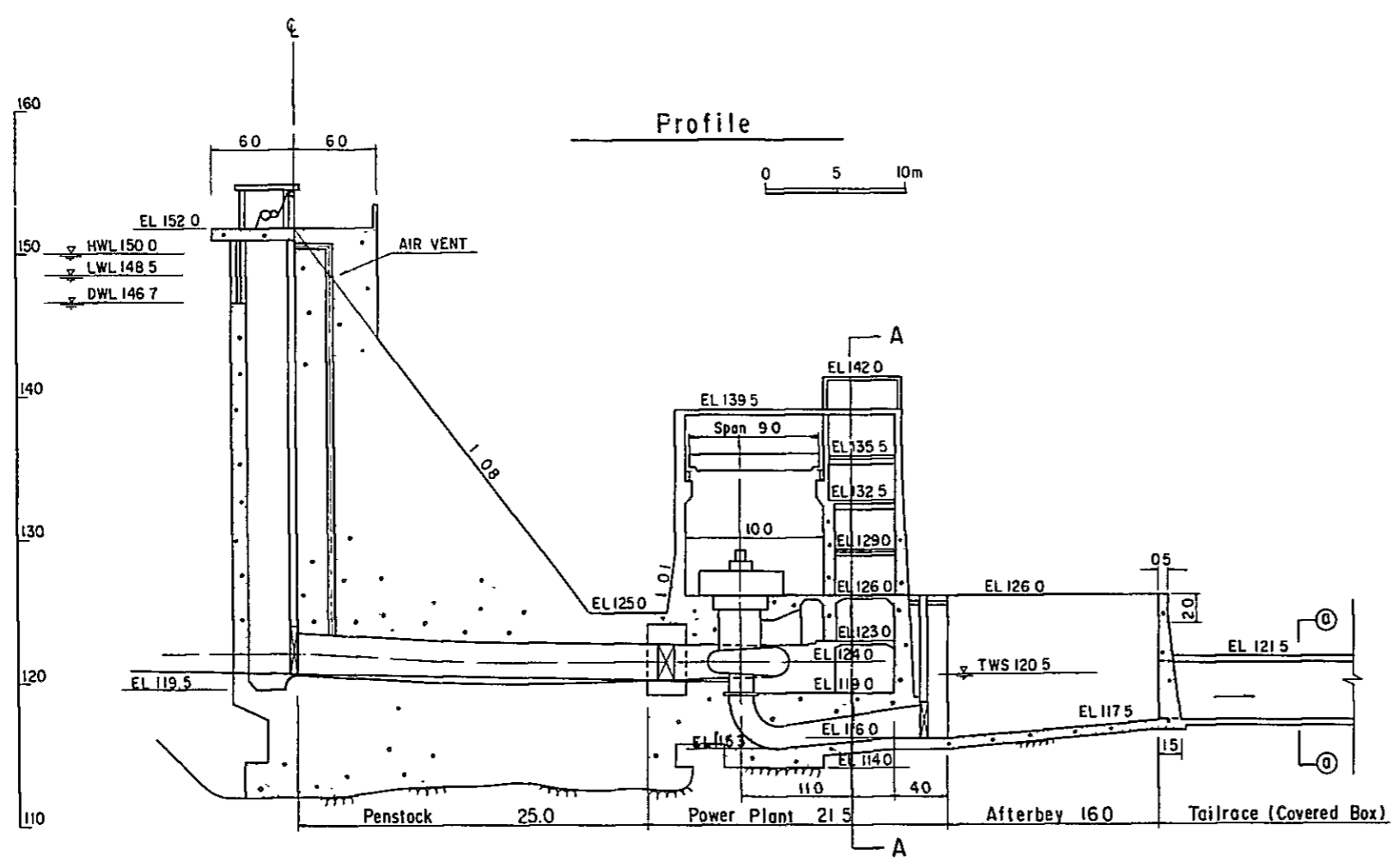
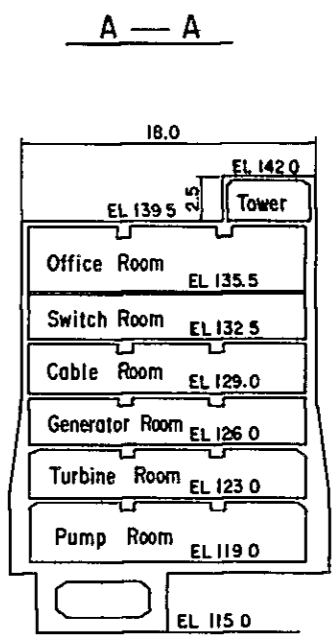
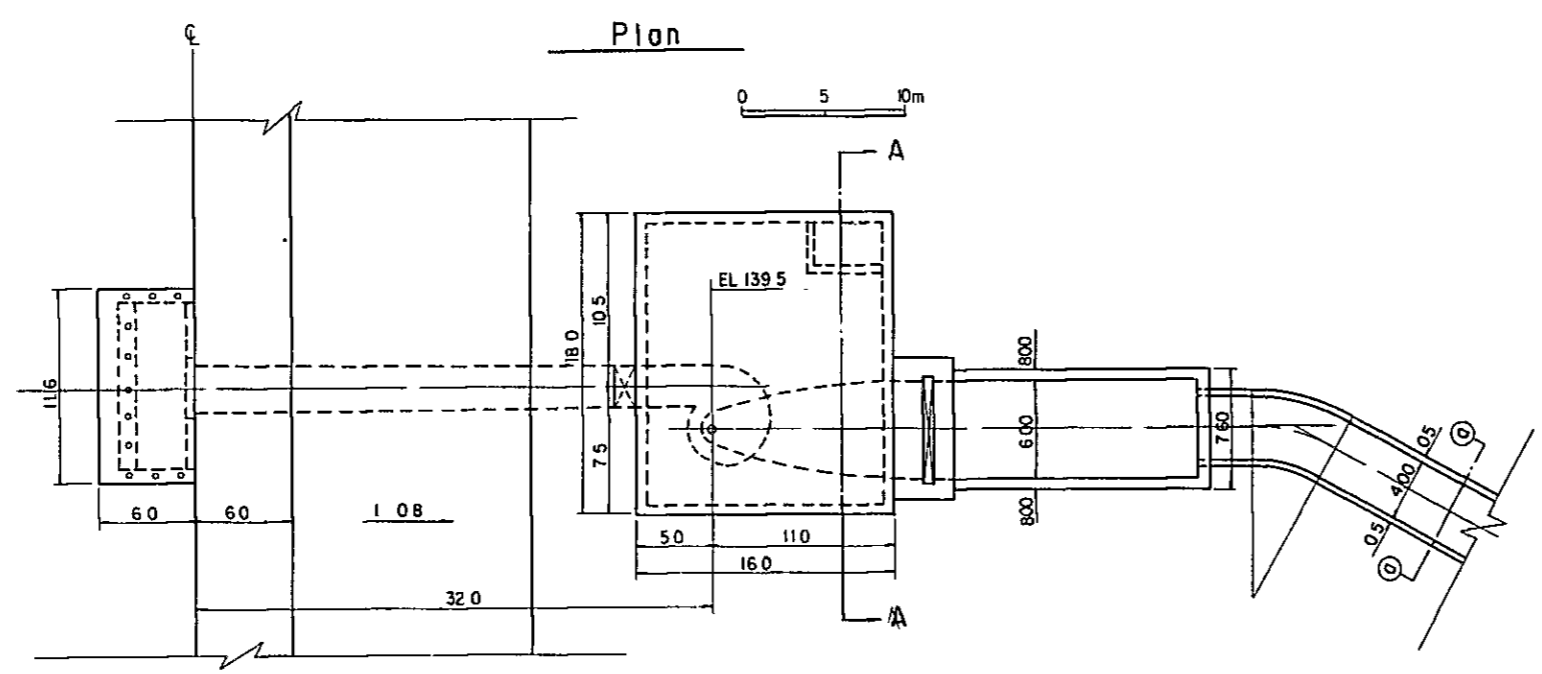


Profile



REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP BONGA POWER STATION AND TAILRACE	
DRAWING NO.	INIS(II)-TP-005
JAPAN INTERNATIONAL COOPERATION AGENCY	

Nueva Era Power Station

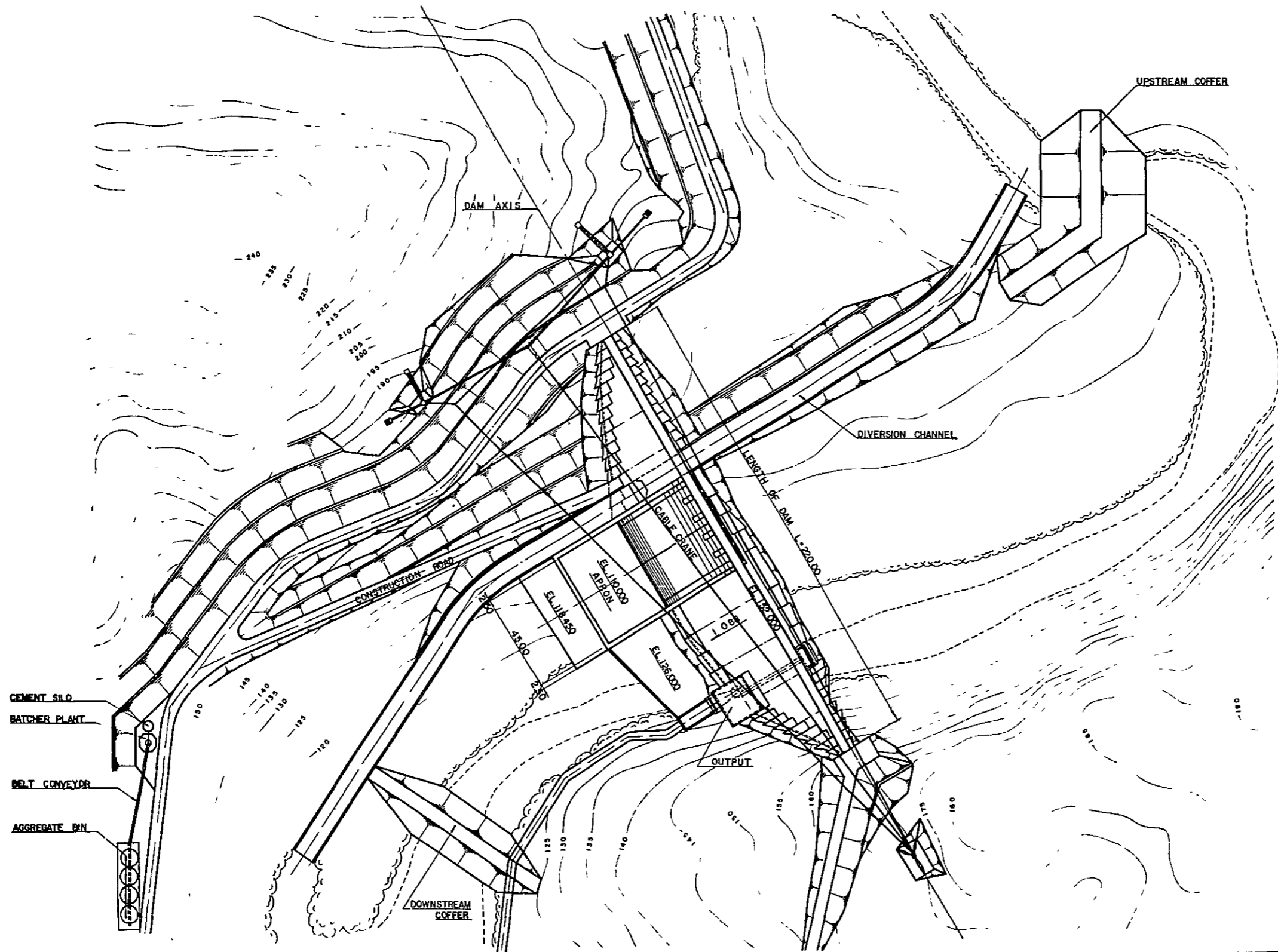


REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION

INIP
 NUEVA ERA DAM AND POWER STATION

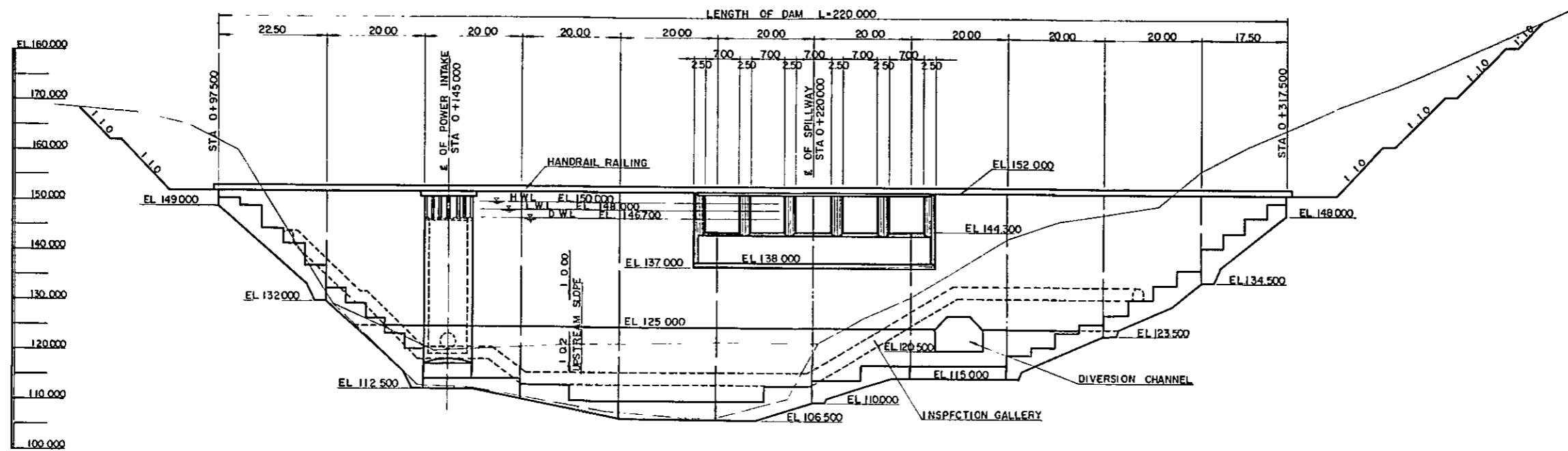
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JAPAN INTERNATIONAL COOPERATION AGENCY

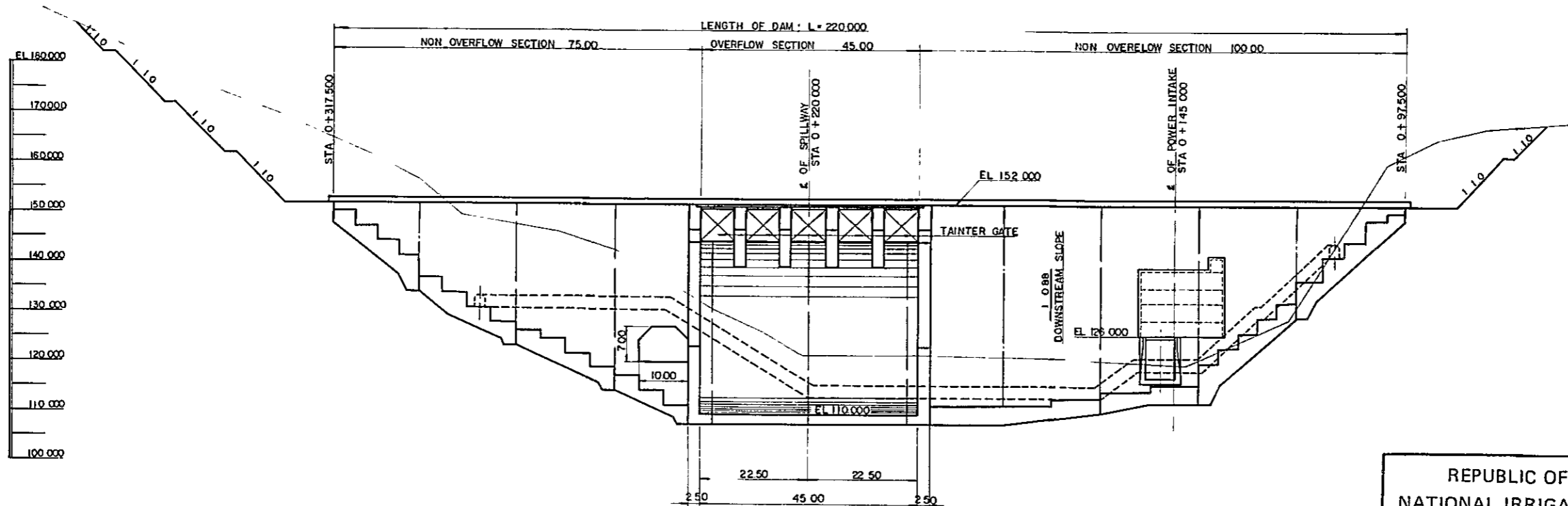


DAM PLAN SCALE 1:100

REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP NUEVA ERA DAM, GENERAL PLAN	
DRAWING NO.	INIS(II)-DA-007
JAPAN INTERNATIONAL COOPERATION AGENCY	

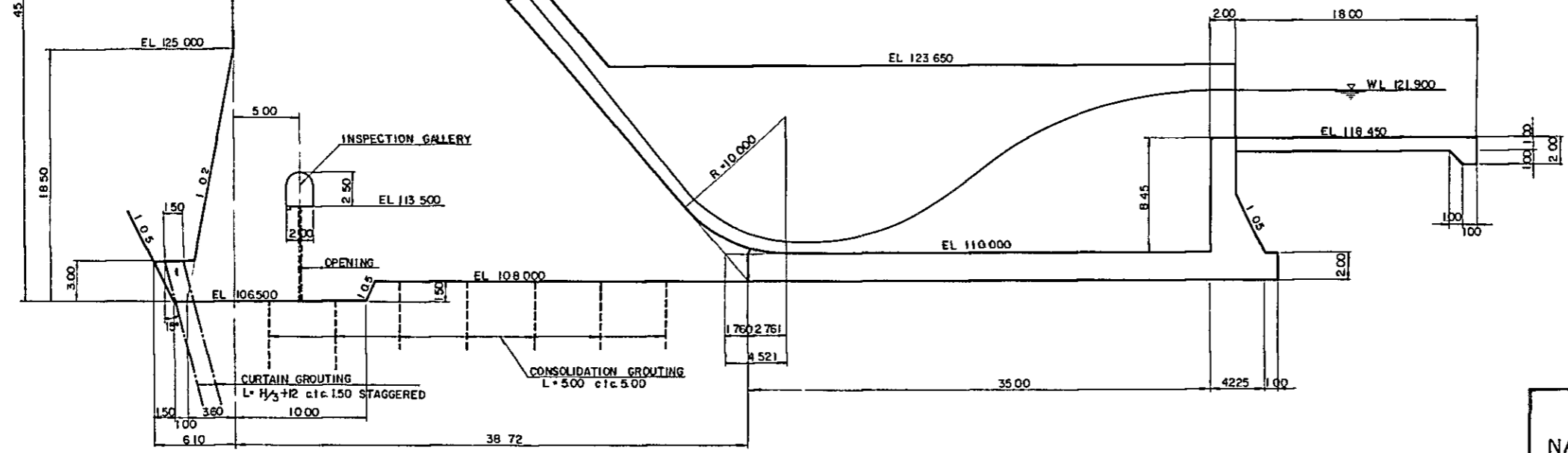
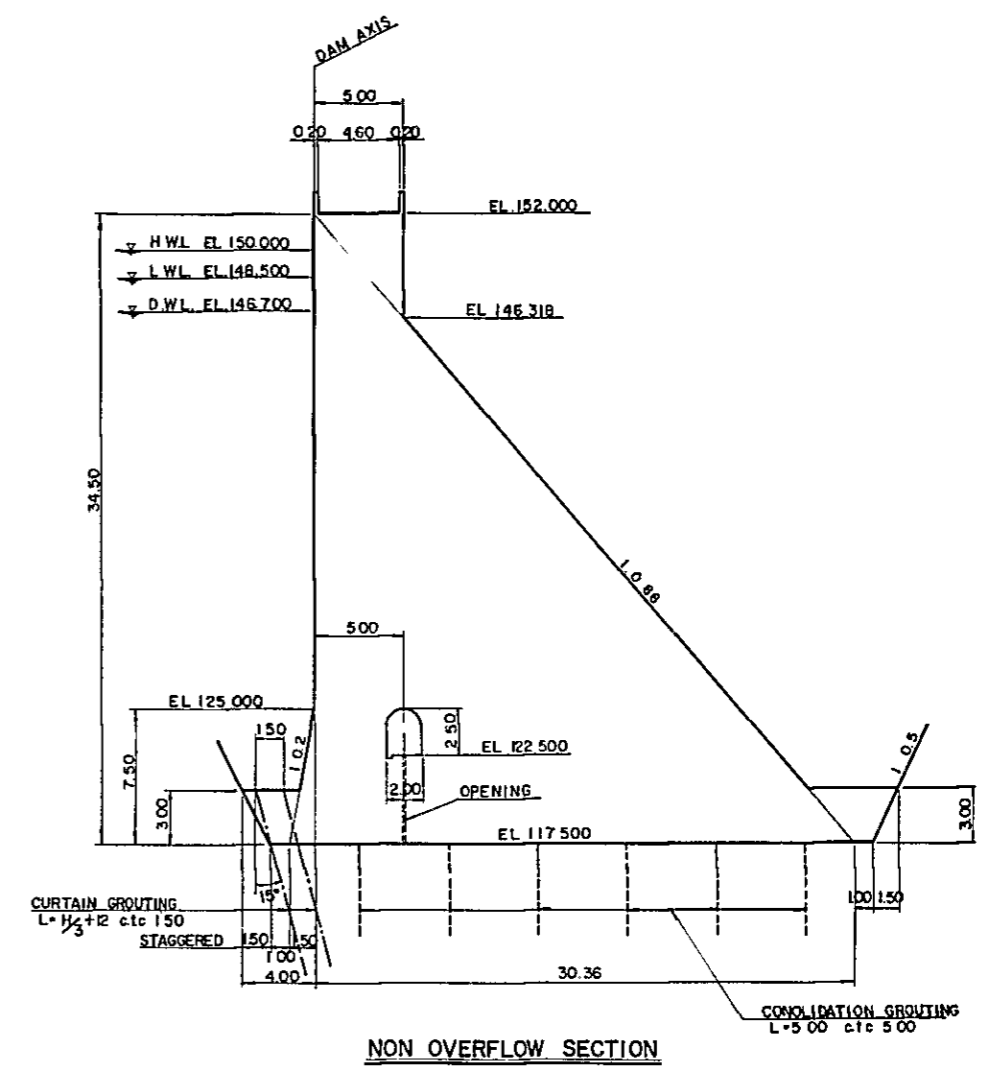
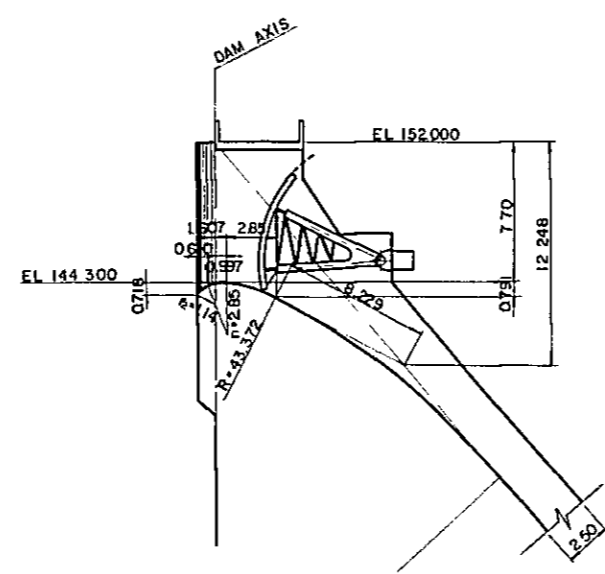
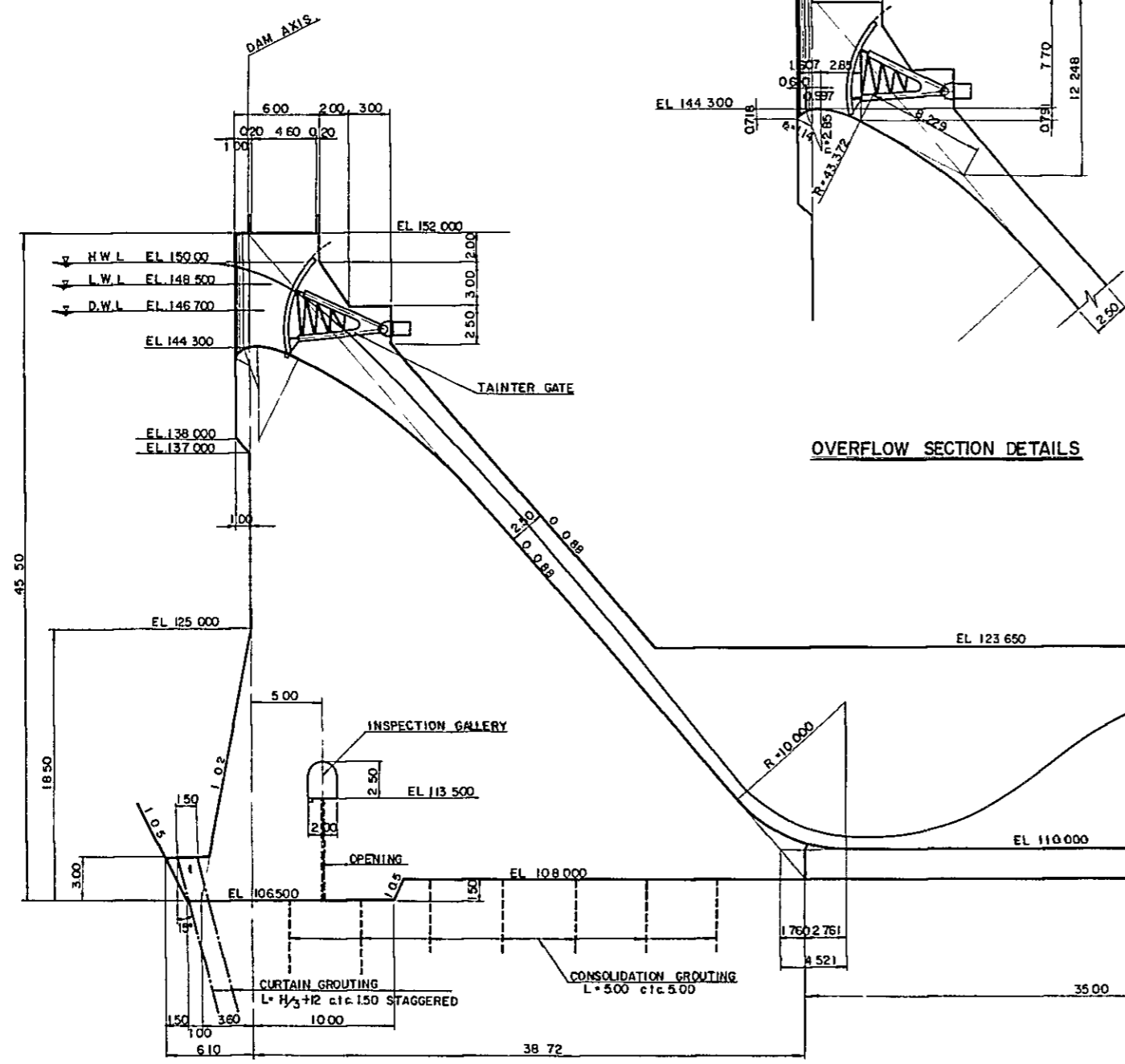


DAM UPSTREAM VIEW
SCALE 1:500



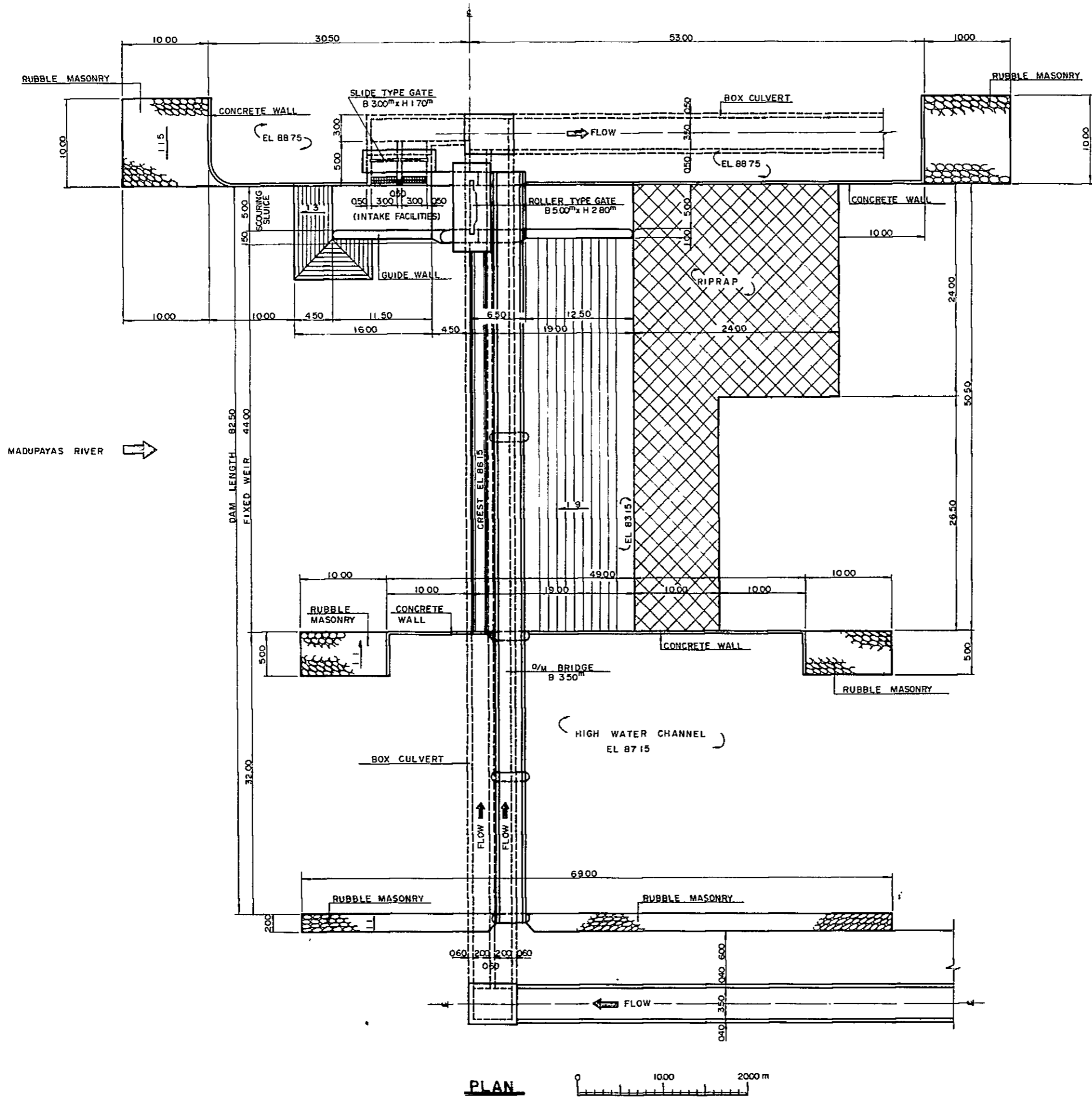
DAM DOWNSTREAM VIEW
SCALE 1:500

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DAM UPSTREAM AND DOWNSTREAM VIEW	
DRAWING NO.	INIS(II)-DA-008
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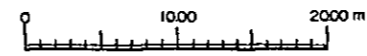


REPUBLIC OF THE PHILIPPINES	
NATIONAL IRRIGATION ADMINISTRATION	
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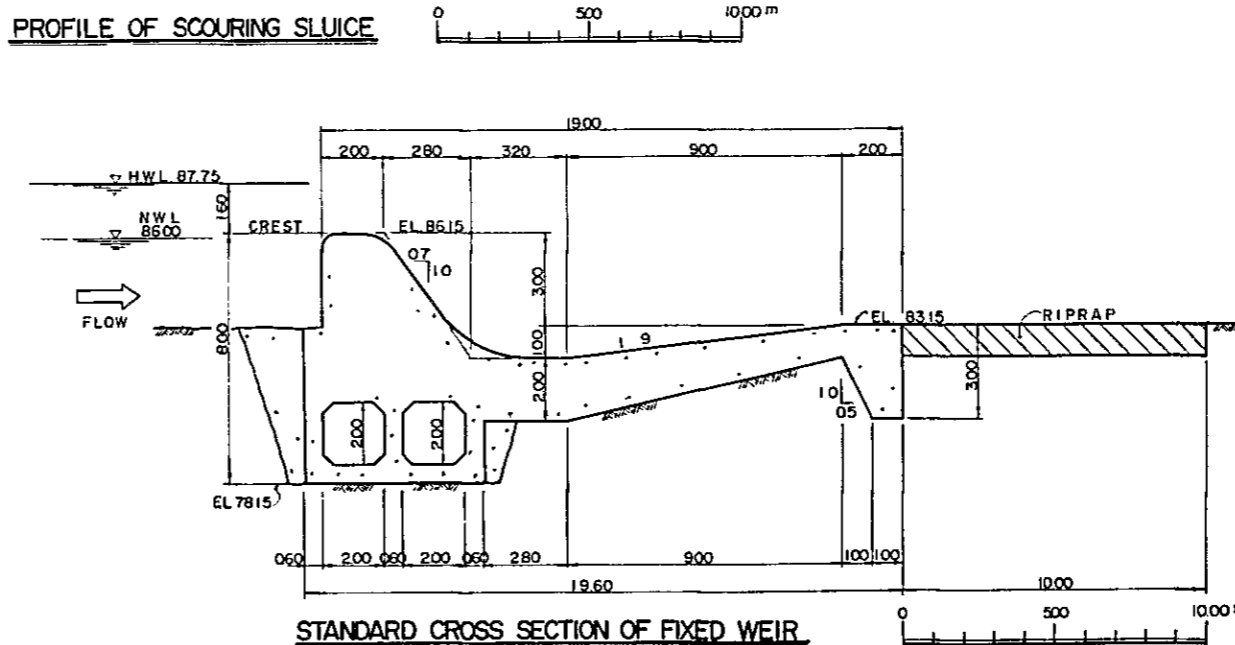
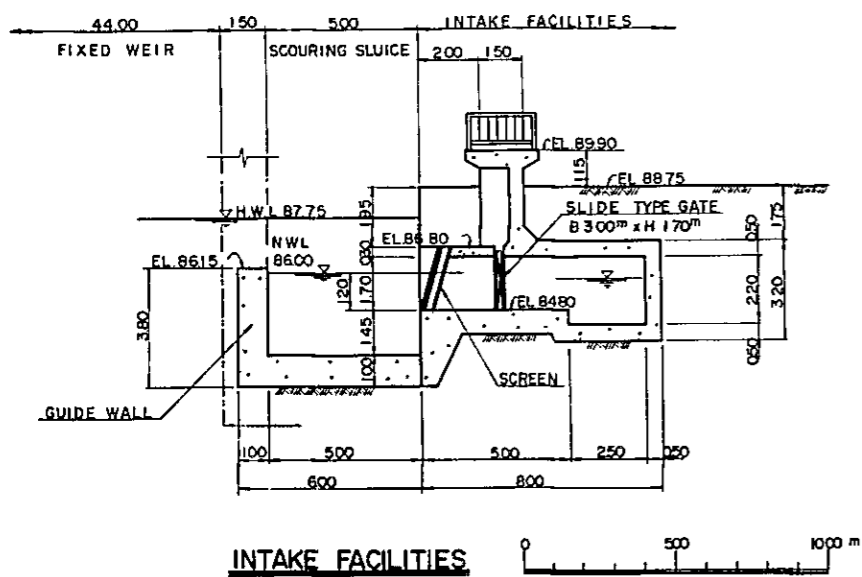
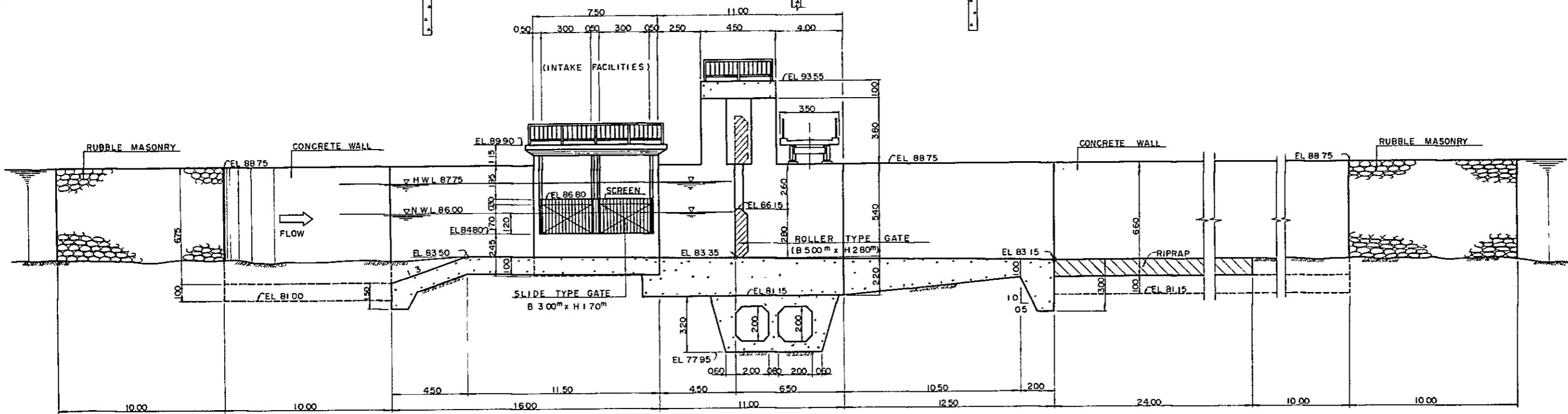
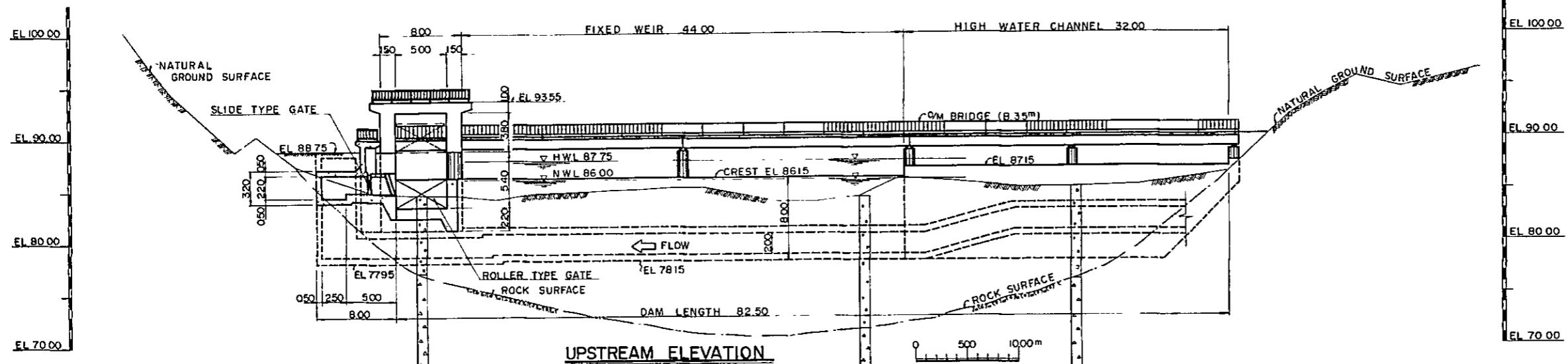
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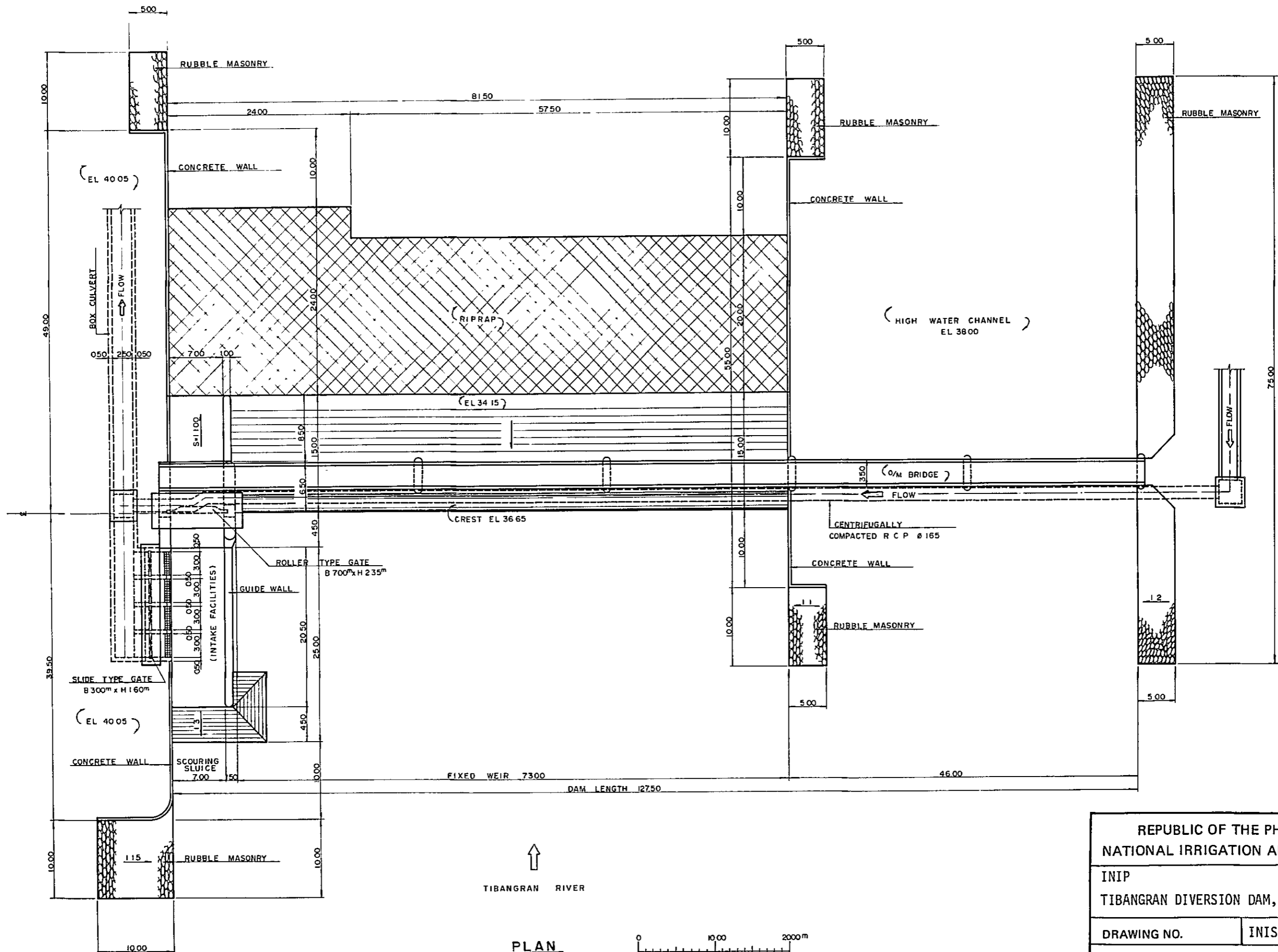
PLAN



REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP MADUPAYAS DIVERSION DAM, GENERAL PLAN	
DRAWING NO.	INIS(II)-DD-010
JAPAN INTERNATIONAL COOPERATION AGENCY	

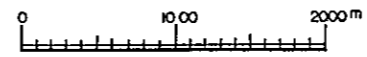


REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION
INIP
MADUPAYAS DIVERSION DAM, TYPICAL SECTION
DRAWING NO. INIS(II)-DD-011
JAPAN INTERNATIONAL COOPERATION AGENCY

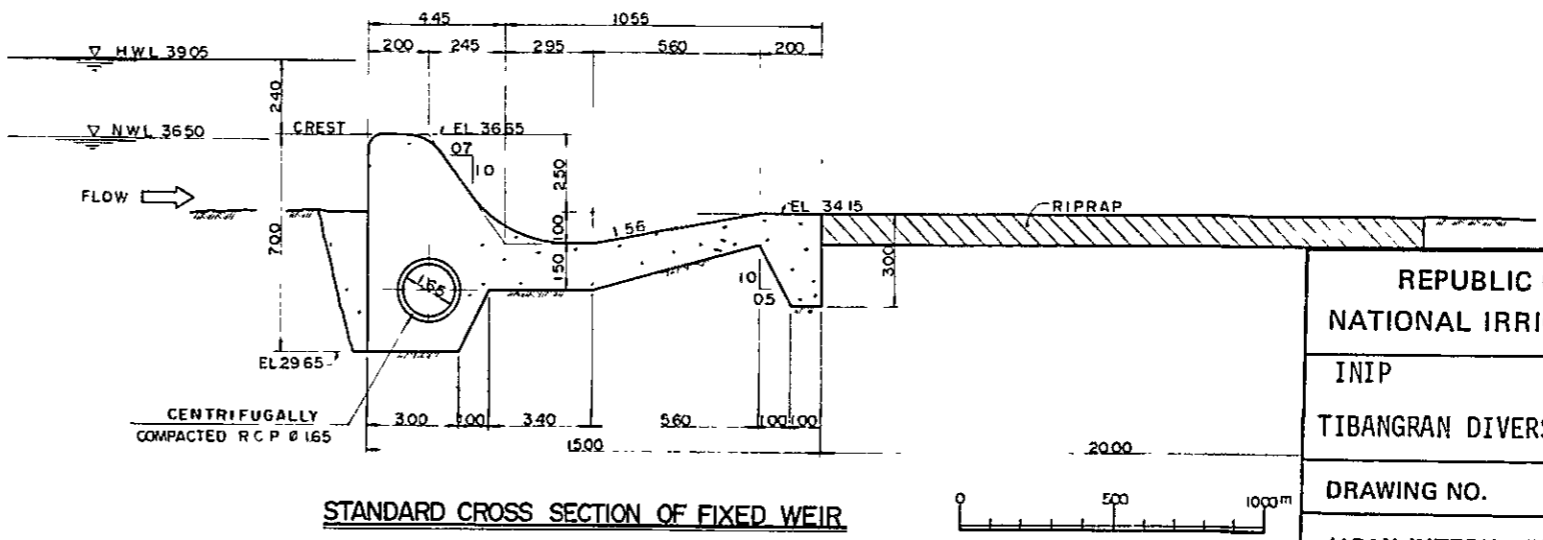
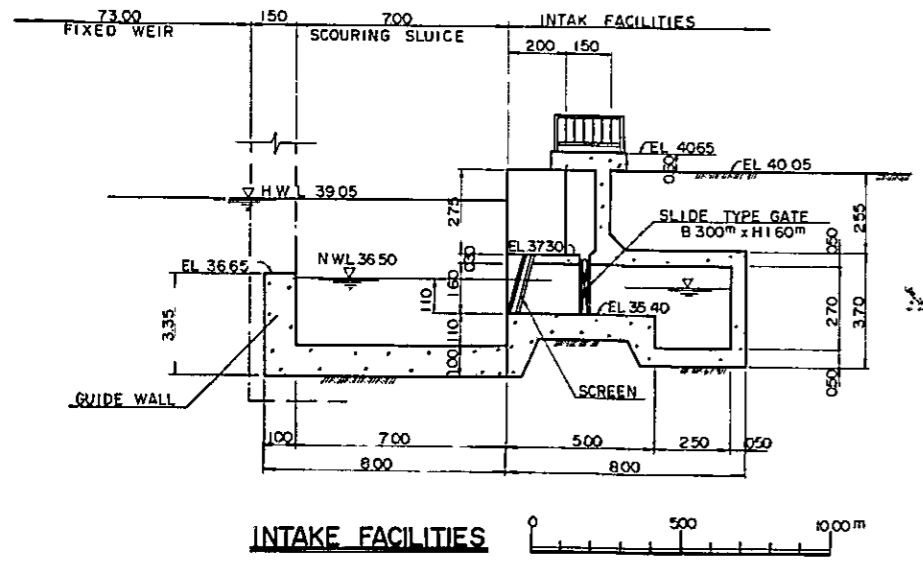
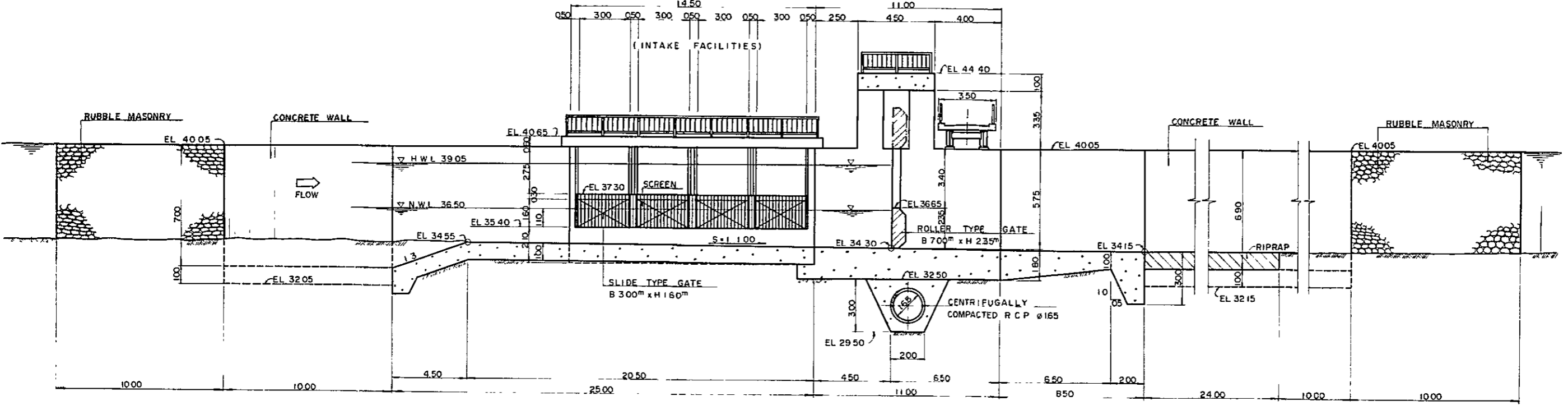
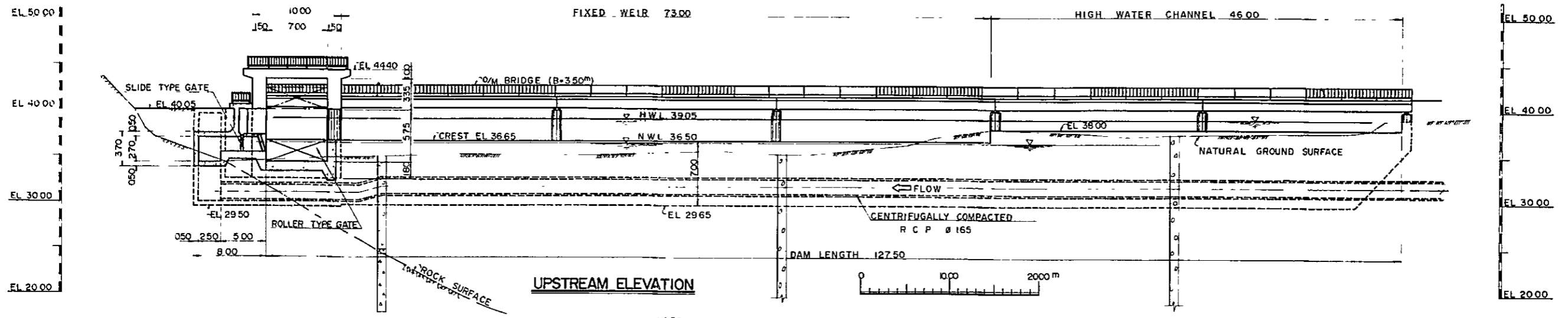


↑
TIBANGRAN RIVER

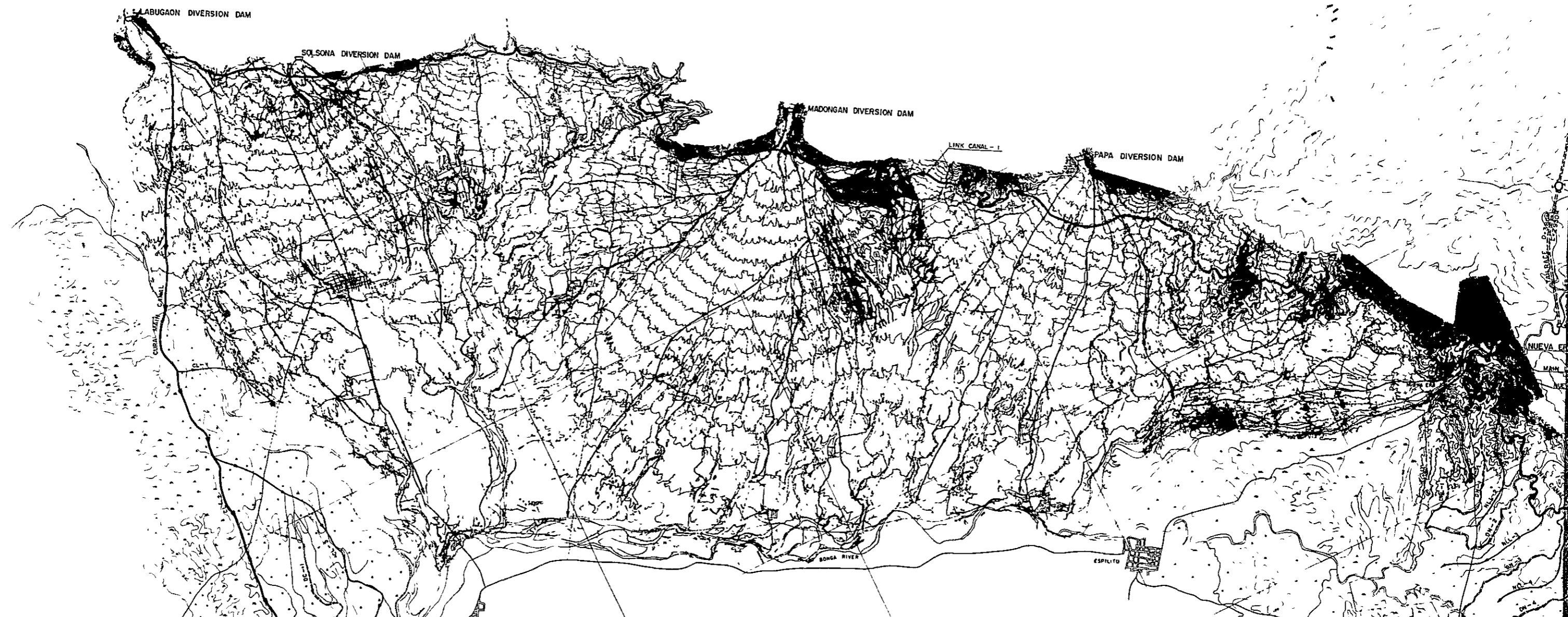
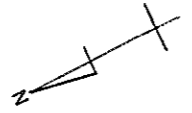
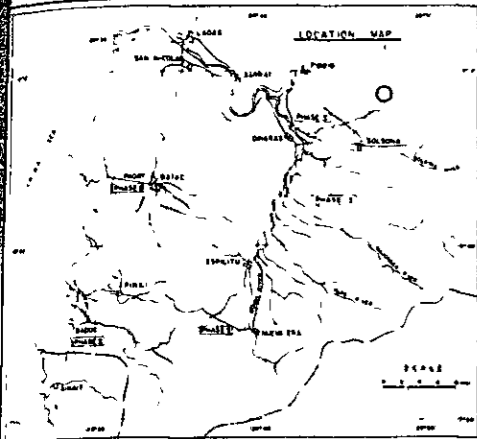
PLAN



REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TIBANGRAN DIVERSION DAM, GENERAL PLAN	
DRAWING NO.	INIS(II)-DD-012
JAPAN INTERNATIONAL COOPERATION AGENCY	

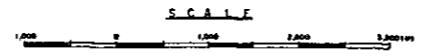


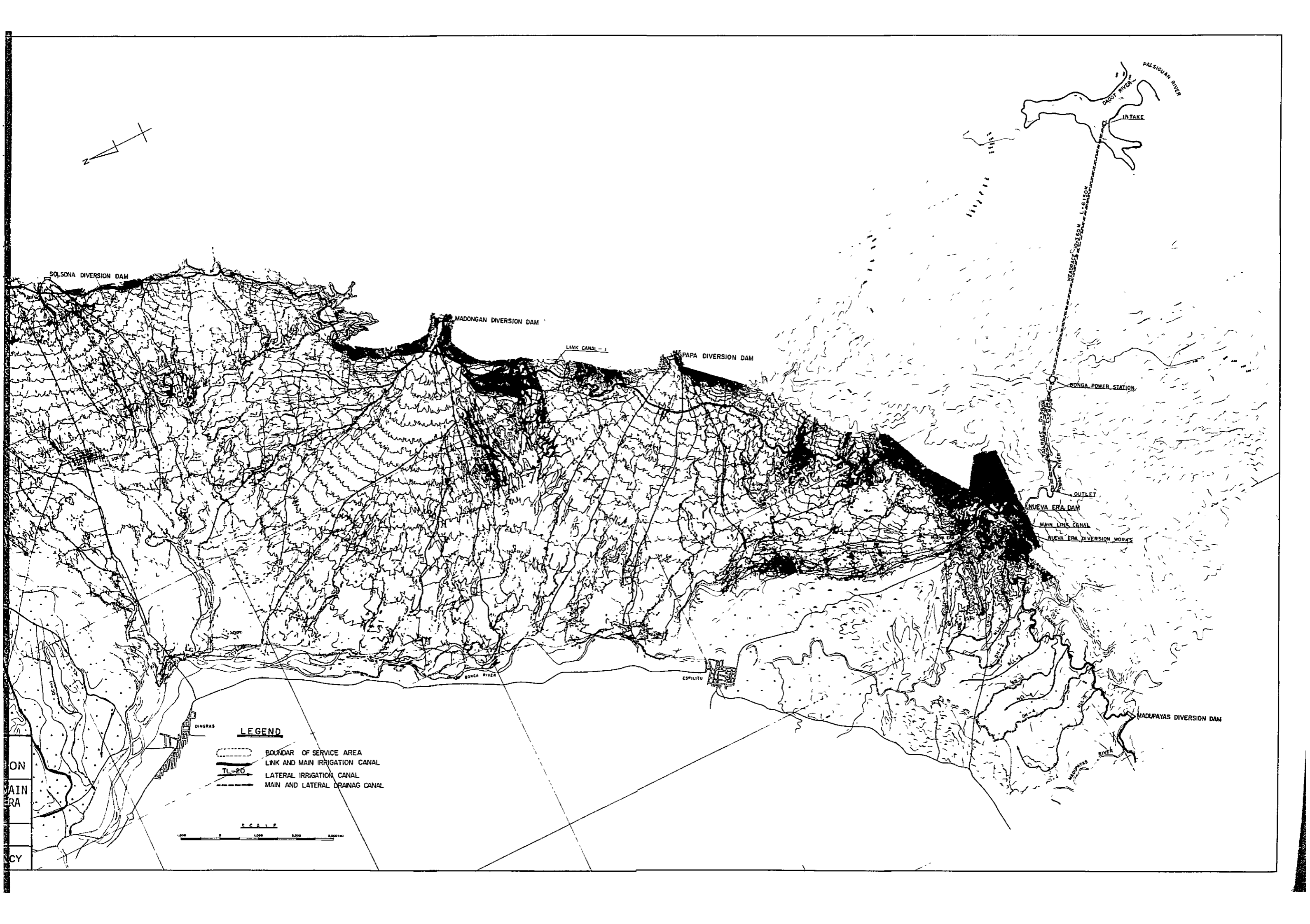
REPUBLIC OF THE PHILIPPINES	
NATIONAL IRRIGATION ADMINISTRATION	
INIP	
TIBANGRAN DIVERSION DAM, TYPICAL SECTION	
DRAWING NO.	INIS(II)-DD-013
JAPAN INTERNATIONAL COOPERATION AGENCY	



REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP, LAYOUT OF CANAL ALIGNMENT, MAIN
 LINK, LINK CANAL-1, CURA AND NUEVA ERA
 (L.B)
 DRAWING NO. INIS(II)-IC-014
 JAPAN INTERNATIONAL COOPERATION AGENCY

LEGEND
 - - - - - BOUNDAR OF SERVICE AREA
 ——— LINK AND MAIN IRRIGATION CANAL
 TL-20 LATERAL IRRIGATION CANAL
 - - - - - MAIN AND LATERAL DRAINAG CANAL





SOLSONA DIVERSION DAM

MADONGAN DIVERSION DAM

LINK CANAL - 1

PAPA DIVERSION DAM

BONGA POWER STATION

OUTLET

NUOVA ERA DAM

MAIN LINK CANAL





NUOVA ERA DIVERSION WORKS

BONGA RIVER

ESPILITU

MADUPAYAS DIVERSION DAM

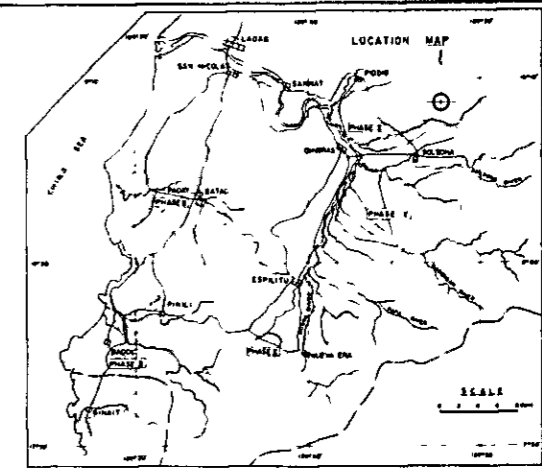
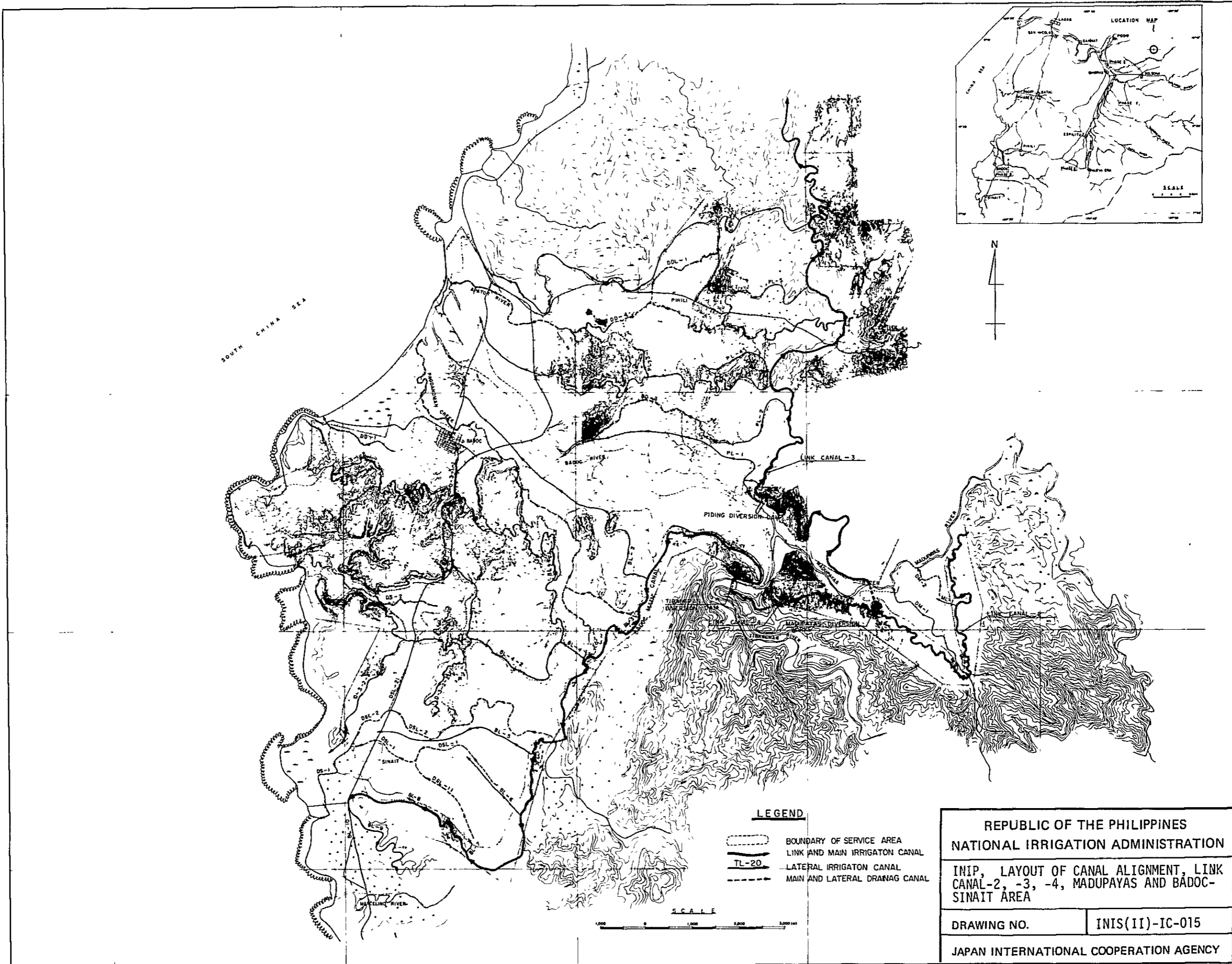
LEGEND

-  BOUNDAR OF SERVICE AREA
-  LINK AND MAIN IRRIGATION CANAL
-  LATERAL IRRIGATION CANAL
-  MAIN AND LATERAL DRAINAG CANAL

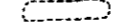

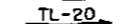

SCALE

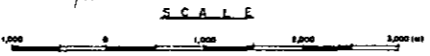


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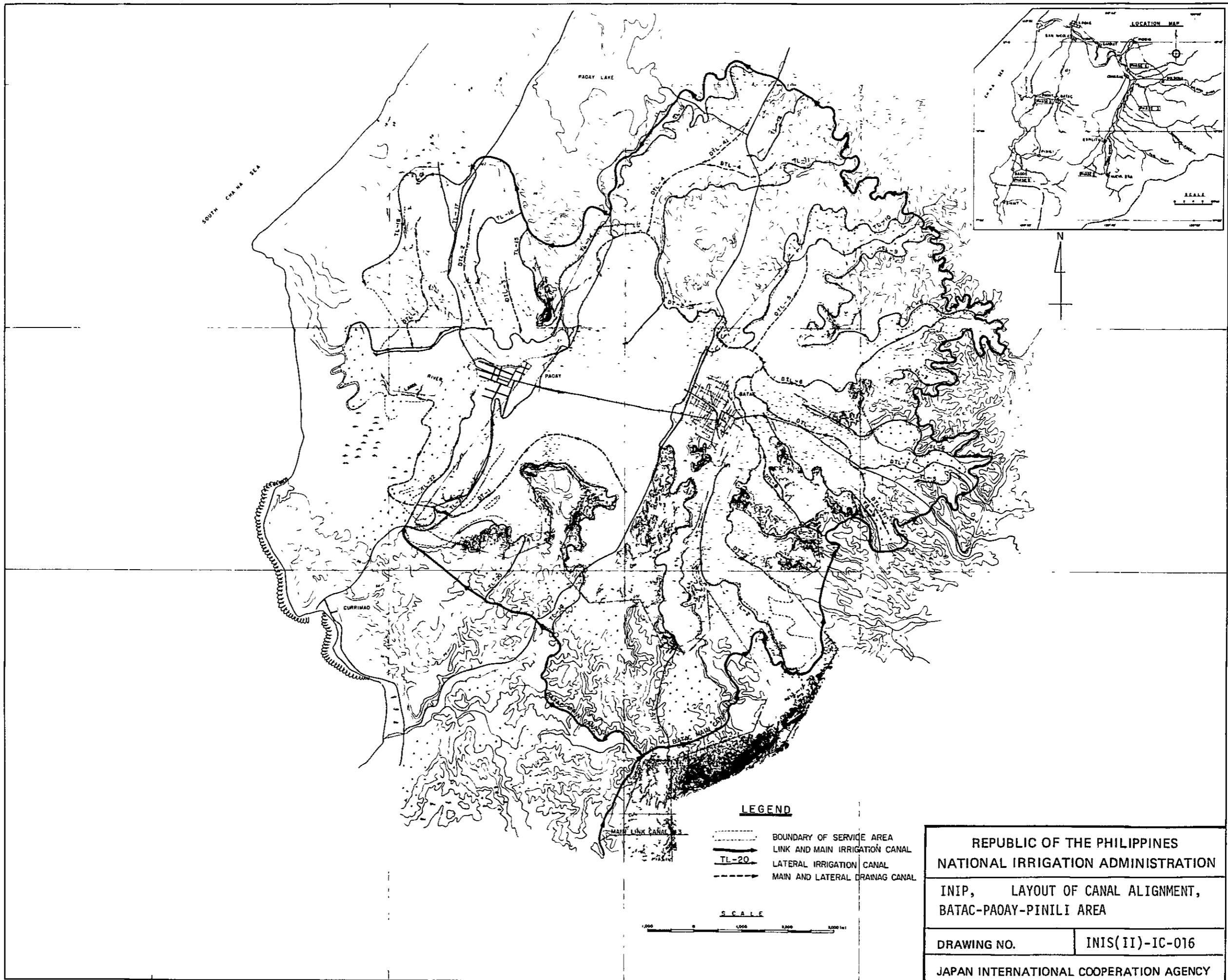


LEGEND

-  BOUNDARY OF SERVICE AREA
-  LINK AND MAIN IRRIGATION CANAL
-  TL-20 LATERAL IRRIGATION CANAL
-  MAIN AND LATERAL DRAINAGE CANAL



REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP, LAYOUT OF CANAL ALIGNMENT, LINK CANAL-2, -3, -4, MADUPAYAS AND BADOOC- SINAIT AREA	
DRAWING NO.	INIS(II)-IC-015
JAPAN INTERNATIONAL COOPERATION AGENCY	



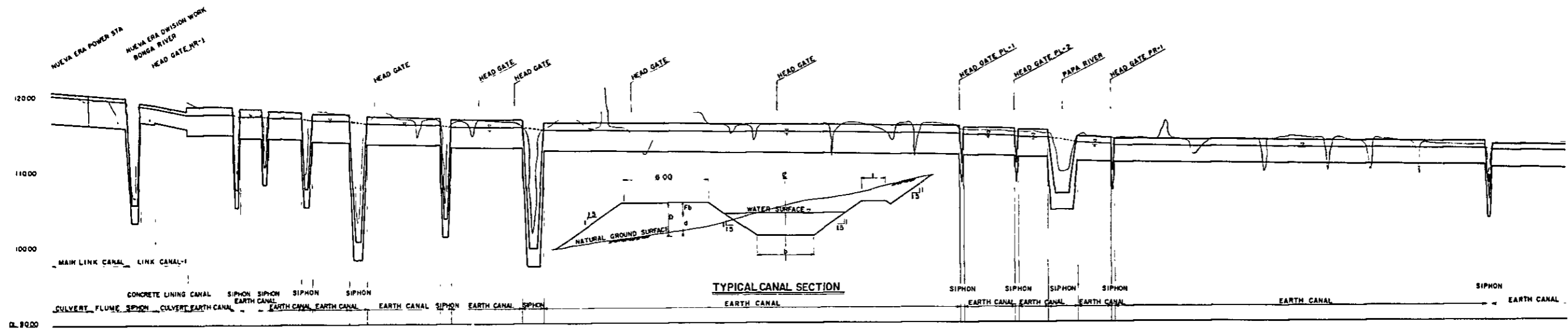
LEGEND

- BOUNDARY OF SERVICE AREA
- LINK AND MAIN IRRIGATION CANAL
- TL-20 LATERAL IRRIGATION CANAL
- MAIN AND LATERAL DRAINAG CANAL

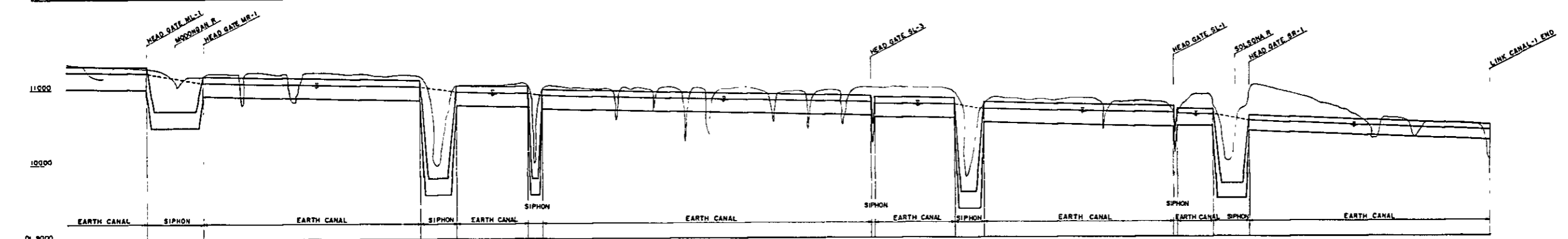
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REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP, LAYOUT OF CANAL ALIGNMENT, BATAC-PAOAY-PINILI AREA	
DRAWING NO.	INIS(II)-IC-016
JAPAN INTERNATIONAL COOPERATION AGENCY	



STATION	STRUCTURE	START	END	CBEL	WSL	Q	V	A	b	d	D	N	S
0+000	CONCRETE LINING CANAL	0+000	0+500	11000	11000	28273	204	1433	410	350	410	0015	100007
0+500	CULVERT	0+500	1+000	10000	10000	-	-	-	-	-	-	-	-
1+000	SIPHON	1+000	1+500	10000	10000	-	-	-	-	-	-	-	-
1+500	EARTH CANAL	1+500	2+000	10000	10000	-	-	-	-	-	-	-	-
2+000	EARTH CANAL	2+000	2+500	10000	10000	-	-	-	-	-	-	-	-
2+500	EARTH CANAL	2+500	3+000	10000	10000	-	-	-	-	-	-	-	-
3+000	EARTH CANAL	3+000	3+500	10000	10000	-	-	-	-	-	-	-	-
3+500	EARTH CANAL	3+500	4+000	10000	10000	-	-	-	-	-	-	-	-
4+000	EARTH CANAL	4+000	4+500	10000	10000	-	-	-	-	-	-	-	-
4+500	EARTH CANAL	4+500	5+000	10000	10000	-	-	-	-	-	-	-	-
5+000	EARTH CANAL	5+000	5+500	10000	10000	-	-	-	-	-	-	-	-
5+500	EARTH CANAL	5+500	6+000	10000	10000	-	-	-	-	-	-	-	-
6+000	EARTH CANAL	6+000	6+500	10000	10000	-	-	-	-	-	-	-	-
6+500	EARTH CANAL	6+500	7+000	10000	10000	-	-	-	-	-	-	-	-
7+000	EARTH CANAL	7+000	7+500	10000	10000	-	-	-	-	-	-	-	-
7+500	EARTH CANAL	7+500	8+000	10000	10000	-	-	-	-	-	-	-	-
8+000	EARTH CANAL	8+000	8+500	10000	10000	-	-	-	-	-	-	-	-
8+500	EARTH CANAL	8+500	9+000	10000	10000	-	-	-	-	-	-	-	-
9+000	EARTH CANAL	9+000	9+500	10000	10000	-	-	-	-	-	-	-	-
9+500	EARTH CANAL	9+500	10+000	10000	10000	-	-	-	-	-	-	-	-
10+000	EARTH CANAL	10+000	10+500	10000	10000	-	-	-	-	-	-	-	-
10+500	EARTH CANAL	10+500	11+000	10000	10000	-	-	-	-	-	-	-	-
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12+500	EARTH CANAL	12+500	13+000	10000	10000	-	-	-	-	-	-	-	-
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25+200	EARTH CANAL	25+200	35+50	10000	10000	-	-	-	-	-	-	-	-
35+50	EARTH CANAL	35+50	35+100	10000	10000	-	-	-	-	-	-	-	-
35+100	EARTH CANAL	35+100	36+100	10000	10000	-	-	-	-	-	-	-	-
36+100	EARTH CANAL	36+100	38+100	10000	10000	-	-	-	-	-	-	-	-
38+100	EARTH CANAL	38+100	39+100	10000	10000	-	-	-	-	-	-	-	-



STATION	STRUCTURE	START	END	CBEL	WSL	Q	V	A	b	d	D	N	S
0+210	EARTH CANAL	0+210	0+410	10000	10000	17544	152	1152	240	220	260	0015	100018
0+410	EARTH CANAL	0+410	0+860	10000	10000	163	1100	170	220	260	-	00005	-
0+860	EARTH CANAL	0+860	1+500	10000	10000	193	912	240	190	240	-	00013	-
1+500	EARTH CANAL	1+500	1+800	10000	10000	080	2938	675	271	370	0025	1000011	-
1+800	EARTH CANAL	1+800	1+500	10000	10000	152	1152	240	240	260	-	0015	100024
1+500	EARTH CANAL	1+500	1+600	10000	10000	060	2938	675	271	370	0025	1000011	-
1+600	EARTH CANAL	1+600	1+500	10000	10000	2746	850	262	360	-	-	-	-
1+500	EARTH CANAL	1+500	11+500	10000	10000	149	1105	235	235	262	0015	100032	-
11+500	EARTH CANAL	11+500	12+700	10000	10000	060	2746	650	262	360	0025	1000011	-
12+700	EARTH CANAL	12+700	13+100	10000	10000	14048	145	968	220	220	210	0015	100013

STATION	START	END	Q	V	A	b	d	D	N	S
0	0+500	0+500	28273	204	1433	410	350	410	0015	100007
0+500	1+0	1+0	-	-	-	-	-	-	-	-

STATION	START	END	Q	V	A	b	d	D	N	S
0	0+210	0+210	17544	152	1152	240	220	260	0015	100018
0+210	0+410	0+410	163	1100	170	220	260	-	00005	-
0+410	0+860	0+860	193	912	240	190	240	-	00013	-
0+860	1+500	1+500	080	2938	675	271	370	0025	1000011	-
1+500	1+800	1+800	152	1152	240	240	260	-	0015	100024
1+800	1+500	1+500	060	2938	675	271	370	0025	1000011	-
1+500	1+500	1+500	2746	850	262	360	-	-	-	-
11+500	11+500	11+500	149	1105	235	235	262	0015	100032	-
11+500	12+700	12+700	060	2746	650	262	360	0025	1000011	-
12+700	13+100	13+100	14048	145	968	220	220	210	0015	100013

STATION	START	END	Q	V	A	b	d	D	N	S
13+100	13+550	13+550	14048	060	2343	600	242	330	0025	1000012
13+550	13+600	13+600	12026	150	800	200	200	200	0015	1000036
13+600	20+900	20+900	060	2007	550	224	310	0025	1000004	-
20+900	21+700	21+700	9103	158	576	240	240	-	0015	1000013
21+700	24+700	24+700	7340	060	1225	450	175	260	0025	1000002
24+700	25+200	25+200	152	484	220	220	220	0015	1000014	-
25+200	35+50	35+50	060	1225	450	175	260	0025	1000002	-
35+50	35+100	35+100	5512	138	400	200	200	0015	1000030	-
35+100	36+100	36+100	060	924	375	152	220	0025	1000002	-
36+100	38+100	38+100	4341	-	729	350	135	210	-	1000026

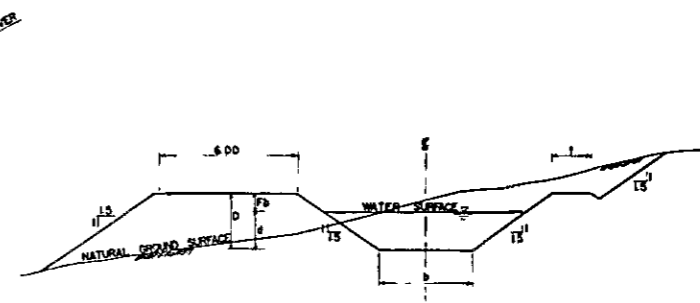
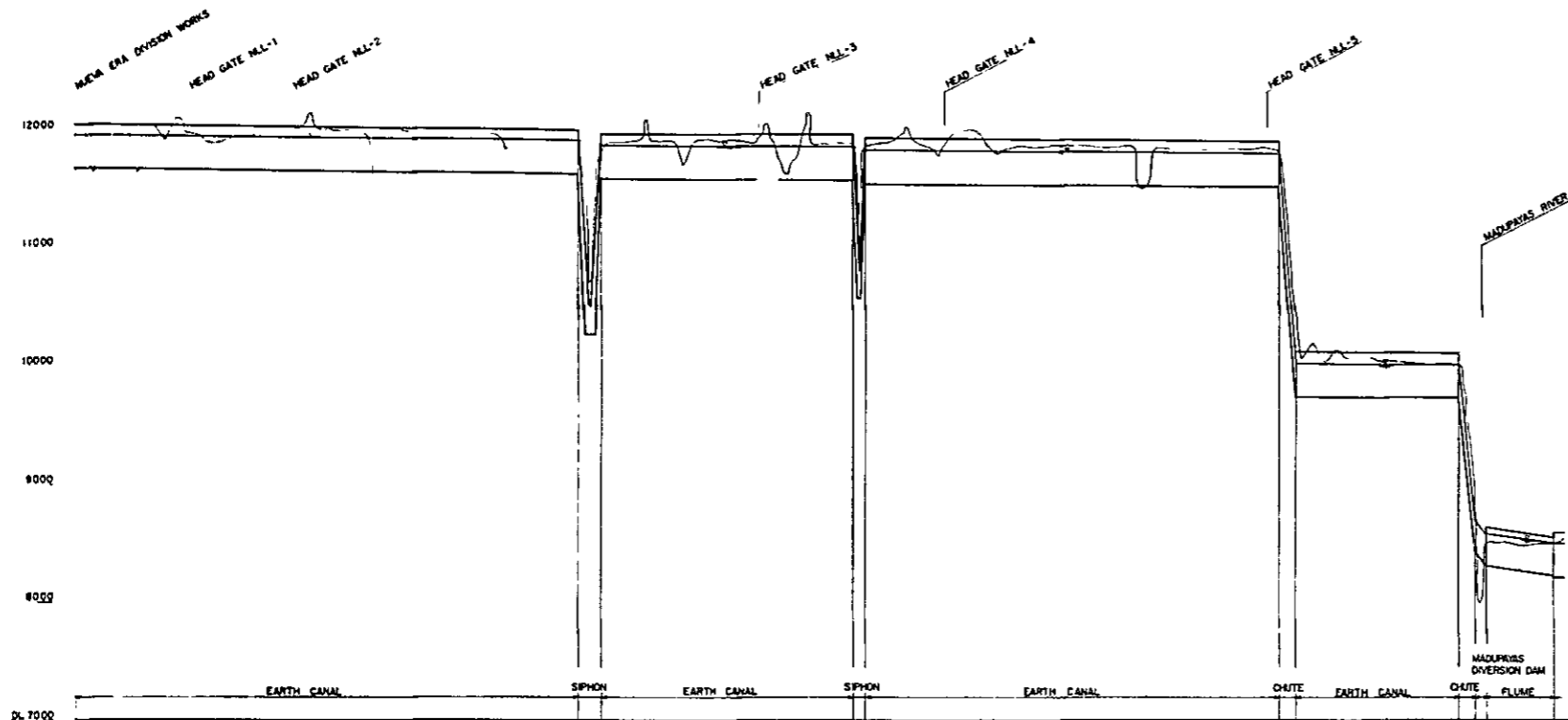
- CO CUMULATIVE DISTANCE (M)
- CBEL CANAL BED ELEVATION (M)
- WSL WATER SURFACE ELEVATION
- Q DISCHARGE (CU M/SEC)
- V CANAL VELOCITY (M/SEC)
- A CANAL CROSS SECTIONAL AREA (SQ M)
- b CANAL BED WIDTH (M)
- d WATER DEPTH (M)
- D CANAL DEPTH (M)
- N MANNING'S ROUGHNESS COEFFICIENT
- S CANAL SLOPE

REPUBLIC OF THE PHILIPPINES
NATIONAL IRRIGATION ADMINISTRATION

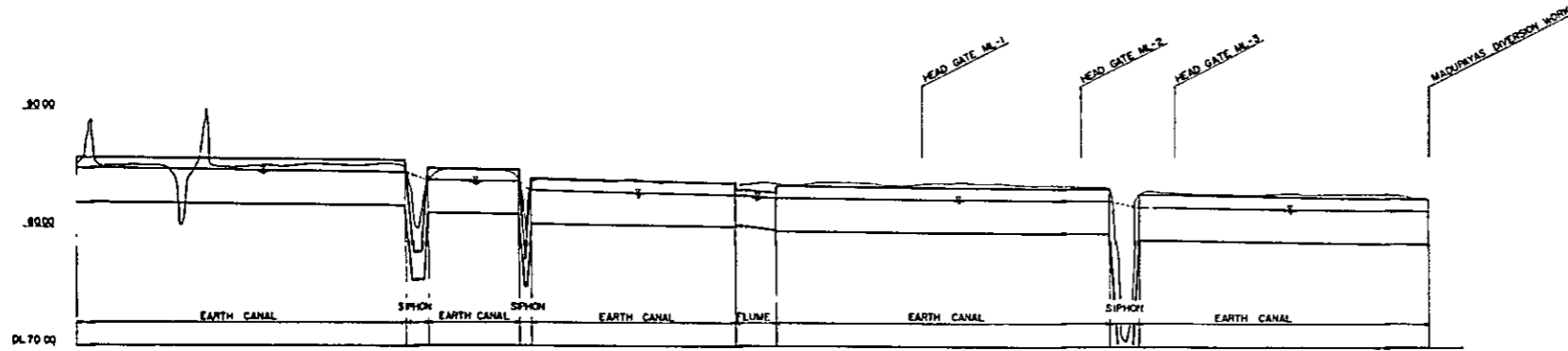
INIP
 PROFILE OF MAIN LINK CANAL AND LINK
 CANAL-1

DRAWING NO. INIS(II)-IC-017

JAPAN INTERNATIONAL COOPERATION AGENCY

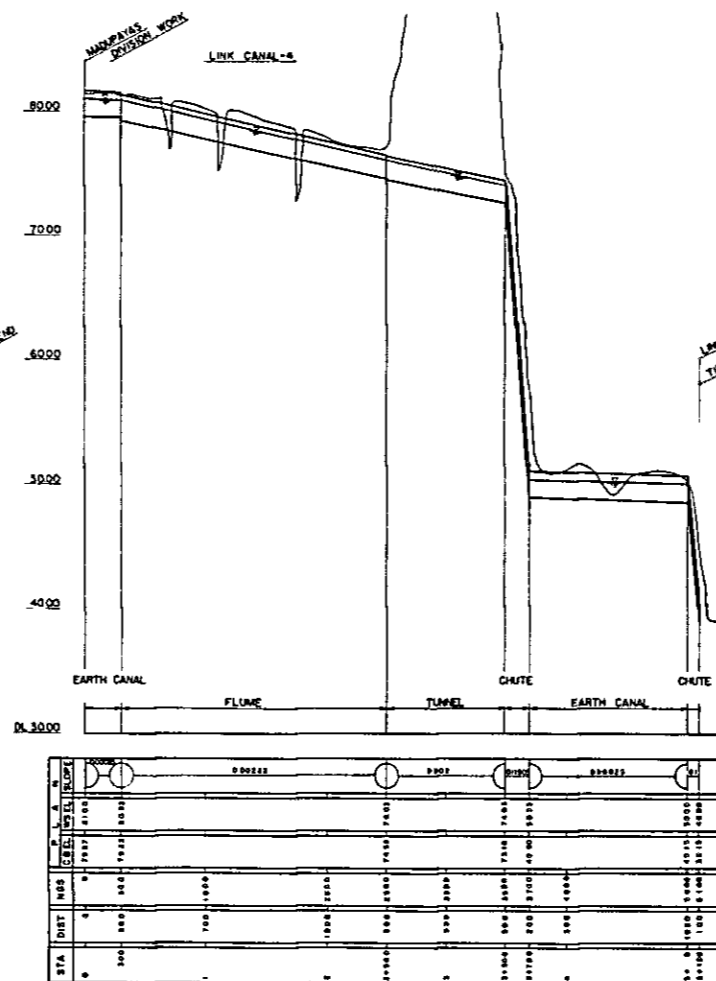
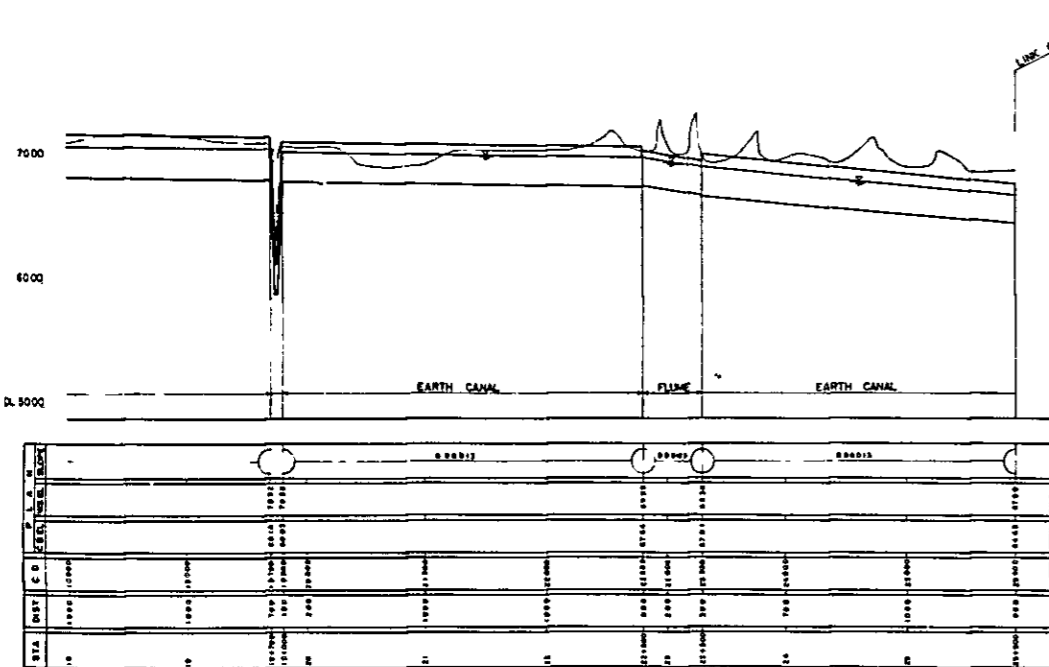
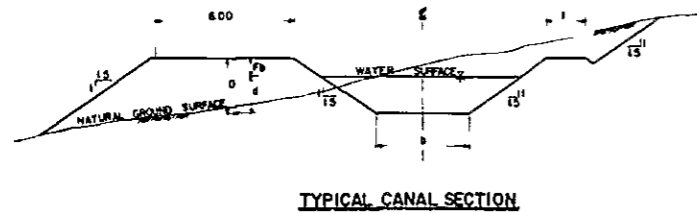
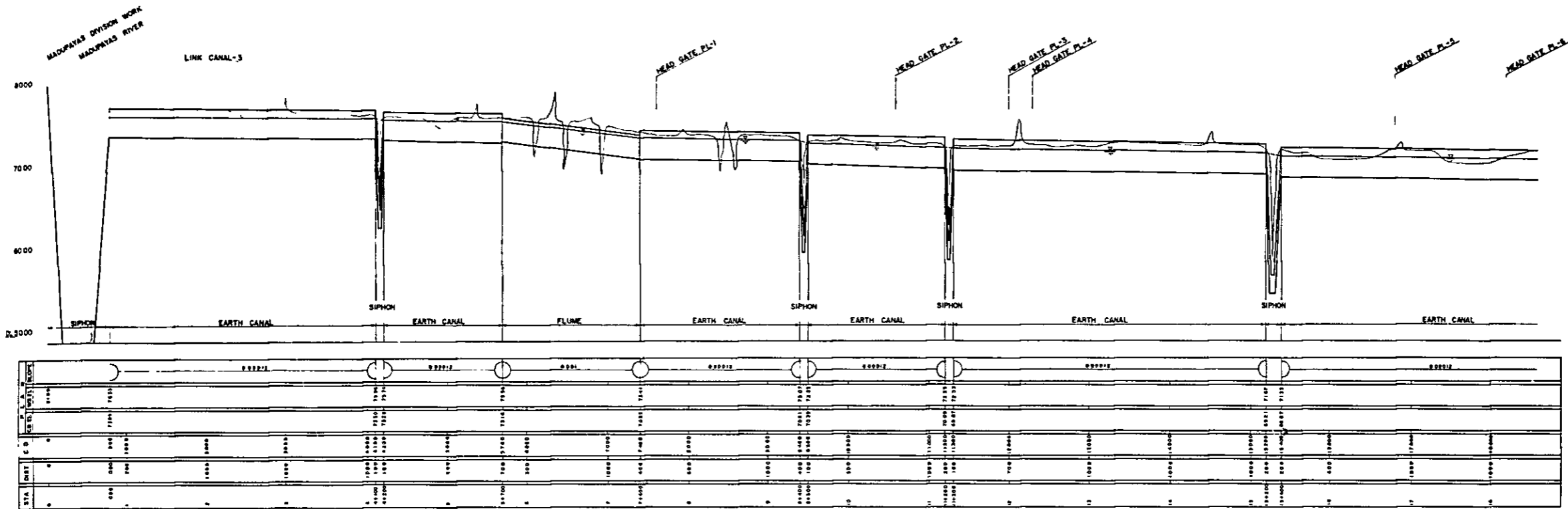


STATION		CANAL DIMENSION									
START	END	D	V	A	b	d	D	N	S		
0	4+400	18958	0.60	3181	700	282	380	0.025	0.00001		
4+400	4+600	-	1.65	1152	240X240X2			0.015	0.00021		
4+600	6+800	-	0.60	3181	700	282	380	0.025	0.00001		
6+800	6+900	-	1.65	1152	240X240X2			0.015	0.00021		
6+900	10+500	-	0.60	3181	700	282	380	0.025	0.00001		
10+500	10+650	-	3.30	550	500	110	240	0.015	0.1176		
10+650	12+50	-	0.60	3181	700	282	380	0.025	0.00001		
12+50	12+200	-	3.30	550	500	110	240	0.015	0.1176		
12+200	12+800	18465	2.00	845	350	270	320	0.015	0.00008		
12+800	15+700	-	0.60	3136	700	280	380	0.025	0.00001		
15+700	15+900	-	1.60	1152	240X240X2			0.015	0.00035		
15+900	16+700	-	0.60	3136	700	280	380	0.025	0.00001		
16+700	16+800	-	1.60	1152	240X240X2			0.015	0.00035		
16+800	18+600	-	0.60	3136	700	280	380	0.025	0.00001		
18+600	18+950	-	2.00	845	350	270	320	0.015	0.00008		
18+950	21+850	-	0.60	3136	700	280	380	0.025	0.00001		
21+850	22+100	-	1.60	1152	240X240X2			0.015	0.00035		
22+100	24+600	-	0.60	3136	700	280	380	0.025	0.00001		



STATION	START	END	D	V	A	b	d	D	N	S
0	4+400	4+600	1.65	1152	240X240X2				0.015	0.00021
4+600	6+800	6+900	1.65	1152	240X240X2				0.015	0.00021
6+900	10+500	10+650	3.30	550	500	110	240		0.015	0.1176
10+650	12+50	12+200	3.30	550	500	110	240		0.015	0.1176
12+200	12+800	12+800	2.00	845	350	270	320		0.015	0.00008
12+800	15+700	15+900	1.60	1152	240X240X2				0.015	0.00035
15+900	16+700	16+800	1.60	1152	240X240X2				0.015	0.00035
16+800	18+600	18+950	2.00	845	350	270	320		0.015	0.00008
18+950	21+850	22+100	1.60	1152	240X240X2				0.015	0.00035
22+100	24+600	24+600	0.60	3136	700	280	380		0.025	0.00001

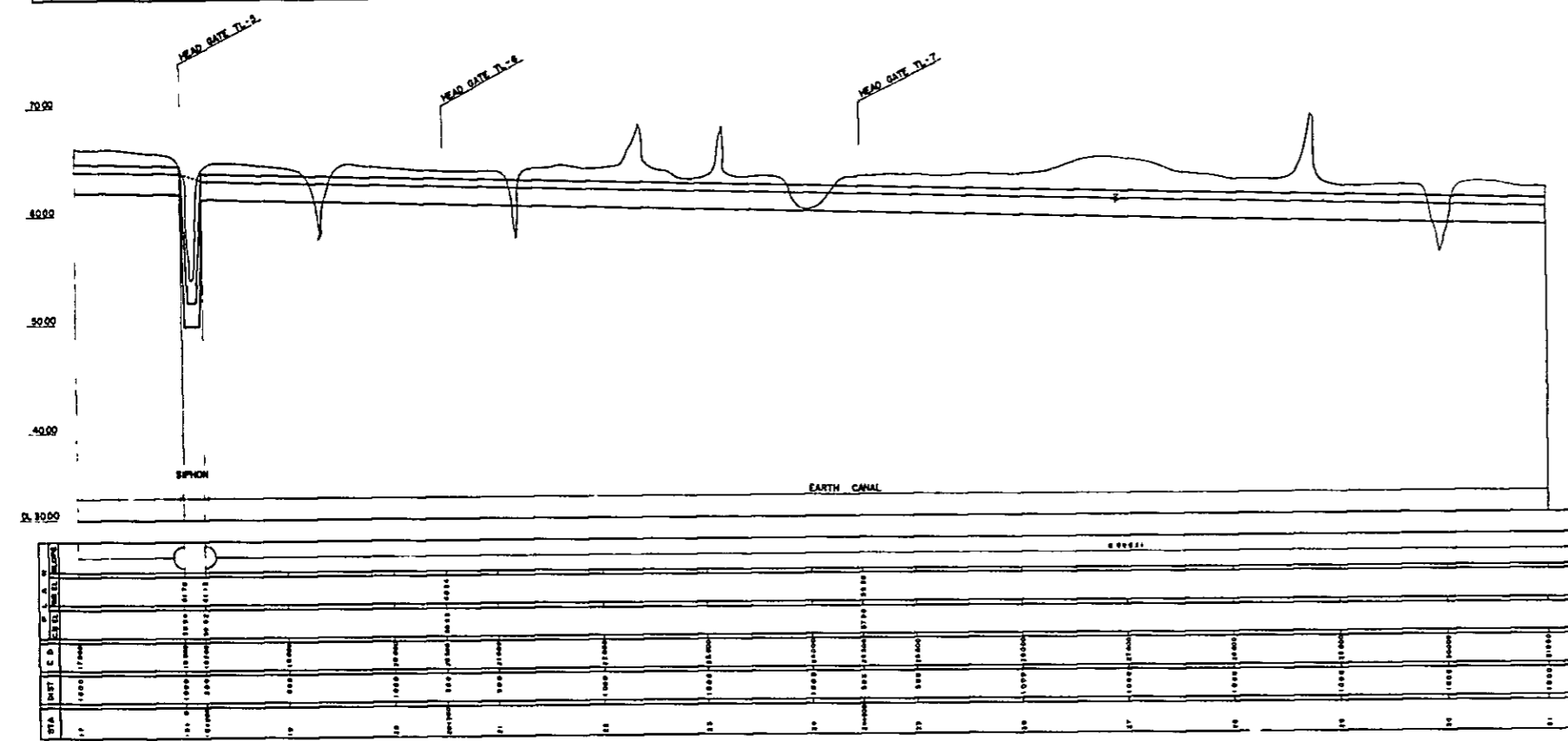
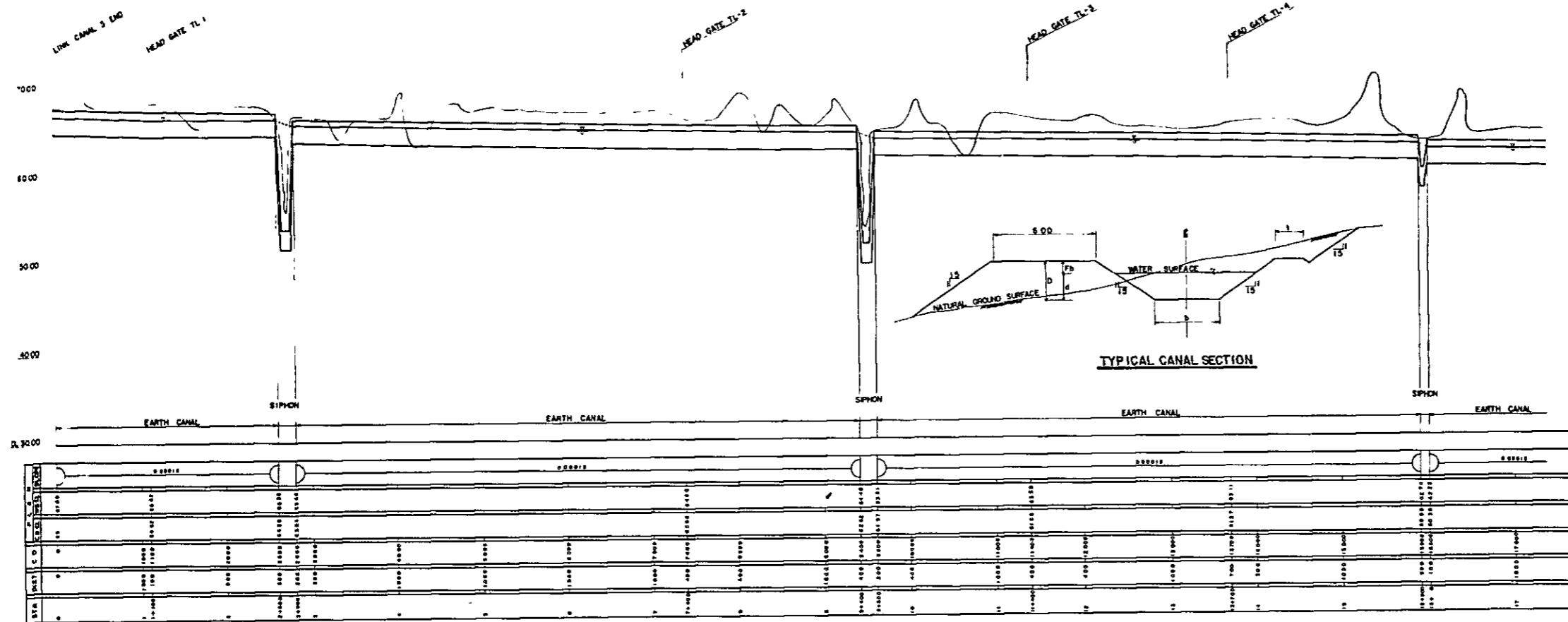
REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP
 PROFILE OF LINK CANAL-2
 DRAWING NO. INIS(II)-IC-018
 JAPAN INTERNATIONAL COOPERATION AGENCY



STATION		CANAL DIMENSION (LINK CANAL-3)									
START	END	Q	V	A	b	d	D	N	S		
0	0+800	14482	320	452	D+240			0.012	0.00039		
0+800	4+100	-	0.60	2421	625	246	350	0.025	0.000012		
4+100	4+200	-	1.64	882	210x210x2			0.015	0.00022		
4+200	5+700	-	0.60	2421	625	246	350	0.025	0.000012		
5+700	7+400	-	2.02	720	300	240	290	0.015	0.00010		
7+400	19+700	-	0.60	2421	625	246	350	0.025	0.000012		
19+700	19+800	15187	1.50	882	210x210x2			0.015	0.00024		
19+800	25+900	-	0.60	2209	600	235	330	0.025	0.000012		

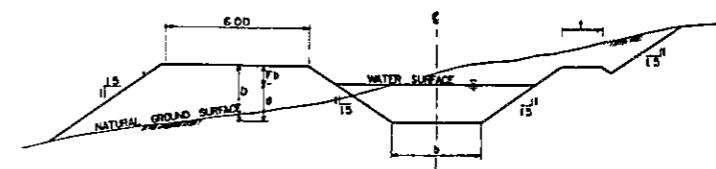
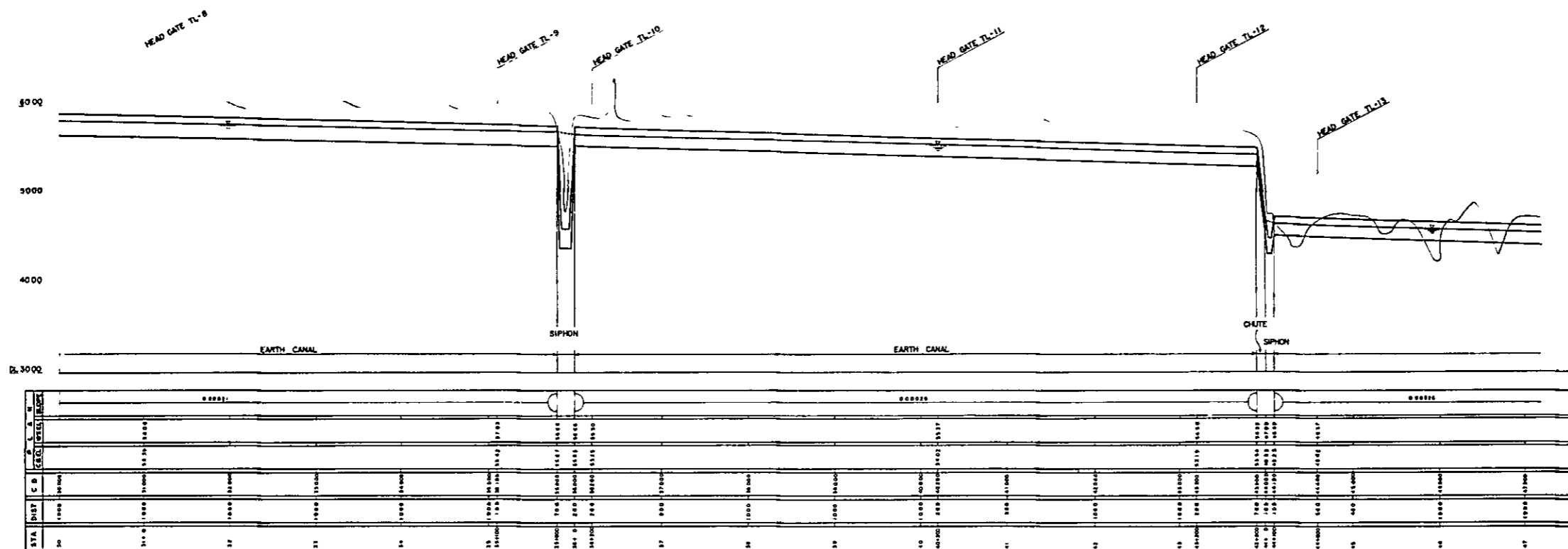
STATION		CANAL DIMENSION (LINK CANAL-4)									
START	END	Q	V	A	b	d	D	N	S		
0	0+300	4885	0.60	818	150	143	210	0.025	0.000026		
0+300	2+500	-	2.03	255	150	170	210	0.015	0.00022		
2+500	3+500	-	1.95	253	160	144	180	-	0.00020		
3+500	3+700	-	2.90	170	200	085	150	-	0.01185		
3+700	5+0	-	0.60	818	150	143	210	0.025	0.000026		
5+0	5+100	-	2.90	170	200	085	150	0.015	0.01000		

REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP
 PROFILE OF LINK CANAL-3 AND -4
 DRAWING NO. INIS(II)-IC-019
 JAPAN INTERNATIONAL COOPERATION AGENCY



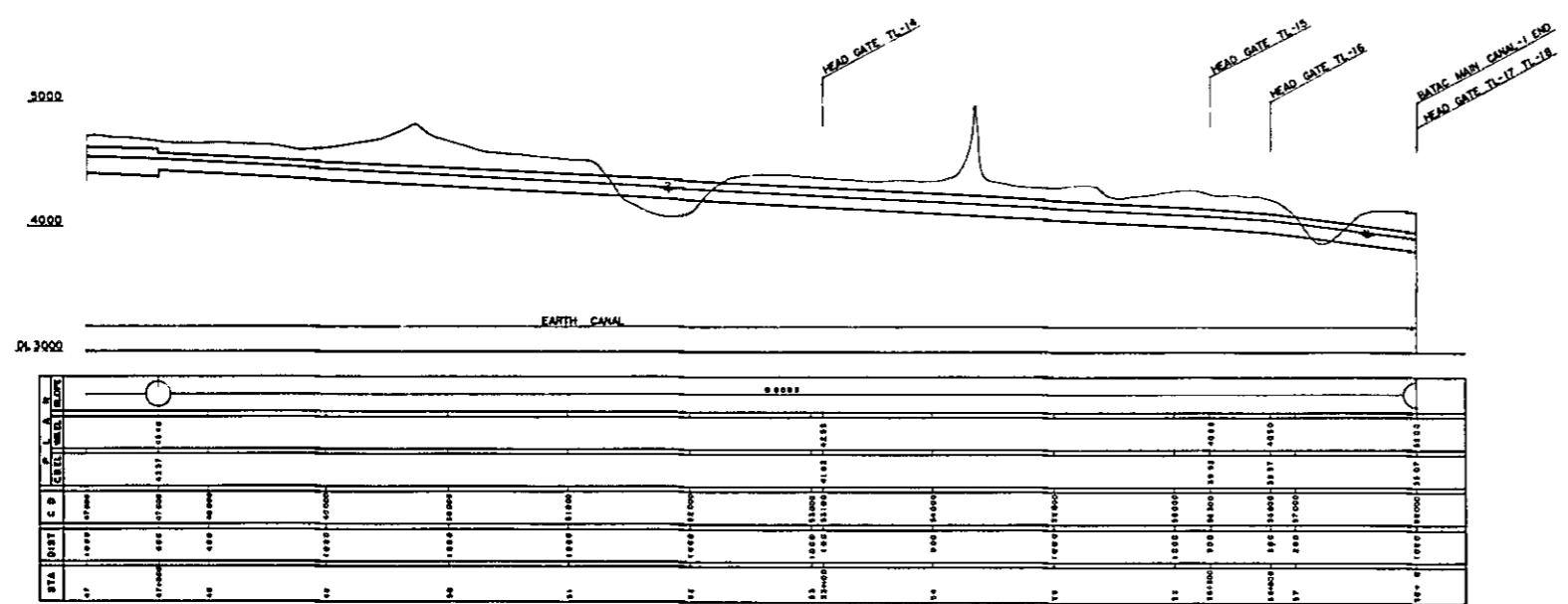
STATION		CANAL DIMENSION							
START	END	Q	V	A	b	d	D	N	S
0	2+600	9.394	0.60	14.00	5.00	2.00	2.80	0.025	0.000016
2+600	2+800	8.074	1.67	4.84	2.20x2.20			0.015	0.00020
2+800	18+0	0	0.60	13.54	4.50	1.64	2.60	0.025	0.000018
18+0	18+200	6.224	1.41	4.41	2.10x2.10			0.015	0.00018
18+200	35+800	-	0.60	10.37	4.00	1.61	2.30	0.025	0.000021
35+800	36+0	4.367	1.35	3.24	1.80x1.80			0.015	0.00010
36+0	43+900	-	0.60	7.29	3.50	1.35	2.10	0.025	0.000028

REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP
 PROFILE OF BATAC MAIN CANAL-1
 DRAWING NO. INIS(II)-IC-020
 JAPAN INTERNATIONAL COOPERATION AGENCY

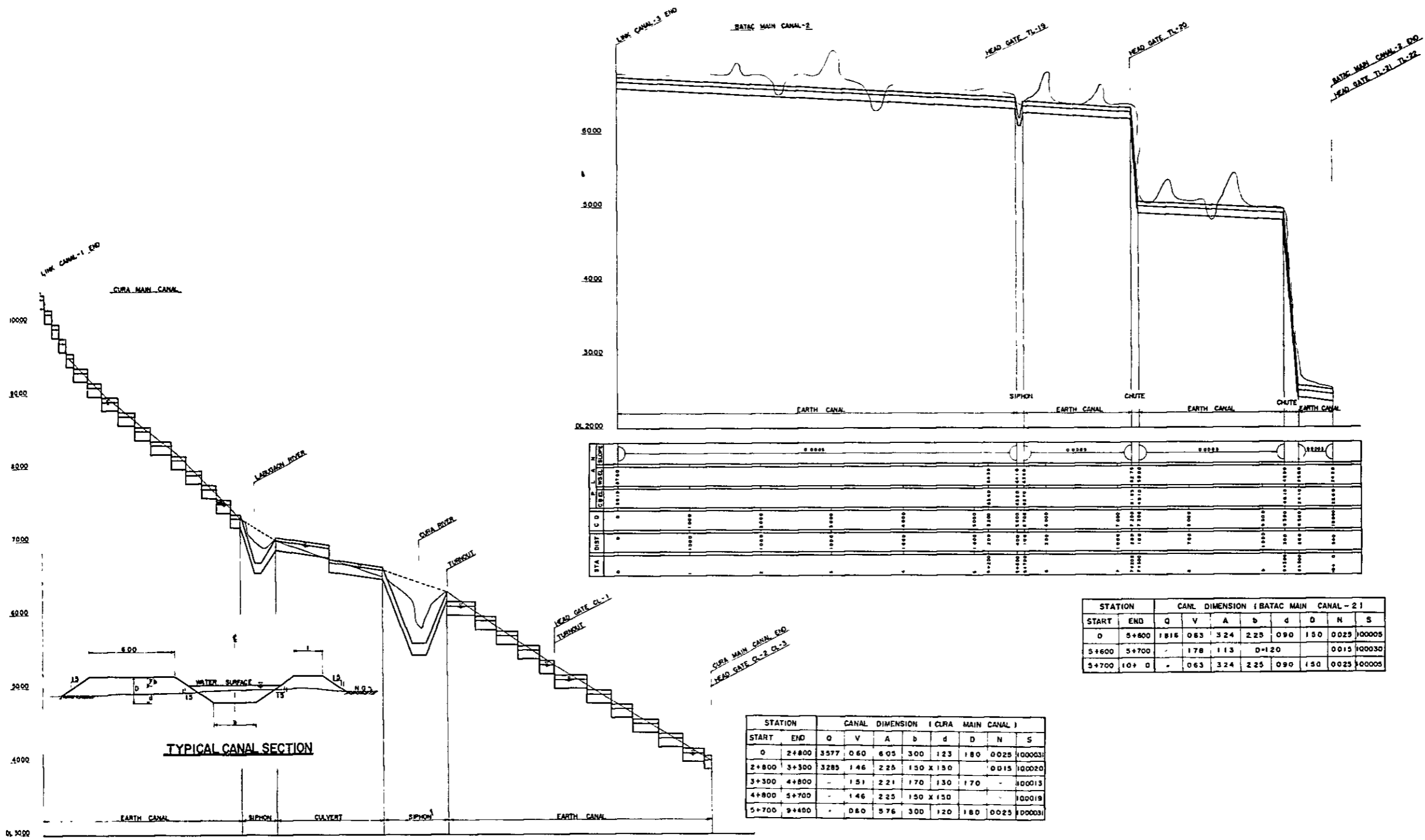


TYPICAL CANAL SECTION

STATION		CANAL DIMENSION								
START	END	Q	V	A	b	d	D	N	S	
36+	43+900	4367	0.60	729	330	1.35	2.10	0.025	1000028	
43+900	44+	-	2.75	156	200	0.78	1.20	0.015	100732	
44+	47+600	-	0.60	720	330	1.35	2.10	0.025	1000028	
47+600	58+	2067	0.60	346	225	0.85	1.50	-	100005	



REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP
 PROFILE OF BATAC MAIN CANAL-1
 DRAWING NO. INIS(II)-IC-021
 JAPAN INTERNATIONAL COOPERATION AGENCY



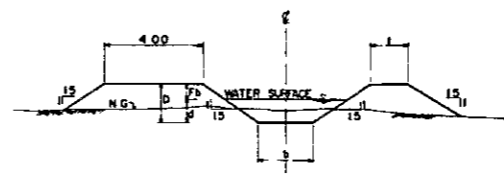
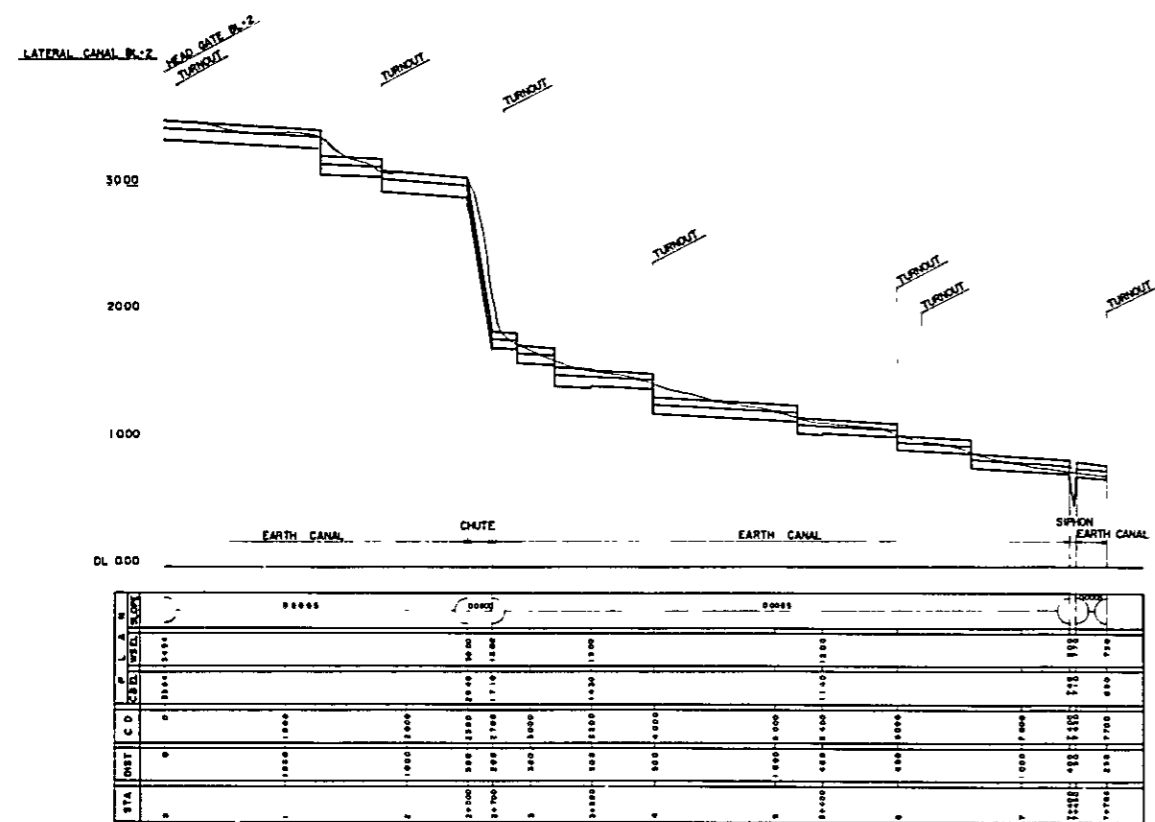
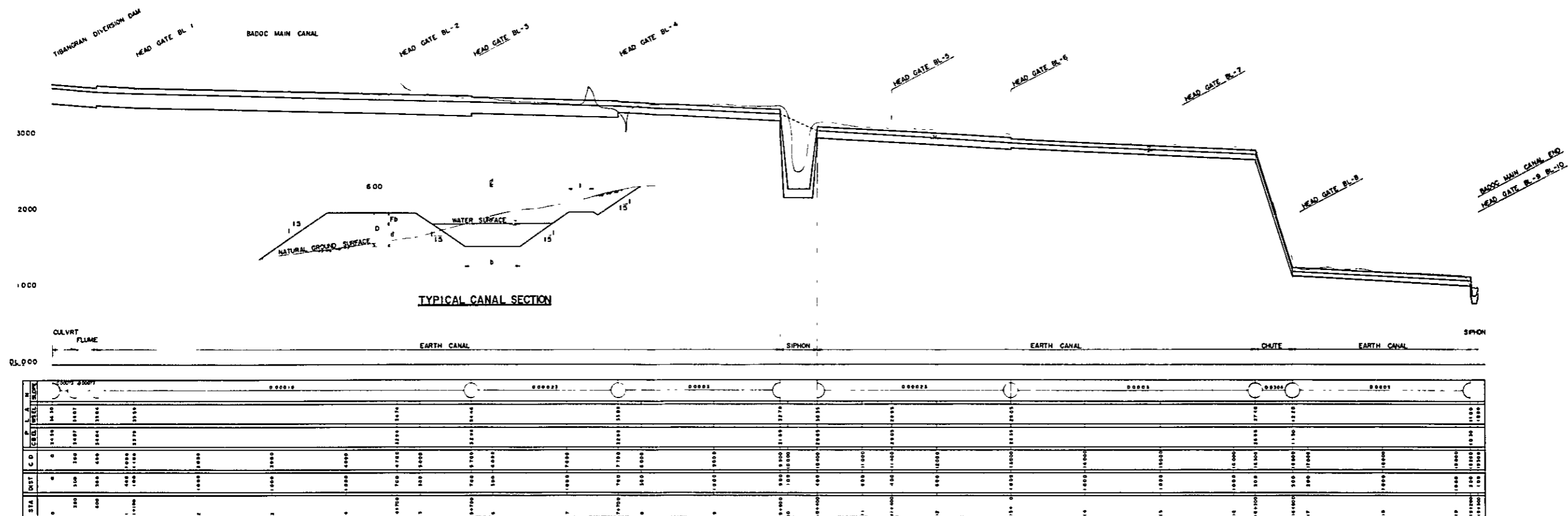
STATION	0+000	0+500	1+000	1+500	2+000	2+500	3+000	3+500	4+000	4+500	5+000	5+500	6+000
PLAN													
SECTION													
C/D													
DIST													
STA													

STATION	CANAL DIMENSION (BATAC MAIN CANAL-2)									
START	END	Q	V	A	b	d	D	N	S	
0	5+800	1818	0.83	3.24	2.25	0.90	1.50	0.025	100009	
5+600	5+700	-	1.78	1.13	0+1.20			0.015	100030	
5+700	10+0	-	0.63	3.24	2.25	0.90	1.50	0.025	100009	

STATION	CANAL DIMENSION (CURA MAIN CANAL)									
START	END	Q	V	A	b	d	D	N	S	
0	2+800	3577	0.60	6.05	3.00	1.23	1.80	0.025	100003	
2+800	3+300	3285	1.46	2.25	1.50 x 1.50			0.015	100020	
3+300	4+800	-	1.51	2.21	1.70 x 1.30			1.70	100013	
4+800	5+700	-	1.46	2.25	1.50 x 1.50				100019	
5+700	9+400	-	D&O	5.76	3.00	1.20	1.80	0.025	100003	

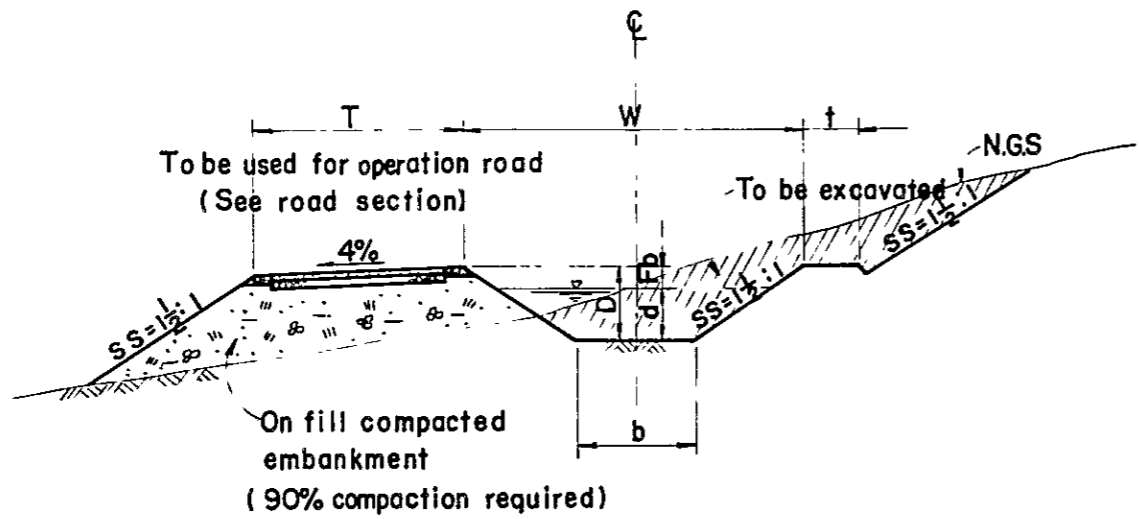
STATION	0+000	0+500	1+000	1+500	2+000	2+500	3+000	3+500	4+000	4+500	5+000	5+500	6+000
PLAN													
SECTION													
C/D													
DIST													
STA													

REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP
 PROFILE OF CURA MAIN CANAL AND BATAC
 MAIN CANAL-2
 DRAWING NO. INIS(II)-IC-022
 JAPAN INTERNATIONAL COOPERATION AGENCY

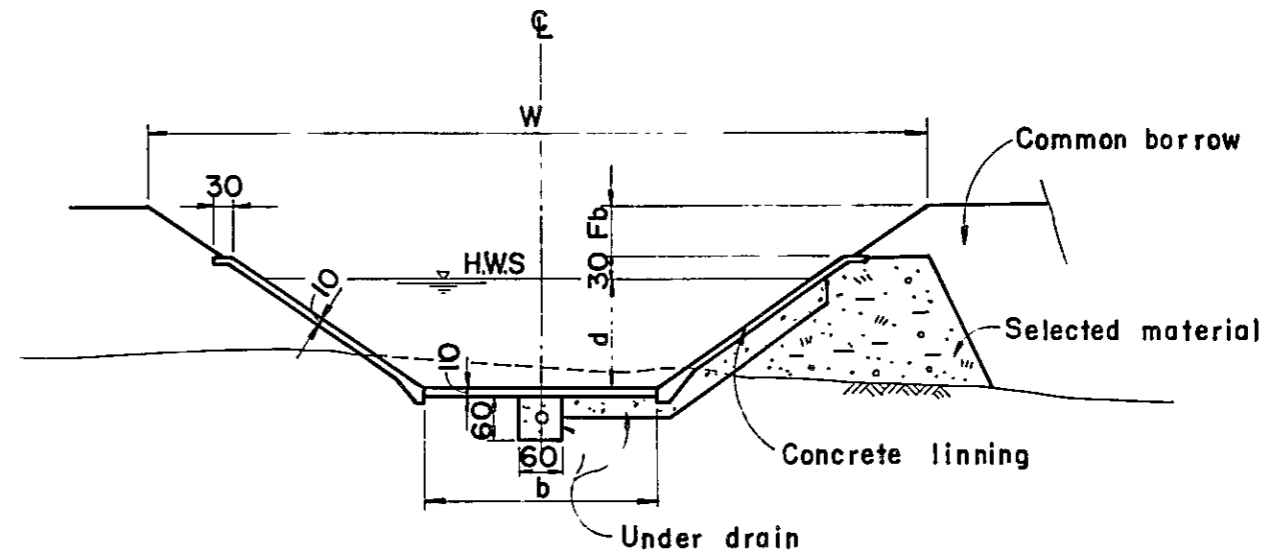


STATION	START	END	Q	V	A	b	d	D	N	S
0	2+500	1862	063	324	225	090	150	0.025	1000005	
2+500	2+700	-	230	078	150	052	100	0.015	100600	
2+700	3+500	-	063	324	225	090	150	0.025	1000005	
3+500	5+400	0948	053	196	175	070	120	-	-	
5+400	7+700	0687	048	144	150	060	110	-	-	

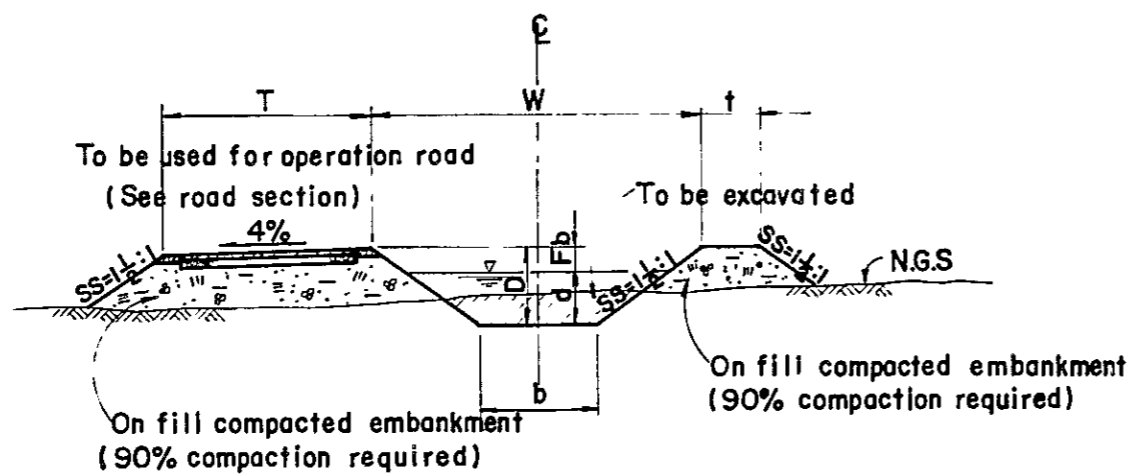
REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION
 INIP
 PROFILE OF BADOC MAIN CANAL AND
 LATERAL CANAL BL-2
 DRAWING NO. INIS(II)-IC-023
 JAPAN INTERNATIONAL COOPERATION AGENCY



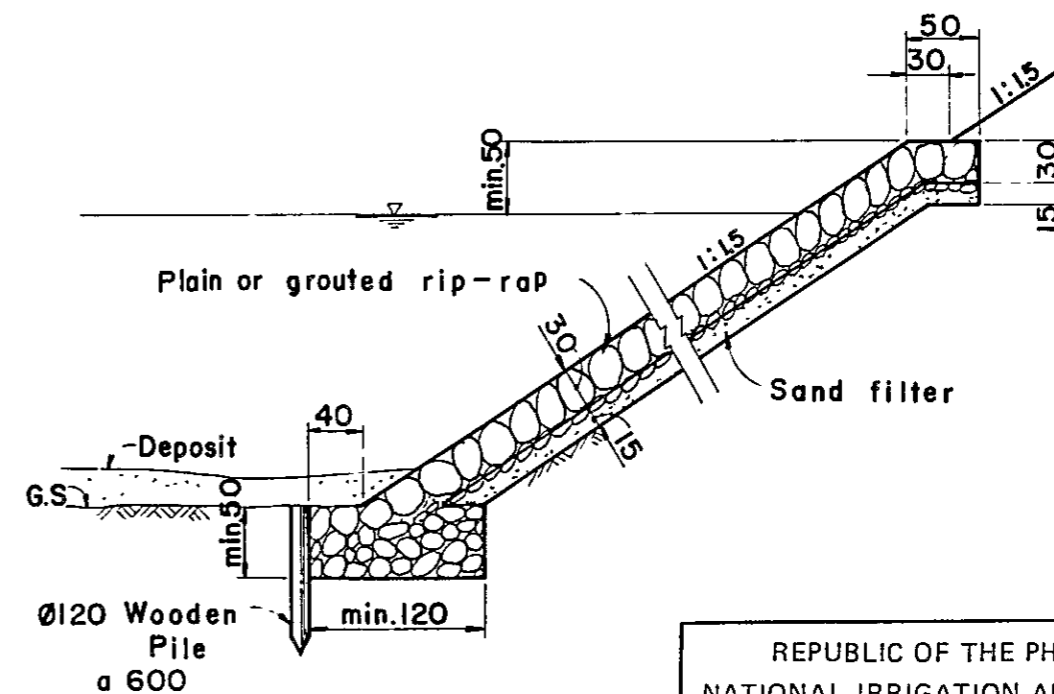
TYPICAL SECTION FOR INCLINED GROUND SURFACE



CONCRET LINNING

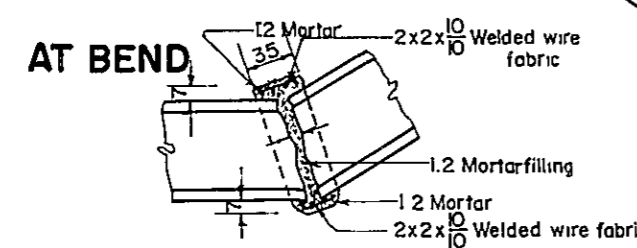
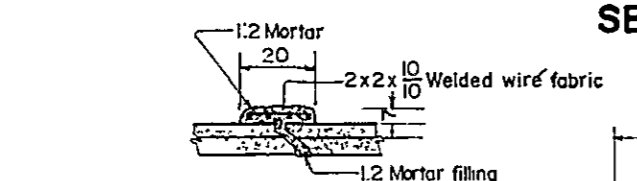
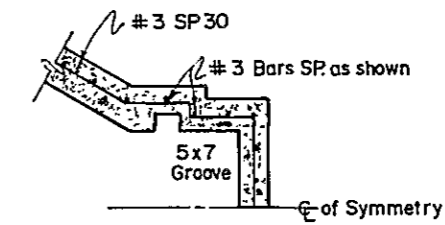
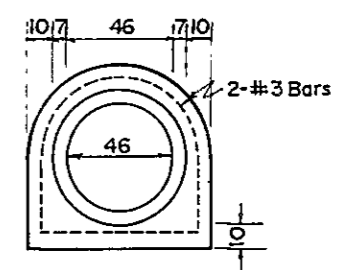
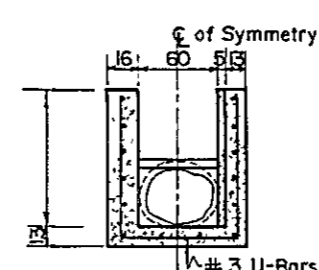
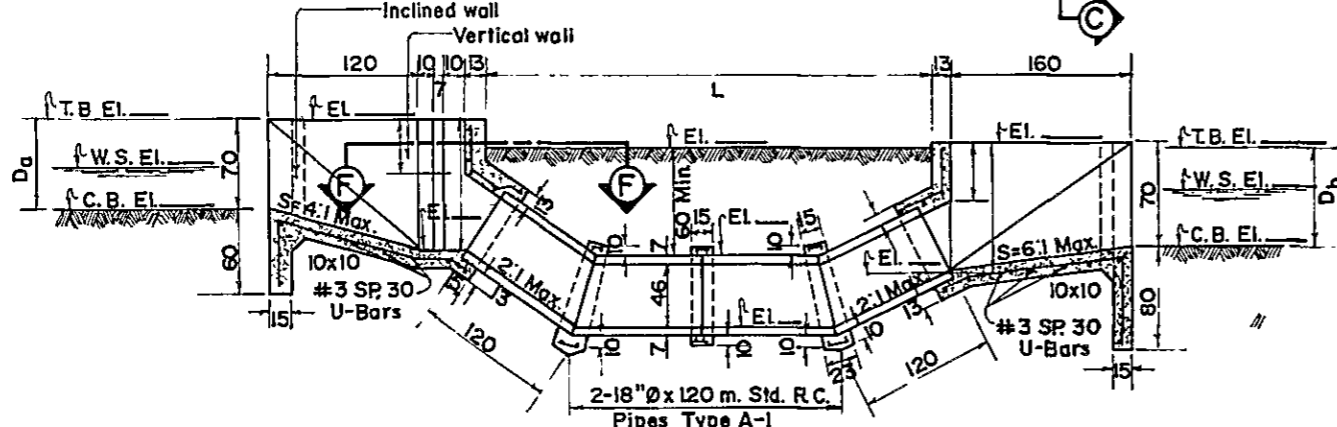
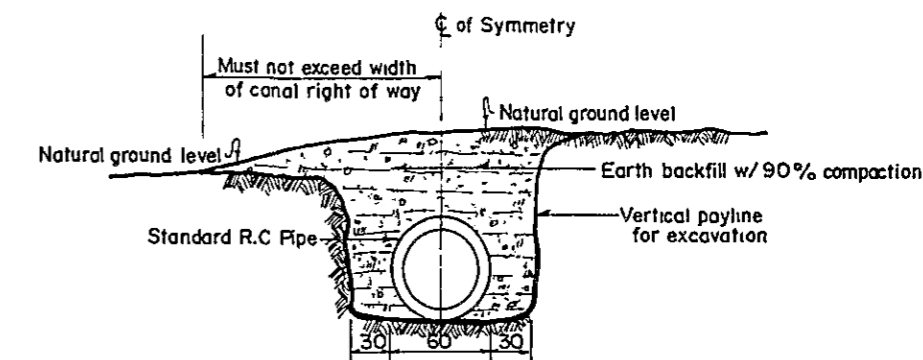
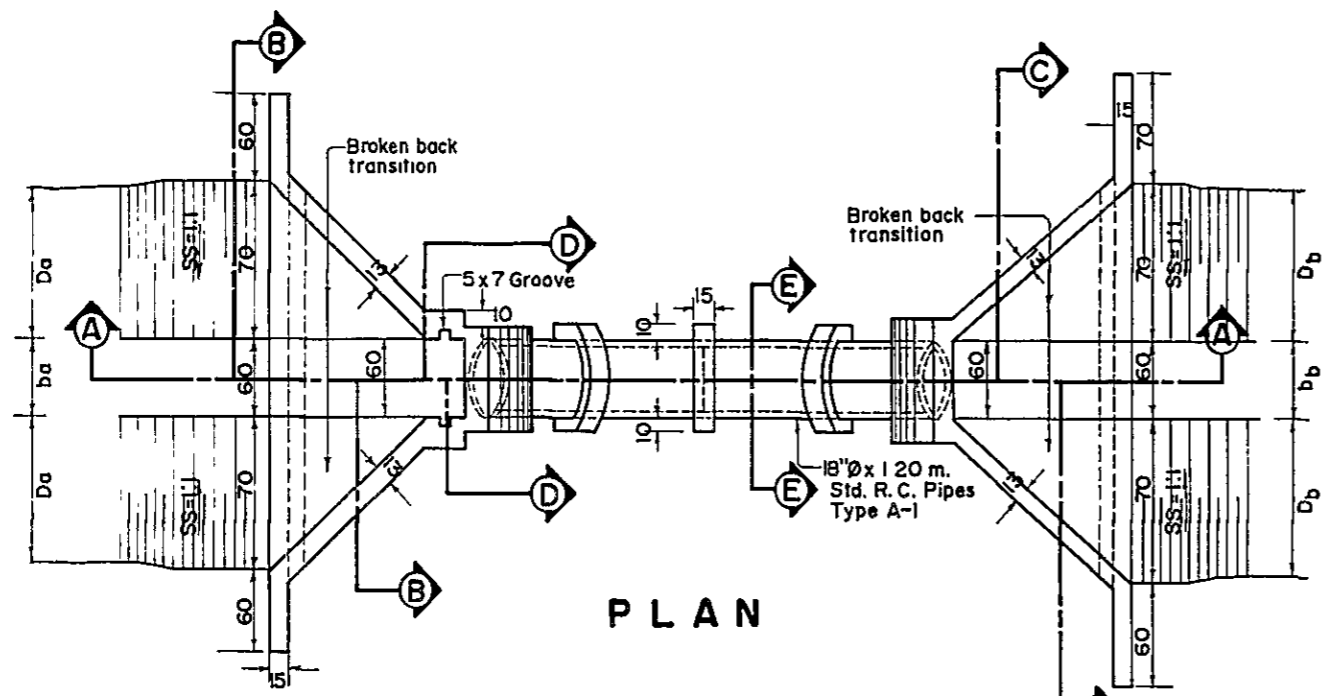


TYPICAL SECTION FOR FLAT GROUND SURFACE

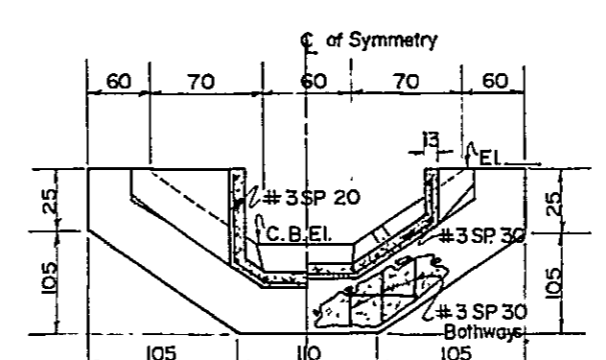
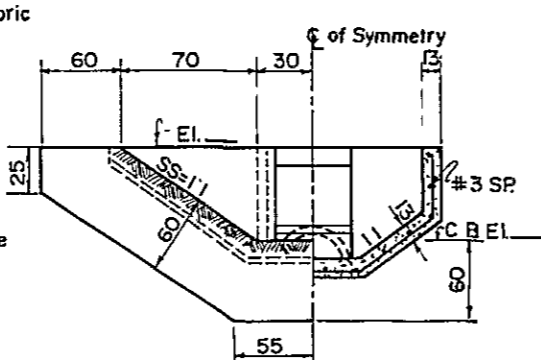


GRAVEL PAVEMENT

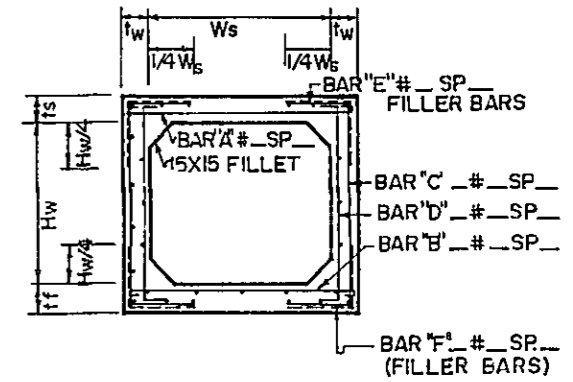
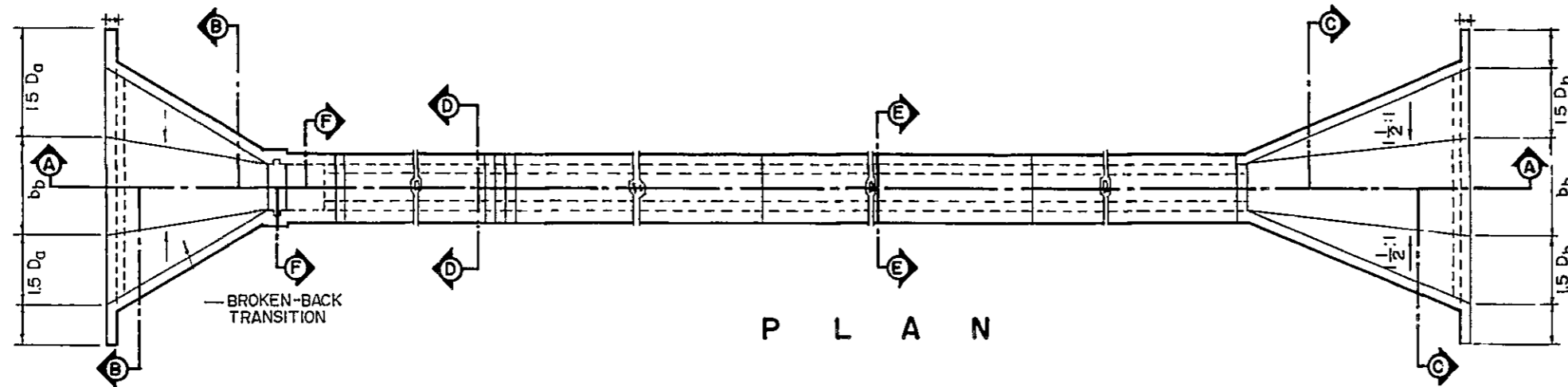
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL SECTION OF IRRIGATION CANAL	
DRAWING NO.	INIS (II) - IC - 024
JAPAN INTERNATIONAL COOPERATION AGENCY	



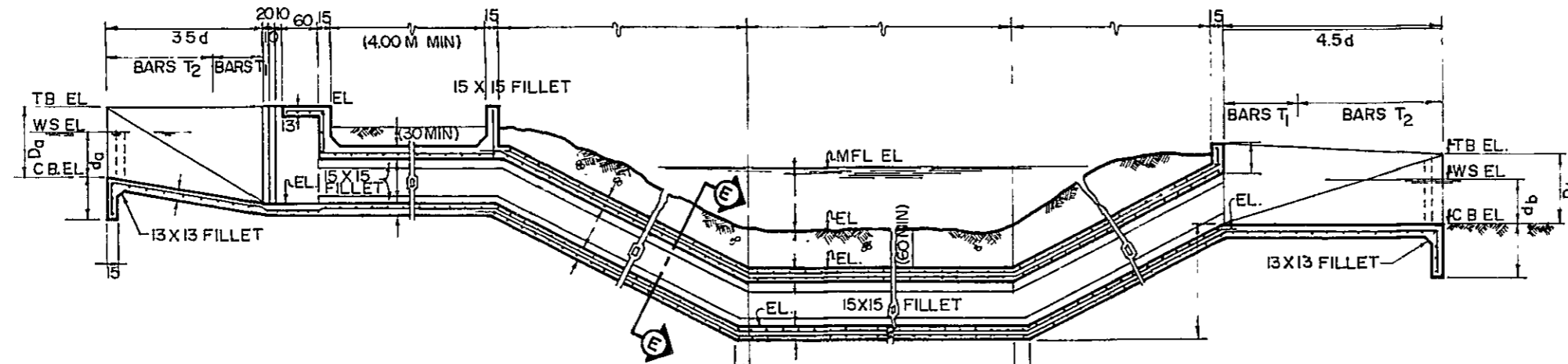
ALTERNATE PIPE COLLAR



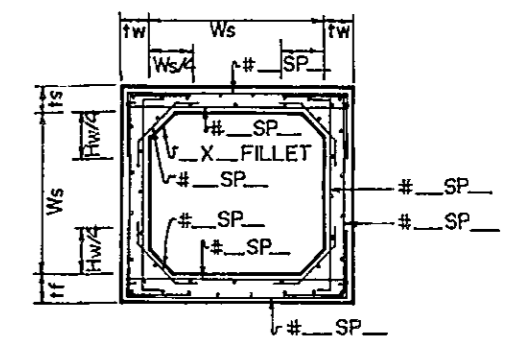
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL RCP CROSSING	
DRAWING NO	INIS (II) - IC - 026
JAPAN INTERNATIONAL COOPERATION AGENCY	



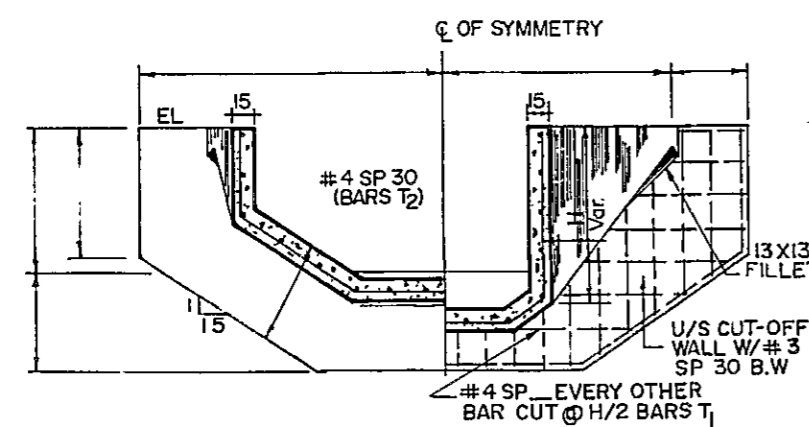
SECTION "D - D"



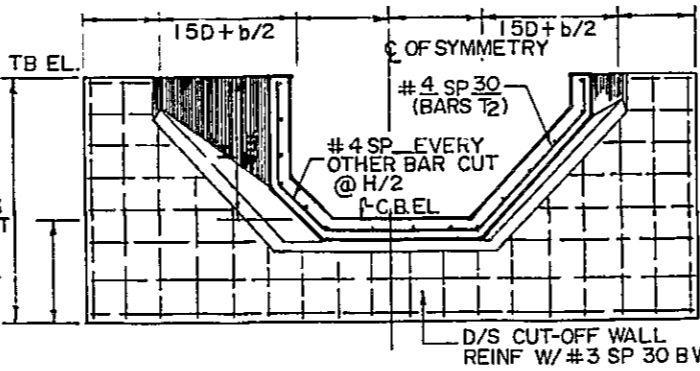
SECTION "A - A"



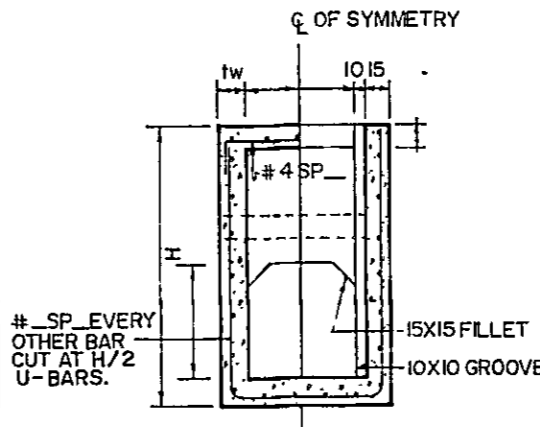
SECTION "E - E"



SECTION "B - B"

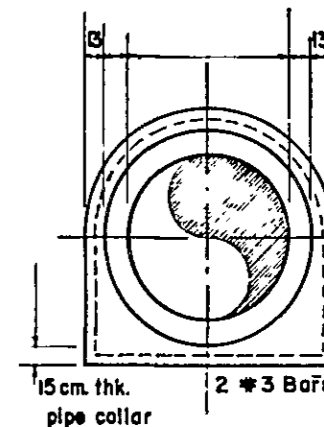
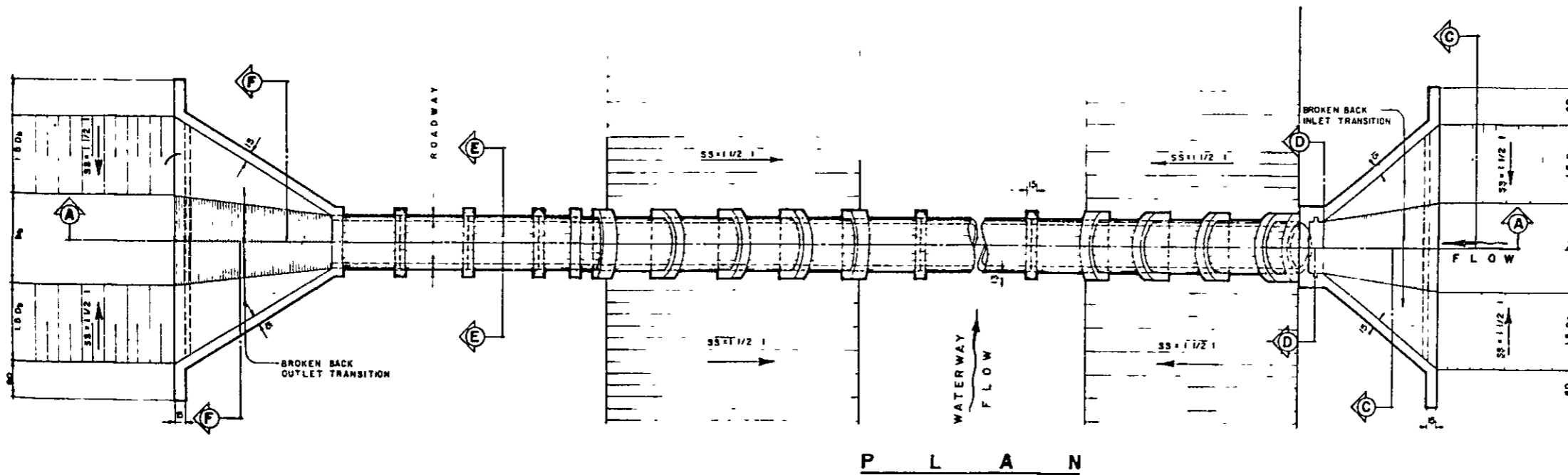


SECTION "C - C"

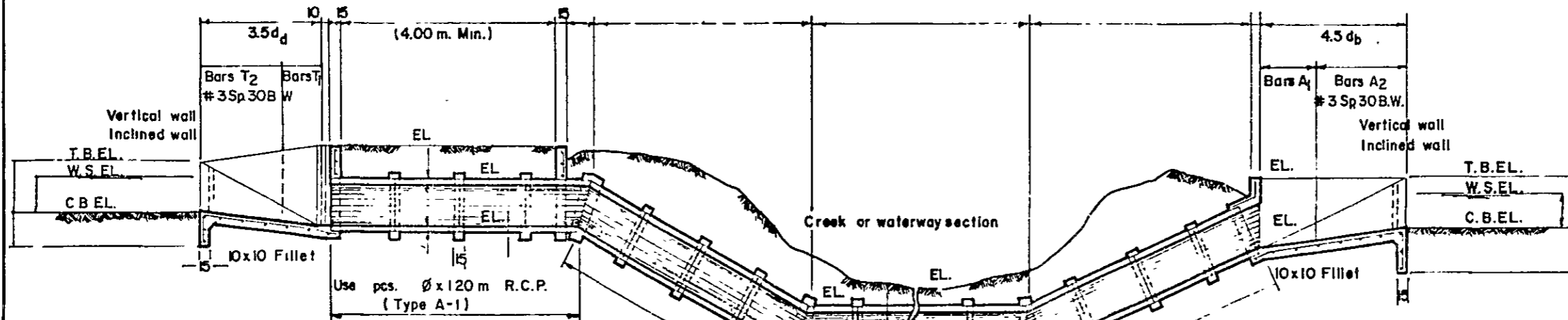


SECTION "F - F"

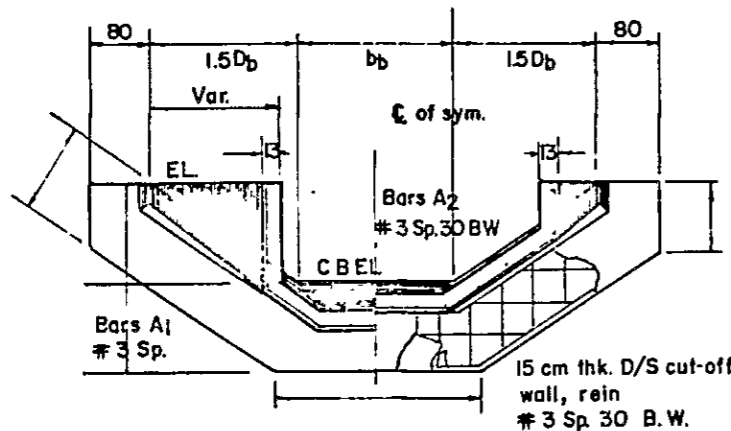
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL BOX SIPHON WITH CROSSING	
DRAWING NO.	INIS (II) - IC - 027
JAPAN INTERNATIONAL COOPERATION AGENCY	



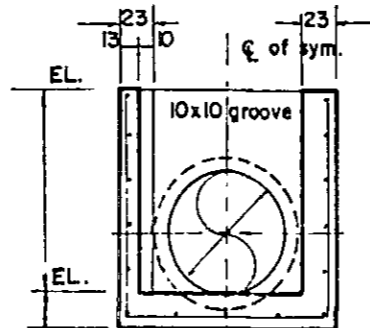
SECTION "E-E"



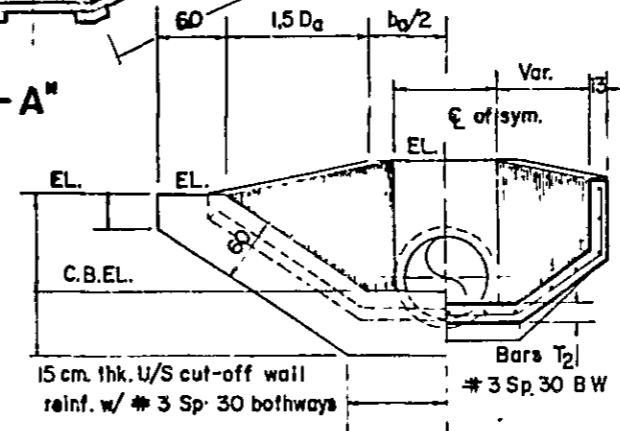
SECTION "A-A"



SECTION "F-F"

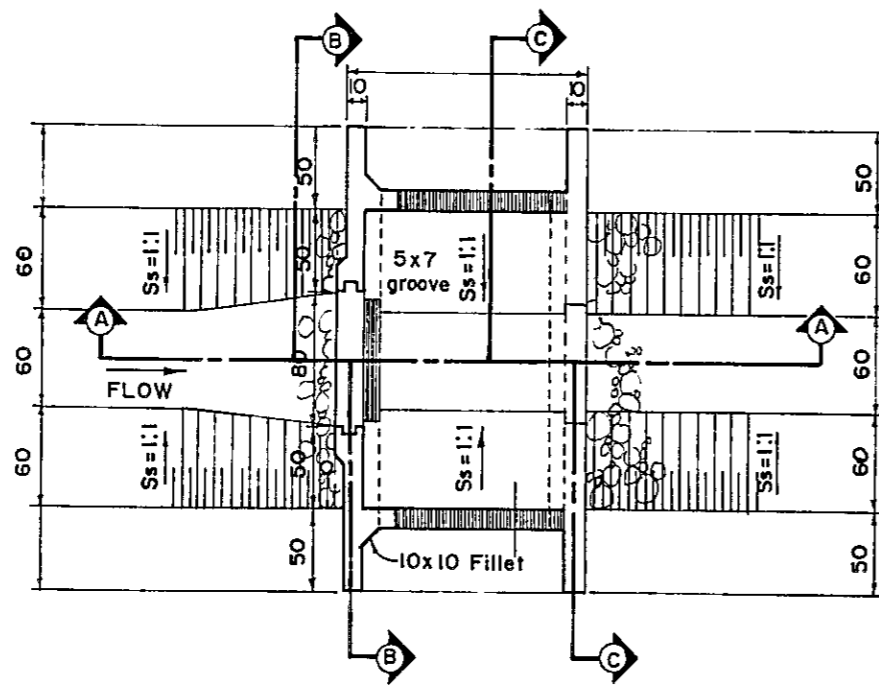


SECTION "D-D"

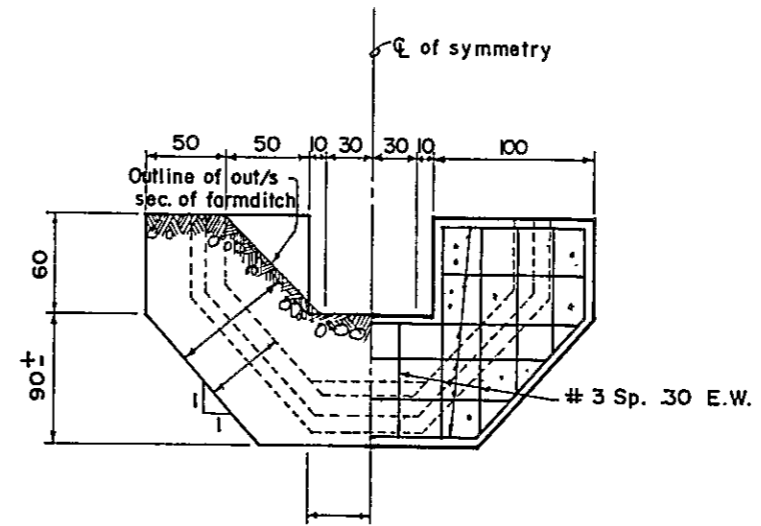


SECTION "C-C"

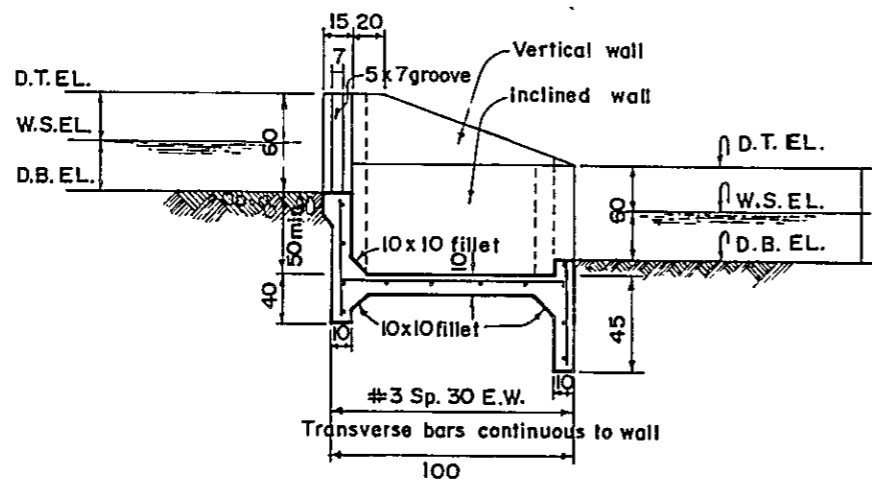
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL RCP SIPHON WITH CROSSING	
DRAWING NO.	INIS (II) - IC - 028
JAPAN INTERNATIONAL COOPERATION AGENCY	



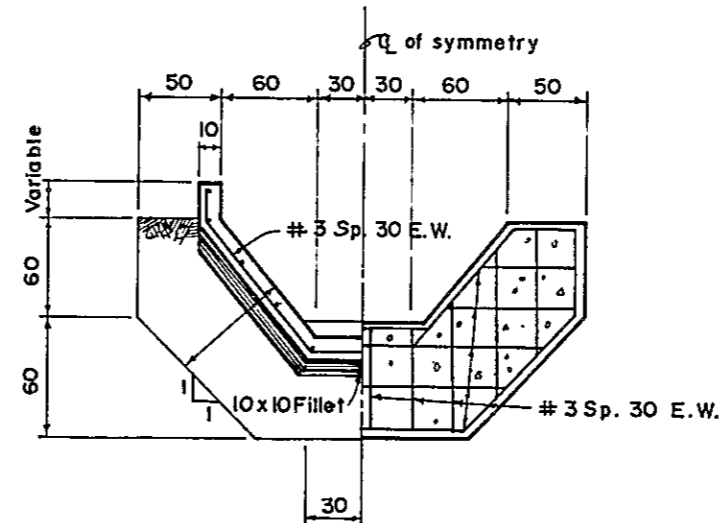
PLAN



SECTION "B-B"

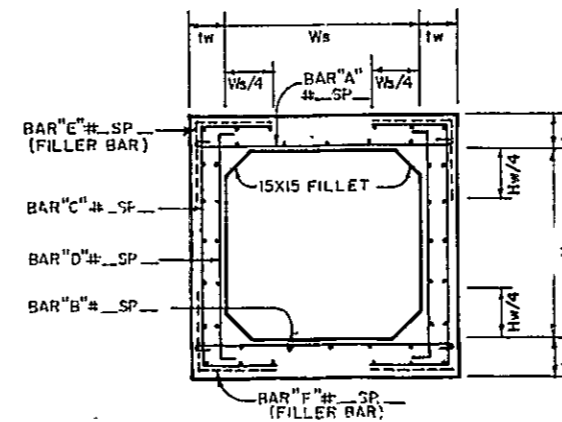
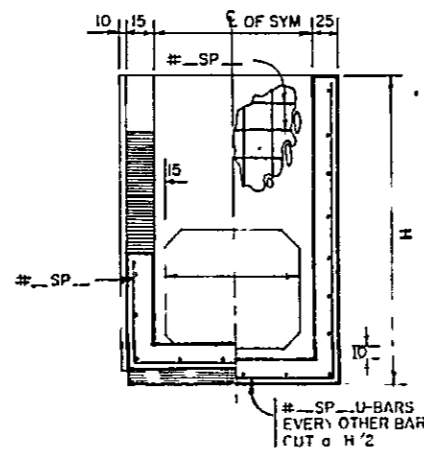
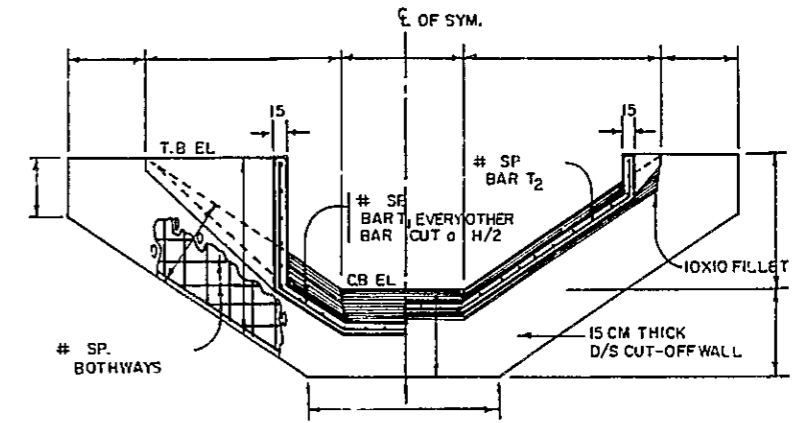
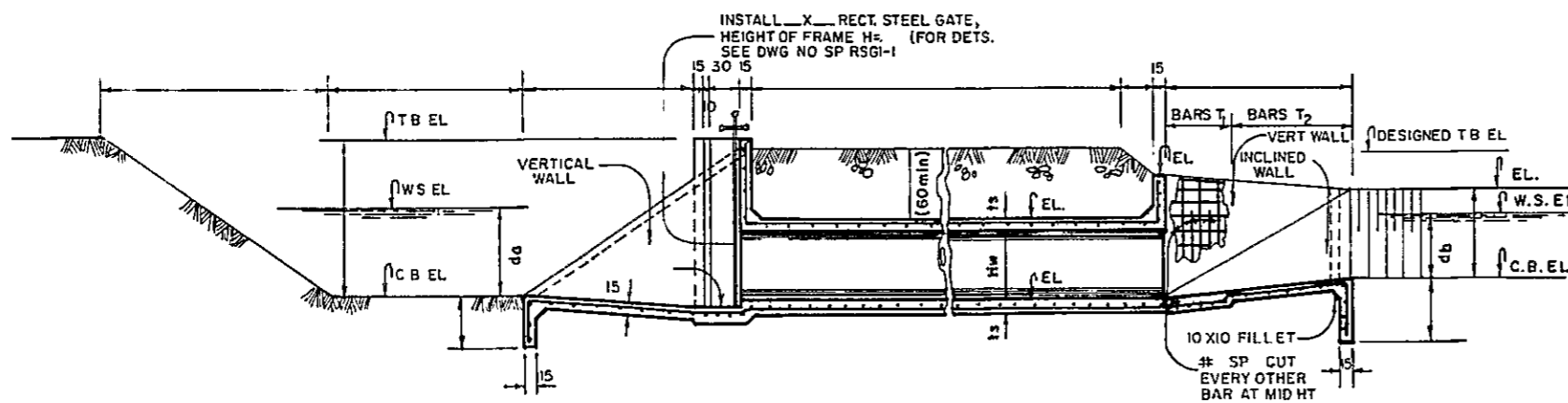
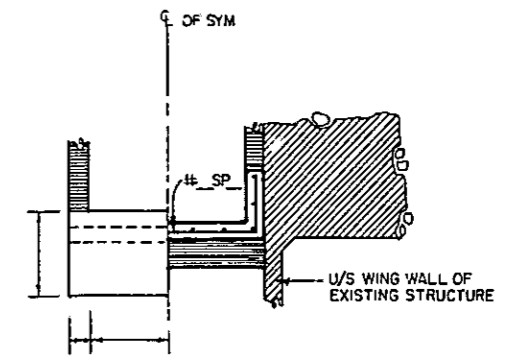
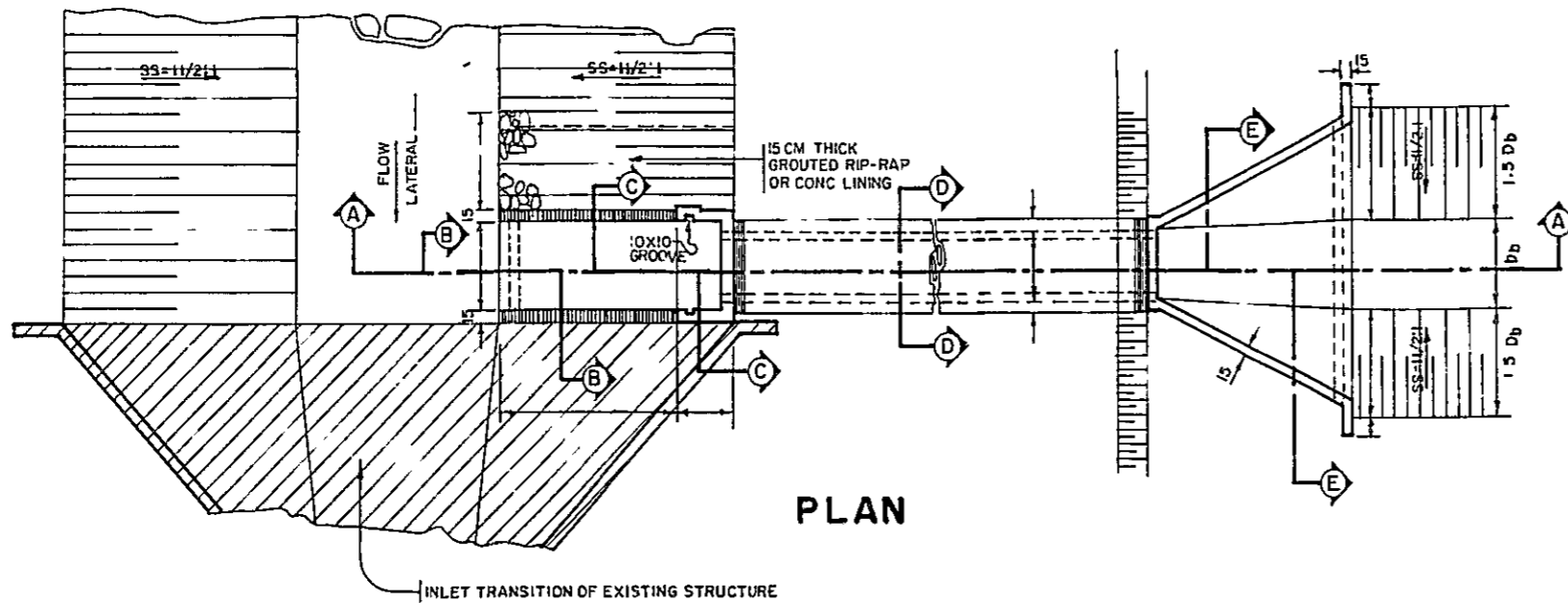


SECTION "A-A"

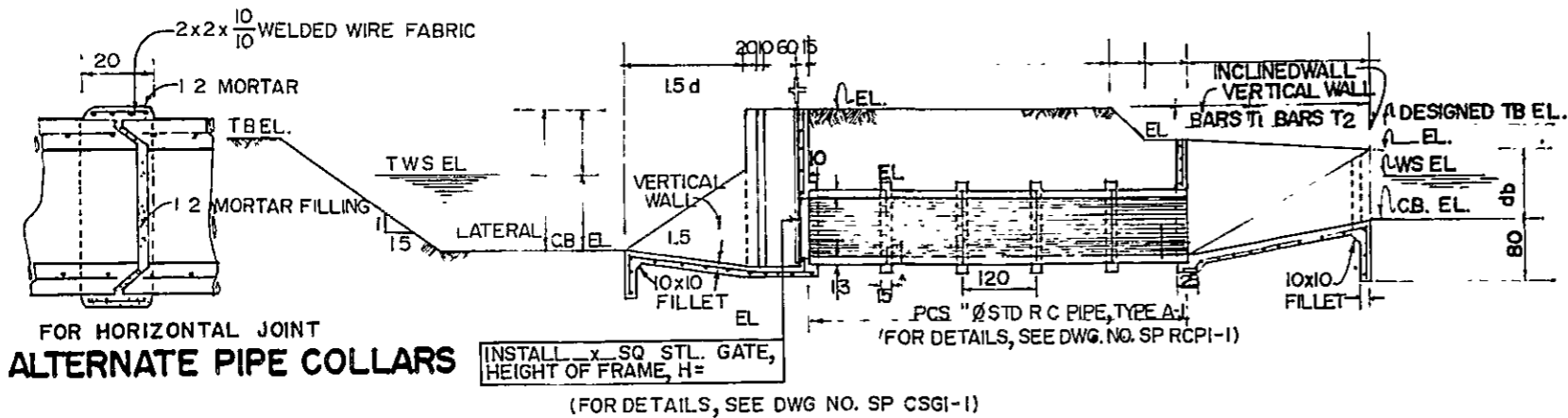
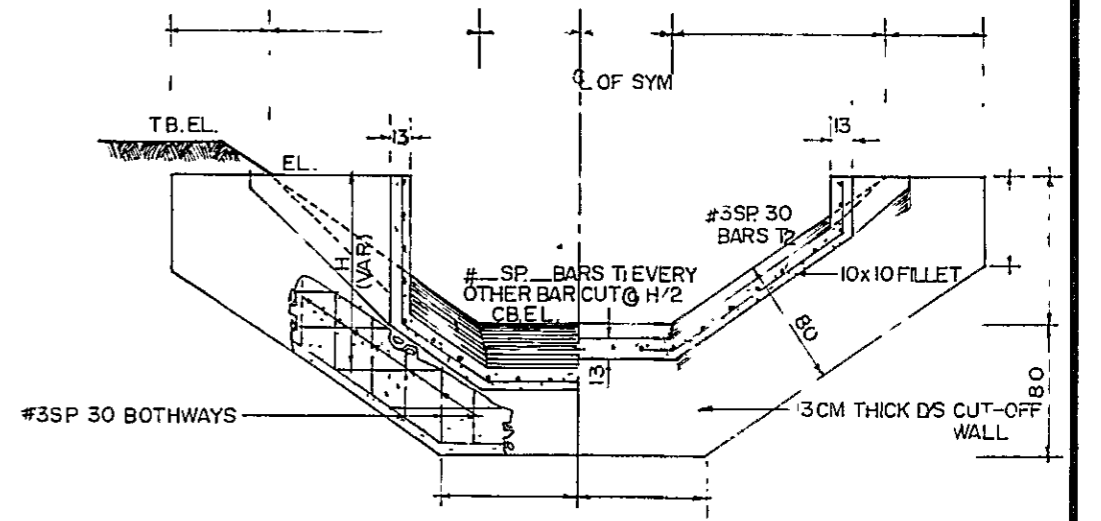
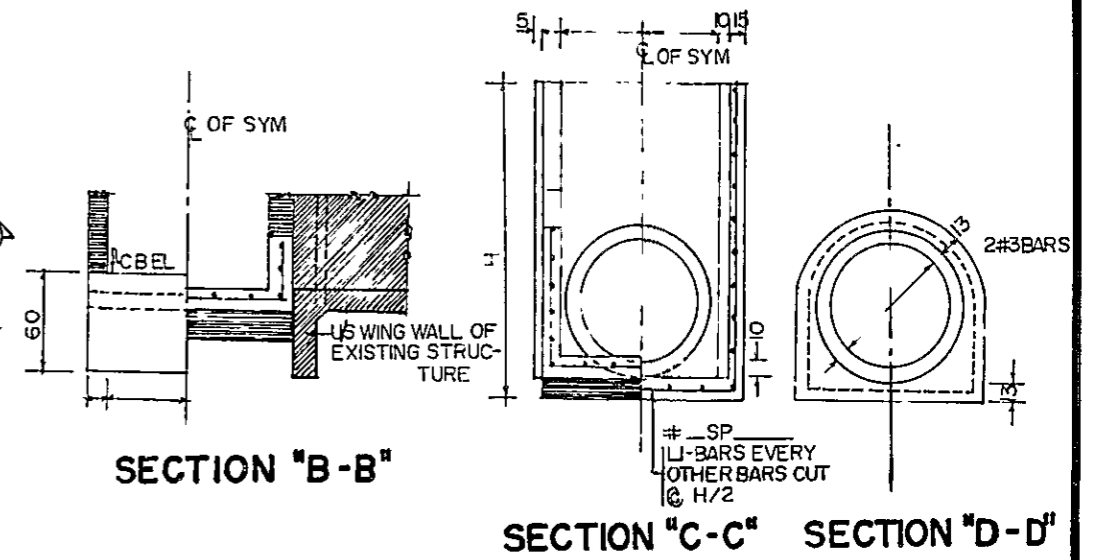
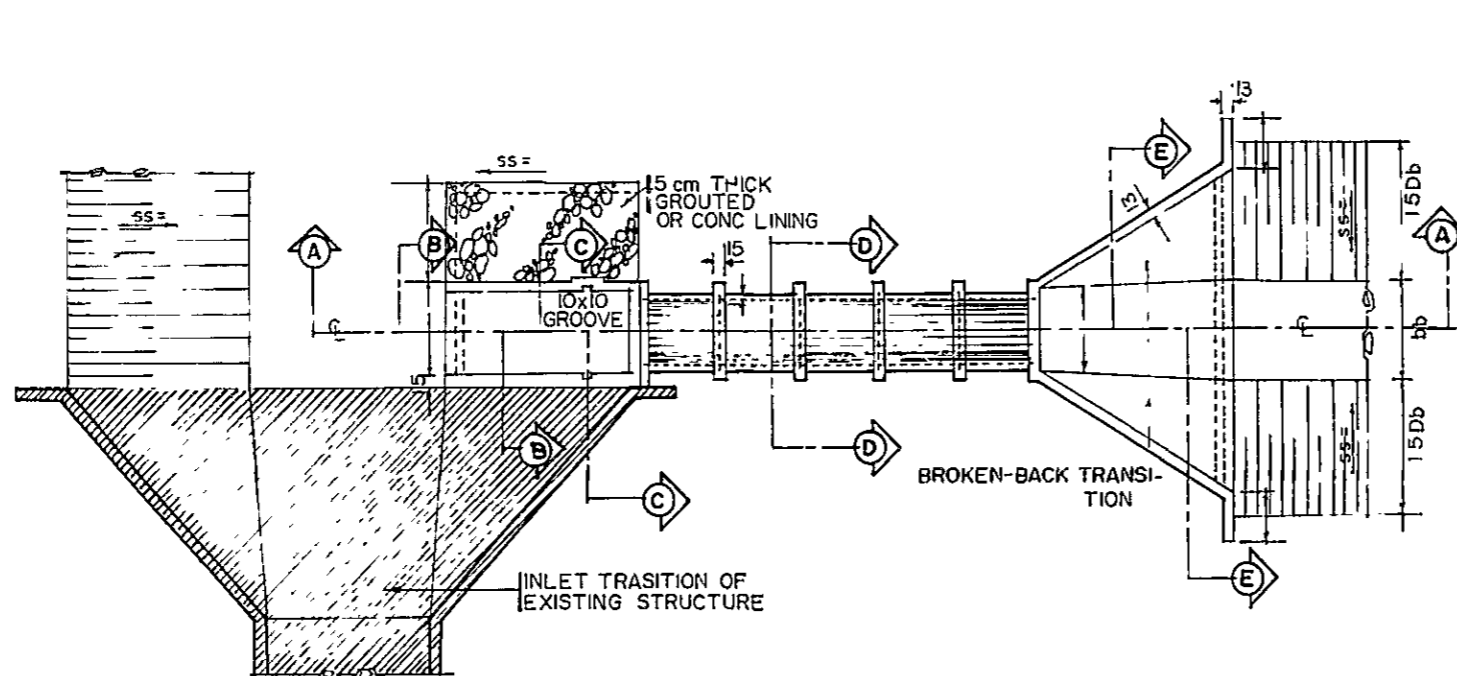


SECTION "C-C"

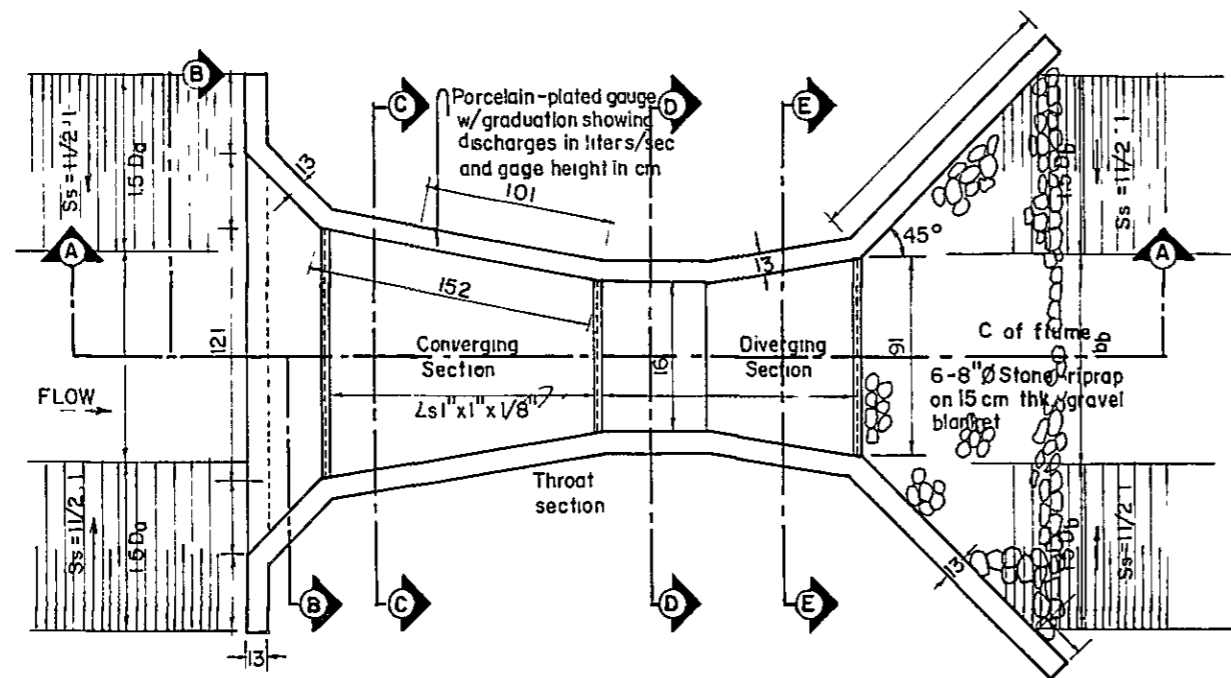
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL SUB-LATERAL DROP	
DRAWING NO.	INIS (III) - IC - 030
JAPAN INTERNATIONAL COOPERATION AGENCY	



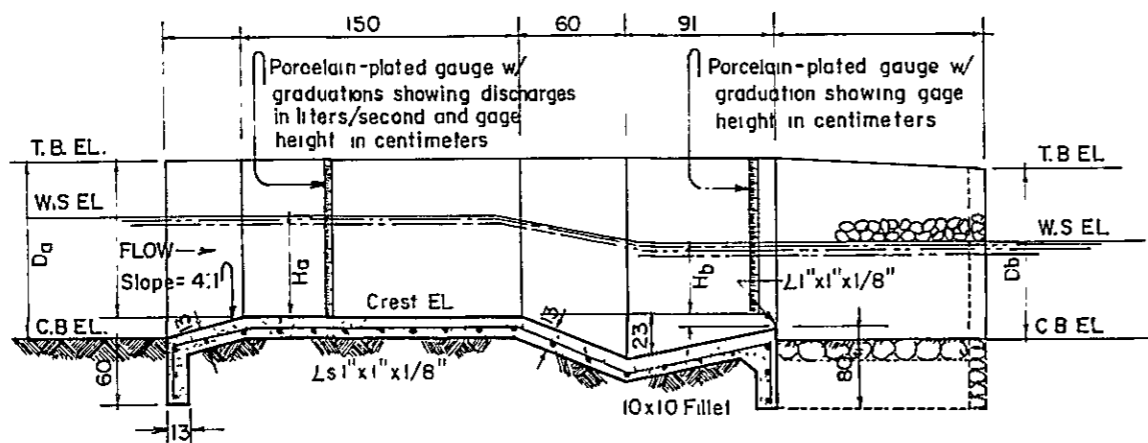
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL HEADGATE WITH BOX CULVERT	
DRAWING NO.	INIS (II) - IC - 031
JAPAN INTERNATIONAL COOPERATION AGENCY	



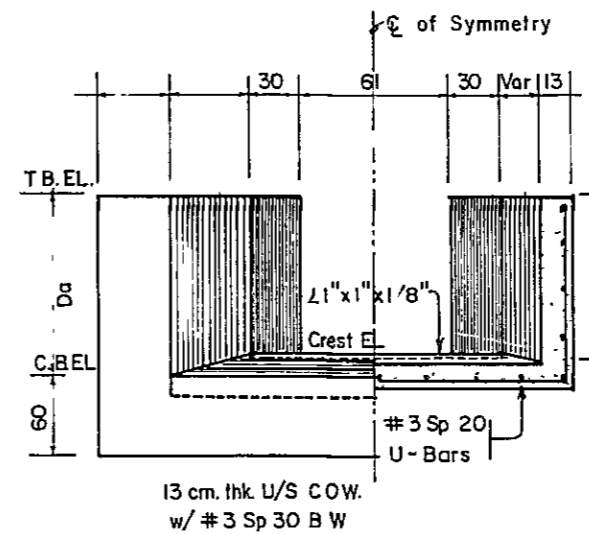
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL HEADGATE WITH PIPE CULVERT	
DRAWING NO.	INIS (II) - IC - 032
JAPAN INTERNATIONAL COOPERATION AGENCY	



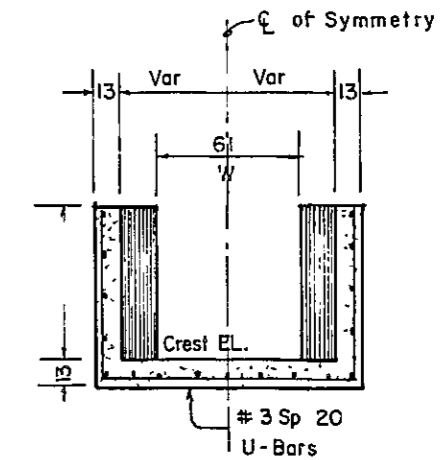
PLAN



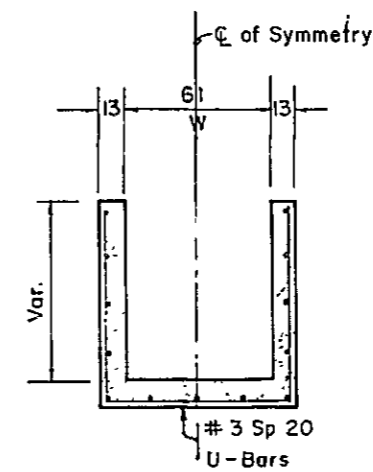
LONGITUDINAL SECTION "A-A"



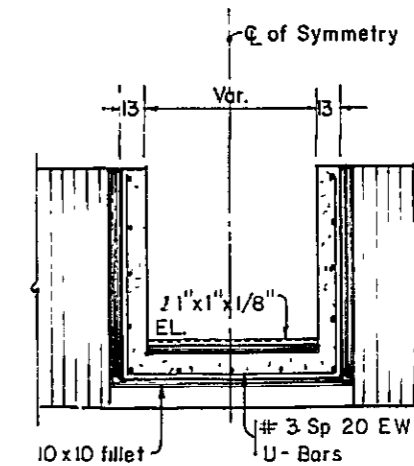
SECTION "B - B"



SECTION "C - C"

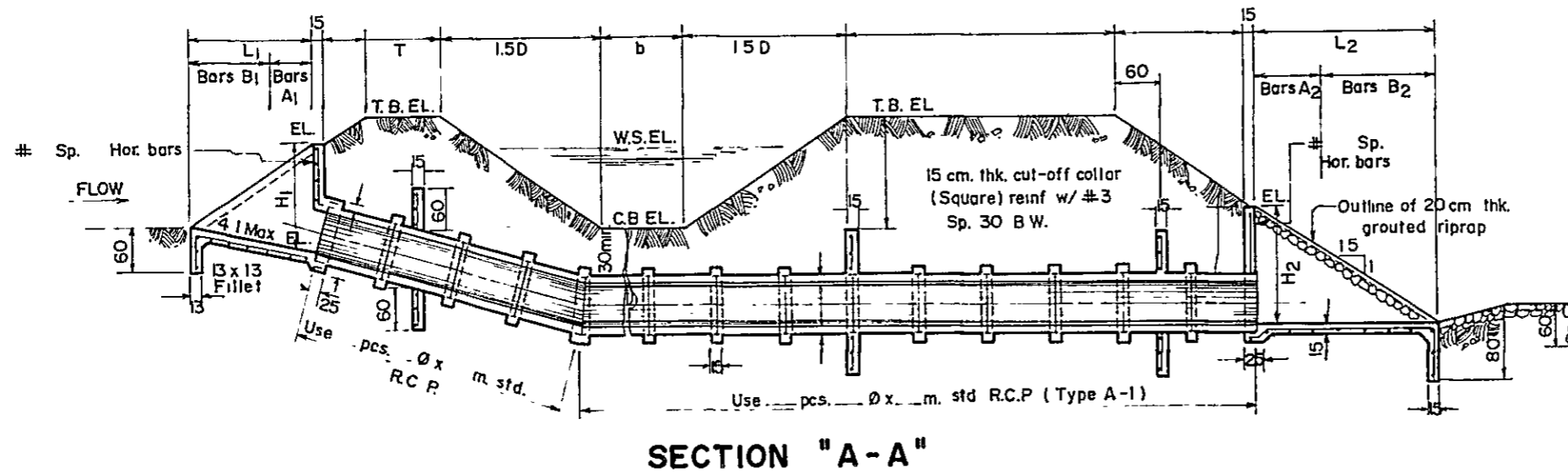
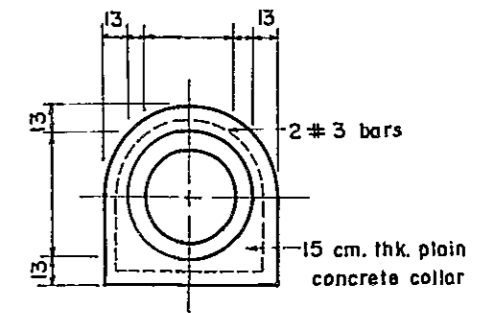
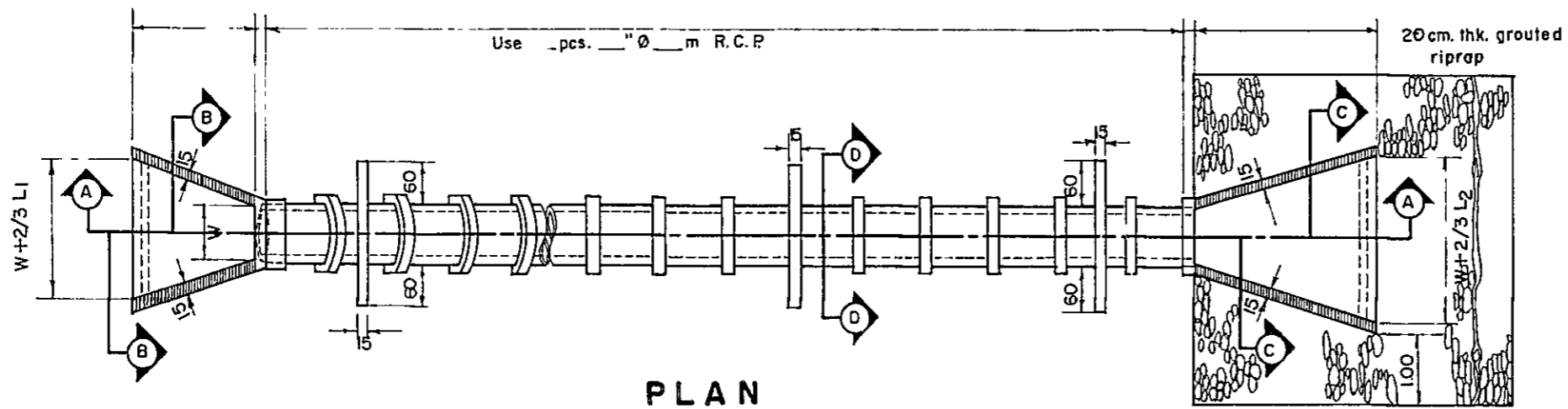


SECTION "D - D"

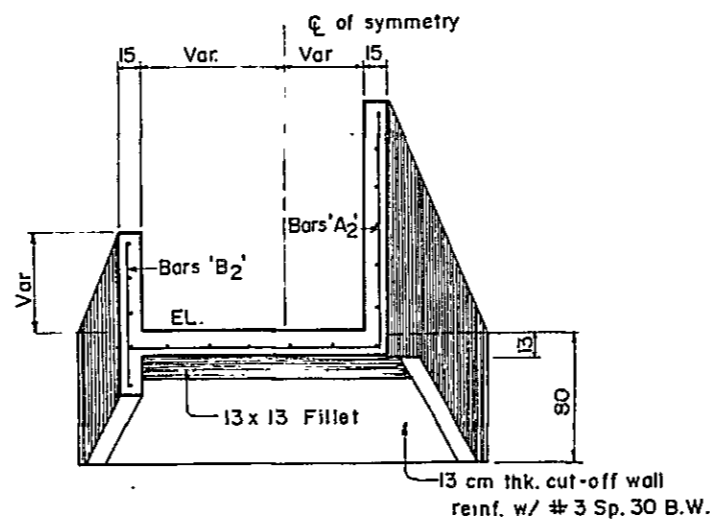
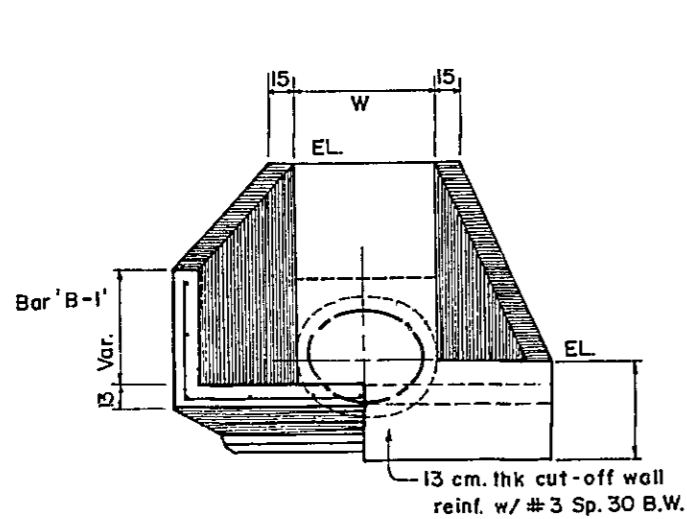


SECTION "E - E"

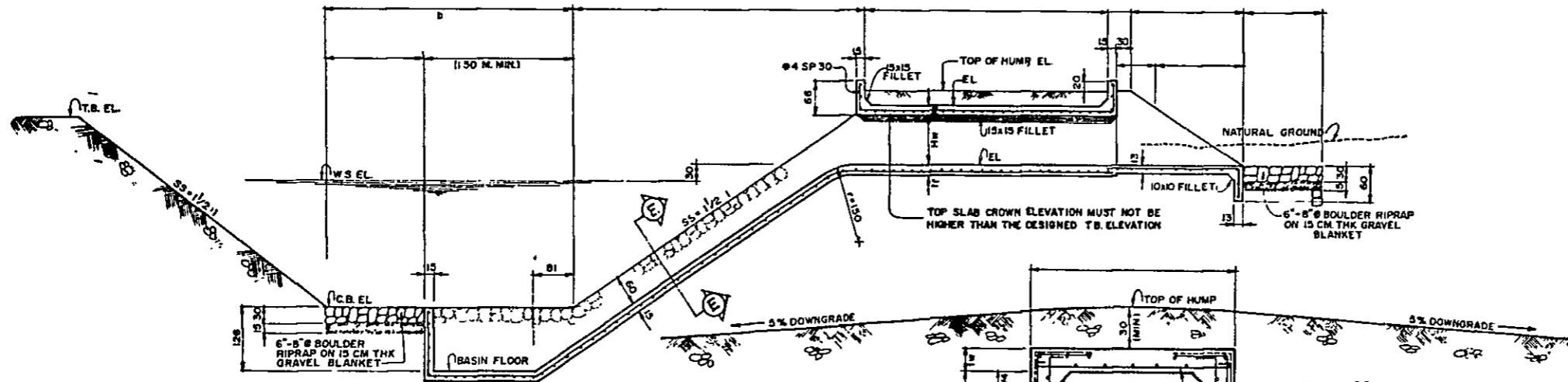
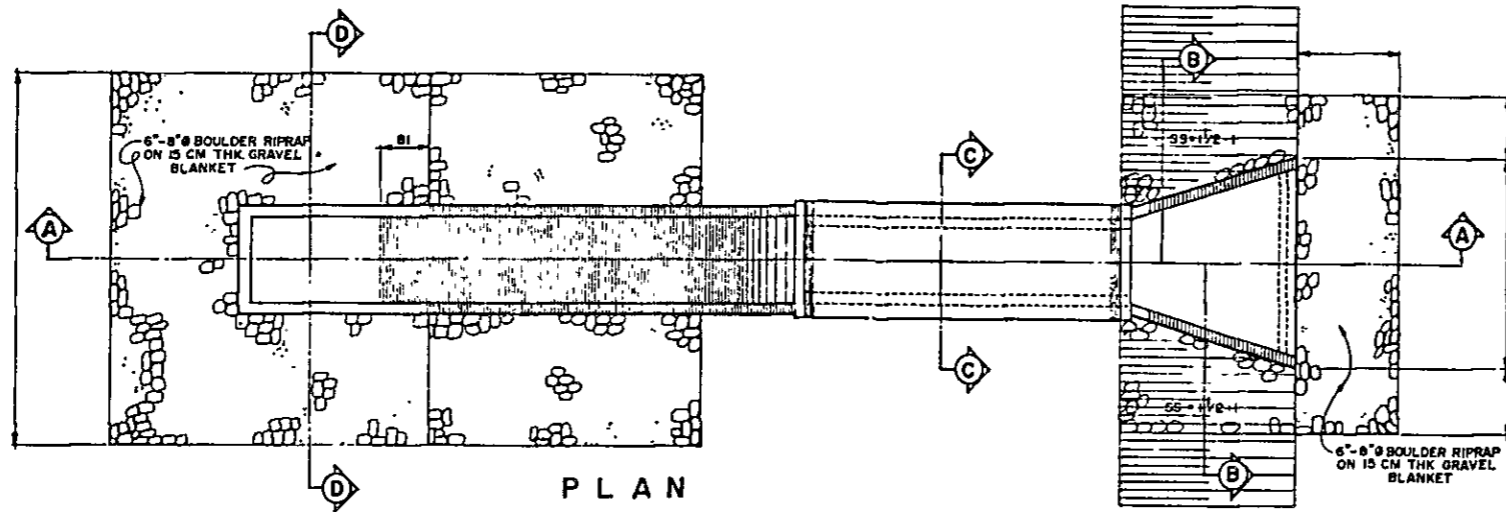
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL PARSHALL FLUME	
DRAWING NO.	INIS (II) - IC - 033
JAPAN INTERNATIONAL COOPERATION AGENCY	



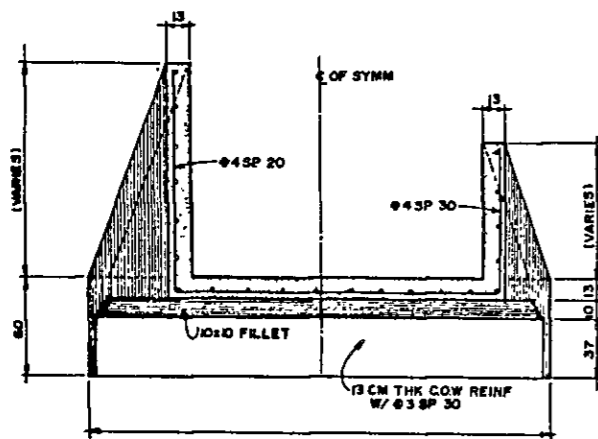
ALTERNATE PIPE COLLAR



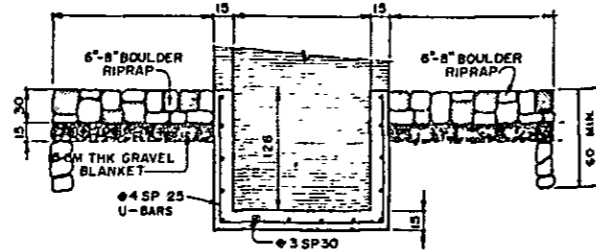
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL DRAINAGE CULVERT	
DRAWING NO.	INIS (III) - IC - 034
JAPAN INTERNATIONAL COOPERATION AGENCY	



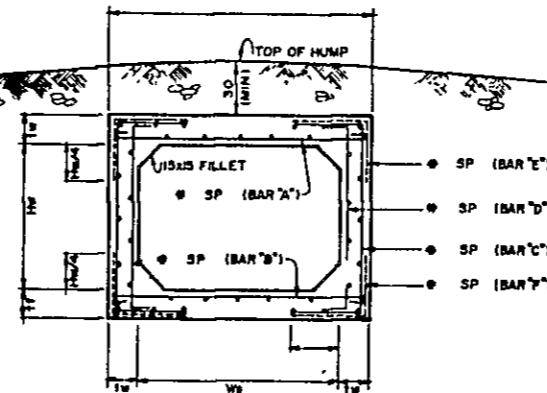
SECTION "A-A"



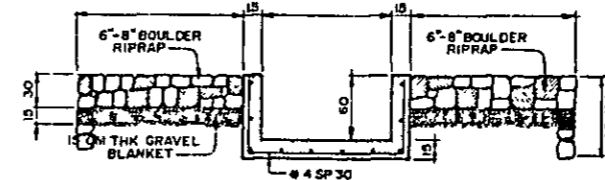
SECTION "B-B"



SECTION "D-D"

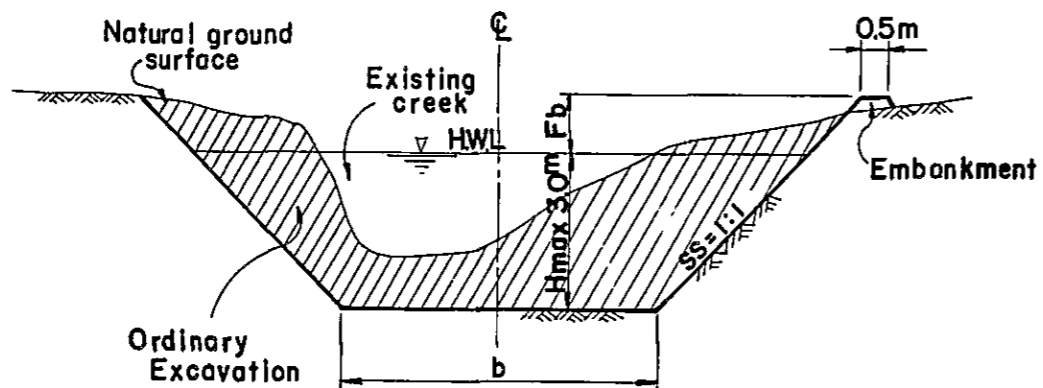


SECTION "C-C"

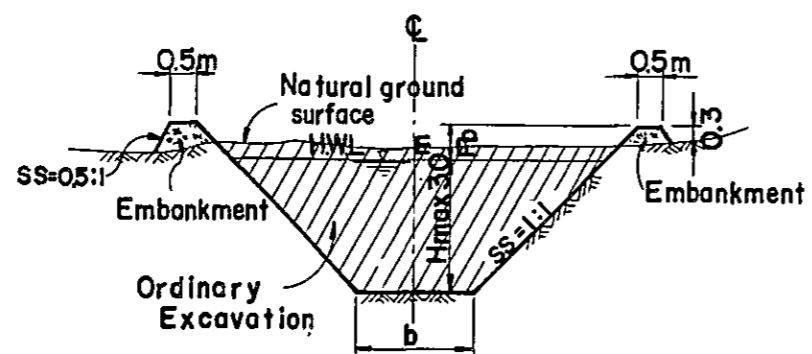


SECTION "E-E"

REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL DRAINAGE INLET	
DRAWING NO.	INIS (II) - IC - 035
JAPAN INTERNATIONAL COOPERATION AGENCY	

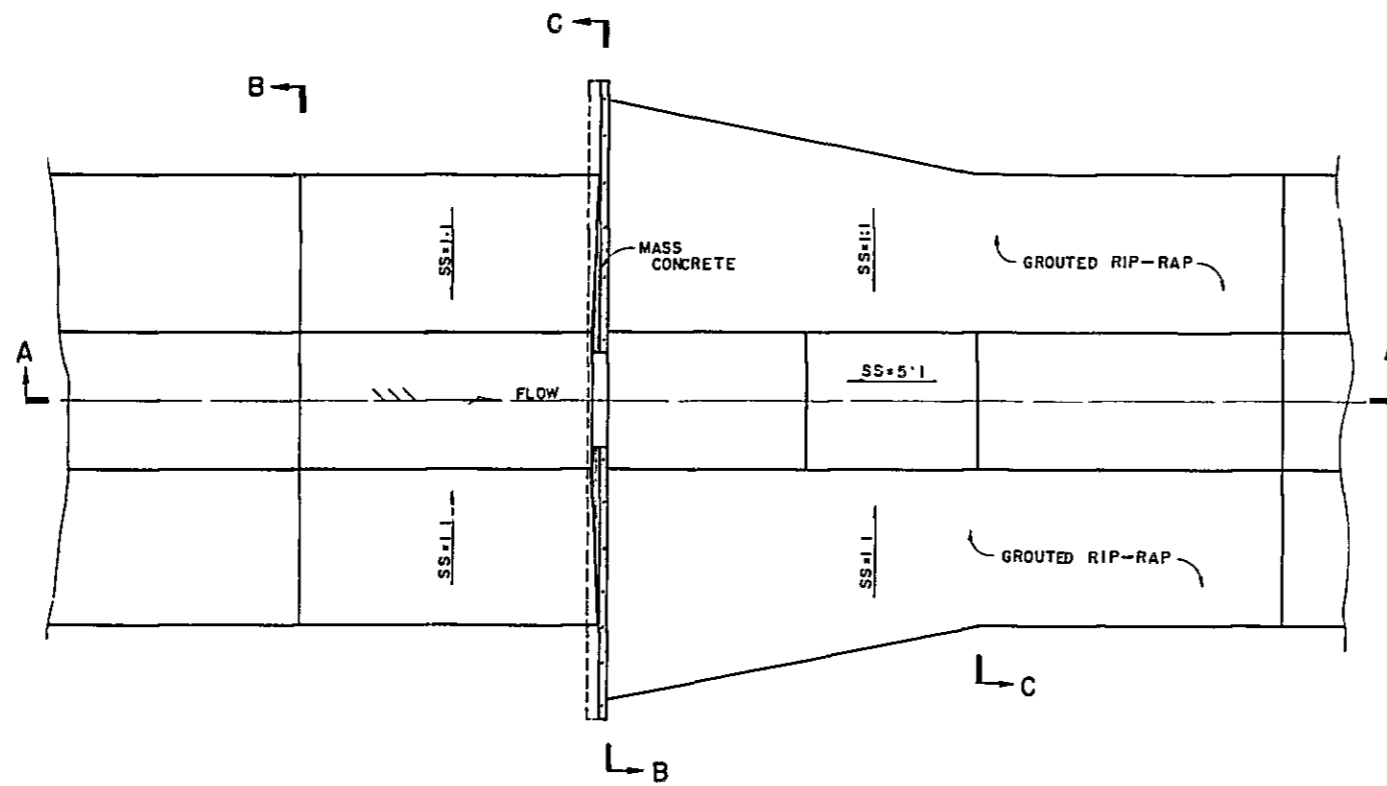


TYPICAL SECTION OF IMPROVEMENT CANALS

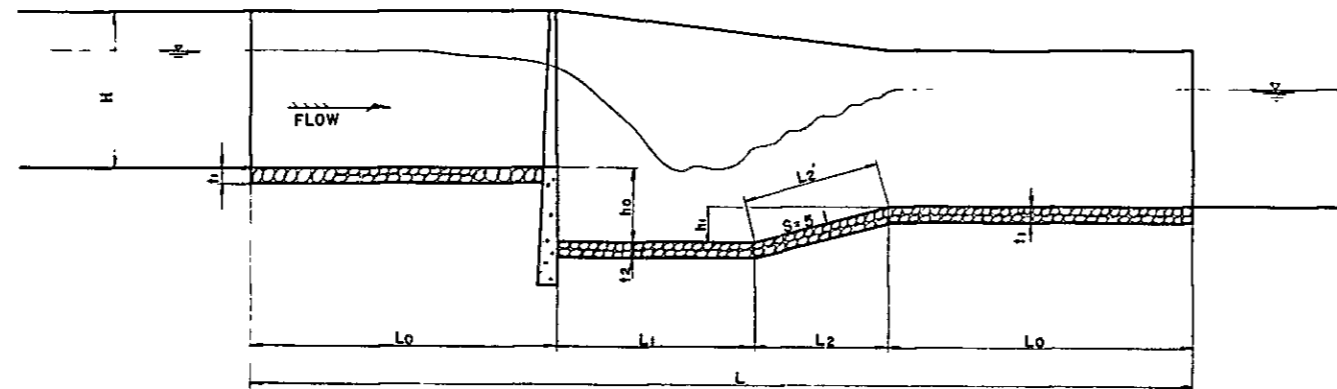


TYPICAL SECTION OF NEWLY CONSTRUCTED CANALS

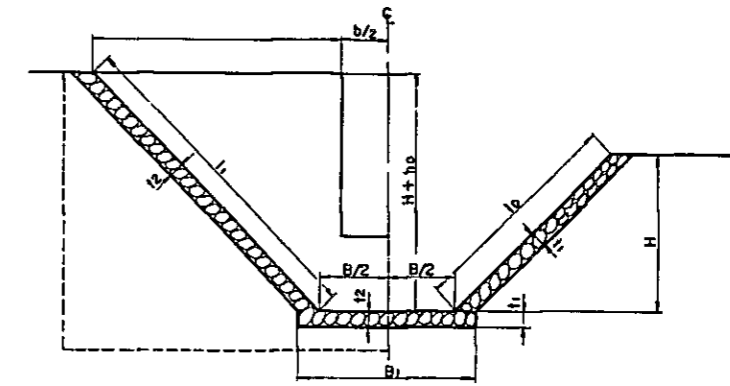
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL DRAINAGE CANAL SECTION	
DRAWING NO.	INIS (II) - DC - 036
JAPAN INTERNATIONAL COOPERATION AGENCY	



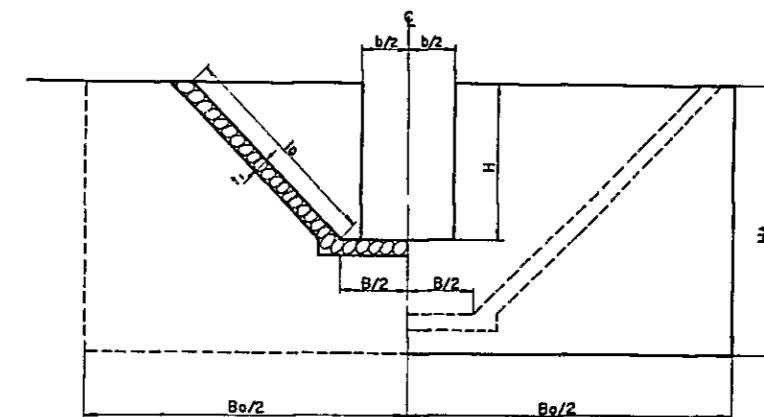
PLAN



SECTION "A-A"



SECTION "B-B"



SECTION "C-C"

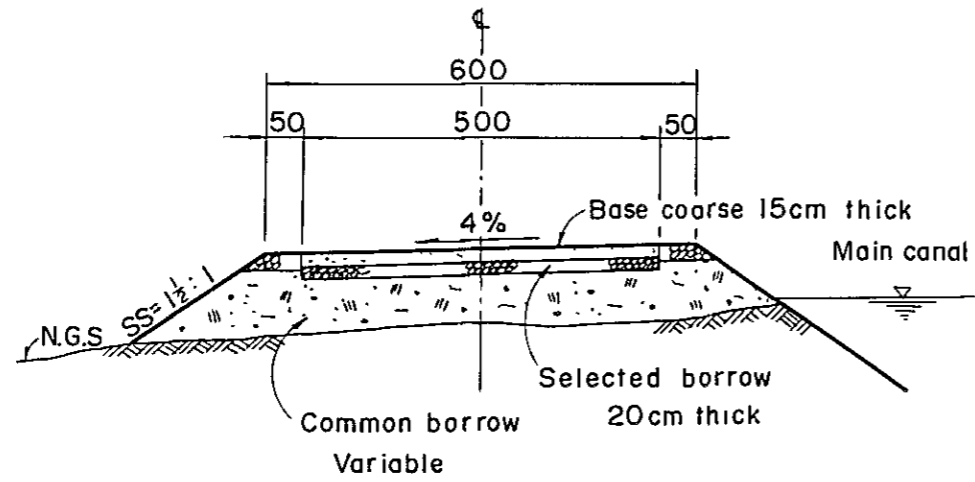
DIMENSION

(UNIT: m)

TYPE	H	L ₀	L ₁	L ₂	L	H	h ₀	h ₁	f ₁	f ₂	B	b	l ₀	H ₁	B ₀	l ₁	B ₁	f ₃	f ₄	L ₂
I	3.0	8.0	5.2	4.5	25.7	4.0	1.9	0.9	0.4	0.4	3.5	2.4	4.0	7.3	16.3	5.9	4.63	0.15	0.6	4.59
II	1.3	3.6	3.5	3.0	10.1	1.7	1.6	0.6	0.3	0.3	1.1	1.0	1.7	4.6	8.7	3.3	1.95	0.15	0.5	3.06
III	0.9	2.8	2.9	2.5	8.2	1.2	1.5	0.5	0.3	0.3	0.9	0.7	1.2	4.0	7.3	2.7	1.55	0.15	0.4	2.55

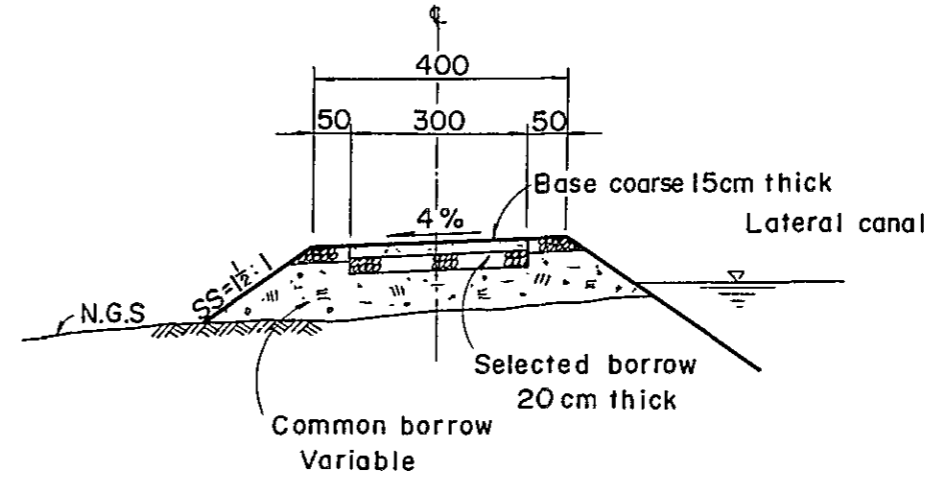
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL DRAINAGE DROP	
DRAWING NO.	INIS (II) - DC - 037
JAPAN INTERNATIONAL COOPERATION AGENCY	

TYPE A



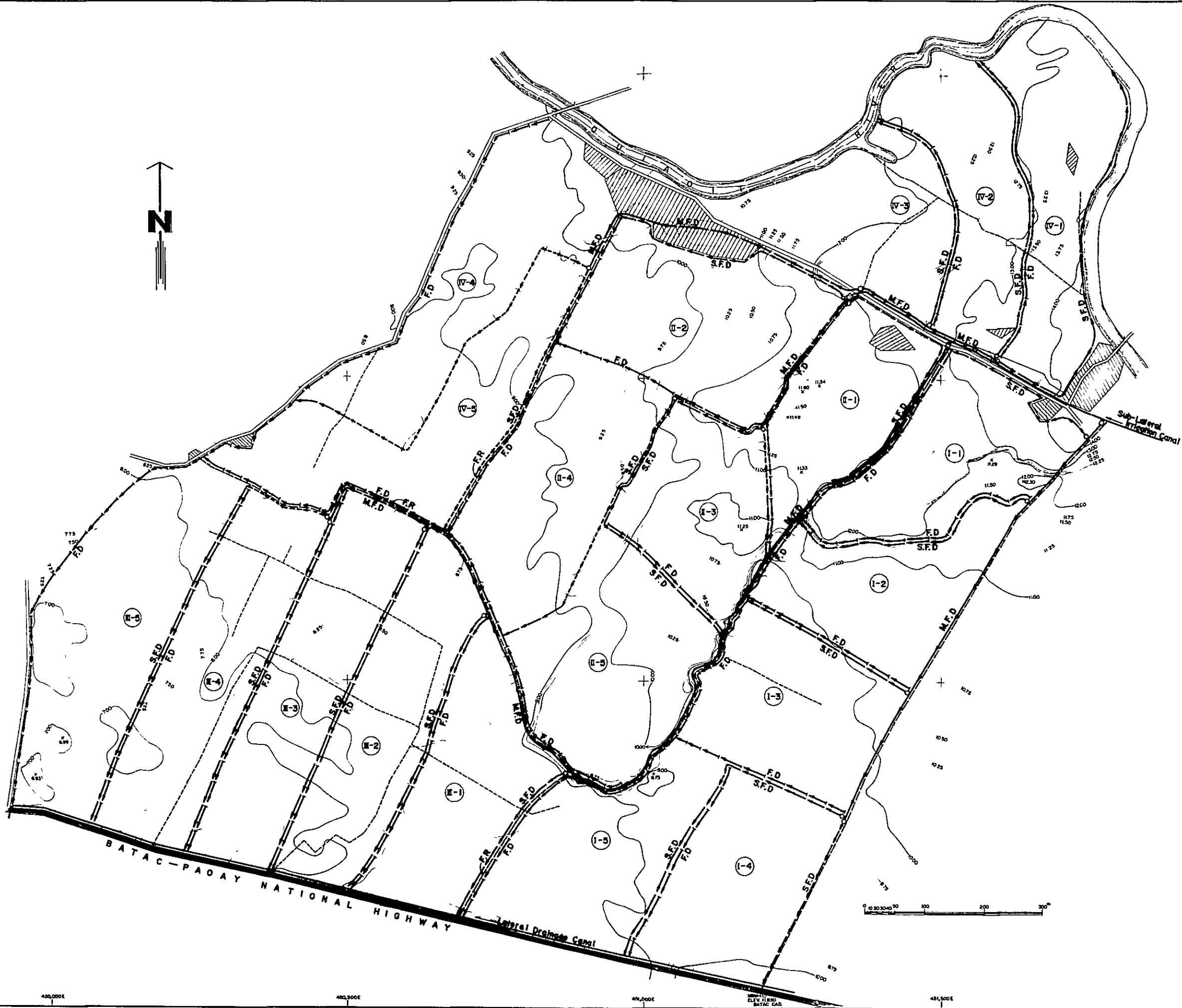
SERVICE ROAD ALONG MAIN CANALS

TYPE B



SERVICE ROAD ALONG LATERAL CANALS

REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL ROAD SECTION	
DRAWING NO.	INIS (II) - RW - 038
JAPAN INTERNATIONAL COOPERATION AGENCY	

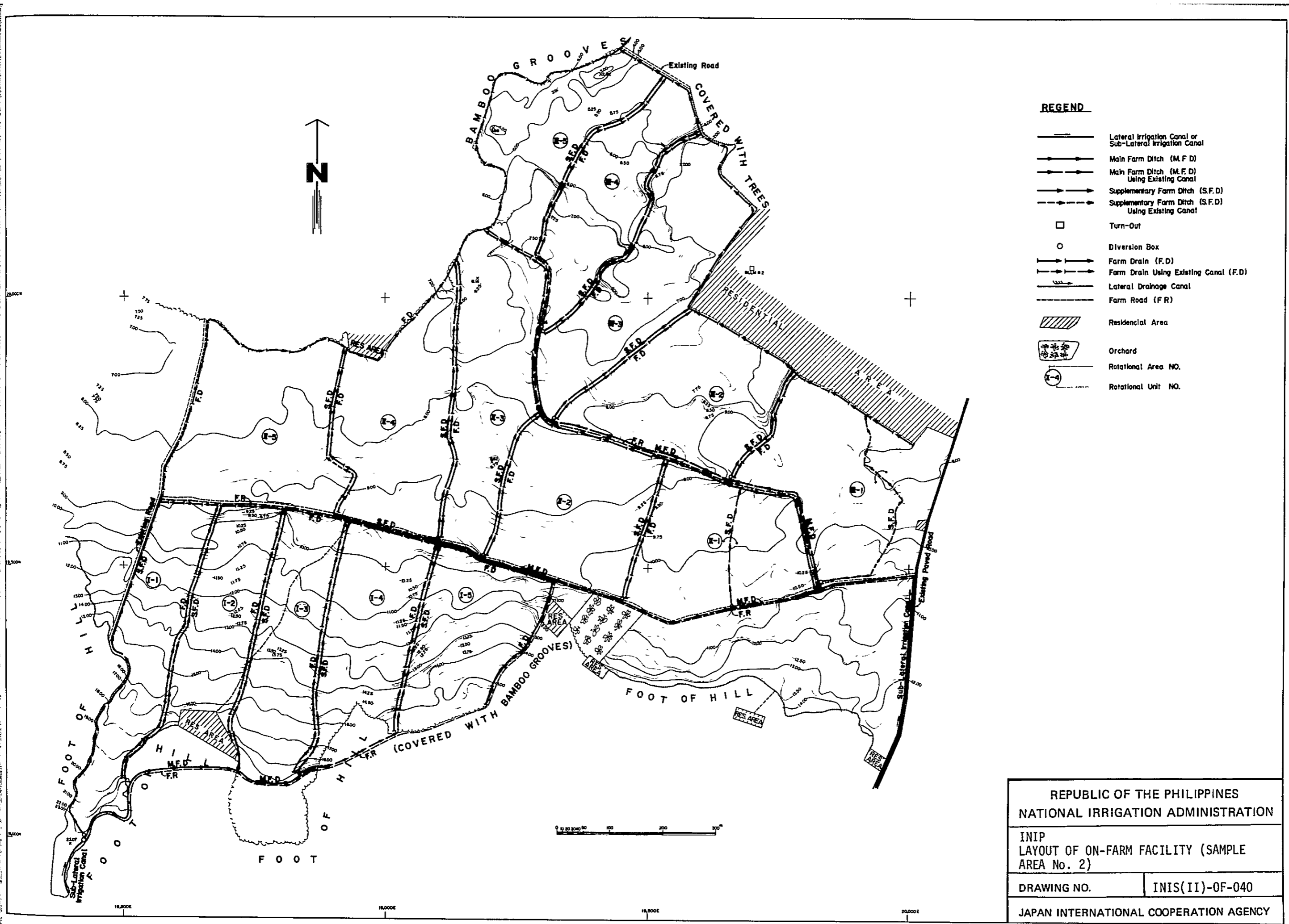


REGEN

- Lateral Irrigation Canal or Sub-Lateral Irrigation Canal
- Main Farm Ditch (M.F.D)
- Main Farm Ditch (M.F.D) Using Existing Canal
- Supplementary Farm Ditch (S.F.D)
- Supplementary Farm Ditch (S.F.D) Using Existing Canal
- Turn-Out
- Diversion Box
- Farm Drain (F.D)
- Farm Drain Using Existing Canal (F.D)
- Lateral Drainage Canal
- Farm Road (F.R)
- Residential Area
- Orchard
- Rotational Area NO
- Rotational Unit NO

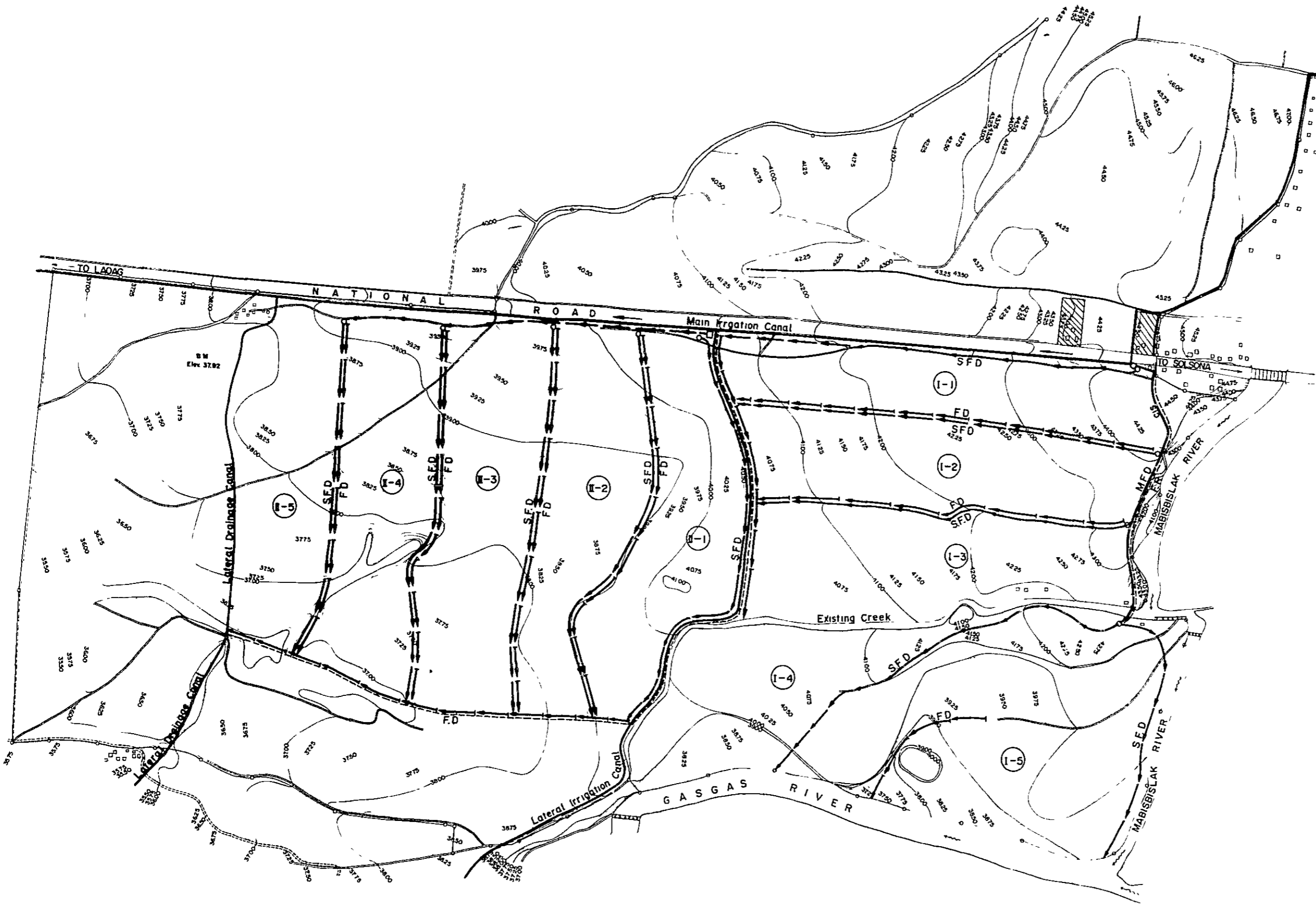
REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP LAYOUT OF ON-FARM FACILITY (SAMPLE AREA No. 1)	
DRAWING NO.	INIS(II)-OF-039
JAPAN INTERNATIONAL COOPERATION AGENCY	

430,000E 400,000E 401,000E 402,000E 403,000E 404,000E



- REGEND**
- Lateral Irrigation Canal or Sub-Lateral Irrigation Canal
 - Main Farm Ditch (M.F.D)
 - Main Farm Ditch (M.F.D) Using Existing Canal
 - Supplementary Farm Ditch (S.F.D)
 - Supplementary Farm Ditch (S.F.D) Using Existing Canal
 - Turn-Out
 - Diversion Box
 - Farm Drain (F.D)
 - Farm Drain Using Existing Canal (F.D)
 - Lateral Drainage Canal
 - Farm Road (F.R)
 - ▨ Residential Area
 - 🌳 Orchard
 - ⊙ Rotational Area NO.
 - ⊙ Rotational Unit NO.

REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP LAYOUT OF ON-FARM FACILITY (SAMPLE AREA No. 2)	
DRAWING NO.	INIS(II)-OF-040
JAPAN INTERNATIONAL COOPERATION AGENCY	

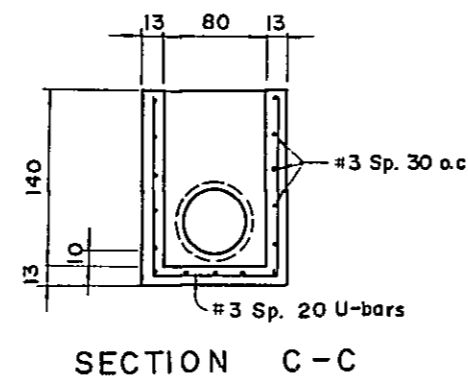
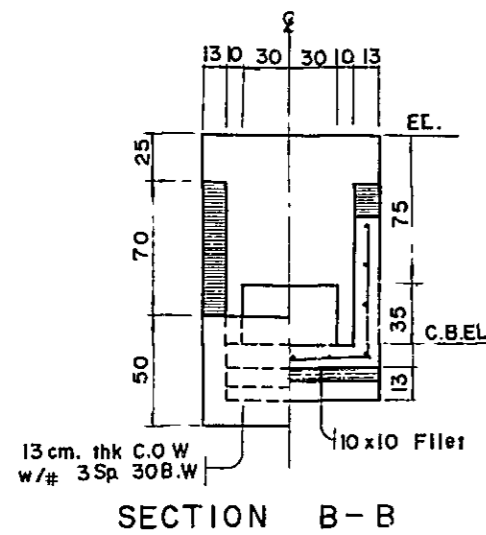
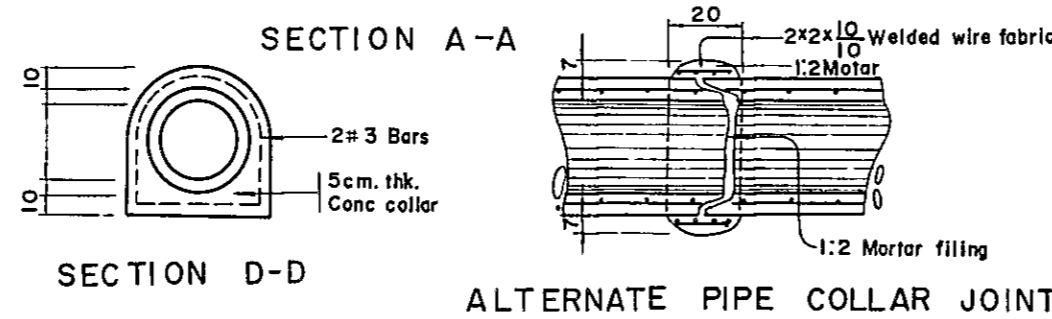
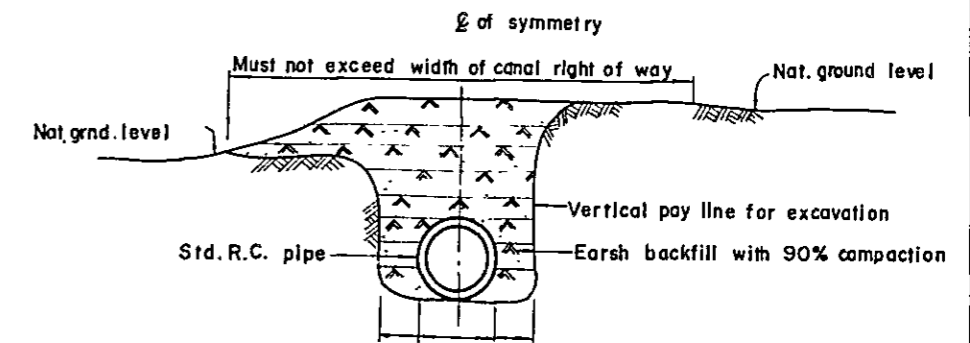
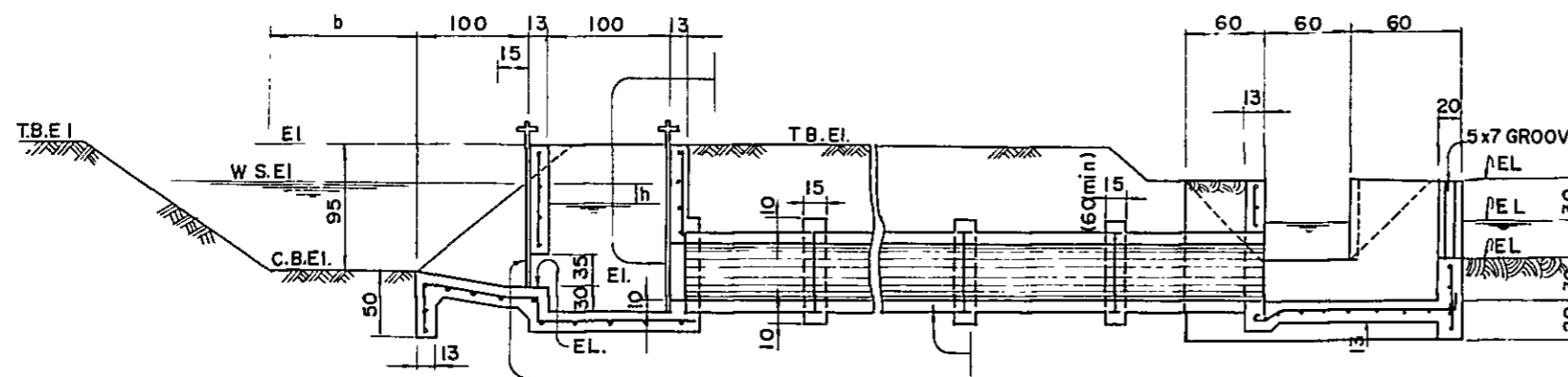
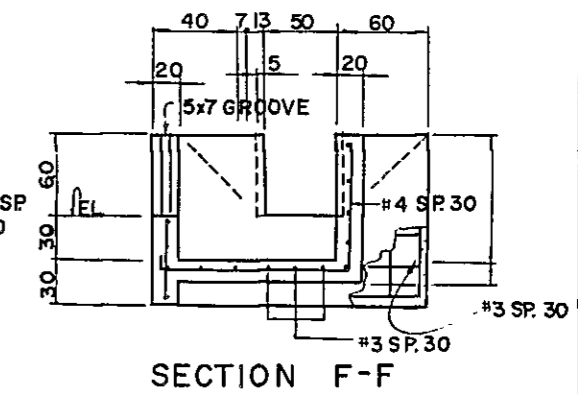
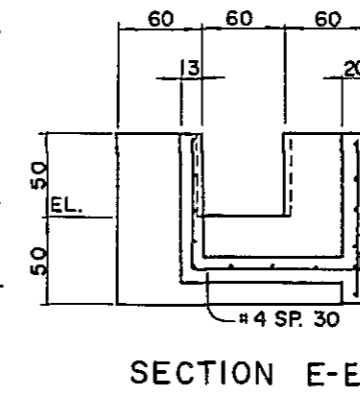
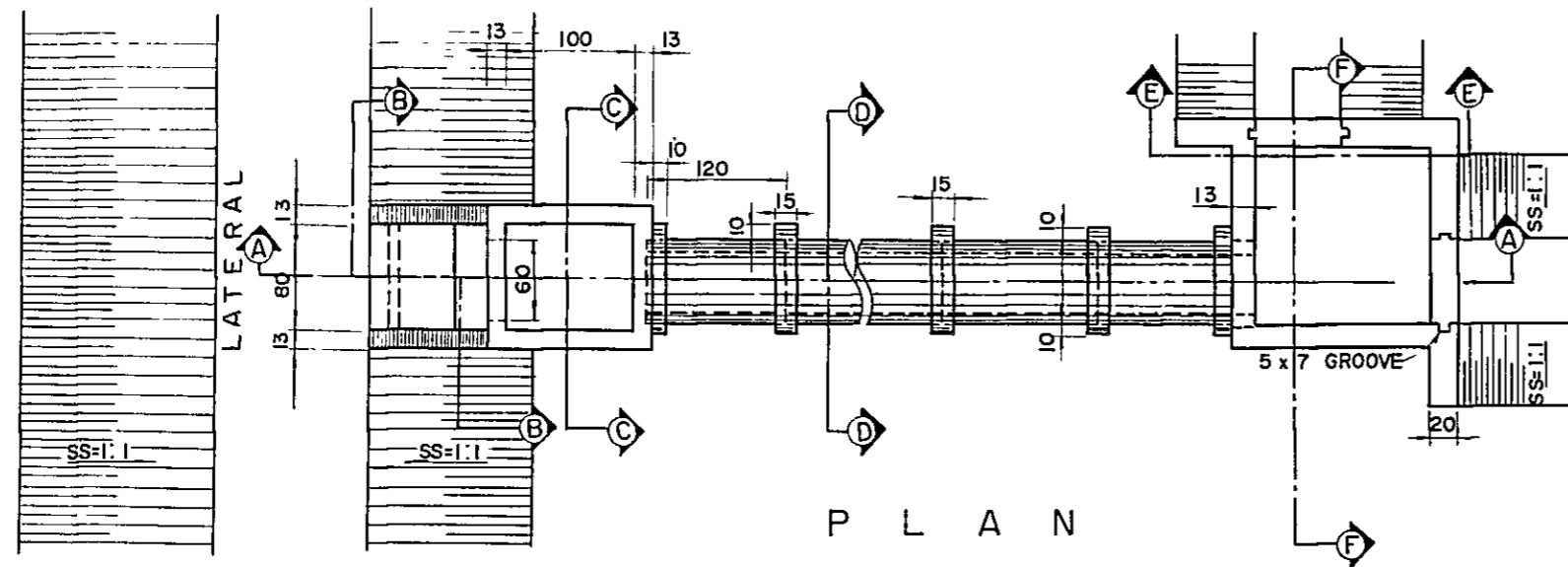


REGEND

- Lateral Irrigation Canal or Sub-Lateral Irrigation Canal
- Main Farm Ditch (M.F.D)
- Main Farm Ditch (M.F.D) Using Existing Canal
- Supplementary Farm Ditch (S.F.D)
- Supplementary Farm Ditch (S.F.D) Using Existing Canal
- Turn-Out
- Diversion Box
- Farm Drain (F.D)
- Farm Drain Using Existing Canal (F.D)
- Lateral Drainage Canal
- Farm Road (F.R)
- Residential Area
- Orchard
- Rotational Area NO
- Rotational Unit NO



REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP LAYOUT OF ON-FARM FACILITY (SAMPLE AREA No. 3)	
DRAWING NO.	INIS(II)-OF-041
JAPAN INTERNATIONAL COOPERATION AGENCY	

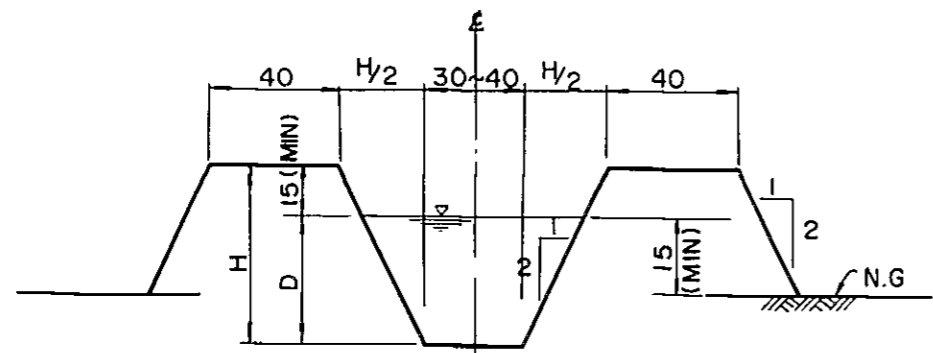


REPUBLIC OF THE PHILIPPINES
 NATIONAL IRRIGATION ADMINISTRATION

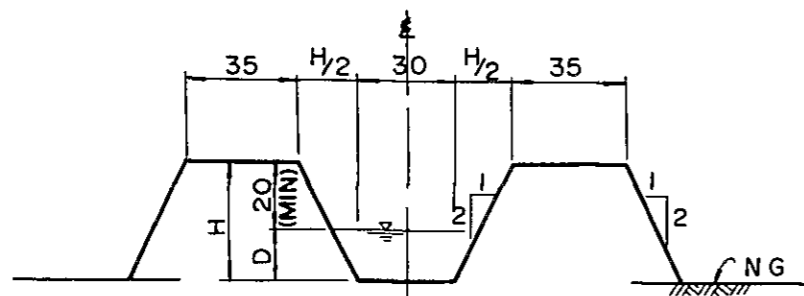
INIP
 TYPICAL TURN-OUT

DRAWING NO. | INIS (II) - OF - 042

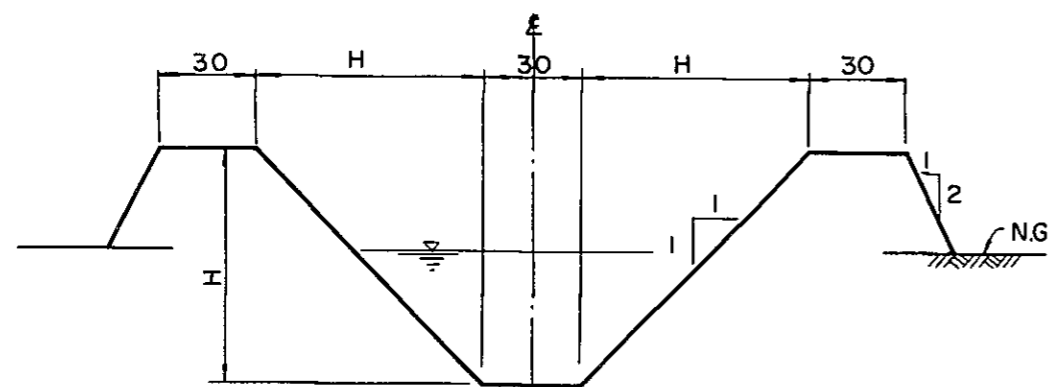
JAPAN INTERNATIONAL COOPERATION AGENCY



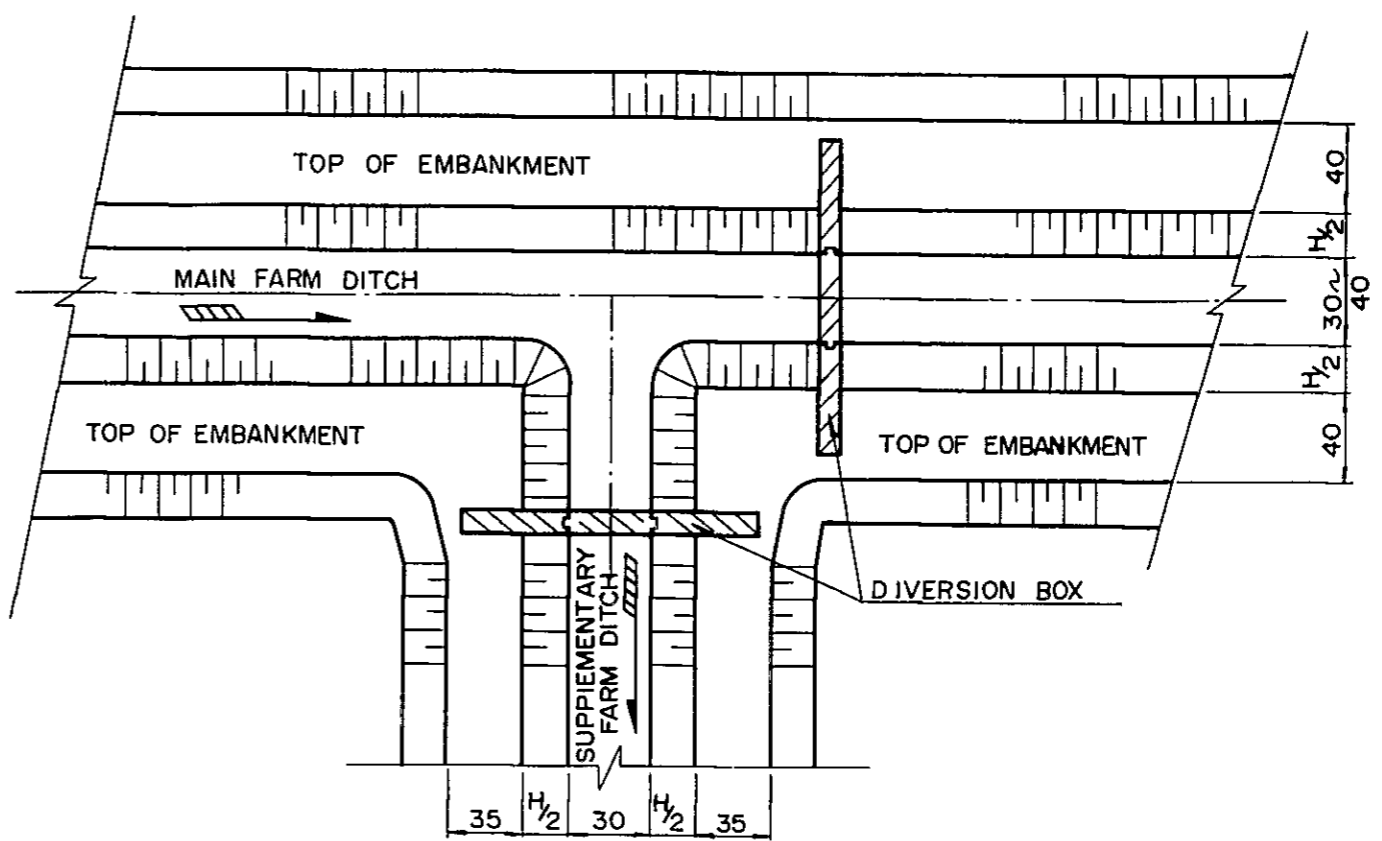
MAIN FARM DITCH



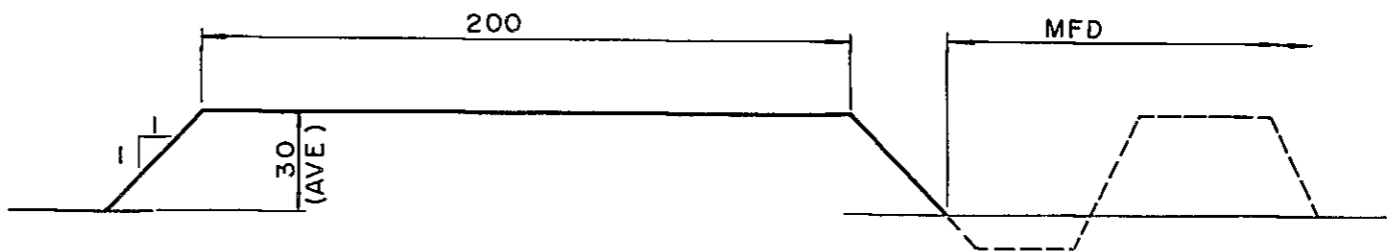
SUPPLEMENTARY FARM DITCH



FARM DITCH



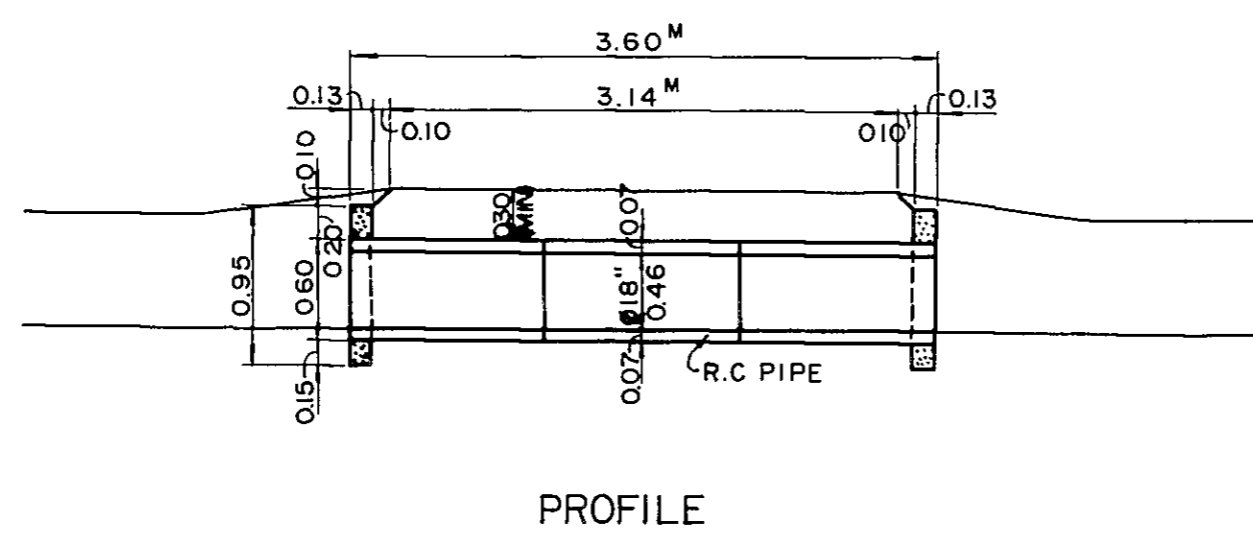
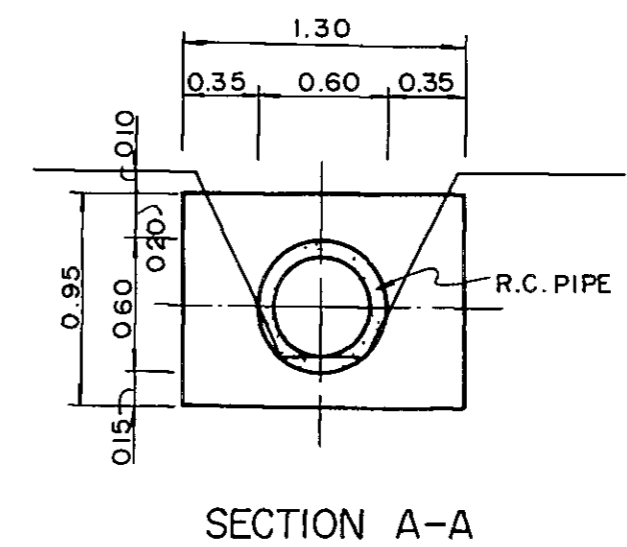
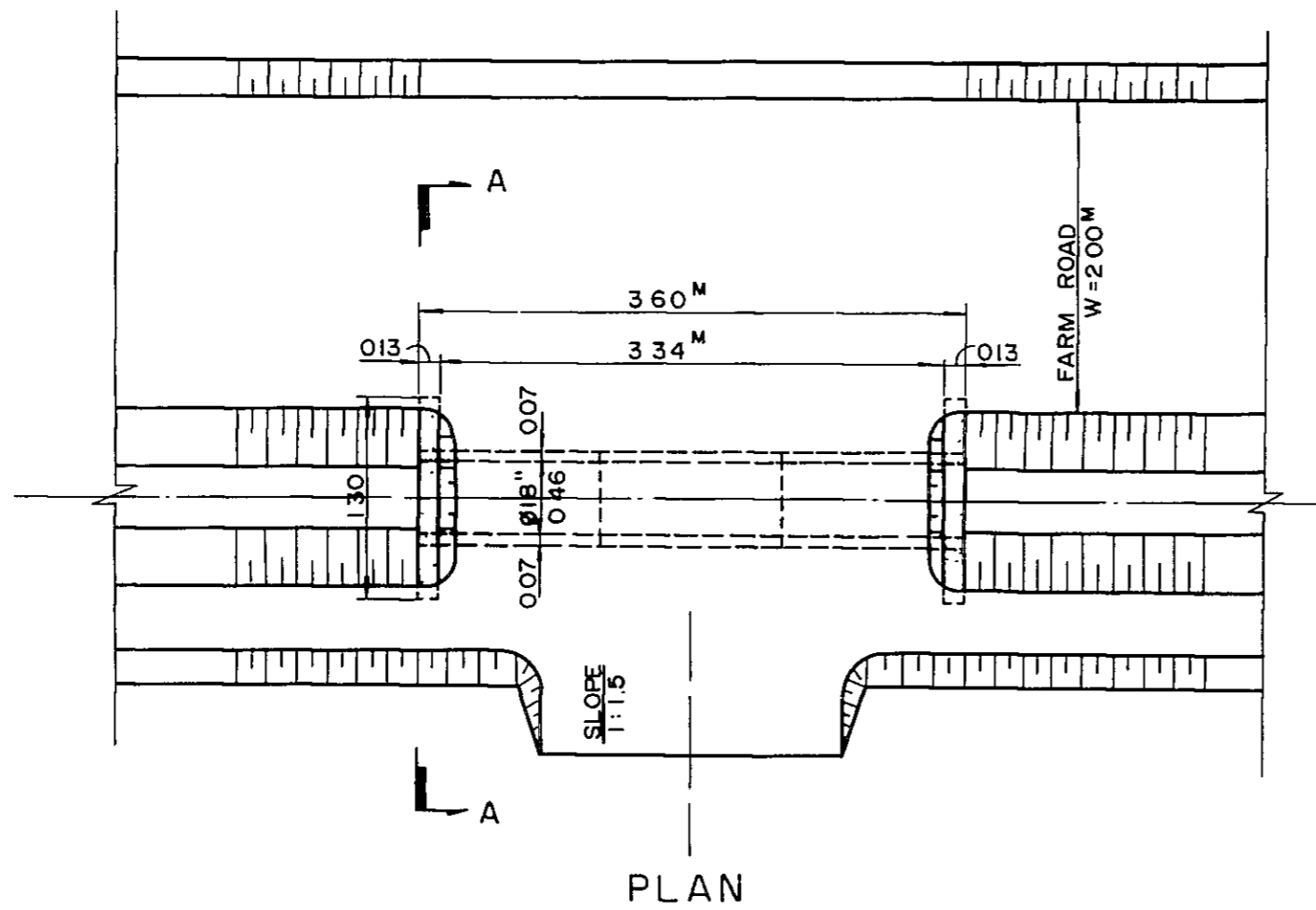
SCHEMATIC PLAN FOR DIVERSION BOX



FARM ROAD

NOTE
1) DIMENSIONS ARE GIVEN BY CENTIMETER.

REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP TYPICAL FARM DITCH SECTION AND DIVERSION BOX	
DRAWING NO.	INIS(II)-OF-043
JAPAN INTERNATIONAL COOPERATION AGENCY	



REPUBLIC OF THE PHILIPPINES NATIONAL IRRIGATION ADMINISTRATION	
INIP LAYOUT OF CROSS STRUCTURE	
DRAWING NO	INIS(II)-OF-044
JAPAN INTERNATIONAL COOPERATION AGENCY	

JICA