

THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA  
MINISTRY OF IRRIGATION, POWER AND ENERGY  
CEYLON ELECTRICITY BOARD

**SAMANALAWEWA HYDROELECTRIC  
PROJECT  
RESERVOIR REMEDIAL WORKS  
- WET BLANKETING -**

***PROPOSED MONITORING PROGRAMME  
FOR SAMANALAWEWA DAM AND  
RIGHT BANK DURING  
IMPOUNDING***



*November 1996*

Nippon Koei Co., Ltd.  
Consulting Engineers, Tokyo

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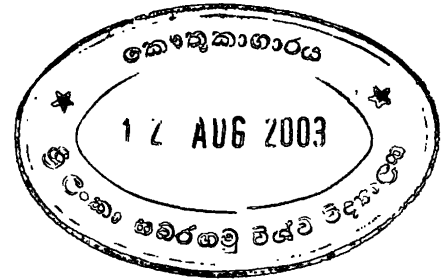
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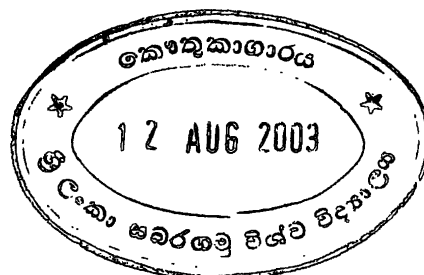
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## **Proposed Monitoring Programme for Samanalawewa Dam and Right Bank during Impounding**

### **1. General**

In accordance with the Cabinet approval to remove the present limitation of the maximum reservoir operating level of 430 M EL to obtain maximum benefits from the project, on 01.10.1996 the impounding of the Samanalawewa reservoir above 430 M EL has commenced.

The reservoir water level was at 431.15 M EL on 30.09.96 and during past one month it has risen upto 437.23 M EL and stored 27.16 M CM of water while the ground water pressure level was changed from 418.16 M EL to 424.63 M EL and the leakage amount was changed from 2.12 cms to 2.36 cms.

After reaching 437 M EL which was recorded in April 1995, the monitoring frequencies have been changed from the schedule which was agreed at the Joint Meeting with CEB, Gibb and NK in January 1996 to the original schedule which was prepared by Gibb in March 1992, in accordance with the first filling rules.

On the other hand, in the Consensus Report after the 2nd International Panel Meeting held on 25-27 September 1996 the Panel strongly recommended to the Ceylon Electricity Board for its consideration to station at site a Dam Engineer having appropriate experience and knowledge on Dam Safety and Operation of reservoirs even it is stated in the Panel Report that the dam, its foundations and the right bank are safe for filling upto full reservoir level.

Gibb has recommended the monitoring plan for the areas of potential land instability including the saddles, Kalunaide Ara and Killekandura Ara through the letter No. POS/A110/J96005/1C/139 dated 09.10.96.

Therefore, the monitoring programme proposed herein for the Dam and Right Bank during impounding should be agreed and confirmed by the concerned parties viz. CEB, the Panel of Experts, ODA UK, OECF, Independent Dam Engineer, Gibb and Nippon Koei including CECB monitoring team.

We trust that you will find this report to be useful in understanding the Monitoring Activity and if you have any queries, or require further information please do not hesitate to contact us.

### **2. Terms of Reference and Organisation for Monitoring Works**

#### **2.1 Status of Monitoring Works**

The dam reservoir monitoring for the Samanalawewa Hydroelectric Project has been carried out by Central Engineering Consultancy Bureau (CECB) since the 1st trial impounding of the reservoir in March 1992. Since the commencement of

Consultancy -Services for the Wet Blanketing, the CECB monitoring team is continuing to carry out the monitoring work under the supervision of Nippon Koei Co., Ltd. (NK ).

The correspondences among CEB, NK and CECB regarding the position of CECB monitoring team are attached in Appendix -A.

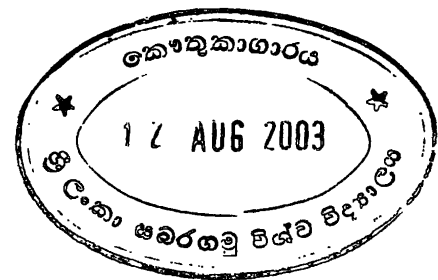
## 2.2 Organisation for Monitoring Works

### Organisation for Monitoring Works

The organisation for the monitoring works is as shown in Figure 2. The CECB monitoring team which headed by Mr. G.H.U.A. Wanigadewa, Chief of CECB monitoring team consists of 21 members, i.e., one (1) Technical Assistant, seven (7) Work Supervisors, one (1) Draughtman, one (1) Laboratory Technician, eight (8) Helpers and two (2) Clerks.

The Work Section is divided into seven (7) groups as shown in Figure 2.

- Dam Monitoring
- GWL Monitoring
- Leakage Monitoring
- Water Sampling and Chemical Analysis
- Slope Stability Monitoring
- Data Processing
- Drawing



### Data Processing

All the data monitored and recorded are input to the data base maintained in the computers provided at the dam site office.

Computer System provided at dam site office consists of following units.

1. 01 No. Pentium Computer 90 Mhz, 16 Mb RAM, 1GB SCSI Hard Disk
2. 01 No. 486 Computer 100 Mhz, 8 Mb RAM, 630 MB Hard Disk
3. 01 No. 486 Computer 4Mb RAM, 200 Mb Hard Disk
4. Laser Printer HP LASERJET 4MPLUS
5. Dot Metrix Printer, STAR XB2425

All these units are net worked under Windows Work Groups.

### Log Book

According to the suggestions of Mr. S. Ganesharajah, three (3) Log-Books have been provided, one at the conference room at the dam site office, one at CEB Dam Control Room/Guard House, and one at SD&CC contractor's site office/Laboratory building so as to maintain the necessary records in the form of Log Book entries.

The intention is to communicate the observations made by the officers already working in the dam area to the parties concerned to take necessary actions if required. Observation on any new leakage points, new crack development, any changes in existing locations blocking of drain ditch along the right bank access road or any other relevant matters regarding the safety of the dam could be reported in the log book.

### 3. Scope of Works for Monitoring

#### 3.1 Scope of Works

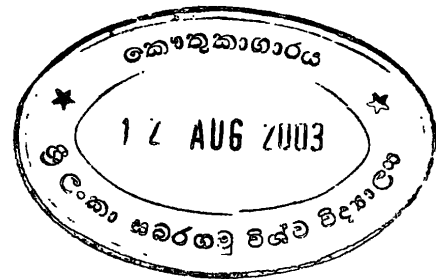
The Scope of Works are broadly divided into the following three (3) categories as shown in Figure 3.

- i) Monitoring and surveillance of dam and appurtenant structures
- ii) Monitoring of right bank and saddles for the reservoir water tightness
- iii) Monitoring of reservoir and downstream water quality for environmental assessment

#### 3.2 Principal Features for Monitoring Items

The monitoring items are mainly divided into six (6) categories as detailed below.

- i) Leakage monitoring
- ii) GWL monitoring
- iii) Dam monitoring
- iv) Water quality monitoring
- v) Slope stability monitoring
- vi) Chemical analysis



#### Leakage monitoring

The leakage measurements except the seepage measuring chamber provided at the toe of the dam are summarised below and shown in Figures 1 and 4 to 7.

No.	Measurement method	Nos. (location)	Purpose
i)	V-notch weir	10	Seepage water through the reservoir
ii)	Drain holes	33 in adit Da	Seepage water in downstream of dam at R/B
		125 at outlet of main leak	Seepage water from the slope behind outlet of main leak
iii)	Embedded pipes	7 in NS series at R/B	Spring at left and right banks of Walawe downstream of dam
		18 in OP series at R/B	
		10 in OP series at L/B	
iv)	Water level gauges	2 at Kalunaide and Kaltota	River flow in dry season

The detailed-features in each monitoring item are described in Table 01, (1/12) to (3/12).

Out of ten weirs, KNS 1 was newly constructed at the left bank of Kalunaide Ara, toe of the spoil bank on 23 October 1996.

Two water level gauging stations have been re established which have been used during Dam construction stage to check the total leakage amounts from both left and right banks through the Samanalawewa reservoir during dry season or non rainy period.

The Kalunaide water level gauging station is located just downstream of confluence point with main Walawe ganga and Kalunaide Ara.

The Kaltota water level gauging station is located 11 km downstream of dam and 7 km downstream of confluence point with main Walawe ganga and Killekandra Ara. However, Kaltota gauging station has been vandalised due to illicit gemming since December 1995. The discharge capacity curves for both gauging stations are shown in Figure 8 and 9. Therefore, this matter was notified to CEB in March 1996 also recommend that the Kaltota gauging station should be urgently repaired.

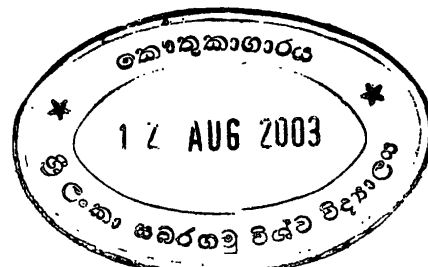
#### GWL monitoring

The monitoring of the ground water pressure at both left and right banks for the dam including the right bank adits are summarised below and shown in Figure 4.

<u>No.</u>	<u>Name of groups</u>	<u>Nos.</u>	<u>Purpose</u>	<u>Remarks</u>
i)	GW	21	measure GWL at left and right bank	GW 01, 10, 13 & 14 are blocked
ii)	MS	4	measure GWL at D/S right bank of dam	
iii)	Y	4	measure GWL at U/S of right bank adit	Y 01 is blocked and Y 02 & 03 were submerged due to impounding
iv)	Z	4	measure GWL near portal of main leak	
v)	LM	2	measure GWL near spillway	
vi)	RI	9	measure GWL near main leak	RI 04,05,06,07,08 & 09 were blocked due to water burst in 92.
vii)	B	7	measure GWL around adit Da	
viii)	RBS	31	measure GWL in adits I, H, F & E	
ix)	Rajawaka bore hole	1	measure GWL along power waterway	

The detailed features for each item are described in Table 01, (4/12) and (5/12).

#### Dam monitoring





The dam instrumentations are summarised below and shown in Figures 10 to 14.

<u>No.</u>	<u>Instrumentation</u>	<u>Name of groups</u>	<u>Nos.</u>	<u>Purpose</u>
i)	Pneumatic piezometer	PP	15	measure pressure in dam foundation at 3 sections
ii)	Standpipe piezometer	SP	28	measure pressure across the grout curtain in dam foundation along dam axis
iii)	Standpipe piezometer	SP	41	measure pressure in the foundation along adits, C,B,A,Ab,D,Db & Da
iv)	Leakage measurement	LAD /RAD	2	measure seepage flow in both left and right grouting galleries
v)	Seepage measuring chamber	SMC	1	measure seepage through dam foundation
vi)	Earth pressure cell	PC	15	measure earth pressure in core zone at 3 sections
vii)	Hydraulic piezometer	HP	33	measure pore pressure in core zone at 3 sections
viii)	Hydraulic settlement cell	HSC	1	measure settlement in core zone at 5 sections
ix)	Double fluid settlement gauge	DFSG	1	measure differential settlement in midheight of core zone
x)	Survey monument	SM	36	measure settlement/movement on dam crest, U/S and D/S surface slopes

The detailed features for each item are described in Table 01, (6/12), (7/12) and (8/12).

### Water quality monitoring

The details of water quality monitoring is summarised below and shown in Figure 15.

<u>No.</u>	<u>Item</u>	<u>Nos. of sampling locations</u>	<u>Purpose</u>
i)	Water quality monitoring	10	assess water quality of U/S and D/S of the reservoir <ul style="list-style-type: none"> <li>• Temperature</li> <li>• Colour of Water</li> <li>• Visibility</li> <li>• PH</li> <li>• DO</li> <li>• COD</li> <li>• BOD</li> <li>• Turbidity etc.</li> </ul>

The detailed features for each location described in Table 01, (9/12) and (10/12).

### Slope stability monitoring

The slope stability monitoring is summarised below.



<u>No.</u>	<u>Item</u>	<u>Nos. of survey locations</u>	<u>Purpose</u>
i)	Slope stability monitoring	4 at right bank access road, saddle -3, L/B at mid Kalunaide and Killekandura	monitor the movement of slope /pavement crack width

The detailed features for each item are described in Table 01, (11/12).

As shown in Figure 16, survey points for slope instability monitoring at the existing slip in area of saddle 3 have been installed at 5m intervals, which were driven 1.3 m into the ground, along the monitoring lines.

Two pillars BLP1 and BLP2 have been constructed on the adjacent hillocks as the base line for measurements and the third pillar, BLP3 was provided close to spoil bank area considering the easy access for routine monitoring, as shown in Figure 5.

Survey points on monitoring lines will be observed by using Wild T2 Theodolite and Wild D1 5S distomat.

#### Water chemical analysis

The water chemical analysis is summarised below.

<u>No.</u>	<u>Item</u>	<u>Nos. of water samples</u>	<u>Purpose</u>
i)	Water chemical analysis	18 at reservoir, main leak, 14 holes in RBS ,Kalunaide and Killekandura	trace leakage path and ingress area at right bank by chemical analysis <ul style="list-style-type: none"> <li>• pH</li> <li>• Elec. conductivity</li> <li>• Hardness</li> <li>• Sodium</li> <li>• Potassium</li> <li>• Alkalinity</li> <li>• Chloroide</li> <li>• Sulphate</li> <li>• Silica</li> </ul>

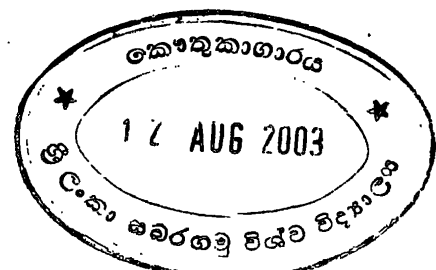
The detailed features for each item are described in Table 01, (12/12).

#### **4. Formating of Monitoring Reports to be sent by FAX**

##### **4.1 Weekly Monitoring Report to be sent by FAX**

Weekly Monitoring Report will be sent from Nippon Koei site office to the concerned parties as in the format attached in Appendix-B, which was agreed between Gibb and NK in the Joint Meeting in January 1996.

##### **4.2 Monthly Monitoring Report to be sent by FAX**



In order for better communication with the concerned parties regarding the hydro-structural behavior of Samanalawewa dam and right bank during each month, we would like to recommend that the monthly monitoring data should be summarised and forwarded to the concerned parties at the beginning of next month.

The proposed monthly monitoring report for October 1996 is as attached in APPENDIX-C.

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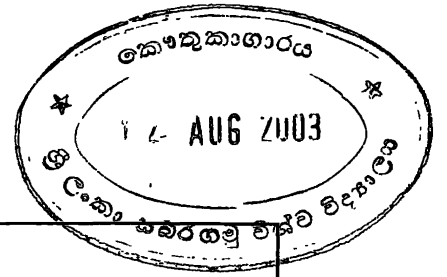


# *TABLES*

**Table 1 Principal Features for Monitoring Items**

(1/12)

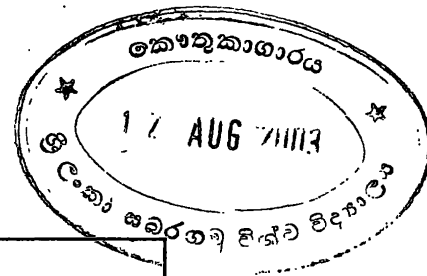
Item No.	Name	Purpose	Frequency of measurement	Location
1	Leakage Monitoring			
/001	Main Leakage Measuring Weir (M3')	To observe the behaviour of the Main Leakage flow with the RWL fluctuations.	Daily	R/B of Walawe about 350 m d/s of the toe of the Dam.
/002	Drain Holes provided at the crown of the Adit D (a) (DR 1 to 31)	Holes were provided to prevent the water migrating from Area B to Area A. Measurements are taken to make a separate assessment of the flow variations of those holes with the RWL fluctuations.	Weekly/Every 1 m increase of RWL	R/B access adit D(a) from Ch.71 ~ 224m.
/003	Drainage Holes provided at the portal of the Main Leakage	Holes were provided to reduce the pressure developing at the portal by draining water. Measurements are taken to make a separate assessment of the flow variations of those holes with the RWL fluctuations.	Weekly/Every 1 m increase of RWL	R/B slope at the portal of the Main Leakage
/004	Weir DW2	To observe the behaviour of the flow collected through cut off adits (Adit D(a), D end, D(b), I, F, H, E) with the RWL fluctuations.	Daily	Adit D(a) portal close to the Toe (R/B) of the Dam.
/005	Weir M1	To observe the fluctuations of the flow collected through drain pipes provided close to the bore hole MS 1 and other minor seepages.	Daily	R/B of Walawe about 100 m d/s of the toe of the Dam.
/006	Weir M4	To observe the seepage flow fluctuations of the flow collected at R/B of Walawe just downstream Main Leakage measuring weir.	Daily	R/B of Walawe about 400 m d/s of the toe of the Dam.



**Table 1 Principal Features for Monitoring Items**

(2/12)

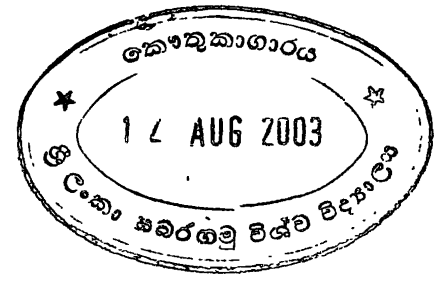
Item No.	Name	Purpose	Frequency of measurement	Location
/007	NS Series (07 Nos)	To observe the variations of seepage flow collected at R/B of Walawe between toe of the dam and d/s causeway. (Identified after the 01 <sup>st</sup> trial impounding in 1991).	Daily	R/B of Walawe from 100 to 400 m d/s of the toe of the Dam.
/008	OP Series (OP 01~OP18) 18 Nos.	To observe the variations of seepage flow collected at R/B of Walawe between toe of the dam and the confluence of Walawe with Kalunaide Ara.	Weekly/Every 1 m increase of RWL	R/B of Walawe from 100 to 950 m d/s of the toe of the Dam.
/009	OP Series (OP 19~OP28) 10 Nos.	To observe the variations of seepage flow collected at L/B of Kalunaide between confluence of Walawe with Kalunaide Ara and the spoil bank.	Weekly/Every 1 m increase of RWL	L/B of Kalunaide Ara from 100 to 300 m from confluence to u/s of Kalunaide Ara.
/010	Weir KNS 1	To observe the variations of flow collected through one of the weak zones, with the RWL fluctuations	Daily	L/B of Kalunaide Ara at the toe of the spoil bank.
/011	Weir S1	To observe the variations of flow collected through R/B saddles 1,2,3 and 4. with the RWL fluctuations.	Daily	Across Kalunaide Ara about 300m u/s of the confluence with Walawe.
/012	Weir S2	To observe the variations of flow collected through R/B saddles 1,2,3 and 4. with the RWL fluctuations.	Daily	Across branch of Kalunaide Ara about 1100 m u/s of the confluence with Walawe.
/013	Weir S3	To observe the variations of flow collected through R/B saddles 1,2,3 and 4. with the RWL fluctuations.	Daily	Across Kalunaide Ara about 1200 m u/s of the confluence with Walawe.



**Table 1 Principal Features for Monitoring Items**

(3/12)

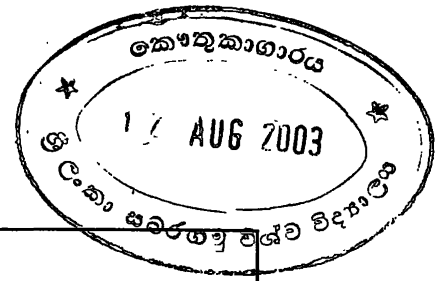
Item No.	Name	Purpose	Frequency of measurement	Location
/014	Weir S4	To observe the variations of flow collected through R/B saddles 1,2,3 and 4. with the RWL fluctuations.	Daily	Across Kalunaide Ara about about 100 m u/s of the confluence with Walawe.
/015	Seepage flow at L/B of Kalunaide Ara.	To make separate assessment of the flow variations from those seepage paths with RWL fluctuations.*	Weekly/Every 1 m increase of RWL	L/B of Kalunaide Ara from 900 to 1100 m u/s from the confluence with Walawe.
/016	Weir KKA	To observe the variations of flow pattern of the springs at L/B with RWL variations.	Weekly/Every 1 m increase of RWL	Weir is located across the stream called Killekandura Ara about 3 Km away from the Dam.
/017	Kalunaide gauging station	To check inflow discharge at Kalunaide gauging station	Once a week during dry season and none during rainy season	About 1.5 km d/s of the Dam
/018	Kaltota gauging station	To check inflow discharge at Kaltota gauging station (Since the station was vandalised, flow measurements are not possible)	Once a week during dry season and none during rainy season	About 11 km d/s of the Dam



**Table 1 Principal Features for Monitoring Items**

(4/12)

Item No.	Name	Purpose	Frequency of measurement	Location
2	<b>GWL Monitoring</b>			
/001	GW Series (GW 1 to GW 19) 21 Nos (GW 01, 10, 13 & 14 are blocked).	GW 01 to GW 18 were installed to assess the ground water level conditions in the R/B while GW 19 was installed at the left bank. (Deep investigation bore holes)	Daily	As shown in the drawing
/002	MS Series (MS 01 to MS 04) 04 Nos (No water in Ms 04)	To assess the ground water level conditions in the d/s of the dam at Right abutment.	Daily	As shown in the drawing
/003	Y Series (Y 01 to Y 04) 04 Nos Y 01 is blocked. Y 02 is covered by slip as well as reservoir water. Y 03 is covered with reservoir water.	To assess the ground water level conditions in the u/s of cut off adits close to the ingress area.	Daily	As shown in the drawing
/004	Z Series (Z 03, 05, 06 and 10) 04 Nos	To assess the ground water level condition around the Main Leakage portal.	Daily	As shown in the drawing
/005	LM Series (LM 01, LM 02) 02 Nos	To assess the ground water level at the L/B close to the spillway.	Weekly	As shown in the drawing

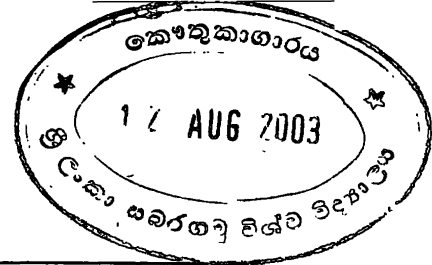




**Table 1 Principal Features for Monitoring Items**

(5/12)

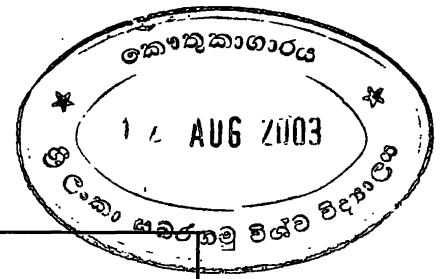
Item No.	Name	Purpose	Frequency of measurement	Location
/006	RI Series (RI 01,02.....09) No access to RI 02. RI 04, 05, 06, 07, 08, 09 was caught by the burst.	To assess the ground water level condition around leakage point.	Daily	As shown in the drawing
/007	B Series (B 01, 02.....07) No water in B 04. Water in B 06,07 are diverted to adit D(a).	To assess the ground water level condition around adit D(a).	Daily	As shown in the drawing
/008	RBS Series (RBS 01) (01 No)	To assess the ground water level condition at d/s of cut off adit I.	Daily	Adit I Ch.1110 m
/009	RBS Series (RBS 02, 03, .....18) (17 Nos)	To assess the ground water level condition at d/s of cut off adit H.	Daily	Adit H Ch.305 to 923 m
/010	RBS Series (RBS 19, 20, .....26) (08 Nos)	To assess the ground water level condition at d/s of cut off adit F	Daily	Adit F Ch.0 to 265 m
/011	RBS Series (RBS 27, 28 .....31) (05 Nos)	To assess the ground water level condition of the overburden d/s of access adit E	Daily	Adit G Ch.48 to 240 m
/012	Rajawaka bore hole	To monitor the GWL pattern variation of the Rajawaka area where GWL has been dropped during power tunnel excavation	Once a week	About 100 m away from the Rajawaka junction towards Kaltota



**Table 1 Principal Features for Monitoring Items**

(6/12)

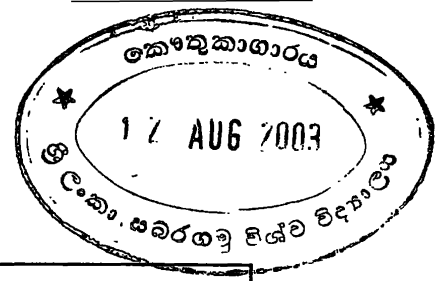
Item No.	Name	Purpose	Frequency of measurement	Location
3	<b>Dam Monitoring</b>			
/001	Pneumatic Piezometers (15 Nos) PP 01, 02, 04 and 12 are not operational.	To monitor the pressure variation at the Dam foundation .	Cav 04 - Daily Others - Three times a week.	Dam foundation at Ch.220, 320 and 420 m.
/002	Standpipe Piezometers (28 Nos ) Grouting Gallery and Adit D SP 01, 02.....28)	To monitor the pressure variation across the grout curtain at the dam foundation	Three times a week	Dam foundation at Ch.64 to 571
/003	Standpipe Piezometers (06 Nos) Adit C SP 33, 34.....38)	To monitor the pressure variation across the grout curtain between adit C and D	Three times a week	Adit C at Ch.469 to 571
/004	Standpipe Piezometers (04 Nos) Adit B (SP 43, 44.....46)	To monitor the pressure variation across the grout curtain between adit B and C	Three times a week	Adit B at Ch.525 to 571 m
/005	Standpipe Piezometers (02 Nos) Adit A (SP 49, 50)	To monitor the pressure variation across the grout curtain formed between adit A and B	Three times a week	Adit A at Ch.570 m
/006	Standpipe Piezometers (04 Nos) Adit A (b) (SP 51, 52.....54)	To monitor the pressure variation across the grout curtain formed between adit A(b) and D(b)	Three times a week	Adit A(b) at Ch.12 to 55 m



**Table 1 Principal Features for Monitoring Items**

(7/12)

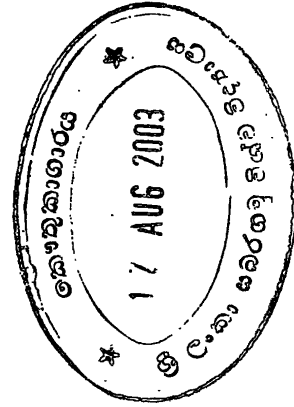
Item No.	Name	Purpose	Frequency of measurement	Location
/007	Standpipe Piezometers (03 Nos) Adit D end (SP 55, 56, 58)	To monitor the pressure variation across the Adit D end	Three times a week	Adit D end at Ch.721 to 724 m
/008	Standpipe Piezometers (10 Nos) Adit D(b) (SP 59, 60.....68)	To monitor the pressure variation across the Adit D(b)	Daily	Adit D(b) at Ch 30 to 224 m
/009	Standpipe Piezometers (01 No) Adit D(a) (SP 69)		Daily	Adit D(a) at Ch 211 m
/010	LAD/RAD (Left Abutment Drain/ Right Abutment Drain)	To check the fluctuations of seepage flow collecting through left abutment and right abutment at the grouting gallery.	Weekly	Bottom level of the grouting gallery at Ch.345 m
/011	SMC(Seepage Measuring Chamber)	To observe the flow pattern variation due to the seepage through dam foundation.	Daily	Toe of the dam
/012	Earth Pressure Cells 15 Nos (PC 01.....15)	To monitor the total stress along vertical, lateral longitudinal directions of the clay core	Weekly	Central clay core of the dam at Ch.210, 310 and 410 m
/013	Hydraulic Piezometers 33 Nos	To monitor the pore pressure variations of the clay core with RWL fluctuations.	Weekly	Central clay core of the dam at Ch.220, 320 and 420 m
/014	Hydraulic Settlement Cells (01 No)	To monitor the settlements of the clay core	Weekly	Central clay core of the dam at Ch.225, 270, 325, 370 and 425 m



**Table 1 Principal Features for Monitoring Items**

(8/12)

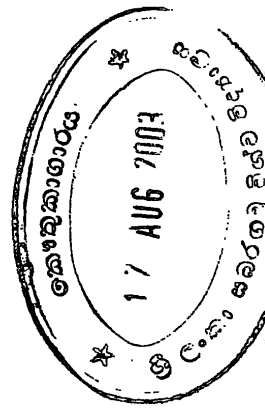
Item No.	Name	Purpose	Frequency of measurement	Location
/015	Double Fluid Settlement Cells (01 No)	To monitor the differential settlements of the at the midheight of the clay core	Monthly	Mid height of central clay core from Ch. 200 to 426 m
/016	Survey monuments SMC 7, 9.....23 09 Nos	To monitor the surface settlements/movements of the dam at the crest	Monthly	At the dam crest from Ch.140 to 460 m
/017	Survey monuments SMC 7/1, 9/1.....23/1 09 Nos	To monitor the surface settlements/movements of the dam at u/s slope	Monthly	At the u/s slope (EL.460.5) of the dam from Ch.140 to 460 m
/018	Survey monuments SMC 7/2, 9/2.....23/2 09 Nos	To monitor the surface settlements/movements of the dam at d/s slope	Monthly	At the d/s slope (EL.453) of the dam from Ch.140 to 460 m
/019	Survey monuments SMC 7/3, 9/3.....23/3 09 Nos	To monitor the surface settlements/movements of the dam at d/s slope	Monthly	At the d/s slope (EL.443) of the dam from Ch.140 to 460 m



**Table 1 Principal Features for Monitoring Items**

(9/12)

Item No.	Name	Purpose	Frequency of measurement	Location
4	<b>Water Quality Monitoring</b>			
/001	Location 01	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Upstream of Walawe, just above the Reservoir formed at HWL 460m
/002	Location 02	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	In front of the power Intake
/003	Location 03	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Upstream of Denagan Oya, just above the Reservoir formed at HWL 460m
/004	Location 04	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	In front of the raised intake for Low Level Outlet
/005	Location 05	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Downstream of Walawe at Kaltota causeway
/006	Location 06	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Downstream of Katupath Oya at the irrigation Anicut located at the confluence with Diyawini Oya
/007	Location 07	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Upstream of Belihul Oya just above the Reservoir formed at HWL 460m
/008	Location 08	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Tributory of Belihul Oya at Seelagama just above the Reservoir formed at HWL 460m



**Table 1 Principal Features for Monitoring Items (10/12)**

Item No.	Name	Purpose	Frequency of measurement	Location
/009	Location 09	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Tributory of Denagan Oya at Daligunurawa just above the Reservoir formed at HWL 460m
/010	Location 10	To assess the water Quality of the Reservoir and surrounding Rivers	Monthly	Tailrace of the Power Station just above the confluence with Katupath Oya

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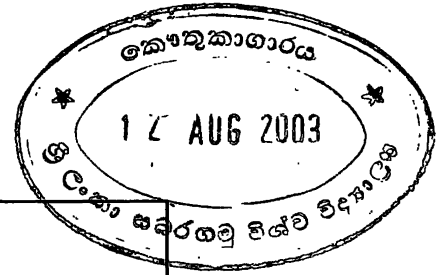


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**Table 1 Principal Features for Monitoring Items**

(11/12)

Item No.	Name	Purpose	Frequency of measurement	Location
5	<b>Instability Slope Monitoring</b>			
/001	Right Bank Access Road	To monitor pavement cracks and movement of slope in the potential slip area	Daily visual observation and weekly survey checking slope movement or road pavement crack width	Downstream of R/B of dam near security guard house
/002	Existing Slip in Area of Saddle 3	To monitor the movement of slope in the existing slip area	Daily visual observation and weekly survey checking slope movement	Upstream of Kalunaide Ara
/003	New Springs South of Spoil Bank on Kalunaide Ara	To inspect the instability of slope behind new springs and when the instability is found then survey lines will be implemented	Daily visual observation and subject to implementation of survey lines	Kalunaide Left bank slope at toe of spoil bank
/004	Instability in Paddy Land at Killekandura Ara	To inspect the instability of paddy land	Weekly visual observation unless otherwise instructed by Independent Dam Engineer or communicate with local people	3 km left bank of dam

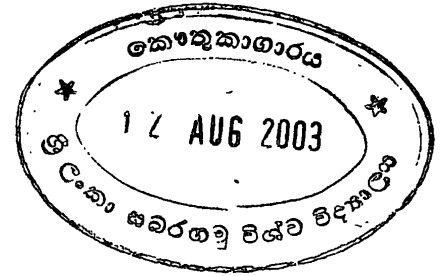


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**Table 1 Principal Features for Monitoring Items**

(12/12)

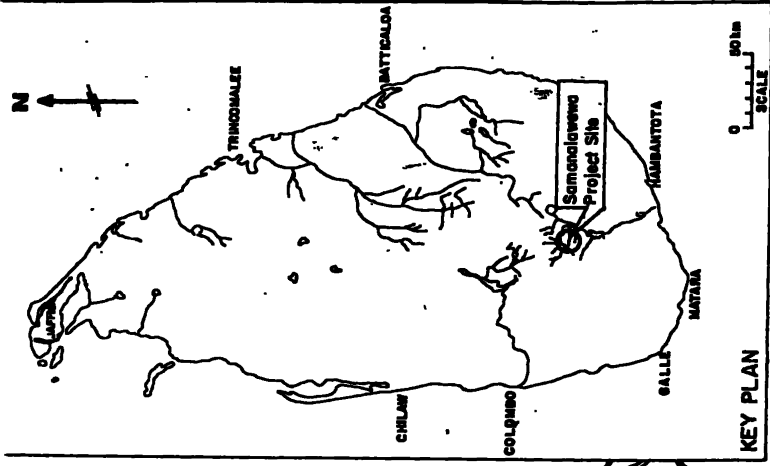
Item No.	Name	Purpose	Frequency of measurement	Location
6	Chemical Analysis			
/001	Ground water flow beneath right bank adit	To check the chemical compositions and trace the water paths	Monthly	R/B adits F,H,I, D end and D(a)
/002	Main Leak	To check the chemical compositions and trace the water paths	Monthly	R/B of Walawe about 350 m d/s of the toe of the Dam.
/003	Seepage flow at Kalunaide	To check the chemical compositions and trace the water paths	Monthly	Kalunaide Ara about 1200 m u/s of the confluence with Walawe.
/004	Seepage flow at Killekandura	To check the chemical compositions and trace the water paths	Monthly	Killekandura Ara about 3 Km away from the Dam.
/005	Reservoir	To check the chemical compositions for main water source	Monthly	In front of adit G at the bottom the reservoir



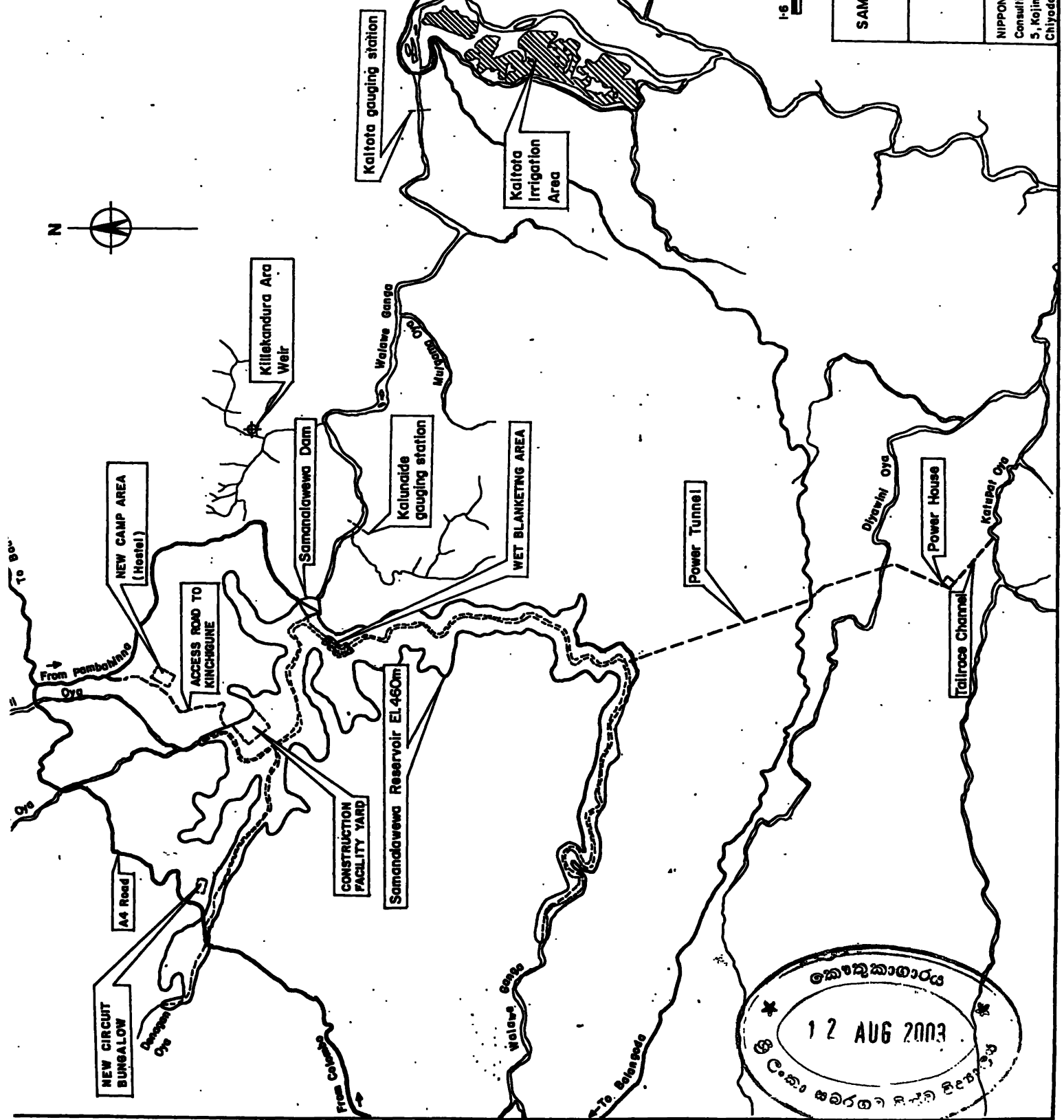
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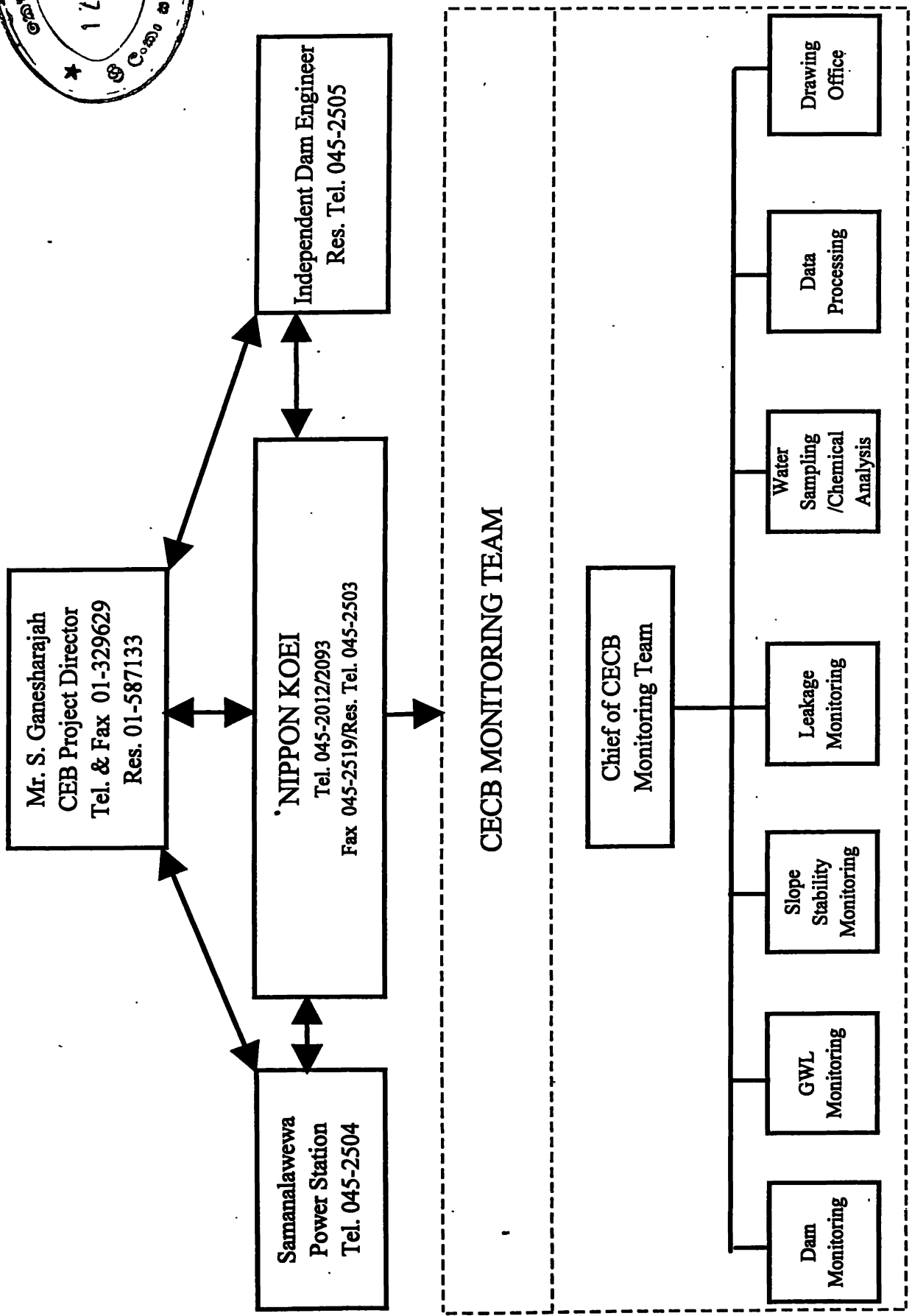
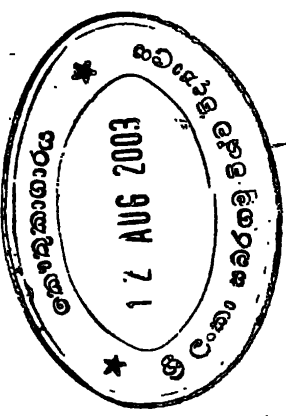
# *FIGURES*



CEYLON ELECTRICITY BOARD SAMANALAWEA HYDRO-ELECTRIC PROJECT RESERVOIR REMEDIAL WORKS - WET BLANKETING -		PROJECT LOCATION MAP	
NIPPON KOEI CO., LTD. Consulting Engineers 5, Kojimechi 2 - Chome Chiyoda - ku, Tokyo, 102, Japan		AS	DATE: MAY, 96
		SCALE: SHOW	
		Fig. 1	

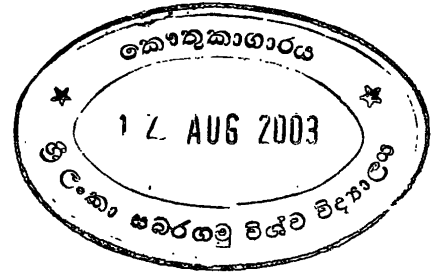
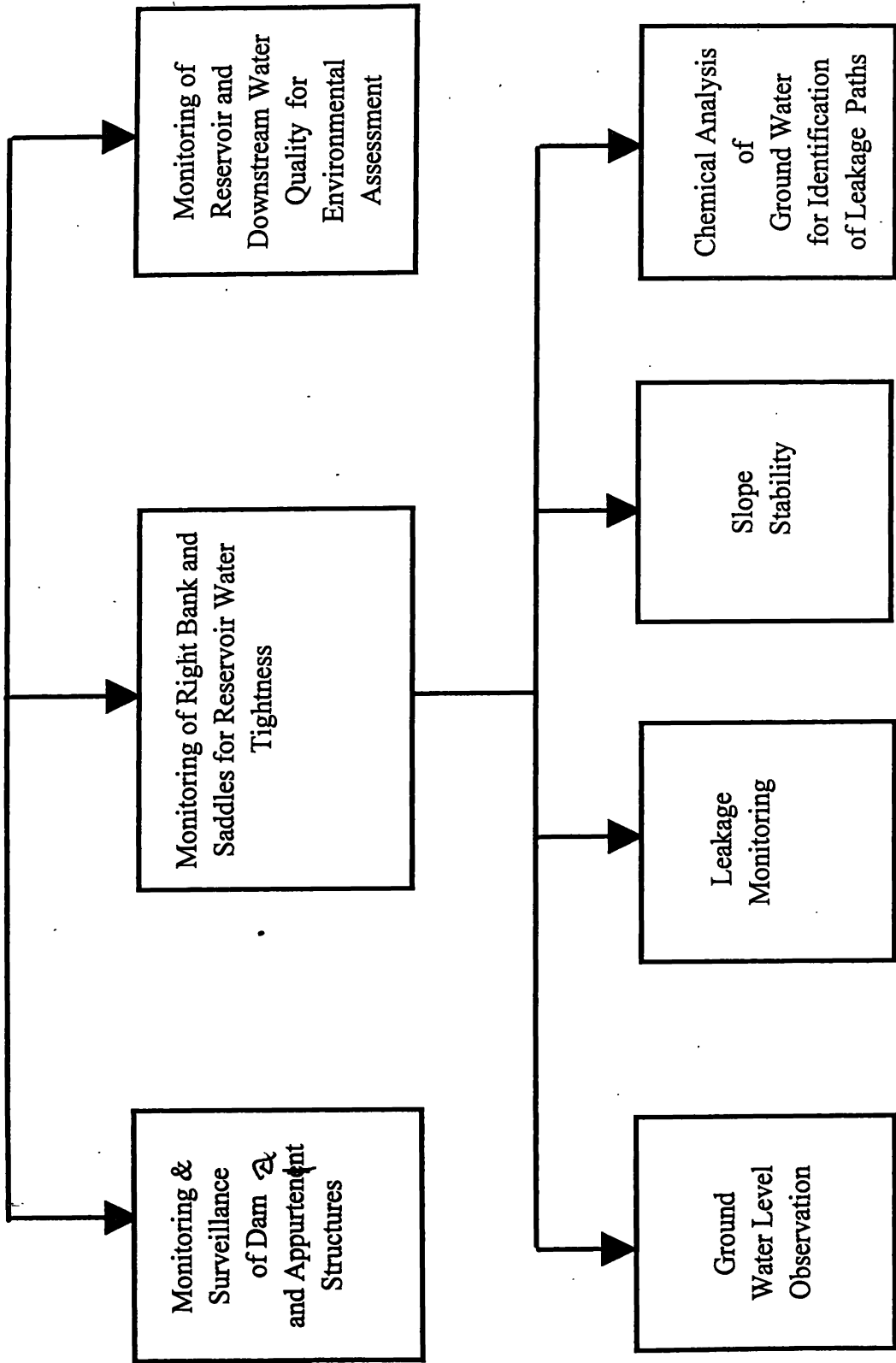


**Figure 2 Organisation of Monitoring Works for Samanalawewa Dam and Right Bank**



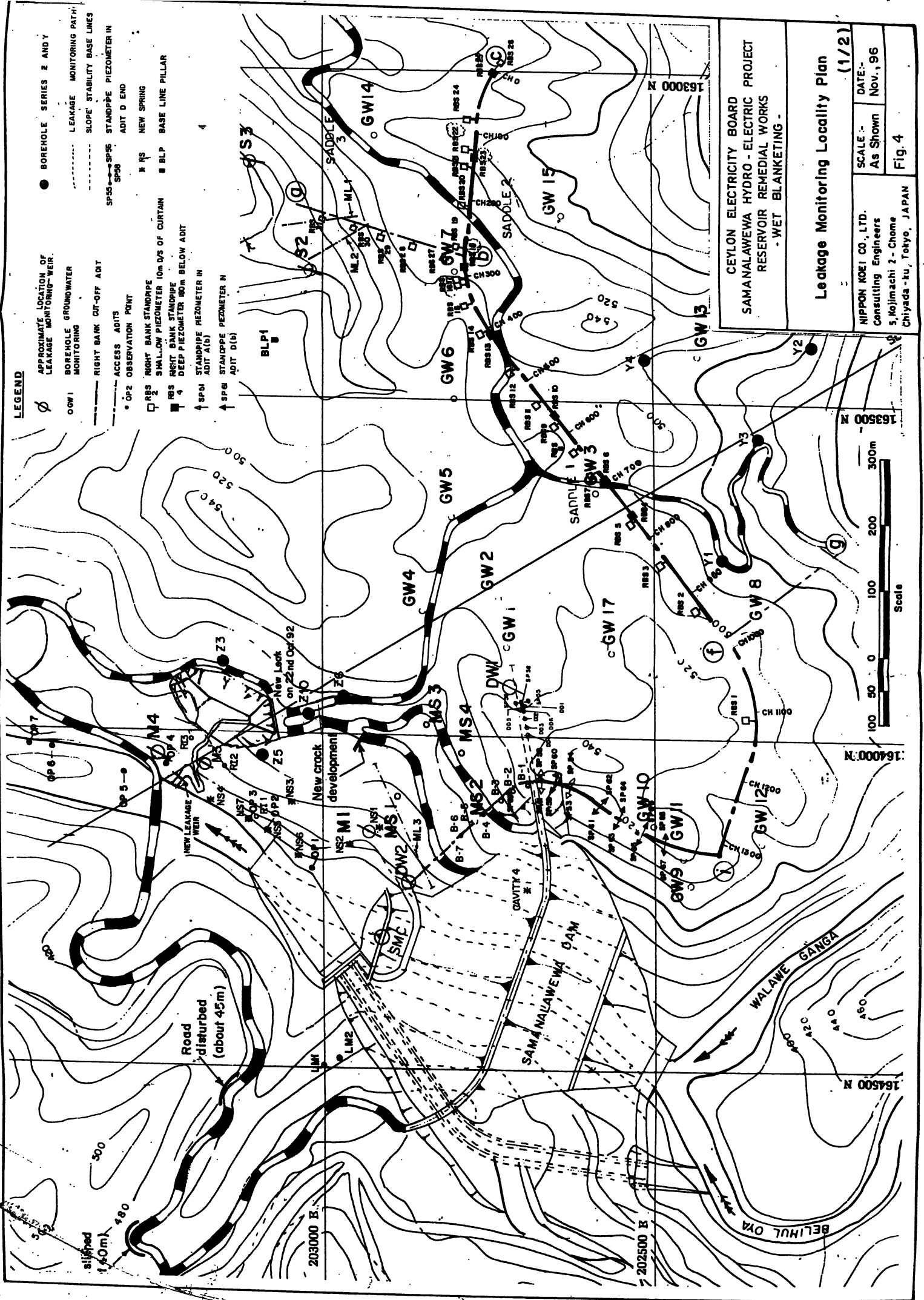
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**Figure 3**  
**Scope of Works for**  
**Samanalawewa Dam & Right Bank Monitoring**



**LEGEND**

- BOREHOLE SERIES Z AND Y
- APPROXIMATE LOCATION OF LEAKAGE MONITORING WEIR
- GW 1 BOREHOLE GROUNDWATER MONITORING
- RIGHT BANK CUT-OFF ADIT
- OP2 ACCESS ADITS
- OP2 OBSERVATION POINT
- RBS RIGHT BANK STANDPIPE
- RBS SHALLOW PIEZOMETER 10m D/S OF CURTAIN
- RBS RIGHT BANK STANDPIPE
- DEEP PIEZOMETER 80m BELOW ADIT
- ↑ SP51 STANDPIPE PIEZOMETER IN ADIT ADIT (a)
- ↑ SP61 STANDPIPE PIEZOMETER IN ADIT ADIT D(b)
- BLP1
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- BLP100



CEYLON ELECTRICITY BOARD  
 SAMANALAWEWA HYDRO - ELECTRIC PROJECT  
 RESERVOIR REMEDIAL WORKS  
 - WET BLANKETING -

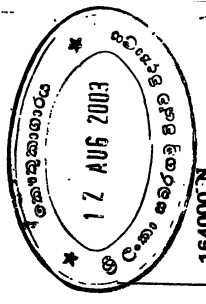
Leakage Monitoring Locality Plan (1/2)

NIPPON KOEI CO., LTD. Consulting Engineers 5, Nijimachi 2 - Chome Chiyoda - ku, Tokyo, JAPAN	SCALE: As Shown	DATE: Nov., 96
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Fig. 4

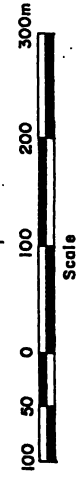
**LEGEND**

- BOREHOLE SERIES Z AND Y
- APPROXIMATE LOCATION OF LEAKAGE MONITORS-WEIR
- OWI BOREHOLE GROUNDWATER MONITORING
- RIGHT BANK CUT-OFF ADIT
- CP2 OBSERVATION POINT
- RBS RIGHT BANK STANDPIPE
- SHALLOW PIEZOMETER 10m/D/S OF CURTAIN
- RBS RIGHT BANK STANDPIPE
- DEEP PIEZOMETER 80m BELOW ADIT
- ↑ SP51 STANDPIPE PIEZOMETER IN ADIT (A1)
- ↑ SP51 STANDPIPE PIEZOMETER IN ADIT (B1)
- LEAKAGE MONITORING PATH
- SLOPE STABILITY BASE LINES
- SP55-SP56 STANDPIPE PIEZOMETER IN ADIT D END
- \* NS NEW SPRING
- BLP BASE LINE PILLAR



164000 N

KALUNAIDE RIVER GAUGING STATION (APPROX)

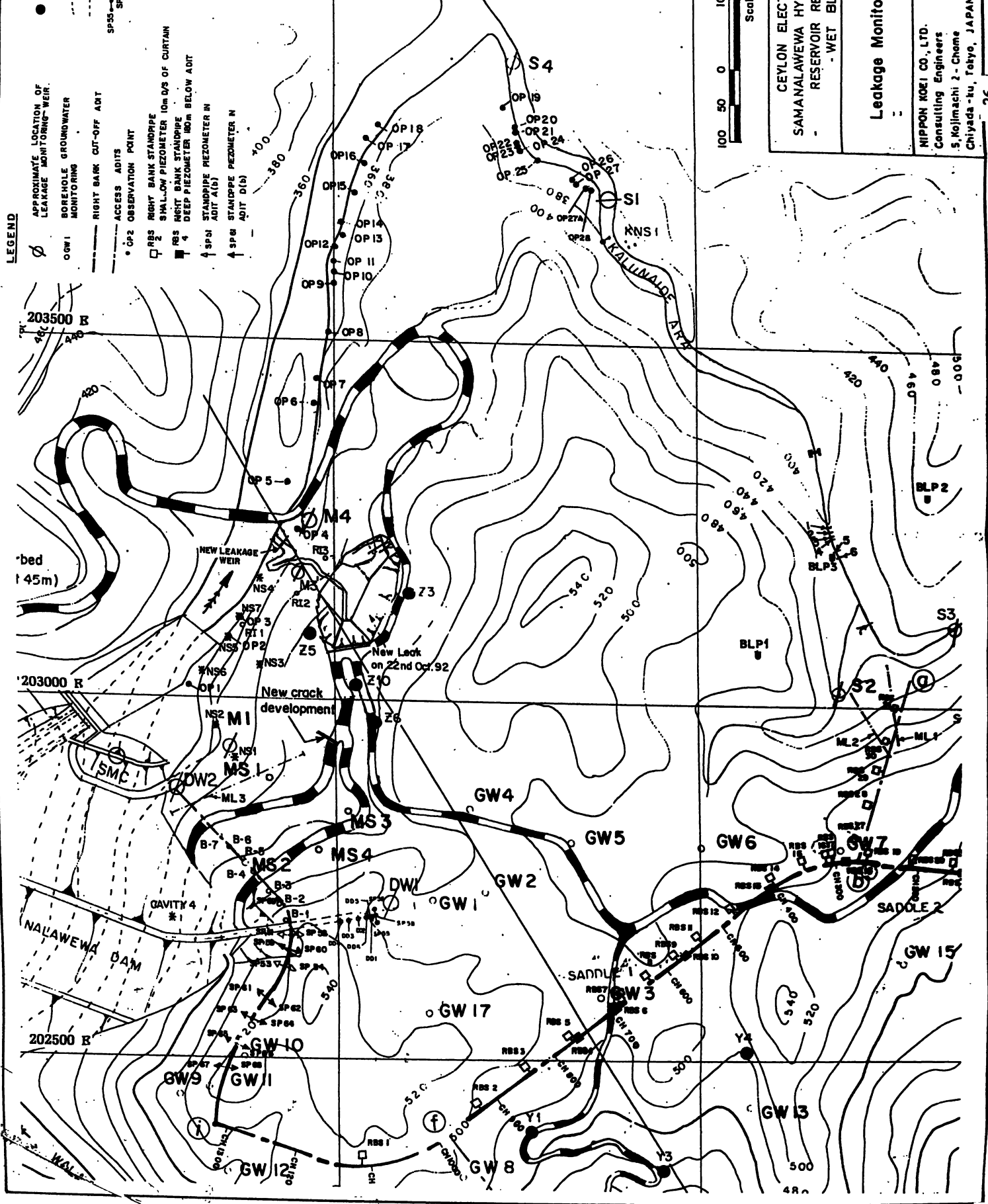


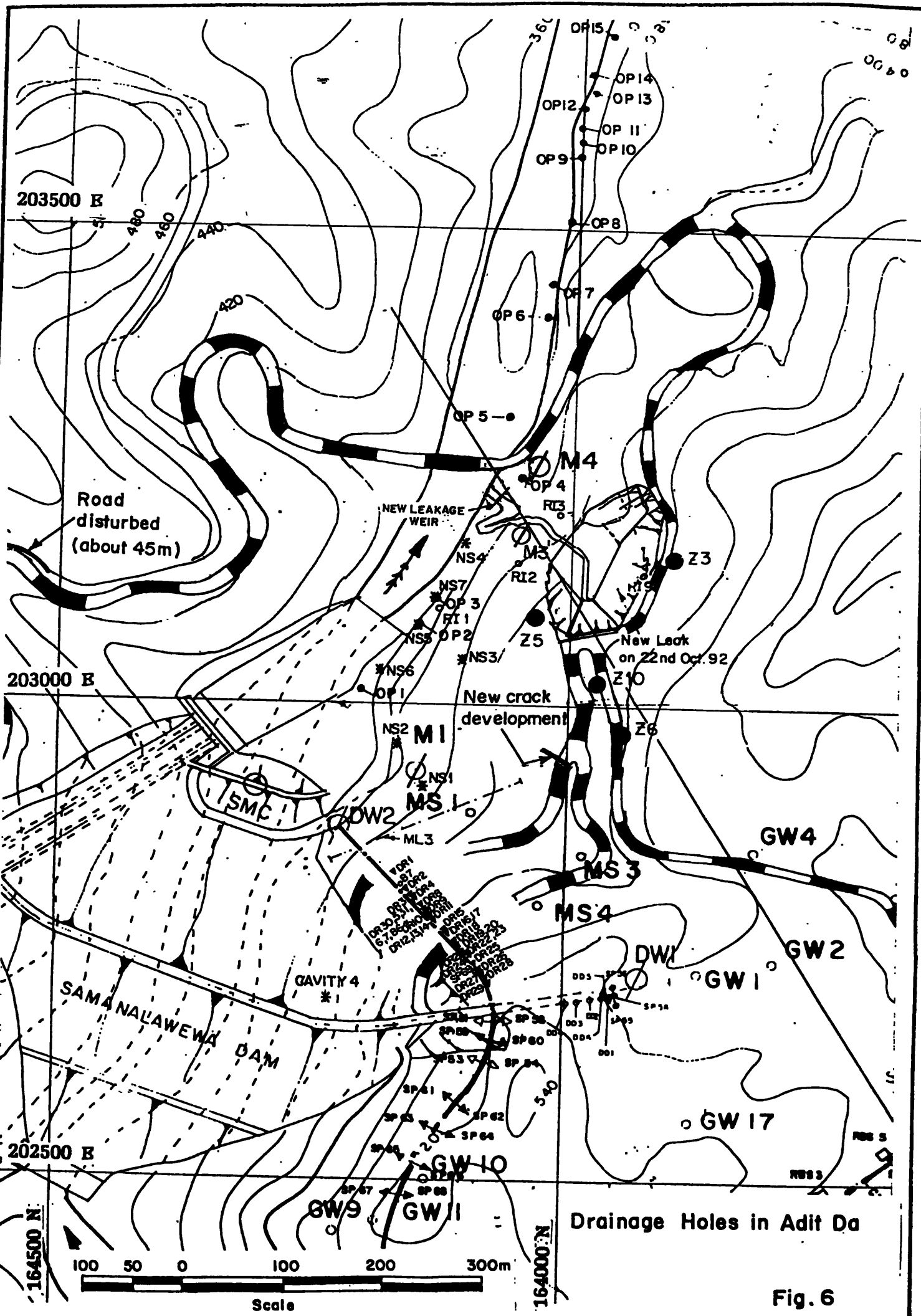
CEYLON ELECTRICITY BOARD  
SAMANALAWWA HYDRO - ELECTRIC PROJECT  
RESERVOIR REMEDIAL WORKS  
- WET BLANKETING -

Leakage Monitoring Locality Plan (2/2)

SCALE: As Shown	DATE: Nov, 96
NIPPON KOEI CO., LTD. Consulting Engineers 5, Kojimachi 2 - Chome Chiyoda - ku, Tokyo, JAPAN	

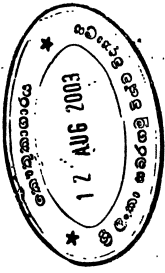
Fig. 5





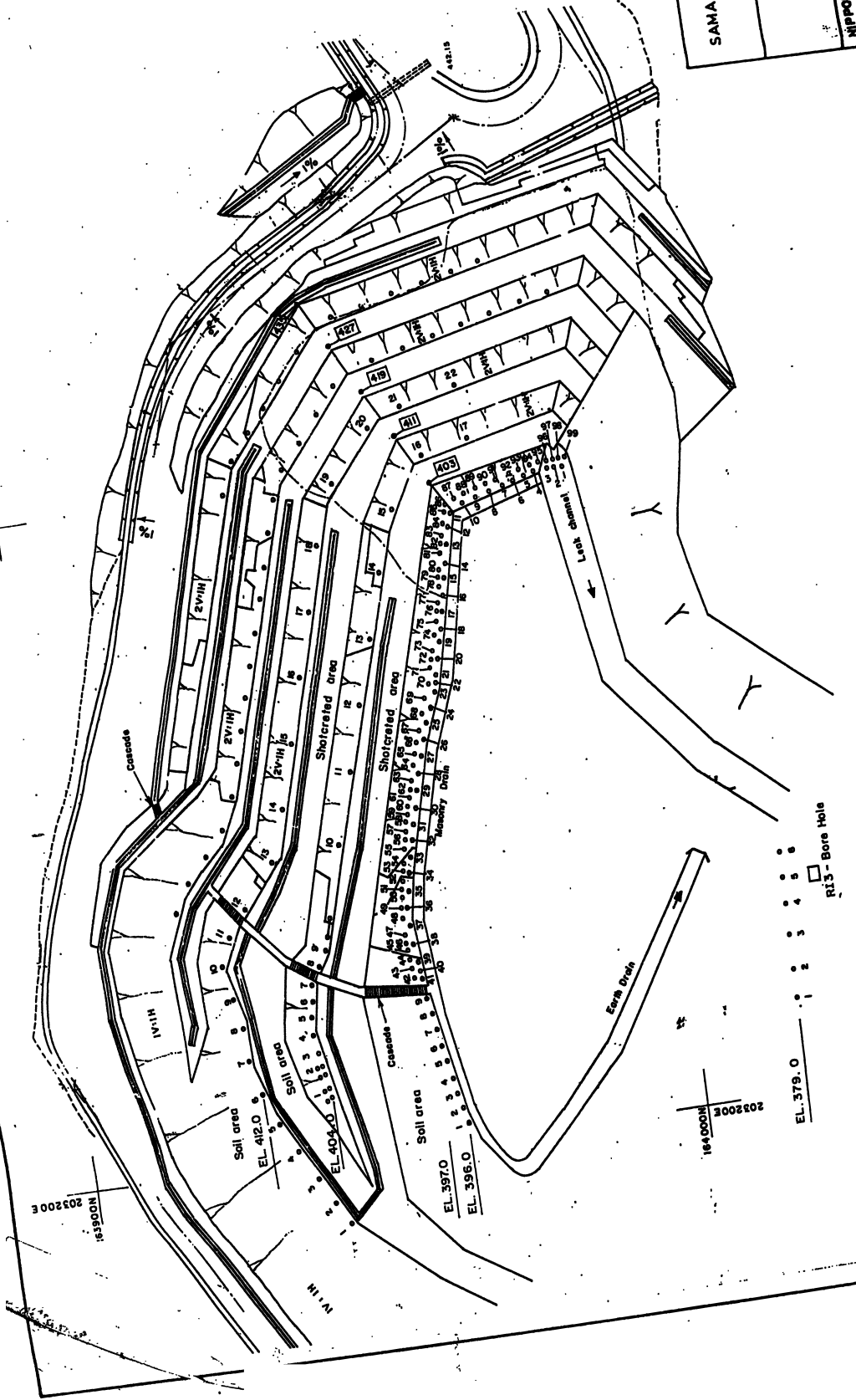
Drainage Holes in Adit Da

Fig. 6



203100 E

163900 N  
203200 E



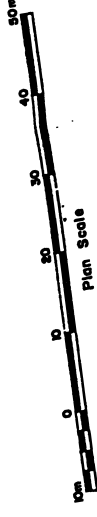
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CEYLON ELECTRICITY BOARD  
SAMANALAWewa HYDRO - ELECTRIC PROJECT  
RESERVOIR REMEDIAL WORKS  
- WET BLANKETING -

Drainage Holes on Slope behind  
Main Leak Outlet

SCALE: As Shown  
DATE: Nov., 96  
Fig. 7

NISSON KOGI CO., LTD.  
Consulting Engineers  
1, Nishimachi 2-Chome  
Chiyoda-ku, Tokyo, JAPAN



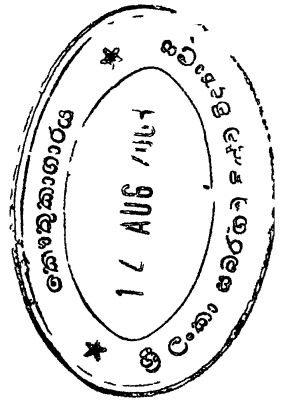
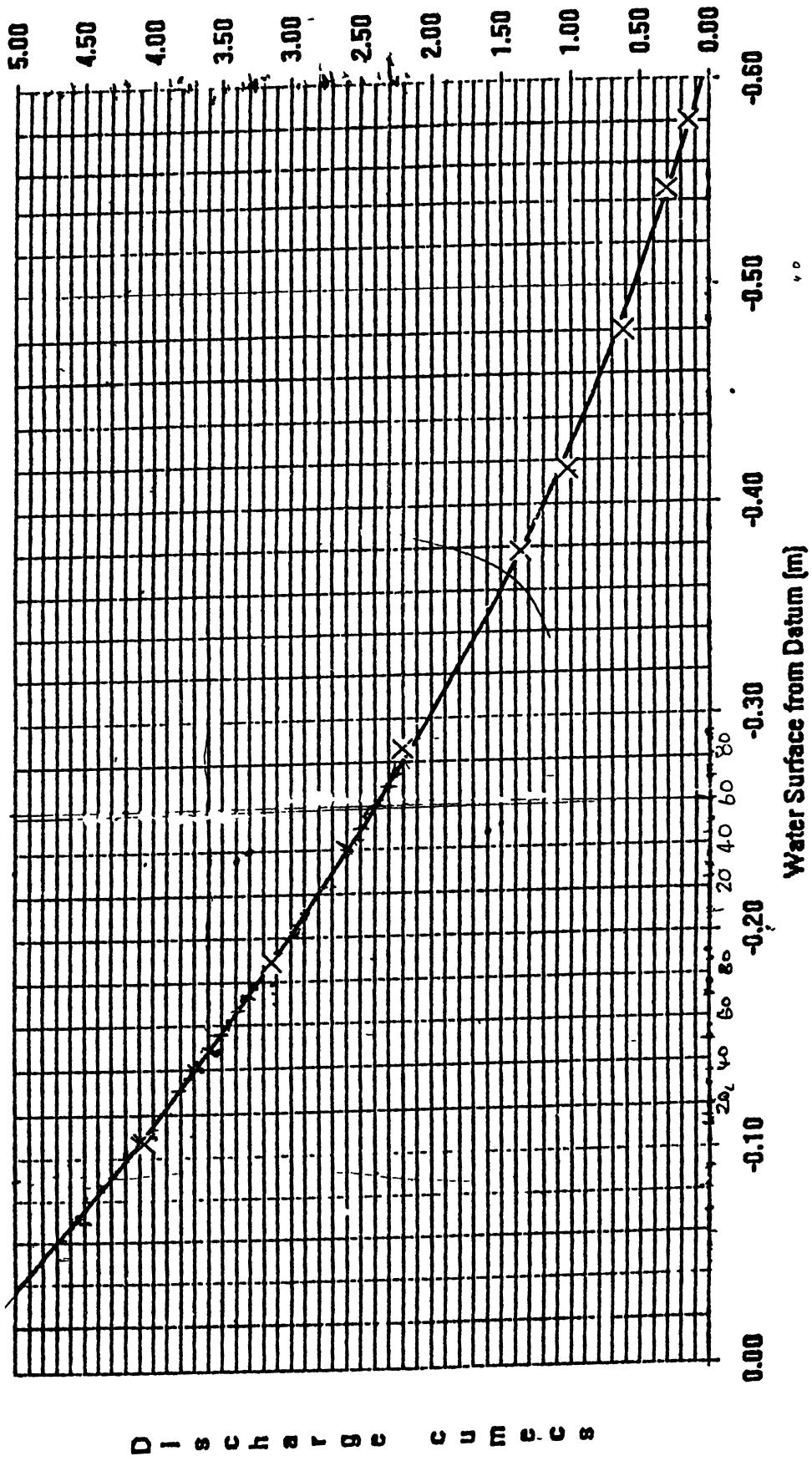
EL. 379.0 1 2 3 4 5 6  
r13 - Bore Hole

EL. 371.0 1 2 3 4

164000 N  
203200 E



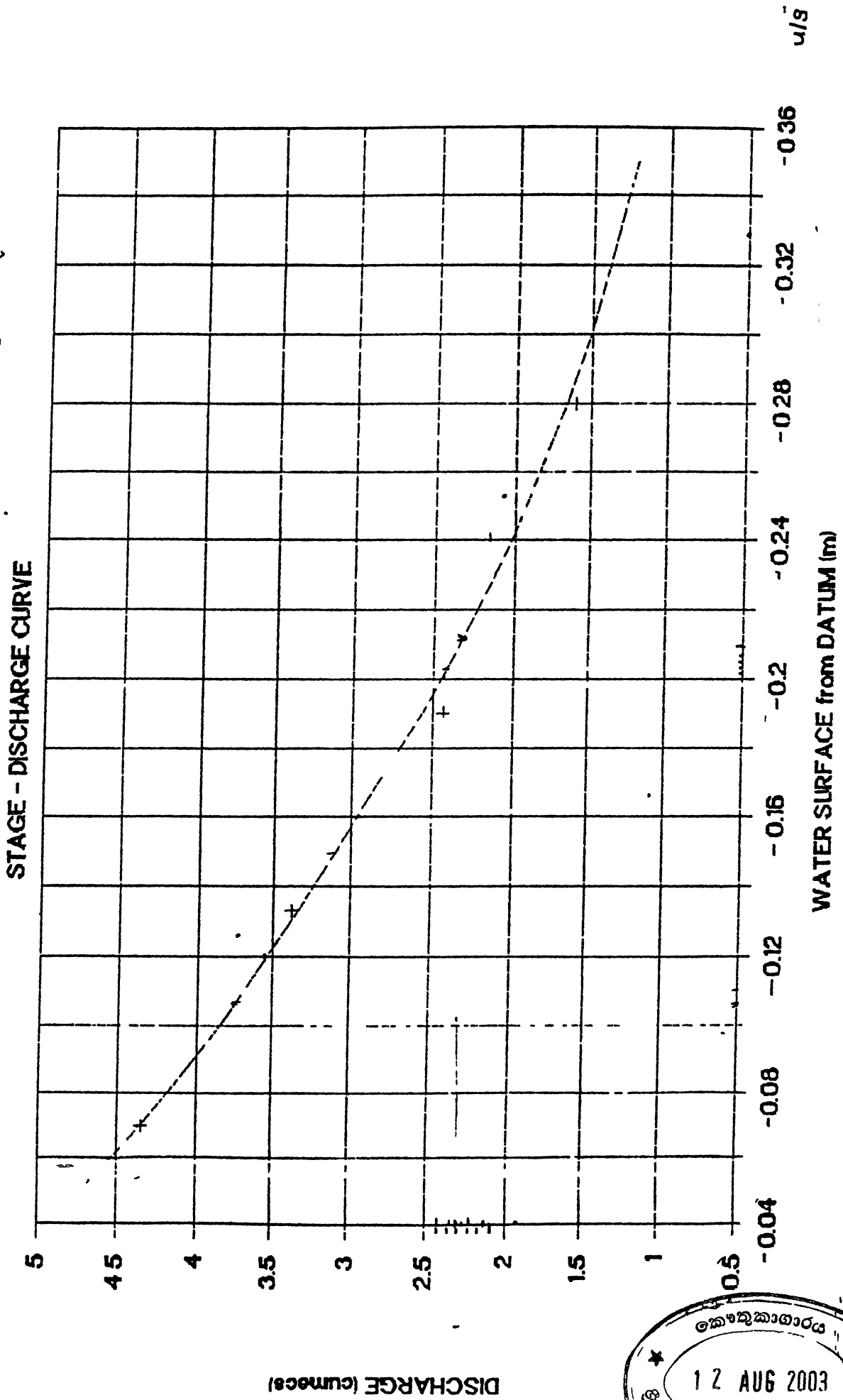
Figure 8 KALUNAIDE GAUGING STATION: STAGE - DISCHARGE CURVE



GIBB - Watawala

177392

Figure 9 KALTOTA GAUGING STATION No.01 (u/s)



DISCHARGE (cumecs)

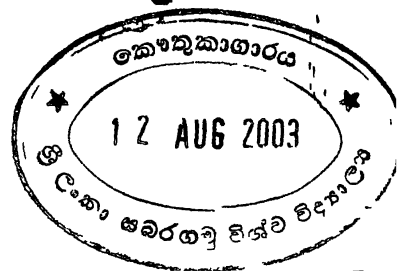


Figure 10 THE LOCATIONS OF SURVEY MONUMENT POINTS AND REFERENCE POINTS ON LEFT BANK / RIGHT BANK

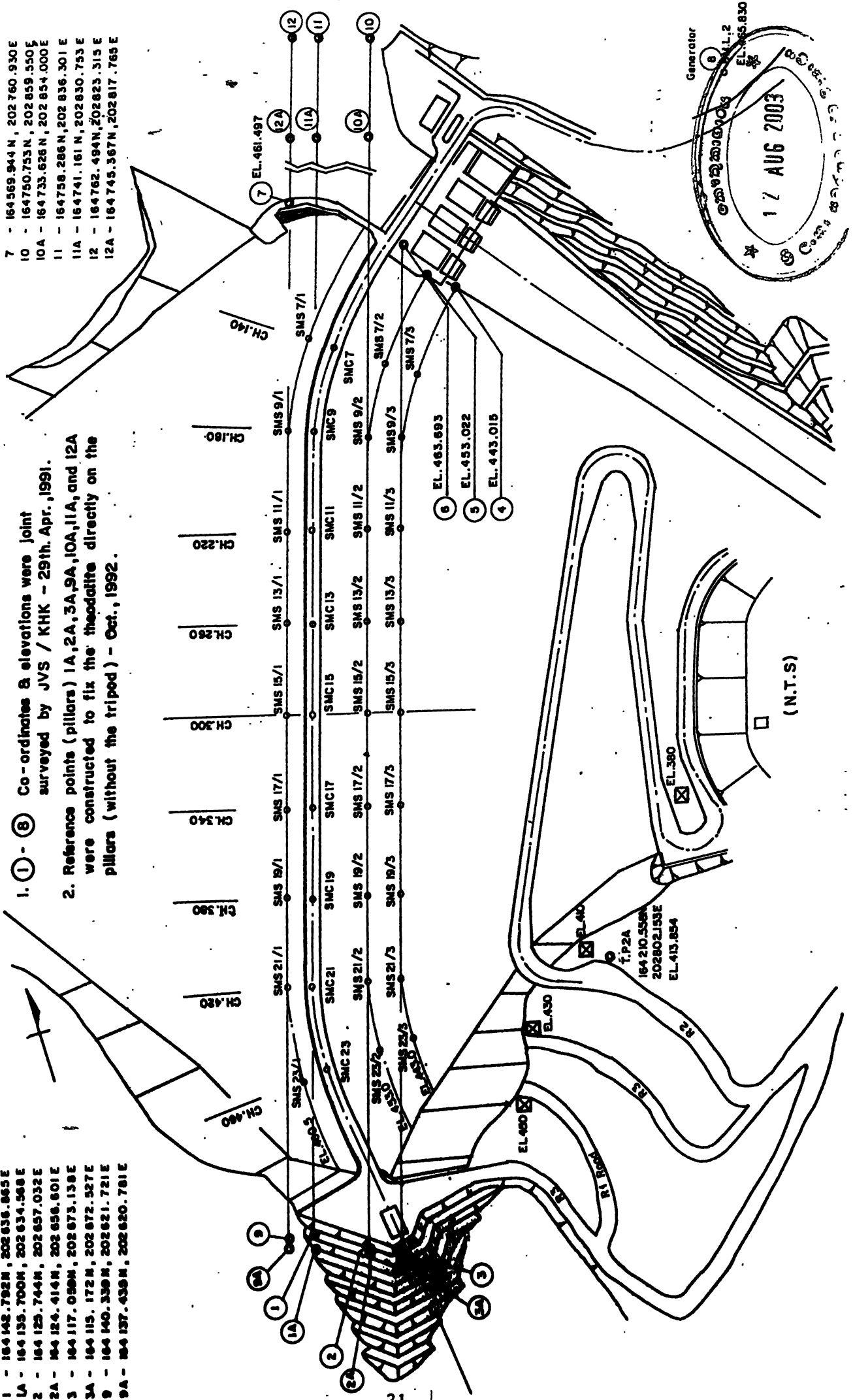
Co-ordinates of Reference points

- 1 - 164 142. 792 N, 202 636. 865 E
- 1A - 164 135. 700 N, 202 634. 568 E
- 2 - 164 129. 744 N, 202 657. 032 E
- 2A - 164 124. 414 N, 202 656. 601 E
- 3 - 164 117. 090 N, 202 673. 138 E
- 3A - 164 115. 172 N, 202 672. 527 E
- 9 - 164 140. 359 N, 202 621. 721 E
- 9A - 164 137. 439 N, 202 620. 781 E

1. (1) - (8) Co-ordinates & elevations were joint surveyed by JVS / KHK - 29th. Apr. ,1991.

2. Reference points (pillars) 1A,2A,3A,9A,10A,11A, and 12A were constructed to fix the theodolite directly on the pillars (without the tripod) - Oct., 1992.

- 7 - 164 569. 944 N, 202 760. 930 E
- 10 - 164 750. 753 N, 202 859. 550 E
- 10A - 164 733. 628 N, 202 854. 000 E
- 11 - 164 758. 286 N, 202 836. 301 E
- 11A - 164 741. 161 N, 202 830. 753 E
- 12 - 164 762. 494 N, 202 823. 315 E
- 12A - 164 745. 367 N, 202 817. 765 E



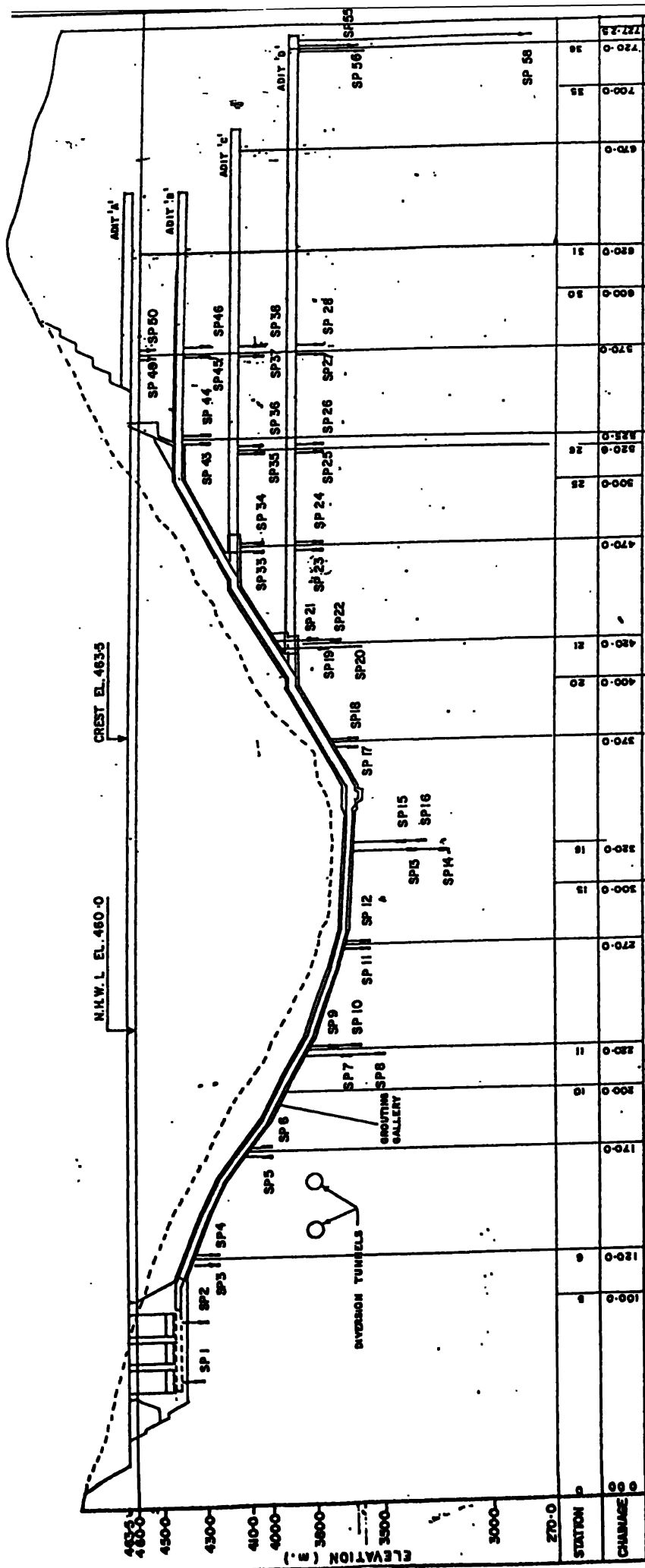
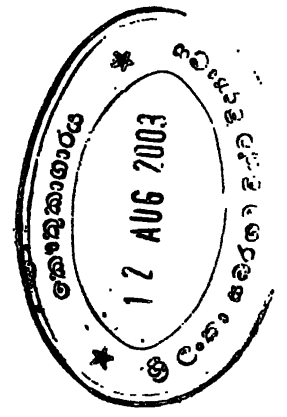
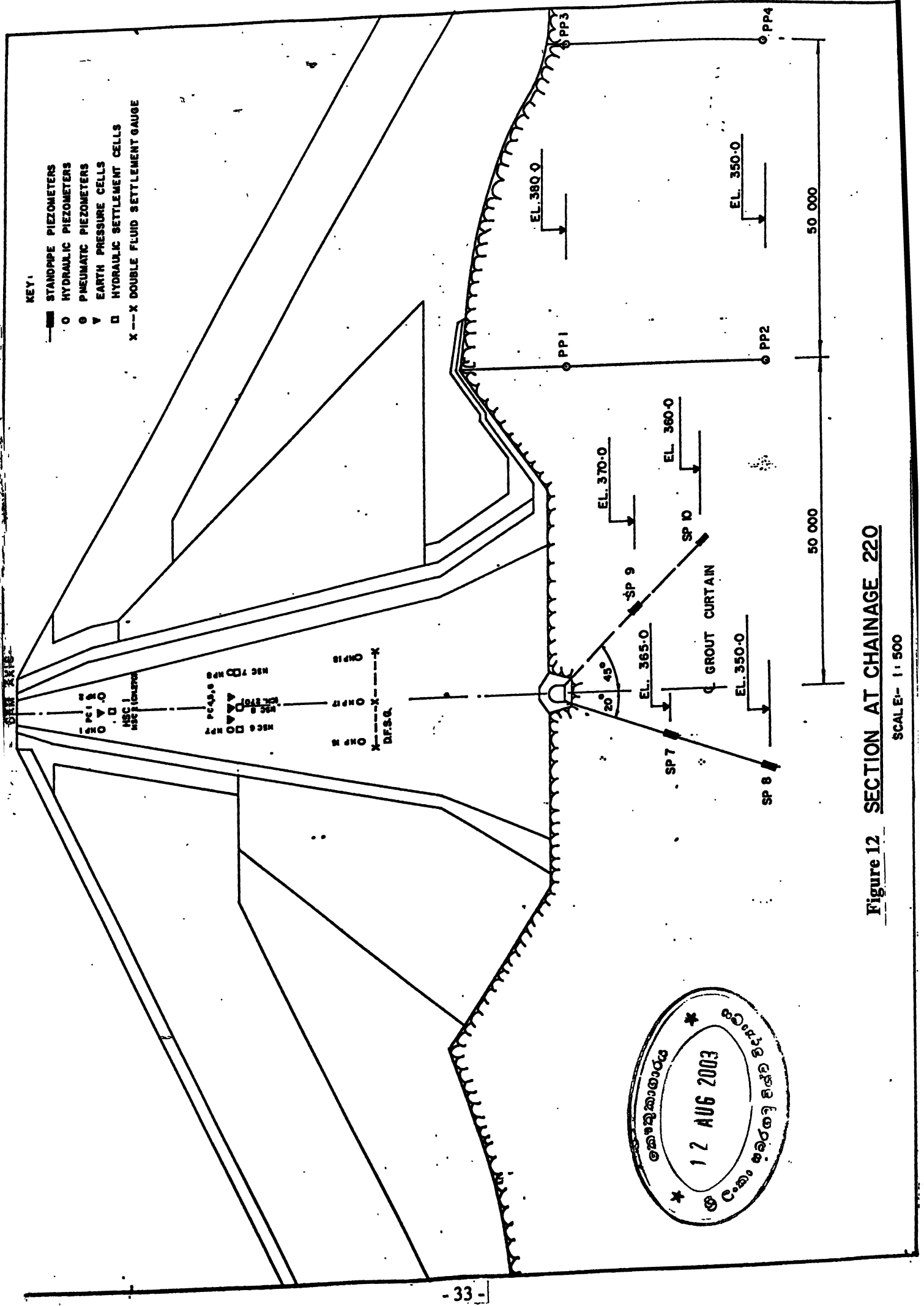


Figure 11 LOCATION OF STANDPIPE PIEZOMETERS

SCALE: NOT TO SCALE

FOR GENERAL ARRANGEMENT OF  
PIEZOMETERS IN ADIT A6 AND  
ADIT D6 SEE FIG A-1 AND  
A-2 IN PART C





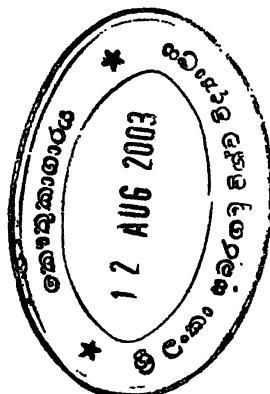
- KEY:
- STANDPIPE PIEZOMETERS
  - HYDRAULIC PIEZOMETERS
  - PNEUMATIC PIEZOMETERS
  - ▽ EARTH PRESSURE CELLS
  - HYDRAULIC SETTLEMENT CELLS
  - X---X DOUBLE FLUID SETTLEMENT GAUGE

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Figure 12 SECTION AT CHAINAGE 220

SCALE:- 1 : 500

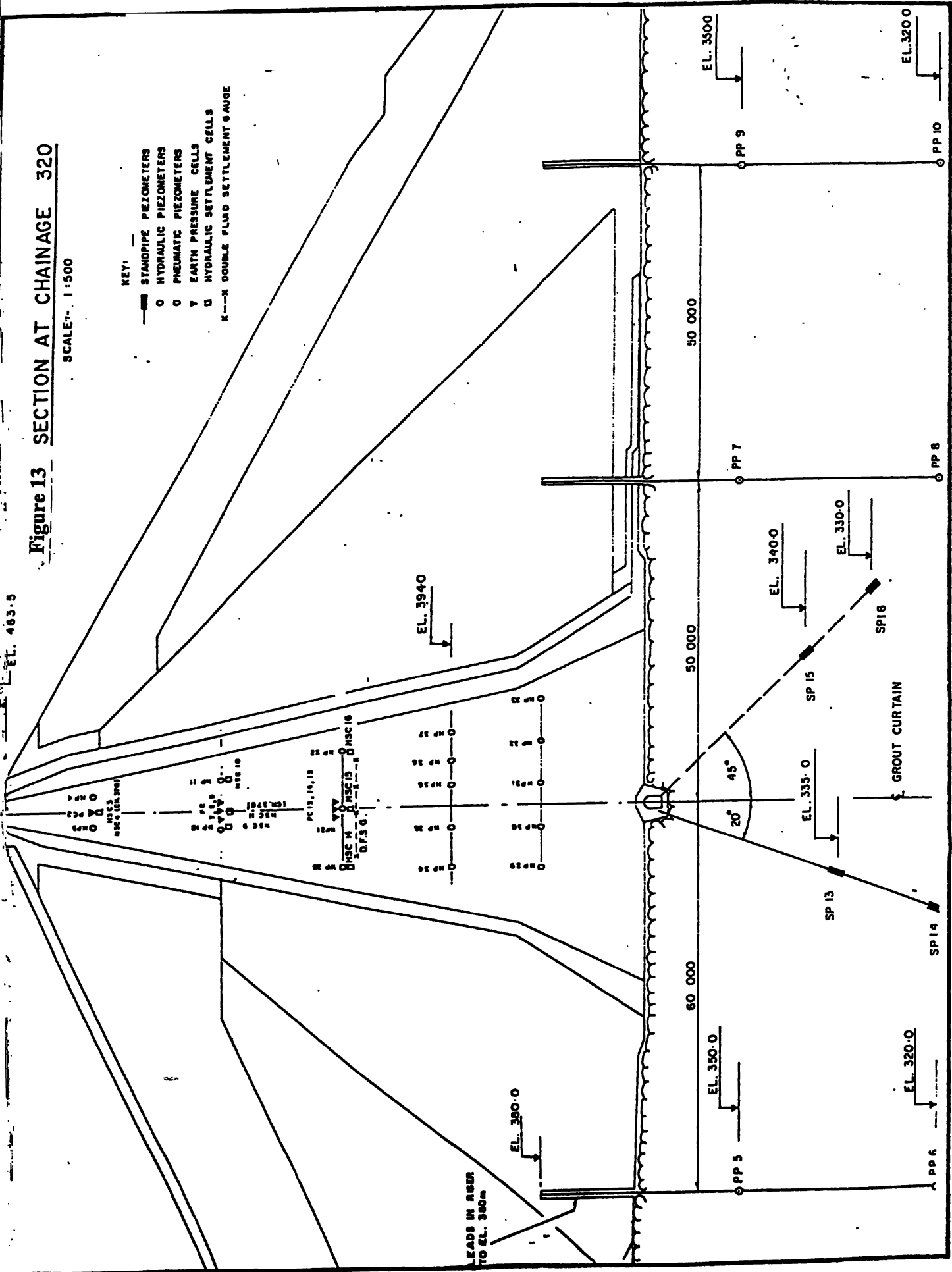


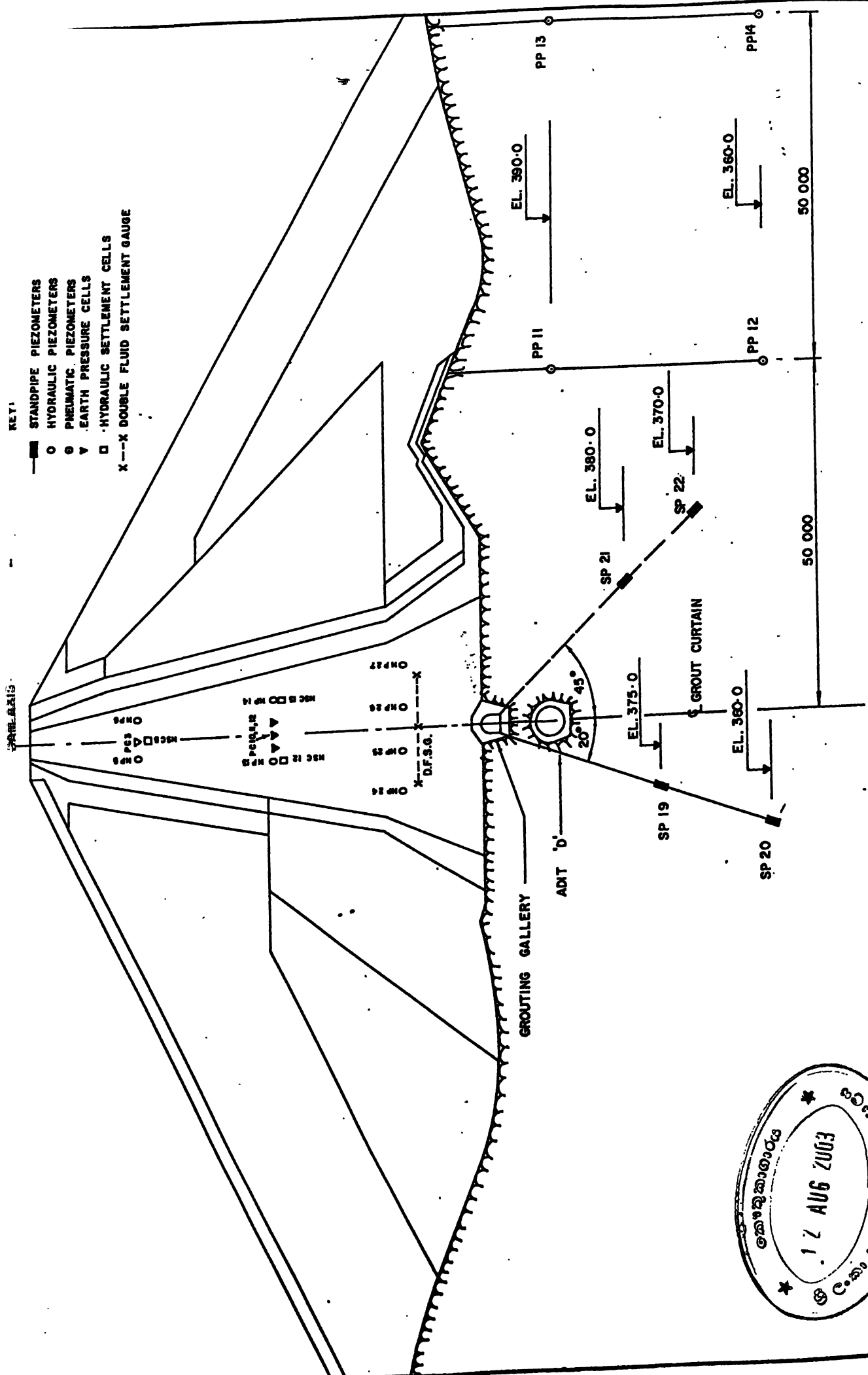
EL. 483.5

Figure 13 SECTION AT CHAINAGE 320

SCALE: 1:500

- KEY:
- STANDPIPE PIEZOMETERS
  - HYDRAULIC PIEZOMETERS
  - PNEUMATIC PIEZOMETERS
  - ▽ EARTH PRESSURE CELLS
  - HYDRAULIC SETTLEMENT CELLS
  - X--X DOUBLE FLUID SETTLEMENT GAUGE





KEY:

- STANDPIPE PIEZOMETERS
- HYDRAULIC PIEZOMETERS
- PNEUMATIC PIEZOMETERS
- ▽ EARTH PRESSURE CELLS
- HYDRAULIC SETTLEMENT CELLS
- X--X DOUBLE FLUID SETTLEMENT GAUGE

PARALLEL

O P 27  
 O P 26  
 O P 25  
 O P 24  
 X D.F.S.G.  
 X  
 O P 27  
 O P 26  
 O P 25  
 O P 24  
 X D.F.S.G.  
 X  
 O P 27  
 O P 26  
 O P 25  
 O P 24  
 X D.F.S.G.  
 X

GROUTING GALLERY

ADT 'b'

20° 45'

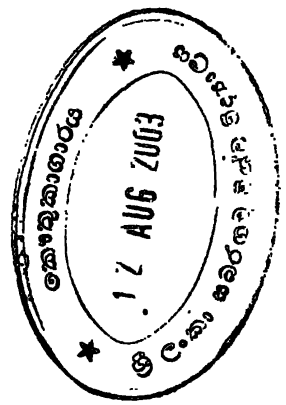
GROUT CURTAIN

50 000

50 000

Figure 14 SECTION AT CHAINAGE 420

SCALE= 1 : 500



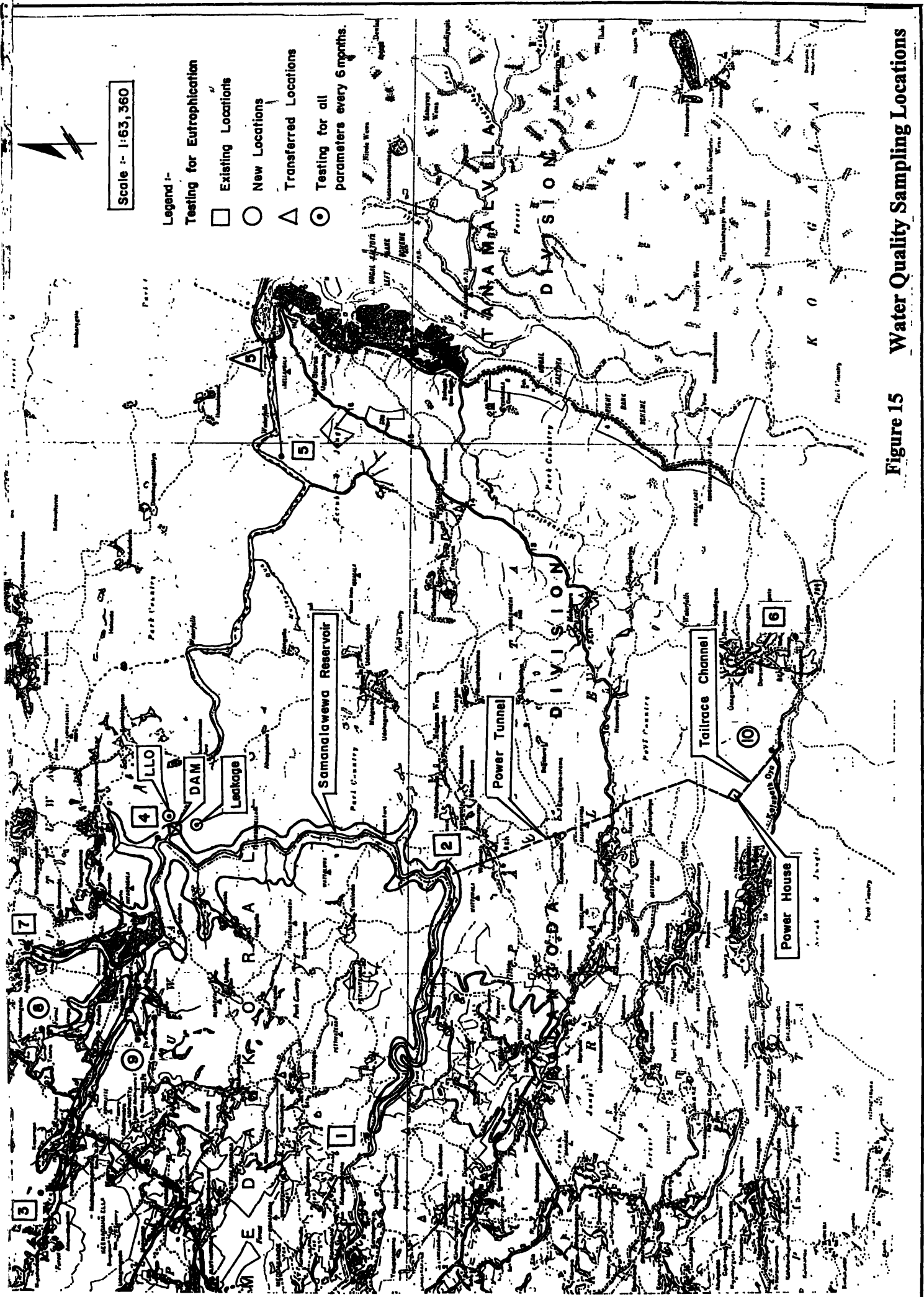
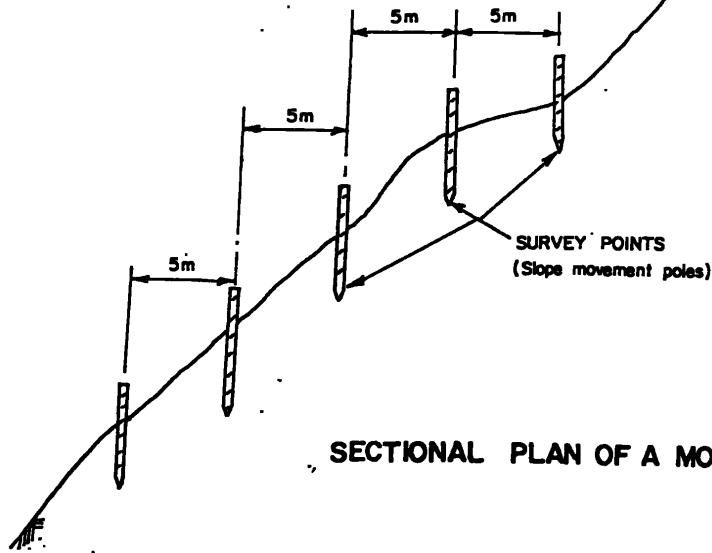
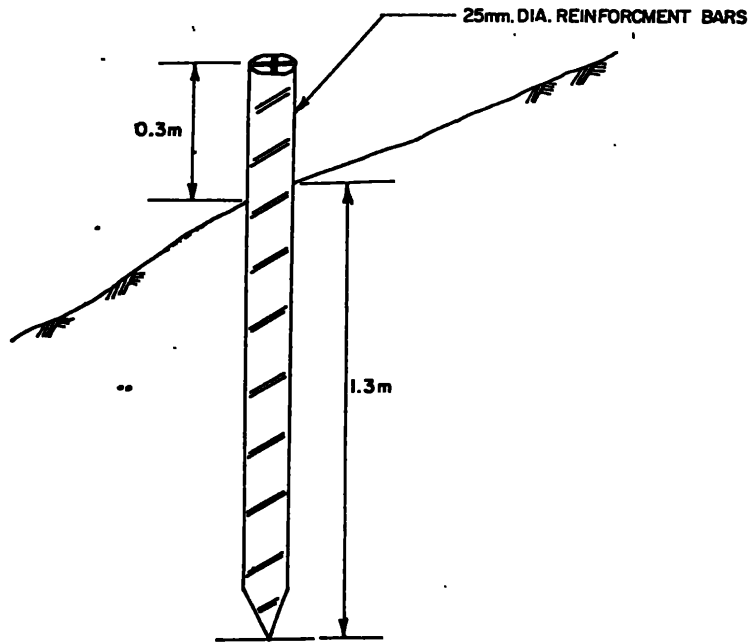


Figure 15 Water Quality Sampling Locations





SECTIONAL PLAN OF A MONITORING LINE



DETAIL OF A SURVEY POINT

(NOT TO SCALE)

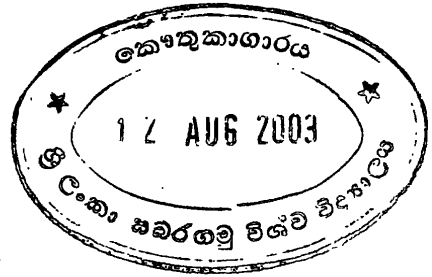
Survey Points for Slope Stability Monitoring

Fig. 16

# *APPENDICES*

**APPENDIX - A**

**STATUS OF CECB MONITORING TEAM**



# ලංකා විදුලිබල මණ්ඩලය

(1969 අංක 17 දරණ පාර්ලිමේන්තු පනතින් ප්‍රකාශිතයි)

இலங்கை மின்சாரக் சபை

(1969 ஆண்டின் 17 ஆம் இல. பாராளுமன்ற அறிவுரை சட்டத்தின் பிரகாரம் நடைமுறைப்படுத்தியது)

## CEYLON ELECTRICITY BOARD

(Established by Act of Parliament No. 17 of 1969)



මෙම ලිපිය විකේතලම් ඊ. ගාඩිනර මාවත, ප. මො. 540, කොළඹ 2, ශ්‍රී ලංකාව.

50, චිත්තම්පලම් ඊ. ගාඩිනර මාවත, ප. මො. 540, කොළඹ 2, ශ්‍රී ලංකාව.

50, Chittampalam A. Gardiner Mawatha, P.O. Box 540, Colombo 2, Sri Lanka.

සභාපති : "සිලවාත" / Chairman

ප්‍රධාන කළමනාකරු : "නිප්පන්" / General Manager

TELEFAX : 94 11 492676

Telegrams : "KILOWATTS"

Telex : 321368 CE

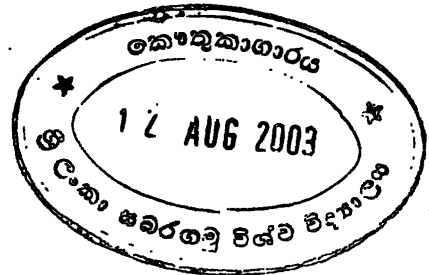
සභාපති Chairman	329894 329108	ප්‍රධාන කළමනාකරු Vice Chairman	422297	ප්‍රධාන කළමනාකරු General Manager	325340 320953	ප්‍රධාන කාර්යාලය Head Office	324471 - 8	කොළඹ විදුලි සැපයීම Colombo Electricity Supply	57592
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මාගේ අංකය : CBB/PDS/NK-35  
உமது இல. :  
My No.

ඔබේ අංකය :  
உமது இல. :  
Your No.

දිනය : 25th May, 1996  
திகதி :  
Date

Messrs. Nippon Koei Co. Ltd.,  
4, Kojimachi 5-Chome  
Chiyoda-Ku  
Tokyo,  
Japan.



Dear Sirs,

**SAMANALAWENA HYDRO ELECTRIC PROJECT**  
**RESERVOIR REMEDIAL WORKS - WET BLANKETING**  
**CONTRACT FOR CONSULTANCY SERVICES**  
**CONFIRMATION OF STATUS OF CECB MONITORING TEAM**

Ceylon Electricity Board has engaged the Central Engineering Consultancy Bureau to carry out Dam/Reservoir Monitoring Services under the responsibility of the Supervising Engineer and to provide Supporting Services for the Supervising Engineer for the Samanalawewa Hydroelectric Project. We wish to confirm the following status of the CECB Monitoring Team under the Consultancy Contract.

CBB has requested the Consultant (NK) the Supervising Engineer for Wet Blanketing Works to supervise the CECB Monitoring Team in the execution of its monitoring activities and utilise the Services of the Monitoring Team in the most efficient manner as described in Section 4.2.1 of the Notes of Discussion on the Proposals for Engineering Consultancy Services. This is fully incorporated into the Contract for Consultancy Services for the Samanalawewa Hydroelectric Project, Reservoir Remedial Works-Wet Blanketing as a part of the Contract.

In order to ensure more firm commitment of NK to be responsible for the monitoring activities, CBB declares that the CECB Monitoring Team should be regarded as a Monitoring Team seconded by CBB to NK to be utilised at the discretion of NK for the successful implementation of the Wet Blanketing Works.

Yours faithfully,

Leslie Hemath  
Chairman  
Ceylon Electricity Board

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ශ්‍රී ලංකා විදුලි බල මධ්‍යම උපදේශන මධ්‍යස්ථානය  
மத்திய பொறியியல் உ-சாதுனை பணியகம்

**CENTRAL ENGINEERING CONSULTANCY BUREAU**

415, බොද්ධලෝක මාවත, කොළඹ 7, ශ්‍රී ලංකා  
415, பெளத்தாலோக மாவத்தை கொழும்பு 7, இலங்கை  
415, Bauddhaloka Mawatha, Colombo 7, Sri Lanka

Cables : "CONSULBURE"  
Telex : 22049 CECE CE  
Telefax : 687369

P.O. Box. 1771  
දුරකථන 696215  
தொலைபேசி 696217  
Telephone 696218  
696230

CB/SAM/MON/02  
28.06.1996

Chairman  
Ceylon Electricity Board  
Colombo 2

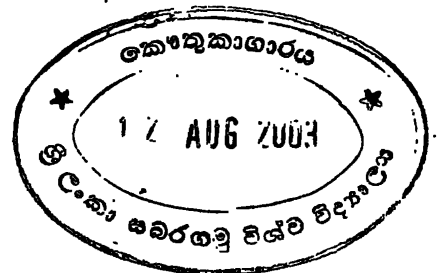
Dear Sir,

**SAMANALAWEWA HYDRO ELECTRIC PROJECT**  
**RESERVOIR REMEDIAL WORKS - WET BLANKETING**  
**CONTRACT FOR CONSULTANCY SERVICES**  
**CONFIRMATION OF STATUS OF CECB MONITORING TEAM**

We refer to your letter No. CEB/PDS/NK - 35 of 25th May, 1996 regarding the above, addressed to Messrs. Nippon Koei Co. Ltd. with copy to G.M., CECB

CECB site monitoring team will be glad to continue the monitoring activities during the Wet Blanketing Works under the supervision of the Engineer (NK). All communications from Engineer (NK) should be directed to CECB Site Representative at Samanalawewa Site. All site administrative matters of the CECB Monitoring Team will be handled by the CECB Site Representative.

Yours faithfully,  
CENTRAL ENGINEERING CONSULTANCY BUREAU

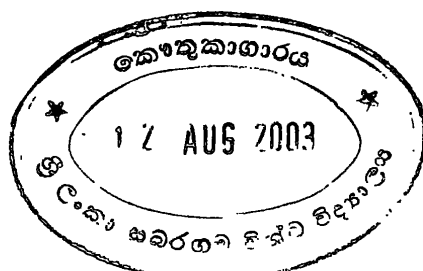


H.B. Jayasekera  
General Manager

Copy to : Project Director, Samanalawewa Project  
M/s. NK, Dam Site  
CECB Site Representative, Samanalawewa

**APPENDIX - B**

**WEEKLY MONITORING REPORT**



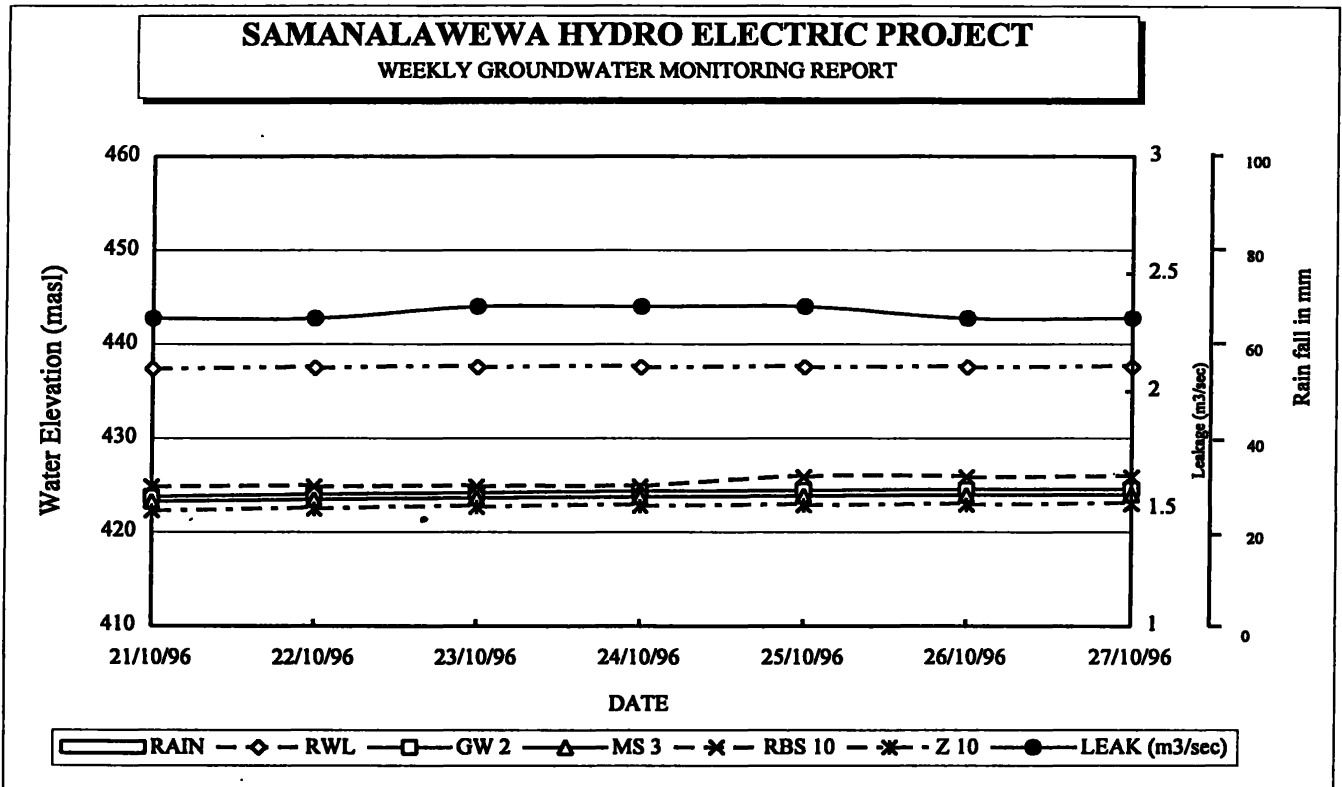
**FAX MESSAGE**

Attention: **Mr. S. Ganesharajah**  
 Company: **Projector Director,**  
 From: **Samanalawewa Dam Site Office**

Date : **28/10/96**

**SAMANALAWEWA HYDRO ELECTRIC PROJECT**  
**WEEKLY GROUND WATER MONITORING REPORT**

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	21/10/96	22/10/96	23/10/96	24/10/96	25/10/96	26/10/96	27/10/96
RWL (08:00)	437.39	437.48	437.55	437.58	437.55	437.57	437.58
GW 2	423.81	424.03	424.22	424.38	424.46	424.55	424.60
MS 3	423.28	423.49	423.66	423.78	423.87	423.97	424
RBS 10	424.86	424.86	424.86	424.86	425.86	425.86	425.86
Z 10	422.30	422.50	422.70	422.81	422.87	422.95	423.00
LEAK (m3/sec)	2.31	2.31	2.36	2.36	2.36	2.31	2.31
LLO DIS. (m3/sec)	1.6	1.6	1.94	2.13	2.13	2.13	2.13
PS DIS. (m3/sec)	5.87	4.59	5.43	5.57	3.91	3.01	9.33
RAIN (mm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0



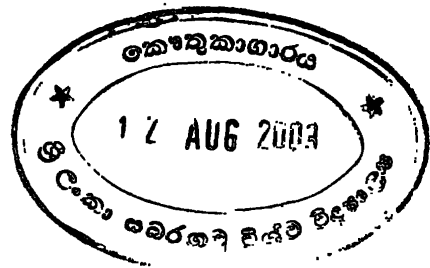
Yours faithfully,  
 Nippon Koei Co. Ltd.

*K. Tsuzuki*

**Kazuo TSUZUKI**  
 Resident Engineer

CC:

1. Mr. B. Cooke, Member, Panel of Expert
2. Dr.S.M.Tariq, Member, Panel of Expert
3. Mr. Kawamura, First Secretary, Embassy of Japan
4. Mr. Ida, OECF-Colombo
5. Mr. P.O. Squire, Gibb, Reading
6. Mr.T. Takasaki, KW-NK Head Office
7. Mr. Laksiri, Samanalawewa P/H, CEB



**APPENDIX - C**  
**MONTHLY MONITORING REPORT**



**NIPPON KOEI CO., LTD.** *Consulting Engineers*

5, Kojimachi 2-Chome, Chiyoda-ku, Tokyo, Japan

**TO :**

Mr. S.Ganesharajah  
Project Director  
CEB - Colombo

**FROM :**

SAMANALAWEWA DAM SITE OFFICE  
P.O.Box 3, Belihuloya, SRI LANKA.  
TEL : (94) - 45 -2012/2093  
FAX : (94) - 45 - 2519/2503  
E-mail : kazuo@sri.lanka.net

FAX: (81) - 3 - 5276 - 3094

TEL : (81) - 3 - 5276 - 2327

Your ref.

Our ref.

N/C 226

Date :

02-Nov-96

**SUBJECT : Monthly Monitoring Report - Oct-96**

We are sending here with the Monthly Monitoring Report for the Month **Oct-96**

**K. TSUZUKI**  
Resident Engineer



c.c to ;

1. Mr. B. Cooke, Member, Panel of Expert
2. Dr. S.M.Tariq, Member, Panel of Expert
3. Mr. Kawamura, First Secretary, Embassy of Japan
4. Mr. Ida, OECF - Colombo
5. Mr. P.O.Squire, GIBB, Reading
6. Mr. T.Takasaki, KW-NK Head Office
7. Mr. Laksiri, Samanalawewa P/H, CEB

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**MONTHLY MONITORING REPORT  
FOR OCTOBER 1996**

**1. Meteorological Data**

The average basin rainfall during this period was 290.18 mm with 18 rainy days.

**2. Reservoir Water Level, Inflow and Outflow**

In accordance with the Cabinet Approval, the impounding of the reservoir above 430 M EL started since 01.10.1996. The maximum RWL during this period was 437.58 M EL on 24.10.96. The reservoir water levels as of 30.09.96 and 31.10.96 were 431.15 M EL and 437.23 M EL, respectively. It has stored 27.16 MCM of water during this period.

Average periodic inflow in this period was 18.6 cms which was equivalent to 49.8 MCM. Irrigation outlet at the dam was opened on 10.10.96 and 26.5 MCM in this month was released to Kaltota irrigation scheme. Power house was operated only for 3 hour peak (average) and 13.3 MCM was released through the turbine. The monthly energy output was 10.23 GWh and total energy during this year as of this month was 119.95 GWh which is equivalent to 51.5 % of accumulated average energy output up to October in past three years from 1993 to 1995.

**3. GWL and Leakage Monitoring**

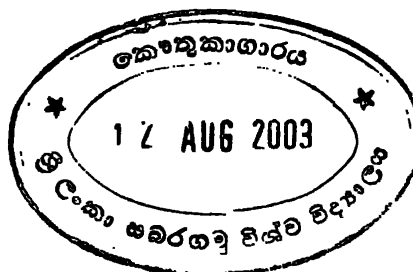
GWL of the representative bore hole in area B, GW 02 was at a maximum of 424.63 M EL on 28.10.96. The difference between RWL and GWL was 11.5 to 13.6 m. The flow measured at main leak changed from 2.17 to 2.36 cms. Flow through the drain holes provided at the shotcrete surface above outlet of main leak was changed from 2.8 l/s to 12.7 l/s. Flow measured at Weir DW 2 at portal of adit Da was changed from 3.8 to 14.8 l/s. Out of this, flow of 80 % was from the drainage holes provided at adit Da. Flow at Weir S4 downstream of Kalunaide Ara was changed from 21.5 to 35.4 l/s except the data recorded in the rainy period.

**4. Dam Monitoring**

The flow at SMC was changed from 0.4 to 1.6 l/s except the data recorded in the rainy period.

The pore pressures in the core zone of the dam embankment have indicated stable condition.

**5. Dam Foundation Monitoring**



The pore pressure in the dam foundation at Cavity 04 was about 4.5 m which is equivalent to 13 % of the reservoir static head. The pore pressure in the dam foundation downstream of grout curtain was 26 - 44 % of the reservoir static head while the pore pressure upstream of grout curtain was 82 - 100 %.

From the above, it is judged as indicated by the Panel that the stability of the dam and its foundation is quite stable.

6. Water Quality Monitoring and Chemical Analysis.

The results of water quality testing and chemical analysis doesn't show any major variations compared to the previous month results.

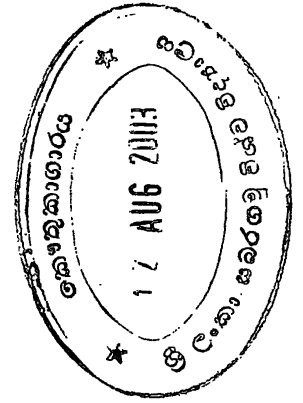
7. Slope Stability Monitoring

Prior to the construction of monuments such as survey points along the specified monitoring slopes and pillars to mount the theodolite, cutting the trees and bushes was commenced on 22.10.96. The construction of survey monuments was commenced at the end of the month.



**Annual Summary of Reservoir  
Operation Data for Samanalawewa HEP (in 1996)**

Month Year	Monthly Rainfall (mm)	Inflow			Reservoir Water Level			Out Flow				Monthly Power Generation			Monthly Running Hours			
		Ave. (m3/s)	Max. (m3/s)	Min. (m3/s)	Ave. (El. - m)	Max. (El. - m)	Min. (El. - m)	LLO & Irrigation Valve		Main Leak Ave. (m3/s)	Power House Ave. (m3/s)	Unit 1 GWh	Unit 2 GWh	Total GWh	Unit 1 hrs.	Unit 2 hrs.	Total hrs.	
								Ave. (m3/s)	Max. (m3/s)									Min. (m3/s)
Jan '96	46.5	6.94	15.52	3.44	427.66	427.97	427.28	0.96	0.97	0.96	2.03	4.49	4.300	4.480	8.780	88	95	183
Feb '96	97.5	9.07	30.50	3.35	427.53	428.86	426.87	0.96	0.98	0.96	2.04	4.09	3.697	3.681	7.378	79	85	164
Mar '96	180.0	8.76	31.73	4.13	428.45	428.96	427.78	0.23	0.97	0.00	2.10	7.98	6.255	8.041	14.296	131	173	304
Apr '96	365.0	20.18	87.08	6.04	428.61	430.5	427.25	0.00	0.00	0.00	2.14	16.92	14.755	16.673	31.428	348	383	731
May '96	10.5	5.16	8.33	2.99	426.38	428.41	425.49	0.00	0.00	0.00	2.07	6.41	5.314	7.223	12.537	120	169	289
Jun '96	64.0	8.69	41.63	3.36	427.03	428.25	425.69	0.00	0.00	0.00	2.06	4.35	5.486	2.380	7.866	134	57	191
July '96	41.0	9.18	55.40	2.57	428.86	430.32	427.18	0.00	0.00	0.00	2.10	3.29	3.325	3.064	6.389	70	71	141
August '9	35.5	5.89	19.10	1.95	429.94	430.35	429.41	0.00	0.00	0.00	2.15	5.00	5.988	4.352	10.340	131	98	229
Sep. '96	61.0	10.43	34.62	3.38	429.13	431.15	427.97	0.00	0.00	0.00	2.13	5.47	3.997	6.712	10.709	103.2	154.5	257.7
Oct. '96	290.2	18.61	58.39	5.54	434.62	437.58	431.24	0.99	2.13	0.00	2.25	4.97	5.306	4.921	10.227	104.8	98.4	203.2
	1191.2	10.29	87.08	1.95	428.82	437.58	425.49	0.31	2.13	0.00	2.11	6.30	58.423	61.527	119.950	1309	1384	2693



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**SAMANALAWEWA HEP - RESERVOIR REMEDIAL WORKS  
MONTHLY MONITORING DATA**

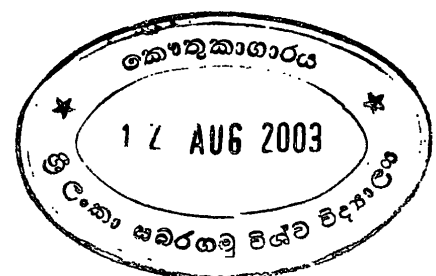
**October-96**

Date	Ave. Rain fall (mm)	Inflow (m3/s)	RWL (m)	Outflow (m <sup>3</sup> /s)			GWL (GW2) (m)	RWL-GWL (m)	Operation hours (two units)	MWh (two units)
				Leak	Irrigation	P. House				
01/10/96	0.31	10.34	431.24	2.17	0.00	3.99	419.56	11.68	4.12	267
02/10/96	0.14	6.74	431.33	2.17	0.00	4.10	419.63	11.70	5.37	271
03/10/96	0.00	7.84	431.34	2.17	0.00	6.13	419.70	11.64	7.43	407
04/10/96	0.00	5.82	431.33	2.17	0.00	5.51	419.77	11.56	6.82	364
05/10/96	0.00	6.13	431.29	2.17	0.00	5.82	419.77	11.52	6.90	386
06/10/96	22.09	11.03	431.25	2.17	0.00	7.01	419.77	11.48	8.52	466
07/10/96	7.53	10.92	431.29	2.17	0.00	5.03	419.78	11.51	7.45	332
08/10/96	33.03	31.98	431.37	2.17	0.00	5.33	419.82	11.55	6.53	354
09/10/96	21.54	19.19	431.89	2.17	0.13	7.83	419.98	11.91	9.49	517
10/10/96	5.16	13.51	432.08	2.17	1.52	4.07	420.17	11.91	6.25	265
11/10/96	15.11	19.95	432.20	2.21	1.52	2.69	420.32	11.88	4.56	171
12/10/96	41.07	44.45	432.48	2.21	1.14	4.71	420.40	12.08	7.34	302
13/10/96	27.81	33.27	433.22	2.21	0.66	3.75	420.62	12.60	5.28	242
14/10/96	46.64	58.39	433.75	2.21	0.51	3.54	420.93	12.82	5.32	233
15/10/96	8.66	26.58	434.76	2.26	0.06	5.24	421.33	13.43	6.60	352
16/10/96	5.39	15.84	435.12	2.26	0.00	4.53	421.76	13.36	5.55	305
17/10/96	37.45	45.41	435.29	2.26	0.00	3.77	422.08	13.21	4.70	252
18/10/96	14.90	49.70	436.02	2.31	0.03	3.52	422.71	13.31	5.41	234
19/10/96	3.05	44.84	436.81	2.31	1.33	4.09	423.16	13.65	6.17	267
20/10/96	0.30	19.50	437.17	2.31	1.59	3.16	423.54	13.63	4.77	206
21/10/96	0.00	14.89	437.39	2.31	1.60	5.87	423.81	13.58	7.60	392
22/10/96	0.00	12.49	437.48	2.31	1.60	4.59	424.03	13.45	5.73	310
23/10/96	0.00	11.44	437.55	2.36	1.94	5.43	424.22	13.33	6.47	369
24/10/96	0.00	8.35	437.58	2.36	2.13	5.57	424.38	13.20	6.47	380
25/10/96	0.00	9.55	437.55	2.31	2.13	3.91	424.46	13.09	4.83	263
26/10/96	0.00	8.02	437.57	2.31	2.13	3.01	424.55	13.02	3.86	199
27/10/96	0.00	6.37	437.58	2.31	2.13	9.33	424.60	12.98	14.74	610
28/10/96	0.00	6.48	437.45	2.31	2.13	5.44	424.63	12.82	7.54	367
29/10/96	0.00	6.38	437.39	2.31	2.13	4.77	424.63	12.76	6.44	322
30/10/96	0.00	5.54	437.34	2.31	2.13	7.32	424.62	12.72	7.84	490
31/10/96	0.00	5.93	437.23	2.31	2.13	4.87	424.63	12.60	7.11	332
Average	9.36	18.61	434.62	2.25	0.99	4.97	422.04	12.58	6.56	330
Maximum	46.64	58.39	437.58	2.36	2.13	9.33	424.63	13.65	14.74	610
Minimum	0.00	5.54	431.24	2.17	0.00	2.69	419.56	11.48	3.86	171

**Total Rain 290.18 mm**

Annual Energy (Planned)  
This Month Production  
Accumulated in this year

403.000 GWh  
10.227 GWh  
119.950 GWh  
29.8 % of Design



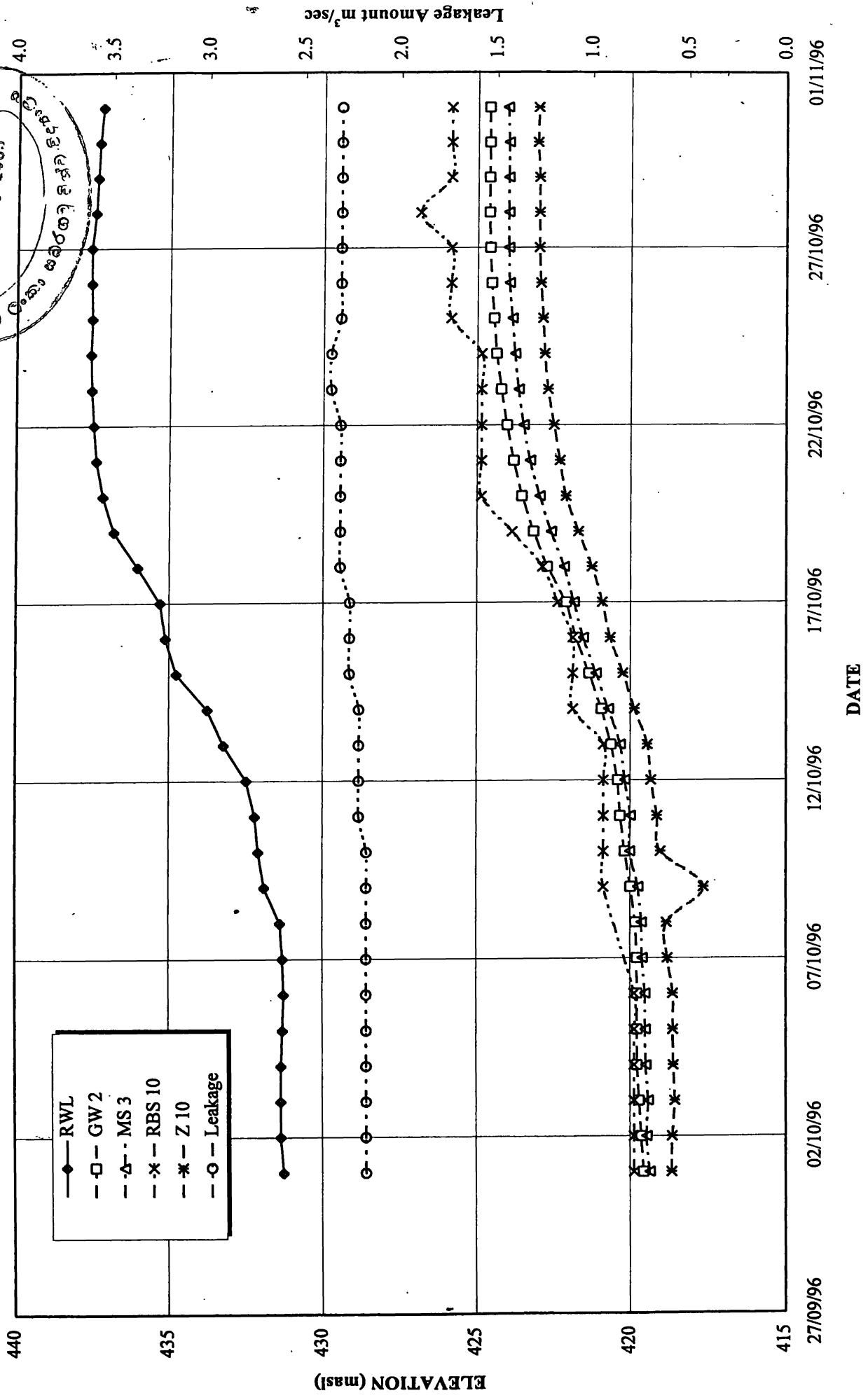
**Leakage Measurements monitored at Major Points including Drain Holes (October '96)**

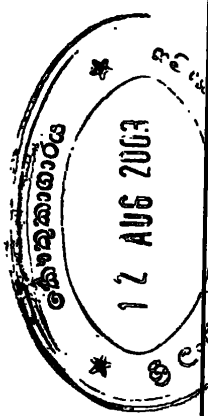
Date	Rainfall at dam mm	RWL masl	GW2 masl	Main Leak m <sup>3</sup> /s	Drain holes at portal of Main Leak l/s	DW2 at portal of D(a) l/s	Drain holes in adit D(a) l/s	SMC at toe of dam l/s	M1 d/s of D(a) portal l/s	S1 w/s of Kalunaide l/s	KNS I mid of Kalunaide l/s	S4 d/s of Kalunaide l/s	KKA Kille-kandura l/s	Total leak* m <sup>3</sup> /s
01-Oct-96	0.0	431.24	419.56	2.17				0.4						
02-Oct-96	0.0	431.33	419.63	2.17		3.8		0.4	3.5	18.6		21.5		2.20
03-Oct-96	0.0	431.34	419.70	2.17		4.2		0.4	3.5	18.6		24.0	15.1	2.20
04-Oct-96	0.0	431.33	419.77	2.17				0.4						
05-Oct-96	0.0	431.29	419.77	2.17	2.77	4.0		0.4	3.5	18.6		21.5		2.20
06-Oct-96	19.0	431.25	419.77	2.17				0.4						
07-Oct-96	16.0	431.29	419.78	2.17		4.3		0.4	3.5	20.6		27.9		2.21
08-Oct-96	26.5	431.37	419.82	2.17	8.88			0.4						
09-Oct-96	31.0	431.89	419.98	2.17		4.3		1.0	3.7	23.6		27.9		2.21
10-Oct-96	26.0	432.08	420.17	2.17	9.62	4.6	3.46	2.1	4.2	30.9		35.4		2.22
11-Oct-96	13.5	432.20	420.32	2.21				2.5						
12-Oct-96	51.5	432.48	420.40	2.21		5.1		2.3	4.4	28.6		35.4		2.26
13-Oct-96	29.5	433.22	420.62	2.21	10.55			6.9						
14-Oct-96	70.5	433.75	420.93	2.21	11.25	5.9	4.67	5.7	5.2	66.0		69.7		2.30
15-Oct-96	0.0	434.76	421.33	2.26	11.94			14.2						
16-Oct-96	7.0	435.12	421.76	2.26		7.8	6.36	6.2	5.1	72.1		75.4		2.35
17-Oct-96	17.0	435.29	422.08	2.26	13.09	8.6		4.0	5.1	59.7		60.1		2.34
18-Oct-96	3.5	436.02	422.71	2.31	11.81		7.68	3.4					36.9	
19-Oct-96	1.0	436.81	423.16	2.31		10.1		2.9	5.1	46.4		51.6		2.38
20-Oct-96	0.0	437.17	423.54	2.31		12.4		2.7	4.9	40.1		48.1		2.38
21-Oct-96	0.0	437.39	423.81	2.31	11.36	13.1	11.13	2.5	5.3	40.1		46.4		2.38
22-Oct-96	0.0	437.48	424.03	2.31		13.7		2.4	5.3	34.4	12.1	43.0		2.37
23-Oct-96	0.0	437.55	424.22	2.36		14.4		2.4	5.3	34.4	12.1	41.5		2.42
24-Oct-96	0.0	437.58	424.38	2.36		14.8		2.1	5.3	34.4	15.5	38.4		2.42
25-Oct-96	0.0	437.55	424.46	2.36		14.8		2.0	5.3	29.8	13.0	43.0	27.9	2.43
26-Oct-96	0.0	437.57	424.55	2.31	10.91	14.8	12.69	1.9	5.3	32.1	12.4	39.9		2.37
27-Oct-96	0.0	437.58	424.60	2.31		14.8		1.9	5.3	30.9	11.6	38.4		2.37
28-Oct-96	0.0	437.45	424.63	2.31		14.8		1.9	5.3	29.8	11.1	35.4	24.0	2.37
29-Oct-96	0.0	437.39	424.63	2.31		15.3		1.9	5.3	28.6	10.7	35.4		2.37
30-Oct-96	0.0	437.34	424.62	2.31		15.3		1.7	5.3	28.6	10.1	35.4		2.37
31-Oct-96	0.0	437.23	424.63	2.31		15.3		1.6	5.3	28.6	9.7	35.4		2.37

Note : Total leak is the sum total of Main Leak, DW2, M1, S4 at right bank and Killekandura at left bank including SMC through the dam foundation.

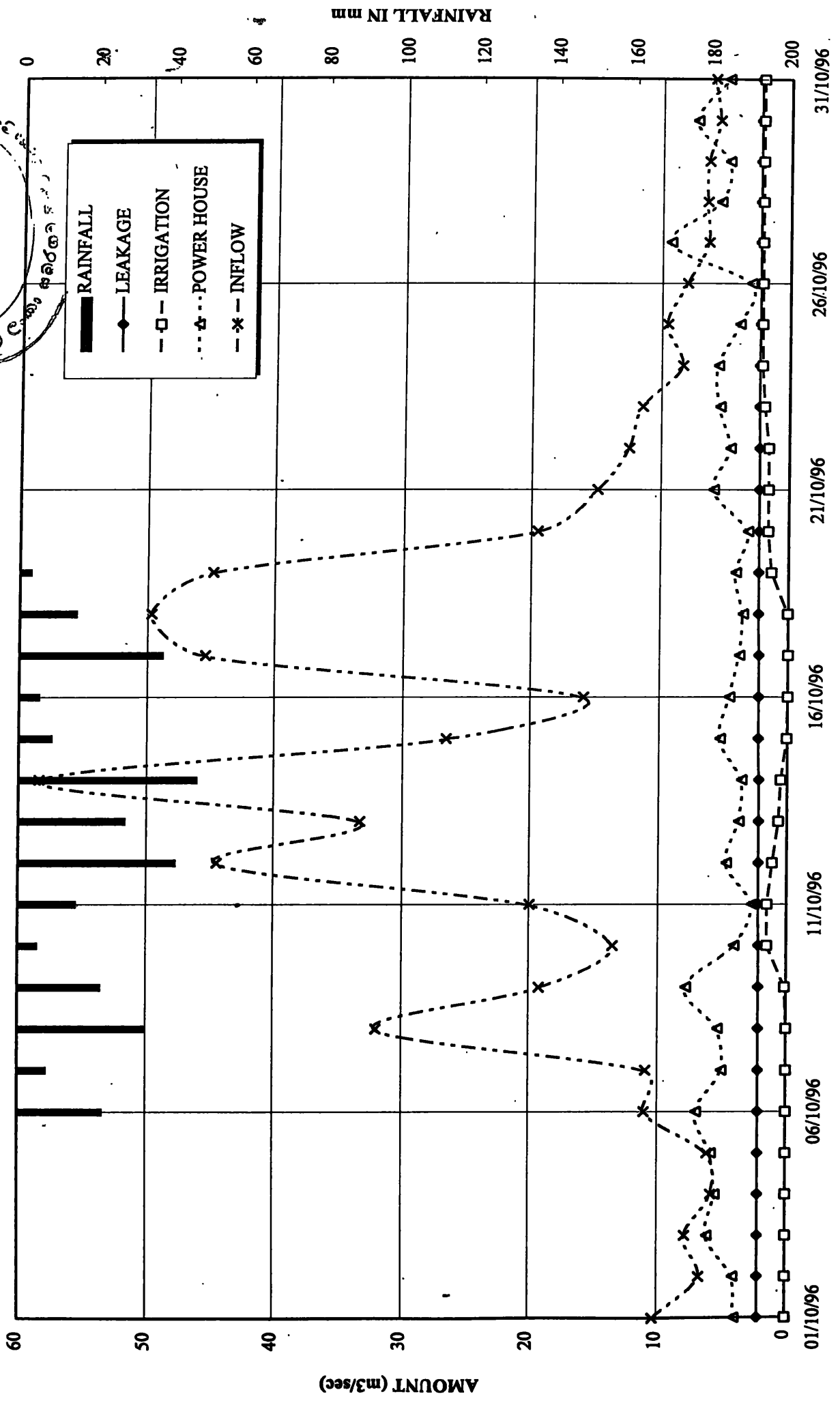
RWL, GWL AND LEAKAGE VARIATION IN OCT '96  
SAMANALAWEWA HEP

17 AUG 2003  
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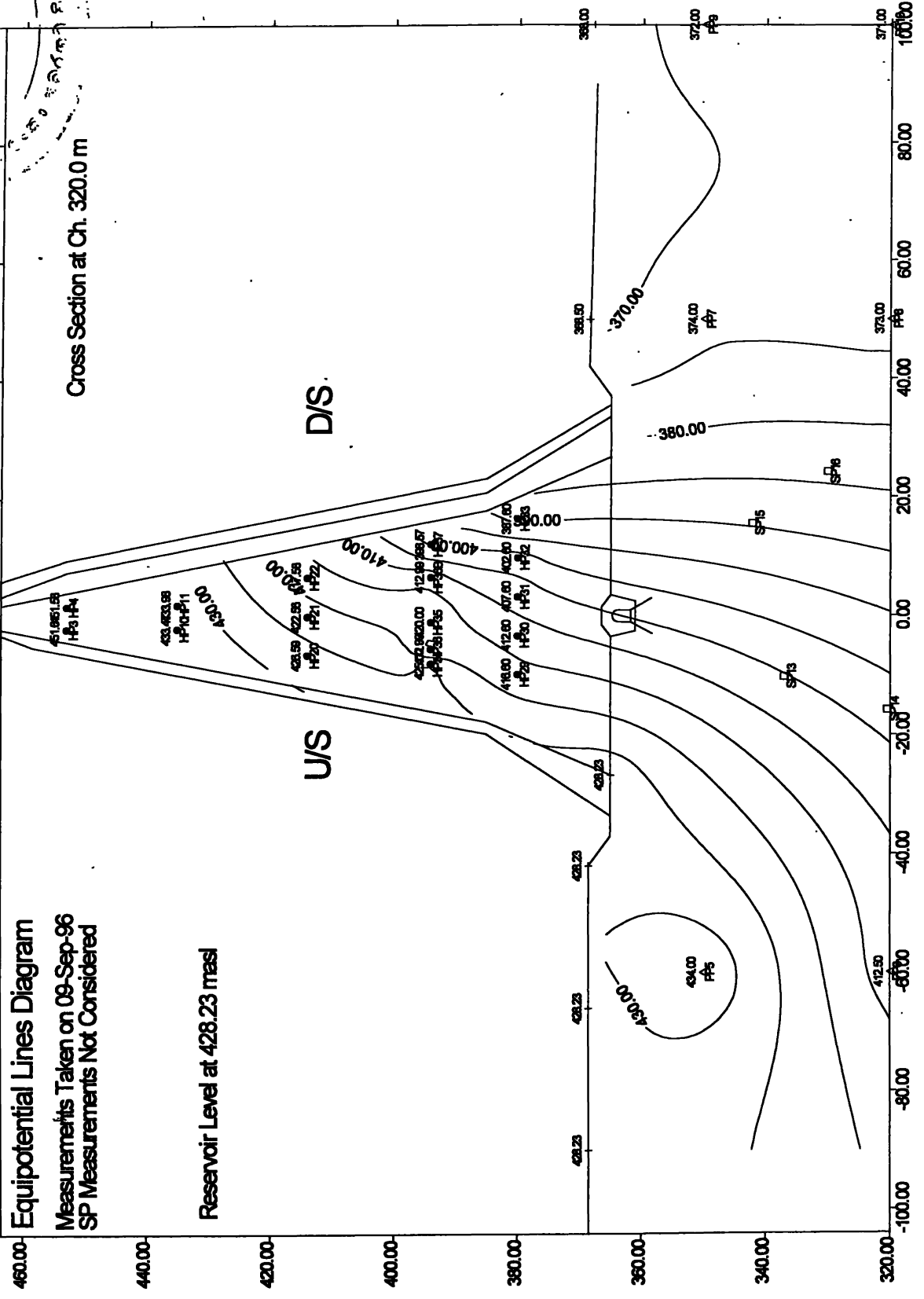
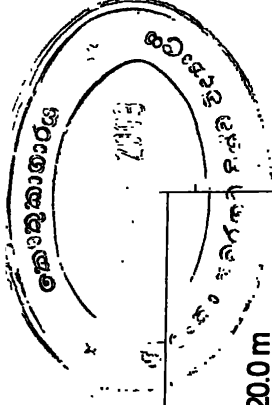
INFLOW AND OUTFLOW DATA  
SAMANALAWEWA HEP

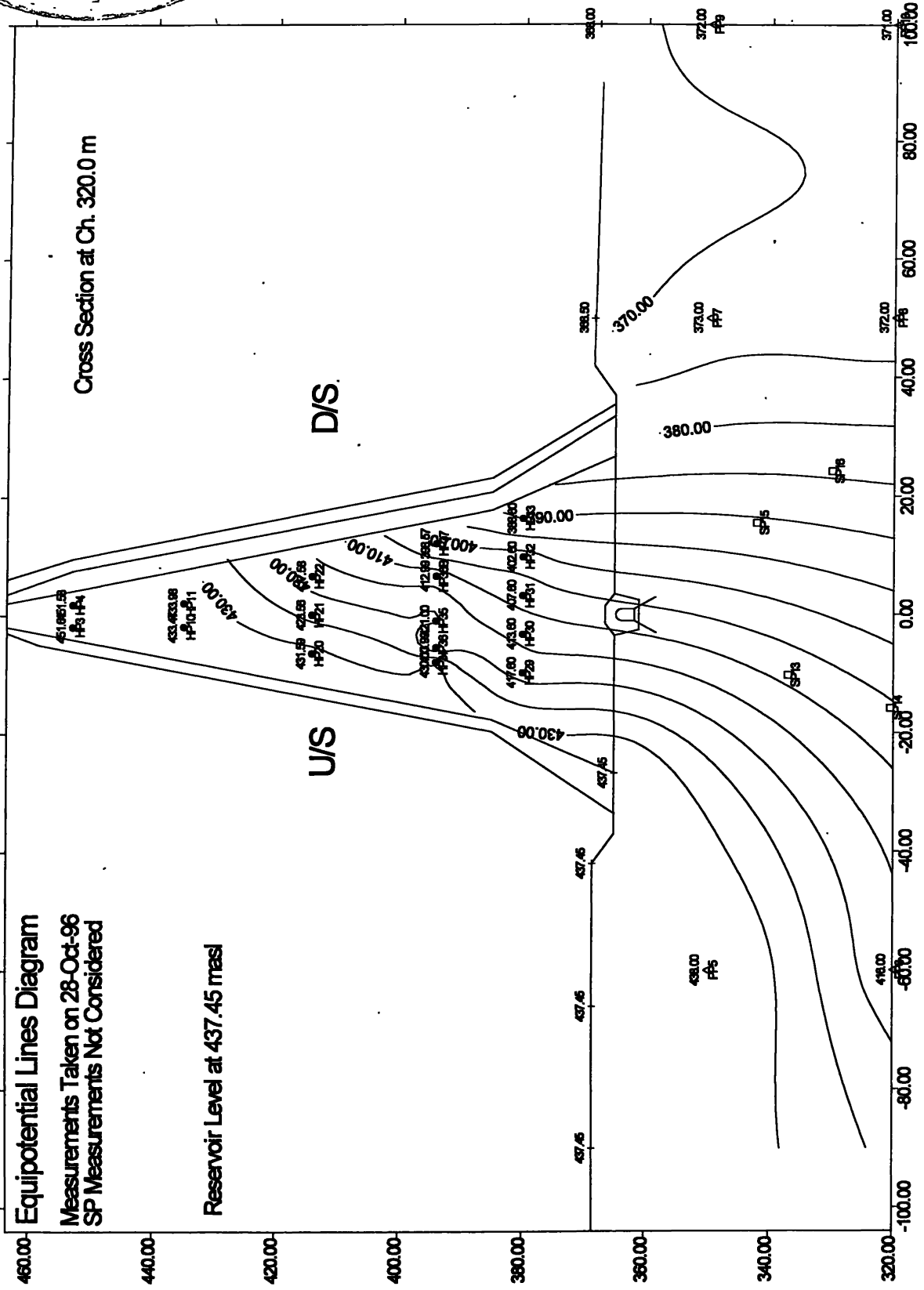
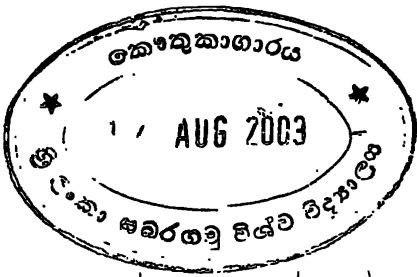


AMOUNT (m³/sec)

DATE



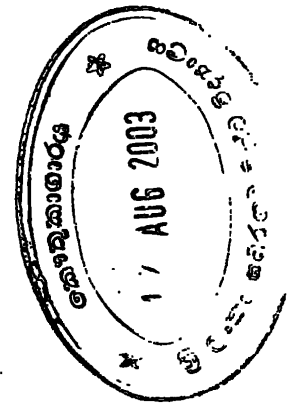




**Pore Pressure Measurements in Dam Foundation (October '96)**

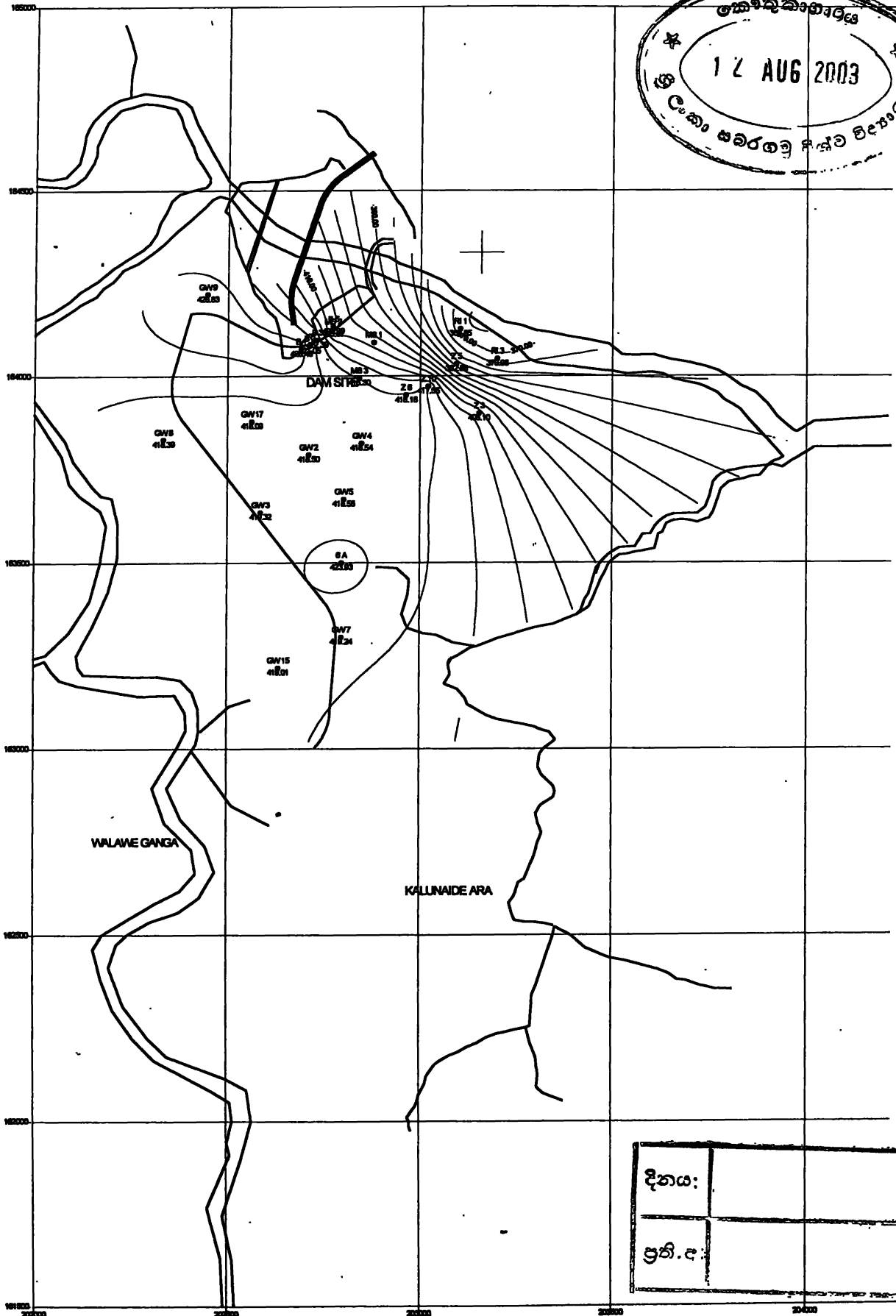
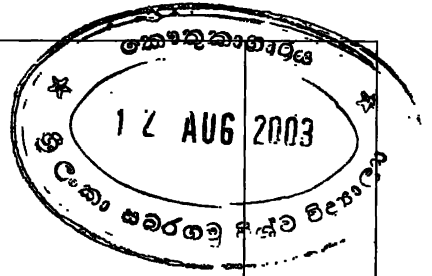
DATE	RWL	CAV-4 EI 401.79, Ch 449.9		PP-5 EI 350, Ch 320		PP-6 EI 320, Ch 320		PP-7 EI 350, Ch 320		PP-8 EI 320, Ch 320		PP-9 EI 350, Ch 320		PP-10 EI 320, Ch 320	
		Pressure (masl)	% of head	Pressure (masl)	% of head	Pressure (masl)	% of head	Pressure (masl)	% of head	Pressure (masl)	% of head	Pressure (masl)	% of head	Pressure (masl)	% of head
02-Oct-96	431.33	404.79	10			372.00	27								
04-Oct-96	431.33	404.79	10			372.00	27								
07-Oct-96	431.29	404.29	8	431.00	100	415.00	85	375.00	31	373.00	48	372.00	27	371.50	46
09-Oct-96	431.89	405.29	12			373.00	28	373.00	28	374.00	29				
11-Oct-96	432.20	405.29	12			374.00	29	374.00	29	373.50	46	372.50	27	371.50	45
14-Oct-96	433.75	405.29	11	432.00	98	414.00	83	373.50	28	372.50	46	372.50	26	372.00	45
16-Oct-96	435.12	405.79	12			373.50	28	373.50	28	373.50	46	372.50	26	372.00	44
19-Oct-96	436.81	405.79	11	438.00	101	417.00	83	375.00	29	373.50	46	372.50	26	372.00	44
21-Oct-96	437.39	406.29	13	438.00	101	417.00	83	375.00	29	373.50	46	372.50	26	372.00	44
23-Oct-96	437.55	406.29	13	438.00	101	415.50	81	374.50	28	373.00	45	372.00	25	371.50	44
25-Oct-96	437.55	406.29	13	428.00	89	416.00	82	373.50	27	373.00	45	372.00	25	370.50	43
28-Oct-96	437.45	406.29	13	438.00	101	416.00	82	373.00	26	372.00	44	372.00	25	371.00	43
30-Oct-96	437.34	406.29	13	438.00	101	416.00	82	373.00	26	372.00	44	372.00	25	371.00	43

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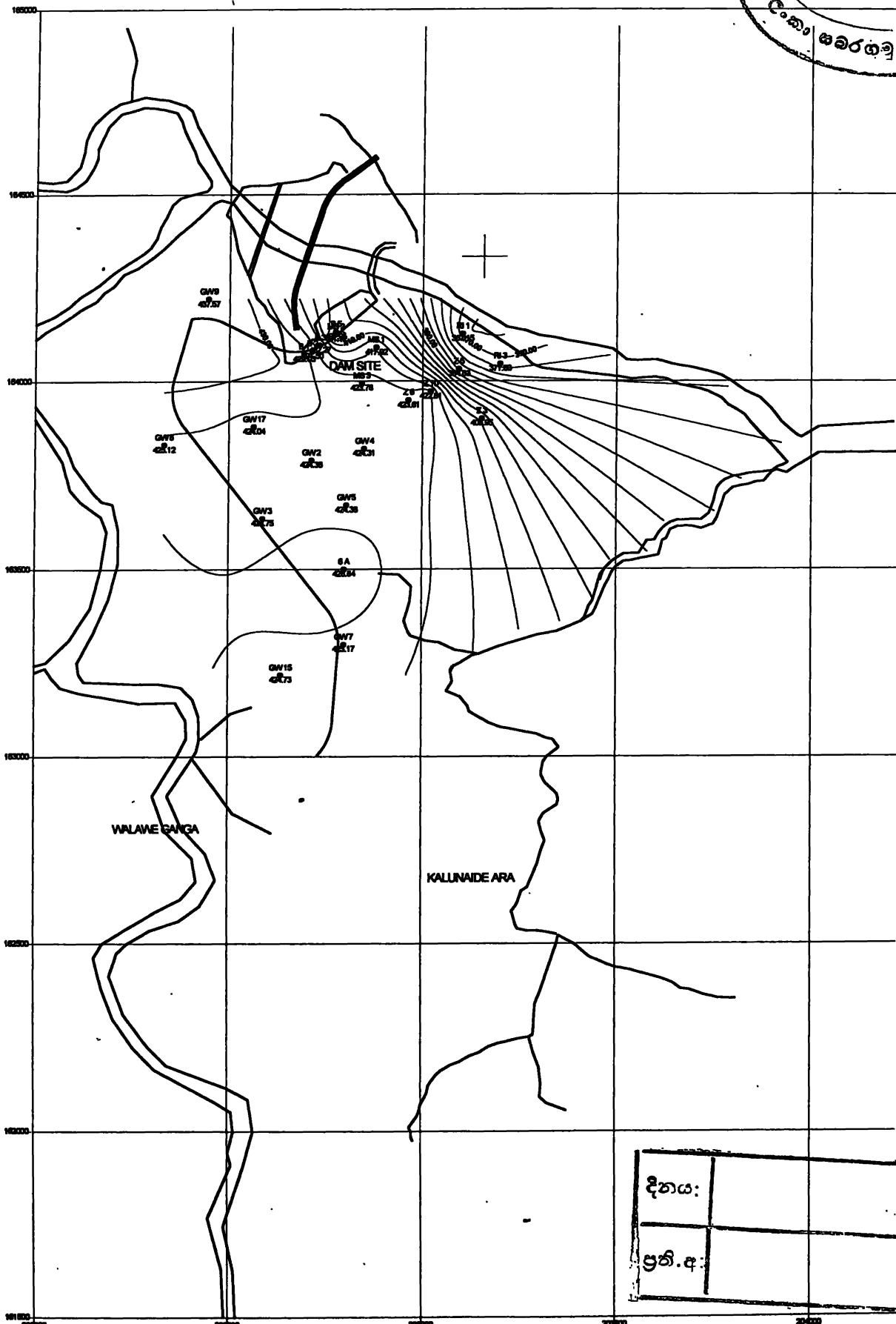
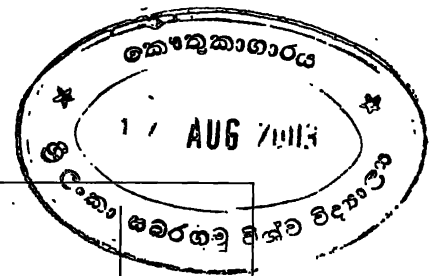
Ground Water Level Contours as on 18 Sep. 1996

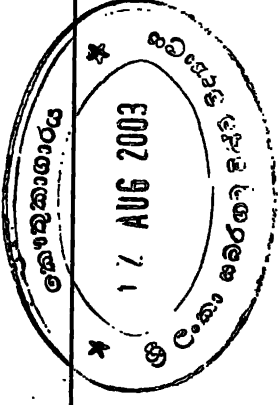
Reservoir Water Level 429.05 masl



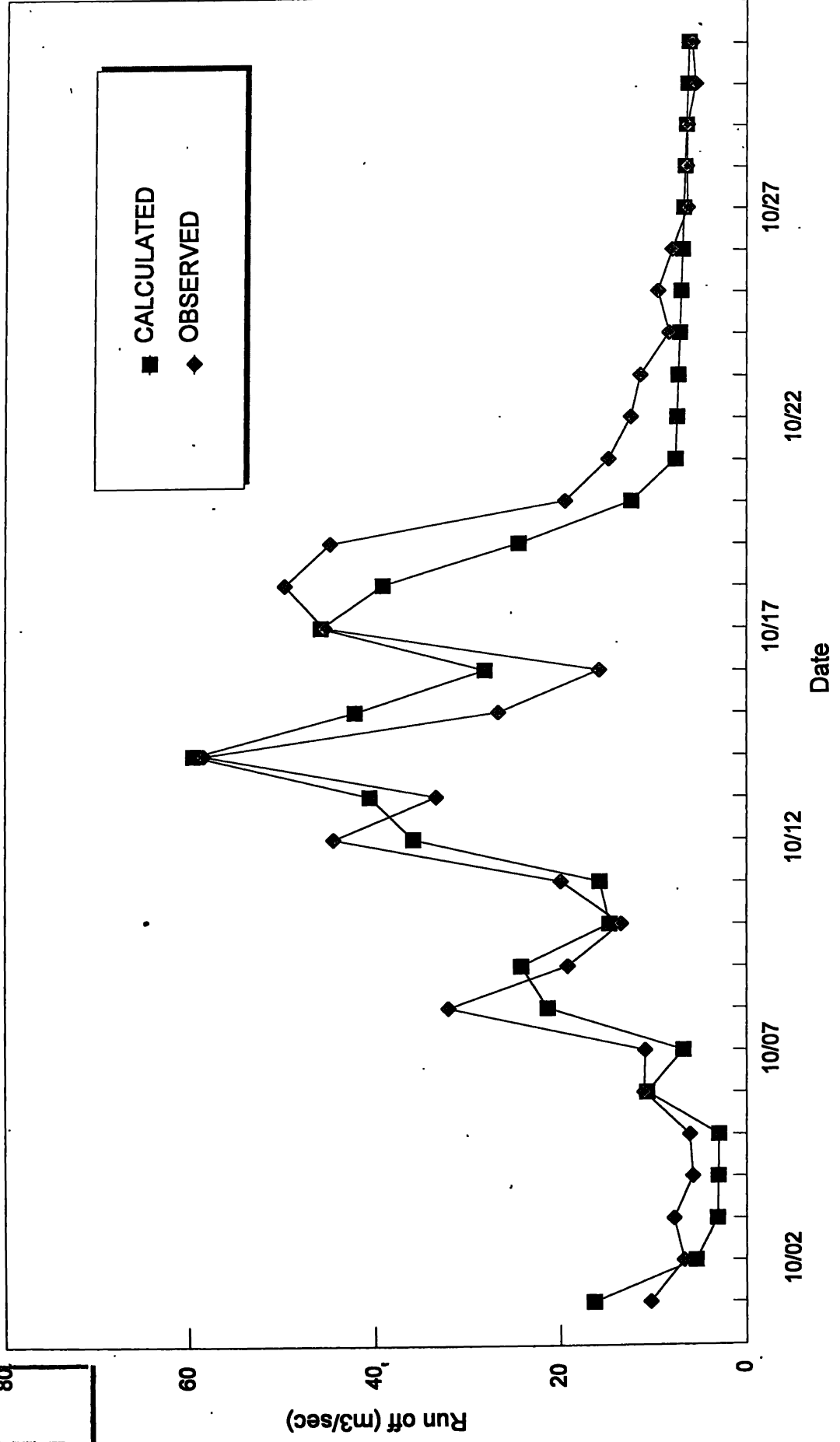
Ground Water Level Contours as on 24 Oct. 1996

Reservoir Water Level 437.58 masl



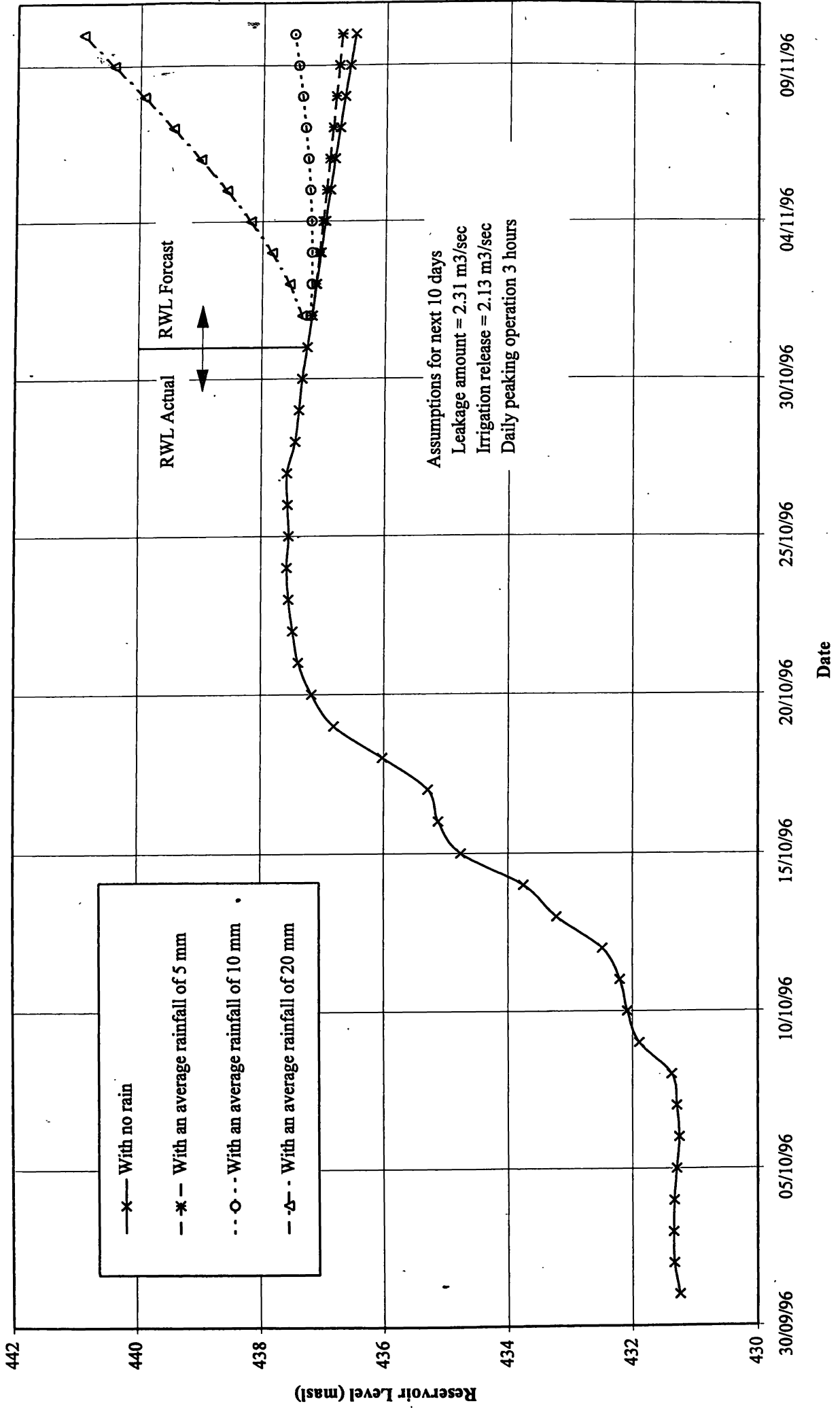


**HBV-MODEL CALIBRATION**  
OBSERVED AND CALCULATED RUNOFF



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Forecast of Reservoir Water Level



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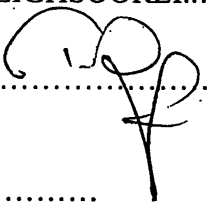
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