APPENDIX D EQIUPMENT DESIGN

APPENDIX D.5.3-1 Capacity Estimates or the Appurtenant Facilities

(1) Capacity of D.C Control Source

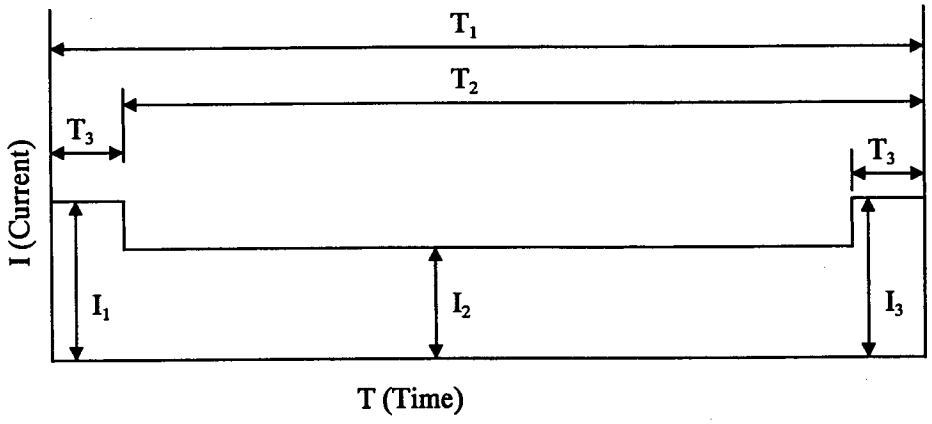
(a) Basic Conditions

- Type of battery : Nickel-Cadmium Alkaline
- Interruption time (discharge time) : 30min.
- Ambient temperature : 25°C
- Minimum voltage per cell : 1.06 V/Cell
- Number of cell : 86 Cell
- Maintenance factor : 0.8

(b) Load Conditions

Item		Nominal load at power interruption	Peak load
Main pump control and lamp indication, others	i_1	25A	—
Circuit breaker operation	i_2	—	20A
Total		25A	20A

(c) Load Pattern



$I_1 = i_1 + i_2 = 25 + 20 = 45A$ $T_1 = 30$ min.

$I_2 = i_1 = 25A$ $T_2 = 29.9$ min.

$I_3 = i_1 + i_2 = 25 + 20 = 45A$ $T_3 = 0.1$ min.

(d) Capacity Calculation Formula

$$C = \frac{1}{L}\left[K_1 \cdot I_1 + K_2 (I_2 - I_1) + K_3 (I_3 - I_2) + \cdots K_n (I_n - I_{n-1})\right]$$

Where:

C: Battery Capacity (Ah)

L: Maintenance Factor, 0.8

K: Capacity Conversion Time (hr)

By Japan Storage Battery Industry Standards (SBA 6001)

I: Discharge Current (A)

(e) Load Characteristics – A

From above load pattern,

$I_1 = 45A \quad T_3 = 0.1$ min. $\quad K_3 = 0.14$

$$C_A = \frac{K_3 - I_1}{L} = \frac{0.14 \times 45}{0.8} = 8(Ah / 1\ Hr)$$

(f) Load Characteristics – B

$I_1 = 45A \quad T_1 = 30$ min. $\quad K_1 = 0.57$

$I_2 = 20A \quad T_2 = 29.9$ min. $\quad K_2 = 0.57$

$I_3 = 45A \quad T_3 = 0.1$ min. $\quad K_3 = 0.14$

$$C_B = \frac{1}{L}[K_1 \cdot I_1 + K_2 (I_2 - I_1) + K_3 (I_3 - I_2)]$$

$$= \frac{1}{0.8}(0.57 \times 45 + 0.57 \times -25 + 0.14 \times 25) = 19\ (Ah / 1\ Hr)$$

Load characteristics = $C_B > C_A$

Accordingly, battery capacity for D.C control source is selected of 20 Ah / 1 Hr.

(g) Battery Charger

The capacity of battery charger shall be computed by the following formula

Ch = Nominal load current + Charging Current (= Battery Capacity/Charging Current hour rate*)

* Alkaline battery charging current hour rate is 5hr.

$$Ch = 25 + \frac{20}{5} = 29A$$

Charger rated charging current is selected of 30A.

(h) Charger Input Capacity

$$P = \frac{E \cdot A \cdot 10^{-3}}{\phi \times \eta}$$

Where:

P: Transformer input capacity

E: Equalizing charging voltage = 129V
(1.5V / Cell x 86 Cell = 129V)

A: Charger output = 29A

ϕ: Power factor = 0.7

η: Effeciency = 0.75

$$P = \frac{129 \times 29 \times 10^{-3}}{0.7 \times 0.75} = 8\ KVA$$

(2) Capacity of Emergency Diesel Generator

(a) Emergency Load List

Load	Output (KW)	Nos. of Running	Load Factor (%)	Total Input (KVA)
Actuator for guard valve	5.5	1	80	6.0
Pipe line guard valve	7.5	1	80	8.0
Sump pump	7.5	2	80	16.0
D.C Power source	8.0	1	90	8.0
Control/Instrumentation*	3.0	1	90	5.0
Lighting*	17.0	1	100	30.0
Total				73.0

* Converted to 3 phase load (= 1 Phase load (KW) x $\sqrt{3}$)

(b) Generator Output

Generator output shall be computed according to the following three formula.

1) Normal Load Capacity (Q_1)

In this case, capacity (Q_1) is equal to total input KVA.

$Q_1 = 73$ KVA

2) Starting Load Capacity (Q_2)

$Q_2 = (B + Bm \cdot N) / K$

Where:

B: Total input KVA in running load – 65 KVA

(Q_1 – Input KVA of 7.5 KW starting motor = 73 – 8 = 65)

Bm: Reactive power of starting motor 7.5 KW motor

N: Current ratio of starting current / rated current on-line start -6 times

K: Short-time withstand over load of generator – 1.5

$Q_2 = (65 + 12.21 \times 6) / 1.5 = 92$ KVA

3) Considering Starting Voltage Drop Capacity (Q_3)

$$Q_3 = \frac{Xd'(1-Vd)}{Vd} \times Bm \cdot N$$

Where:

Xd': Generator transient reactance (25%)

Vd: Permissible instantaneous voltage drop (30%)

$$Q_3 = \frac{0.25(1-0.3)}{0.3} \times 12 \times 6 = 42 \text{ KVA}$$

From above 1) – 3), generator output shall be not less than 92 KVA.

(c) Diesel Engine Output

Diesel engine output shall be computed according to the following three formula.

1) Required output for normal load (PE_1)

$PE_1 = Q_1 \cdot P_{fg} / 0.736 - \eta_G$

Where:

Q_1: Total normal load - 73 KVA

P_{fg}: Generator power factor - 0.8

η_G: Generator efficiency - 0.87

$PE_1 = 73 \times 0.8 / 0.736 \times 0.87 = 92$ PS

2) Required output for starting load (PE_2)

$PE_2 = B \cdot P_{fg} + B_m \cdot N \cdot P_{fms} / 0.736 \cdot \eta G \cdot KE$

Where:

P_{fms}: Motor Starting power factor - 0.4

KE: Diesel engine withstand over load - 1.1

$PE_2 = 65 \times 0.8 + 12 \times 6 \times 0.4 / 0.736 \times 0.87 \times 1.1 = 115$ PS

3) Required output for starting voltage drop (PE_3)

$PE_3 = Q_3 \cdot P_{fms} / 0.736 \cdot \eta G \cdot KE$

Where:

Q_3: Considering starting voltage drop capacity - 42 KVA

$PE_3 = 42 \times 0.4 / 0.736 \times 0.87 \times 1.1 = 24$ PS

From above 1) – 3), diesel engine output shall be not less than 115 PS.

APPENDIX E MINUTES OF DISCUSSIONS

APPENDIX E.1 : Minutes and Resolutions for PSC Meeting held on 30th September 1999

Resolution for the Technical Comments on the Interim Report (2)
for
The North Sinai Integrated Rural Development Project (Phase III)

(Detailed Design Study)

October, 1999

JICA Study Team
(Sanyu Consultants Inc.)
(Pacific Consultants International)

Resolutions for the Comments which has been issued during PSC, PMC and individual meetings with MED

I. PSC meeting held on September 30th, 1999

Item I-1 (1) : Economic Internal Rate of Return(EIRR) shall be analyzed accurately based on the cost estimated after the completion of D/D and the benefit estimated on the base of revised development plan by NSDO.

Resolution : EIRR will be calculated based on the accurate cost estimates of conveyance canal for subject section, and cost estimates of irrigation/drainage facilities as well as on-farm facilities by NSDO and benefit estimates by the NSDO/PPD at the Phase III of the study.

Item I-2 (2) : NSDO explained that the Study schedule be shorten in order to make possible the early commencement of the construction work.

Resolution : JICA will make efforts to accelerate commencement of the 4th field survey work (Dispatching explanation mission for Interim Report (3) in Phase II and phase III (Cost estimates and tender documentation) as early as possible. Commencement of the work will be expected late March, 2000.

Item I-3 (3) : NSDO shall make effort to keep the stick of the centerline of the topographic survey by fixing it with concrete until the construction works start.

Resolution : NSDO shall make the countermeasures in proper time.

Item I-4 (4) : The slope of the berm between open canal and O/M road shall be reverse direction in order to prevent the dredged materials flowing into the canal.

Resolution : The berms of the reversed slope are shown in Figure 4.1.
The dredging works will be done in October/November and the dredged materials will be temporarily stocked on the berms. No runoff will occur in October/November because the average monthly rainfall of these month is only 6 mm to 16 mm. Therefore, it is not recommended to construct the berms with "reversed slope" that requires higher construction cost as compared with the original plan. The original plan is shown in Figure 4.2.

Monthly Runoff in El Arish

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.
Rainfall (mm)	20.3	17.1	12.8	6.1	3.2	0.0	0.0
Month	Aug.	Sep.	Oct.	Nov.	Dec.	Total	
Rainfall (mm)	0.2	0.6	6.0	16.2	22.2	104.7	

Item I-5 (5) : Pipeline operation rule of number of pipeline utilized and hydraulic losses shall be incorporated with the pump operation simulation study (4.2 in M/M of PMC-7).

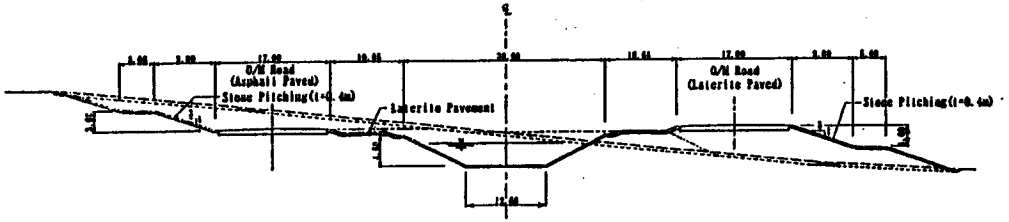
Resolution : Conclusion will be incorporated in the D/D reports (Interim report (3)).

Item I-6 (6) : By-pass shall be provided from immediate downstream of the No.7 Pumping Station (PS) to the upstream.

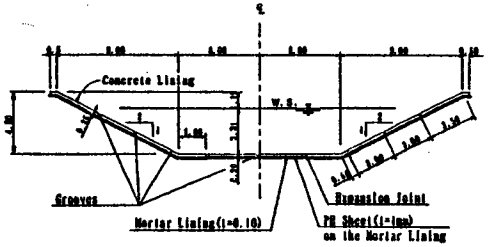
Resolution : This by-pass system has very important functions to release water in the pipelines during O/M and or emergency case. The by-pass pipes with diameter of 400 mm shall be installed under the ground from the valve chamber of immediately downstream of header pipe to suction sump in order to release water in the main pipe by gravity, and some remaining water below EL10.70 m in the main pipes will be drained to drain pit in the main pump room by other pipeline routes.

Item I-7 (7) : The durability of pipe against negative pressure shall be examined.

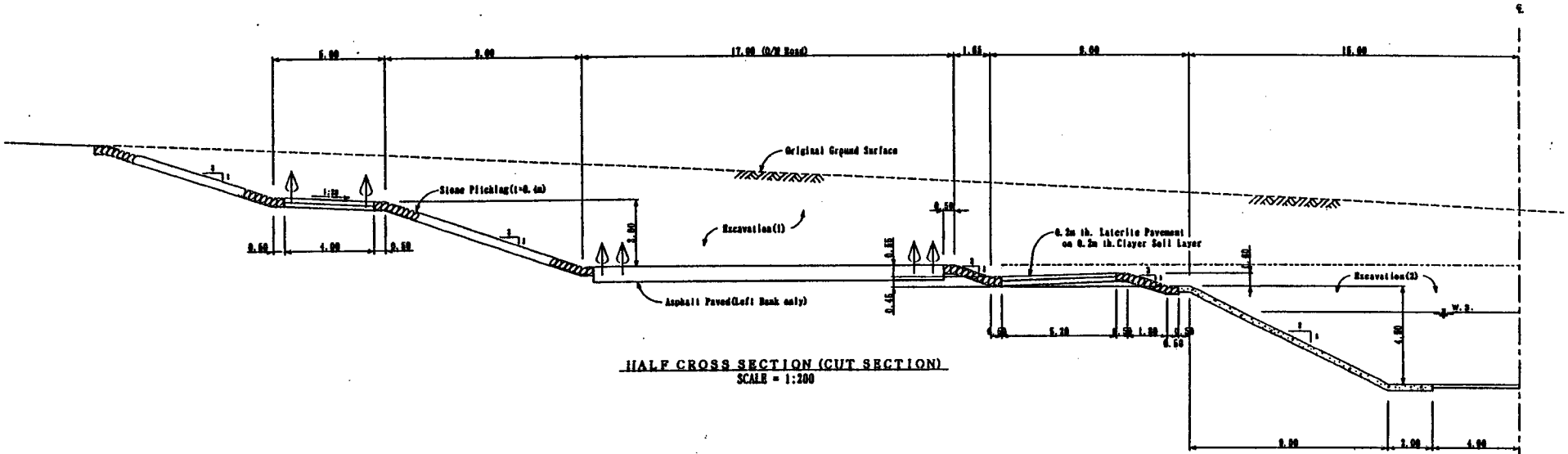
Resolution : This is still under study, so conclusion of the study will be discussed in the D/D reports.



TYPICAL CROSS SECTION OF OPEN CANAL



CONCRETE LINED SECTION



HALF CROSS SECTION (CUT SECTION)
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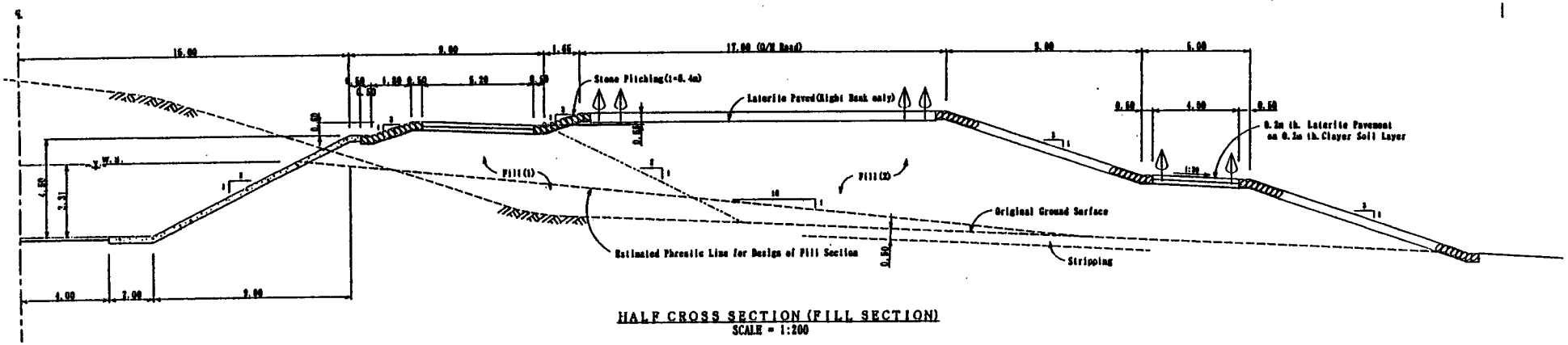

HALF CROSS SECTION (FILL SECTION)
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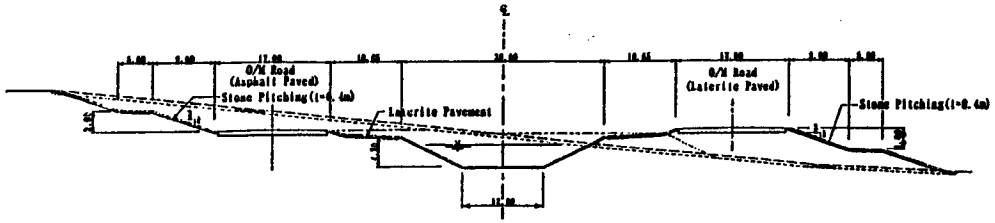
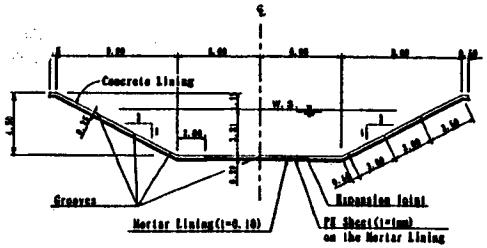
Figure 4.1 Open Canal with Berm of Reversed Slope



TYPICAL CROSS SECTION OF OPEN CANAL



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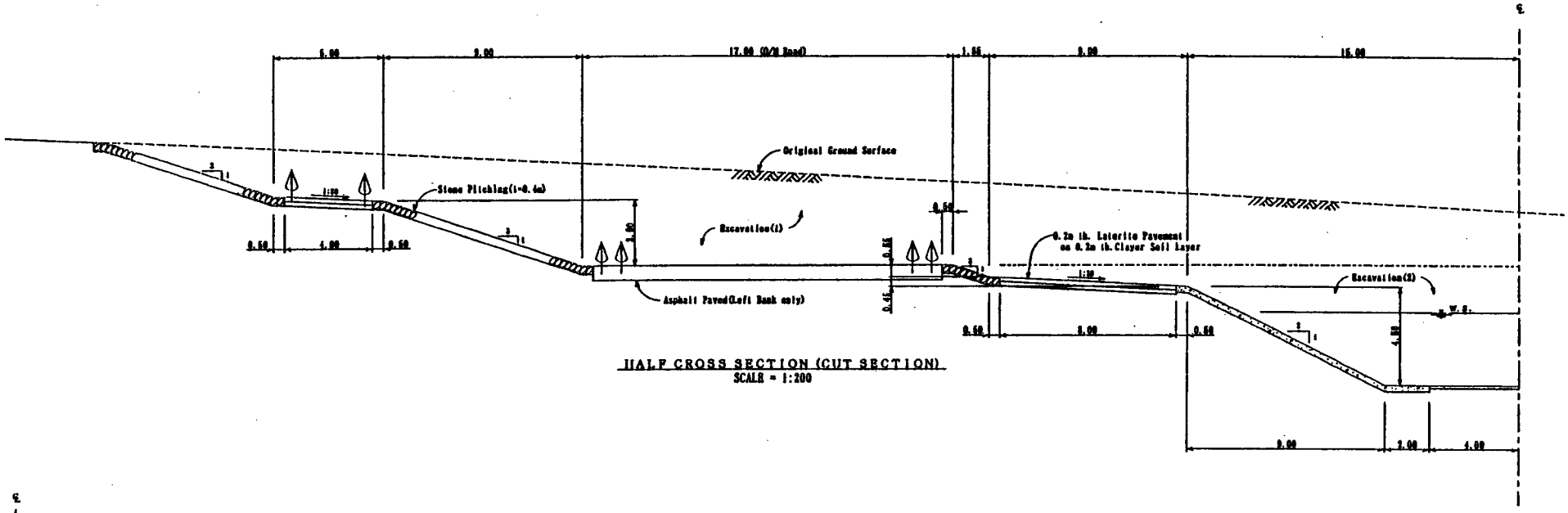

HALF CROSS SECTION (CUT SECTION)
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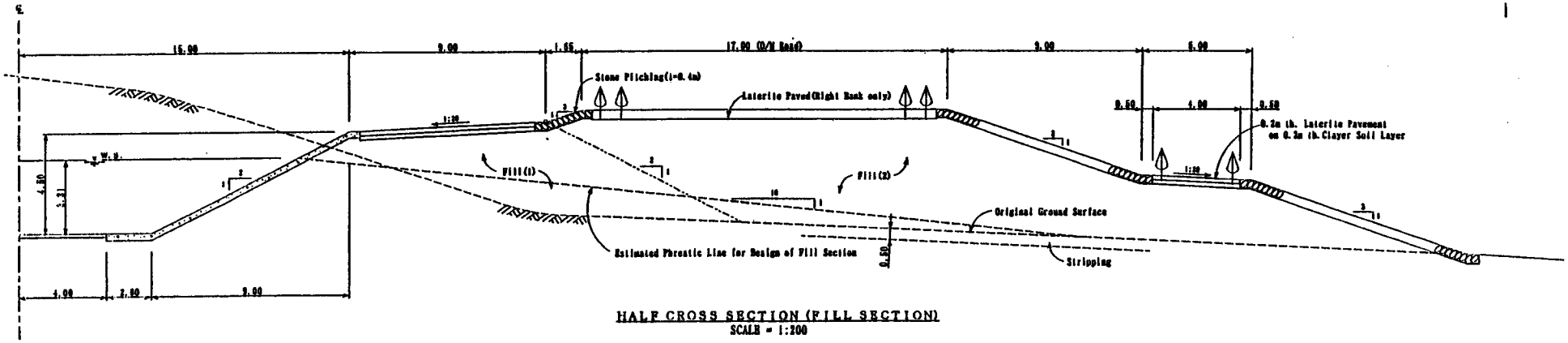

HALF CROSS SECTION (FILL SECTION)
SCALE = 1:200

Figure 4.2 Open Canal (Original Plan)

APPENDIX E.2 : Minutes and Resolutions for PMC Meeting held on 28th September 1999

II.PMC Meeting held on September 28th, 1999

Item II-1 (1.1) : The guideline for the pre-qualification shall be included in the Tender Documents which will be submitted in August, 2000.

Resolution : The study team shall prepare Pre-Qualification Documents including evaluation criteria and submit such draft documents to MPWWR by the 5th Field Survey Period(may be by July or August). This documents, however, shall be prepared only for the Second Package of the tenders. Because bidders of the 2nd package tender are to be made consortium consisting of, at least, civil contractor (pumping station and steel pipe installation) and pumping plants supplier (mechanical and electrical equipment supply and installation).

Item II-2 (1.2) : The soil survey and borehole data shall be compiled and shown together with the tender documents.

Resolution : All geological data and information concerning the subject section of the tender will be incorporated in the respective tender documents.

Item II-3 (1.3) : For the reinforcement bar, grade of steel of St52 shall be exclusively used and St37 will be removed from this project.

Resolution : Study team accepted the recommendation.

Item II-4 (2.1) : Slope stability analysis shall be conducted to optimize the open canal section specially at the high fill section.

Resolution : The results of the slope stability analysis are shown in attached papper-1(Table A-1, A-2, A-3, A-4 and Figure A-1, A-2, A-3, A-4) . Conclusion are summarized as follows :

- Concrete lining slope is 1 : 2.0, recommendable, because safety factor is 1.254 (more than 1.20)
- Embankment soil slope is 1 : 3.0, recommendable, because safety factor is 1.339 (more than 1.20)

Item II-5 (2.2) : A kind of settling basin shall be provided at every 1.0 km to 1.5 km interval along the open canal .

Resolution : Study team, in general, accepted the recommendation.

The settling basin (approx. 8 m wide x 20 m long x 1 m deep) will be provided at every 1.0 km – 1.5

km interval. (refer to Figure 2) This settling basin will be also provided in the open canal section located at just upstream from the beginning point of the box culvert section.

Item II-6 (3.1) : A kind of settling basin shall be provided by lowering the bed of box culvert about 1 m at the beginning and the first opening and slot for stop-log shall be provided for all the openings of the box culvert.

Resolution : Study team accepted the recommendation.
The settling basin (3.7m wide x 12m long x 1m deep x 4 Nos.) will be provided at the first opening as shown in Figure 3.1. The stop-log slots will be prepared for all the openings as shown in Figure 3.2.

Item II-7 (3.2) : Foundation of the box culvert and/or the alternative structure shall be examined at the section of high fill.

Resolution : In addition to the box culvert on the embanked foundation, the two alternatives, such as "siphon" and "elevated canal" will be examined and be reported in the Interim Report (3) (D/D reports).

Item II-8 (4.1) : The pump suction level shall be checked in case the canal concrete is new and the Manning's coefficient is smaller than the design coefficient of n=1/55.

Resolution : The Manning's coefficient of new canal section is depended upon roughness of concrete surface of the canal and/or structures. As the alternatives study of the uniform flow of the open canal, water depth is as follows ;

"n" value	Discharge (cu.m/sec)	Width of canal bed (m)	Water depth of canal (m)	Hydraulic gradient
N1=0.018	52.66 (10.83)	12.00	3.287 (1.373)	1/12,500
N2=0.015	52.66 (10.83)	12.00	2.983 (1.238)	1/12,500
N3=0.012	52.66 (10.83)	12.00	2.646 (1.086)	1/12,500
Differ : N1-N2			0.304 (0.135)	
Differ : N1-N3			0.641 (0.287)	

Figures in parenthesis indicate condition of one unit operation of pump.

However, lowest operation water level at the No.7 pumping station set up 8.80 m for one unit pump operation even though the water depth of upper reach canal is sallower than the design depth as indicated in the above table. Therefore, cavitation phenomenon will not be occurred in

the initial stage(coefficient of roughness of concrete surface will rather be small) of pump operation.

Item II-9 (4.2) : Pump operation rule of number of pump units and operation interval shall be shown in the D/D report which also include the behavior of water level fluctuation at the suction.

Resolution : Study will be carried out during detailed design stage and conclusions of the study are incorporated in the D/D report.

Item II-10 (4.3) : Plan of symbolic or monumental landscape worth looking shall be applied for the architectural design of the No.7 Pumping Station.

Resolution : Study team will consult with NSDO on this subject before finalizing detailed design drawings. Preparation of detailed design drawings, however, is subject to consultation with JICA depend upon the nature and scale of the monuments.

Item II-11 (5.1) : The necessity of coating and the method of mortar coating for steel pipe shall be explained in the D/D report.

Resolution : Detailed explanation notes of coating materials and method of mortar coating will be incorporated in the D/D reports.

Item II- 12 (5.2) : Explanation shall be given in D/D report for the reason of no need of thrust block and joint for steel pipeline, except near concrete facilities.

Resolution : Technical discussion will be made in the D/D reports.

Item II-13 (5.3) : Comparison study on flap valve with a stop-log instead of weir in the discharge tank shall be made for the optimization.

Resolution : As indicated in the previous Interim Report (2), possible alternatives of the discharge tank types for the large scale discharges and high lifting pumping plants are four types, and comparative table of discharge tank type is shown below. From the table, "rectangular weir type" of discharge tank was adopted because, there are no technical hazard than other alternatives and no different initial and energy costs.

Alternatives and Advantage/ Disadvantage of Discharge Tank Type

Type	Rectangular Weir type	Round weir type	Siphon type	Non-return valve type
Description	• Straight weir	• Round weir	• Siphon at the downstream end of the discharge pipe	• Non-return valve at the downstream end of the discharge pipe
Hydraulic character	• Head loss equal to the overflow depth occurs. (Head loss:1.0m) • Deviated flow tends to occur.	• Head loss equal to the overflow depth occurs. (Head loss:1.0m) • Deviated flow hardly occurs.	• Head loss is less than weir type. (Head loss:0.5m) • Deviated flow tends to occur.	• Head loss is small. (Head loss:0.4m) • Deviated flow tends to occur • Discharge tank shall be required countermeasure for water hammer in the case of rather large discharge and high lifting head of PS. • Additional conventional surge tank and or air bend may be necessary because negative pressure will be occurred at immediately upstream of the flap valve when it closed.
Structural character	• Straight structure ensures easy construction.	• Curved structure result in hard construction	• Curved structure on curved discharge pipe result in hard construction.	• Installation of non-return valve only makes construction easy.
Past example	• Head loss can be decreased by lengthening the weir .Many examples for large discharge and less limitation of land	• Largest head loss. As discharged vertically upward, many examples for medium to small discharge.	• Least head loss. Many examples for large discharge with medium to high pumping head in case initial siphon flow are formed by themselves. • No.6 Pumping Station of this project	• Little head loss. Many examples for wide range of discharge with low pumping head. • No.5 Pumping Station of this Project.
Economic	(1,000 L.E.)			
1.Initial Cost	1,109	1,331	1,370	3,568
2.Convert to Annual Cost	70	84	87	226
3.Energy Cost	55,820	55,820	55,540	55,483
4.Overall ann. Cost (2+3)	55,890 (1.005)	55,904 (1.005)	55,627 (1.000)	55,709 (1.001)

Item II-14 (5.4) : Explanation for the program of water hammer analysis shall be given in the D/D report including the theory applied, input and output etc.

Resolution : Overall information and the result of analysis based on the final dimensions of proposed pump and pipeline systems will be incorporated in the D/D reports.

Item II-15 (6.1) : Stop-log shall be provided at the upstream of the spillway radial gates.

Resolution : Study team accepted the recommendation and typical section of stop-log slots was provided as shown in Figure 6.1.

Item II-16 (6.2) : The typical cross section at the downstream of the chute shall be changed to stone pitching.

Resolution : The canal section of the spillway outlet channel at the downstream of the stilling basin will be designed as a stone pitching canal as shown in Figure 6.2.

Item II-17 (6.3) : The duration time required for emptying the water from the open canal through the gates shall be examined.

Resolution : The duration time required for emptying the water stored (0.967MCM) under the overflow crest of EL.11.10m is calculated and its result is shown in Figure 6.3 and Table 6.1. Based on the detailed calculation, the width of the spillway outlet channel is changed from 15m shown in the Interim Report (2) to 10 m.

Item II-18 (7.1) : Road asphalt paving shall be one layer.

Resolution : Study team, in general, accepted the recommendation.

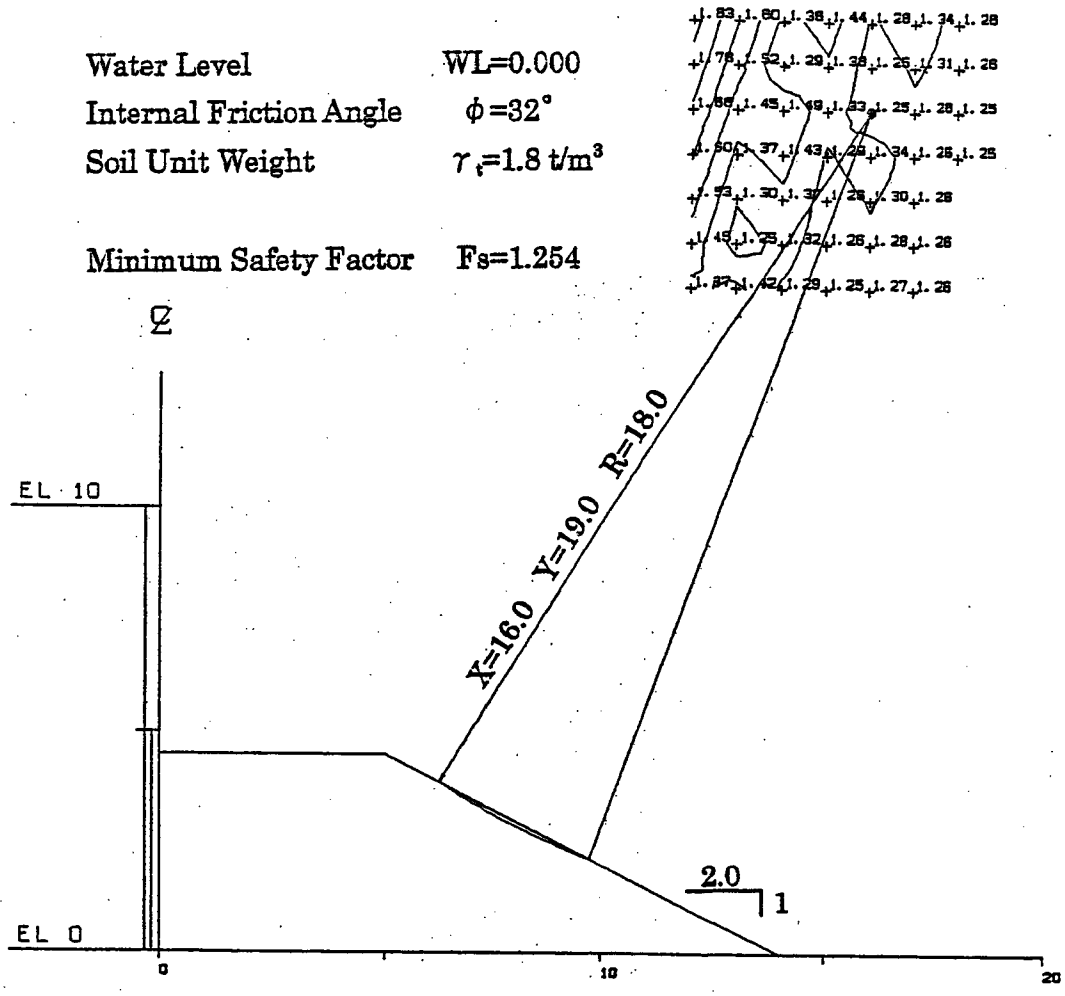

Figure A-1 Stability Analysis of Lining Slope of Conveyance Canal

Table A-1 Stability Analysis of Lining Slope of Conveyance Canal

X (M)	Y (M)	R (M)	CL (TON/M)	NTAN (TON/M)	T (TON/M)	F.S.
16.00	19.00	19.00	0.0	8.700	6.297	1.382
		18.00	0.0	0.279	0.222	1.254
16.00	20.00	20.00	0.0	9.826	6.894	1.425
		19.00	0.0	0.804	0.640	1.257
16.00	21.00	21.00	0.0	10.939	7.441	1.470
		20.00	0.0	1.431	1.110	1.288

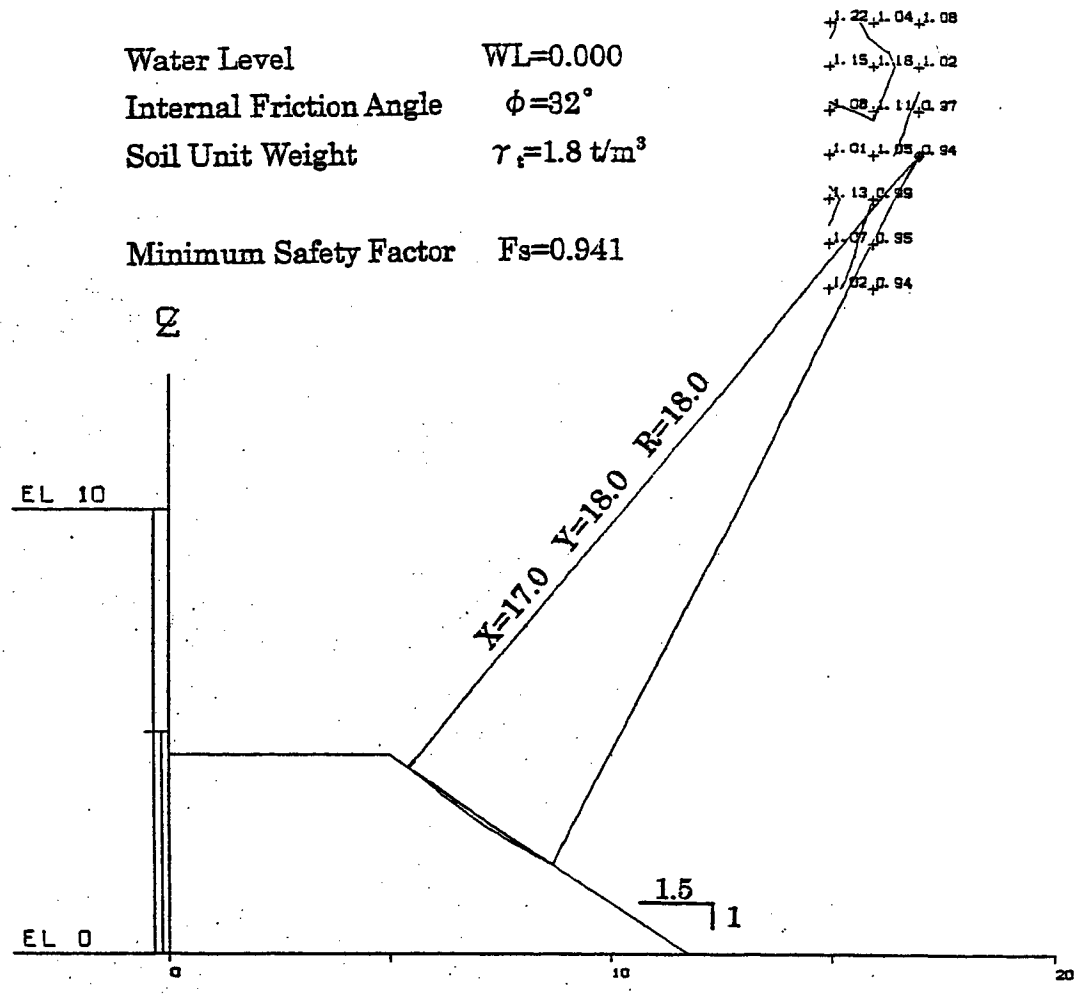

Figure A-2 Stability Analysis of Lining Slope of Conveyance Canal

Table A-2 Stability Analysis of Lining Slope of Conveyance Canal

X (M)	Y (M)	R (M)	CL (TON/M)	NTAN (TON/M)	T (TON/M)	F.S.
16.00	20.00	20.00	0.0	5.307	4.549	1.167
16.00	21.00	21.00	0.0	6.334	5.188	1.221
		20.00	0.0	0.271	0.260	1.046
17.00	18.00	18.00	0.0	0.256	0.272	0.941
17.00	19.00	19.00	0.0	0.998	1.024	0.975
17.00	20.00	20.00	0.0	1.832	1.779	1.030
17.00	21.00	21.00	0.0	2.715	2.501	1.085

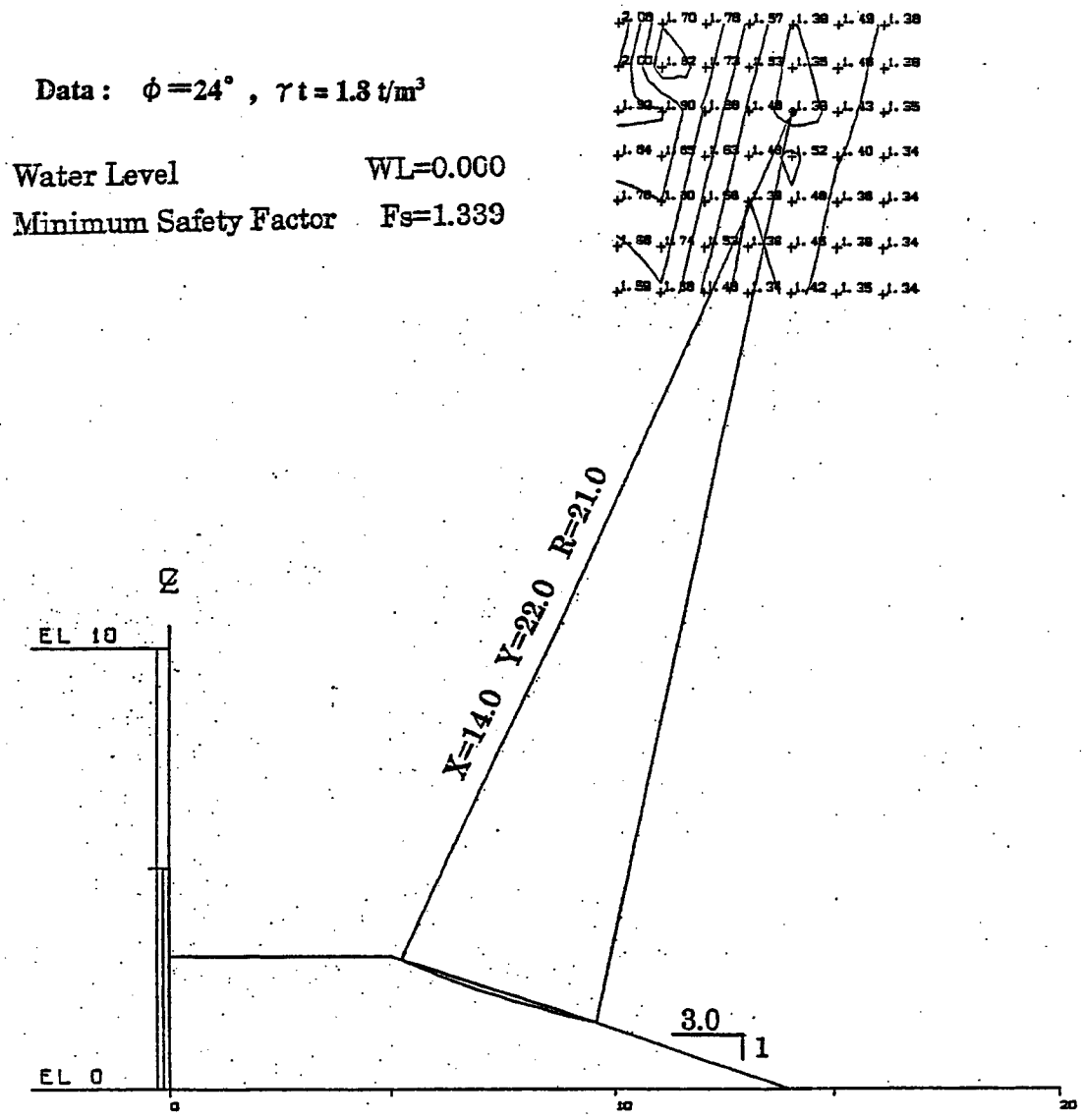

Figure A-3 Stability Analysis of Embanked Slope of Conveyance Canal

Table A-3 Stability Analysis of Embanked Slope of Conveyance Canal

X (M)	Y (M)	R (M)	CL (TON/M)	NTAN (TON/M)	T (TON/M)	F.S.
14.00	22.00	22.00	0.0	6.838	4.386	1.559
		21.00	0.0	0.286	0.214	1.339
14.00	23.00	23.00	0.0	7.256	4.547	1.596
		22.00	0.0	0.476	0.350	1.358
14.00	24.00	24.00	0.0	7.665	4.693	1.633
		23.00	0.0	0.676	0.487	1.390

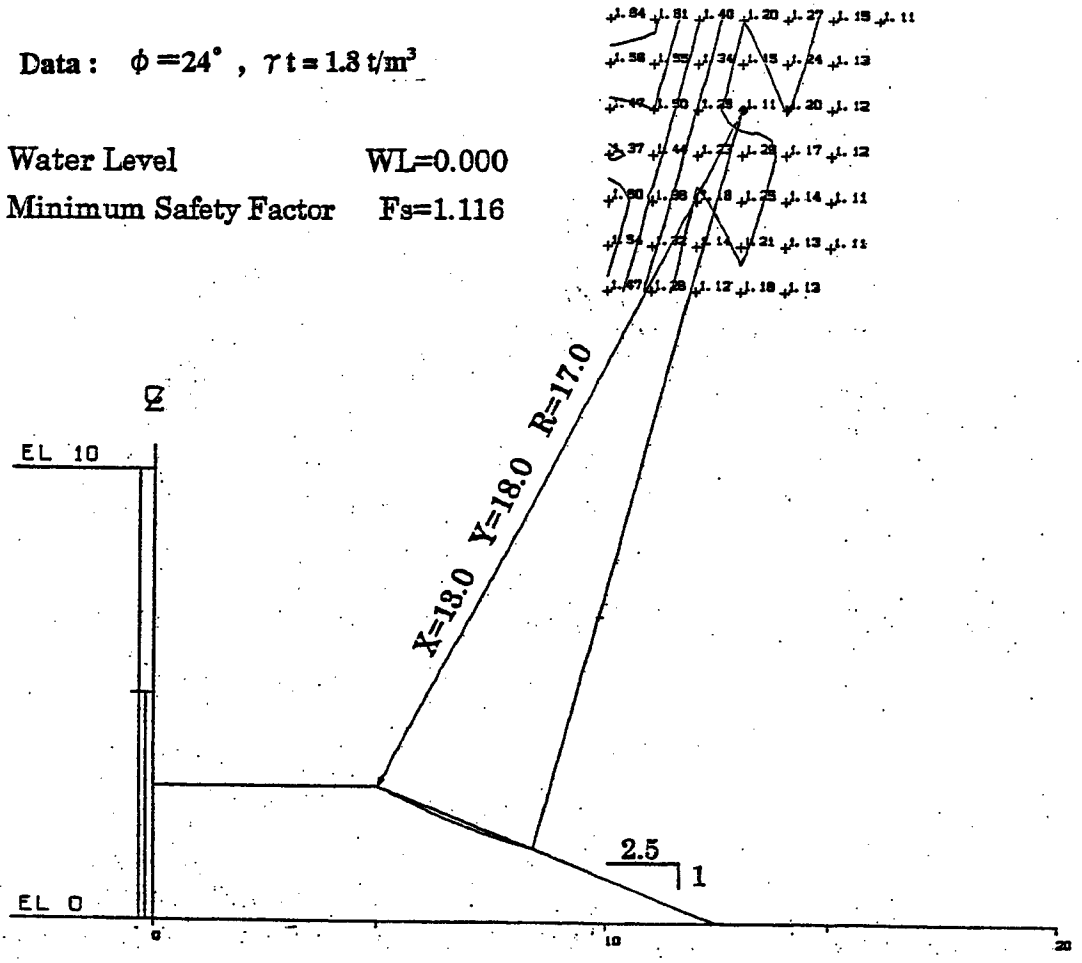

Figure A-4 Stability Analysis of Embanked Slope of Conveyance Canal

Table A-4 Stability Analysis of Embanked Slope of Conveyance Canal

X (M)	Y (M)	R (M)	CL (TON/M)	NTAN (TON/M)	T (TON/M)	F.S.
13.00	18.00	18.00	0.0	5.622	4.207	1.336
		17.00	0.0	0.173	0.155	1.116
13.00	19.00	19.00	0.0	6.078	4.406	1.380
		18.00	0.0	0.369	0.319	1.156
13.00	20.00	20.00	0.0	6.531	4.591	1.423
		19.00	0.0	0.586	0.488	1.201
14.00	14.00	14.00	0.0	1.510	1.337	1.130
14.00	15.00	15.00	0.0	1.961	1.733	1.131

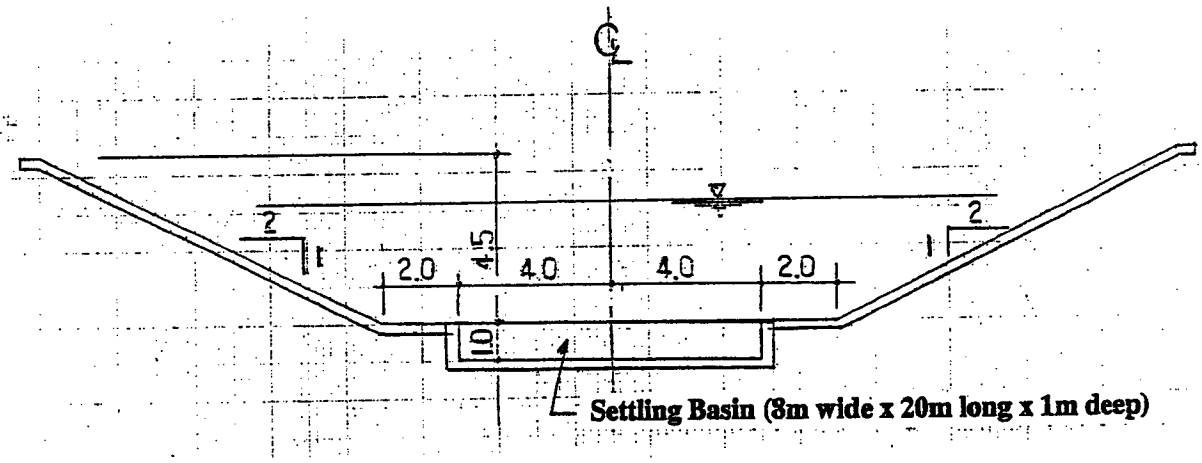

Figure 2 Typical Cross Section of Open Canal with Settling Basin

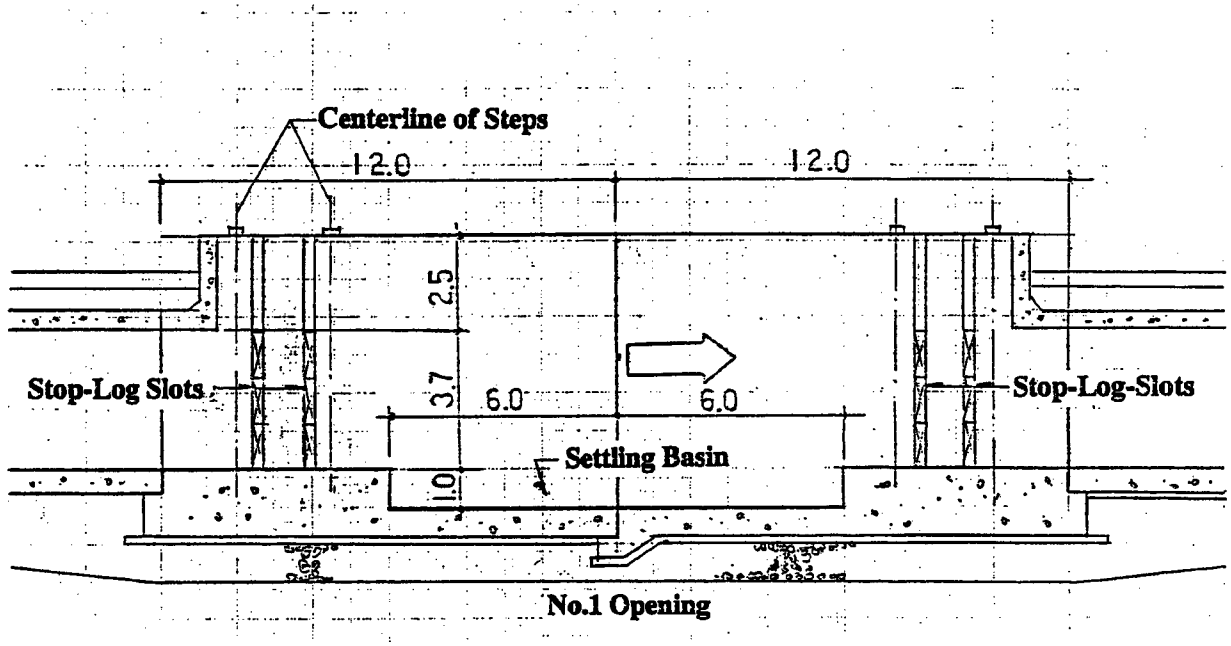

Figure 3.1 Longitudinal Section of No.1 Opening

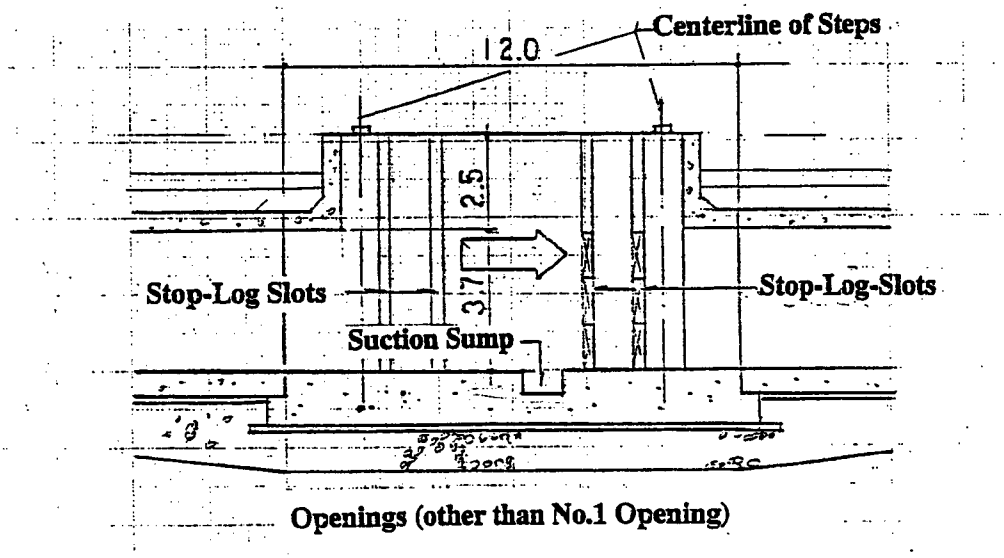

Figure 3.2 Longitudinal Section of Openings other than No.1 Opening

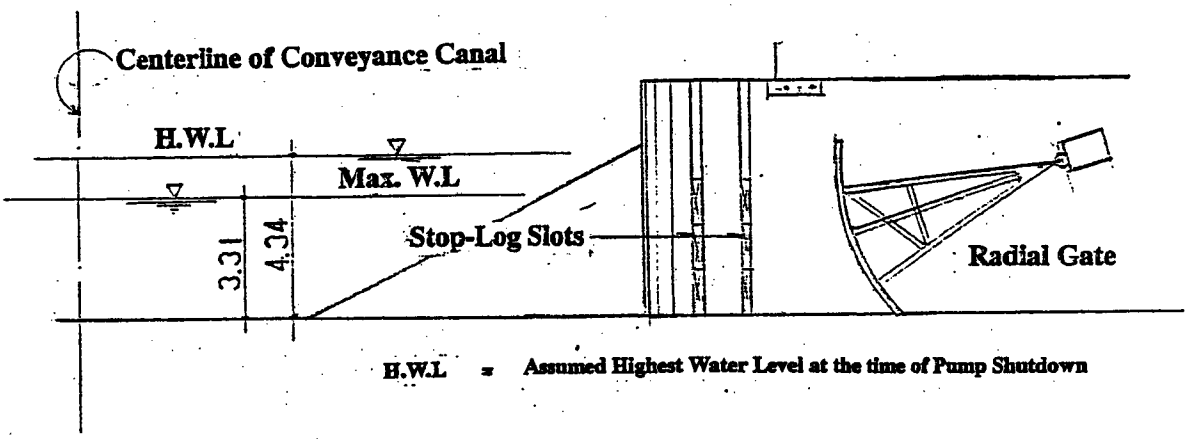

Figure 6.1 Gated Section of Spillway

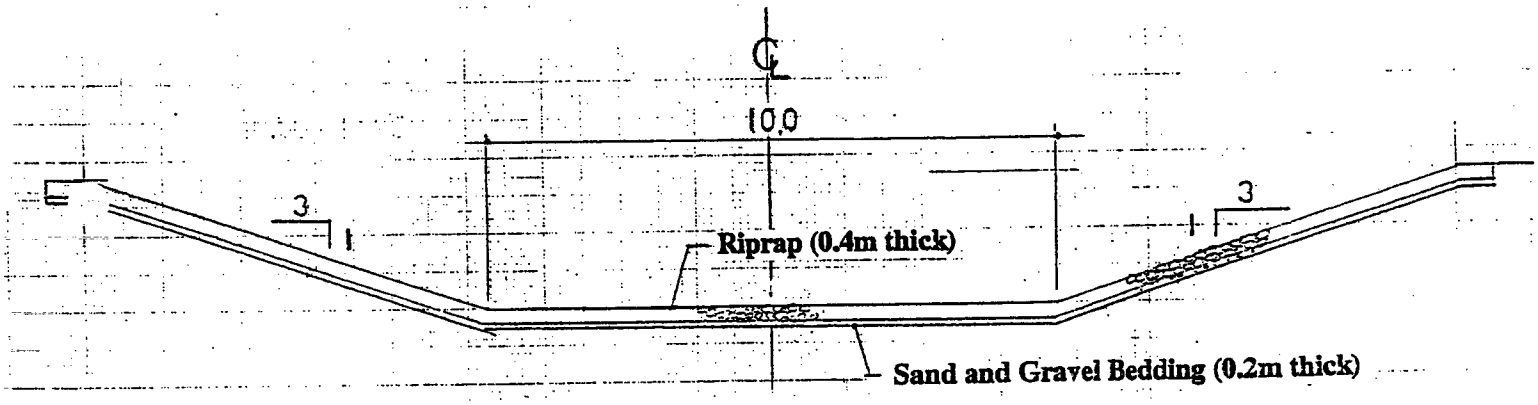

Figure 6.2 Spillway Outlet Channel at the Downstream from the Stilling Basin

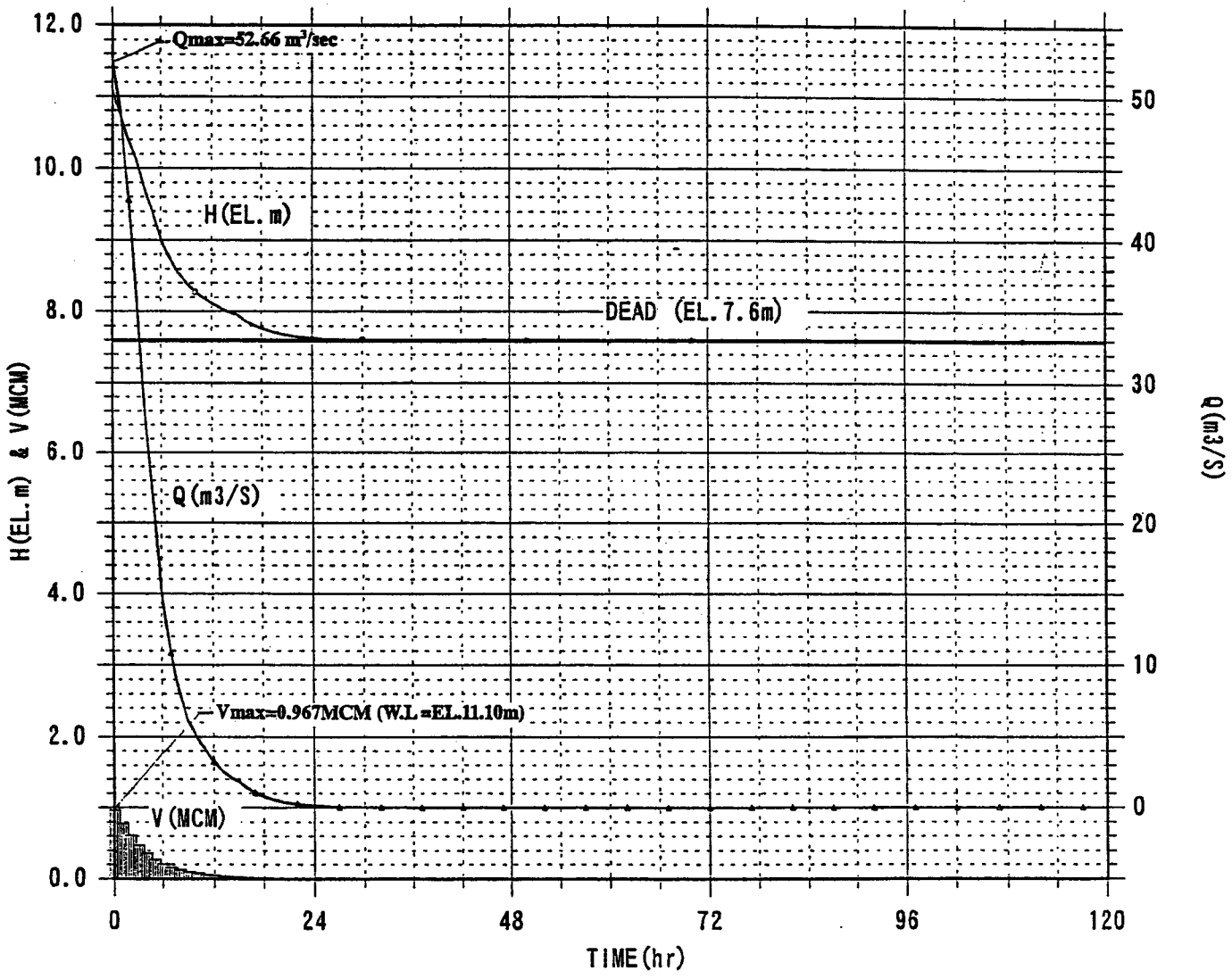

Figure 6.3 Outflow from Gated Sections of Spillway

Table 6.1 Calculation of Outflow from Gated Sections of Spillway

TIME(hr)	H(EL.m)	V(MCM)	Q(m3/S)
1	10.73	0.781	48.906
2	10.39	0.616	42.793
3	10.09	0.475	35.646
4	9.71	0.362	27.718
5	9.40	0.273	21.580
6	9.01	0.208	14.962
7	8.75	0.162	10.825
8	8.55	0.128	8.135
9	8.40	0.103	6.129
10	8.28	0.083	4.964
11	8.18	0.067	4.020
12	8.11	0.054	3.256
13	8.05	0.043	2.637
14	7.99	0.035	2.136
15	7.95	0.028	1.806
16	7.87	0.022	1.388
17	7.81	0.017	1.049
18	7.76	0.014	0.793
19	7.72	0.012	0.599
20	7.69	0.010	0.453
21	7.67	0.008	0.342
22	7.65	0.007	0.259
23	7.64	0.007	0.196
24	7.63	0.006	0.148
25	7.62	0.005	0.112
26	7.62	0.005	0.085
27	7.61	0.005	0.064
28	7.61	0.005	0.048
29	7.61	0.004	0.037
30	7.61	0.004	0.028
31	7.60	0.004	0.021
32	7.60	0.004	0.016
33	7.60	0.004	0.012
34	7.60	0.004	0.009
35	7.60	0.004	0.007
36	7.60	0.004	0.005
37	7.60	0.004	0.004
38	7.60	0.004	0.003
39	7.60	0.004	0.002
40	7.60	0.004	0.002
41	7.60	0.004	0.001
42	7.60	0.004	0.001
43	7.60	0.004	0.001
44	7.60	0.004	0.001
45	7.60	0.004	0.000
46	7.60	0.004	0.000
47	7.60	0.004	0.000
48	7.60	0.004	0.000
49	7.60	0.004	0.000
50	7.60	0.004	0.000
51	7.60	0.004	0.000
52	7.60	0.004	0.000
53	7.60	0.004	0.000
54	7.60	0.004	0.000
55	7.60	0.004	0.000
56	7.60	0.004	0.000
57	7.60	0.004	0.000
58	7.60	0.004	0.000
59	7.60	0.004	0.000
60	7.60	0.004	0.000

APPENDIX E.3 : Minutes and Resolutions for MED Meeting held on 26th September and 2nd October, 1999

3. Technical Meeting with MED held 26th September and 2nd October 1999

Item III-1 (1.1) : The screens of suction sump of the pumping station should be doubled and those major dimensions are as follows :
(1) Upstream screen : 50 mm width of opening and traveler trash car type
(2) Downstream screen : 100 mm width of opening and manual operating type
(3) The length of suction sump may be 30.5 m as shown attached paper.

Resolution : Study team accepted the conclusion of discussion and proposed dimension of feeder canal between both screens shall be followed the Figure in the M/M. .

Item III-2 (1.2) : Suction pipe of the pump shall be reinforced concrete lined with embedded steel plates shattering for smooth surfacing and convenient construction.

Resolution : Concepts of study team on this subject was same as the recommendation of MED request..

Item III-3(1.3) : The existing silty clay layer which are classified as inorganic clay of high plasticity (CH by USCS) and indicates 50 or more N value, under the basement of pumping station has enough bearing capacity without any settlement (refer to p-3-9 and p-3-54 to 55 of Interim Report(2)).

Resolution : As confirmed in the meeting, no foundation treatment under the basement of No.7 Pump Station is required.

Item III-4(1.4) : Grain size of sand dune blown into conveyance canal has been investigated ranged 0.3 to 1.0 mm and settling basin has been designed to deposit 0.3 mm or more of grain size. Design of pump materials, however, shall be carefully carried out taking into account water quality and sand particle.

Resolution : Designing of settling basin shall be followed the concept mentioned in the ITR(2) and selection of pumping plant materials especially impellers will be carried out taking into account the such contents of sand below 0.3 mm.

Item III-5(1.5) : The layout plan of pump house has been agreed by the MED Engineers.
(1) As shown in the Dwg. BB-05, the wall for Auxiliary Substation(ground floor EL +

13.70) will be close of pump room.

(2) The space of office and the location of WC are satisfactorily agreed.

Resolution : For the item (1) of the above, please refer to Item IV-11, and for item (2), Study team also accepted the conclusion.

Item III-6(1.6) : Dewatering during construction of pumping station will be carried out by deep well method (not be used sheet piles) and more studies of dewatering will be conducted at Detailed Design Stage.

Resolution : More detailed study based on the deep well method (lowering groundwater level is more than 9 m) will be conducted by the team in D/D stage.

Item III-7(2) : The study of cathodic protection method for steel pipe including coating methods shall be done at D/D Stage. Prestressed Concrete Cylinder Pipe(PCCP) shall not be accepted for the project because of restriction of joint which discussed on Progress Report(2) and p-5-70 of ITR(2).

Resolution : Coating method including cathodic protection of steel pipe shall be carefully studied more comprehensively during D/D stage by the team.

Item III-8(E1) : Two(2) 66kv transmission lines from the existing El Abd substation managed by EEA to the main substation for No.7 pumping station about 35 km north west, all works shall be executed by REA before beginning operation of the pumping station comply with the NSDO requirement.

Resolution : Both sides confirmed the above obligations and responsibility, so that study work shall only be carried out detailed design and documentation of the main substation.

Item III-9(E2) : For main substation(66kv/11kv), main circuit configuration was confirmed by MED as it was shown on the Dwg.No.DS-01(stage I) and Dwg. No.DS-10(Stage II) in the Interim Report(2). However, the following comments on the above drawings was given by MED and it was agreed by JICA study team.

a. On Dwg.No.DS-01, 66kv bus tie connector(DC or CB) shall be provided for sstage II 66kv bus connection in near future.

b. On Dwg. No.DS-10, one(1) main transformer shall be added for maintain the 100%

standby.

Resolution : Study team accepted the recommendation.

Item III-10(E3) : For the auxiliary substation (11kv/380-220v), main circuit configuration was confirmed by MED as it was shown on the Dwg.No.DS-06(StageI) and Dwg. No. DS-13 (StageII) in the Interim Report(2).
In relation to main circuit, MED requested to install the emergency diesel generator for essential loads such as emergency lights and essential instrumentation loads in the Pumping Station. The equipment shall be minimized size(minimized loads).

Resolution : Study team will examine the optimum capacity of diesel generator based on the minimized loads.

Item III-11(E4) : MED was requested by JICA study team to issue the following matters. MED agreed to issue shortly.

a. **Main transformer(66/11kv, 25MVA REA standard) technical data such as impedance and over all dimension, etc.**
b. **Earthing system of the 66/11kv, 25MVA main transformer**
c. **REA's comments on the main substation drawings(electrical and building works), if any.**

Resolution : Study team already received information for the item a and b, except item c.
For the item c, there were no further REA comments except Item IV-03 (G4).

Item III-12(E5) : Communication method between PS No.6 and PS No.7.
A communication system (only limited to voice communication both P.S.) is necessary between PS No.6 and PS No.7 in case of power failure of No.7 PS.
A VHF radio communication system may be most suitable, this matter will discuss with NSDO and JICA Study Team at the detailed design stage.

Resolution : Study team will be carefully examined the specification of communication equipment and details will be discussed in the reports of OM in the D/D reports.

APPENDIX E.4 : Minutes and Resolutions for MED Meeting held on 14th October 1999

4. Additional Comment from MED (dated October 14th, 1999)

Item IV-01 (G2) : A view for Toshka pump station showing its building similar to Abo Simpel Temple which is near by it, so a Nomad(Bedouin) view for pumping station No.7 can be made.

Resolution : Study team will refer to such fruitful comments for the project design and will request to MED and/or NSDO to provide more detail information. (Refer to Item II-10)

Item IV-02 (G3) : A longitudinal cross section drawing for El-Nasr Canal Pumping Station Nos.(1,2,3) showing the weed screens and guard screens arrangement, in which discharge of the pumping station can be measured on the discharge pipeline – a similar arrangement for weed screens and guard screens can be accepted for pumping station No.7.

Resolution : Study team agreed it and refer to Item III-1 (1.1) discussion.

Item IV-03 (G4) : A single line diagram of typical 66/11kV substation prepared by REA.

Resolution : Study team referred to the REA' diagram for detailed design.

Item IV-04 (CN1) : Sand dunes studies for protection of feeder roads, open channels and pipelines land mark needs more details.

Resolution : Study team would like to know more detailed explanation of meaning of the comments.

Item IV-05 (CN2) : Studies on effect of water loaded by sand (even for less than 0.3 mm size) on pump units.

Resolution : Study team understood it and refer to Item III-4(1.4) discussion

Item IV-06 (CN3) : Cathodic protection of pipeline coating, life time, maintenance plan studies has to be detailed.

Resolution : Study team understood it and refer to Item III-7(2) discussion

Item IV-07 (CN4) : In the water hammer protection system has a similar one been used in similar project before what is the safety limit for the moving parts of this system..

Resolution : Safety limit and/or guarantees for " Bi-plane butterfly valves" at pump room and "check valves and boll tap system" at the surge tanks will be studied in more detail in the D/D stage.

Item IV-08 (CN5) : Does the pipeline need more flexible joints than the given one's for more security against differential settlement for the line ?

Resolution : Study team will examine the comments and refer to Item II- 12(5.2).

Item IV-09 (CN6) : Machinery, cost, timing of cleaning (Bc-08)

Resolution : Operation and maintenance plans for settling basin will be prepared at the late D/D stage and detailed information will be incorporated in the D/D reports.

Item IV-10 (CN7) : Does the building of pump station stage I needs expansion joint, length of the building more than 60 m ?

Resolution : No expansion joint is required because temperature loads(stress) shall be taken into account in the design of the building structures.

Item IV-11 (CN8) : Auxiliary substation is required to be in closed area not with motors area (Bc-13).

Resolution : Conclusions of the electrical engineer of the study team on this subject, instead of the confirmations at the meeting with MED(dated 2nd October), are as follows ;
Auxiliary substation is provided without separating walls. The reasons are

- All existing pump stations (No.1 to No.6) are not provided separating wall between auxiliary substation and motor room,
- Main pump units are to be operated by the main pump control panel, which is located in the auxiliary substation. Therefore it is preferable that the operator can be watching situation of the pump units from the control panel side.

Item IV-12 (CN9) : Foundation of the two maintenance bays(L.H.S.) is a big block of plain concrete and the rest of the station's foundation is on a different layers of soil, differential settlement has to be detailed.

Resolution : Foundation under the maintenance space in the motor room is rather shallower than that of main pump room (difference is about 12.90 m). Since the bearing capacity of sand layer of the proposed pumping station is very high (more than 50 of N value), foundation treatment of the maintenance space will be applied directly place the reinforced concrete after plain concrete replacement was made at the parts of excavated soil area. Obviously, bearing capacity of the replaced basement and its shape by the plain concrete shall be carefully studied on its shape of basement and short term settlement of the said basement in the detailed design stage.