APPENDICES

Appendix - 1   List of Members of the Study Team

Appendix - 1

List of Members of the Study Team

Field	Name	Position
1. Leader/Grant Aid Planner	Mr. Haruo Iwahori	Development Specialist, JICA
2. Water Supply Quality Planner	Mr. Toru Okubo	Deputy Manager, Osaka City Waterworks
3. Treatment Plant Facilities Planner	Mr. Toru Hayashi	Nippon Jogesuido Sekkei Co., Ltd.
4. Water Treatment Facilities Designer	Mr. Yoshihiko Sato	ditto
5. Mechanical Equipment Planner	Mr. Shigekazu Kobayashi	ditto
6. Electrical Hammer of Equipment Planner	Mr. Kiyoshi Amano	ditto
7. Cost Estimator	Mr. Masanobu Ishioka	ditto

Appendix - 2 Study Schedule

FIELD SURVEY SCHEDULE
FOR BASIC DESIGN STUDY ON THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT

DATE	TIME	ACTIVITIES
June		
15(Mon)	21:45	Arrival of First Batch in Colombo by UL 457
16(Tue)	09:00	JICA (Mr.Sakamaki, Mr.Kawasaki)
	10:00	Embassy of Japan (Dr.Furuhata)
	11:30	Dept.of External Resources (Mr.S.Weerapana, Deputy Director)
	14:45	Ministry of Housing and Construcction (Mr.W.D.Ailaperuma, Dr.Joachim)
17(Wed)	09:00	Meeting with NWSDB
18(Thu)		Meeting with NWSDB, Site Survey
19(Fri)		Ditto
20(Sat)		Ditto
21(Sun)		Mission Meeting
22(Mon)		Meeting with NWSDB, Site Survey
July		
01(Wed)		Arrival of Second Batch in Colombo by UL303
		Meeting with NWSDB, Site Survey
20(Mon)		Arrival of Third Batch in Colombo by UL457, Leave for Tokyo (Mr.Ishioka)
21(Tue)	9:00	JICA (Mr.Sakamaki, Mr.Kawasaki)
	10:00	Embassy of Japan (Dr.Furuhata)
	11:30	Dept. of External Resources (Mr.S.Weerapana, Deputy Director)
	14:30	Ministry of Housing and Construction (Mr.W.D.Ailaperuma, Secretary)
22(Wed)		Meeting with NWSDB, Site Survey
23(Thu)		Ditto
24(Fri)		Ditto
25(Sat)		Mission Meeting
26(Sun)		Ditto
27(Mon)		Meeting with NWSDB
28(Tue)		Ditto
29(Wed)		Signing of Minutes of Discussions
30(Thu)		Report to Embassy of Japan and JICA
31(Fri)		Leave for Tokyo (Mr.Iwahori, Mr.Okubo)
		Meeting with NWSDB, Site Survey
August		
08(Sat)		Leave for Tokyo (Mr.Kobayashi, Mr.Amano)
		Meeting with NWSDB, Site Survey
11(Tue)	10:30	Report to Embassy of Japan and JICA
12(Wed)		Leave for Tokyo (Mr.Hayashi, Mr.Sato)

DRAFT FINAL REPORT EXPLANATION FOR BASIC DESIGN STUDY ON THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT

DATE	TIME	ACTIVITIES
October		
29(Thu)		Arrival in Colombo by UL 457
30(Fri)	09:00	JICA (Mr. Sakamaki, Mr. Kawasaki)
	10:30	Embassy of Japan (Dr. Furuhata)
	11:30	Dept. of External Resources (Mr. Weerapana, Deputy Director)
	12:30	Ministry of Housing & Construction - Mr. Ailapperuma, Secretary and Mr. Madugalle, Chairman, National Water Supply & Drainage Board
31(Sat)		Explanation of the Report at NWSDB
November		
01(Sun)		Mission Meeting
02(Mon)		Explanation of the Report at NWSDB
03(Tue)		Explanation of the Report & Discussions on Minutes of Discussions at NWSDB
04(Wed)		Singning Minutes of Discussions at Ministry of Housing & Construction
05(Thu)	14:30	Embassy of Japan JICA
06(Fri)	15:30	Lv. Colombo by TG 308

Appendix - 3 List of Personnels Concerned

LIST OF PERSONNELS CONCERNED

·MINISTRY OF HOUSING & CONSTRUCTION

Mr. W. D. Ailaperuma	Secretary, Ministry of Housing and Construction
Mr. C. H. De Tissera	Secretary to the Ministry of State for Housing
Dr. M. E. Joachim	Secretary for Construction & Building Materials
Mr. S. Weerapana	Deputy Director, Department of External Resources

·NATIONAL WATER SUPPLY & DRAINAGE BOARD

Mr. T. B. Madugalla	Chairman
Mr. K. A. H. Ranaweera	Vice Chairman
Mr. A. P. Chandraratne	General Manager
Mr. S. Nagaratnam	Additional General Manager(quitted)
Mr. M. Wickramage	Additional General Manager
Mr. P. M. R. Pathiraja	Additional General Manager(promoted)
Mr. P. U. Gunasinghe	Deputy General Manager(promoted)
Mr. S. R. J. R. Senanayake	Deputy General Manager (G. C.)
Mr. S. K. H. Perera	Assistant General Manager (Distribution)
Mr. A. H. C. De Silva	Assistant General Manager (Production)
Mr. S. K. Wijetunga	Assistant General Manager (P&C)
Mr. D. D. N. Padmasiri	Chief of Laboratory Services
Mr. R. H. Ruvinis	Planning Engineer
Mr. B. L. Gunaratne	Manager (Production)
Mr. Y. S. Silva	Engineer(Ambatale)
Mr. D. H. K. Arachchige	O. I. C. Kalatuwawa
Mr. K. T. Gunadasa	O. I. C. Labugama

·EMBASSY OF JAPAN, SRI LANKA

Dr. M. Huruhata	Second Secretary

·JICA, SRI LANKA OFFICE

Mr. Y. Sakamaki	Resident Representative
Mr. Y. Kawasaki	Assistant Resident Representative

NWSDB PROJECT TEAM ORGANISATION AND MEMBER LIST

Leader : Mr. S. K. Wijetunga

Group A (Measurement of Flow Rate)

Mr. Y. S. Silva - Civil Engineer, Ambatale
Miss. Deepthi Jayasinghe - Civil Engineer, Design Section, P&D Div., NWSDB
Mr. Karannagoda - Chemist, Ambatale
Two Technicians - From Central Laboratory

Group B (Measurement of Structures and Water Level Survey)

Mr. P. Ramawickrama - Civil Engineer, Ambatale
Mr. Senarath Bandara - Surveyer, Design Section, P&D Div., NWSDB
Mr. U. S. Hetiwarachchi - Temporary Trainee Engineer, Ministry of Mahaweli Development
Mr. H. W. Gunawaradhene - ditto
Miss. P. Paranavitana - ditto
Miss. D. Siriwardhene - Engineering Assistant, CMC

Group C (Water Quality Analysis and Experiment of Filtration)

Mr. S. K. Wijetunga - A. G. M., Production
Mrs. I. S. Perera - Chemist
Mrs. C. Jayasinghe - Civil Engineer, Design Section, P&D Div., NWSDB
Miss. P. Sangarapillai - ditto

Group D (Mechanical and Electrical Investigation)

Mr. B. L. Gunaratne - Mechanical Engineer, Manager, Production
Mr. H. M. N. Wijetunga - Electrical Engineer, Ambatale
Mr. R. M. S. Upali - Mechanical Engineer, Ambatale
Mr. S. Jinadasa - Electrical Engineer, Ambatale

Appendix - 4 Minutes of Discussions

Appendix 4-1 Minutes of Discussions (July 29th, 1992)

MINUTES OF DISCUSSIONS ON THE BASIC DESIGN STUDY ON THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

Based on the result of the Preliminary Study, the Japan International Cooperation Agency (JICA) decided to conduct a Basic Design Study on the Project for Rehabilitation of the Ambatale Treatment Plant (hereinafter referred to as "the Project").

JICA sent to the Democratic Socialist Republic of Sri Lanka a study team, which is headed by Mr. Haruo IWAHORI, Development Specialist, JICA, and is scheduled to stay in the country from July 20th to 31st, 1992.

The team held discussions with the officials concerned of the Government of Sri Lanka and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described in the attached sheets. The team will proceed to further works and prepare the Basic Design Study Report.

Colombo, July 29th, 1992

岩堀春雄	
Mr. Haruo IWAHORI Leader of Basic Design Study Team JICA	Mr. C. H. de Tissera Secretary to the Ministry of State for Housing

ATTACHMENT

1. Objective

The objective of the Project is to rehabilitate the Ambatale Treatment Plant to ensure the supply of good quality of water to the public in Greater Colombo area.

2. Project site

The Project site is located at Ambatale/Mulleriyawa in Greater Colombo area which is shown in Annex I.

3. Executing agency

National Water Supply and Drainage Board (NWSDB) under Ministry of Housing and Construction is responsible for the administration and execution of the Project.

4. Items requested by Sri Lanka

After discussions with the Basic Design Study team, the following items were finally requested by the Sri Lanka side.

(1) Items originally requested

1) Chemical dosing system
   a) Alum dosing
   b) Lime dosing
2) Coagulation and flocculation
3) Filters
4) Chlorinator
5) Electrical system
   a) Treatment plant
   b) Old intake
6) Pumping set
   a) Kolonnawa pumps
   b) Dehiwala pumps

(2) The Sri Lankan side strongly requested to include the following items. Details are shown in ANNEX III.

1) Improvement of Lime loading system
2) Improvement of a sludge recycling system of the PRETREATERs
3) Replacement of sludge scraper of the CENTRIFLOCs
4) Provision of weighing scale for chlorine cylinder
5) Improvement of lighting system of the treatment plant
6) Replacement of No.2 and No.3 pump/motor of old intake
7) Replacement of defective valves of new intake
8) Provision of lightening protection system
9) Provision of additional pump/motor unit to be No.4 for Dehiwala pump
10) Replacement of starter panel for NO.3 for Dehiwala pump
11) Provision of level indication system for Ambatale Tower
12) Provision of Central Laboratory equipment
13) Improvement of communication equipment
14) Truck with crane
15) Spare parts for Kalatuwawa/Labugama
16) Construction of distribution chamber

The Government of Sri Lanka will submit official letter to the Government of Japan by the end of August, 1992.

However, the final items of the Project will be decided after further studies.

5. Japan's Grant Aid system

(1) The Government of Sri Lanka has understood the system of Japanese Grant Aid explained by the team.

(2) The Sri Lankan side will take necessary measures, as described in Annex II for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

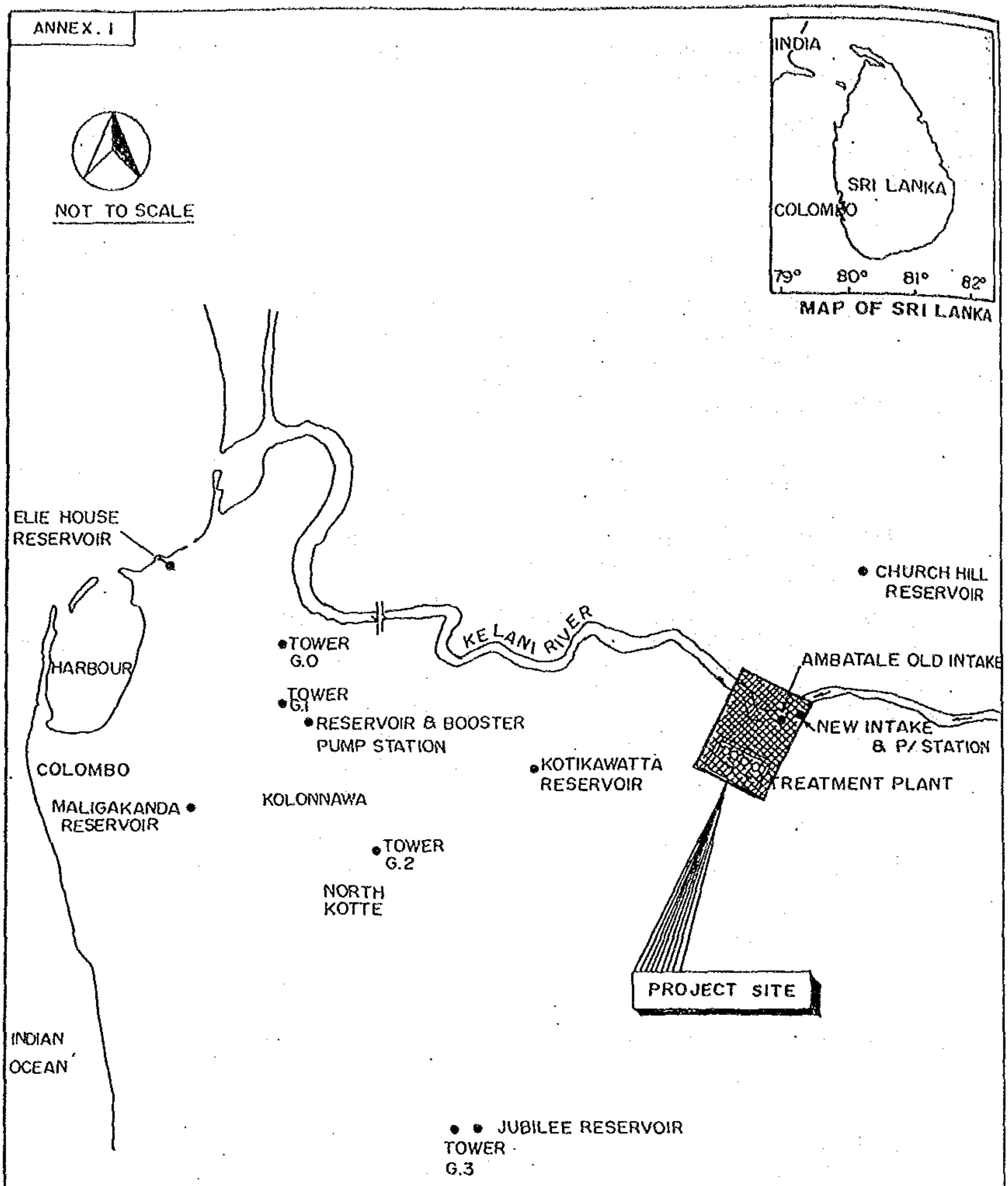
6. Schedule of the study

(1) The consultants will proceed to further studies in Sri Lanka until August 12th, 1992.

(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around October, 1992.

(3) In case that the contents of the report is accepted in principle by the Sri Lankan side, JICA will complete the final report and send it to the Government of Sri Lanka by December, 1992.

ANNEX. I



LOCATION MAP

ANNEX II

Necessary measures to be taken by the Government of Sri Lanka on condition that Japan's Grant Aid is extended:

1. To secure the site for the Project.
2. To clear, level and reclaim the site prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.
4. To construct the access road to the site prior to commencement of the construction.
5. To provide facilities for distribution of electricity and other incidental facilities in and around the Project site.
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the banking arrangement.
7. To exempt taxes and to take necessary measures for custom clearances of the materials and equipment brought for the Project at the port of disembarkation.
8. To exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in Sri Lanka with respect to the supply of the products and services under the verified contracts.
9. To accord Japanese nationals, whose services may be required in connection with the supply of the products and the services under the verified contracts, such facilities as may be necessary for the performance of their work.
10. To use and maintain properly and effectively the facilities constructed and equipment purchased under the Grant Aid.
11. To bear operation and maintenance cost of Central laboratory equipment, which is written in Table 1, 7.6 in Annex III.
12. To bear all the expenses other than those to be borne by the Grant, necessary for the execution of the Project.
13. To install chlorinators at the reservoirs, necessary for residual chlorine control by the completion of the Project.

ANNEX III

නිවාස හා ඉදිකිරීම් අමාත්‍යාංශය
வீடமைப்பு நிர்மாணத்துறை அமைச்சு
MINISTRY OF HOUSING AND CONSTRUCTION
"සෙත්සිරිපාය", ශ්‍රී ජයවර්ධනපුර කෝට්ටේ, බත්තරමුල්ල. "செத்சிரிபாய", ஸ்ரீ ஜயவர்த்தனபுர கோட்டே, பத்தரமுல்ல. "SETHSIRIPAYA", SRI JAYEWARDENEPURA KOTTE, BATTARAMULLA

මගේ අංකය: / எனது இல. / My No.
ඔබේ අංකය: / உமது இல. / Your No.
දුරකථනය: / தொலைபேசி / Telephone.
දිනය: / திகதி / Date 27 July, 1992

Mr. Haruo Iwahori
Leader of Basic Design Study Team
JICA

Dear Mr. Iwahori,

SUPPLEMENTARY REQUEST AND CONFIRMATION OF REQUESTED ITEMS REHABILITATION OF THE AMBATALE TREATMENT PLANT

Based on the result of the field survey, started on 15 June, 1992, in co-operation with the Basic Study Team of JICA, NWS&DB would like to strongly request the inclusion of the following items with the Project, which was found to be essential to achieve the objectives of the Project.

Detail study results are shown in Table 1, Confirmation on Requested Items.

Supplementary request are summarised as follows;

(1) Improvement of Lime loading system
(2) Improvement of a sludge recycling system of the PRETREATERs
(3) Replacement of sludge scraper of the CENTRIFLOCs
(4) Provision of weighing scale for chlorine cylinder
(5) Improvement of lighting system of the treatment plant
(6) Replacement of No. 2 and No. 3 pump and motor of old intake
(7) Replacement of defective valves of new intake
(8) Provision of lightening protection system
(9) Provision of additional pump and motor unit to be No. 4 for Dehiwala pump

..2/

(10) *Replacement of starter panel for No. 3 for Dehiwala pump*
(11) *Provision of level indication system for Ambatale Tower*
(12) *Provision of Central Laboratory equipment*
(13) *Improvement of communication equipment*
(14) *Truck with crane*
(15) *Spare parts for Kalatuwawa and Labugama*
(16) *Construction of distribution chamber*

I am in agreement with the above proposal. Please be good enough to include the Items therein, in the Project.

Thanking you,.

Yours faithfully,

C H de Tissera
Secretary to the
Minister of State for Housing

cc. Chairman/NWS&DB - for information

TABLE 1 CONFIRMATION OF REQUESTED ITEMS

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
1	CHEMICAL DOSING SYSTEM					
1.1	ALUM					
a.	Replacement of 4 defective mixers	Y			Y	Two out of three mixers are out of order. The remaining one barely survives, but it will be damaged sooner or later. Therefore all of these 4 defective mixers should be replaced. Renewals of control panels and appurtenant wiring should be also included.
b.	Replacement of 4 defective Alum dosing pumps	Y			Y	All of 4 pumps are out of order and impossible to operate. At present a small dosing pump subsequently installed barely works and Alum solution is dosed through a small elevated dosing tank to the raw water distribution chambers by gravity. Therefore, all of these 4 defective dosing pumps should be replaced.
c.	Redesign and construction of Alum feeding pipe network with provision of independent dosing arrangements to different clarifiers	Y			Y	Distribution and measurement of inflowed raw water should be done in a unified manner at the "new distribution chamber". Hence, dosing of all the chemicals (not only alum, but also lime and chlorine) also should be done only at the said distribution chamber. Chemical pipelines should entirely be renewed and rerouted.

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
d.	Alum metering control system (Provision of a gravity feeding if possible)	Y			Y	Dosing rate control/measurement for each clarifier system should be provided in a new chemical dosing system.
e.	Replacement of 1/2 ton hoist	Y			Y	Very much deteriorated. Replacement should be executed.
1.2	LIME					
a.	Replacement of 2 horizontally driven mixers and 4 vertical mixers with new 8 vertically driven mixers.	Y			Y	Both horizontally driven and vertically driven mixers are severely deteriorated. New 8 vertically driven mixers shoud be provided(incld. control panels and appurtenant wiring).
b.	Replacement of 4 Lime dosing pumps	Y			Y	Two of them are damaged, and the rest of two are also heavily deteriorated. New 4 dosing pumps should be provided (incld. control panels and appurtenant wiring).
c.	Redesign and construction of lime feeding network	Y			Y	As stated in 1-1-c.
d.	Lime metering control system	Y			Y	Metering control devices should be installed at the discharge side of dosing pumps for easy operation.
e.	*Improvement of loading system*			Y	Y.	*Current loading of lime into solution* tanks is dealt by manpower entirely. Thus, labourers breath in very dusty air wheather they like or not. This causes a serious health hazard to the labourers.

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
2	COAGULATION AND FLOCCULATION					
2.1	Provision of independent Alum dosing points to each clarifier for proper control of dosage	Y			Y	As stated in 1-1-c.
2.2	Replacement of damaged distribution plates (stilling plates) in the PULSATOR	Y	Y			Good flocculation will be expected without stilling plates (through several years actual operation).
2.3	Rehabilitation of automatic sludge withdrawal system in the PRETREATERS	Y			Y	Replacement of already unfunctioning automatic sludge withdrawal valves with much simpler and reliable system should be executed.
2.4	Improvement of a sludge recycling system of the PRETREATERS and replacement of automatic backwash control system	Y	Y			Misdescription (see item 2.5)
2.5	Improvement of a sludge recycling system of the PRETREATERS			Y	Y	One of the recycling pumps is damaged and removed. The other one is also unsatisfactory. Replacement of both two pumps and motors with new, much energy effective ones should be excecuted.
2.6	Provision of a sludge recirculation system of CENTRIFLOCs	Y			Y	Existing CENTORIFLOCs have no recirculation system. Appropriate recirculation system should be provided (incld. control panel and wiring).
2.7	Replacement of sludge scraper of the CENTRIFLOCs			Y	Y	Sludge scraper of the CENTRIFLOCs worn out due to corrosion should be replaced.

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
3.	FILTER					
3.1	Modification of distribution channel to the filters to ensure uniform water inflow to all filters	Y			Y	A distribution weir should newly be installed at the inlet of each filter (No.1– No.12) to ensure uniform inflow of settled water hydrologically to each filter. To eliminate complicated and often troublesome rate controller should be replaced with much simpler one.
3.2	Provision of a proper filtration control system and head loss indicators	Y			Y	As stated in 3.1. Manometres should be provided with each filters for head loss indication.
3.3	Modification of filter back-washing system	Y			Y	Existing backwash system are deteriorated. Deteriorated parts should be replaced.
3.4	Replacement of underdrain of filters	Y			Y	Replacement of damaged nozzels should be executed. Sealing of underdrain-board should be done.
3.5	Replacement of filter media from dual media to single media	Y			Y	Filter media of the filters No.1– No.12 should be replaced.
3.6	Construction of washing troughs	Y			Y	For the filters No.1–No.12, it should be done to ensure effective discharge of washwater.
4	CHLORINATOR					
4.1	Replacement of 4 defective chlorinators	Y			Y	Replacement of defective 4 chlorinators should be executed.

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
4.2	Replacement of chlorine feeding pipe network	Y			Y	As to pre-chlorination, refer to 1-1-c. As to post-chlorination, dosing points should be decided in consideration of clear water tanks.
4.3	Replacement of defective 2 ton hoist	Y			Y	Replacement should be executed.
4.4	Provision of weighing scale			Y	Y	Weighing scale for chlorine cylinders should be provided to ensure proper chlorine dosing.
5	ELECTRICAL SYSTEM					
5.1	TREATMENT PLANT					
a.	Replacement of high tension panel	Y			Y	Replacement should be executed due to defective OCB malfunctioning, defective protection device and impossibility of repair.
b.	Replacement of low tension panel	Y			Y	As stated above.
c.	Replacement of wiring system	Y			Y	Replacement should be executed due to defective wiring related to the panels as mentioned in 5-1-a,b.
d.	Improvement of lighting system			Y	Y	Lighting at process sites (indoors and outdoors) are heavily deteriorated. Provision of necessary improvement of lighting is essential for proper operation of the plant.
5.2	OLD INTAKE					
a.	Replacement of high tension switch gear	Y			Y	Replacement should be executed due to defective OCB, malfunctioning, defective protection device and impossibility of repair.

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
b.	Replacement of low tension switch gear	Y			Y	As stated above.
c.	Replacement of No.3 motor/starter	Y			Y	Due to deterioration (installed in 1965), unreliable starting is observed. Replacment should be executed.
d.	Replacement of No.2 and No.3 pump/motor			Y	Y	Due to deterioration (installed in 1965), defective vibration and noise are observed. Replacement should be executed.
5.3	NEW INTAKE					
a.	Replacemnet of defective valves			Y	Y	Replacement should be executed due to deterioration.
5.4	Provision of lightening protection system			Y	Y	Due to meteorological condition, proper lightening protection system is inevitable for protection of facilities.
6.	PUMPING SETS					
6.1	KOLONNAWA PUMPS					
a.	Replacement of pump/motor (3 units)	Y			Y	Replacement should be executed (due to much vibration and noise are observed). One of them is already out of order.
b.	Installation of headstock extension spindle and an actuator for discharge valves (3 units)	Y			Y	Appropriate stages should be provided in order to make it easy to handle with.
c.	Replacement of low voltage electrical panels	Y			Y	Replacement should be executed in connection with the replacement of pumps and motors.

小岩

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
6.2	DEHIWALA PUMP					
a.	Replacement of No.3 old 20 MGD pump/motor unit	Y	Y			Misdescription (see Item 6.2.b)
b.	Provision of additional pump/motor unit to be No.4			Y	Y	Pump and motor capacitiy should be finalised after detailed investigation of the expected change of flow allotment for Dehiwala.
c.	Replacement of starter panel with resister	Y	Y			Misdescription (see Item 6.2.d)
d.	Replacement of starter panel for No.3 .			Y	Y	Only the starter panel for No.3 pump (incld. replacement of motor) should be replaced.
e.	Replacement of No.4 motor unit	Y	Y			Misdescription.
f.	Provision of level indication system for Ambatale Tower			Y	Y	Due to the increase of importance of Ambatale Tower in connection with increase of water supply through the Tower, water level of the Tower should be monitored.
7	OTHER ITEMS					
7.1	Provision of raw water metering units for old raw water mains of 1000 mm dia.and 1200 mm dia.	Y	Y			Provision of raw water measuring weirs at new distribution chamber (see Item 8) is recommmended for easy maintenance.
7.2	Provision of laboratory equipment for process water quality control and training of the staff	Y			Y	Necessary laboratory equipment should be provided.

小岩

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
7.3	Provision of process water sampling system and measuring facilities for different treatment lines for parametres such as pH and turbidity	Y	Y			Careful on-site observation is essential for proper day-to-day treatment operation and maintenance.
7.4	Essential tools for operating and maintenance	Y			Y	Necessary tools accompanied with the rehabilitation/replacememt should be provided for day-to-day O&M.
7.5	Training of operators, technical staff, and chemists	Y			Y	Necessary on-site training (incld. provision of training equipment such as OHP and slide projector) should be implemented for proper operation and maintenance.
7.6	Provision of Central Lab. equipment			Y	Y	Monitoring the quality of water source, especially heavy metals and toxic substances, is essential for safe drinking water supply. Such sophisticated lab. equipment as an atomic-absorption spectrophotometer and gas-chromatograph should be provided.
7.7	Improvement of communication equipment			Y	Y	Present communication system for Ambatale water treatment plant are deteriorated, malfunctioning, and compel much inconvenience to the plant staff, especially in an emergency. Necessary improvement should be taken for proper operation and maintenace of the plant.

ITEM NO.	DESCRIPTION OF ITEMS	ORIGINAL REQUEST	TO BE TAKEN OUT FROM ORIGINAL REQUEST	SUPPLEMENTAL REQUEST	FINAL REQUEST	REMARKS
7.8	Truck with crane			Y	Y	Ambatale water treatment plant is not only a treatment plant, but also, headquaters of water production. Such mobile supporting system as 4-ton truck with crane is inevitable for proper maintenace of the rehabilitated facilities.
7.9	Spare parts for Kalatuwawa/Labugama			Y	Y	Supplement of necessary spare parts should be provided.
8	Construction of distribution chamber			Y	Y	At present, raw water is distributed by two receiving chambers, which causes uneven inflow rate into each treatment system and unsatisfactory water treatment. New distribution chamber in which chemicals and measuring weirs will be applied should be constructed to ensure raw water distribution properly to three treatment lines. New distribution chamber will play key role for steady operation of the plant.

Appendix 4-2 Minutes of Discussions (November 4th, 1992)

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF THE AMBATALE TREATMENT PLANT
IN
THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
(CONSULTATION ON DRAFT REPORT)

In June 1992, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Rehabilitation of the Ambatale Treatment Plant (hereinafter referred to as "the Project") to the Democratic Socialist Republic of Sri Lanka, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Sri Lankan side on the components of the draft report, JICA sent to Sri Lanka a study team, which is headed by Mr. Haruo Iwahori, Development Specialist, JICA, and is scheduled to stay in the country from October 29th to November 6th, 1992.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Colombo, November 4th, 1992

岩堀春雄

Mr. Haruo Iwahori
Leader of Basic
Design Study Team
JICA

Mr. W.D. Ailapperuma
Secretary
Ministry of Housing &
Construction

ATTACHMENT

1. Components of Draft Report

(1) The Government of Sri Lanka has agreed and accepted in principle the components of the Draft Report prepared by the JICA Study Team, except (2) described herewith.

(2) The Government of Sri Lanka requested that the capacity of main pump for the old intake pump station, which is described in b, (1), 4-3-2 of the chapter 3 of the Draft Report prepared by the JICA Study Team, should be reviewed as described in ANNEX III.

(3) The Government of Sri Lanka has agreed and accepted to implement those recommendations, described in ANNEX II which are proposed by the JICA Study Team in section 3 of the chapter 5 of the Draft Report prepared by the JICA Study Team.

2. Japan's Grant Aid system

(1) The Government of Sri Lanka has understood the system of Japanese Grant Aid explained by the JICA Study Team.

(2) The Government of Sri Lanka will take necessary measures, described in ANNEX I, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further schedule

The JICA Study Team will make the Final Report in accordance with the confirmed items, and send it to the Government of Sri Lanka by the end of December, 1992.

ANNEX I

Necessary measures to be taken by the Government of Sri Lanka on condition that Japan's Grant Aid is extended:

1. To expedite legal procedures for Exchange of Notes (E/N).
2. To secure the site for the Project.
3. To clear, level and reclaim the site prior to the commencement of construction.
4. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the Project site.
5. To construct the access road to the site prior to the commencement of construction.
6. To provide facilities for distribution of electricity and other incidental facilities in and around the Project site.
7. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the banking arrangement.
8. To exempt taxes and to take necessary measures for custom clearances of the materials and equipment brought for the Project at the port of disembarkation.
9. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Sri Lanka with respect to the supply of products and services under the verified contracts.
10. To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the verified contracts, such facilities as may be necessary for the performance of their work.

山
石

11. To use and maintain properly the facilities constructed and equipment purchased under the Grant Aid.

12. To bear all expenses other than those to be borne by the Grant, necessary for the execution of the Project.

岩

ANNEX II

It is recommended that the following measures should be implemented by the Government of Sri Lanka to ensure maximisation of the Project effects and benefits:

A. Before the implementation of the Project

(1) To secure necessary budget from the Government of Sri Lanka.

(2) To organise a promotion committee of the Project in order to coordinate the Project smoothly.

B. During the implementation of the Project

(3) To implement those projects which are described in the section 2-3 of the chapter 3 in the Draft Report prepared by the JICA Study Team to accelerate the effects of the Project.

(4) To organise a Project Team exclusively for the Project consisting of several expert engineers on planning, construction and O & M to take part in the detailed design period through the construction period reflecting such results to the future O & M system.

(5) To prohibit the diversion of the facilities/equipment purchased under the Project for another purpose.

(6) To clear the site especially where a distribution chamber is to be constructed and reconstruct the wall which may be damaged during the construction of the distribution chamber.

(7) To install chlorinators at the reservoirs, necessary for residual chlorine control by the end of the Project.

C. After the implementation of the Project

(8) To improve the collection efficiency of water revenue where the budget for O & M of the Plants will come from.

(9) To secure budgetary scheme for the future rehabilitation works of the Plants.

(10) To implement preventive O & M for the Plants regularly.

(11) To secure budgetary scheme sufficiently for the O & M for the Plants.

(12) To implement training for the officials concerned with O & M.

(13) To develop institutional and supervisory responsibility for each facility and equipment of the Plants.

(14) To implement raw water source control in order to secure good quality of raw water in the application of the existing treatment process.

(15) To secure appropriate storerooms to keep spare parts and tools purchased under the Grant Aid at the Plants, including Ambatale, Labugama and Kalatuwawa.

ANNEX III

1. As a basic strategy on rehabilitation of intake pumps, during the period of field survey, it was confirmed between the JICA Study Team and NWS&DB that the total intake capacity should have 20% surplus for the designed capacity of treatment plant (=305,000 cu. m³/d), using regularly six pumps out of nine existing pumps, thus, the deteriorated two units of old intake pumps (20 mgd capacity each) have to be replaced with new 13.6 mgd capacity pumps each, considering total capacity of intake and efficiency of operation.

2. After the return home of JICA Study Team, one of the units of the new intake pumps was broken down unexpectedly. Dismantling the broken-down pump, and finding much inferior quality of the pump, NWS&DB came to a conclusion that each unit of new intake pumps may possibly break down at rather early time than their expected life.

3. Therefore, on the occasion of consultation of Draft Report, NWS&DB requested the JICA Study Team to change the once confirmed basic strategy of replacing two units of the old intake pumps from 20 mgd capacity to 13.6 mgd capacity each. Instead, NWS&DB requested the JICA Study Team, that the replacement of two units of the old intake pumps should have 20 mgd capacity each, in order to secure necessary intake capacity when unscheduled but possible damage of the new intake pump units happen.

MEMORANDUM

As a result of discussions on the Draft Report prepared by the JICA Study Team, both parties confirmed the comments made by NWS&DB and the reply to the comments made by the JICA Study Team as described on the attached sheets.

Colombo, November 4th, 1992

岩堀春雄

Mr. Haruo Iwahori
Leader of Basic
Design Study Team
JICA

Mr. A. P. Chandraratne
General Manager
NWS&DB

P&D/AGM1/MP/A1

92.11.02

Mr. Haruo Iwahori
Leader/Grant Aid Planner
Japan International Corporation Agency

Comments on Draft Basic Design Study Report on the Project for Rehabilitation of the Ambatale Treatment Plant

---

1. PLANT CAPACITY

1.1. Treatment plant output to be reviewed for a overloading factor of 10% above 67 m.g.d. (existing Ambatale Treatment Plant capacity = 67 m.g.d. of treated water).

1.2. Individual units to be studied and the function of each unit to be optimized so that the maximum output could be obtained, from the treatment plant. The consultant should identify additionally required units to the treatment plant to achieve this objective.

1.3. Provision shall be made to bypass any units required. The hydraulic capacity of the structures should be designed to take this into account.

2. INTAKE PUMPS

The intake pumps on the old intake to be replaced by two pumps each 90,909 m3/day (20 mgd) to have more flexibility in operation.

3. HIGHLIFT PUMPS

The NWSDB has difficulties in Operation & Maintenance of Church Hill, Elie House and Maligakanda pumps. Therefore, the NWSDB requests to replace with new pumps. (If possible, existing electrical motors, panel boards etc. shall be made use of for this purpose.)

4. TREATMENT PLANT

4.1. Distribution chamber - provision should be made for a future sedimentation basin.

4.2. Flow measuring device - details to be provided.

4.3. Chemical mixing - details to be provided.

4.4. Pre chlorination - Health aspects to be studied.

4.5. Surface loading of the settling basins to be reviewed in order to optimize their capacity. The original designers of these units should be consulted in this regard.

4.6. The requirement for the use stilling plates on the pulsator should be checked with the original designers of the unit (M/s. Degremont, France)

4.7. Backwashing and air scouring methods and rates of filtration to be reviewed.

4.8. Provision should be made for the addition of future filters.

4.9. Treated water flow measurement devices to be provided.

4.10. Chemical feeding system - provision of gravity dosing system or appropriate easy maintenance system to be considered.

4.11. Solution strength of lime to be 5 p.p.m.

4.12. Chlorinator safety equipment to be provided.

4.13. Process water sampling - at least raw water sampling to be provided.

5. IMPLEMENTATION

5.1. Consultant must propose a workplan to minimize interruptions to the existing treatment process during installation.

5.2. Performance testing at the manufacturers' factory to be witnessed by the client.

5.3. A shipping schedule should be provided together with CIF value of the equipment.

5.4. Minor repairs and colour washing of existing units and buildings to be carried out.

6. O&M

6.1. At least 12 months maintenance period after commissioning shall be incorporated in the program.

6.2. Local agents should be available for servicing equipment.

6.3. Proposed counter measures (Page 27 - 4) details to be provided.

6.4. A suitable passenger vehicle to be provided for O&M activities.

6.5. Counterpart training shall be arranged through JICA.

A.P.Chandraratne
General Manager

P.S. I agree that the Item 10 b. – Gas chromatography & Atomic absorption spectrophotometer be deleted

4/11/90

3rd November, 1992

Mr. A.P. Chandraratne
General Manager
NWS&DB

Reply to the comments on Draft Report

This is to reply to the comments issued on 2nd November, 1992 from you regarding Draft Basic Design Study Report on the JICA Project for Rehabilitation of the Ambatale Treatment Plant.

Our reply to your comments shall be summarised as following three points :

a. The basic concept on the Project which was agreed and confirmed by both parties in the Minutes of Discussions on 29th July, 1992 shall not be changed.

   Hence, the objective of the Project is to rehabilitate the Ambatale Treatment Plant to ensure the supply of good quality of water to the public of GC area. Stabilisation as well as increase of plant output will be brought about in consequence, not the primary objective.

b. JICA Study Team conducted the Basic Design based on the understanding that the design capacity of the plant as 67 mgd (305,000 cu.m/d) which was given by your side. But we have no objection if you increase the plant output to some extent by your own practical operation and skillfulness at treatment.

c. No additional request other than the items that were confirmed in the Minutes of Discussions on 29 July, 1992 shall be accepted.

Thus our itemised reply are as following :

1. Plant Capacity

   Not to be accepted. Reason: a and b.

2. Intake Pumps

   JICA Study Team will convey the request made by NWS&DB to JICA Headquarters.

3. Highlift Pumps

Not to be accepted. Reason : c.

4 Treatment Plant

Items 4.1:to 4.3 will be done as your request.

Item 4.4: The Study Team will prepare some explanatory description in the Final Report.

Item 4.5 and 4.6: Should rather be clarified by NWS&DB to contact the original designers. Reason: b

Item 4.7 and 4.8: Some review will be prepared in the Final Report.

Item 4.9 : Included in the Basic Design as requested.

Item 4.10: Included as requested.

Item 4.11: Some review will be prepared in the Final Report

Item 4.12: Will be provided.

Item 4.13: Not to be accepted. Reason: c

Operator and chemist shall check the actual water condition at each treatment process site, this is essential for proper operation of the system.

5. Implementation

Item 5.1 : Shall be proposed as requested.

Item 5.2 : It belongs to a matter of Contract between NWS&DB and the selected contractor. (But limited only to very important equipment).

Item 5.3 : Will be provided.

Item 5.4 : Not to be accepted
Recurrent cost shall be prepared by your side.

6. O & M

Item 6.1 : It will be followed according to the JICA regulation.

Item 6.2 : Consideration shall be paid in Detailed Design Phase. (Please refer to the Table 4.4.1 in the Draft Report, P.122).

Item 6.3 : Details will be provided in Detailed Design Phase.

Item 6.4 : Not to be accepted.

Recurrent cost shall be prepared by your side.

Item 6.5 : Under processing by JICA side.

NWS&DB is also kindly requested to promote its realisation in the course of processing (e.g., to contact JICA Sri Lanka Office from time to time).

Haruo Iwahori
Leader JICA Study Team

Appendix - 5 Field Survey Data

5-1 Operating Capacity Measurement
5-2 Process Water Quality
5-3 Pilot Filtration Test
5-4 Grain Size Analysis
5-5 Concrete Compressive Strength Test
5-6 Existing Mechanical Facilities/Equipment Investigation
5-7 Existing Electrical Facilities/Equipment Investigation

Appendix 5-1 Operating Capacity Measurement

Appendix 5-1 OPERATING CAPACITY MEASUREMENT

The Study Team conducted an investigation of the operating capacity to confirm the capacity delivered to five sedimentation tanks including Pulsator, Centriflocs and Pretreaters.

1. Measuring Points

- Distribution channels for Pulsator/Centrifloc
- Distribution chamber for Pretreater

2. Flow Measurement

- Ultra sonic flow metre
- Existing weir at the distribution chamber

3. Capacity Calculation

(1) Pulsator/Centrifloc

Operating capacity
= (Section Area at the Measuring Points) X (Flow Rate Measured by Ultra Sonic Flow Metre at the Measuring Points)

(2) Pretreater

Operating Capacity was calculated by JIS (Japan Industrial Standard) formula for rectangular weir, applying overflow depth at the weir of the distribution chamber, width of weir, and height of the weir.

4. Findings

The result (see the following table) shows that actual inflow rate of the sedimentation tanks varied from 62 % to 172 % of the designed capacity.

DATE	PULSATOR (61,000M^3/D)		CENTRIFLOC 1 (61,000M^3/D)				CENTRIFLOC 2 (61,000M^3/D)				PRETREATOR 1 (61,000M^3/D)		PRETREATOR 2 (61,000M^3/D)	
	OPERATING CAP.	LOADING RATIO (%)	OPERATING INLET CAP.	LOADING RATIO (%)	OPERATING OUTLET CAP.	LOADING RATIO (%)	OPERATING INLET CAP.	LOADING RATIO (%)	OPERATING OUTLET CAP.	LOADING RATIO (%)	OPERATING INLET CAP.	LOADING RATIO (%)	OPERARING INLET CAP.	LOADING RATIO (%)
JUN 23			48,816	108			47,340	78						
JUN 24	48,800	80	50,039	111			46,584	76						
JUN 25	43,799	72	50,547	112	47,490	106	45,863	75	42,328	69				
JUN 26	44,217	72	49,394	110	48,918	109	46,116	76	46,161	76				
JUN 29	45,492	75	47,484	106	45,928	102	45,088	74	39,196	64				
JUN 30	43,568	71	49,559	110	50,877	113	47,552	78	45,508	75				
JUL 01	39,604	65	46,070	102	45,708	102	44,360	73	42,935	70				
JUL 02	70,463	116	73,000	162	68,954	153	58,500	96	57,327	94				
JUL 03	69,212	113	63,282	141	64,708	144	57,086	94	53,460	88				
JUL 06	37,905	62	43,329	96	47,960	107	44,668	73	44,952	74				
JUL 07	53,654	88	50,000	111	50,402	112	48,591	80	45,292	74				
JUL 08	60,781	100	44,577	99	41,846	93	43,697	72	38,408	63				
JUL 09	54,845	90	43,170	96	41,685	93	44,425	73	44,258	73				
JUL 10	52,254	86	45,037	100	38,762	86	42,810	70	38,723	63				
JUL 13	49,960	82	44,481	99	36,125	80	43,872	72	39,685	65				
JUL 15	51,487	84	41,723	93	35,876	82	40,663	67	33,131	54	68,428	112	59,992	98
	77,576	127	55,894	124	56,157	125								
JUL 16	69,375	114	57,120	127	58,054	129					72,487	119	64,005	105
JUL 17	48,411	79	57,066	127	56,732	126					67,194	110	59,078	97
	54,615	90	37,409	83	38,662	86								
JUL 20		0	70,954	158	77,180	172	77,497	127	76,238	125	69,980	115	61,525	101
JUL 21		0	69,630	155	76,082	169	76,590	126	73,879	121	80,507	132	71,960	118
JUL 22			65,900	146	60,645	135	74,322	122	74,793	123	65,054	107	56,663	93
JUL 24											67,810	111	59,382	97
MAX	77,576	127	73,000	162	77,180	172	77,497	127	76,238	125	80,507	132	71,960	118
AVG	53,475	88	52,530	117	51,893	115	51,571	85	49,193	81	70,209	118	61,801	104
MIN	37,905	62	37,409	83	36,125	80	40,663	67	33,131	54	65,054	110	56,663	97

Appendix 5-2 Process Water Quality

Appendix 5-2 PROCESS WATER QUALITY

The Study Team conducted a process water quality analysis for raw water, settled water, filtered water, and distributed water to evaluate the existing treatment process.

1. Sampling Points

(1) Raw Water

- Receiving well
- Distribution chamber

(2) Settled Water

- Effluent channel of each sedimentation tank

(3) Filtered Water

- Filter No. 1, No. 2 and No. 7 which treat settled water from Pretreater.

- Filter No. 13 which treats settled water from Pulsator.

(4) Distributed Water

- Clear water reservoir

2. Findings

The existing treatment process is found to be functionable, referring to the attached results, if inflow rate is controlled to distribute the design treatment capacity to each treatment process. The marks * and ** in the following list show the minimum and maximum results of each item during survey period, respectively.

Raw Water at Receiving Well

Date	Tu	pH	Alk	IRON	RCl
22/06/92	7.4	6.5*	30.0	<0.2	<0.1
23/06/92	6.8	6.6	30.0	<0.2	<0.1
24/06/92	8.6	6.6	30.0	<0.2	<0.1
25/06/92	6.5	6.6	30.0*	<0.2	<0.1
26/06/92	5.5	6.8	30.0	<0.2	<0.1
29/06/92	5.0*	6.6	30.0	<0.2	<0.1
30/06/92	5.0	6.8	30.0	<0.2	<0.1
01/07/92	5.8	6.8**	30.0	<0.2	<0.1
02/07/92	19.0**	6.8	38.0**	<0.2	<0.1
03/07/92	9.5	6.6	30.0	<0.2	<0.1
AVG	7.91	6.67	30.8	<0.2	<0.1

Raw Water at Distribution Chamber

Date	Tu	pH	Alk	IRON	RCl
22/06/92	7.5	6.6	30.0*	<0.2	<0.1
23/06/92	6.7	6.7	30.0	<0.2	<0.1
24/06/92	8.5	6.6	30.0	<0.2	<0.1
25/06/92	6.5	6.5*	30.0	<0.2	<0.1
26/06/92	5.4	6.6	30.0	<0.2	<0.1
29/06/92	4.4*	6.6	30.0	<0.2	<0.1
30/06/92	4.9	6.8**	30.0	<0.2	<0.1
01/07/92	6.0	6.8	30.0	<0.2	<0.1
02/07/92	16.0**	6.6	36.0**	<0.2	<0.1
03/07/92	9.3	6.6	30.0	<0.2	<0.1
AVG	7.52	6.64	30.8	<0.2	<0.1

Settled Water at Pulsator

Date	Tu	pH	Alk	IRON	RCl
22/06/92	1.0	6.6	26.0	<0.2	<0.1
23/06/92	1.2	6.8**	22.0*	<0.2	<0.1
24/06/92	0.75	6.7	26.0	<0.2	<0.1
25/06/92	1.0	6.7	22.0	<0.2	<0.1
26/06/92	0.9	6.4	24.0	<0.2	<0.1
29/06/92	0.85	6.8	26.0	<0.2	<0.1
30/06/92	0.4*	6.8	24.0	<0.2	<0.1
01/07/92	0.9	6.4	22.0	<0.2	<0.1
02/07/92	1.6	6.2	32.0**	<0.2	<0.1
03/07/92	1.9**	6.2*	28.0	<0.2	<0.1
AVG	1.05	6.56	25.2	<0.2	<0.1

Settled Water at Centrifloc No.1/No.2

Date	pH		TU		Alk		IRON		RCl	
	①	②	①	②	①	②	①	②	①	②
22/06/92	6.9	—	1.4	—	26.0	—	<0.2	—	<0.1	—
23/06/92	6.7	6.5*	1.5	1.6	24.0	24.0	<0.2	<0.2	<0.1	<0.1
24/06/92	6.9	6.9**	1.95	1.25	26.0	28.0**	<0.2	<0.2	<0.1	<0.1
25/06/92	6.7	6.7	1.1	1.25	26.0	26.0	<0.2	<0.2	<0.1	<0.1
26/06/92	6.6	6.6	1.4	1.0	26.0	24.0	<0.2	<0.2	<0.1	<0.1
29/06/92	6.6	6.8	1.0	0.9	26.0	26.0	<0.2	<0.2	<0.1	<0.1
30/06/92	**7.0	6.8	*0.52	0.43*	24.0	24.0	<0.2	<0.2	<0.1	<0.1
01/07/92	6.6	6.8	0.9	0.9	*22.0	22.0*	<0.2	<0.2	<0.1	<0.1
02/07/92	6.6	6.8	**2.6	2.25**	26.0	24.0	<0.2	<0.2	<0.1	<0.1
03/07/92	*6.4	6.8	2.25	2.25	**26.0	26.0	<0.2	<0.2	<0.1	<0.1
AVG	6.75	6.75	1.46	1.31	25.2	24.8	<0.2	<0.2	<0.1	<0.1

Settled Water at Pretreater No.1/No.2

Date	pH		TU		Alk		IRON		RCl	
	①	②	①	②	①	②	①	②	①	②
22/06/92	2.1	—	6.7	—	26.0	—	<0.2	—	<0.1	—
23/06/92	1.5	3.6	6.7	6.6	26.0	26.0	<0.2	<0.2	<0.1	<0.1
24/06/92	1.75	3.5*	6.8	6.8	26.0	28.0	<0.2	<0.2	<0.1	<0.1
25/06/92	2.1	3.6	6.7	6.8	24.0	22.0	<0.2	<0.2	<0.1	<0.1
26/06/92	*1.1	5.45**	6.8	7.4**	26.0	32.0**	<0.2	<0.2	<0.1	<0.1
29/06/92	1.6	5.3	6.8	6.4	22.0	22.0	<0.2	<0.2	<0.1	<0.1
30/06/92	2.4	4.5	**7.0	7.2	28.0	28.0	<0.2	<0.2	<0.1	<0.1
01/07/92	1.9	5.1	7.0	6.4*	*20.0	22.0*	<0.2	<0.2	<0.1	<0.1
02/07/92	**3.5	—	*6.2	—	**34.0	—	<0.2	—	<0.1	—
03/07/92	1.5	—	6.4	—	22.0	—	<0.2	—	<0.1	—
AVG	1.95	4.43	6.71	6.8	25.4	25.7	<0.2	<0.2	<0.1	<0.1

*02/07 & 03/07 PT_2 is empty.

Filtered Water at Filter No.1

Date	Tu	pH	Alk	IRON	RCl
22/06/92	←		Closed		→
23/06/92	1.5	6.6	22.0	<0.2	<0.1
24/06/92	←		Closed		→
25/06/92	1.4	6.8	24.0	<0.2	<0.1
26/06/92	0.5	6.5	26.0	<0.2	<0.1
29/06/92	0.7	6.6	28.0	<0.2	<0.1
30/06/92	0.35*	6.8**	24.0	<0.2	<0.1
01/07/92	0.9	6.4	22.0*	<0.2	<0.1
02/07/92	1.6	6.2	32.0**	<0.2	<0.1
03/07/92	5.2**	6.2*	28.0	<0.2	<0.1
AVG	1.52	6.5	25.75	<0.2	<0.1

Filtered Water at Filter No.2

Date	Tu	pH	Alk	IRON	RCl
22/06/92	0.8	6.5	22.0	<0.2	<0.1
23/06/92	1.45	6.6	24.0	<0.2	<0.1
24/06/92	0.8	6.8	22.0	<0.2	<0.1
25/06/92	0.8	6.8	24.0	<0.2	<0.1
26/06/92	0.66	6.5	24.0	<0.2	<0.1
29/06/92	0.65	6.6	26.0	<0.2	<0.1
30/06/92	0.55‡	6.8‡‡	24.0	<0.2	<0.1
01/07/92	0.8	6.6	22.0‡	<0.2	<0.1
02/07/92	2.75	6.6	34.0‡‡	<0.2	<0.1
03/07/92	5.4‡‡	6.4‡	24.0	<0.2	<0.1
AVG	1.46	6.63	24.6	<0.2	<0.1

Filtered Water at Filter No.7

Date	Tu	pH	Alk	IRON	RCl
22/06/92	2.0	6.7	22.0	<0.2	<0.1
23/06/92	3.6	6.8	22.0	<0.2	<0.1
24/06/92	2.65	6.9‡‡	22.0	<0.2	<0.1
25/06/92	1.7	6.7	26.0	<0.2	<0.1
26/06/92	0.95	6.7	26.0	<0.2	<0.1
29/06/92	1.0	6.6‡	24.0	<0.2	<0.1
30/06/92	1.0	6.8	22.0‡	<0.2	<0.1
01/07/92	0.9‡	6.8	24.0	<0.2	<0.1
02/07/92	6.75‡‡	6.8	34.0‡‡	<0.2	<0.1
03/07/92	3.0	6.8	26.0	<0.2	<0.1
AVG	2.35	6.76	24.8	<0.2	<0.1

Filtered Water at Filter No.13

Date	Tu	pH	Alk	IRON	RCl
22/06/92	0.5	6.5	24.0	<0.2	<0.1
23/06/92	0.75‡‡	6.9‡‡	22.0	<0.2	<0.1
24/06/92	0.5	6.7	22.0	<0.2	<0.1
25/06/92	0.5	6.8	22.0	<0.2	<0.1
26/06/92	0.25	6.5	22.0	<0.2	<0.1
29/06/92	0.15	6.6	24.0	<0.2	<0.1
30/06/92	0.11‡	6.8	22.0	<0.2	<0.1
01/07/92	0.16	6.8	22.0	<0.2	<0.1
02/07/92	0.6	6.6	32.0‡‡	<0.2	<0.1
03/07/92	0.4	6.4‡	20.0‡	<0.2	<0.1
AVG	0.392	6.66	23.2	<0.2	<0.1

Distributed Water in the Plant

Date	Tu	pH	Alk	IRON	RCl
22/06/92	1.4	6.9	30.0	<0.2	1.0
23/06/92	1.25	8.0	30.0	<0.2	1.7
24/06/92	0.8*	8.0**	30.0	<0.2	1.5
25/06/92	1.25	8.0	32.0	<0.2	1.5
26/06/92	0.95	6.9	30.0	<0.2	1.0
29/06/92	0.83	7.0	28.0	<0.2	1.0
30/06/92	0.7	7.4	30.0	<0.2	1.0
01/07/92	1.4	7.6	28.0*	<0.2	1.0
02/07/92	2.4	6.8	40.0**	<0.2	1.0
03/07/92	3.5**	6.4*	28.0	<0.2	1.0
AVG	1.45	7.3	30.6	<0.2	1.17

Appendix 5-3 Pilot Filtration Test

Appendix 5-3 PILOT FILTRATION TEST

The Study Team conducted a pilot filtration test, using the pilot filter as shown in the drawing attached herewith, to confirm an optimum filter media such as effective size, uniformity coefficient, and filter depth, which enable uniform inflow rate to the 18 filters with a treatment capacity of 305,000 m^3/d.

1. Findings

According to the test, the following filter enable filtration rate to be 200 m/d at 24 hr filter run.

Effective size : 0.9 mm
Uniformity coefficient : < 1.5
Depth : 800 mm

2. Data

Test results are summarized as shown below:

Run No.	Filter Run (hr)	Loss of Head (m)	Filtered Water Turbidity (NTU)
1	28	0.20	3.20
2	49	0.23	1.10
3	23	0.16	0.66
4	33	1.32	0.32
5	48	0.38	0.85
6	36	0.40	2.20
7	41	1.47	2.10

Notes:

1) Tested filter media are summarised as follows:

Run No.	Effective Size (mm)	Uniformity Coefficient	Depth (mm)
1, 2	1.15	< 1.5	800
3, 4, 7	1.0	< 1.5	800
5, 6	1.0	< 1.5	800

2) Run 1
Filtered water turbidity reached at 3.2 NTU in 28 hr filter run (Sri Lankan Drinking Water Standard regulates turbidity less than 2.0 NTU)

3) Run 2
Filter run lasted 49 hr within the turbidity regulated in the Sri Lankan Drinking Water Standard

4) Run 3
Test was accidintally stopped at 23 hr filter run when the filtered water turbidity was kept in desirable level.

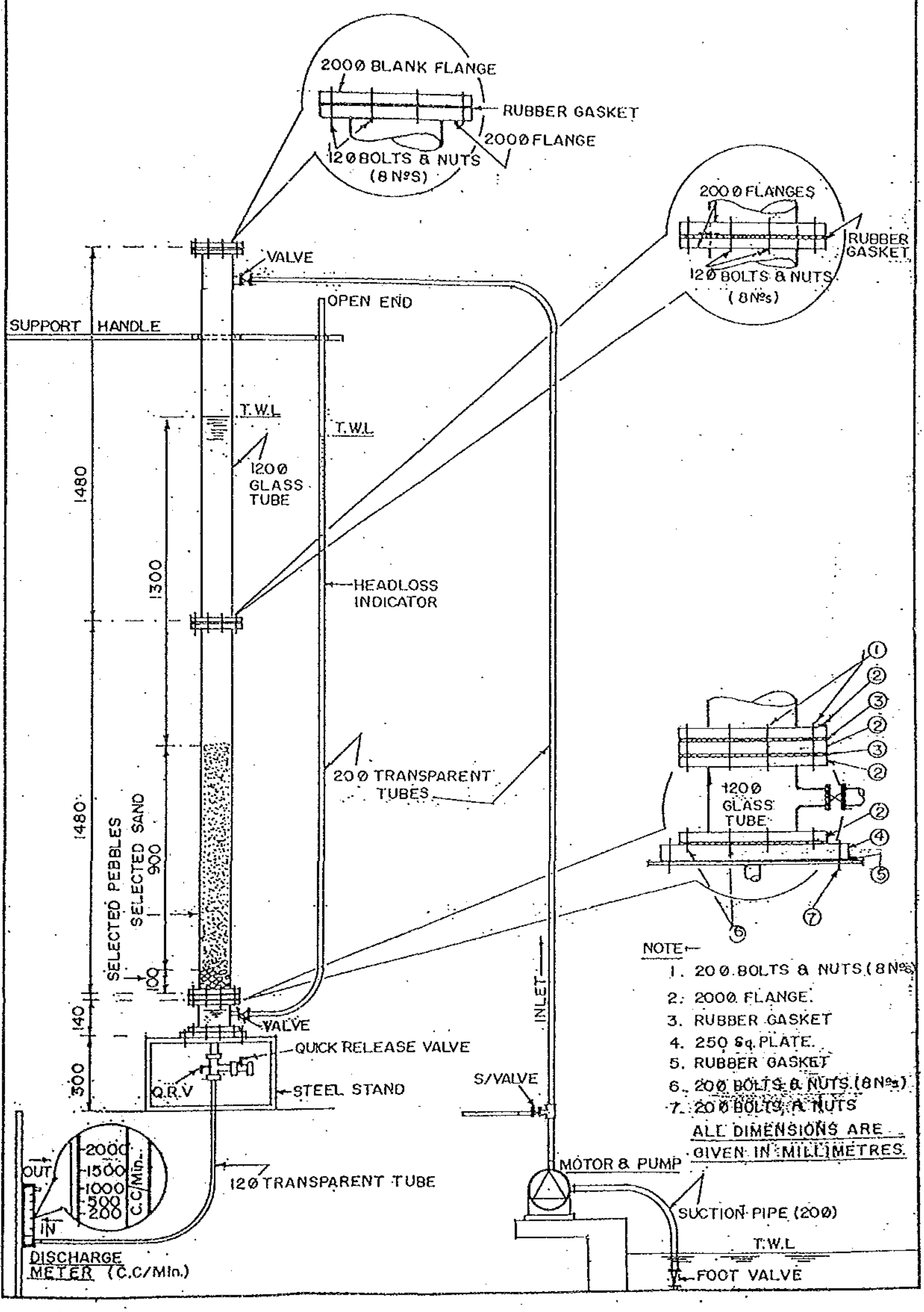
5) Run 4
Filtered water turbidity was desirable level at 33 hr filter run, however the loss of head reached 1.32 m.

6) Run 5
Both loss of head and filtered water turbidity was kept in desirable level.

7) Run 6
Filtered water turbidity exceeded 2 NTU at 36 hr filter run.

8) Run 7
Filtered water turbidity exceeded 2 NTU at 41 hr filter run.

PILOT FILTER



NOTE:—
1. 20Ø BOLTS & NUTS (8N°s)
2. 200Ø FLANGE.
3. RUBBER GASKET
4. 250 Sq. PLATE.
5. RUBBER GASKET
6. 20Ø BOLTS & NUTS (8N°s)
7. 20Ø BOLTS & NUTS

ALL DIMENSIONS ARE GIVEN IN MILLIMETRES.

Appendix 5-4 Grain Size Analysis

Appendix 5-4 GRAIN SIZE ANALYSIS

The Study Team conducted an investigation of the filters including depth of filter bed and grain size analysis such as effective size, uniformity coefficient, and sand-anthracite mixing ratio.

1. Findings

(1) Filter No.1 to No.12

Filter No. 1 to No. 12 were modified in the last expansion project in 1987 from single layer to double layer to accelerate the filtration rate. However, as shown in the table of sand-anthracite ratio attached herewith, the existing filter media of the filter No. 1 and No. 12 is not satisfactory particularly in the distribution of sand and anthracite. The results shows anthracite and sand are remarkably mixed, which should be perfectly separated in upper and lower layers, respectively. Then, it apparent that the filters don't work as multiple layer anymore.

Likewise, the depth of layer has varying from 70 cm to 90 cm. Mud balls are found in every levels of layer, which is an evident that filter media are deteriorated and backwash effects are not satisfactory.

Therefore, it is concluded that the existing filter media in the filter No. 1 to No. 12 should be replaced.

(2) Filter No. 13 to No. 18

Filter No. 13 to No. 18 was constructed in 1979 with an expansion of Pulsator which might have treated less capacity than that of design. The settled water is very clean and is introduced into filter No. 13 to No. 18.

As indicated in test results, sand are still kept in designed condition with a uniformity coefficient of almost less than 1.5 and with a effective size of around 1.1 to 1.2 mm.

Therefore, it is concluded that sand of filter No. 13 to No. 18 are unnecessarily replaced.

FILTER No.1 (SAND)

LOCATION TRIAL No.	UNIFORMITY COEF.	EFFECTIVE SIZE
UPPER LAYER		
TRIAL 1	1.47	0.60
TRIAL 2	1.38	0.62
AVERAGE	1.43	0.61
MIDDLE LAYER		
TRIAL 1	1.69	0.70
TRIAL 2	1.74	0.68
AVERAGE	1.72	0.69
LOWER LAYER		
TRIAL 1	1.39	0.64
TRIAL 2	1.39	0.64
AVERAGE	1.39	0.64

FILTER No.1 (ANTHRACITE)

LOCATION TRIAL No.	UNIFORMITY COEF.	EFFECTIVE SIZE
UPPER LAYER		
TRIAL 1	1.33	1.43
TRIAL 2	1.38	1.45
AVERAGE	1.36	1.44
MIDDLE LAYER		
TRIAL 1	1.30	1.50
TRIAL 2	1.26	1.53
AVERAGE	1.28	1.52
LOWER LAYER		
TRIAL 1	1.62	1.08
TRIAL 2	1.72	1.96
AVERAGE	1.67	1.02

FILTER No.2 (SAND)

LOCATION TRIAL No.	UNIFORMITY COEF.	EFFECTIVE SIZE
UPPER LAYER		
TRIAL 1	N/A	N/A
TRIAL 2	N/A	N/A
AVERAGE	N/A	N/A
MIDDLE LAYER		
TRIAL 1	1.46	0.66
TRIAL 2	1.17	0.90
AVERAGE	1.31	0.78
LOWER LAYER		
TRIAL 1	1.37	1.70
TRIAL 2	1.32	0.68
AVERAGE	1.35	1.19

FILTER No.2 (ANTHRACITE)

LOCATION TRIAL No.	UNIFORMITY COEF.	EFFECTIVE SIZE
UPPER LAYER		
TRIAL 1	1.70	1.18
TRIAL 2	1.50	1.20
AVERAGE	1.60	1.19
MIDDLE LAYER		
TRIAL 1	1.33	1.34
TRIAL 2	1.24	1.48
AVERAGE	1.29	1.41
LOWER LAYER		
TRIAL 1	1.27	1.36
TRIAL 2	1.35	1.38
AVERAGE	1.31	1.37

FILTER No.13 (SAND)

LOCATION TRIAL No.	UNIFORMITY COEF.	EFFECTIVE SIZE
UPPER LAYER		
TRIAL 1	1.359	1.170
MIDDLE LAYER		
TRIAL 1	1.333	1.050
TRIAL 2	1.227	1.100
TRIAL 3	1.225	1.100
AVERAGE	1.262	1.083
LOWER LAYER		
TRIAL 1	1.273	1.100
TRIAL 2	1.694	0.980
TRIAL 3	1.333	1.050
AVERAGE	1.433	1.043

FILTER No.16

LOCATION TRIAL No.	UNIFORMITY COEF.	EFFECTIVE SIZE
UPPER LAYER		
TRIAL 1	1.416	1.250
TRIAL 2	1.714	1.400
TRIAL 3	1.385	1.300
AVERAGE	1.505	1.317
MIDDLE LAYER		
TRIAL 1	1.475	1.300
TRIAL 2	1.207	1.450
TRIAL 3	1.438	1.200
AVERAGE	1.373	1.283
LOWER LAYER		
TRIAL 1	1.575	1.000
TRIAL 2	1.348	1.150
TRIAL 3	1.316	1.146
AVERAGE	1.413	1.099

SAND-ANTHRACITE RATIO

LOCATION	SAND/ANTH. RATIO(%)	FILTER NO.1	FILTER NO.2
UPPER LAYER	SAND	85.77	32.96
	ANTHRACITE	14.23	67.04
MIDDLE LAYER	SAND	93.29	63.32
	ANTHRACITE	7.71	36.68
LOWER LAYER	SAND	77.32	66.86
	ANTHRACITE	22.68	33.14

Appendix 5-5 Concrete Compressive Strength Test

Appendix 5-5 CONCRETE COMPRESSIVE STRENGTH TEST

The Study Team conducted a concrete compressive strength test as a test for the durability of the existing concrete structure, using type V concrete test hammer.

Test result, as shown in the following table, indicates all of the existing concrete structures have satisfactory compressive strength, ranging 360 kgf/cm^2 to 580 kgf/cm^2.

Concrete Compressive Strength Test Results

Facilities	Results (kg f/cm^2)
Inlet Chamber	580
Distribution Chamber	425
Pulsator	445
Centrifloc No. 1	360
Centrifloc No. 2	450
Pretreater No. 1	380
Pretreater No. 2	360
Filters	494

Appendix 5-6 Existing Mechanical Facilities/Equipment Investigation

Appendix 5-6 EXISTING MECHANICAL FACILITIES/EQUIPMENT INVESTIGATION

The Study Team conducted an investigation of the operating conditions of the existing mechanical facilities/equipment. The results of the investigation are summarised as shown below:

Level	Description
A	Operational/Functionable without replacement
B	Need to repair /replace some parts
C	Need to replace entirely

According to the investigation, the Project involves the rehabilitation of facilities/equipment leveled B and C, except those which NWSDB planned to rehabilitate them by themselves.

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
M-1	Old Intake Pump Station (Mechanical)							
M-1-1	Manually Operated Bar Screen	1. Quantity	: 2 sets	1960	○			
		2. Materials	: Mild Steel					
M-1-2	Suction Valve *	1. Quantity	: 3 sets (No. 1,3,4)	1965		○		Deteriorated
		2. Type	: Manually Operated Gate Valve					
		3. Size	: 700 mm					
M-1-3	Main Pump	1. Quantity	: 2 + (2) sets	1983 (No.1)		○		No.2 & 3 are heavily deteriorated
		2. Type	: Vertical Shaft Double Suction Centrifugal Pump	1965 (No.2,3) 1989 (No.4)		○ ○		
		3. Size	: 600 x 500 mm					
		4. Capacity	: 3,848 m3/hr x 21.5 m x 730 rpm					
M-1-4	Notor	1. Quantity	: 2 + (2) sets					
		2. Type	: Squirrel Cage Induction Motor					
		3. Capacity	: 400v x 298kw x 8p	1983 (No.1)		○		Defective noise and vibration
			400v x 300kw x 8p	1965 (No.2)		○		
			400v x 298kw x 8p	1965 (No.3)		○		
			400v x 280kw x 8p	1989 (No.4)	○			
M-1-5	Check Valve *	1. Quantity	: 2 sets	1965		○		Leakage
		2. Type	: Swing					
		3. Size	: 700 mm					

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
M-1-6	Delivery Valve	1. Quantity : 2 sets 2. Type : Manually Operated Gate Valve 3. Capacity : 700 mm	1965	O			
M-1-7		1. Quantity : 1 set 2. Type : Manual 3. Size : 8 ton	1965	O			Deteriorated
M-1-8	Drainage Pump	1. Quantity : 1 set 2. Type : Submersible 3. Size : 50 mm	Unknown		O		Deteriorated Leakage

Notes 1. M-1-2, Suction Valve and M-1-3, Main Pump
No.1 and No.4 will be repaired by NWSDB

2. M-1-4, Main Motor
No.1 will be repaired by NWSDB

3. M-1-5, Check Valve
No.2 and No.3 will be replaced in connection with the replacement of No.2 and No.3 main pumps.

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
M-2	New Intake Pump Station (Mechanical)						
M-2-1	Manually Operat-ed Bar Screen	1. Quantity : 2 sets 2. Materials : Mild Steel	1987	O			
M-2-2	Travelling Screen	1. Quantity : 2 sets 2. Type : Rotary Screen with Auto-Wash	1987	O			
M-2-3	Wash Pump for Travelling Screen *	1. Quantity : 3 sets 2. Type : Horizontal Shaft Volute Pump 3. Capacity : 60.12 m3/hr x 60 m 4. Motor : 400 v x 22 kw x 2 p	1987 1987		O		1 set of the pump is out of order
M-2-4	Suction Valve	1. Quantity : 2 sets 2. Type : Manually Operated Butterfly valve 3. Size : 500 mm	1987		O		Malfunction in operation
		1. Quantity : 3 sets 2. Type : Manually Operated Butterfly valve 3. Size : 800 mm (No.2,3,4)	1987		O		
M-2-5	Main Pump	1. Quantity : 1 + (1) sets (No.1,5) 2. Type : Vertical Shaft Double Suction Centrifugal Pump 3. Size : 350 x 300 mm 4. Capacity : 1,067 m3/hr x 20.1 m x 975 rpm	1987	O			Good in operation but leakage at the ground of No.1 pump.
		1. Quantity : 2 + (1) sets (No.2,3,4) 2. Type : Vertical Shaft Double Suction Centrifugal Pump 3. Size : 500 x 450 mm 4. Capacity : 2,339 m3/hr x 20.4 mm x 730 rpm	1987	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-2-6	Main Motor	1. Quantity : 1 + (2) sets (No.1,5) 2. Type : Squirrel Cage Induction Motor 3. Capacity : 400 v x 93 kw x 6 p	1987	○			
		1. Quantity : 2 + (1) sets (No.2,3,4) 2. Type : Squirrel Cage Induction Motor 3. Capacity : 400 v x 186.5 kw x 6 p	1987		○		
M-2-7	Check Valve	1. Quantity : 5 sets 2. Type : Swing Type with By-pass 3. Size : 600 mm	1987		○		Malfunction Leakage
M-2-8	Delivery Valve	1. Quantity : 5 sets 2. Type : Manually Operated Butterfly Valve 3. Size : 600 mm	1987		○		Malfunction
M-2-9	Crane	1. Quantity : 1 set 2. Type : Electrical Operated Travelling Crane	1987	○			
M-2-10	Drainage Pump	1. Quantity : 1 set 2. Type : Submersible 3. Size : 50 mm				○	Deterioration Leakage
M-2-11	Compressor	1. Quantity : 1 set 2. Capacity : 415 v x 1 HP x 1,430 rpm x 7 kgf/cm2	1987	○			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-2-12	Air Chamber	1. Quantity : 1 set	1987	○			
M-2-13		1. Quantity : 5 sets 2. Capacity : 415 v x 1.5 kw x 1,400 rpm	1987	○			
Notes	M-2-3	Travelling screen will be repaired by NWSDB.					

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
M-3	No.1 Receiving Chamber						
M-3-1	Drainage Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 100 mm	1962	O			
		1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 150 mm	1962	O			
M-3-2	Stop Log	1. Quantity : 1 set 2. Materials : Wooden made	1962	O			
		1. Quantity : 1 set 2. Materials : Aluminum	1962	O			
M-4	No.2 Receiving Chamber						
M-4-1	Drainage Valve	1. Quantity : 3 sets 2. Size : 50 mm	1962	O			
M-4-2	Stop Log	1. Quantity : 4 sets 2. Materials : Aluminum	1962	O			

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
M-5	Centrifloc							
M-5-1	Sludge Scraper	1. Quantity	: 2 sets	1962		○		Submerged parts are corroded.
		2. Type	: Circular Type					
		3. Dimensions	: 39.6 m x 6.85 m					
		4. Motor	: 0.75 kw					
M-5-2	Sludge Withdrawal Valve	1. Quantity	: 2 sets	1962	○			
		2. Type	: Telescope Type (Manual)					
		3. Size	: 150 mm					
M-5-3	Sludge Withdrawal Valve	1. Quantity	: 2 sets	1962			○	Electric magnetic valves are corroded.
		2. Type	: Hydraulically Operated Butterfly Valve		○			
		3. Size	: 100 mm		○			
M-5-4	Valve	1. Quantity	: 4 sets	1962			○	
		2. Type	: Manually Operated Gate Valve					
		3. Size	: 150 mm					
M-5-5	Valve	1. Quantity	: 4 sets	1962	○			
		2. Type	: Manually Operated Gate Valve					
		3. Size	: 100 mm					

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
M-6	Pulsator						
M-6-1	Inflow Pipe	1. Quantity : L.S. 2. Size : 700 mm 3. Materials : Asbestos	1980	○			
M-6-2	Stilling Buffles *	1. Quantity : 444 pcs. 2. Materials : Asbestos	1980		○		
M-6-3	Collecting Trough	1. Quantity : L.S. 2. Materials : Concrete (R.C)	1980	○			
M-6-4	Vacuum Fan	1. Quantity : 1 set 2. Type : Turbo Blower 3. Capacity 100 m3/min x -1 mAq	1980	○			
M-6-5	Vacuum Breaker (1)	1. Quantity : 2 set 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 250 mm	1980	○			
M-6-6	Vacuum Breaker (2)	1. Quantity : 2 sets 2. Type : Manually Operated Gate Valve 3. Size : 150 mm	1980	○			
M-6-7	Automatic Sludge Sithdrawal Valve	1. Quantity : 8 sets 2. Type : Hydraulically Operated Diaphragm Valve 3. Size : 150 mm	1980	○			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-6-8	Valve for M-6-7	1. Quantity : 8 sets 2. Type : Manually Operated Gate Valve	1980	O			
M-6-9	Drainage Valve	1. Quantity : 5 sets 2. Type : Manually Operated Gate Valve 3. Size : 200 mm	1980	O			
M-6-10	Drainage Valve	1. Quantity : 2 sets 2. Type : Manually Operated Gate Valve 3. Size : 80 mm	1980	O			
Notes	M-6-2	Stilling Buffles are not to be replaced. Because, Pulsator works well without the stilling buffles.					

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
M-7	Pretreater							
M-7-1	Sludge Scraper	1. Quantity 2. Type 3. Dimensions	: 2 sets : Circular Type : 39.6 m x 7 m depth	1987	O			
M-7-2	Sludge Recircu -lation Pump	1. Quantity 2. Type 3. Size 4. Capacity	: 2 sets : Vertical Shaft Axial Flow Pump : 400 mm : 5,636 gpm x 10.54 m	1987		O		1 set - out of order 1 set - noise
M-7-3	Valve for M-7-2	1. Quantity 2. Type 3. Size	: 2 sets : Butterfly Valve (manual) : 300 mm	1987	O			
		1. Quantity 2. Type 3. Size	: 2 sets : Butterfly Valve (manual) : 300 mm	1987	O			
M-7-4	Mixer	1. Quantity 2. Type	: 2 sets : Static Mixer	1987		O		Removed
M-7-5	Valve for M-7-4	1. Quantity 2. Type	: 6 sets : Manually Operated Butterfly Valve with Headstock	1987	O			
M-7-6	Automatic Sludge With -drawal Valve	1. Quantity 2. Type 3. Size	: 2 sets : Electrical Operated Diaphragm Valve : 150 mm	1987	O			Out of order
M-7-7	Valve for M-7-6	1. Quantity 2. Type 3. Size	: 3 sets : Manually Operated Gate Valve : 150 mm	1987	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-8	Filter No.1-No.12						
M-8-1	Underdrain	1. Type : R.C.	1987		O		Partly damaged
M-8-2	Filter Sand	1. Size : 1 mm	1987		O		Deteriorated
M-8-3	Inflow Valve	1. Quantity : 12 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 800 mm	1987		O		Electromagnetic valve, Actuator : out of order
M-8-4	Effluent Valve	1. Quantity : 12 sets 2. Type : Hydraulically Operated Control Valve 3. Size : 450 mm	1987		O		Flow detector : out of order
M-8-5	Backwash Valve (influent)	1. Quantity : 12 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 800 mm	1987		O		Electromagnetic valve, Actuator : out of order
M-8-6	Backwash Valve (influent)	1. Quantity : 12 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 600 mm	1987		O		Ditto
M-8-7	Backwash Valve	1. Quantity : 24 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 200 mm	1987	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-8-8	Air Scoring Valve	1. Quantity : 12 sets 2. Type : Hydraulically Operated Butterfly Valve	1987		O		Electromagnetic Valve, Actuator out of order
M-8-9	Backwash Flow Meter	1. Quantity : 1 set 2. Type : Olifice 3. Size : 600 mm	1987		O		Out of order

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-9	Filter No.13-No.18						
M-9-1	Underdrain	1. Type : R.C.	1980	O			
M-9-2	Filter Sand	1. Size : 1 mm	1980	O			
M-9-3	Effluent Valve	1. Quantity : 6 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 450 mm	1980		O		Electromagnetic Valve, Actuator : out of order
M-9-4	Air Scoring Valve	1. Quantity : 6 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 250 mm	1980		O		Ditto
M-9-5	Drainage Valve	1. Quantity : 6 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 400 mm	1980		O		Ditto
M-9-6	Backwash Valve	1. Quantity : 6 sets 2. Type : Hydraulically Operated Butterfly Valve 3. Size : 400 mm	1975		O		Ditto
M-9-7	P-Box	1. Quantity : 6 sets	1975		O		Deteriorated
M-9-8	Backwash Pump *	1. Quantity : 2 sets 2. Type : Single Suction Centrifugal Pump 3. Capacity : 1,026 m3/hr x 20 m 4. Motor : 90 kw	1980		O		1 set : out of order

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-9-9	Air Scoring Blower	1. Quantity : 2 sets 2. Type : Roots Blower 3. Capacity : 78.9 m3/min x 3 m 4. Motor : 55 kw	1980	○			
M-9-10	Air Compressor	1. Quantity : 2 sets 2. Capacity : 7.4 m3/min x 7.7 bar 3. Motor : 52 kw	1988		○		1 set-out of order
M-9-11	Air Dryer	1. Quantity : 2 sets 2. Type : Absorption Type 3. Heater : 230 v	1987		○		Out of order
M-9-12	Air Tank	1. Quantity : 2 sets 2. Type : Cylindrical Tank 3. Dimensions : 762 mm x 1,580 mm	1987		○		
Notes	M-9-8	Backwash pump is under repair by NWSDB.					

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-10	Alum Feeding Facilities						
M-10-1	Solution Tank	1. Quantity : 4 tanks 2. Volume : 45 m3			O		Anti-acid painting is deteriorated.
M-10-2	Mixer	1. Quantity : 2 sets 2. Type : Vertical 3. Motor : 5 HP 4. Gear Reduction Ratio : 6.97:1	1966		O		Rubber lining is deteriorated.
		1. Quantity : 1 set 2. Type : Vertical 3. Motor : 7.5 kw 4. Gear Reduction Ratio : 20:1	1987		O		
M-10-3	Pump	1. Quantity : 2 sets 2. Type : Diaphragm 3. Capacity : 3,080 e/h 4. Motor : 4 kw	1980			O	
		1. Quantity : 2 sets 2. Type : Diaphragm 3. Capacity : 3,080 e/h 4. Motor : 4 kw	1987			O	
		1. Quantity : 1 set 2. Type : Horizontal shaft centrifugal Pump 3. Size : 25mm	1965			O	Installed as a temporary use
M-10-4	Hoist	1. Quantity : 1 set 2. Type : Electrically Operated Hoist 3. Capacity : 500 kg	1965			O	

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-11	Lime Feeding Facilities						
M-11-1	Solution Tank	1. Quantity : 4 tanks 2. Volume : 40 m3	1965		O		
M-11-2	Mixer	1. Quantity : 2 sets 2. Type : Horizontal Type	1965		O		Leakage at wall
		1. Quantity : 2 sets 2. Type : Vertical Type 3. Motor : 4 HP	1980		O		Out of order
		1. Quantity : 2 sets 2. Type : Vertical 3. Motor : 3.7 kw	1987		O		Ditto
M-11-3	Pump	1. Quantity : 3 sets 2. Type : Plunger Type 3. Piston Size : 110 mm dia 4. Motor : 3 HP	1980			O	2 sets are out of order
		1. Quantity : 3 sets 2. Type : Plunger Type	1987			O	2 sets are out of order

No.	Equipment		Construction Year	Level			Remarks
				A	B	C	
M-12	Chlorination Facilities						
M-12-1	Evaporator				○		Removed
M-12-2	Chlorinator	1. Quantity : 2 sets (No.6,7) 2. Type : Vacuum Operated Type 3. Capacity : 0-10 kg/hr	1979		○		No.7 is out of order
		1. Quantity : 2 sets (No.4,5) 2. Type : Vacuum Operated Type 3. Capacity : 0-40 kg/hr	1979		○		No.5 is out of order
		1. Quantity : 2 sets (No.1,8) 2. Type : Vacuum Operated Type 3. Capacity : 0-675 kg/d	1986		○		Out of order
		1. Quantity : 2 sets (No.2,8) 2. Type : Vacuum Operated Type 3. Capacity : 0-900 kg/d	1986		○		Out of order
M-12-3	Pressured Water Pump	1. Quantity : 2 sets 2. Type : Single Suction Centrifugal Pump 3. Capacity : 30 m3/hr x 53 m 4. Motor : 11 kw	1980	○			
		1. Quantity : 1 set 2. Type : Single Suction Centrifugal Pump 3. Capacity : 26 m 4. Motor : 18.5 kw	1987	○			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-12-4	Crane	1. Quantity : 1 set 2. Type : Motor Operated Type (2 ton) 3. Motor : Travelling 0.24 kw x 2 Lifting 1.8kw	1980		O		Out of order
M-12-5	Hoist	1. Quantity : 1 set 2. Type : 2 ton, Mono Rale Hoist	1965		O		Deteriorated

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
M-13	Dehiwala Transmission Pump						
M-13-1	Main Pump *	1. Quantity : 1 set (No.1)	1965		O		Deteriorated
		2. Type : Horizontal Shaft Double Suction Centrifugal Pump					
		3. Size : 450 x 350 mm					
		4 Capacity : 1,816 m3/hr x 43 m x 745 rpm					
		1. Quantity : 1 set (No.2)	1989	O			Cavitation
		2. Type : Horizontal Shaft Double Suction Centrifugal Pump					
		3. Size : 600 x 600 mm					
		4 Capacity : 3,636 m3/hr x 42.67 m x 745 rpm					
		1. Quantity : 1 sets (No.3)	1965		O		Cavitation
		2. Type : Horizontal Shaft Double Suction Centrifugal Pump					
		3. Size : 600 x 500 mm					
		4 Capacity : 3,636 m3/hr x 42.67 m x 745 rpm					
M-13-2	Motor *	1. Quantity : 1 + (2) sets					
		2. Type : Squirrel Cage Induction Motor					
		3. Capacity : 400 v x 280 kw x 4 p	1965 (No.1)		O		Deteriorated
		415 v x 500 kw x 8 p	1989 (No.2)	O			Oil leakage at starter
		400 v x 560 kw x 8 p	1965 (No.3)		O		Deteriorated
M-13-3	Check Valve *	1. Quantity : 3 sets	1965 (No.1)		O		Deteriorated
		2. Type : Swing Type	1989 (No.2)	O			
		3. Size : 700 mm	1965 (No.3)		O		Deteriorated

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-13-5	Vacuum Pump	1. Quantity : 2 sets 2. Capacity : 400 v x 3 HP x 2,840 rpm	1965		O		
M-13-6	Crane	1. Quantity : 1 set 2. Type : Manually Operated Geared Trolley 3. Capacity : 5 ton	1965	O			
Notes	M-13-1 (Main Pump), M-13-2 (Motor), M-13-3 (Check Valve), and M-13-4 (Delively Valve) will be repaired by NWSDB.						

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
M-14	Dolonnawa Transmission Pump							
M-14-1	Suction Valve	1. Quantity	: 3 sets	1987	○			
		2. Type	: Manually Operated Butterfly Valve					
		3. Size	: 450 mm					
M-14-2	Main Pump	1. Quantity	: 2 + (1) sets	1987		○		Deteriorated
		2. Type	: Vertical shaft Double Suction Centrifugal Pump					
		3. Size	: 250 x 200 mm					
		4. Capacity	: 630 m3/hr x 45 m x 1,475 rpm					
M-14-3	Motor	1. Quantity	: 2 + (1) sets	1987		○		Deteriorated
		2. Type	: Squirrel Cage Induction Motor					
		3. Capacity	: 415 v x 110 kw x 4 p					
M-14-4	Check Valve	1. Quantity	: 3 sets	1987	○			
		2. Type	: Swing Type					
		3. Size	: 250 mm					
M-14-5	Delivery Valve	1. Quantity	: 3 sets	1987		○		Short spindle
		2. Type	: Manually Operated Butterfly Valve					
		3. Size	: 250 mm					
M-14-6	Crane	1. Quantity	: 1 set		○			
		2. Type	: Electrical Operated Hoist Crane					
		3. Capacity	: 10 sets					
M-14-7	Drainage Pump	1. Quantity	: 1 set		○			Deteriorated
		2. Type	: Submersible Type					
		3. Size	: 50 mm					

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M–14–8	Conpressor for Air Chamber *	1. Quantity : 1 set 2. Capacity : 415 v x 1.5 kw	1987		O		
M–14–9	Air Chamber	1. Quantity : 1 set	1987	O			
M–14–10	Fan *	1. Quantity : 1 set			O		
Notes	M–14–8 (Compressor), M–14–1– (Fan) will be repaired by NWSDB.						

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M–15	Eli House Transmission Pump						
M–15–1	Suction Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 300 mm	1980	○			
M–15–2	Main Pump	1. Quantity : 2 + (1) sets 2. Type : Vertical Shaft Double Suction Centrifugal Pump 3. Size : 300 mm x 200 mm 4 Capacity : 720 m3/hr x 106 m x 1,470 rpm	1980	○			Operated at opening ratio of 12 %
M–15–3	Motor *	1. Quantity : 2 + (1) sets 2. Type : Squirrel Cage Induction Motor 3. Capacity : 3,300 v x 300 kw x 4 p	1980		○		1 set is out of order
M–15–4	Check Valve	1. Quantity : 3 sets 2. Type : Swing Type 3. Size : 250 mm	1980	○			
M–15–5	Delivery Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 250 mm	1980	○			
M–15–6	Drainage Pump	1. Quantity : 1 set 2. Type : Submersible Type 3. Size : 50 mm		○			
M–15–7	Compressor for Air Chamber	1. Quantity : 1 set 2. Capacity : 400 v x 0.75 kw		○			
M–15–8	Air Chamber	1. Quantity : 1 set		○			
Notes	M–15–3, Motor will be repaired by NWSDB.						

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
M-16	Maligakanda Transmission Pump						
M-16-1	Suction Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 450 mm	1980	O			
M-16-2	Main Pump	1. Quantity : 2 + (1) sets 2. Type : Vertical Shaft Double Suction Centrifugal Pump 3. Size : 450 x 300 mm 4 Capacity : 1,730 m3/hr x 86 m x 980 rpm	1980	O			Leakage at ground
M-16-3	Motor	1. Quantity : 2 + (1) sets 2. Type : Squirrel Cage Induction Motor 3. Capacity : 3,300 v x 570 kw x 6 p	1980	O			
M-16-4	Check Valve	1. Quantity : 3 sets 2. Type : Swing Type 3. Size : 400 mm	1980	O			
M-16-5	Delivery Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 400 mm	1980	O			
M-16-6	Compressor for Air Chamber	1. Quantity : 1 set 2. Capacity : 400 v x 0.75 kw	1980	O			
M-16-7	Air Chamber	1. Quantity : 2 Sets	1980	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
M-17	Church Hill Transmission Pump						
M-17-1	Suction Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 400 mm	1980	O			
M-17-2	Main Pump	1. Quantity : 2 + (1) sets 2. Type : Vertical Shaft Double Suction Centrifugal Pump 3. Size : 400 x 250 mm 4 Capacity : 1,290 m3/hr x 84.5 m x 1,470 rpm	1980	O			Leakage at ground
M-17-3	Motor	1. Quantity : 2 + (1) sets 2. Type : Squirrel Cage Induction Motor 3. Capacity : 3,300 v x 430 kw x 4 p	1980	O			
M-17-4	Check Valve	1. Quantity : 3 sets 2. Type : Swing Type 3. Size : 350 mm	1980	O			
M-17-5	Delivery Valve	1. Quantity : 3 sets 2. Type : Manually Operated Gate Valve 3. Size : 350 mm	1980	O			
M-17-6	Compressor for Air Chamber	1. Quantity : 1 set 2. Capacity : 400 v x 0.75 kw	1980		O		
M-17-7	Air Chamber	1. Quantity : 1 Sets	1980	O			
Notes	M-17-6, Compressor will be repaired by NWSDB.						

No.	Description	Section	Size, Materials	Level A	 B	 C	Remarks
M-18	Piping						
M-18-1	Pulsator Sludge Withdrawal Pipe	Sludge Pit- Sludge Discharge Channel	Steel Pipe : 80, 150, 200 mm	O			Slightly corroded
M-18-2	Centrifloc Sludge Withdrawal Pipe	In the Valve Pit	Cast Iron : 100, 150 mm	O			Submerged
M-18-3	Pretreater Sludge Withdrawal Pipe	In the Valve Pit	Cast Iron : 150, 200 mm	O			Ditto
	Pretreater Sludge Circulation Pipe	Sludge Circulation Chamber	Steel Pipe : 300, 400 mm	O			
M-18-4	Filter (No.1-No.12) Backwash Pipe	Head Tank-Each Filter	Steel Pipe : 600 mm	O			
	Air Scoring Pipe	Blower-Each Valve	Steel Pipe : 100, 250, 300 mm		O		Due to lower level than filter water level, water is intruded into the piping.
	Instrumentation Air Pipe	Compressor-Each Valve	Steel Pipe : 50 mm Cupper Tube : 8 mm			O	Deteriorated
M-18-5	Filter(No.13-No.18) Backwash Main	Head Tank-Each Filter 400 v x 0.75 kw	Steel Pipe : 400,600 mm	O			
	Air Scoring Pipe	Blower-Each Filter	Steel Pipe : 50, 250, 500 mm		O		Necessary to install drainage
	Instrumentation Air Pipe	Control Panel-Each Valve	Cupper Tube : 8 mm			O	Deteriorated

No.	Description	Section	Size, Materials	Level			Remarks
				A	B	C	
M-18-6	Backwash Lift Pipe	Transmission Pipe-Head Tank Branch		O			
M-18-7	Alum Pipe		VP : 50 mm			O	
M-18-8	Lime Pipe		VP : 50 mm			O	
M-18-9	Solution Water Pipe		Steel Pipe : 50, 100, 150 mm			O	Deteriorated
M-18-10	Chlorine Gas Pipe	Cylinder Room-Chlorinator	Steel Pipe : 25 mm			O	Deteriorated
	Pressured Water Pipe	Booster Pump-Chlorinator	Steel Pipe : 100 mm			O	
	Chlorine Solution Pipe	Chlorinator-Feeding Point	VP : 50, 80 mm			O	

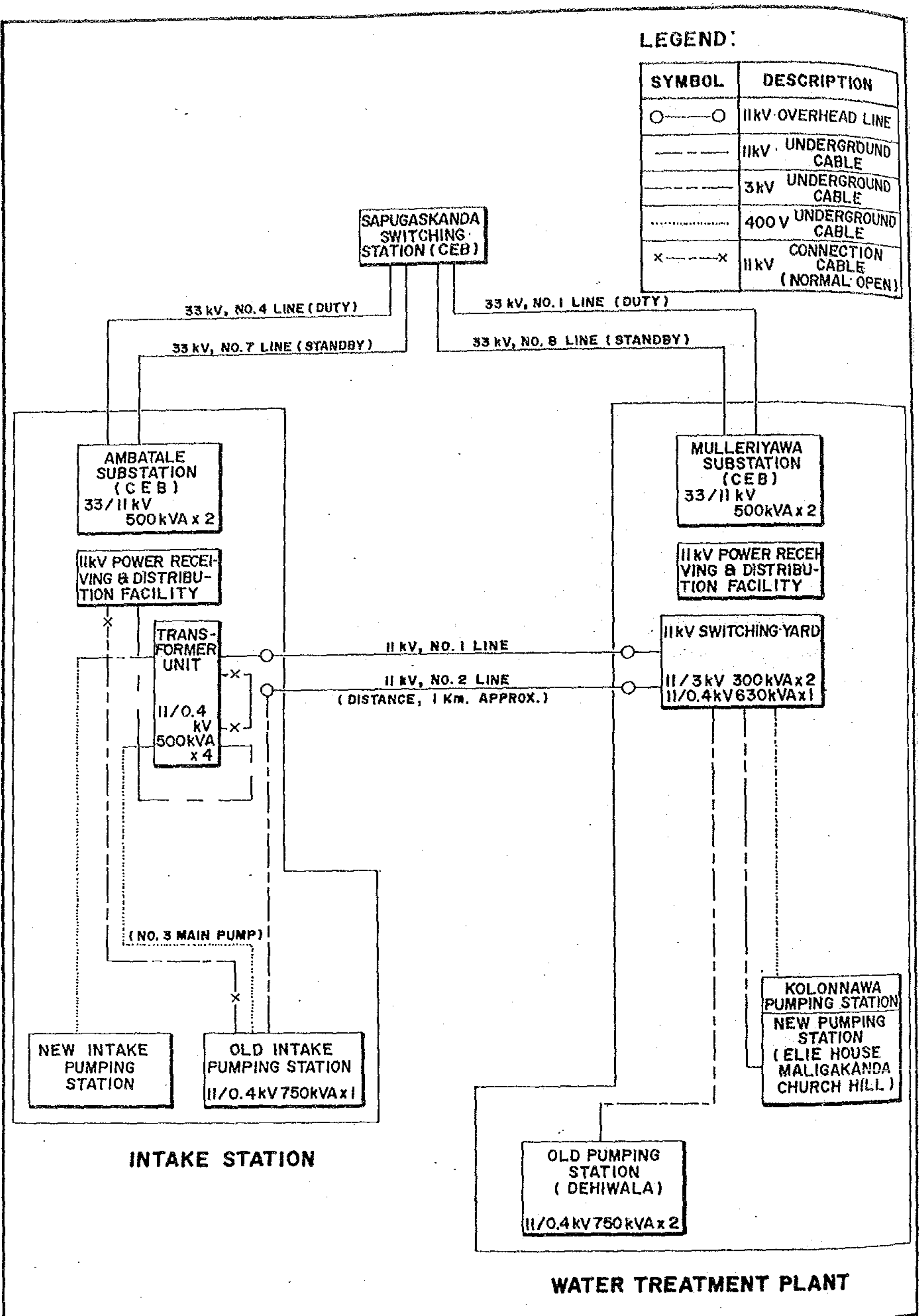
Appendix 5-7 Existing Electrical Facilities/Equipment Investigation

Appendix 5-7 EXISTING ELECTRICAL FACILITIES/EQUIPMENT INVESTIGATION

The Study Team conducted an investigation of the operating conditions of the existing electrical facilities/equipment in the same manner as the mechanical portion. The results of the investigation are summarised as shown below:

Level	Description
A	Operational/Functionable without replacement
B	Need to repair /replace some parts
C	Need to replace entirely

According to the investigation, the Project involves the rehabilitation of facilities/equipment leveled B and C, except those which NWSDB planned to rehabilitate them by themselves. The existing electrical transmission and distribution system is referred to the following drawing.



TRANSMISSION & DISTRIBUTION SYSTEM

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-1	High Tension Power Receiving and Transforming Facilities						
E-1-1	11KV High Tension Panel	1. Location : Mulleriyawa S/S 2. Manufacturer : BBC 3. Quantity : 8 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed Self-standing Type Approx. W6400 x D820 x H2040mm 5. Use : For Power Receiving and Distribution of Intake Station and Water Treatment Plant	1965	○			
E-1-2	Auxiliary Panel	1. Location : Electrical room in Mulleriyawa Substation 2. Manufacturer : BBC 3. Quantity : 4 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standby Type Approx. W3200 x D590 x H2005mm 5. Use : For Protective Relays and Control of Transformer Top Changer	1965	○			
E-1-3	Metering Panel	1. Location : Electrical room in Mulleriyawa : Substation 2. Manufacturer : Not Clear 3. Quantity : 1 set 4. Type, Dimensions : Wall Mounted Type Approx. W600 x D260 x H800mm 5. Use : For Metering of Power Receiving	1965	○			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-1-4	11KV Switching Yard	1. Location : Electrical Room in Mulleriyawa 2. Manufacturer : Not Clear 3. Quantity : Disconnecting Switch (DS) - 5 sets Disconnecting Switch w/Fuse - 2 sets Lightning Arrester - 3 sets 4. Type, Dimensions : Outdoor Type 5. Use : Receive 11KV from Substation and Separate power Distribution to Intake Facility and Water Treatment Plant	1965	○			
E-1-5	Transformer	1. Location : 11KV Switching Yard 2. Manufacturer : LANKA TRANSFORMERS 3. Quantity : 1 pc. 4. Type, Dimensions Capacity : Oil immersed Self Cooled Type 3 dia, 630 KVA 11KV/433V 5. Use : For Kolonnawa P/S	1965	○			
E-1-6	11KV High Tension Panel	1. Location : 11KV Switching Yard 2. Manufacturer : Not Clear 3. Quantity : 2 sets 4. Type, Dimensions : Cubicle for Outdoor Use Approx. W2400 x D2000 x H2400mm 5. Use : 3000KVA for Primary side of Transformer	1965	○			

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
E-1-7	Transformer	1. Location : 11KV Switching Yard 2. Manufacturer : BHRAT BIJLEE 3. Quantity : 2 pcs. 4. Type, Dimensions Capacity : Oil immersed Self-Cooled Type with on Load Top Changer 3 dia, 3000KVA 11/3.3KV 5. Use : For Miligakanda, Elie House and Church Hill P/S	1979	O			
E-1-8	11KV Overhead Transmission Line	1. Location : From 11KV Switching Yard in Water Treatment Plant to Transformer Unit in Intake P/S 2. No. of Line : 2 circuits	1965	O			
E-1-9	3.3 KV High Tension Panels and Motor Starter Panels. (Elie House, Maligakanda and church hill)	1. Location : New Pumping Station 2. Manufacturer : Fuji Electric 3. Quantity : 11 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standing Type Approx. W9100 x D2000 x H2300mm 5. Use : a. For Power Receiving b. For Pump Starting (Reactor Starting)	1979	O			

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
E-1-10	DC Power Supply Device	1. Location : New Pumping Station 2. Manufacturer : VASA Electric 3. Quantity : 1 lot	1979	O			
E-1-11	11KV High Tension Panel	1. Location : Electrical Room in Dehiwala P/S 2. Manufacturer : SOUTH WALES 3. Quantity : 5 sets 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type Approx. W2620 x D1570 x H2470mm 5. Use : For 11KV Power Receiving and Primary Side of 750KVA Transformer	1966			O	1 unit of OCB (Twice Damage) Protective Relay Damage
E-1-12	Transformer	1. Location : Electrical Room in Dehiwala P/S 2. Manufacturer : SOCIETA IMPIANTI 3. Quantity : 2 pcs. 4. Type, Dimension : Oil Immerse Self-Cooled Type 3 Phase, 750KVA, 11KV/435V 5. Use : For 400V Power Source in Dehiwala P/S	1966	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-1-13	DC Power Supply Device	1. Location : Electrical Room in Dehiwala P/S 2. Manufacturer : Not Clear 3. Quantity : 60 cells 4. Type, Dimension : Lead Acid Storage Battery, DC 120V 5. Use : For Control of Circuit Breaker	1966			O	
E-1-14	11KV High Tension Panel-1	1. Location : Ambatale S/S 2. Manufacturer : SOUTH WALES 3. Quantity : 7 sets 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type Approx. W4080 x D1570 x H2475mm 5. Use : For Power Distribution to Intake P/S (Standby Power Source), Pump No. 3 in Old Intake P/S and Three Circuits of General Loads Except Intake P/S	1965	O			
E-1-15	11KV High Tension Panel-2	1. Location : Ambatale S/S 2. Manufacturer : SOUTH WALES 3. Quantity : 3 sets 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type Approx. W1575 x D1570 x H2475mm 5. Use : For Transformer of Auxiliary Loads	1965	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-1-16	Transformer	1. Location : Ambatale S/S 2. Manufacturer : JHONSON ELECTRIC 3. Quantity : 1 pc 4. Type, Dimension : Oil immersed Self-Cooled Type 3 phase, 150kVA, 10750/433V 5. Use : For Auxiliary Loads	1965	O			
E-1-17	DC Power Supply Device	1. Location : Ambatale S/S 2. Manufacturer : Not Clear 3. Quantity : 12 cells 4. Type, Dimension : Lead Acid Storage Battery, DC 24V 5. Use : For Control of Circuit Breaker	1965	O			
E-1-18	Transformer Unit *	1. Location : Outside near by Ambatale S/S 2. Manufacturer : BETON BAU GMBH 3. Quantity : 4 pcs. 4. Type, Dimension Capacity : Pad-mounted Type Oil immersed Self-Cooled Transformer. 3 Phase,500KVA,11KV/415V, including 11KV DS, 400V CB. 5. Use : 2 pcs. : For New Intake S/S 1 pc : For Pump No.3 in Old intake P/S 1 pc : For Standby Power Source	1965	O			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-1-19	Metering Booth *	1. Location : Outside near by Ambatale S/S 2. Manufacturer : Not Clear 3. Quantity : 1 pc 4. Type, Dimension : For Metering of New Pumping Station	1965	O			
E-1-20	11KV High Tension Panel-1 *	1. Location : Electrical Room in Old P/S 2. Manufacturer : MEI 3. Quantity : 3 sets 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type Approx. W1740 x D900 x H1350mm 5. Use : For Power Receiving form Water Treatment Plant and Primary side of Transformer	1965	O			Protective Relay Damage Malfunction
E-1-21	11KV High Tension Panel-2	1. Location : Electrical Room in Old P/S 2. Manufacturer : BIECCO/SOUTH WALES 3. Quantity : 5 sets 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type Approx. W2685 x D1600 x H2465mm 5. Use : For Diverter of Power Receiving	1965			O	Protective Relay Damage Malfunction

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
E-1-22	Transformer *	1. Location : Electrical Room in Old P/S 2. Manufacturer : SOCIETA IMPIANTI 3. Quantity : 1 pc 4. Type, Dimension Capacity : Oil immersed Self-Cooled Type 3 phase, 750 KVA 11KV/435V 5. Use : For Power Source of Pump No.1, No.2 and No.4 in Old Intake P/S	1965	O			
E-1-23	DC Power Supply Device *	1. Location : Electrical Room in Old P/S 2. Manufacturer : YUASA ELECTRIC 3. Quantity : 60 cells 4. Type, Dimension : Lead Acid Storage Batter, DC 120V 5. Use : For Control of Circuit Breaker	1965			O	Not Working
E-1-24	Standby Generator Facility	1. Location : Dehiwala P/S 2. Manufacturer : Not Clear 3. Quantity : 1 lot 4. Type, Dimension Capacity : Diesel Engine 3 Phase, 11KV, 1500KVA 5. Use : Power Source for emergency	1966	O			

Notes :

1. E-1-20, 11KV High Tension Panel -1, E-1-21, 11KV High Tension Panel-2 and E-1-23 DC Power Supply Device will be replaced by NWSDB.

2. Capacity of E-1-18, Transformer Unit, E-1-22, Transformer will be change and replace by NWSDB.
3. E-1-19, Metering Booth will be removed by NWSDB.

No.	Equipment	Specification	Construction Year	Level A	Level B	Level C	Remarks
E-2	Low Tension Distribution Facilities						
E-2-1	Low Tension Panel for Dehiwala P/S	1. Location : Pumping Room in Dehiwala P/S 2. Manufacturer : J.G. STATTER 3. Quantity : 5 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standing Type Approx. W2920 x D1090 x H2000mm 5. Use : a. For Power Receiving (3 phase, 4 Wire, 415/240V) b. For Power Feeding of Pump No.1,2 and 3. c. For Main Feeder Line of Water Treatment Plant	1966			O	Protective Relay Damage and Malfunction
E-2-2	Low Tension Distribution Panel for Lighting and Auxiliary	1. Location : Pumping Room in Dehiwala P/S 2. Manufacturer : OTTERMILL SWITCHGEAR 3. Quantity : 3 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standing Type Approx. W1750 x D600 x H2100mm 5. Use : For Power Feeding of Water Treatment Plant	1965			O	
E-2-3	Low Tension Power Receiving Panel in Kolonnawa P/S	1. Location : Kolonnawa P/S 2. Manufacturer : ESWARAN & SONS 3. Quantity : 1 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standing Type : Approx. W540 x D840 x H1820mm 5. Use : For Power Receiving (3 phase, 4 wire, 415/250V)				O	Protective Relay Damage

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-2-4	Low Tension Tension Panel and Motor Starter Panel in Kolonnawa P/S	1. Location : Kolonnawa P/S 2. Manufacturer : STAR ENGINEERING 3. Quantity : 6 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standing Type 5. Use : a. (Ractor Starting) For Starter of Pump No.1,2 and 3. b. For Power Feeding of Other and lighting facilities	1987			O	Fuse Switch Damage. Replacement with change of pump/motor
E-2-5	Low Tension Panel	1. Location : Pumping Room in Old Intake P/S 2. Manufacturer : J.G. STATTER 3. Quantity : 4 sets 4. Type, Dimensions : Indoor Use, Metal Enclosed, Self-standing Type Approx. W2350 x D1080 x H1970mm 5. Use : For Power Feeding to Pump No.1 2 and 4 in Old Intake P/S	1965			O	Protective Relay Damage
E-2-6	Low Tention Oil immersed circuit breaker	1. Location : Old Intake P/S 2. Manufacturer : MEI 3. Quantity : 1 pc 4. Type, Dimensions : Floor Mounted Type, 3 Phase, 416V, 800A 5. Use : For Power Feeding to Pump No.3 in Old Intake P/S 6.Others : Metering Device	1965			O	Protective Relay Damage

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-2-7	Low Tension Panel and Motor Starter Panel New Intake Pump	1. Location : Pumping Room in New Intake P/S 2. Manufacturer : Not Clear 3. Quantity : 12 sets 4. Type, Dimensions Indoor Use, Metal Enclosed, Self-standing Type : Approx. W8380 x D1260 x H2300mm 5. Use : a. For Power Receiving, 3 Phase 4 wire, 415/240V b. For Power Supply of Pump and other c. For lighting and Single load.	1967	O			Protective Relay Damage and Malfunction
E-3	Operation and Control Facilities						
E-3-1	Motor Starter Panel for Main Pump No.1 in Old Intake P/S	1. Location : Near Site of Main Pump No.1 2. Manufacturer : NORTH WEST 3. Quantity : 1 lot 4. Construction : Metal Enclosed, Self-standing type, Air Breaking System Starter Panel and Metal Resistor 5. Starting Method : Secondary Resistor Starting by Manual Operation.	1965	O			
E-3-2	Motor Starter Panel for Main Pump No.2 in Old Intake P/S	1. Location : Near Site of Main Pump No. 2 2. Manufacturer : ELLISON 3. Quantity : 1 lot 4. Construction : Metal Enclosed, Self-Standing Type Panel with Oil Circuit Breaker and Oil immersed Metal Resistor 5. Starting Method : Secondary Resistor Starting by Manual Operation	1965		O		OCB for Starting Damage

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
E-3-3	Motor Starter Panel for Main Pump No. 3 in Old Intake P/S	1. Location 2. Manufacturer 3. Quantity 4. Type, Dimensions 5. Standing Method	: Near Site of Main Pump No. 3 : ALLENWEST : 1 lot : Metal Enclosed, Self-standing type, Air Breaking System Starter Panel/Oil immersed Metal Resistor : Secondary Resistor Starting by manual operation	1965		O		Magnetic Contracto for Starting Damag
E-3-4	Motor Starter Panel for Main Pump No.4 in Old Intake P/S	1. Location 2. Manufacturer 3. Quantity 4. Construction 5. Starting Method	: Near Site of Main Pump No.4 : METALIX : 1 lot : Metal Enclosed, Self-standing type, Air Breaking System Starter Panel/Metal Resistor : Secondary Resistor Starting by manual operation.	1988	O			
E-3-5	Motor Starter Panel for Main Pump No.1 in Dahiwala P/S	1. Location 2. Manufacturer 3. Quantity 4. Construction 5. Starting Method	: Near Site of Main Pump No. 1 : ELLISON : 1 lot : Metal Enclosed, Self-Standing Type Panel with Oil circuit Breaker and Oil immersed Metal Resistor : Secondary Resistor Starting by manual operation	1965	O			

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
E-3-6	Motor Starter Panel for Main Pump No. 2 in Dehiwala P/S	1. Location 2. Manufacturer 3. Quantity 4. Construction 5. Starting Method	: Near Site of Main Pump No. 2 : METALIX : 1 lot : Metal Enclosed, Self-standing Type Panel with Oil Circuit Breaker and Oil Immersed Metal Resistor. : Secondary Resistor Starting by manual operation	1988	O			
E-3-7	Motor Starter Panel for Main Pump No.3 in Dehiwala P/S	1. Location 2. Manufacturer 3. Quantity 4. Construction 5. Starting Method	: Near Site of Main Pump No. 3 : ELLISON : 1 lot : Metai Enclosed, Self-standing Type Panel with Oil Circuit Breaker and Oil immersed Metal Resistor. Secondary Resistor starting by manual operation	1965		O		OCB Damage
E-3-8	Distribution Panel in Chemical Building	1. Location 2. Manufacturer 3. Quantity 4. Type, Dimensions 5. Use	: Laboratory : METALIX ENGINEER : 1 sets : Indoor Use, Metal Enclosed, Self-standing Type : Approx. W870 x D600 x H1500mm : Power Supply to Control Panel for Chemical Facilities	1985	O			Replacement with change of Mechanical Device

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-3-9	Control Panel for Alum/Lime Dosing Pumps	1. Location : Laboratory 2. Manufacturer : Made of India 3. Quantity : 1 set 4. Construction : Indoor Use, Wall Mounted Type W800 x D150 x H500mm 5. Use : For Manual Operation of Dosing Pump (Alum 2 pcs., Lime 3 pcs)	1985	O			Replacement with change of Mechanical Device
E-3-10	Control Panel for Alum/Lime Mixer	1. Location : Laboratory 2. Manufacturer : Made of India 3. Quantity : 1 lot (Separately Installation of Three Panels) 4. Construction : Indoor Use, Wall Mounted Type W300 x D200 x H400/Panel 5. Use : Manual Operation of Mixer (Alum 1 pc. Lime 2 pcs.)	1985	O			Replacement with change of Mechanical Device
E-3-11	Control Panel for Pretreater	1. Location : Laboratory 2. Manufacturer : Made of India 3. Quantity : 1 lot (Grouped Installation with Six Panels 4. Type, Dimensions : Indoor Use, Wall Mounted Type : W1200 x D230 x H800 5. Use : For Manual Operation of following machine a. Sludge Collector 2 pcs. b. Sludge Withdrawal Valve 2 pcs. c. Sludge Recirculation Pump 2 pcs.	1985	O			Replacement with change of Mechanical Device

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-3-12	Power Supply Panel for Chlorine facilities	1. Location : Laboratory 2. Manufacturer : REDON-DALMON 3. Quantity : 1 set 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type W1600 x D1600 x H2200mm 5. Use : Power Supply to Control Panel	1979	○			Replacement with change of Mechanical Device
E-3-13	Chlorinator Panel	1. Location : Laboratory 2. Manufacturer : PANWALT WALIANCE & TIERNAN 3. Quantity : 2 sets 4. Type, Dimension : Indoor Use, Wall Mounted Type Approx. W500 x D300 x H600mm 5. Use : For Dosing of Pre and Post Chlorinator		○			Replacement with change of Mechanical Device
E-3-14	Evaporator Panel	1. Location : Laboratory 2. Manufacturer : PENWALT WALLIACE & TIERNAN 3. Quantity : 2 sets 4. Type, Dimension : Indoor Use, Wall Mounter Type W600 x D220 x H750 5. Use : Evaporator		○			Replacement with change of Mechanical Device

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-3-15	Chlorine Drum Line Panel	1. Location : Laboratory 2. Manufacturer : PENWALT WALLIACE & TIERNAN 3. Quantity : 1 set 4. Type, Dimension : Indoor Use, Wall Mounted Type 5. Use : For Changing Switch of Power Circuit		○			Replacement with change of Mechanical Device
E-3-16	Main Control Panel (SBI)	1. Location : Pumping Room in Dehiwala P/S 2. Manufacturer : REDON-DALMON 3. Quantity : 1 lot (Constructed by Three Panels) 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type W2600 x D600 x H2200mm 5. Use Power Supply of Following Facilities: a. Pulsator Panel b. Pressurised Water Panel c. Power Supply Panel for Chlorine Facilities d. Work Shop e. Filter Control Panel (No. 13-18) Manual Operation of Following Facilities: - Wash Water Lift Pump 2 pcs. - Chlorine Water Pump 2 pcs.	1980	○			
E-3-17	Low Tension Control Panel	1. Location : New Pumping Station 2. Manufacturer : FUJI ELECTRIC 3. Quantity : 1 set 4. Type, Dimension Indoor Use, Metal Enclosed, Self-standing Type Approx. W900 x D800 X h1900mm 5. Use : For Operation of Air Compressor of Three pcs.	1979	○			

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-3-18	Pressured Water Panel (SB4)	1. Location : New Pumping Station 2. Manufacturer : REDON-DALMON 3. Quantity : 1 set 4. Type, Dimension : Indoor Use, Metal Enclosed, Self-standing Type W900 x E400 x H2000mm 5. Use : Operation of Following Facilities: a. Pressured Water Pump 2 pcs. b. Air Compressor 2 pcs.	1980	O			
E-3-19	Pulsator Panel (SB5)	1. Location : Operation Room of Pulsator 2. Manufacturer : REDON-DALMON 3. Quantity : 1 set 4. Type, Dimension : Indoor Use, Wall Mounted Type W680 x D300 X H1000mm 5. Use : For Operation of Pulsator		O			
E-3-20	Power Supply Panel for Filter and Centrifloc.	1. Location : Filter Gallary 2. Manufacturer : Not Clear 3. Quantity : 1 set 4. Type, Dimension : Indoor use, Wall Mounted type 5. Use : For Power Supply to Following Facilities: a. Filter Control Panel 4 sets b. Centrifloc 2 sets	1966			O	Corrosion and Damage

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-3-21	Control Panel Filter From No. 1 to No. 12	1. Location : Filter Gallery 2. Manufacturer : DORR OLIVER 3. Quantity : 4 sets (1 set/3 filter) 4. Type, Dimension : Desk Type W2250 x D875 x H772mm 5. Use : For Operation of Filter No. 1 to No. 12 by Timer Control	1985			O	Not Working
E-3-22	Control Panel for Filter From No. 13 to No. 18	1. Location : Filter Gallery 2. Manufacturer : REDON 3. Quantity : 1 set per 6 basins 4. Type, Dimension : Desk Type W2550 x D700 x H800mm 5. Use : For Operation of Filter No. 3 to No. 18 by Timer Control	1980	O			Replacement with change of Mechanical Device
E-4	Instrumentation Facilities						
E-4-1	Raw Water Flow Meter for Pretreator *	1. Location : Raw Water Distribution Chamber 2. Type : Saddle (Sparling Meter) 3. Manufacturer : BURCE MILL Sx 4. Scale : 5. Indicator :	1985			O	Damage (Transmitter removed)

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-4-2	Total Raw Water Flow Meter *	1. Location : Raw Water Metering Flumes 2. Type : Parshall Flume 3. Manufacturer : Not Clear 4. Scale : 5. Indicator :	1966			O	Not Working
E-4-3	Raw Water Flow Meter for Centri-floc and Pulsator *	1. Location : Raw Water Metering Flumes 2. Type : Weir for Three Waterway 3. Manufacturer : Not Clear 4. Scale : 5. Indicator				O	Not Working
E-4-4	Clear Water Flow Meter for Filter No. 1 to No. 12	1. Location : Outlet of Filter 2. Type : Parshall Flume 3. Manufacturer : Not Clear 4. Scale : 0-10,700 cu.m/h 5. Indicator : Instrumentation Panel in Laboratory				O O	Not Working and Not Working

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-4-5	Clear Water Flow Meter for Filter No. 13 to No. 18	1. Location : Near Clear Water Reservoir-II 2. Type : Venturi Tube 3. Manufacturer : Not Clear 4. Scale : 0-9,600 cu.m/h 5. Indicator : Instrumentation Panel in Laboratory	1980			O O	Not Working Transmitter removed Not Working
E-4-6	Backwash Water Flow Meter For Filter No. 1 to No. (Note)	1. Location : Filter Gallery 2. Type : Orifice Plate 3. Manufacturer : Not Clear 4. Scale : 0-10,000g/h 5. Indicator : Instrumentation Panel in Dehiwara P/S	1966			O O	Not Working Transmitter Damage Not Working
E-4-7	Backwash Water Flow Meter for No. 13 to No. 18 (Note)	1. Location : Filter Gallery 2. Type : Orifice Plate 3. Manufacturer : Not Clear 4. Scale : 5. Indicator : Instrumentation Panel in Laboratory	1980			O O	Not Working and Transmitter Damage Not Working

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
E-4-8	Filter Flow Rate Meter *	1. Location 2. Type 3. Manufacturer 4. Scale 5. Indicator	: Filter Gallery : Venturi Tube : Not Clear : : Filter Control Panel	1985			O O	Not Working for all (Transmitter Damage) Not Working
E-4-9	Filter Level Switches	1. Location 2. Type 3. Control Device	: Each Filter : Electro rod : On the Wall of Filter Gallery	1985			O O	All Electro-rod Damage Not Working
E-4-10	Filter Wash Air Flow Meter *	1. Location 2. Type 3. Manufacturer 4. Scale 5. Indicator	: Not Clear : : : 0-100 cu.ft/mm :	1966			O O	Orifice Plate, Transmitter Removed Not Working

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
E-4-11	Filter Head Loss Meter for Filter No. 1 to No. 12 *	1. Location	: Each Filter	1966				
		2. Type	: Pneumatic Differential Pressure Type				O	Not Working
		3. Manufacturer	:					
		4. Scale	: 0–2.5m					
		5. Indicator	: Filter Control Panel				O	Not Working
E-4-12	Filter Head Loss Meter for Filter No. 13 to No. 18 *	1. Location	: Each Filter	1980				
		2. Type	: Differential Pressure Type				O	Not Working
		3. Manufacturer	:					
		4. Scale	: 0–15PSI					
		5. Indicator	: Filter Control Panel				O	Not Working
E-4-13	Clear Water Tank Level Meter	1. Location	: Clear Water Tank in Dehiwala P/S	1966				
		2. Type	: Pneumatic Type				O	Not Working, Transmitter Removed
		3. Manufacturer	:					
		4. Scale	:					
		5. Indicator	: Instrument Panel in Dehiwala P/S				O	Not Working

No.	Equipment	Specification		Construction Year	Level			Remarks
					A	B	C	
E-4-14	Washwater Tank Level Meter *	1. Location	: Washwater Tank	1966				
		2. Type	: Pneumatic Type		O			Working
		3. Manufacturer	: KENT					
		4. Scale	: 0-12ft					
		5. Indicator	: Instrument Panel in Dehiwala P/S				O	Alarm Meter Damage
E-4-15	Clear Water Flow Meter for Dehiwal P/S *	1. Location	: Near P/S	1966				
		2. Type	: Venturi				O	Not Working, Transmitter Removed.
		3. Manufacturer	:					
		4. Scale	:					
		5. Indicator	:				O	Not Working
E-4-16	Clear Water Flow Meter for Elie House P/S *	1. Location	: Near Entrance of W.T.P	1979				
		2. Type	: Venturi				O	Not Working, Transmitter Damage
		3. Manufacturer	: FUJI ELCTRIC					
		4. Scale	: 0-35 X 100 cu.m/h					
		5. Indicator	: Instrument Panel in New P/S				O	Not Working

No.	Equipment	Specification		Construction Year	Level A	Level B	Level C	Remarks
E-4-17	Clear Water Flow Meter for Maligakanda P/S *	1. Location	: Near 11KV Switching Yard	1979				
		2. Type	: Venturi				O	Not Working, Transmitter Damage
		3. Manufacturer	: FUJI ELECTRIC					
		4. Scale	: 0-5 X 1000 cu.m/h					
		5. Indicator	: Instrument Panel in New P/S				O	Not Working
E-4-18	Clear Water Flow Meter for Church Hill P/S *	1. Location	: Near 11KV Switching Yard	1979				
		2. Type	: Venturi				O	Not Working, Transmitter Damage
		3. Manufacturer	: FUJI ELECTRIC					
		4. Scale	: 0-35 x 100 cu.m/h					
		5. Indicator	: Instrument Panel in New P/S				O	Not Working
E-4-19	Clear Water Flow Meter for Kolonnawa P/S *	1. Location	: Near Clear Water Reservoir					
		2. Type	: Venturi				O	Not Working, Transmitter Removed
		3. Manufacturer	:					
		4. Scale	:					
		5. Indicator	: Kolonnawa P/S				O	Not Working

No.	Equipment	Specification	Construction Year	Level			Remarks
				A	B	C	
E-5	Wiring						
E-5-1	11KV Cable	1. Location : PTA Cable	1965			○	Deterioration by Aging
E-5-2	3KV Cable	1. Location : CV Cable	1980	○			Deterioration Aging
E-5-3	Low Voltage Cable	1. Location : PTA Cable CV Cable	1965 1980	 ○		○	Deterioration
E-6	Lighting Facilities	1. Location :	1965	○			
E-6-1	Lighting Fixture Wiring	1. Location : Flourescent Lamp : Mercury Vapour Lamp	1965		○		Insufficiency of Telephone Sets and Capacity
E-7	Communication Facilities						
E-7-1	Telephone sets Exchanger and Wiring	1. Location : :	1965		○		Insufficiency of Telephone Sets and Capacity
E-8	Lightning Devices	:					
E-8-1	Lightning Arrester, Lightning Rod		1965		○		Insufficiency of Lightning Devices against thunderstorm

Note:

1. Raw Water Flow Meter of E-4-1, E-4-2 and E-4-3 will change the measuring method to Weir System.
2. Bank Wash Flow Meter for Filter No.1 - No. 12 (E-4-6) and No. 13 - No. 18 (E-4-7) will change the type to direct reading system.
3. Filter Flow Rate Meter (No. 1 - No. 12) of E-4-8 wil be changed the design by Mechanical side.
4. Filter Wash Air Flow Meter of E-4-10 will be needless.
5. Filter Head Loss Meter of E-4-11 and E - 4 12 will change the type to direct reading system.
6. Wash Water Tank Level Meter will change the type to Float System (only site measuring).
7. Clear Water Flow Meter for Dehiwala, Elie House, Maligakanda, Church Hill and Kolonnawa P/S Showing E-4-15, E-4-16, E-4-17, E-4-18 and E-4-19 will be planned by NWSDB as to repair or replacement.

Appendix - 6 Rehabilitation Plan

Rehabilitation Plan

Item No.	Facilities/Equipment	Quantity	Specification
1.	Old Intake Facilities (Mechanical Portion)		
a.	Suction Valve	2	Size : 700 mm Type : manually opeated gate valve
b.	Main Pump	2	Size : 700 mm x 600 mm Type : vertical shaft double suction centrifugal pump
c.	Motor	2	Type : Open type dripproof motor, 340 kw
d.	Check Valve	2	Size : 700 mm Type : swing type
e.	Delivery Valve	2	Size : 700 mm Type : manually opeated butterfly valve
f.	Drain Pump	1	Size : 50 mm Type : submersible
2.	New Intake Facilities (Mechanical Portion)		
a.	Suction Valve	1 3	Size : 500 mm Size : 800 mm Type : manually operated gate valve
b.	Check Valve	4	Size : 600 mm Type : swing type
c.	Delivery Valve	4	Size : 600 mm Type : manually operated butterfly valve
d.	Drain Pump	1	Size : 50 mm Type : submersible
3.	Distribution chamber		
a.	Distribution Chamber	1	Dim. : 10.8 m x 13.7 m x 11.8 m depth
b.	Outlet Penstock	5	Size : 1,000 mm x 1,000 mm Type : manually operated out screw type weir gate
c.	Inlet Valve	2	Size : 1,000 mm Type : manually operated butterfly valve

Rehabilitation Plan

Item No.	Facilities/Equipment	Quantity	Specification
4.	Sedimentation Facilities		
1)	Centrifloc		
a.	Sludge Scraper	2	Type : circular type
b.	Sludge Wihdrawal Valve	2	Type : motor operated eccentric valve
c.	Sludge Recirculation Pump	2	Type : horizontal sludge pump
d.	Drain Pump	2	Type : submersible sludge type
2)	Pretreater		
a.	Sludge Recirculation Pump	2	Type : horizontal sludge pump
b.	Sludge Withdrawal Valve	2	Type : motor operated eccentric valve
c.	Drain Pump	2	Type : submersible
5.	Filtration Facilities		
1)	Filter No. 1 – No. 12		
a.	Inflow Weir	12	Length : 3.6 m
b.	Wash-Water Through	96	Dim. : 500 mm x 400 mm
c.	Nozzle	1,400	Matrls : ABS resin
d.	Filter Media	1,000 cu.m	Effective Size: 0.9 mm Uniformity coefficient: 1.5> Depth : 900 mm
e.	Valve(Actuator only)		Type : air operated butterfly valve
	Inflow	12	Size : 800 mm
	Wash-water discharge	12	Size : 800 mm
	Wash-water inflow	12	Size : 600 mm
	air Score	12	Size : 300 mm
	Effluent	12	Size : 450 mm
	Effluent Controller	12	Size : 450 mm (butterfly float)
f.	Backwash Flow Meter	1	Size : 600 mm Type : orifice
g.	Back-wash Flowrate Control Valve	1	Size : 600 mm Type : manually operated butterfly valve
h.	Ventilation Fan	2	Size : 400 mm Type : in-line fan

Rehabilitation Plan

Item No.	Facilities/Equipment	Quantity	Specification		
2)	Filter No. 13 – No. 18				
a.	Level controller	6	Type	:	float type
b.	Valve		Type	:	air operated butterfly valve
	Inflow	6	Size	:	450 mm
	air Score	6	Size	:	250 mm
	Wash–water Discharge	6	Size	:	400 mm
	Back–wash	6	Size	:	400 mm
c.	Air Compressor	2	Size	:	pressure switch type
d.	Air Dryer	2	Size	:	air cooled dehumidifier
e.	Back–Wash Flow Meter	1	Size	:	orifice type
f.	Level Meter for Back–Wash Tank	2	Size	:	float type
6.	Chemical Feeding Facilities				
1)	Alum				
a.	Mixer	4	Type	:	vertical mixer
b.	Solution Tank	4			Anti–acid painting
c.	Feed Pump	2	Type	:	horizontal centfugal pump
d.	Head Tank	2	Size	:	1.5 m x 1.5 m x 1.5 m depth
e.	Constant Level Tank	2	Size	:	0.6 m x 0.9 m x 1.6 m depth
f.	Distribution Tank	2	Size	:	0.6 m x 0.9 m x 1.6 m depth
g.	Hoist	1	Type	:	electrical operated mono rail type
2)	Lime				
a.	Mixer	8	Type	:	vertical mixer
b.	Feed Pump	4	Type	:	horizontal centrifugal pump
c.	Feeder	3	Type	:	mechanical agitation type
d.	Dust Washing Equipment	1	washing tank, dust collecting duct, solution tank cover		
7.	Chlorination Facilities				
a.	Chlorinator	4	Type	:	self–standing cabinet type
			Cap	:	75 kg/hr, 20 kg/hr
b.	Pressured Water Pump	2	Type	:	horizontal centrifugal pump
c.	Chlorine Cylinder Scale	1	Type	:	load cell, 0 – 1 ton
d.	Crane	1	Type	:	motor operated type, 2 ton
e.	Hoist	1	Type	:	motor operated type, 2 ton

Rehabilitation Plan

Item No.	Facilities/Equipment	Quantity	Specification		
8.	Transmission Facilities				
1)	Kolonnawa				
a.	Main Pump		Type	:	vertical double suction centrifugal pump
		2	Size	:	300 mm x 200 mm
			Cap.	:	640 cu.m/hr x 45 m
		1	Size	:	350 mm x 250 mm
			Cap.	:	1,280 cu.m/hr x 45 m
b.	Motor		Type	:	squirrel cage induction motor
		2	Cap.	:	110 kw x 4 p x 400 v
		1	Cap.	:	220 kw x 4 p x 400 v
c.	Check Valve	1	Size	:	400 mm
			Type	:	swing
d.	Delivery Valve		Type	:	manual operated butterfly valve
		2	Size	:	250 mm
		1	Size	:	400 mm
e.	Drain Pump	2	Type	:	submerged pump
2)	Dehiwala				
a.	Main Pump	1	Type	:	horizontal double suction centrifugal pump
			Cap.	:	2,988 cu.m/hr x 42.67 m
b.	Motor	1	Type	:	squirrel cage induction motor
			Cap.	:	440 kw
c.	Check Valve	1	Size	:	600 mm
			Type	:	swing type
d.	Delivery Valve	1	Size	:	600 mm
			Type	:	manual operated gate valve
9.	Electrical Facilities				
1)	Old Intake (Electrical Portion)				
a.	Low Tension Panel	4	Type	:	indoor use metal enclosed self-standing type
b.	Motor Starter Panel No.2	1	Type	:	indoor use metal enclosed

Rehabilitation Plan

Item No.	Facilities/Equipment	Quantity	Specification
			self-standing type
c.	Motor Starter Panel No.1	1	Type : indoor use metal enclosed self-standing type
2)	Treatment Facilities		
a.	Centrifloc panel	1	Type : indoor use metal enclosed self-standing type
b.	Centrifloc Local Panel	1	Type : standing type for outdoor use
c.	Pretreater Panel	1	Type : indoor use metal enclosed self-standing type
d.	Pretreater Local Panel	1	Type : standing type for outdoor use
e.	Filter No.1 – No. 12 Panel	4	Type : indoor use desk type
f.	Filter No.1 – No. 12 Magnetic Box	4	Type : standing type for indoor use
g.	Filter No. 13 – No. 18 Panel	2	Type : indoor use desk type
h.	Filter No. 13 – No. 18 Magnetic Box	2	Type : standing type for indoor use
i.	Distribution Panel	1	Type : standing type for indoor use
3)	Chemical Facilities		
a.	Chemical Building Distribution Panel	2	Type : indoor use metal enclosed self-standing type
b.	Alum Panel	1	Type : indoor use metal enclosed self-standing type
c.	Lime Panel	1	Type : indoor use metal enclosed self-standing type
d.	Chlorintor Panel	1	Type : indoor use metal enclosed self-standing type
e.	Lime Local Panel	1	Type : indoor use metal enclosed self-standing type
f.	Push Button Switch for Chemical Equipment	6	Type : indoor use metal enclosed self-standing type
4)	Dehiwala		
a.	High Tension Panel	4	Type : indoor use metal enclosed self-standing type
b.	High Tension Receiving Panel	1	Type : indoor use metal enclosed self-standing type
c.	DC Power Panel	1	Type : indoor use metal enclosed self-standing type
d.	Low Tension Panel	6	Type : indoor use metal enclosed self-standing type

Rehabilitation Plan

Item No.	Facilities/Equipment	Quantity	Specification
e.	Dehiwala No. 3 Starter Panel	1	Type : indoor use metal enclosed self-standing type
f.	Dehiwala No. 4 Starter Panel	1	Type : indoor use metal enclosed self-standing type
g.	Vacuum Pump Panel	1	Type : standing type for indoor use
5)	Kolonnawa		
a.	Low Tension Panel	5	Type : indoor use metal enclosed self-standing type
6)	Instrumentation		
	Level Meter	L.S.	
7)	Lighting Facilities		
a.	Indoor Lighting	L.S.	Type : fluorescent light, mercury light
b.	Outdoor Lighting	L.S.	Type : mercury light
c.	Distribution Panel	4	Type : wall mounting type indoor use
8)	Lightning Ffacilities		
a.	Lightning Rod	L.S.	
b.	Overhead Grounding Line	L.S.	
9)	Others		
a.	Treatment Lab. Equipment	L.S.	Jar tester, pH meter
b.	Central Lab. Equipment	L.S.	miscellaneous
c.	Maintenance Tool	L.S.	
d.	Truck with Crane	L.S.	Type : 4 ton
e.	Spare Parts for Kalatuwawa/Labugama	L.S.	
f.	Communication Facilities	L.S.