

POSTGRADUATE INSTITUTE OF SCIENCE

**UNIVERSITY OF PERADENIYA
PERADENIYA
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Report on

WATER QUALITY EXAMINATION

In the Kandy and Nuwara-Eliya Districts

Submitted to

JICA study Team, NWSDB, Kandy

By

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INTRODUCTION

An agreement was signed between the JICA study team and the Postgraduate Institute of Science, University of Peradeniya in March 1998 for the chemical and biological analysis of water quality of springs, streams, ground water sources, raw sewage, water bodies (rivers and lakes) and sludge. The study area covered the greater Kandy area and the Nuwara Eliya basin. The corresponding collection points are depicted in the attached maps.

Experimental

Samples were collected in cleaned acid washed bottles and sampling was carried out according to accepted methods. Sample preservation depending on the parameter to be analysed was carried out in situ. The general procedures employed for all analytical determinations are those given in "Standard Methods for the Examination of Water and Wastewater" 19th edition (1995) published by the American Public Health Association, Washington, D.C.

The BOD, COD were analysed by standard titrimetric procedures. Cl⁻ & F⁻ were analysed using ion-selective electrodes. Total nitrogen was analysed using the Kjeldhal method and total phosphorus (T-P) using colorimetry (vanadomolybdate method). Cd, Zn and Co were determined using atomic absorption. As was determined by conversion into the hydride and Hg by converting into elemental form by borohydride reduction followed by atomic absorption spectrometry.

Results and Discussion

(I) Raw water quality survey

Results of the raw water quality survey are given in tables 1-6 and the results of the pesticide analysis and their detection limits are given separately in annexure 1. There was total absence of any of the pesticides generally used in Sri Lanka in any of the water quality samples which were investigated.

The conductivity of ground water sources was high compared to those collected from springs from Nuwara-Eliya. This is probably due to high calcium and magnesium salts as indicated by total alkalinity and hardness. The sulphate contents of these samples were also high. Out of the bore hole wells, those at Upper Lake road, Galway forest and golf club had relatively low mineralization. The free ammonia contents of bore holes of Inter-fashion, golf club & brewery were also high which is perhaps due to the high level of fertilizer application in the surrounding areas. There was no significant variation of the water composition for samples collected from springs over a 24h period indicating little human activity except for the sample at the Water field(new) upstream with respect of these samples. There is also no evidence of pesticide contamination for any of these samples (both spring water & bore holes at Nuwara

Eliya). It is also clear that the sample at Water field (new) is contaminated by coliforms indicating human faecal contamination of this source upstream.

It is also clear that the Palladium bore hole water is also highly contaminated as seen in its high bacterial contamination, high iron content, high chloride etc. This is a shallow bore hole present in a highly contaminated area and it is not surprising that its water is highly polluted. The high iron content may arise due to corroding metallic pipes since this bore hole is situated in the heart of the city. Also because of close proximity to septic tanks it exhibits a high level of ammonia. The hill club bore hole has exceptionally high concentrations of minerals as seen from the hardness and conductivity data and the bed rock may be of a dolomitic type.

Survey points and the keys to samples

Raw water quality

KANDY

WQ/K/1 Intake point of Kandy water treatment plant.
WQ/K/2 Polgolla dam intake

NUWARA ELIYA

Surface intakes

WQ/N/ 1 Bambarakele
WQ/N/2 Shanthipura
WQ/N/3 Pedro intake
WQ/N/4 Water field (old)
WQ/N/5 Water field (new)
WQ/N/6 Piyatissapura
WQ/N/7 Brewery falls
WQ/N/8 Gemunupura
WQ/N/9 Lovers leap

Ground water resources

WQ/N/10 Hill club
WQ/N/11 Old bore hole
WQ/N/12 Upper lake road bore hole
WQ/N/13 Galway forest bore hole
WQ/N/14 Interfashion bore hole
WQ/N/15 Palladium bore hole
WQ/N/16 Golf club bore hole
WQ/N/17 Brewery bore hole

2. Sewage quality survey

The location of sample collection and the key to sample numbers are given below:

- Kandy*
- K/1. Middle income house - Domestic sewage
 - K/2. Low income house - Effluent from septic tank
 - K/3. Low income house - Domestic sewage
 - K/4. Hantana scheme - Before treatment
 - K/5. Office sewage - Education office, Kandy
 - K/6. Middle income house - Effluent from septic tank
 - K/7. Hantana scheme - After treatment
 - K/8. NWSDB ***
 - K/9. Hotel with treatment facility - Swiss Hotel Influent
 - K/10. Hotel with treatment facility - Swiss Hotel Effluent
 - K/11. Hotel (without treatment facility) Riverdale grey water
 - K/12. Industrial waste water - Chocolate company
 - K/13. Industrial waste water - Sun match company
 - K/14. Hospital sewage - Peradeniya teaching hospital - Before treatment
 - K/15. Hospital sewage - Peradeniya teaching hospital - After treatment

Notes: Sample 12 could not be collected because the company refused entry to Premises.

Only one sample was collected from point 13 (sun match company) since the effluent is discharged only at 3.00 p.m. from the factory.

- Nuwara-Eliya*
- N/1. Domestic sewage (middle income) **
 - N/2. Domestic sewage (low income) *
 - N/3. Effluent from septic tank (Cey Bank Rest) *
 - N/4. Hotel (with treatment facility) - before treatment (Grand Hotel)
 - N/5. Hotel (with treatment facility) - after treatment (Grand Hotel)
 - N/6. Hotel (without treatment facility)- Cey Bank Rest *
 - N/7. Industrial wastewater - drain (Ceylon Brewery)
 - N/8. Industrial wastewater - effluent after treatment (Ceylon Brewery)
 - N/9. Hospital sewage
 - N/10. Municipality - NuwaraEliya *

* no flow

** adequate amount of sample was available only once

*** No sample was available to be collected

The analytical results are given in tables 7-9. The pH of the sewage samples were generally higher than 7.0 and hence within tolerance limits for disposal. Several had

high sulphate contents (K/7,K/10,K/13,K/14,K/15,N/7,N/10). Among heavy metals, only zinc appears in almost all samples while cadmium is present in the sample K/11 (riverdale grey water) and K/13 (Sun match company). Zinc probably originates in the galvanised tubing used in most sewage disposal systems.

The bacterial and E.Coli counts for samples N/7 and N/8 are low for a sewage sample since these two samples are from the Brewery (before and after treatment). The relatively low values of bacterial counts observed from hospital sewage may be due to the extensive use of disinfectants at the hospital.

The sample 3.1 showing very high values for COD,SS and TDS is owing to the fact that this particular sample when collected had a lot of suspended solids (taken early morning from the slums area housing scheme). This is the time that the cattle-sheds are washed and the water is highly turbid contaminated with the excreta and cow-dung. The other two samples had less of all these parameters since only routine washing of dishes was involved at other times when the samples were collected.

3. River water quality

The locations of sample collection and the keys to sample numbers is given below.

Kandy:	RWQ/K/1	Gangawata Korale- near University Gymnasium
	RWQ/K/2	Intake point of Kandy water treatment plant
	RWQ/K/3	Katugastota district (Pinga oya near meda-ela bridge)
	RWQ/K/4	Polgolla dam site intake
	RWQ/K/5	Stream near Polgolla University
	RWQ/K/6	Kundasale intake
	RWQ/K/7	Meda Ela
Nuwara-Eliya	RWQ/N/1	Upstream of city's borders
	RWQ/N/2	Victoria park
	RWQ/N/3	Influent point to Gregory lake
	RWQ/N/4	Upstream of Hospital and Brewery
	RWQ/N/5	Influent point to Barrack's plain reservoir

The analytical data for samples are given in tables 10-11. These samples show increased contamination with the time of the day they were collected. The samples collected very early in the morning showed high DO, lower BOD & COD and total coliforms. The samples taken from Meda Ela which is a highly polluted canal show increased nitrate, sulphate, coliforms, suspended solids, etc. Dissolved oxygen was also very low for these samples.

Those samples collected from Nuwara Eliya were highly contaminated compared to Kandy samples. In particular, those samples collected at the influx point to Barracks

Plain reservoir had zero dissolved oxygen with relatively high pH values. Also RWQ/N/4 and RWQ/N/5 showed high suspended and dissolved solids, high total nitrogen and high BOD values. These samples also had high COD values indicating increased contamination from organic wastes. This can be easily explained since sewage from the hospital, factories and even households are directly added to the stream feeding the Barracks Plain reservoir. There is also intensive agricultural activities and a lot of houses dumping septic tank wastes direct into this stream which explains the abnormal values for COD, SS, TDS and chloride for sample N/4.1. However apart from zinc which probably originate from rusting galvanized iron, heavy metal contamination is virtually non-existent.

Out of the Kandy samples RWQ/K/3 and RWQ/K/7 are those collected from Pinga-Oya and Meda-Ela and these are highly polluted streams specially during the dry season and this is seen from their high level of contamination. The sample collected from a stream near Polgolla (RWQ/K/5) was also highly polluted and being the dry season did not show any appreciable flow. This again is reflected in the analytical data with high total nitrogen, chloride and BOD.

4. Lake water quality

The location from where samples were collected and the key to samples is given below.

Kandy:	LWQ/K/1	Kandy lake near Mahamaya college
	LWQ/K/2	Kandy lake near lakefront hotel
Nuwara-Eliya	LWQ/N/1	Gregory lake (near playground)
	LWQ/N/2	Gregory lake (middle of the lake)
	LWQ/N/3	Barrack Plains Reservoir (middle)
	LWQ/K/4	Barrack Plains Reservoir (end)

The analytical data are given in table 12.

The Kandy lake is relatively unpolluted compared to Nuwara Eliya lake system. However, the total dissolved solids of the Kandy lake samples was relatively high. However Kandy lake had more electrolytes dissolved in it and clearer water (less suspended solids). Samples numbers LWQ/N/4.1 to 4.3 show high BOD and virtually no dissolved oxygen and these are the samples taken from the Barrack's plains which is extremely highly polluted. At the time of sample collection it could be hardly called a lake since no water was visible from a distance. Samples were collected under the vegetation at several places perhaps owing to the prevailing drought at that time.

5. Sludge quality survey

Samples were collected from both Kandy and Nuwara-Eliya. However there were problems collecting samples for this analysis as planned in the schedule of work since septic pits are either permanently sealed or the sludge from septic tanks is regularly cleaned by the municipalities.

The samples points and the key to samples is given below:

<i>Kandy</i>	SQ/K/1	Hantana Housing scheme treatment plant
	SQ/K/2	Suisse Hotel
	SQ/K/3	Sun Match company
<i>Nuwara Eliya</i>	SQ/N/1	Ceylon brewery
	SQ/N/2	Grand Hotel

The analytical results are given in table 13. In certain cases the sludge was fairly dry and in others mostly wet. Also, the sludge collected from the Brewery is contaminated with silica used in the sand filters since the sludge is disposed along with the silica used in the filter. This may account for the fact that there is significant non-organic matter in the analytical data. The same is true for Hantana housing scheme sludge where sludge is inevitably contaminated with sand or soil. The type of sludge from the sun match factory is mainly of the inorganic raw materials used for the match manufacturing process and is has very little organic matter. One notable feature is the presence of Zn as a heavy metal in all these samples. Perhaps this originates from the galvanised piping used in plumbing etc. The high phosphate content may be a reflection of the increased use of detergents specially in the hotel industry.

Water Quality
Sample points:

Kandy
WQ/K/1. Kandy water treatment plant (Getambe)
WQ/K/3. Polgolla dam

Nuwara-Eliya

Surface intakes:

WQ/N/1. Bambarakele
WQ/N/2. Shanthipura
WQ/N/3. Pedru intake
WQ/N/4. Water field - old
WQ/N/5. Water field - new
WQ/N/6. Piyatissapura
WQ/N/7. Brewery falls
WQ/N/8. Gemunupura
WQ/N/9. Lovers leap

Ground water resources:

WQ/N/10. Hill Club
WQ/N/11. Old bore hole
WQ/N/12. Upper Lake Road
WQ/N/13. Galway Forest bore hole
WQ/N/14. Interfashion
WQ/N/15. Palladium bore hole
WQ/N/16. Golf Club bore hole
WQ/N/17. Brewery bore hole

Table 1. Raw Water Quality Data (Kandy district)

Units employed : Temperature- °C, COD,BOD,SS,TDS(mg/l), free ammonia,Cl⁻,NO₃⁻,NO₂⁻,PO₄³⁻,SO₄²⁻, Cu,Mn,Pb,Hg,Cr,Fe,As,Cd,Zn,Co - ppm
Total hardness and alkalinity (mg/l), Conductivity µs cm⁻¹, Coliform Total at 35°C/100ml, *E.Coli* at 44°C/100ml

SAMPLE	Turbidity NTU	pH	Cond. µs/cm	TDS	Cl ⁻	Total Alkali mity	Free NH ₃	NO ₃ ⁻	NO ₂ ⁻	F	PO ₄ ³⁻	Total Hardne ss	SO ₄ ²⁻	Total coliform	<i>E.Coli</i>
WQ/K/1.1	8.2	6.2	61.4	22	4.2	24.8	Nil	1.28	0.02	0.04	0.80	23.3	3.31	280**	170**
WQ/K/1.2	46.3	7.0	69.3	40	7.4	24.2	Nil	1.28	0.01	0.20	1.10	25.2	3.41	800**	150**
WQ/K/1.3	4.4	7.0	81.7	35	4.6	32.7	Nil	2.38	0.03	0.05	0.38	31.0	1.13	100**	70**
WQ/K/1.4	5.0	6.8	80.0	44	7.8	36.3	Nil	2.80	Nil	0.10	0.47	32.9	2.98	>1000*	200*
WQ/K/1.5	4.4	7.1	74.1	54	5.0	36.3	Nil	2.61	Nil	0.05	0.32	27.2	2.53	400**	150**
WQ/K/1.6	31.0	7.5	75.1	74	5.6	29.1	Nil	2.91	Nil	0.17	0.52	29.1	2.68	>1000**	>1000**
WQ/K/1.7	4.9	6.5	75.1	81	5.4	39.3	Nil	3.02	0.24	0.05	0.93	38.8	2.31	400**	20**
WQ/K/1.8	5.6	6.5	70.4	87	7.6	27.8	0.20	2.16	0.27	0.11	0.83	27.2	2.53	400**	150**
WQ/K/2.1	20.9	6.6	66.7	13	5.0	26.6	Nil	1.52	0.01	0.05	1.00	25.2	2.50	180**	40**
WQ/K/2.2	6.5	6.8	73.8	50	7.9	23.6	0.02	2.14	0.01	0.12	0.75	23.3	2.31	960**	340**
WQ/K/2.3	3.8	6.5	84.5	55	7.4	35.1	Nil	5.05	0.01	0.04	0.81	31.0	2.68	250**	40**
WQ/K/2.4	2.7	6.6	69.6	51	7.4	38.1	Nil	2.67	Nil	0.07	0.81	31.0	1.21	600**	120**
WQ/K/2.5	14.8	8.2	71.8	51	9.3	30.3	Nil	3.97	Nil	0.05	0.86	36.9	2.34	960**	340**
WQ/K/2.6	50.0	7.0	76.8	56	6.5	29.1	Nil	2.50	Nil	0.05	0.64	27.2	2.41	160**	100**
WQ/K/2.7	22.4	7.5	59.8	80	6.7	39.9	0.03	4.17	0.96	0.06	0.91	38.8	2.58	180**	40**
WQ/K/2.8	4.5	6.8	77.8	73	8.4	28.4	0.19	2.09	0.27	0.04	0.85	27.2	2.67	200**	40**

* per 10 ml

** per 100ml

Table 2. Raw Water quality (Kandy district) heavy metals and cyanides (mol/l)

SAMPLE	Cu	Mn	As	Cd	Pb	Hg	Cr	Total iron	CN ⁻
WQ/K/1.1	Nil	0.06	Nil	Nil	Nil	Nil	Nil	0.5	< 10 ⁻⁴
WQ/K/1.2	Nil	0.10	Nil	Nil	Nil	Nil	Nil	0.5	< 10 ⁻⁴
WQ/K/1.3	Nil	0.10	Nil	Nil	Nil	Nil	Nil	0.4	< 10 ⁻⁴
WQ/K/1.4	Nil	0.11	Nil	Nil	Nil	Nil	Nil	0.4	< 10 ⁻⁴
WQ/K/1.5	Nil	0.06	Nil	Nil	Nil	Nil	Nil	0.4	< 10 ⁻⁴
WQ/K/1.6	Nil	0.22	Nil	Nil	Nil	Nil	Nil	0.6	< 10 ⁻⁴
WQ/K/1.7	Nil	0.13	Nil	Nil	Nil	Nil	Nil	0.4	< 10 ⁻⁴
WQ/K/1.8	Nil	0.12	Nil	Nil	Nil	Nil	Nil	0.5	< 10 ⁻⁴
WQ/K/2.1	Nil	0.06	Nil	Nil	Nil	Nil	Nil	0.6	< 10 ⁻⁴
WQ/K/2.2	Nil	0.10	Nil	Nil	Nil	Nil	Nil	0.6	< 10 ⁻⁴
WQ/K/2.3	Nil	0.06	Nil	Nil	Nil	Nil	Nil	0.2	< 10 ⁻⁴
WQ/K/2.4	Nil	0.07	Nil	Nil	Nil	Nil	Nil	0.2	< 10 ⁻⁴
WQ/K/2.5	Nil	0.09	Nil	Nil	Nil	Nil	Nil	0.5	< 10 ⁻⁴
WQ/K/2.6	Nil	0.07	Nil	Nil	Nil	Nil	Nil	1.0	< 10 ⁻⁴
WQ/K/2.7	Nil	0.25	Nil	Nil	Nil	Nil	Nil	1.0	< 10 ⁻⁴
WQ/K/2.8	Nil	0.20	Nil	Nil	Nil	Nil	Nil	0.7	< 10 ⁻⁸

Table 3. Raw Water Quality (Nuwara-Eliya district) Ground water sources

SAMPLE	Turbidity	pH	Cond	TDS	Cl ⁻	Tot alkali mity	Free NH ₃	NO ₃ ⁻	NO ₂ ⁻	F ⁻	PO ₄ ³⁻	Total Hardne ss	SO ₄ ²⁻	CN ⁻	Total Colifor m	E. coli
WQ/N/1.1	2.06	7.3	18.8	16	0.76	9.1	Nil	0.26	0.05	0.03	0.89	5.8	0.75	<10 ⁻⁴	44	28
WQ/N/1.2	2.36	6.1	12.8	15	1.98	7.3	Nil	0.48	Nil	0.03	0.57	5.8	0.06	<10 ⁻⁴	10	Nil
WQ/N/2.1	8.20	6.6	17.6	12	0.79	3.0	Nil	2.11	0.05	0.03	1.31	5.8	1.38	<10 ⁻⁴	60	04
WQ/N/2.2	0.72	6.6	15.0	10	1.04	4.8	Nil	2.36	0.05	0.03	0.85	4.6	0.01	<10 ⁻⁴	60	Nil
WQ/N/3.1	0.65	6.7	17.5	13	1.14	7.3	Nil	0.57	0.05	0.03	0.82	4.9	0.63	<10 ⁻⁴	40	12
WQ/N/3.2	1.87	6.8	17.1	12	0.91	7.3	Nil	0.44	0.05	0.03	0.60	5.8	0.31	<10 ⁻⁴	100	20
WQ/N/4.1	1.18	7.2	18.1	14	1.10	7.9	Nil	0.21	0.05	0.03	0.55	3.9	0.88	<10 ⁻⁴	60	Nil
WQ/N/4.2	0.52	6.1	16.6	12	1.02	7.9	Nil	0.14	0.05	0.03	1.28	5.8	Nil	<10 ⁻⁴	80	Nil
WQ/N/5.1	1.43	7.2	17.6	10	1.41	7.3	Nil	2.28	0.05	0.03	0.54	3.9	0.60	<10 ⁻⁴	>1000	>1000
WQ/N/5.2	1.21	7.7	12.6	11	1.31	7.5	0.21	0.58	0.05	0.03	1.16	4.5	0.48	<10 ⁻⁴	80	Nil
WQ/N/6.1	0.56	7.8	13.7	10	1.20	7.9	Nil	0.17	0.05	0.03	0.85	5.8	0.01	<10 ⁻⁴	40	Nil
WQ/N/6.2	2.10	5.0	15.9	12	1.31	8.5	0.28	0.63	Nil	0.05	0.93	5.9	Nil	<10 ⁻⁴	60	Nil
WQ/N/7.1	2.43	6.4	20.6	17	1.20	7.3	Nil	2.45	0.05	0.03	0.84	7.8	0.63	<10 ⁻⁴	700	320
WQ/N/7.2	1.83	4.5	17.1	11	2.15	9.1	0.28	1.02	Nil	0.03	0.90	8.7	0.04	<10 ⁻⁴	600	280
WQ/N/8.1	1.09	7.2	13.6	8	2.95	7.3	Nil	0.43	0.05	0.03	0.65	4.9	0.56	<10 ⁻⁴	800	40
WQ/N/8.2	1.50	4.6	14.2	6	2.13	7.9	0.54	0.54	Nil	0.03	0.73	6.8	0.09	<10 ⁻⁴	100	Nil
WQ/N/9.1	0.47	6.6	14.5	8	1.09	6.1	Nil	0.37	0.05	0.03	1.21	4.9	0.31	<10 ⁻⁴	400	30
WQ/N/9.2	1.20	5.5	17.3	6	1.51	7.9	0.35	1.21	Nil	0.03	1.43	6.8	0.57	<10 ⁻⁴	140	Nil
WQ/N/10.1	0.83	7.5	222.0	119	1.20	138.0	0.02	1.27	0.05	0.07	0.57	107.0	4.06	<10 ⁻⁴	12	06
WQ/N/10.2	0.89	7.3	222.0	120	3.30	132.0	Nil	3.31	Nil	0.09	0.45	111.0	1.68	<10 ⁻⁴	06	Nil
WQ/N/10.3	7.00	5.2	220.0	122	2.50	137.0	0.27	3.18	Nil	0.05	0.53	108.0	3.21	<10 ⁻⁴	02	Nil

Table 4. Raw Water Quality (Nuwara-Eliya district) Ground water sources-heavy metals

SAMPLE	Cu	Cr	Mn	Hg	As	Cd	Pb	Total iron
WQ/N/1.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/1.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/2.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/2.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/3.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/3.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.2
WQ/N/4.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/4.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/5.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/5.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/6.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/6.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.3
WQ/N/7.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/7.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.2
WQ/N/8.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/8.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/9.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/9.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.5
WQ/N/10.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	1.0
WQ/N/10.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	1.0
WQ/N/10.3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	1.0

Table 5. Raw Water Quality (Nuwara-Eliya district) bore holes

SAMPLE	Turbidity	pH	Cond	TDS	Cl ⁻	Total Alkalinity	Free NH ₃	NO ₃ ⁻	NO ₂ ⁻	F	PO ₄ ³⁻	Tot hard ness	SO ₄ ²⁻	CN ⁻	Total Coli form	E. coli
WQ/N/11.1	0.42	7.8	270.0	142	1.30	169.0	Nil	0.59	0.05	0.10	1.31	136.0	2.13	<10 ⁻⁴	10	04
WQ/N/11.2	0.41	7.7	260.0	136	1.60	163.0	0.08	1.55	0.05	0.07	1.25	136.0	0.78	<10 ⁻⁴	Nil	Nil
WQ/N/11.3	2.01	7.2	262.0	139	2.80	162.0	Nil	1.99	0.06	0.07	1.31	132.0	2.18	<10 ⁻⁴	Nil	Nil
WQ/N/12.1	0.45	6.5	134.0	81	1.90	58.0	Nil	2.00	0.05	0.10	0.73	49.0	2.13	<10 ⁻⁴	Nil	Nil
WQ/N/12.2	0.47	6.8	111.0	74	2.40	54.0	Nil	2.21	0.05	0.04	0.75	49.0	1.88	<10 ⁻⁴	Nil	Nil
WQ/N/12.3	0.67	6.1	108.0	44	3.30	54.0	Nil	3.75	Nil	0.04	0.91	47.0	1.86	<10 ⁻⁴	Nil	Nil
WQ/N/13.1	0.81	5.1	142.0	121	21.38	5.5	Nil	5.39	0.02	0.06	0.94	46.0	20.13	<10 ⁻⁴	Nil	Nil
WQ/N/13.2	0.36	5.0	151.0	128	22.90	10.3	0.26	7.08	0.05	0.07	0.68	50.0	1.63	<10 ⁻⁴	Nil	Nil
WQ/N/13.3	0.71	6.2	151.0	120	30.90	7.3	Nil	5.04	Nil	0.12	0.94	47.0	4.78	<10 ⁻⁴	Nil	Nil
WQ/N/14.1	3.68	6.9	250.0	72	1.99	151.0	Nil	0.76	0.04	0.13	1.70	138.0	0.13	<10 ⁻⁴	Nil	Nil
WQ/N/14.2	1.28	5.8	134.0	86	3.20	30.5	2.69	2.69	0.04	0.09	0.41	124.2	0.07	<10 ⁻⁴	Nil	Nil
WQ/N/14.3	3.30	4.3	254.0	146	2.75	154.0	2.17	2.17	Nil	0.08	0.58	135.8	3.72	<10 ⁻⁴	140	Nil
WQ/N/15.1	5.30	5.6	142.0	87	143.00	43.6	0.05	0.56	Nil	0.05	0.08	162.4	0.32	<10 ⁻⁴	200	80
WQ/N/15.2	25.70	5.2	138.0	83	144.54	30.3	5.49	0.16	Nil	0.05	0.17	205.6	11.14	<10 ⁻⁴	>1000	>1000
WQ/N/15.3	5.80	6.2	143.0	90	155.24	37.8	4.16	0.17	0.26	0.05	0.23	194.0	0.98	<10 ⁻⁴	>1000	>1000
WQ/N/16.1	1.20	7.3	110.0	21	1.58	8.5	Nil	1.78	Nil	0.03	0.27	Nil	0.60	<10 ⁻⁴	Nil	Nil
WQ/N/16.2	1.20	4.8	65.1	18	8.12	12.7	2.39	4.49	Nil	0.03	0.37	6.79	2.46	<10 ⁻⁴	Nil	Nil
WQ/N/17.1	2.30	4.7	220.0	165	3.98	122.84	5.03	5.03	Nil	0.05	0.38	110.5	2.68	<10 ⁻⁴	16	Nil

Table 6. Raw Water Quality (Nuwara-Eliya district) Bore holes - heavy metals

SAMPLE	Cu	Cd	Cr	Mn	Hg	As	Pb	Total iron
WQ/N/11.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.2
WQ/N/11.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/11.3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/12.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.2
WQ/N/12.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
WQ/N/12.3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.3
WQ/N/13.1	Nil	Nil	Nil	0.20	Nil	Nil	Nil	0.2
WQ/N/13.2	Nil	Nil	Nil	0.22	Nil	Nil	Nil	Nil
WQ/N/13.3	Nil	Nil	Nil	0.24	Nil	Nil	Nil	0.2
WQ/N/14.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.2
WQ/N/14.2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.1
WQ/N/14.3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.3
WQ/N/15.1	Nil	Nil	Nil	0.17	Nil	Nil	Nil	1.5
WQ/N/15.2	Nil	Nil	Nil	0.22	Nil	Nil	Nil	1.8
WQ/N/15.3	Nil	Nil	Nil	0.20	Nil	Nil	Nil	1.7
WQ/N/16.1	Nil	Nil	Nil	0.10	Nil	Nil	Nil	Nil
WQ/N/16.2	Nil	Nil	Nil	0.13	Nil	Nil	Nil	Nil
WQ/N/17.1	Nil	Nil	Nil	0.06	Nil	Nil	Nil	0.5

2.3.2 Sewage quality

Sample points:

Kandy

- K/1. Middle income house - Domestic sewage
- K/2. Low income house - Effluent from septic tank
- K/3. Low income house - Domestic sewage
- K/4. Hantana scheme - Before treatment
- K/5. Office sewage - Education office, Kandy
- K/6. Middle income house - Effluent from septic tank
- K/7. Hantana scheme - After treatment
- K/8. NWSDB ***
- K/9. Hotel with treatment facility - Swiss Hotel Influent
- K/10. Hotel with treatment facility - Swiss Hotel Effluent
- K/11. Hotel (without treatment facility) Riverdale grey water
- ~~K/12. Industrial waste water - Chocolate company~~
- K 12. Industrial waste water - Sun match company
- K 13. Hospital sewage - Peradeniya teaching hospital - Before treatment
- K 14. Hospital sewage - Peradeniya teaching hospital - After treatment

Notes: Sample 12 could not be collected because the company refused entry to premises
Only one sample was collected from point 13 (sun match company)

Nuwara-Eliya

- N/1. Domestic sewage (middle income) **
- N/2. Domestic sewage (low income) *
- N/3. Effluent from septic tank (Cey Bank Rest) *
- N/4. Hotel (with treatment facility) - before treatment (Grand Hotel)
- N/5. Hotel (with treatment facility) - after treatment (Grand Hotel)
- N/6. Hotel (without treatment facility) - Cey Bank Rest *
- N/7. Industrial wastewater - drain (Ceylon Brewery)
- N/8. Industrial wastewater - effluent after treatment (Ceylon Brewery)
- N/9. Hospital sewage
- N/10. Municipality - NuwaraEliya *

* no flow

** adequate amount of sample was available only once

Table 7. Sewage Quality Survey (Kandy district)

Sample	T air	T sewage	pH	BOD	COD	SS	TDS	Cl ⁻	SO ₄ ²⁻	T-N	T-P	Total coliform	<i>E. coli</i>	As	Cd	Zn	Co
Sewage																	
K/1.1	28.3	27.4	7.2	172.7	244	159	127	32	3.5	80	1.63	>1000	>1000	Nil	Nil	0.16	Nil
K/1.2	29.5	28.1	7.7	70.2	52	195	98	38	13.2	40	1.31	>1000	>1000	Nil	Nil	0.18	Nil
K/1.3	31.3	28.5	6.9	230.2	262.9	179	90	37	5.4	103	1.37	>1000	>1000	Nil	Nil	0.20	Nil
K/2.1	28.5	27.5	6.6	67.7	64	102	125	46	13.8	85	1.02	>1000*	>1000*	Nil	Nil	0.20	Nil
K/2.2	27.5	28.0	7.0	35.2	72	136	162	84	14.6	92	1.03	>1000*	>1000*	Nil	Nil	0.17	Nil
K/2.3	27.0	27.5	6.7	35.2	48	116	68	18	14.9	109	1.17	>1000*	>1000*	Nil	Nil	0.18	Nil
K/3.1	31.0	28.0	10.0	318	3288	1578	2584	117	24.83	529	1.03	>1000	>1000	Nil	Nil	0.06	0.2
K/3.2	29.5	30.0	9.0	127	360	172	220	151	2.78	144	1.13	600	200	Nil	Nil	0.02	0.3
K/3.3	31.0	28.5	7.4	17.7	256	522	329	201	34.81	187	1.05	700	80	Nil	Nil	0.15	0.2
K/4.1	31.5	29.5	8.4	90.2	160	101	229	117	0.98	55	1.23	>1000*	>1000*	Nil	Nil	0.05	Nil
K/4.2	31.2	29.6	8.7	120.3	384	184	352	199	0.03	61	1.35	>1000*	>1000*	Nil	Nil	0.03	Nil
K/4.3	29.5	27.5	7.8	70.2	184	188	300	158	0.65	63	1.41	>1000*	>1000*	Nil	Nil	0.05	Nil
K/5.1	30.0	28.5	6.4	50.2	130	120	172	58	13.20	57	0.98	>1000	>1000	Nil	Nil	0.12	Nil
K/5.2	31.5	29.5	7.4	65.2	182	123	158	125	18.40	112	0.83	>1000	>1000	Nil	Nil	0.05	0.01
K/5.3	32.0	29.0	7.6	85.2	126	119	171	48	4.60	73	0.88	>1000	>1000	Nil	Nil	0.10	Nil
K/6.1	28.5	27.0	7.1	240.2	1736	5804	568	41	10.00	323	0.93	>1000*	>1000*	Nil	0.05	4.20	Nil
K/6.2	27.5	28.0	7.2	202.7	1804	4276	480	45	10.90	283	0.98	>1000*	>1000*	Nil	0.04	4.60	Nil
K/6.3	27.0	27.0	7.3	120.2	535	990	510	39	12.80	245	1.31	>1000*	>1000*	Nil	0.04	4.50	Nil

* per 10 ml

Table 8. Sewage Quality Survey (Kandy district) contd..

Sample	T air	T sewage	pH	BOD	COD	SS	TDS	Cl ⁻	SO ₄ ²⁻	T-N	T-P	Total coliform m	E. coli	As	Cd	Zn	Co
Sewage																	
K/7.1	31.5	30.5	7.8	10.20	32	94	244	199	24.93	81	1.65	>1000*	>1000*	Nil	Nil	0.04	Nil
K/7.2	31.4	30.0	7.5	11.50	40	116	283	200	0.98	88	1.43	>1000*	>1000*	Nil	Nil	0.03	Nil
K/7.3	29.5	29.0	8.0	60.20	108	79	205	199	12.96	117	1.53	>1000*	>1000*	Nil	Nil	0.03	Nil
K/8.1	30.0	29.0	7.2	5.20	42	174	117	42	13.40	104	1.27	>1000	>1000	Nil	Nil	0.06	Nil
K/9.1	28.9	27.1	8.3	90.20	424	170	318	147	3.61	226	1.63	>1000	>1000	Nil	Nil	0.05	Nil
K/9.2	29.1	27.2	8.7	120.50	636	342	352	150	2.43	48	1.73	>1000	>1000	Nil	Nil	0.06	Nil
K/9.3	29.5	28.1	8.5	135.05	848	253	383	142	2.86	61	1.55	>1000	>1000	Nil	Nil	0.05	Nil
K/10.1	28.9	27.2	7.7	0.20	120	94	389	117	24.83	60	1.28	>1000*	>1000*	Nil	Nil	0.07	Nil
K/10.2	29.8	27.6	7.4	12.70	144	119	450	151	2.78	99	1.65	>1000*	>1000*	Nil	Nil	0.06	Nil
K/10.3	29.1	28.5	7.8	15.30	120	135	398	114	7.36	47	1.35	>1000*	>1000*	Nil	Nil	0.07	Nil
K/11.1	31.0	27.5	7.6	160	148	168	142	147	3.61	92	1.56	>1000	>1000	Nil	0.05	0.10	Nil
K/11.2	29.5	28.0	7.2	120	56	181	153	150	2.43	58	1.68	>1000	>1000	Nil	0.06	0.05	Nil
K/11.3	31.0	29.5	7.0	333	1200	188	802	210	3.68	64	1.58	>1000	>1000	Nil	0.05	0.07	Nil
K/12.1	31.5	30.0	8.6	2.70	78	500	614	119	107.80	44	1.53	>1000	>1000	Nil	0.05	0.60	Nil
K/13.1	28.5	30.0	7.0	85.20	208	281	159	84	13.90	145	1.01	>1000*	>1000*	Nil	Nil	0.60	Nil
K/13.2	29.0	29.5	7.1	45.20	192	247	168	24	17.30	122	1.02	>1000*	>1000*	Nil	Nil	0.40	Nil
K/13.3	29.5	28.0	6.5	15.20	344	80	144	26	14.10	124	1.31	>1000*	>1000*	Nil	Nil	0.22	Nil
K/14.1	28.5	29.0	6.7	40.20	152	300	133	29	25.20	81	1.38	>1000*	>1000*	Nil	Nil	0.25	0.4
K/14.2	29.0	29.0	6.8	35.20	144	273	119	23	23.40	104	1.41	>1000*	>1000*	Nil	Nil	0.27	0.4
K/14.3	29.5	28.0	6.6	10.20	144	108	135	26	24.30	115	1.46	>1000*	>1000*	Nil	Nil	0.25	0.4

* per 10 ml

Table 9. Sewage Quality Survey (Nuwara-Eliya district)

SAMPLE	T air	T sewa ge	pH	BOD	COD	SS	TDS	Cl ⁻	SO ₄ ²⁻	T-N	T-P	Total Colifor m	E. coli	As	Cd	Zn	Co
Sewage																	
N/1.1	21.0	22.3	5.2	320	1616	1059	277	198.2	3.71	180	0.94	>1000	>1000	Nil	Nil	0.38	0.01
N/2.1	20.0	18.0	7.2	258	640	470	586	37.2	2.79	249	1.56	>1000	>1000	Nil	Nil	0.15	Nil
N/3.1	22.0	21.0	7.4	236	336	207	262	152.1	4.31	116	1.53	>1000	>1000	Nil	Nil	0.03	Nil
N/4.1	20.0	24.0	7.2	95	340	131	192	41.7	3.68	134	0.95	>1000	>1000	Nil	Nil	0.10	Nil
N/4.2	23.0	24.0	6.8	103	296	142	204	39.9	3.50	158	0.87	>1000	>1000	Nil	Nil	0.10	Nil
N/4.3	20.0	25.0	7.3	75	388	136	194	43.9	3.79	169	0.93	>1000	>1000	Nil	Nil	0.12	Nil
N/5.1	20.0	23.0	8.1	20	160	223	191	87.1	2.44	129	1.98	>1000	>1000	Nil	0.06	0.16	Nil
N/5.2	22.0	23.5	8.3	40	176	242	202	76.1	3.14	144	1.73	>1000	>1000	Nil	0.07	0.12	Nil
N/5.3	20.0	23.0	7.9	75	240	253	187	93.4	2.95	98	1.84	>1000	>1000	Nil	0.06	0.14	Nil
N/6.1	22.0	24.0	6.2	30	280	450	80	97.7	0.98	68	1.23	>1000	>1000	Nil	Nil	1.20	Nil
N/7.1	26.0	23.0	6.2	298	1192	386	151	148.1	33.87	155	1.53	140	20	Nil	Nil	0.80	Nil
N/7.2	22.5	26.0	5.0	290	804	386	151	158.9	33.47	104	1.63	400	270	Nil	Nil	0.38	Nil
N/7.3	20.0	24.0	6.0	305	908	351	172	160.5	32.76	137	1.67	300	100	Nil	Nil	0.40	Nil
N/8.1	26.0	23.0	7.2	283	1860	325	683	186.9	43.63	183	1.78	1000	800	Nil	Nil	0.60	Nil
N/8.2	22.5	26.0	6.1	355	1952	401	708	164.8	46.83	107	1.63	140	20	Nil	Nil	0.50	Nil
N/8.3	20.0	25.0	7.6	305	1876	375	695	175.8	45.23	151	1.78	100	70	Nil	Nil	0.50	Nil
N/9.1	22.0	20.0	10	29	72	151	269	21.4	1.63	84	0.98	600	230	Nil	Nil	0.10	Nil
N/9.2	22.0	19.0	8.4	40	112	164	274	24.5	3.45	104	1.03	62	6	Nil	Nil	0.07	Nil
N/9.3	20.0	22.0	7.8	18	260	158	282	22.6	2.86	99	0.94	100	40	Nil	Nil	0.07	Nil
N/10.1	24.0	21.0	5.5	12	880	142	87	202.8	90.69	140	1.23	700	450	Nil	Nil	0.10	Nil

2.3.3. River Water Quality

Sample points :

Kandy:

- RWQ/K/1. Gangawata District (University)
- RWQ/K/2. Intake point of Kandy water treatment plant (Gatambe) --
- RWQ/K/3. Katugastota District (Pinga Oya - near Meda ela bridge)
- RWQ/K/4. Polgolla dam
- RWQ/K/5. Ela near Polgolla dam
- RWQ/K/6. Kundasale District (Kundasale intake)
- RWQ/K/7. Meda Ela

Nuwara - Eliya:

- RWQ/N/1. Upstream of city's border
- RWQ/N/2. Victoria Park
- RWQ/N/3. Influent point to Gregory Lake
- RWQ/N/4. Upstream of Hospital and Brewery
- RWQ/N/5. Influent point to Barrack Plains reservoir

Table 10. River Water Quality Survey (Kandy district)

Sample	T air	T water	pH	Elec. Cond	COD	BOD	DO	SS	TDS	SO ₄ ²⁻	T-N	T-P	Total coliform	<i>E. coli</i>	As	Cd	Zn	Co	Cl ⁻
RWQ/K/1.1	24.9	25.3	6.4	63	24	2.45	7.5	133	38	1.9	3.72	1.3	250	100	Nil	Nil	0.02	Nil	5.40
RWQ/K/1.2	29.6	29.0	6.8	63	32	3.20	5.3	130	42	2.3	4.30	1.5	>1000	500	Nil	Nil	0.02	Nil	4.07
RWQ/K/1.3	29.1	29.4	7.1	64	24	2.95	5.6	142	44	2.0	3.70	1.3	800	150	Nil	Nil	0.02	Nil	5.49
RWQ/K/2.1	25.2	25.4	6.2	61	32	5.70	5.5	149	31	3.3	2.22	0.8	100	70	Nil	Nil	0.01	Nil	4.17
RWQ/K/2.2	33.0	29.4	6.8	64	32	1.95	2.2	130	40	2.5	5.26	0.8	800	150	Nil	Nil	0.01	Nil	4.57
RWQ/K/2.3	28.1	28.4	7.1	62	24	4.70	5.8	175	35	2.1	4.60	0.8	600	150	Nil	Nil	0.01	Nil	3.98
RWQ/K/3.1	30.5	28.3	6.6	184	40	4.20	2.2	201	67	1.6	6.44	1.5	>1000	>1000	Nil	Nil	0.02	Nil	22.90
RWQ/K/3.2	32.2	32.5	6.5	193	32	4.70	1.2	172	50	3.4	6.58	1.8	>1000	>1000	Nil	Nil	0.06	Nil	21.30
RWQ/K/3.3	28.5	29.7	6.7	200	28	4.70	1.0	188	98	4.1	6.06	1.6	>1000	>1000	Nil	Nil	0.01	Nil	21.30
RWQ/K/4.1	31.1	29.2	6.4	70	48	5.45	4.5	143	18	2.6	4.97	1.4	140	20	Nil	Nil	0.02	Nil	4.89
RWQ/K/4.2	32.5	31.0	6.8	69	24	3.45	4.9	151	9	2.1	4.48	1.7	>1000	>1000	Nil	Nil	0.01	Nil	4.00
RWQ/K/4.3	29.5	28.4	6.8	73	24	4.70	4.4	158	35	2.4	4.92	1.4	>1000	>1000	Nil	Nil	0.01	Nil	4.26
RWQ/K/5.1	30.5	31.0	6.8	280	24	3.70	3.4	121	151	1.3	7.06	1.9	600	250	Nil	Nil	0.01	Nil	20.89
RWQ/K/5.2	32.5	31.0	6.8	69	24	2.20	3.6	129	162	1.4	7.58	1.7	>1000	>1000	Nil	Nil	0.01	Nil	19.95
RWQ/K/5.3	27.4	28.4	6.7	290	32	4.70	1.4	145	169	1.4	6.96	1.9	>1000	>1000	Nil	Nil	0.01	Nil	21.34
RWQ/K/6.1	31.0	31.2	6.8	82	28	2.45	5.3	110	40	3.4	4.06	1.8	220	80	Nil	Nil	0.01	Nil	5.55
RWQ/K/6.2	32.0	31.0	7.2	92	24	3.20	6.4	123	46	2.9	4.24	2.4	250	100	Nil	Nil	0.01	Nil	6.02
RWQ/K/6.3	26.0	27.8	7.0	82	44	1.70	6.3	115	38	3.1	3.88	1.2	220	80	Nil	Nil	0.01	Nil	5.12
RWQ/K/7.1	27.6	26.5	6.5	404	40	7.80	3.6	258	191	10.4	18.40	1.7	>1000	>1000	Nil	Nil	0.02	Nil	50.11
RWQ/K/7.2	32.3	32.4	6.5	470	52	8.20	0.3	273	187	6.8	15.42	1.3	200	40	Nil	Nil	0.02	Nil	75.86
RWQ/K/7.3	28.6	28.0	6.6	500	60	5.96	0.3	268	201	10.4	16.22	1.8	250	80	Nil	Nil	0.06	Nil	93.30

Table 11. River Water Quality Survey (Nuwara-Eliya district)

SAMPLE	T air	T water	pH	Elec. Cond	BOD	DO	COD	SS	TDS	SO ₄ ²⁻	T-N	T-P	Total coliform	<i>E. coli</i>	Cl ⁻	Cd	As	Zn	Co
RWQ/N/1.1	18.5	14.0	5.6	20	0.93	7.8	24	145	29	0.1	7.20	0.3	1600	400	1.41	Nil	Nil	Nil	Nil
RWQ/N/1.2	18.0	20.6	4.0	20	1.49	7.0	24	152	32	0.2	7.42	0.4	800	120	1.67	Nil	Nil	Nil	Nil
RWQ/N/1.3	26.0	19.8	5.2	20	1.68	7.7	16	152	40	0.1	6.68	0.3	>1000	250	1.80	Nil	Nil	Nil	Nil
RWQ/N/2.1	16.0	15.5	6.2	190	8.10	0.9	32	124	70	0.1	8.34	0.4	>1000	>1000	21.38	Nil	Nil	0.02	Nil
RWQ/N/2.2	25.0	22.6	5.2	200	5.21	1.5	36	130	78	0.3	9.20	0.5	>1000	>1000	24.54	Nil	Nil	0.02	Nil
RWQ/N/2.3	28.0	22.6	4.5	200	8.30	0.9	16	128	65	0.1	8.88	0.4	>1000	>1000	24.55	Nil	Nil	0.02	Nil
RWQ/N/3.1	18.5	16.9	4.8	230	8.10	2.1	56	92	177	0.1	10.1	2.1	>1000	>1000	27.54	Nil	Nil	0.18	Nil
RWQ/N/3.2	30.0	23.8	5.7	150	12.10	7.8	36	98	150	0.3	12.6	2.0	>1000	>1000	21.30	Nil	Nil	0.06	Nil
RWQ/N/3.3	28.5	25.2	5.6	200	4.10	6.6	24	5	165	1.4	11.6	2.0	>1000	>1000	21.37	Nil	Nil	0.05	Nil
RWQ/N/4.1	25.0	20.9	7.5	720	40.20	1.9	416	1123	406	Nil	21.6	0.3	>1000	>1000	158.45	Nil	Nil	0.06	Nil
RWQ/N/4.2	28.0	23.8	6.0	420	47.70	2.7	60	905	425	0.1	23.6	0.4	>1000	>1000	61.66	Nil	Nil	0.12	Nil
RWQ/N/4.3	28.0	21.9	5.9	470	55.20	2.3	116	1075	402	Nil	21.7	0.3	250	60	61.66	Nil	Nil	0.13	Nil
RWQ/N/5.1	24.0	23.8	5.6	400	135.20	Nil	532	389	321	0.6	20.2	0.5	240	60	57.59	Nil	Nil	0.20	Nil
RWQ/N/5.2	25.0	27.9	4.8	400	ϕ	Nil	1084	315	305	Nil	23.0	0.5	300	40	69.61	Nil	Nil	0.11	Nil
RWQ/N/5.3	26.0	27.1	4.8	370	105.20	0.2	324	370	312	0.1	28.6	0.4	80	Nil	72.44	Nil	Nil	0.15	Nil
					75.20														

2.3.4. Lake Water Quality

<u>Sample points</u>	<u>Units</u>	
LWQ/N/1	Temperature °C	Gregory Lake (near the play ground)
LWQ/N/2	COD, BOD, SS, TDS, Cl ⁻ , SO ₄ ²⁻ , As, Cd, Zn, Co	Gregory Lake (middle)
LWQ/N/3	Conductivity : s cm ⁻¹	Barrack Plains Reservoir (middle)
LWQ/N/4	Coliform Total at 35°C/ 100ml	Barrack Plains Reservoir (end)
LWQ/K/1	<i>E. coli</i> at 44°C/ 100ml	Kandy Lake (point 1) Near Mahamaya College
LWQ/K/2		Kandy Lake (point 2) Near Lakefront Hotel

Table 12. Lake Water Quality (Kandy and Nuwara-Eliya districts)

SAMPLE	T air	T water	pH	Elec cond	DO	COD	BOD	SS	TDS	SO ₄ ²⁻	T-N	T-P	Total coliform	<i>E. coli</i>	As	Total Iron	Cd	Zn	Co	Cl ⁻
LWQ/N/1.1	21.0	22.3	6.2	128	7.0	28	3.2	145	60	0.6	37.0	0.2	180	50	Nil	1.4	Nil	0.02	Nil	10.7
LWQ/N/1.2	25.5	20.2	4.2	139	9.0	28	6.3	150	150	0.4	51.0	0.3	180	80	Nil	1.5	Nil	0.02	Nil	9.8
LWQ/N/1.3	25.5	25.1	6.6	128	9.4	28	3.5	148	60	0.6	58.0	0.3	70	06	Nil	1.5	Nil	0.01	Nil	11.8
LWQ/N/2.1	23.0	22.2	6.0	133	7.8	44	5.9	122	66	0.6	23.0	0.8	180	60	Nil	1.2	Nil	0.01	Nil	11.2
LWQ/N/2.2	25.0	22.6	5.2	132	8.8	8	5.2	130	100	0.1	48.0	0.8	200	80	Nil	1.5	Nil	0.02	Nil	11.8
LWQ/N/2.3	28.0	23.9	7.0	130	8.1	12	4.7	142	70	0.7	38.0	0.8	230	60	Nil	1.8	Nil	0.02	Nil	14.1
LWQ/N/3.1	24.0	20.0	4.4	125	0.3	24	12.3	236	60	5.0	40.0	0.6	>1000	740	Nil	1.8	Nil	0.07	Nil	3.8
LWQ/N/3.2	29.0	21.2	4.9	132	0.2	44	12.1	260	80	3.9	30.6	0.7	300	160	Nil	2.0	Nil	0.10	Nil	6.2
LWQ/N/3.3	27.0	21.1	4.8	125	0.1	28	14.8	271	70	4.8	36.2	0.8	>1000	>1000	Nil	3.1	Nil	0.07	Nil	10.7
LWQ/N/4.1	25.5	20.2	4.2	293	Nil	152	31.6	222	150	0.9	44.8	1.5	>1000	>1000	Nil	3.0	Nil	0.07	Nil	36.3
LWQ/N/4.2	26.0	22.2	4.9	325	0.2	124	28.7	287	160	0.4	51.0	1.4	>1000	>1000	Nil	3.2	Nil	0.07	Nil	36.3
LWQ/N/4.3	27.0	20.1	4.7	368	Nil	128	30.1	174	160	0.3	59.0	1.4	>1000	>1000	Nil	4.0	Nil	0.07	Nil	33.9
LWQ/K/1.1	31.6	29.2	8.6	250	5.2	28	11.0	60	134	6.1	35.0	1.4	200	70	Nil	0.5	Nil	0.08	Nil	43.6
LWQ/K/1.2	34.9	30.6	7.4	260	5.0	20	8.5	62	130	6.2	32.0	1.4	250	12	Nil	0.6	Nil	0.09	Nil	42.6
LWQ/K/1.3	31.8	29.5	7.3	260	4.8	16	6.5	64	134	5.0	38.0	1.3	500	50	Nil	0.5	Nil	0.10	Nil	39.8
LWQ/K/2.1	29.5	30.5	7.3	230	6.8	8	9.5	62	132	6.2	20.0	1.0	600	40	Nil	0.4	Nil	0.07	Nil	38.9
LWQ/K/2.2	37.1	32.2	8.5	250	7.1	8	9.2	73	148	7.7	22.0	0.9	800	50	Nil	0.4	Nil	0.06	Nil	43.7
LWQ/K/2.3	30.9	30.5	8.9	250	7.4	12	11.8	76	118	5.4	24.0	1.4	40	10	Nil	0.4	Nil	0.07	Nil	39.8

Table 13. Sludge quality survey (Kandy and Nuwara-Eliya Districts)

SAMPLE	T _{air}	T _{sludge}	Water content(%)	SS (%)	VSS(%)	T-N g/Kg	T-P mg/Kg	As	Cd	Co	Zn mg/kg
SQ/K/1	28.7	28.5	5.84	52.82	5.18	24.10	14.35	Nil	Nil	Nil	0.27
SQ/K/2	29.5	29.7	60.38	24.01	2.27	38.40	12.56	Nil	Nil	Nil	0.05
SQ/K/3	29.1	28.2	3.32	2.28	2.20	1.96	19.30	Nil	Nil	Nil	0.26
SQ/N/1	23.0	20.5	67.53	4.96	0.73	11.32	11.86	Nil	Nil	Nil	0.10
SQ/N/2	22.2	20.6	93.99	4.06	0.29	9.88	13.50	Nil	Nil	Nil	0.04

Sludge quality survey

Sample points:

Kandy SQ/K/1. Hantana Housing Scheme
 SQ/K/2. Suisse Hotel
 SQ/K/3. Sun Match Company

Nuwara-eliya: SQ/N/1. Ceylon Brewery
 SQ/N/2. Grand Hotel

Annexure 1. Pesticide analysis results of raw water samples

Parameter	SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	SP 13	SP 14	SP 15	SP 16	SP 17	SP 18	SP 19	SP 20	Det. Limit µg/l
α-HCH	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.2
β-HCH	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.4
γ-HCH(Lindane)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.2
δ-HCH	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.2
Aldrin	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
Dieldrin	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
Heptachlorepoide	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
Endosulfan	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
p,p'DDE	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
o,p'DDT	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
p,p'DDT	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
o,p'DDD	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
p,p'DDD	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
Chlorpyrifos	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
Dimethoate	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	0.5
Diazinon	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	1
Fenthion	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	5
Fenitrothion	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Malathion	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Monocrotophos	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Methamidaphos	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	5
Parathion	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	5
Parathion Methyl	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Pirimiphos Methyl	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Profenophos	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Quinalphos	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Carbofuran	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2
Chlorothalonil	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	5
Captan	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	5
Metaxyl	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	1
Alachlor	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	5
Propanil	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D	2

N.D not detected

Key to sample numbers in the pesticide analysis

SP1=WQ/N/3.1
SP2=WQ/N/13.1
SP3= WQ/N/10.1
SP4= WQ/N/5.2
SP5= WQ/N/6.2
SP6= WQ/K/3.1
SP7= WQ/K/1.1
SP8= WQ/N/2.2
SP9= WQ/N/12.1
SP10= WQ/N/9.2
SP11= WQ/N/4.2
SP12= WQ/N/11.1
SP13= WQ/N/8.2
SP14= WQ/N/1.2
SP15= WQ/N/8.2
SP16= WQ/N/7.1
SP17=WQ/N/14.1
SP18=WQ/N/ 15.1
SP19=WQ/N/16.1
SP20=WQ/17.1

Appendix 15.4 Land Acquisition Procedures

Annex A1

Land Acquisition

There are two procedures described for land acquisition for a public purpose, namely; (i) when land acquisition to be undertaken under normal conditions and (ii) when the land acquisition is urgently required. Two procedures are described in detail in the Land Acquisition Act of 1950 (as amended in 1954, 1955, 1961, 1964, 1969, 1971 and 1979). Stepwise procedures are laid down in the Act and is shown in the schematic diagram annexed. The salient features of the Land Acquisition Act is given below.

- i When a Government Department or Agency require to acquire a particular land for a public purpose, an application is made to the Secretary of the Ministry in charge of the subject of Land.
- ii The Ministry issues a directive to the Land Commissioner and the Commissioner in turn issues a directive to his representative in the district (District Secretary, Asst. Land Commissioner, District land Officer or Divisional Secretary to give notice.
- iii Under normal circumstances the land acquisition procedure begin with a Preliminary Investigation and Declaration of the intention to acquire the identified land for a public purpose as required by the Section 2 to 5 of Chapter 460 of the Land Acquisition Ordinance. Notices are posted near the land to be acquired and adequate time is given to the owners or claimants to register objections to the take over of the land and or to place claims for compensation. After these initial procedures if the Minister in Charge of the subject of land makes the decision to acquire the particular land area, the minister directs the acquiring officer to publish in the Government Gazzette the intentions to acquire said land.

If the exact location of the land to be acquired is not know, the Secretary of the Ministry in charge of the subject of Land will direct the Land Acquisition officer post a notice in the area, where the land is required. Then the Acquisition Officer will authorize the interested Agency/Department to make the investigations.

- iv Objections to take over of land will be inquired in to and the Minister in charge of the subject of lands will make a final decision in this regard .
- v If the Minister decides to acquire the land, the decision will be communicated to the Surveyor General who will take action to prepare a plan of the said land ,if there is no such plan already available.
- vi The copy of the plan is sent to the chief valuer for valuation of the said land/property. If the value of the land is more than Rs.500/ the notice should be published in news papers all three languages. The notice require that persons

affected or interested to appear before the Acquiring Officer on a date specified not less than 21 days from the date of the notice. The interested parties should notify in writing, at least 7 days prior the date specified, giving particulars of compensation. The acquiring officer can on good cause shown extend the date for notification of claims and appearance before him up to a period of 28 days. A copy of the claim is forwarded to the chief valuer.

vii On the fixed date or the new date fixed, the Acquiring Officer will cause an inquiry in to the claims for compensation. After the inquiry the Acquiring Officer will give a decision regarding any dispute among claimants. In the even that the claimants are not satisfied with the compensation determined by the Acquiring Officer, those who are affected are allowed to appeal to the Board of Review. The decision of the Board of Review is final.

viii Payment of compensation arise at two stages in the process of land acquisition, namely; (1) At preliminary Investigation stage and (II) at the stage of taking over of possession of land by the State.

In the first stage any damage caused to movable and immovable property on the land at the preliminary investigations, for each owner the Officer responsible for land acquisition determines the compensation. Land Acquisition Officer in the Division/ District then inform the possible claimants about the compensation by posting a notice at the site

The second and the final compensation is determined by the Officer in charge of land acquisition in the district after considering the claims made by the affected , current market value, claimants ownership relation to the land and any other factor that may be required for the valuation under Section 17 of the Chapter 460 of the Land Acquisition Ordinance.

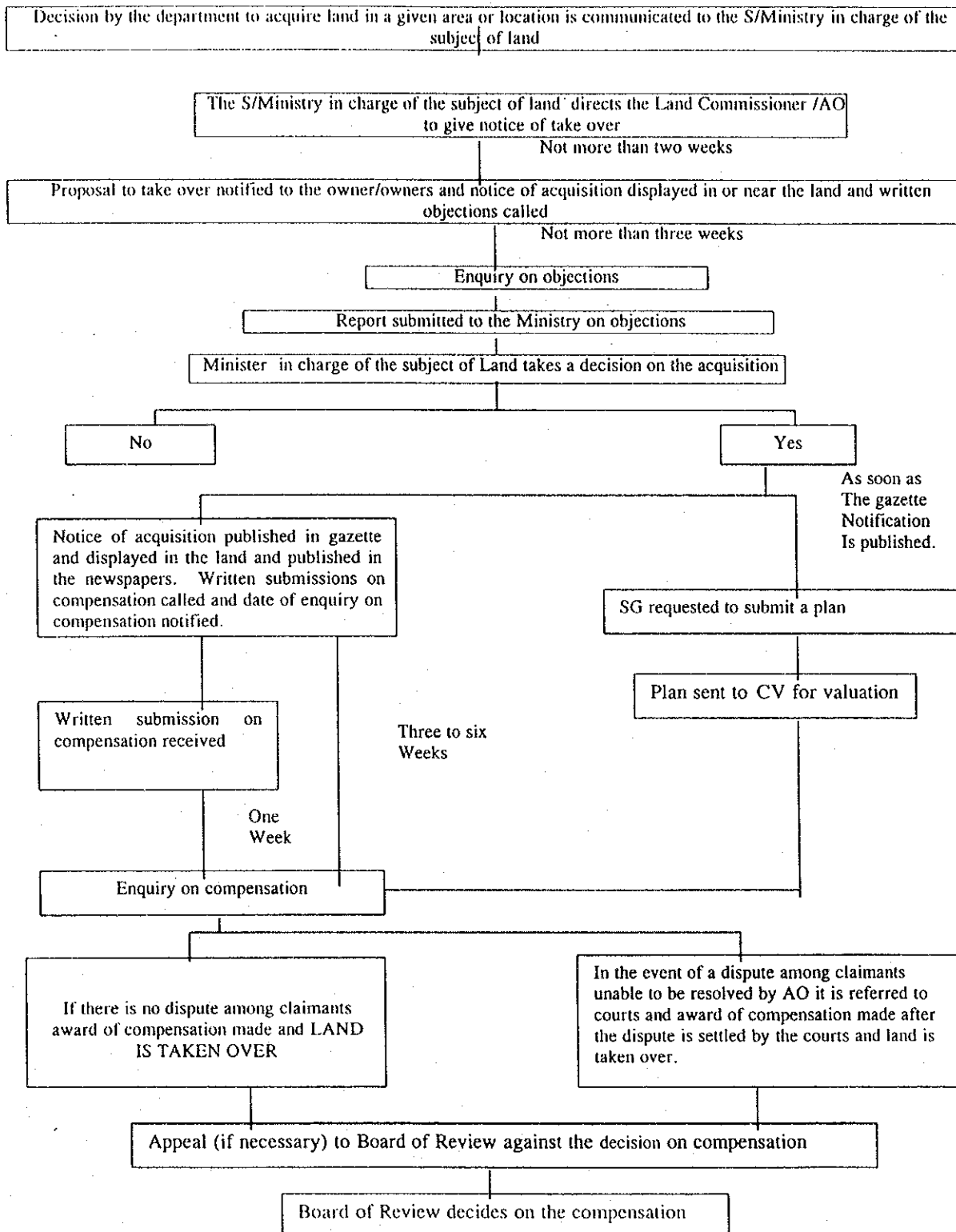
ix Where no interested persons appear on the date of the inquiry the inquiry will be postponed for at least 14 days and a notice will be posted in or near the land stating that the amount of compensation will be determined on the adjourned date whether the interested persons appears or not.

x At any time after the award the Minister may publish an order in the gazette directing the acquiring officer to take possession of the land and from the date of the publication of the order the land will vest absolutely in the hands of the State. The possession of an occupied house can not be taken without giving the occupant at least 48 hrs notice.

Annex A2

Land Acquisition Procedure

Procedure adopted when land is not urgently required.



AO - Land Commissioner or representative / Land Acquisition Officer / District Representative / Divisional Secretary
 SG - Survey General
 CV - Chief Valuer

Annex A2

Urgent Land Acquisition

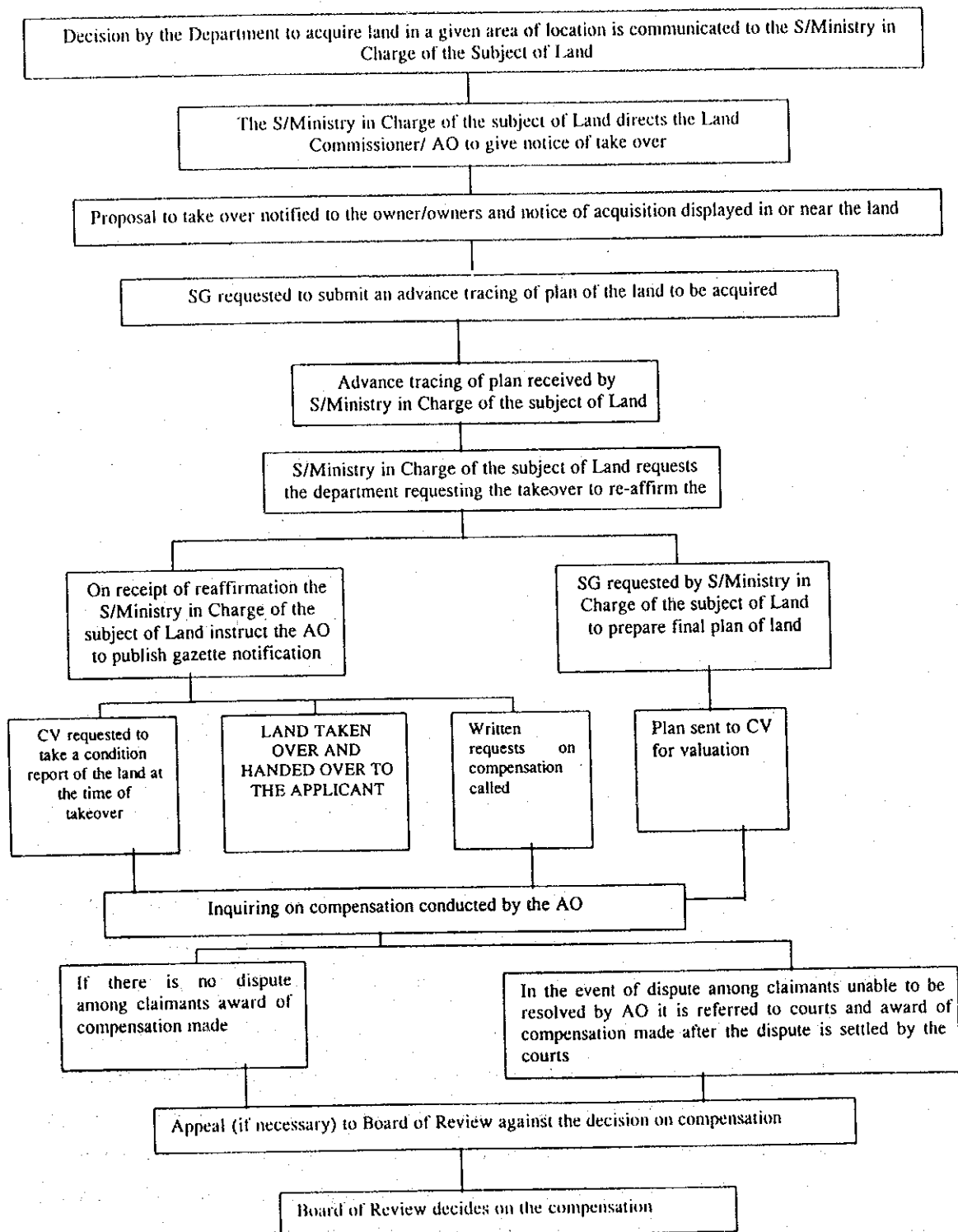
This procedure deviates from the normal, because of the urgency to take over an specified land area. Deviation is from the step of posting the notices.

Soon after posting of notice under Section 2 of the Chapter 460 of the Land Acquisition Ordinance that is after posting of a notice on the identified land and in the neighbouring area indicating the intended acquisition under Section 4 of the said Ordinance, if a need arises for immediate possession of the said land Minister has the power to Publish in the Government Gazette an Order to take over the possession of the said land for the State. The step by step procedure is given in the attached chart 2.

(Deviation from the time frame indicated is common for Urgent Acquisition)

Land Acquisition Procedure

Procedure adopted when land is urgently required



AO - Land Commissioner or Representative/ Acquiring Officer / District Representative/ Divisional Secretary
SG - Survey General
CV - Chief Valuer

Appendix 15.5

**WASTE WATER TREATMENT PLANTS MONITORING AND
REPORTING PROGRAM**

RECOMMENDED PROCEDURE

A) General Monitoring and Reporting Provisions (GMRP)

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored waste stream. All samples shall be taken at the monitoring points specified in Order No. or this MRP and, unless otherwise specified, before the waste stream joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall be subject to the approval of the HWSDB and shall not be changed without notification to and the approval of the Executive Officer. Samples shall be collected at times representative of "worst case" conditions with respect to compliance with the requirements of Order No.....

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to ensure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 5 percent from true discharge rates throughout the range of expected discharge volumes.

Monitoring must be conducted according to Central Environmental Authority test procedures, if existing.

Monitoring results must be reported on Discharge Monitoring Report (DMR) forms approved by the Executive Officer of the HWSDB.

If the discharger monitors any pollutant more frequently than required using test procedures approved by CEA/HWSDB, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. The increased frequency of monitoring shall also be reported.

The discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this MRP, any enforcement order issued by the CEA or the HWSDB and records of all data used to complete the application. Records shall be maintained for a minimum of five years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer. It is recommended that the discharger maintain the results of all analyses indefinitely (until the dismissal of the plant).

Records of monitoring information shall include ;

- ☐ the date, exact location, and time of sampling or measurements;
- ☐ the individual(s) who performed the sampling or measurements;
- ☐ the date(s) analyses were performed;
- ☐ the laboratory and individual(s) who performed the analyses;
- ☐ the analytical techniques or methods used; and
- ☐ the results of all such analyses.

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this MRP. The discharger shall report the analysis results, calculation results, data, and equation used in calculations.

All monitoring instruments and devices used by the discharger to fulfil the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once per year, or more frequently, to ensure continued accuracy of the devices. Annually, the discharger shall submit to the Executive Officer a written statement signed by a registered professional engineer certifying that all flow measurement devices have been calibrated and will reliably achieve the accuracy required under CEB/HWSDB procedures.

All analyses shall be performed in a laboratory certified to perform such analyses, or a laboratory approved by the HWSDB Executive Officer.

If only measurement is made during the time period associated with a discharge specification, effluent limitation, or receiving water limit (e.g. 30-day average or 6-month median), that single measurement shall be used to determine compliance with the discharge specification, effluent limitation, or receiving water limitation for the entire time period.

The discharger shall have, and implement, an acceptable written quality assurance (QA) plan for laboratory analyses. An annual report shall be submitted by March 30 of each year, which summarizes the QA activities for the previous year. Duplicate chemical analyses must be conducted on a minimum of ten percent of the samples or at least one sample per month, whichever is greater. The discharger must have a success rate equal to or greater than 80 percent. A similar frequency shall be maintained for analyzing spiked samples.

The discharger shall report all instances of noncompliance at the time monitoring reports are submitted.

The monitoring reports shall be signed by an authorized person, as required by CEA procedures.

Laboratory method detection limits (MDLs) and practical quantitation levels (PQLs) shall be identified for each constituent in the matrix being analyzed with all reported analytical data. Acceptance of data shall be based on demonstrated laboratory performance.

A composite sample is defined as a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period. For volatile pollutants, aliquots must be combined in the laboratory immediately before analysis. The composite must be flow proportional, either the time interval between each aliquot or the volume of each aliquot must be proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot. Aliquots may be collected manually or automatically.

A grab sample is an individual sample of at least 100 milliliters collected at a randomly selected time over a period not exceeding 15 minutes.

For all bacterial analyses, sample dilutions shall be performed so the range of values extends from 2 to 16,000. The detection method used for each analysis shall be reported with the results of the analysis.

Detection methods used for coliforms (total and fecal) shall be those presented in the most recent edition of Standard Methods for the Examination of Water and Wastewater (USA), or any improved method determined by the HWSDB and approved by CEA to be appropriate. Detection methods used for enterococcus shall be those presented in Test Method for Escherichia coli and Enterococcus in Water by Membrane Filter Procedure or any improved method determined by the HWSDB to be appropriate.

Revisions to this MRP may be made by the Executive Officer at any time, and may include a change in the location of sampling stations and/or a reduction or increase in the number of parameters to be monitored, the frequency of monitoring, the number of sampling stations and/or the number and/or size of samples collected.

By of each year, the discharger shall submit an annual report to the Regional Board which contains tabular and graphical summaries of the monitoring data obtained during the previous year. The discharger shall discuss the compliance record and corrective actions taken, or which may be needed, to bring the discharge into full compliance with the requirements of CEA. The report shall address operator certification and provide a list of current operating personnel and their grade of certification. The report shall include the date of the facilities' Operations and Maintenance Manual, the date the manual was last reviewed, and a statement as to whether the manual is complete and valid for the current facilities. The report shall restate, for the record, the laboratories used by the discharger to monitor compliance with admitted parameters and provide a summary of performance relative to the requirements in this MRP.

The sampling frequency of “daily” means that samples shall be collected seven days per week. “Weekly” samples shall be collected such that each day of the week is represented during a seven week period.

Monitoring results shall be reported at intervals and in a manner specified in this MRP. Monitoring reports shall be submitted to the HWSDB according to the following schedule:

Reporting

MONTHLY Influent, Effluent, sludge analysis, and Receiving water, including all continuous, daily, weekly, and monthly monitoring results.

ANNUAL: Pretreatment Report and sludge analysis.

ANNUAL Report described in General Monitoring and Reporting Provision under this MRP, QA, flow measurement report, and receiving water reports.

B) Influent Monitoring

Influent monitoring is required to determine compliance with CEA permit conditions and water quality standards, to determine the effectiveness of pretreatment and nonindustrial source control programs, to assess the performance of the treatment plant, and to evaluate compliance with effluent limitations (eg. percent removal). The influent sampling station shall be located where representative samples of the influent can be obtained. The sampling station shall be located upstream of any in-plant return flows, recycle flows, or the addition of treatment chemicals. Influent samples shall be collected on the same day as, and shortly before the collection of effluent samples.

During periods when no effluent is discharged from the WITP, no influent monitoring, except for flowrate monitoring, is required.

Influent monitoring shall be conducted as shown in the following table:

INFLUENT SAMPLING AND ANALYSIS MINIMUM REQUIREMENTS

Parameter	Units	Sample Type	Sample/Analyses Frequency	Report Frequency
Flow rate	MC/Day	Record / totaliser	continuous	monthly
Total Dissolved Solids	mg/l	24 hr. composite	weekly	monthly
Temperature	°C	grab	weekly	monthly
Floating particulate	mg/l	24 hr. composite	weekly	monthly
Grease & oil	mg/l	grab	weekly	monthly
Total Suspended Solids	mg/l	24 hr. composite	weekly	monthly
Settable Solids	ml/l	grab	weekly	monthly
Turbidity	NTU	24 hr. composite	weekly	monthly
pH	units	grab	weekly	monthly
Ammonia (as N)	mg/l	24 hr. composite	weekly	monthly

C) Sludge Monitoring Requirements

C1) General Requirements

The discharge of sludge from the WITP at a location where the sludge or sludge constituents could be conveyed to surface or ground water is prohibited.

All sludge generated by the discharger's wastewater treatment facilities shall be removed from the plant site within 6 months. Any site where sludge generated by the discharger is stored for more than two years will be classified as a surface disposal site, and/subject to relevant The discharger must ensure that the operator of any such surface disposal site submits the notification required in to CEA 180 days before the site becomes a surface disposal site, and that the site operator begins complying fully with the requirements surface disposal sites at the two-year start date. If the discharger wants to store sludge for over two years, or allow a contractor to stone sludge for over two years, the discharger must submit the information in writing to CEA 180 days prior to the date at which the site becomes a surface disposal site.

Duty to mitigate : The discharger shall take all reasonable steps to prevent or minimize any sludge handling, use or disposal which has a likelihood of adversely affecting human health or the environment.

Good management practices will be implemented to minimize production of odors, dust, and vector attraction during sludge treatment, transfer and storage.

The solids and sludge treatment and storage site shall have facilities adequate to divert surface water runoff from adjacent areas, to protect the boundaries of the site from erosion, to prevent drainage from the treatment and storage site, and to prevent ground water contamination. Adequate protection is defined as protection from at least a 100 year storm and protection from the highest possible tidal stage that may occur.

Proper Operation and Maintenance : The discharger shall at all times properly operate and maintain all facilities and systems of sludge treatment and control, including adequate laboratory controls and quality assurance procedures. The discharger shall ensure that any person who takes the discharger's sludge for further treatment shall also properly operate and maintain their facilities.

C2) Monitoring

The sludge shall be tested for all pollutants indicated by CEA procedures.

The discharger shall develop a sampling plan for collection of representative samples for monitoring pollutants, pathogens (for land application or surface disposal), and vector attraction reduction (for land application or surface disposal). The plan should include number and location of sampling points. If pathogen reduction is determined by time and temperature, the plan must be designed to determine the representative temperature of the process.

Samples of sludge shall be collected according to the procedures for compositing samples adopted by CEA (if existing). Samples shall be split, and a portion of the sample preserved, in the event that the results show concentrations of waste constituents that exceed 10 times ... admitted....

Results of analyses shall be reported in mg/kg, wet weight and 100 percent dry weight. If the results indicate that the total concentration of any waste constituent is greater than 10 times the fixed value for the constituent, then the discharger shall also perform a Waste Extraction Test on the sludge sample.

C3) Notification of Non-compliance

The discharger shall notify CEA and the HWSDB of any non-compliance which may seriously endanger health or environment as soon as possible, but no later than 24 hours from the time the discharger first become aware of the circumstances. A written report shall be submitted to CEA and the HWSDB within five days. For other instances of non-compliance, the discharger shall notify CEA and the HWSDB in writing within five working days of becoming aware of the non-compliance.

C4) Reporting Requirements

The discharger shall submit an annual report to CEA and the HWSDB by (March 30)¹ of each year for the period from January 1 through December 31. The report shall include :

1. Amount of sludge generated that year at the WITP, in dry metric tons, and amount of sludge leaving the WITP;
2. A description or certification of the ultimate destination of the sludge;
3. Results of all monitoring performed during the past 12 months.

D) Effluent Monitoring

Effluent monitoring is required to determine compliance with CEA permit conditions and water quality standards, to identify operational problems in order to improve plant performance, and to provide information on waste characteristics and flows for use in interpreting water quality and biological data.

The effluent sampling station shall be located where representative samples of the effluent discharged through the ocean outfall can be obtained. The sampling station shall be located downstream from any in-plant return flows, disinfection units, and from the last connection through which wastes can be admitted to the outfall.

During periods when no effluent is discharged from the WITP no effluent monitoring, except for flowrate monitoring, is required.

Effluent monitoring shall be conducted as shown in the following table:

¹ A different date can be specified

EFFLUENT SAMPLING AND ANALYSIS REQUIREMENTS

Parameter	Units	Sample Type	Sample/Analyses Frequency	Report Frequency
Flow rate	MC/Day	Record/totalizer	continuous	monthly
BOD ₅ @20°C	mg/l	24 hr. composite	daily	monthly
Total dissolved solids	mg/l	24 hr. composite	daily	monthly
Temperature	°C	grab	daily	monthly
Floating particulars	mg/l	24 hr. composite	daily	monthly
Grease & oil	mg/l	grab	daily	monthly
Total Susp. Solids	mg/l	24 hr. composite	daily	monthly
Settable solids	ml/l	grab	daily	monthly
Turbidity	NTU	24 hr. composite	daily	monthly
PH	units	grab	daily	monthly
Dissolved Oxygen	Mg/l	grab sample	weekly	monthly
Total Coliforms	MPH/100 ml	24 hr. composite	weekly	monthly
Ammonia (as N)	Mg/l	24 hr. composite	weekly	monthly

Chapter 17

Appendix 17.1 NWSDB Financial Data

**Appendix 17.2 Water Supply Project
- Financial Analysis Calculation**

**Appendix 17.3 Sewerage Project
- Financial Analysis Calculation**

Table A17.1.1

NATIONAL WATER SUPPLY & DRAINAGE BOARD
BALANCE SHEET
as at 31st December 1996

		MRS.		Current Liabilities	MRS.
Current Assets		4,402			
Bank and Cash Balance		112		Creditors	347
Short Term Investment		1,294		Loan Installments within one y.	10
Deposits & Advances		610		Loan interest payable	80
Debtors		836		Provisions and Accrued Exp.	170
Other Receivables		243		Other Current Dues	44
Stocks & Goods in Transit		1,306			43
Inter Regional Current Accounts		1		Long Term Liabilities	
				Creditors due after one year	8,267
				Provisions for Liabilities and Charges	7,863
Fixed Assets		21,055			404
Property, Plant & equipment		12,741			
Capital Work in Progress		8,249		Capital and Reserves	17,028
Long Term investment		65		Assets from Government	185
				Capital Grants	17,907
Deferred Expenditure		185		Revaluation Reserve	310
				Retained Income	-1,481
				Suspense Balance	107
Total Assets		25,642		Total Liabilities and Equity	25,642

Table A17.1.2

NATIONAL WATER SUPPLY & DRAINAGE BOARD
BALANCE SHEET
as at 31st December 1995

		MRS.		Current Liabilities	MRS.
Current Assets		4,363			1,543
Bank and Cash Balance		113		Creditors	7
Short Term Investment		1,568		Loan Installments within one y.	649
Deposits & Advances		561		Loan interest payable	743
Debtors		659		Provisions and Accrued Exp.	97
Other Receivables		318		Other Current Dues	47
Stocks & Goods in Transit		1,130			
Inter Regional Current Accounts		14		Long Term Liabilities	6,120
				Creditors due after one year	5,996
				Provisions for Liabilities and Charges	124
Fixed Assets		20,014			
Property, Plant & equipment		4,083			
Capital Work in Progress		15,866		Capital and Reserves	16,909
Long Term investment		65		Assets from Government	185
				Capital Grants	17,393
Deferred Expenditure		196		Revaluation Reserve	324
				Retained Income	-993
				Suspense Balance	0
Total Assets		24,573		Total Liabilities and Equity	24,572

Table A17.1.3

**NATIONAL WATER SUPPLY & DRAINAGE BOARD
INCOME & EXPENDITURE ACCOUNT
for the year ended 31st December 1996**

	(1000 Rs.)	
Total Revenue	2,003,826	100.0 %
Sale of Water	1,525,829	
Other	477,997	
 Direct Operating Expenses	 1,183,708	 59.1 %
Personnel Cost	427,431	
Pumping Cost	508,425	
Chemicals	72,558	
Repairs & Maint.	71,992	
Establishment	50,198	
Security & Other	37,600	
Rents, Rates, Taxes	15,504	
 Other Scheme Costs	 445,585	 22.2 %
Admin. Overhead	317,648	
Bad Debts	230	
Retiring Gratuity	127,707	
 <u>Income before Depr. & Interest</u>	 374,533	 18.7 %
Depreciation	309,681	
Deferred Cost W/Off	20,694	
Loan Interest	356,420	
Sub-total	686,795	34.3 %
 Income for the Year	 -312,262	 -15.6 %
 Debt Service	 427,574	
interest	356,420	
capital	71,154	
 Debt Service ratio	 88 %	

Table A17.1.4

**NATIONAL WATER SUPPLY & DRAINAGE BOARD
INCOME & EXPENDITURE ACCOUNT
for the year ended 31st December 1995**

	(1000 Rs.)	
Total Revenue	1,943,197	100.0%
Sale of Water	1,498,904	
Other	444,293	
 Direct Operating Expenses	 948,565	 48.8%
Personnel Cost	367,107	
Pumping Cost	399,423	
Chemicals	62,565	
Repairs & Maint.	45,384	
Establishment	39,806	
Security & Other	22,683	
Rents, Rates, Taxes	11,597	
 Other Scheme Costs	 246,206	 12.7%
Admin. Overhead	227,748	
Bad Debts	5,501	
Retiring Gratuity	12,957	
 <u>Income before Depr. & Interest</u>	 748,426	 38.5%
Depreciation	219,199	
Deferred Cost W/Off	57,529	
Loan Interest	285,875	
Sub-total	562,603	29.0%
 Income for the Year	 185,823	 9.6%
 Debt Service	 332,292	
interest	285,875	
capital	46,417	
 Debt Service ratio	 225%	

Table A17.1.5

NATIONAL WATER SUPPLY & DRAINAGE BOARD
TREND OF INCOME STATEMENT (1989 - 1996) (MRs.)

Year	1989	1990	1991	1992	1993	1994	1995	1996
Revenue								
Customer Billing	292,725	478,203	923,708	964,842	1,128,899	1,299,416	1,498,904	1,525,829
Other	64,019	77,430	176,784	248,881	360,026	408,290	444,293	477,997
Total Revenue	356,744	555,633	1,100,492	1,213,723	1,488,925	1,707,706	1,943,197	2,003,826
Operating Costs								
Chemicals	21,460	29,511	39,742	54,463	52,742	57,642	62,563	72,558
Pumping (Electricity)	128,889	143,559	151,201	168,549	230,909	312,089	399,423	508,424
Pumping (Fuel)	1,327	2,086	1,098	1,503	1,065	1,058	0	0
Repairs & Maintenance	19,031	12,559	75,630	79,614	51,947	53,121	45,384	71,992
Personnel Cost	123,951	146,187	195,755	224,446	279,003	356,331	367,107	427,430
Direct Operating Exp.	294,658	333,902	463,426	528,575	615,666	780,241	874,477	1,080,404
Establishment	9,325	13,229	15,458	20,749	25,689	26,357	39,806	50,198
Security & Other	6,407	6,655	7,608	11,515	42,803	33,977	22,683	37,600
Rent, Rates, Taxes, Other	3,048	3,910	4,839	3,952	4,042	3,705	11,597	15,504
Other Scheme Costs	18,780	23,794	27,905	36,216	72,534	64,039	74,086	103,302
Total Operating Costs	313,438	357,696	491,331	564,791	688,200	844,280	948,563	1,183,706
Surplus from Operation	43,306	197,937	609,161	648,932	800,725	863,426	994,634	820,120
Administration Overhead	60,856	67,274	82,896	107,017	126,292	157,182	227,748	317,648
Other Recoveries	5,286	3,351	0	0	-9,673	0	0	0
Bad debt W/Off						2,919	5,501	230
Retiring Gratuity						13,169	12,957	127,707
Surplus before Depr. & Interest	-12,264	134,014	526,265	541,915	664,760	690,156	748,428	374,535
Depreciation	214,571	205,656	193,169	199,159	228,232	226,920	219,199	309,681
Deferred Cost W/Off	36,420	42,575	48,926	52,180	54,706	56,805	57,529	20,694
Loan Interest	129,257	73,994	74,867	101,215	201,891	224,146	285,875	356,420
Government Levy								40,000
Sub-total	380,248	322,225	316,962	352,554	484,829	507,871	562,603	726,795
Surplus for the Year	-392,512	-188,211	209,303	189,361	179,931	182,285	185,825	-352,260
Balance B/F	-1,324,926	-1,719,806	-1,864,171	-1,664,219	-1,480,055	-1,328,475	-1,153,742	-993,360
Prior year adjustment	-2,368	43,846	-9,351	-5,197	-28,351	-7,552	-25,443	-135,614
BALANCE C/F	-1,719,806	-1,864,171	-1,664,219	-1,480,055	-1,328,475	-1,153,742	-993,360	-1,481,234
The Du Pont Chart (Profit Margin * Assets Turnover = Return on Assets (ROA))								
Profit Margin	-116.0%	-33.9%	19.0%	15.6%	12.1%	10.7%	9.6%	-17.6%
Asset Turnover	3.58%	4.99%	8.63%	7.75%	8.18%	7.91%	7.91%	7.81%
Return on Total Assets (ROA)	-3.94%	-1.69%	1.64%	1.21%	0.99%	0.84%	0.76%	-1.37%

Table A17.1.6

**NATIONAL WATER SUPPLY & DRAINAGE BOARD
TREND OF BALANCE SHEET (1989 - 1996) (M Rs.)**

	1989	1990	1991	1992	1993	1994	1995	1996
Current Assets								
Cash & Bank Balances	1,432	1,766	2,535	2,825	3,415	3,950	4,364	4,403
Deposits & Advance To Contractors	93	266	160	177	177	187		
Investments	527	424	601	489	456	651		
Other Receivables	0	0	361	706	1,114	1,156		
Debtors (Water Supply) Less Prov. For Bad Debt	38	50	115	105	191	229		
Stocks & Goods In Transit	298	350	568	586	651	733		
	476	666	730	770	826	994		
Total Fixed Assets	8,227	9,054	9,888	12,510	14,473	17,233	20,015	21,055
Fixed Assets	4,070	3,964	3,796	3,777	4,431	4,256	4,149	12,806
Revalued/Cost as at 01.01.93	4,789	4,890	4,987	5,015	5,199	6,081		
Addition Less Disposals	101	98	28	184	881	51		
(Less Accumulated Depreciation)	-820	-1,024	-1,219	-1,422	-1,649	-1,876		
Written Down Value as at 31.12.93								
Construction Work in Progress	4,157	5,090	6,092	8,733	10,042	13,077	15,866	8,249
Water Piped	2,319	3,262	4,106	6,709	7,838	10,680		
Water non Piped	212	262	318	354	399	432		
Sewerage	1,440	1,440	1,502	1,507	1,529	1,537		
Others	5	31	48	108	191	321		
Rechargeable Works less Customer Advance	181	95	118	55	85	107		
Deferred Cost	298	314	337	323	313	303	196	185
Total Assets	9,957	11,134	12,760	15,658	18,201	21,586	24,575	25,643
Current Liabilities	1,214	1,347	1,126	1,096	1,317	1,450	1,545	347
Creditors for Supplies	19	20	19	20	3	3		
Central Bank-Imprest Acct	102	84	89	90	58	3		
Provisions and Accrued Expenses	180	251	242	72	84	91		
Loan Interest Payable	440	514	354	459	579	698		
Loan Capital Payable	397	446	388	417	512	581		
Other Current Liabilities	76	32	34	38	81	74		
Long Term Liabilities	2,057	2,446	2,511	3,534	3,761	5,022	6,120	8,267
Foreign Loans Through Treasury	2,022	2,268	2,331	3,348	3,564	4,809	5,996	7,865
Local Loans	17	130	126	125	124	114	0	0
Security Deposit	18	48	54	61	73	86	124	404
Retiring Gratuity Provision	0	0	0	0	0	13	0	0
Shareholders' Equity	6,689	7,341	9,122	11,029	13,123	15,114	16,910	17,029
Financed by	8,409	9,205	10,786	12,511	14,453	16,270	17,903	18,510
Assets Taken Over From Government	185	185	185	185	185	185		
Capital Grant - Central Government	5,851	6,383	7,701	9,101	9,834	10,938		
Capital Grant - Local Government	402	402	402	402	402	402		
Capital Grant - Foreign Agency	1,661	1,925	2,183	2,504	3,711	4,423		
Capital Reserve on Re-Valuation of Assets	310	310	315	319	321	322		
Retained Earnings / (Deficit)	-1,720	-1,864	-1,664	-1,462	-1,330	-1,156	-993	-1,481
Total Liabilities and Shareholders' Equity	9,960	11,134	12,759	15,659	18,201	21,586	24,575	25,643

Table A17.1.7

NWSDB CASH REQUIREMENT PROJECTION (1997 - 2015) (M Rs.)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Direct O&M Costs																			
Personnel Cost	1,029,600	1,168,860	1,317,254	1,453,679	1,561,577	1,668,369	1,837,456	2,023,679	2,228,775	2,454,658	2,703,434	2,977,423	3,279,180	3,611,519	3,977,541	4,380,658	4,824,631	5,313,599	5,852,124
Electricity/Power	548,969	594,908	666,750	758,052	821,131	886,612	976,087	1,074,349	1,182,503	1,301,544	1,432,570	1,576,785	1,735,519	1,910,232	2,102,534	2,314,194	2,547,162	2,803,582	3,082,817
Chemicals	84,600	94,430	105,830	120,325	130,339	140,764	155,853	172,560	191,058	211,538	234,214	259,321	287,119	317,897	351,974	389,704	431,478	477,731	528,942
Repairs & Maint.	76,140	84,987	95,247	108,293	117,304	126,687	140,267	155,303	171,551	190,383	210,791	233,366	258,404	286,104	316,772	350,728	388,325	429,951	476,039
Establishment Cost	149,460	166,826	186,967	212,575	230,264	248,683	273,341	304,856	337,535	373,717	413,778	458,133	507,243	561,617	621,820	688,476	762,278	843,991	934,463
Direct O & M Total	1,888,769	2,110,011	2,372,028	2,652,924	2,860,614	3,071,516	3,385,004	3,750,747	4,111,822	4,531,841	4,994,787	5,505,049	6,067,465	6,687,369	7,370,641	8,123,761	8,953,874	9,868,854	10,877,394
Capital Expenses																			
Rehabilitation Exp.	151,102	168,801	189,762	212,224	228,849	245,706	270,797	298,451	328,929	362,520	399,540	440,341	485,309	534,869	589,490	649,689	716,036	789,157	869,746
Board Funds Schemes	125,000	75,000	75,000	102,000	102,000	127,500	128,006	128,514	129,024	129,536	130,050	130,566	131,084	131,604	132,127	132,651	133,177	133,706	134,237
Board Capital Expenses	30,000	40,000	50,000	61,200	71,400	81,600	99,679	121,764	148,741	181,696	221,952	271,127	331,197	404,576	494,213	603,709	737,466	900,856	1,100,447
Staff Loan	10,296	11,689	13,173	14,537	15,616	16,684	18,375	20,238	22,289	24,548	27,036	29,776	32,794	36,118	39,778	43,810	48,250	53,141	58,527
Capital Expenses Total	316,398	295,490	327,935	389,972	417,865	471,490	516,857	568,966	628,983	698,299	778,578	871,810	980,384	1,107,168	1,255,608	1,429,860	1,634,929	1,876,860	2,162,957
Less Capitalized O&M Costs	-251,040	-284,135	-319,894	-354,909	-381,829	-408,748	-450,607	-496,753	-547,624	-603,706	-665,530	-733,686	-808,821	-891,651	-982,964	-1,083,627	-1,194,600	-1,316,937	-1,451,802
Debt Service																			
Interest on Loans	528,000	496,667	469,167	556,750	670,650	753,950	809,626	869,413	933,615	1,002,559	1,076,593	1,156,094	1,241,467	1,333,143	1,431,590	1,537,306	1,650,829	1,772,735	1,903,644
Capital Repayments	130,000	130,000	160,000	200,940	281,520	281,520	328,566	383,474	447,557	522,350	609,642	711,522	830,427	969,203	1,131,170	1,320,204	1,540,628	1,798,322	2,098,546
Debt Service Total	658,000	626,667	629,167	757,690	952,170	1,035,470	1,138,192	1,252,887	1,381,173	1,524,909	1,686,235	1,867,616	2,071,894	2,302,346	2,562,760	2,857,510	3,191,657	3,571,057	4,002,490
Gross Cash Requirement	2,612,127	2,748,033	3,009,236	3,445,676	3,848,821	4,169,528	4,539,447	5,055,848	5,574,354	6,151,344	6,794,070	7,510,790	8,310,922	9,205,232	10,206,045	11,327,503	12,585,860	13,999,835	15,591,029

Table A17.1.8

NWSDB REVENUE PROJECTION (1997 - 2015)
Case A (12% annual tariff increase in real term)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Projected Average Water Price																			
Domestic	7.64	7.55	8.32	9.28	10.60	11.70	13.10	14.67	16.44	18.41	20.62	23.09	25.86	28.97	32.44	36.33	40.69	45.58	51.05
Standposts	3.62	3.78	4.16	4.64	5.30	5.85	6.55	7.34	8.22	9.20	10.31	11.55	12.93	14.48	16.22	18.17	20.35	22.79	25.52
Bulk	8.92	8.81	9.70	10.83	12.36	13.65	15.29	17.13	19.18	21.48	24.06	26.95	30.18	33.80	37.86	42.40	47.49	53.19	59.57
Re/Schools	2.55	2.52	2.78	3.09	3.53	3.90	4.36	4.89	5.47	6.13	6.87	7.69	8.61	9.65	10.80	12.10	13.55	15.18	17.00
Commercial	22.69	22.42	24.69	27.55	31.46	34.73	38.90	43.57	48.80	54.65	61.21	68.56	76.78	86.00	96.32	107.88	120.82	135.32	151.56
Shipping	63.69	62.94	69.31	77.32	88.41	97.52	109.22	122.33	137.01	153.45	171.86	192.49	215.58	241.45	270.43	302.88	339.23	379.93	425.53
Projected Demand by Customer Categories																			
Domestic	7,614,000	7,854,840	8,284,680	8,688,760	8,852,760	8,991,000	9,294,949	9,609,174	9,934,021	10,269,850	10,617,032	10,975,951	11,347,003	11,720,599	12,127,163	12,560,963	13,029,121	13,532,091	14,070,400
Standposts	282,000	290,920	306,840	327,880	327,880	333,000	344,257	355,895	367,927	380,365	393,223	406,517	420,259	434,467	449,154	464,338	480,096	496,264	513,040
Bulk	1,269,000	1,309,140	1,380,780	1,475,460	1,475,460	1,498,500	1,549,158	1,601,529	1,655,670	1,711,642	1,769,505	1,829,325	1,891,167	1,955,100	2,021,194	2,089,522	2,160,161	2,233,187	2,308,682
Re/Schools	282,000	290,920	306,840	327,880	327,880	333,000	344,257	355,895	367,927	380,365	393,223	406,517	420,259	434,467	449,154	464,338	480,096	496,264	513,040
Commercial	4,634,900	4,785,634	5,047,518	5,393,626	5,393,626	5,477,350	5,663,024	5,854,478	6,052,394	6,257,001	6,468,525	6,687,200	6,913,267	7,146,976	7,388,586	7,638,365	7,896,587	8,163,558	8,439,514
Shipping	14,100	14,546	15,342	16,394	16,394	16,630	17,213	17,795	18,396	19,018	19,661	20,326	21,013	21,725	22,458	23,217	24,002	24,813	25,652
Total Demand	14,101,000	14,546,000	15,342,000	16,250,000	16,394,000	16,650,000	17,212,869	17,794,766	18,396,335	19,018,241	19,661,170	20,325,835	21,012,969	21,723,332	22,457,710	23,216,914	24,001,783	24,813,186	25,652,020
Water Sales by Customer Categories																			
Domestic	698,052	711,649	827,142	967,594	1,125,669	1,262,184	1,461,435	1,692,142	1,959,268	2,268,563	2,626,684	3,041,339	3,521,453	4,077,359	4,721,022	5,466,295	6,325,219	7,328,366	8,485,042
Standposts	12,927	13,196	15,317	18,257	20,846	23,374	27,064	31,336	36,283	42,010	48,642	56,321	65,212	75,507	87,426	101,228	117,208	135,710	157,134
Bulk	135,639	138,402	160,776	191,694	218,880	245,495	284,249	329,122	381,078	441,235	510,890	591,541	684,923	793,046	918,239	1,063,194	1,231,033	1,425,367	1,650,380
Re/Schools	8,629	8,797	10,224	12,171	13,897	15,567	18,024	20,870	24,164	27,979	32,396	37,510	43,431	50,287	58,226	67,418	78,060	90,383	104,651
Commercial	1,263,080	1,287,527	1,495,454	1,783,026	2,096,360	2,383,153	2,643,577	3,060,899	3,544,101	4,103,582	4,751,384	5,501,451	6,369,924	7,375,497	8,559,813	9,887,931	11,448,866	13,256,214	15,348,875
Shipping	10,776	10,986	12,759	15,212	17,394	19,484	22,560	26,122	30,245	35,020	40,548	46,949	54,361	62,942	72,879	84,383	97,704	113,128	130,987
Total Collection	2,129,297	2,170,558	2,521,674	2,987,954	3,433,046	3,849,256	4,456,910	5,160,490	5,975,138	6,918,390	8,010,545	9,273,111	10,739,304	12,434,640	14,397,605	16,670,449	19,302,090	22,349,170	25,877,269
Collection at 94%	2,001,540	2,040,324	2,370,374	2,808,676	3,227,063	3,618,301	4,189,495	4,850,860	5,616,630	6,503,286	7,529,912	8,718,604	10,094,946	11,688,561	13,533,749	15,670,222	18,143,965	21,008,219	24,334,633
Service Charge etc.	368,800	453,870	448,992	500,357	555,698	615,101	687,384.59	724,112.27	785,661.82	852,443.07	924,900.73	994,268	1,068,838	1,149,001	1,235,176	1,327,815	1,427,401	1,534,456	1,649,540
Government Subsidy	88,000	96,800	106,480	117,128	128,841	141,725	151,771.63	166,842.21	181,023.80	196,410.82	213,105.74	230,089	246,270	264,741	284,596	305,941	328,886	353,553	380,069
Total Revenue	2,458,340	2,590,994	2,925,146	3,426,161	3,911,602	4,375,127	5,010,652	5,741,815	6,583,316	7,552,140	8,667,919	9,941,961	11,410,055	13,102,303	15,053,521	17,303,978	19,900,252	22,896,228	26,354,242
Gross Cash Requirement	2,612,127	2,748,033	3,009,236	3,445,676	3,948,121	4,169,528.46	4,589,447	5,051,848	5,574,354	6,151,344	6,794,070	7,510,790	8,310,922	9,265,232	10,206,045	11,227,503	12,345,860	13,599,835	15,091,029
Cash needed / Total Revenue	106.26%	106.06%	102.85%	100.57%	98.40%	95.30%	91.59%	88.05%	84.67%	81.45%	78.38%	75.55%	72.84%	70.25%	67.80%	65.45%	63.24%	61.14%	59.16%
Cash Surplus	-153,787	-157,039	-83,390	-19,515	62,781	205,598	421,205	685,967	1,008,962	1,400,796	1,873,848	2,431,171	3,099,133	3,897,072	4,847,476	5,976,474	7,314,392	8,996,393	10,703,213
Retained Income	-1,481,234	-1,792,060	-1,875,451	-1,894,966	-1,832,185	-1,626,536	-1,205,331	-519,414	489,543	1,390,344	3,764,132	6,195,363	9,294,496	13,191,568	18,035,044	24,015,518	31,329,910	40,226,303	50,989,516
Average Water Tariff	14.84																		
Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015

Table A17.1.9

**NATIONAL WATER SUPPLY & DRAINAGE BOARD
DEBT OUTSTANDING & REPAYMENT SCHEDULE**

No.	Project - Donor	Loan Balance As at 31.12.97	1997		1998		1999		2000		1000 Rs.
			Interest	Repayment	Interest	Repayment	Interest	Repayment	Interest	Repayment	
1	IDA - 1700	793,886	88,712	0	95,266	0	95,266	36,086	90,936	36,086	
2	ADB 817	1,028,667	33,088	0	123,440	0	123,440	46,758	117,829	46,758	
3	ODA	65,323	6,270	3,609	7,406	3,609	6,973	3,609	6,540	3,609	
4	OECD (Towns East of Colombo)	420,578	48,140	0	50,469	0	50,469	0	50,469	0	
5	IDA - 1041	226,574	11,081	17,429	25,097	17,429	23,006	17,429	20,915	17,429	
6	USAID	56,447	1,399	3,497	6,354	3,497	5,934	3,497	5,515	3,497	
7	French - Trincomalee	133,744	8,642	10,288	14,815	10,288	13,580	10,288	12,346	10,288	
8	French - Negombo (1)	32,776	3,883	2,521	3,631	2,521	3,328	2,521	3,025	2,521	
9	French - Negombo (11)	32,833	3,852	2,189	3,677	2,189	3,415	2,189	3,152	2,189	
10	French - Kurunegala	31,063	3,914	1,553	3,541	1,553	3,355	1,553	3,168	1,553	
11	French - Badulla	38,837	4,906	2,044	4,415	2,044	4,170	2,044	3,925	2,044	
12	French - Ambatale	519,580	65,319	24,742	59,381	24,742	56,412	24,742	53,442	24,742	
13	ADB - 1235	503,254	44,806	0	60,391	0	60,391	0	60,391	0	
14	OECD (Towns South of Colombo)	145,493	8,152	0	17,459	0	17,459	0	17,459	0	
15	Karumunia - EFIC	91,260	9,079	0	10,951	0	10,951	0	10,951	0	
16	Matara/Nilambe - ODA	544,858	63,445	0	65,383	0	65,383	0	65,383	0	
17	Ambatale - Remote Supervision French	189,000	22,680	0	22,680	0	22,680	0	22,680	0	
18	Ambatale - Refur. & Impr. French	120,000	9,360	0	14,400	0	14,400	0	14,400	0	
Total		4,974,173	436,728	67,872	588,756	67,872	580,612	150,716	562,526	150,716	

Appendix 17.2 Water Supply Project - Financial Analysis Calculation

- Appendix 17.2.1 Pro-forma Financial Statements**
- Nuwara Eliya Water Supply Project (Master Plan)
- Appendix 17.2.2 Calculation of FIRR**
- Nuwara Eliya Water Supply Project (Master Plan)
- Appendix 17.2.3 Pro-forma Financial Statements**
- Nuwara Eliya Water Supply Project (Feasibility Study)
- Appendix 17.2.4 Calculation of FIRR**
- Nuwara Eliya Water Supply Project (Feasibility Study)

Table A17.2.1

Pro Forma Financial Statements (M Rs.)
Nuwara Eliya Water Supply Project (Master Plan) 1.0 % annual tariff increase in real terms

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fixed Flow Table																											
Annual Sales	0.0	0.0	0.0	0.0	45.8	52.5	60.2	68.9	78.8	90.0	102.8	117.3	133.6	152.2	173.3	197.2	224.7	255.9	291.2	331.3	376.7	428.0	486.2	551.8	626.2	696.7	774.0
Subsidy from GSL	0.0	24.6	145.8	252.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	27.3	0.0	0.0	0.0	0.0	146.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% Interest)	0.0	24.6	145.8	252.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	27.3	0.0	0.0	0.0	0.0	146.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	49.1	291.6	503.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.9	54.7	0.0	0.0	0.0	0.0	0.0	292.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	2.5	17.0	42.1	41.3	39.4	37.5	35.6	33.7	31.7	29.8	28.7	26.5	27.6	25.5	23.4	21.3	19.2	31.8	29.7	26.9	24.2	21.4	18.7	16.0	13.3	11.4
Annual Loan Repayment	0.0	0.0	0.0	1.1	7.7	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	19.7
O & M	0.0	0.0	0.0	0.0	19.2	21.1	23.2	25.6	28.1	30.9	34.0	37.4	41.2	46.3	50.9	56.0	61.6	67.3	74.6	82.0	90.2	99.2	109.2	120.1	132.1	145.3	159.8
Overhead (1.5 % of Sales)	0.0	0.0	0.0	0.0	6.9	7.9	9.0	10.3	11.8	13.5	15.4	17.6	20.0	22.8	26.0	29.6	33.7	38.4	43.7	49.7	56.5	64.2	72.9	82.8	93.9	104.5	116.1
Net Cash Inflow	0.0	(2.5)	(17.0)	(43.2)	(29.4)	(35.1)	(28.8)	(21.8)	(14.0)	(5.4)	4.3	14.3	23.7	36.0	50.1	67.4	87.2	108.7	130.4	149.1	175.6	212.9	255.2	302.8	356.8	407.2	467.0
Working Capital Burden																											
Cumulative Cash Deficit	(2.5)	(19.5)	(62.7)	(92.1)	(127.3)	(156.1)	(177.9)	(191.9)	(197.3)	(193.0)	(178.6)	(154.9)	(119.0)	(88.9)	(41.5)	85.7	195.4	315.8	464.9	640.5	853.4	1108.6	1411.4	1768.2	2175.5	2642.5	3149.9
10% Interest on above	(0.2)	(1.9)	(6.3)	(9.2)	(12.7)	(15.6)	(17.8)	(19.2)	(19.7)	(19.3)	(17.9)	(15.5)	(11.9)	(6.9)	(0.2)	8.6	19.5	31.6	46.5	64.0	85.3	110.9	141.1	176.8	217.5	264.2	314.9
Cum. Interest payment	(0.2)	(2.2)	(8.5)	(17.7)	(30.4)	(46.0)	(63.8)	(83.0)	(102.7)	(122.0)	(139.9)	(155.4)	(167.3)	(174.2)	(174.3)	(163.7)	(146.2)	(114.6)	(88.1)	(41.1)	81.2	192.1	333.2	510.1	727.6	991.9	1326.8
Income Statement																											
Annual Sales	0.0	0.0	0.0	0.0	45.8	52.5	60.2	68.9	78.8	90.0	102.8	117.3	133.6	152.2	173.3	197.2	224.7	255.9	291.2	331.3	376.7	428.0	486.2	551.8	626.2	696.7	774.0
O & M	0.0	0.0	0.0	0.0	19.2	21.1	23.2	25.6	28.1	30.9	34.0	37.4	41.2	46.3	50.9	56.0	61.6	67.3	74.6	82.0	90.2	99.2	109.2	120.1	132.1	145.3	159.8
Overhead (1.5 % of Sales)	0.0	0.0	0.0	0.0	6.9	7.9	9.0	10.3	11.8	13.5	15.4	17.6	20.0	22.8	26.0	29.6	33.7	38.4	43.7	49.7	56.5	64.2	72.9	82.8	93.9	104.5	116.1
Annual Depreciation	0.0	0.4	3.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
Interest Payment (10%)	0.0	2.5	17.0	42.1	41.3	39.4	37.5	35.6	33.7	31.7	29.8	28.7	26.5	27.6	25.5	23.4	21.3	19.2	31.8	29.7	26.9	24.2	21.4	18.7	16.0	13.3	11.4
Net Income	0.0	(2.9)	(20.4)	(52.1)	(31.6)	(25.9)	(19.6)	(12.6)	(4.8)	3.8	13.5	23.4	32.2	44.8	60.2	77.5	97.3	119.8	123.1	151.8	184.9	222.3	264.5	312.2	366.1	415.4	468.6
Balance Sheet																											
Cash	(2.5)	(19.5)	(62.7)	(92.1)	(127.3)	(156.1)	(177.9)	(191.9)	(197.3)	(193.0)	(178.6)	(154.9)	(119.0)	(88.9)	(41.5)	85.7	195.4	315.8	464.9	640.5	853.4	1108.6	1411.4	1768.2	2175.5	2642.5	3149.9
Capital Investment	41.1	332.8	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7
Less Accum. Depreciation	0.4	3.7	13.7	23.7	33.7	43.7	53.7	63.7	73.7	83.7	93.7	103.7	113.7	123.7	133.7	143.7	153.7	163.7	173.7	183.7	193.7	203.7	213.7	223.7	233.7	243.7	253.7
Land	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Assets	46.2	317.5	768.2	768.2	728.8	683.7	644.9	613.1	589.0	573.7	568.0	588.1	653.7	681.0	720.4	777.0	853.5	952.5	1346.8	1477.8	1653.3	1830.1	2067.2	2351.9	2690.6	3079.7	3528.7
Loan Balance	24.6	170.4	421.2	413.5	394.3	375.1	355.9	336.7	317.5	298.3	287.0	295.2	275.6	254.8	234.0	213.2	192.4	171.6	150.8	129.9	109.1	88.3	67.5	46.7	25.9	5.1	113.6
Grant from GSL	24.6	170.4	421.2	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3
Reserved Fund	(2.9)	(23.2)	(75.4)	(107.0)	(132.9)	(152.5)	(165.2)	(170.0)	(166.2)	(162.2)	(157.6)	(153.3)	(149.1)	(145.0)	(140.9)	(136.8)	(132.7)	(128.6)	(124.5)	(120.4)	(116.3)	(112.2)	(108.1)	(104.0)	(100.0)	(96.0)	(92.0)
Total Liab. & Capital	46.2	317.5	768.2	728.8	683.7	644.9	613.1	589.0	573.7	568.0	588.1	653.7	681.0	720.4	777.0	853.5	952.5	1346.8	1477.8	1653.3	1830.1	2067.2	2351.9	2690.6	3079.7	3528.7	4028.7

Table A17.2.1

Pro Forma Financial Statements (M Rs.)

Nuwara Eliya Water Supply Project (Master Plan)

1.0 % annual tariff increase in real terms

Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Food Flow Table																								
Annual Sales	859.9	955.4	1,061.4	1,179.3	1,310.2	1,455.6	1,617.2	1,796.7	1,996.1	2,217.7	2,463.8	2,737.3	3,041.2	3,378.7	3,753.8	4,170.4	4,633.3	5,147.6	5,719.0	6,353.8	7,059.1	7,842.7	8,713.2	9,680.4
Subsidy from GSL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% Interest)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	0.0	0.0	0.0	0.0	0.0	1,219.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,094.8	0.0	0.0
Interest Payment (10%)	10.5	9.7	8.9	8.1	7.2	6.4	66.6	65.8	62.2	58.8	55.3	51.9	48.4	45.0	41.6	38.8	36.0	33.3	30.5	27.7	24.9	21.7	18.5	15.3
Annual Loan Repayment	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4
O & M	175.8	193.4	212.8	234.0	257.4	283.2	311.5	342.6	376.9	414.6	456.0	501.7	551.8	607.0	667.7	734.5	807.9	888.7	977.6	1,075.3	1,182.9	1,301.2	1,431.5	1,574.4
Overhead (15 % of Sales)	129.0	143.3	159.2	176.9	196.5	218.3	242.6	269.5	299.4	332.6	369.6	410.6	456.2	506.8	563.1	625.6	695.0	772.1	857.9	953.1	1,058.9	1,176.4	1,307.0	1,452.1
Net Cash Inflow	536.3	600.7	672.3	752.0	840.7	939.4	988.3	1,110.5	1,222.0	1,377.3	1,548.5	1,738.8	1,950.4	2,185.5	2,447.1	2,749.9	3,066.7	3,425.8	3,825.4	4,270.0	4,764.7	5,308.5	5,973.1	6,750.6
Working Capital Balance																								
Cumulative Cash Deficit	3,178.8	3,779.6	4,451.9	5,204.0	6,044.7	6,984.1	7,972.4	9,082.9	10,304.9	11,682.2	13,203.8	14,969.6	16,920.0	19,105.5	21,529.6	24,296.4	27,363.1	30,788.9	34,614.3	38,884.3	43,649.0	48,709.5	54,332.6	60,633.2
10% Interest on above	317.9	378.0	445.2	520.4	604.5	698.4	797.2	908.3	1,030.5	1,168.2	1,323.1	1,497.0	1,692.0	1,910.5	2,155.3	2,429.6	2,736.3	3,078.9	3,461.4	3,888.4	4,364.9	4,870.9	5,433.3	6,063.3
Cum. Interest payment	1,309.8	1,687.7	2,132.9	2,633.3	3,257.8	3,956.2	4,753.4	5,661.7	6,692.2	7,860.4	9,183.5	10,680.5	12,372.5	14,283.0	16,438.3	18,867.9	21,604.2	24,683.1	28,144.5	32,033.0	36,397.9	41,268.8	46,707.1	52,770.4
Income Statement																								
Annual Sales	859.9	955.4	1,061.4	1,179.3	1,310.2	1,455.6	1,617.2	1,796.7	1,996.1	2,217.7	2,463.8	2,737.3	3,041.2	3,378.7	3,753.8	4,170.4	4,633.3	5,147.6	5,719.0	6,353.8	7,059.1	7,842.7	8,713.2	9,680.4
O & M	175.8	193.4	212.8	234.0	257.4	283.2	311.5	342.6	376.9	414.6	456.0	501.7	551.8	607.0	667.7	734.5	807.9	888.7	977.6	1,075.3	1,182.9	1,301.2	1,431.5	1,574.4
Overhead (15 % of Sales)	129.0	143.3	159.2	176.9	196.5	218.3	242.6	269.5	299.4	332.6	369.6	410.6	456.2	506.8	563.1	625.6	695.0	772.1	857.9	953.1	1,058.9	1,176.4	1,307.0	1,452.1
Annual Depreciation	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0	49.0
Interest Payment (10%)	10.5	9.7	8.9	8.1	7.2	6.4	66.6	65.8	62.2	58.8	55.3	51.9	48.4	45.0	41.6	38.8	36.0	33.3	30.5	27.7	24.9	21.7	18.5	15.3
Net Income	526.5	590.9	662.5	742.2	830.9	929.6	947.5	1,069.8	1,208.6	1,362.6	1,539.9	1,734.1	1,953.7	2,170.9	2,432.4	2,722.6	3,043.4	3,404.5	3,804.1	4,243.7	4,743.4	4,910.0	5,522.6	6,215.9
Balance Sheet																								
Cash	3,178.8	3,779.6	4,451.9	5,204.0	6,044.7	6,984.1	7,972.4	9,082.9	10,304.9	11,682.2	13,203.8	14,969.6	16,920.0	19,105.5	21,529.6	24,296.4	27,363.1	30,788.9	34,614.3	38,884.3	43,649.0	48,709.5	54,332.6	60,633.2
Capital Investment	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2	1,199.2
Less Accum. Depreciation	399.2	357.3	375.4	393.5	411.6	429.7	478.7	527.8	576.8	625.8	674.8	723.9	772.9	821.9	871.0	920.0	969.0	1,018.0	1,067.1	1,116.1	1,165.1	1,213.4	1,261.5	1,309.7
Land	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9
Total Assets	105.4	97.1	88.9	80.7	72.4	64.2	66.5	67.5	62.9	58.7	55.2	51.9	48.4	45.0	41.6	38.8	36.0	33.3	30.5	27.7	24.9	21.7	18.5	15.3
Loan Balance	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6	639.6
Grant from GSL	3,337.9	3,928.8	4,591.3	5,333.4	6,164.3	7,099.9	8,041.4	9,111.1	10,319.7	11,682.2	13,203.8	14,969.6	16,920.0	19,105.5	21,529.6	24,296.4	27,363.1	30,788.9	34,614.3	38,884.3	43,649.0	48,709.5	54,332.6	60,633.2
Reserved Fund	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9	4,046.9
Total Liab. & Capital	105.4	97.1	88.9	80.7	72.4	64.2	66.5	67.5	62.9	58.7	55.2	51.9	48.4	45.0	41.6	38.8	36.0	33.3	30.5	27.7	24.9	21.7	18.5	15.3

Table A17.2.2

Calculation of FIRR
Nuwara Eliya Water Supply Project (Master Plan)

(1998 Price)

Year	Water Sales			Tariff	Revenue	Investment	50% of Inv.	O&M	OH15%	Total Outlay	Net Inflow	FIRR
	Dom	N-Dom	Total	Rs./cum	M Rs./y	M Rs.	M Rs.	M Rs.	M Rs.	M Rs.	M Rs.	
	cum/d	cum/d	cum/d									
2001						36.9	18.45		0.00	18.45	(18.45)	
2002						199.2	99.60		0.00	99.60	(99.60)	
2003						312.9	156.45		0.00	156.45	(156.45)	
2004	3,510	1,434	4,944	14.18	25.58		0.00	10.85	3.84	14.68	10.90	
2005	3,624	1,480	5,104	14.32	26.68		0.00	10.85	4.00	14.85	11.83	
2006	3,738	1,526	5,264	14.46	27.79		0.00	10.85	4.17	15.01	12.77	
2007	3,851	1,573	5,424	14.61	28.92		0.00	10.85	4.34	15.18	13.74	
2008	3,965	1,619	5,584	14.75	30.07		0.00	10.85	4.51	15.36	14.71	
2009	4,078	1,666	5,744	14.90	31.24		0.00	10.85	4.69	15.53	15.71	
2010	4,192	1,712	5,904	15.05	32.43		0.00	10.85	4.86	15.71	16.72	
2011	4,303	1,758	6,061	15.20	33.63	4.6	2.30	10.85	5.04	18.19	15.44	
2012	4,415	1,803	6,218	15.35	34.84	14.4	7.20	10.85	5.23	23.27	11.57	
2013	4,526	1,849	6,375	15.51	36.08		0.00	11.08	5.41	16.50	19.58	
2014	4,638	1,894	6,532	15.66	37.34		0.00	11.08	5.60	16.68	20.65	
2015	4,749	1,940	6,689	15.82	38.62		0.00	11.08	5.79	16.88	21.74	
2016	4,871	1,990	6,861	15.98	40.01		0.00	11.08	6.00	17.09	22.92	
2017	4,994	2,040	7,034	16.14	41.43		0.00	11.08	6.21	17.30	24.13	
2018	5,116	2,089	7,205	16.30	42.86	43.4	21.70	11.08	6.43	39.21	3.65	
2019	5,239	2,139	7,378	16.46	44.33		0.00	11.08	6.65	17.73	26.59	
2020	5,361	2,189	7,550	16.62	45.81		0.00	11.08	6.87	17.96	27.86	
2021	5,483	2,239	7,722	16.79	47.33		0.00	11.08	7.10	18.18	29.14	
2022	5,606	2,289	7,895	16.96	48.87		0.00	11.08	7.33	18.41	30.45	
2023	5,728	2,338	8,066	17.13	50.43		0.00	11.08	7.56	18.65	31.78	
2024	5,851	2,388	8,239	17.30	52.02		0.00	11.08	7.80	18.89	33.14	
2025	5,859	2,391	8,250	17.47	52.61		0.00	11.08	7.89	18.98	33.64	
2026	5,859	2,391	8,250	17.65	53.14		0.00	11.08	7.97	19.06	34.09	
2027	5,859	2,391	8,250	17.82	53.67		0.00	11.08	8.05	19.13	34.54	
2028	5,859	2,391	8,250	18.00	54.21		0.00	11.08	8.13	19.22	34.99	
2029	5,859	2,391	8,250	18.18	54.75		0.00	11.08	8.21	19.30	35.45	
2030	5,859	2,391	8,250	18.36	55.30		0.00	11.08	8.29	19.38	35.92	
2031	5,859	2,391	8,250	18.55	55.85		0.00	11.08	8.38	19.46	36.39	
2032	5,859	2,391	8,250	18.73	56.41		0.00	11.08	8.46	19.55	36.86	
2033	5,859	2,391	8,250	18.92	56.97	43.4	21.70	11.08	8.55	41.33	15.64	
2034	5,859	2,391	8,250	19.11	57.54		0.00	11.08	8.63	19.72	37.83	
2035	5,859	2,391	8,250	19.30	58.12		0.00	11.08	8.72	19.80	38.32	
2036	5,859	2,391	8,250	19.49	58.70		0.00	11.08	8.80	19.89	38.81	
2037	5,859	2,391	8,250	19.69	59.29		0.00	11.08	8.89	19.98	39.31	
2038	5,859	2,391	8,250	19.89	59.88		0.00	11.08	8.98	20.07	39.81	
2039	5,859	2,391	8,250	20.08	60.48		0.00	11.08	9.07	20.16	40.32	
2040	5,859	2,391	8,250	20.28	61.08		0.00	11.08	9.16	20.25	40.84	
2041	5,859	2,391	8,250	20.49	61.69		0.00	11.08	9.25	20.34	41.36	
2042	5,859	2,391	8,250	20.69	62.31		0.00	11.08	9.35	20.43	41.88	
2043	5,859	2,391	8,250	20.90	62.93		0.00	11.08	9.44	20.52	42.41	
2044	5,859	2,391	8,250	21.11	63.56		0.00	11.08	9.53	20.62	42.94	
2045	5,859	2,391	8,250	21.32	64.20		0.00	11.08	9.63	20.71	43.49	
2046	5,859	2,391	8,250	21.53	64.84		0.00	11.08	9.73	20.81	44.03	
2047	5,859	2,391	8,250	21.75	65.49		0.00	11.08	9.82	20.91	44.58	
2048	5,859	2,391	8,250	21.97	66.14	43.4	21.70	11.08	9.92	42.71	23.44	
2049	5,859	2,391	8,250	22.19	66.81		0.00	11.08	10.02	21.10	45.70	
2050	5,859	2,391	8,250	22.41	67.47	(34.7)	(17.36)	11.08	10.12	3.85	63.63	7.20%

Note: 1.0 % annual tariff increase in real terms

Table A17.2.3

Pro Forma Financial Statements (M Rs.)

Nuwara Eliya Water Supply Project (F/S)

1.0 % annual tariff increase in real terms

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fund Flow Table																											
Annual Sales	0.0	0.0	0.0	0.0	45.8	52.5	60.2	68.9	78.8	90.0	102.8	116.9	132.9	151.0	171.4	194.5	216.1	240.1	266.8	296.4	329.3	365.8	406.4	451.5	501.7	557.4	619.2
Grant from GSL	0.0	24.6	145.8	252.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	146.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% Interest)	0.0	24.6	145.8	252.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	146.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	49.1	291.6	503.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	292.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	2.5	17.0	42.1	41.3	39.4	37.5	35.6	33.7	31.7	29.8	27.9	26.0	24.1	22.2	20.2	18.3	16.4	14.4	12.4	10.4	8.4	6.4	4.4	2.4	0.4	0.0
Annual Loan Repayment	0.0	0.0	0.0	1.1	7.7	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	18.1
O & M	0.0	0.0	0.0	0.0	19.2	21.1	23.2	25.6	28.1	30.9	34.0	37.4	41.2	45.3	49.8	54.8	60.3	66.3	73.0	80.3	88.3	97.1	106.8	117.5	129.3	142.2	156.4
Overhead (15 % of Sales)	0.0	0.0	0.0	0.0	6.9	7.9	9.0	10.3	11.8	13.5	15.4	17.5	19.9	22.6	25.7	29.2	32.4	36.0	40.0	44.5	49.4	54.9	61.0	67.7	75.3	83.6	92.9
Net Cash Inflow	0.0	(2.5)	(17.0)	(43.2)	(29.4)	(35.1)	(28.8)	(21.8)	(14.0)	(5.4)	4.3	14.8	26.6	39.7	54.5	71.1	85.9	102.2	105.5	125.3	141.2	166.0	193.4	223.7	257.1	295.1	341.9
Working Capital Burden																											
Cumulative Cash Deficit	(2.5)	(19.5)	(62.7)	(92.1)	(127.3)	(156.1)	(177.9)	(191.9)	(197.3)	(197.3)	(193.0)	(178.1)	(151.6)	(111.8)	(57.3)	13.8	98.7	201.9	307.4	432.7	573.9	739.9	933.4	1,157.0	1,414.1	1,709.2	2,051.1
10% Interest on above	(0.2)	(1.9)	(6.3)	(9.2)	(12.7)	(15.6)	(17.8)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)	(19.2)
Cum. Interest payment	(0.2)	(2.2)	(8.5)	(17.7)	(30.4)	(46.0)	(63.8)	(83.0)	(102.7)	(122.0)	(139.8)	(155.0)	(166.2)	(171.9)	(170.5)	(166.6)	(140.4)	(109.6)	(66.4)	(9.0)	(5.0)	55.0	158.4	274.1	415.5	586.4	791.5
Income Statement																											
Annual Sales	0.0	0.0	0.0	0.0	45.8	52.5	60.2	68.9	78.8	90.0	102.8	116.9	132.9	151.0	171.4	194.5	216.1	240.1	266.8	296.4	329.3	365.8	406.4	451.5	501.7	557.4	619.2
O & M	0.0	0.0	0.0	0.0	19.2	21.1	23.2	25.6	28.1	30.9	34.0	37.4	41.2	45.3	49.8	54.8	60.3	66.3	73.0	80.3	88.3	97.1	106.8	117.5	129.3	142.2	156.4
Overhead (15 % of Sales)	0.0	0.0	0.0	0.0	6.9	7.9	9.0	10.3	11.8	13.5	15.4	17.5	19.9	22.6	25.7	29.2	32.4	36.0	40.0	44.5	49.4	54.9	61.0	67.7	75.3	83.6	92.9
Annual Depreciation	0.0	0.4	3.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Interest Payment (10%)	0.0	2.5	17.0	42.1	41.3	39.4	37.5	35.6	33.7	31.7	29.8	27.9	26.0	24.1	22.2	20.2	18.3	16.4	14.4	12.4	10.4	8.4	6.4	4.4	2.4	0.4	0.0
Net Income	0.0	(2.9)	(20.4)	(52.1)	(31.6)	(25.9)	(19.6)	(12.6)	(4.8)	3.8	13.5	24.0	35.8	48.9	63.7	80.3	95.1	111.4	107.3	127.1	149.6	174.5	201.8	232.1	265.5	302.4	342.6
Balance Sheet																											
Cash	(2.5)	(19.5)	(62.7)	(92.1)	(127.3)	(156.1)	(177.9)	(191.9)	(197.3)	(197.3)	(193.0)	(178.1)	(151.6)	(111.8)	(57.3)	13.8	98.7	201.9	307.4	432.7	573.9	739.9	933.4	1,157.0	1,414.1	1,709.2	2,051.1
Capital Investment	41.1	332.8	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7	836.7
Less Accum. Depreciation	0.4	3.7	13.7	23.7	33.7	43.7	53.7	63.7	73.7	83.7	93.7	103.7	113.7	123.7	133.7	143.7	153.7	163.7	173.7	183.7	193.7	203.7	213.7	223.7	233.7	243.7	253.7
Land	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Assets	46.2	317.5	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2
Loan Balance	24.6	170.4	421.2	413.5	394.3	375.1	355.9	336.7	317.5	298.3	279.1	259.9	240.7	221.5	202.3	183.1	163.9	144.7	125.5	106.3	87.1	67.9	48.7	29.5	10.3	(9.9)	(9.9)
Grant from GSL	24.6	170.4	421.2	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3	422.3
Reserve Fund	(2.9)	(23.2)	(75.4)	(107.0)	(132.9)	(152.5)	(165.2)	(170.0)	(176.2)	(182.2)	(187.9)	(193.2)	(198.1)	(202.6)	(206.8)	(210.7)	(214.3)	(217.6)	(220.6)	(223.3)	(225.7)	(227.8)	(229.6)	(231.1)	(232.4)	(233.5)	(234.5)
Total Liab. & Capital	46.2	317.5	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2	768.2

Table 17.17

Pro Forma Financial Statements (M Rs.)

Nuwara Eliya Water Supply Project (P/S)

1.0 % annual tariff increase in real terms

Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Fund Flow Table																								
Annual Sales	688.0	764.3	849.2	943.4	1,048.1	1,164.5	1,293.7	1,437.3	1,596.9	1,774.1	1,971.1	2,189.8	2,432.9	2,703.0	3,003.0	3,336.3	3,706.7	4,118.1	4,575.2	5,083.1	5,647.3	6,274.1	6,970.6	7,744.3
Grant from GSL	0.0	0.0	0.0	0.0	0.0	0.0	609.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,547.4	0.0	0.0
Loan (10% Interest)	0.0	0.0	0.0	0.0	0.0	0.0	609.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,547.4	0.0	0.0
Capital Investment	0.0	0.0	0.0	0.0	0.0	0.0	1,219.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,094.8	0.0	0.0
Interest Payment (10%)	9.3	8.6	8.0	7.3	6.6	6.0	66.3	65.6	62.2	58.8	55.3	51.9	48.4	45.0	41.6	38.8	36.0	33.3	30.5	27.7	24.9	276.9	274.1	259.8
Annual Loan Repayment	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
O & M	172.0	189.2	208.2	229.0	251.9	277.1	304.8	335.2	368.8	405.7	446.2	490.8	539.9	593.9	653.3	718.6	790.5	869.5	956.5	1,052.2	1,157.4	1,273.1	1,400.4	1,540.5
Overhead (15 % of Sales)	103.2	114.6	127.4	141.5	157.2	174.7	194.1	215.6	239.5	266.1	295.7	328.5	364.9	405.4	450.5	500.5	556.0	617.7	686.3	762.5	847.1	941.1	1,045.6	1,161.6
Net Cash Inflow	396.8	445.2	499.0	559.0	625.8	700.1	722.0	814.2	892.0	1,009.3	1,139.5	1,284.3	1,445.3	1,624.2	1,823.3	2,050.7	2,296.4	2,569.9	2,874.2	3,213.0	3,590.2	3,755.3	4,222.7	4,638.9
Working Capital Burden																								
Cumulative Cash Deficit	2,447.9	2,893.1	3,392.1	3,951.1	4,576.9	5,277.0	5,995.0	6,813.2	7,705.2	8,714.5	9,854.0	11,138.3	12,583.5	14,207.8	16,031.1	18,081.8	20,378.2	22,948.1	25,822.3	29,035.3	32,625.5	36,380.8	40,603.5	45,242.4
10% Interest on above	244.8	289.3	339.2	395.1	457.7	527.7	599.9	681.3	770.5	871.4	985.4	1,113.8	1,258.4	1,420.8	1,603.1	1,808.2	2,037.8	2,294.8	2,582.2	2,903.5	3,262.6	3,638.1	4,060.4	4,531.2
Cum. Interest payment	1,036.3	1,325.6	1,664.8	2,059.9	2,517.6	3,045.3	3,645.2	4,326.5	5,097.1	5,968.5	6,951.9	8,067.7	9,326.1	10,746.8	12,350.0	14,158.1	16,196.0	18,490.8	21,073.0	23,976.5	27,239.1	30,877.2	34,937.5	39,461.8
Income Statement																								
Annual Sales	688.0	764.3	849.2	943.4	1,048.1	1,164.5	1,293.7	1,437.3	1,596.9	1,774.1	1,971.1	2,189.8	2,432.9	2,703.0	3,003.0	3,336.3	3,706.7	4,118.1	4,575.2	5,083.1	5,647.3	6,274.1	6,970.6	7,744.3
O & M	172.0	189.2	208.2	229.0	251.9	277.1	304.8	335.2	368.8	405.7	446.2	490.8	539.9	593.9	653.3	718.6	790.5	869.5	956.5	1,052.2	1,157.4	1,273.1	1,400.4	1,540.5
Overhead (15 % of Sales)	103.2	114.6	127.4	141.5	157.2	174.7	194.1	215.6	239.5	266.1	295.7	328.5	364.9	405.4	450.5	500.5	556.0	617.7	686.3	762.5	847.1	941.1	1,045.6	1,161.6
Annual Depreciation	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4
Interest: Payment (10%)	9.3	8.6	8.0	7.3	6.6	6.0	66.3	65.6	62.2	58.8	55.3	51.9	48.4	45.0	41.6	38.8	36.0	33.3	30.5	27.7	24.9	276.9	274.1	259.8
Net Income	386.0	434.4	488.3	548.2	615.0	689.4	680.3	772.5	878.1	995.3	1,125.5	1,270.3	1,431.3	1,610.3	1,809.3	2,030.1	2,275.8	2,549.3	2,853.6	3,192.4	3,569.6	3,605.5	4,072.9	4,604.9
Balance Sheet																								
Cash	2,447.9	2,893.1	3,392.1	3,951.1	4,576.9	5,277.0	5,995.0	6,813.2	7,705.2	8,714.5	9,854.0	11,138.3	12,583.5	14,207.8	16,031.1	18,081.8	20,378.2	22,948.1	25,822.3	29,035.3	32,625.5	36,380.8	40,603.5	45,242.4
Capital Investment	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7	1,128.7
Less Accum. Depreciation	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1	345.1
Land	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Assets	3,256.9	3,684.6	4,166.3	4,707.8	5,316.2	5,998.9	7,892.2	8,658.1	9,501.8	10,462.8	11,553.9	12,789.9	14,186.8	15,762.8	17,537.8	19,540.2	21,788.3	24,309.8	27,135.7	30,300.4	33,842.3	42,514.8	46,560.0	51,021.5
Loan Balance	92.9	86.3	79.6	73.0	66.4	59.7	662.9	656.3	621.9	587.6	553.2	518.9	484.5	450.1	415.8	381.1	360.3	332.6	304.9	277.2	249.5	2,769.1	2,741.4	2,597.9
Grant from GSL	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3	568.3
Reserved Fund	2,595.6	3,030.0	3,518.3	4,066.5	4,681.5	5,370.9	6,051.2	6,823.7	7,701.8	8,697.0	9,822.6	11,092.9	12,524.2	14,134.5	15,943.8	17,973.9	20,249.8	22,799.0	25,652.7	28,845.1	32,414.6	36,020.1	40,095.1	44,698.0
Total Liab. & Capital	3,256.9	3,684.6	4,166.3	4,707.8	5,316.2	5,998.9	7,892.2	8,658.1	9,501.8	10,462.8	11,553.9	12,789.9	14,186.8	15,762.8	17,537.8	19,540.2	21,788.3	24,309.8	27,135.7	30,300.4	33,842.3	42,514.8	46,560.0	51,021.5

Table A17.2.4

Calculation of FIRR
Nuwara Eliya Water Supply Project (F/S)

(1998 Price)

Year	Water Sales			Tariff Rs./cum	Revenue M Rs./y	Investment M Rs.	50% of Inv. M Rs.	O&M M Rs.	OH15% M Rs.	Total Outlay M Rs.	Net Inflow M Rs.	FIRR
	Dom cum/d	N-Dom cum/d	Total cum/d									
2001						36.90	18.45		0.00	18.45	(18.45)	
2002						199.20	99.60		0.00	99.60	(99.60)	
2003						312.90	156.45		0.00	156.45	(156.45)	
2004	3,510	1,434	4,944	14.18	25.58		0.00	10.85	3.84	14.68	10.90	
2005	3,624	1,480	5,104	14.32	26.68		0.00	10.85	4.00	14.85	11.83	
2006	3,738	1,526	5,264	14.46	27.79		0.00	10.85	4.17	15.01	12.77	
2007	3,851	1,573	5,424	14.61	28.92		0.00	10.85	4.34	15.18	13.74	
2008	3,965	1,619	5,584	14.75	30.07		0.00	10.85	4.51	15.36	14.71	
2009	4,078	1,666	5,744	14.90	31.24		0.00	10.85	4.69	15.53	15.71	
2010	4,192	1,712	5,904	15.05	32.43		0.00	10.85	4.86	15.71	16.72	
2011	4,294	1,750	6,044	15.20	33.53		0.00	10.85	5.03	15.87	17.66	
2012	4,395	1,787	6,182	15.35	34.64		0.00	10.85	5.20	16.04	18.60	
2013	4,497	1,825	6,322	15.51	35.78		0.00	10.85	5.37	16.21	19.57	
2014	4,598	1,862	6,460	15.66	36.93		0.00	10.85	5.54	16.38	20.54	
2015	4,700	1,900	6,600	15.82	38.10		0.00	10.85	5.72	16.56	21.54	
2016	4,700	1,900	6,600	15.98	38.49		0.00	10.85	5.77	16.62	21.87	
2017	4,700	1,900	6,600	16.14	38.87		0.00	10.85	5.83	16.68	22.19	
2018	4,700	1,900	6,600	16.30	39.26	43.40	21.70	10.85	5.89	38.43	0.83	
2019	4,700	1,900	6,600	16.46	39.65		0.00	10.85	5.95	16.79	22.86	
2020	4,700	1,900	6,600	16.62	40.05		0.00	10.85	6.01	16.85	23.20	
2021	4,700	1,900	6,600	16.79	40.45		0.00	10.85	6.07	16.91	23.54	
2022	4,700	1,900	6,600	16.96	40.85		0.00	10.85	6.13	16.97	23.88	
2023	4,700	1,900	6,600	17.13	41.26		0.00	10.85	6.19	17.03	24.23	
2024	4,700	1,900	6,600	17.30	41.67		0.00	10.85	6.25	17.10	24.58	
2025	4,700	1,900	6,600	17.47	42.09		0.00	10.85	6.31	17.16	24.93	
2026	4,700	1,900	6,600	17.65	42.51		0.00	10.85	6.38	17.22	25.29	
2027	4,700	1,900	6,600	17.82	42.94		0.00	10.85	6.44	17.29	25.65	
2028	4,700	1,900	6,600	18.00	43.37		0.00	10.85	6.50	17.35	26.02	
2029	4,700	1,900	6,600	18.18	43.80		0.00	10.85	6.57	17.42	26.39	
2030	4,700	1,900	6,600	18.36	44.24		0.00	10.85	6.64	17.48	26.76	
2031	4,700	1,900	6,600	18.55	44.68		0.00	10.85	6.70	17.55	27.13	
2032	4,700	1,900	6,600	18.73	45.13		0.00	10.85	6.77	17.61	27.51	
2033	4,700	1,900	6,600	18.92	45.58	43.40	21.70	10.85	6.84	39.38	6.20	
2034	4,700	1,900	6,600	19.11	46.03		0.00	10.85	6.91	17.75	28.28	
2035	4,700	1,900	6,600	19.30	46.49		0.00	10.85	6.97	17.82	28.68	
2036	4,700	1,900	6,600	19.49	46.96		0.00	10.85	7.04	17.89	29.07	
2037	4,700	1,900	6,600	19.69	47.43		0.00	10.85	7.11	17.96	29.47	
2038	4,700	1,900	6,600	19.89	47.90		0.00	10.85	7.19	18.03	29.87	
2039	4,700	1,900	6,600	20.08	48.38		0.00	10.85	7.26	18.10	30.28	
2040	4,700	1,900	6,600	20.28	48.87		0.00	10.85	7.33	18.17	30.69	
2041	4,700	1,900	6,600	20.49	49.36		0.00	10.85	7.40	18.25	31.11	
2042	4,700	1,900	6,600	20.69	49.85		0.00	10.85	7.48	18.32	31.53	
2043	4,700	1,900	6,600	20.90	50.35		0.00	10.85	7.55	18.40	31.95	
2044	4,700	1,900	6,600	21.11	50.85		0.00	10.85	7.63	18.47	32.38	
2045	4,700	1,900	6,600	21.32	51.36		0.00	10.85	7.70	18.55	32.81	
2046	4,700	1,900	6,600	21.53	51.87		0.00	10.85	7.78	18.63	33.25	
2047	4,700	1,900	6,600	21.75	52.39		0.00	10.85	7.86	18.70	33.69	
2048	4,700	1,900	6,600	21.97	52.92	43.40	21.70	10.85	7.94	40.48	12.43	
2049	4,700	1,900	6,600	22.19	53.44		0.00	10.85	8.02	18.86	34.58	
2050	4,700	1,900	6,600	22.41	53.98	(34.72)	(17.36)	10.85	8.10	1.58	52.40	6.43%

Note: 1.0 % annual tariff increase in real terms

Appendix 17.3 Sewerage Project - Financial Analysis Calculation

- Appendix 17.3.1 Pro-forma Financial Statements**
- Nuwara Eliya Sewerage Project (Master Plan, Case 1)
- Appendix 17.3.2 Calculation of FIRR**
- Nuwara Eliya Sewerage Project (Master Plan, Case 1)
- Appendix 17.3.3 Pro-forma Financial Statements**
- Nuwara Eliya Sewerage Project (Master Plan, Case 2)
- Appendix 17.3.4 Calculation of FIRR**
- Nuwara Eliya Sewerage Project (Master Plan, Case 2)
- Appendix 17.3.5 Pro-forma Financial Statements**
- Nuwara Eliya Sewerage Project (Feasibility Study, Case 1)
- Appendix 17.3.6 Calculation of FIRR**
- Nuwara Eliya Sewerage Project (Feasibility Study, Case 1)
- Appendix 17.3.7 Pro-forma Financial Statements**
- Nuwara Eliya Sewerage Project (Feasibility Study, Case 2)
- Appendix 17.3.8 Calculation of FIRR**
- Nuwara Eliya Sewerage Project (Feasibility Study, Case 2)

Table A17.3.1

Pro Forma Financial Statements (M Rs.)
Nuwara Eliya Sewerage Project (M/P)
Case 1 100 % subsidy
1.0 % tariff increase in real terms

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fund Flow Table																											
Annual Sales	0.0	0.0	0.0	0.0	1.3	3.0	5.1	7.8	9.0	10.3	11.8	13.4	15.2	17.4	21.7	25.7	30.1	35.3	40.2	45.7	52.0	59.0	67.3	76.0	84.4	93.8	104.2
Subsidy from GSL	0.0	62.6	136.2	442.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	363.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% Interest)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	62.6	136.2	442.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.4	212.7	739.4	0.0	0.0	0.0	0.0	363.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Loan Repayment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O & M	0.0	0.0	0.0	0.0	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.5	19.0	21.6	24.6	27.9	31.1	34.5	38.3	42.6	47.4	52.5	57.8	63.6	69.9
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.5	1.7	2.2	2.6	3.0	3.5	4.0	4.6	5.2	5.9	6.7	7.6	8.4	9.4	10.4
Net Cash Inflow	0.0	0.0	0.0	0.0	(1.9)	(1.4)	(0.8)	0.1	0.4	0.8	1.2	0.3	0.7	1.3	0.5	1.5	2.5	3.8	5.1	6.7	8.5	10.4	13.2	15.8	18.2	20.8	23.8
Working Capital Burden																											
Cumulative cash deficit	0.0	0.0	0.0	0.0	(1.9)	(3.3)	(4.1)	(4.0)	(3.5)	(2.8)	(1.6)	(1.3)	(0.6)	0.6	1.1	2.6	5.0	8.9	14.0	20.6	29.1	39.5	52.7	68.5	86.7	107.5	131.3
10% interest on above	0.0	0.0	0.0	0.0	(0.2)	(0.3)	(0.4)	(0.4)	(0.4)	(0.3)	(0.2)	(0.1)	(0.1)	0.1	0.1	0.3	0.5	0.9	1.4	2.1	2.9	3.9	5.3	6.9	8.7	10.7	13.1
Cum. Interest Payment	0.0	0.0	0.0	0.0	(0.2)	(0.5)	(0.9)	(1.3)	(1.7)	(2.0)	(2.1)	(2.2)	(2.3)	(2.2)	(2.1)	(1.9)	(1.4)	(0.5)	0.9	3.0	5.9	9.8	15.1	22.0	30.6	41.4	54.5
Income Statement																											
Annual Sales					1.3	3.0	5.1	7.8	9.0	10.3	11.8	13.4	15.2	17.4	21.7	25.7	30.1	35.3	40.2	45.7	52.0	59.0	67.3	76.0	84.4	93.8	104.2
O & M					3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.5	19.0	21.6	24.6	27.9	31.1	34.5	38.3	42.6	47.4	52.5	57.8	63.6	69.9
Overhead (10 % of Sales)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Depreciation					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Income					0.0	0.0	0.0	0.1	0.4	0.8	1.2	0.3	0.7	1.1	0.5	1.5	2.5	3.8	5.1	6.7	8.5	10.4	13.2	15.8	18.2	20.8	23.8
Balance Sheet																											
Cash	0.0	0.0	0.0	0.0	(1.9)	(3.3)	(4.1)	(4.0)	(3.5)	(2.8)	(1.6)	(1.3)	(0.6)	0.6	1.1	2.6	5.0	8.9	14.0	20.6	29.1	39.5	52.7	68.5	86.7	107.5	131.3
Capital Investment	30.6	166.8	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	651.1	833.8	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1	1,603.1
Less Accum. Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	62.6	198.7	641.6	641.6	639.7	638.3	637.5	637.6	638.1	638.8	640.0	631.8	895.1	1,635.6	1,636.2	1,637.6	1,640.1	1,644.0	2,012.0	2,018.7	2,027.1	2,037.6	2,050.8	2,066.6	2,084.8	2,105.6	2,129.4
Loan Balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant from GSL	62.6	198.7	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	683.0	895.7	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1	1,635.1
Reserved Fund	0.0	0.0	0.0	0.0	(1.9)	(3.3)	(4.1)	(4.0)	(3.5)	(2.8)	(1.6)	(1.3)	(0.6)	0.6	1.1	2.6	5.0	8.9	14.0	20.6	29.1	39.5	52.7	68.5	86.7	107.5	131.3
Total Liab. & Capital	62.6	198.7	641.6	641.6	639.7	638.3	637.5	637.6	638.1	638.8	640.0	631.8	895.1	1,635.6	1,636.2	1,637.6	1,640.1	1,644.0	2,012.0	2,018.7	2,027.1	2,037.6	2,050.8	2,066.6	2,084.8	2,105.6	2,129.4

Table A17.3.1

Pro Forma Financial Statements (M Rs.)
Nuwara Eliya Sewerage Project (M/P)

Case 1 100 % subsidy
1.0 % tariff increase in real terms

Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Fund Flow Table																								
Annual Sales	115.7	128.6	142.9	158.7	176.3	195.9	217.6	241.8	268.6	298.5	331.6	368.4	409.3	454.7	505.2	561.3	623.6	692.8	769.7	855.1	950.1	1,055.5	1,172.7	1,302.8
Subsidy from GSL	0.0	494.1	0.0	0.0	0.0	0.0	1,516.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,813.5	0.0	0.0	0.0	0.0	6,334.4	0.0	0.0
Loan (10% Interest)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	434.1	0.0	0.0	0.0	0.0	1,516.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,813.5	0.0	0.0	0.0	0.0	6,334.4	0.0	0.0
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Loan Repayment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O & M	76.9	84.6	93.1	102.4	112.6	123.9	136.3	149.9	164.9	181.4	199.5	219.5	241.5	265.6	292.2	321.4	353.5	388.9	427.8	470.5	517.6	569.3	626.5	688.9
Overhead (10 % of Sales)	11.6	12.9	14.3	15.9	17.6	19.6	21.8	24.2	26.9	29.8	33.2	36.8	40.9	45.5	50.5	56.1	62.4	69.3	77.0	85.5	95.0	105.6	117.3	130.3
Net Cash Inflow	27.2	31.1	35.5	40.4	46.1	52.4	59.6	67.7	76.9	87.2	98.9	112.1	126.9	143.7	162.5	183.8	207.7	234.7	265.0	299.1	337.5	380.6	429.1	483.7
Working Capital Burden																								
Cumulative cash deficit	135.5	189.6	225.1	265.5	311.6	364.0	423.6	491.3	568.1	655.4	754.2	866.3	993.2	1,136.9	1,299.4	1,483.1	1,690.9	1,925.5	2,190.5	2,489.6	2,827.0	3,207.7	3,636.8	4,120.4
10% interest on above	15.9	19.0	22.5	26.6	31.2	36.4	42.4	49.1	56.8	65.5	75.4	86.6	99.3	113.7	129.9	148.3	169.1	192.6	219.0	249.0	282.7	320.8	363.7	412.0
Cum. Interest Payment	70.4	89.3	111.8	138.4	169.5	205.9	248.3	297.4	354.2	419.8	495.2	581.8	681.1	794.8	924.8	1,073.1	1,242.2	1,434.7	1,653.8	1,902.7	2,185.4	2,506.2	2,869.9	3,281.9
Income Statement																								
Annual Sales	115.7	128.6	142.9	158.7	176.3	195.9	217.6	241.8	268.6	298.5	331.6	368.4	409.3	454.7	505.2	561.3	623.6	692.8	769.7	855.1	950.1	1,055.5	1,172.7	1,302.8
O & M	76.9	84.6	93.1	102.4	112.6	123.9	136.3	149.9	164.9	181.4	199.5	219.5	241.5	265.6	292.2	321.4	353.5	388.9	427.8	470.5	517.6	569.3	626.5	688.9
Overhead (10 % of Sales)	11.6	12.9	14.3	15.9	17.6	19.6	21.8	24.2	26.9	29.8	33.2	36.8	40.9	45.5	50.5	56.1	62.4	69.3	77.0	85.5	95.0	105.6	117.3	130.3
Annual Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Income	27.2	31.1	35.5	40.4	46.1	52.4	59.6	67.7	76.9	87.2	98.9	112.1	126.9	143.7	162.5	183.8	207.7	234.7	265.0	299.1	337.5	380.6	429.1	483.7
Balance Sheet																								
Cash	158.5	189.6	225.1	265.5	311.6	364.0	423.6	491.3	568.1	655.4	754.2	866.3	993.2	1,136.9	1,299.4	1,483.1	1,690.9	1,925.5	2,190.5	2,489.6	2,827.0	3,207.7	3,636.8	4,120.4
Capital Investment	1,968.1	2,400.3	2,400.3	2,400.3	2,400.3	2,400.3	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7	3,916.7
Less Accum. Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	2,156.6	2,621.8	2,657.3	2,697.8	2,743.8	2,796.2	4,372.2	4,439.9	4,516.8	4,604.0	4,702.9	4,814.9	4,941.8	5,085.5	5,248.0	5,431.8	5,635.0	5,857.7	6,099.2	6,369.2	6,658.6	6,967.3	7,296.2	7,645.0
Loan Balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant from GSL	1,998.1	2,432.2	2,432.2	2,432.2	2,432.2	2,432.2	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6	3,948.6
Reserved Fund	158.5	189.6	225.1	265.5	311.6	364.0	423.6	491.3	568.1	655.4	754.2	866.3	993.2	1,136.9	1,299.4	1,483.1	1,690.9	1,925.5	2,190.5	2,489.6	2,827.0	3,207.7	3,636.8	4,120.4
Total Liab. & Capital	2,156.6	2,621.8	2,657.3	2,697.8	2,743.8	2,796.2	4,372.2	4,439.9	4,516.8	4,604.0	4,702.9	4,814.9	4,941.8	5,085.5	5,248.0	5,431.8	5,635.0	5,857.7	6,099.2	6,369.2	6,658.6	6,967.3	7,296.2	7,645.0

Table A17.3.2

Calculation of FIRR
Nuwara Eliya Sewerage Project (M/P)
Case 1

(1998 Price)												
Year	Volume		Tariff		Revenue			Investment	O&M	OH	Net Inflow	FIRR
	Dom	Non-Dom	Dom	Non-Dom	Dom	Non-Dom	Total	Capital				
	cum/d	cum/d	Rs./cum	Rs./cum	M Rs./Y	M Rs./Y	M Rs./Y	M Rs.	M Rs.	M Rs.	M Rs.	
2000								47.0		0.00	0.00	
2001								93.0		0.00	0.00	
2002								275.0		0.00	0.00	
2003									1.79	0.07	(1.13)	
2004	33	244	2.0	8.0	0.0	0.7	0.74		2.28	0.15	(0.89)	
2005	68	505	2.0	8.1	0.1	1.5	1.54		2.77	0.24	(0.61)	
2006	104	779	2.0	8.2	0.1	2.3	2.40		3.27	0.33	(0.28)	
2007	143	1,070	2.1	8.2	0.1	3.2	3.33		3.30	0.35	(0.18)	
2008	148	1,103	2.1	8.3	0.1	3.4	3.46		3.33	0.36	(0.09)	
2009	152	1,136	2.1	8.4	0.1	3.5	3.60		3.37	0.37	0.00	
2010	157	1,170	2.1	8.5	0.1	3.6	3.75		3.40	0.39	0.09	
2011	160	1,199	2.1	8.6	0.1	3.8	3.88	12.0	3.43	0.40	0.18	
2012	164	1,229	2.2	8.7	0.1	3.9	4.02	56.0	3.47	0.42	0.27	
2013	169	1,260	2.2	8.7	0.1	4.0	4.16	177.0	4.14	0.47	0.12	
2014	313	1,389	2.2	8.8	0.3	4.5	4.73		4.28	0.51	0.29	
2015	435	1,449	2.2	8.9	0.4	4.7	5.07		4.43	0.54	0.45	
2016	553	1,508	2.3	9.0	0.5	5.0	5.42		4.57	0.58	0.63	
2017	675	1,569	2.3	9.1	0.6	5.2	5.77		4.62	0.60	0.75	
2018	691	1,606	2.3	9.2	0.6	5.4	5.97	54.0	4.66	0.62	0.90	
2019	709	1,645	2.3	9.3	0.6	5.6	6.18		4.71	0.64	1.04	
2020	726	1,684	2.3	9.4	0.6	5.8	6.39		4.76	0.66	1.17	
2021	715	1,725	2.4	9.5	0.6	6.0	6.58		4.81	0.68	1.34	
2022	763	1,766	2.4	9.6	0.7	6.2	6.83		4.85	0.70	1.46	
2023	770	1,795	2.4	9.7	0.7	6.3	7.01		4.85	0.71	1.52	
2024	770	1,795	2.4	9.8	0.7	6.4	7.08		4.85	0.72	1.59	
2025	770	1,795	2.5	9.9	0.7	6.5	7.15		4.85	0.72	1.65	
2026	770	1,795	2.5	10.0	0.7	6.5	7.22		4.85	0.73	1.72	
2027	770	1,795	2.5	10.1	0.7	6.6	7.30		4.85	0.74	1.78	
2028	770	1,795	2.5	10.2	0.7	6.7	7.37	24.9	4.85	0.74	1.85	
2029	770	1,795	2.6	10.3	0.7	6.7	7.44		4.85	0.75	1.92	
2030	770	1,795	2.6	10.4	0.7	6.8	7.52		4.85	0.76	1.98	
2031	770	1,795	2.6	10.5	0.7	6.9	7.59		4.85	0.77	2.05	
2032	770	1,795	2.6	10.6	0.7	6.9	7.67		4.85	0.77	2.12	
2033	770	1,795	2.7	10.7	0.8	7.0	7.74	54.0	4.85	0.78	2.19	
2034	770	1,795	2.7	10.8	0.8	7.1	7.82		4.85	0.79	2.26	
2035	770	1,795	2.7	10.9	0.8	7.1	7.90		4.85	0.80	2.33	
2036	770	1,795	2.7	11.0	0.8	7.2	7.98		4.85	0.81	2.40	
2037	770	1,795	2.8	11.1	0.8	7.3	8.06		4.85	0.81	2.48	
2038	770	1,795	2.8	11.2	0.8	7.4	8.14		4.85	0.82	2.55	
2039	770	1,795	2.8	11.3	0.8	7.4	8.22		4.85	0.83	2.62	
2040	770	1,795	2.9	11.4	0.8	7.5	8.30		4.85	0.84	2.70	
2041	770	1,795	2.9	11.6	0.8	7.6	8.39		4.85	0.85	2.77	
2042	770	1,795	2.9	11.7	0.8	7.6	8.47		4.85	0.86	2.85	
2043	770	1,795	2.9	11.8	0.8	7.7	8.56	24.9	4.85	0.86	2.93	
2044	770	1,795	3.0	11.9	0.8	7.8	8.64		4.85	0.87	3.00	
2045	770	1,795	3.0	12.0	0.8	7.9	8.73		4.85	0.88	3.08	
2046	770	1,795	3.0	12.2	0.9	8.0	8.81		4.85	0.89	3.16	
2047	770	1,795	3.1	12.3	0.9	8.0	8.90		54.0	4.85	0.90	3.24
2048	770	1,795	3.1	12.4	0.9	8.1	8.99		4.85	0.91	3.32	
2049	770	1,795	3.1	12.5	0.9	8.2	9.08		4.85	0.92	3.40	13.18%
2050	770	1,795	3.2	12.6	0.9	8.3	9.17	(43.2)	4.85	0.92	3.40	13.18%

- Note: 1. 1 % annual tariff increase in real terms.
 2. Unit tariff of Non Domestic User is 4 times of Domestic User.
 3. 100 % subsidy for capital investment.
 4. Overhead is assumed to be 10% of Revenue.
 5. Investment Cost in 2050 is assumed salvage value.

Table A17.3.3

Pro Forma Financial Statements (M Rs.)
Nuwara Eliya Sewerage Project (M/P)

Case 2 90 % subsidy

1.0 % tariff increase in real terms

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fund Flow Table																											
Annual Sales	0.0	0.0	0.0	0.0	1.6	3.8	6.5	10.0	11.6	13.4	15.5	17.8	20.5	23.6	29.7	35.2	41.7	49.2	56.5	65.0	74.6	85.5	98.5	112.3	126.0	141.4	158.6
Subsidy from GSL	0.0	56.3	122.5	398.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.3	191.4	663.4	0.0	0.0	0.0	327.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% Interest)	0.0	6.3	13.6	44.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	21.3	75.9	0.0	0.0	0.0	36.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	62.6	136.2	442.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.4	212.7	739.4	0.0	0.0	0.0	0.0	363.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.6	2.0	6.4	6.3	6.0	5.7	5.4	5.1	4.8	4.5	4.7	6.5	13.6	13.2	12.4	11.7	11.0	14.3	13.6	12.7	11.7	10.8	9.9	8.9	8.0	7.2
Annual Loan Repayment	0.0	0.0	0.0	0.3	0.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	3.1	4.1	7.4	7.4	7.4	7.4	9.3	9.3	9.3	9.3	9.3	9.3	9.0	8.4	8.4
O & M	0.0	0.0	0.0	0.0	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.5	19.0	21.6	24.6	27.9	31.1	34.5	38.3	42.6	47.4	52.5	57.8	63.6	69.9
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Cash Inflow	(0.6)	(2.0)	(6.7)	(6.7)	(8.8)	(9.6)	(8.1)	(6.0)	(5.0)	(3.8)	(2.5)	(1.5)	(2.0)	(7.6)	(6.6)	(6.3)	(2.1)	2.9	3.7	9.5	14.3	21.8	31.0	40.6	49.9	60.7	73.1
Working Capital Burden																											
Cumulative cash deficit	(0.6)	(2.6)	(9.3)	(18.0)	(27.6)	(35.7)	(41.7)	(46.7)	(50.6)	(53.1)	(54.6)	(54.6)	(56.6)	(64.2)	(70.8)	(77.0)	(79.1)	(76.3)	(72.6)	(63.1)	(48.8)	(27.0)	4.1	44.6	94.6	155.3	228.4
10% interest on above	(0.1)	(0.3)	(0.9)	(1.8)	(2.8)	(3.6)	(4.2)	(4.7)	(5.1)	(5.3)	(5.5)	(5.7)	(5.7)	(6.4)	(7.1)	(7.7)	(7.9)	(7.6)	(7.3)	(6.3)	(4.9)	(2.7)	0.4	4.5	9.5	15.5	22.8
Cum. Interest Payment	0.1	0.2	0.7	(1.1)	(3.8)	(7.4)	(11.6)	(16.2)	(21.3)	(26.6)	(32.1)	(37.7)	(44.1)	(51.2)	(58.9)	(66.8)	(74.5)	(81.7)	(88.0)	(92.9)	(95.2)	(95.6)	(95.2)	(90.8)	(81.5)	(65.8)	(42.9)
Income Statement																											
Annual Sales	1.6	3.8	6.5	10.0	11.6	13.4	15.5	17.8	20.5	23.6	29.7	35.2	41.7	49.2	56.5	65.0	74.6	85.5	98.5	112.3	126.0	141.4	158.6	178.6	198.5	218.4	238.4
O & M	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.5	16.0	17.8	19.0	21.6	24.6	27.9	31.1	34.5	38.3	42.6	47.4	52.5	57.8	63.6	69.9	76.2	82.5
Overhead (10 % of Sales)	0.0	0.1	0.3	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	2.2	4.3	4.3	4.3	4.3	4.3	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Annual Depreciation	0.6	2.0	6.4	6.3	6.0	5.7	5.4	5.1	4.8	4.5	4.7	6.5	13.6	13.2	12.4	11.7	11.0	14.3	13.6	12.7	11.7	10.8	9.9	8.9	8.0	7.2	6.4
Interest Payment (10%)	(0.7)	(2.3)	(6.1)	(9.5)	(8.4)	(6.8)	(4.6)	(3.8)	(2.6)	(1.3)	(0.4)	(1.2)	(8.8)	(6.8)	(6.3)	(3.1)	1.1	6.0	4.7	10.7	17.4	25.0	34.2	43.7	53.1	63.6	75.3
Net Income	(0.6)	(2.6)	(9.3)	(18.0)	(27.6)	(35.7)	(41.7)	(46.7)	(50.6)	(53.1)	(54.6)	(54.6)	(56.6)	(64.2)	(70.8)	(77.0)	(79.1)	(76.3)	(72.6)	(63.1)	(48.8)	(27.0)	4.1	44.6	94.6	155.3	228.4
Balance Sheet																											
Cash	30.6	166.8	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7
Capital Investment	0.1	0.4	2.1	3.8	5.4	7.1	8.8	10.5	12.1	13.8	15.6	17.8	21.3	26.3	30.6	34.9	39.1	43.5	51.7	57.9	64.1	70.2	76.4	82.6	88.8	95.0	101.2
Less Accum. Depreciation	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Land	61.9	195.7	630.2	619.8	608.5	598.8	591.1	584.4	578.9	574.7	570.5	566.3	562.1	557.9	553.7	549.5	545.3	541.1	536.9	532.7	528.5	524.3	520.1	515.9	511.7	507.5	503.3
Total Assets	63.0	199.9	639.9	630.0	601.1	571.1	541.2	511.3	481.4	451.5	421.6	391.7	361.8	331.9	302.0	272.1	242.2	212.3	182.4	152.5	122.6	92.7	62.8	32.9	2.9	-27.1	-57.2
Loan Balance	56.3	178.8	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4
Grant from GSL	(0.7)	(3.0)	(11.1)	(20.6)	(29.0)	(35.8)	(40.6)	(44.3)	(46.9)	(48.2)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)	(48.6)
Reserved Fund	61.9	195.7	630.2	619.8	608.5	598.8	591.1	584.4	578.9	574.7	570.5	566.3	562.1	557.9	553.7	549.5	545.3	541.1	536.9	532.7	528.5	524.3	520.1	515.9	511.7	507.5	503.3
Total Liab. & Capital	63.0	199.9	639.9	630.0	601.1	571.1	541.2	511.3	481.4	451.5	421.6	391.7	361.8	331.9	302.0	272.1	242.2	212.3	182.4	152.5	122.6	92.7	62.8	32.9	2.9	-27.1	-57.2

Table A17.3.3

Pro Forma Financial Statements (M Rs.)
Nuwara Eliya Sewerage Project (M/P)
Case 2 90 % subsidy
1.0 % tariff increase in real terms

Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Food Flow Table																								
Annual Sales	177.9	199.7	224.0	251.3	282.0	316.4	355.0	398.3	446.9	501.5	562.6	631.3	708.3	794.7	891.7	1,000.4	1,122.5	1,259.4	1,413.1	1,585.5	1,778.9	1,995.9	2,239.4	2,512.7
Subsidy from GSL	0.0	391.0	0.0	0.0	0.0	0.0	1,365.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,633.5	0.0	0.0	0.0	0.0	5,705.2	0.0	0.0
Loan (10% interest)	0.0	43.4	0.0	0.0	0.0	0.0	151.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.5	0.0	0.0	0.0	0.0	633.9	0.0	0.0
Capital Investment	0.0	434.5	0.0	0.0	0.0	0.0	1,517.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,815.0	0.0	0.0	0.0	0.0	6,339.1	0.0	0.0
Interest Payment (10%)	6.5	11.3	10.7	9.8	8.9	8.0	24.4	23.5	21.8	20.3	19.1	17.8	16.6	15.4	14.2	13.2	10.3	33.8	31.7	29.7	27.6	27.4	95.3	90.0
Annual Loan Repayment	6.4	6.4	6.4	6.4	6.4	6.4	8.9	8.9	16.5	15.5	12.2	12.2	12.2	12.2	12.2	10.3	10.3	10.3	10.3	20.6	20.6	20.6	20.6	53.2
O & M	76.9	84.6	93.1	102.4	112.6	123.9	136.3	149.9	164.9	181.4	199.6	219.5	241.5	265.6	292.2	321.4	353.5	388.9	427.8	470.5	517.6	569.3	626.3	688.9
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Cash Inflow	88.1	97.3	113.8	130.3	151.6	175.6	185.5	216.1	243.7	284.3	331.9	381.8	438.1	501.5	573.1	655.6	723.9	826.5	933.0	1,064.7	1,213.1	1,308.6	1,497.2	1,680.5
Working Capital Burden																								
Cumulative cash deficit	316.5	413.8	527.6	657.9	809.5	985.1	1,170.6	1,386.7	1,630.4	1,914.6	2,246.5	2,628.3	3,066.3	3,567.9	4,141.0	4,796.6	5,520.5	6,347.0	7,280.0	8,344.7	9,557.8	10,866.5	12,363.7	14,044.2
10% interest on above	31.6	41.4	52.8	65.8	80.9	98.5	117.1	138.7	163.0	191.5	224.7	262.8	306.6	356.8	414.1	479.7	552.0	634.7	728.0	834.5	955.8	1,086.6	1,236.4	1,404.4
Cum. Interest Payment	(11.3)	30.1	82.9	148.6	229.6	328.1	445.1	583.8	746.9	938.3	1,163.0	1,425.8	1,732.4	2,089.2	2,503.3	2,983.0	3,535.0	4,169.7	4,897.7	5,732.2	6,688.0	7,774.6	9,011.0	10,413.4
Income Statement																								
Annual Sales	177.9	199.7	224.0	251.3	282.0	316.4	355.0	398.3	446.9	501.5	562.6	631.3	708.3	794.7	891.7	1,000.4	1,122.5	1,259.4	1,413.1	1,585.5	1,778.9	1,995.9	2,239.4	2,512.7
O & M	76.9	84.6	93.1	102.4	112.6	123.9	136.3	149.9	164.9	181.4	199.6	219.5	241.5	265.6	292.2	321.4	353.5	388.9	427.8	470.5	517.6	569.3	626.3	688.9
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Depreciation	6.2	9.1	9.1	9.1	9.1	9.1	9.1	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	29.3	29.3	29.3	29.3	29.3	29.3	65.8	65.8
Interest Payment (10%)	6.5	11.3	10.7	9.8	8.9	8.0	24.4	23.5	21.8	20.3	19.1	17.8	16.6	15.4	14.2	13.2	10.3	33.8	31.7	29.7	27.6	27.4	95.3	90.0
Net Income	88.3	94.6	111.1	130.0	151.3	175.4	176.5	207.1	242.4	281.9	326.2	376.1	432.4	485.9	537.5	648.1	704.8	807.5	924.3	1,050.0	1,204.4	1,263.4	1,452.1	1,668.0
Balance Sheet																								
Cash	316.5	413.8	527.6	657.9	809.5	985.1	1,170.6	1,386.7	1,630.4	1,914.6	2,246.5	2,628.3	3,066.3	3,567.9	4,141.0	4,796.6	5,520.5	6,347.0	7,280.0	8,344.7	9,557.8	10,866.5	12,363.7	14,044.2
Capital Investment	1,986.4	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9	2,400.9
Less Accum. Depreciation	101.2	110.3	119.4	128.5	137.6	146.7	155.8	164.6	173.4	182.1	190.8	200.2	209.4	218.6	227.7	236.7	245.7	254.6	263.5	272.4	281.3	290.2	299.1	308.0
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	2,213.6	2,736.3	2,841.0	2,962.2	3,104.7	3,271.2	3,456.4	3,660.4	3,884.5	4,128.5	4,392.6	4,676.7	4,981.6	5,308.3	5,657.1	6,028.7	6,424.2	6,846.5	7,295.8	7,772.1	8,276.3	8,809.4	9,372.5	9,975.7
Loan Balance	60.7	97.7	91.3	82.5	73.6	64.8	56.1	47.5	38.9	30.3	21.7	13.1	4.5	-4.1	-12.6	-25.1	-37.6	-50.1	-62.6	-75.1	-87.6	-100.1	-112.6	-125.1
Grant from GSL	1,798.5	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6	2,189.6
Reserved Fund	354.4	449.0	500.1	590.2	641.5	692.8	744.1	795.4	846.7	898.0	949.3	1,000.6	1,051.9	1,103.2	1,154.5	1,205.8	1,257.1	1,308.4	1,359.7	1,411.0	1,462.3	1,513.6	1,564.9	1,616.2
Total Liab. & Capital	2,213.6	2,736.3	2,841.0	2,962.2	3,104.7	3,271.2	3,456.4	3,660.4	3,884.5	4,128.5	4,392.6	4,676.7	4,981.6	5,308.3	5,657.1	6,028.7	6,424.2	6,846.5	7,295.8	7,772.1	8,276.3	8,809.4	9,372.5	9,975.7

Table A17.3.4

Calculation of FIRR
Nuwara Eliya Sewerage Project (M/P)
Case 2

Year	Volume		Tariff		Revenue			Investment	10% of Inv.	O&M	OH	(1998 Price)	
	Dom cum/d	Non-Dom cum/d	Dom Rs./cum	Non-Dom Rs./cum	Dom M Rs./Y	Non-Dom M Rs./Y	Total M Rs./Y	M Rs.	M Rs.	M Rs.	M Rs.	Net Inflow	FIRR
2000													
2001								47.0	4.7		0.00	(4.70)	
2002								93.0	9.3		0.00	(9.30)	
2003								275.0	27.5		0.00	(27.50)	
2004	33	244	2.0	10.0	0.0	0.9	0.91		0.0	1.79	0.09	(0.97)	
2005	68	505	2.0	10.1	0.1	1.9	1.91		0.0	2.28	0.19	(0.56)	
2006	104	779	2.0	10.2	0.1	2.9	2.98		0.0	2.77	0.30	(0.09)	
2007	143	1,070	2.1	10.3	0.1	4.0	4.13		0.0	3.27	0.41	0.45	
2008	148	1,103	2.1	10.4	0.1	4.2	4.30		0.0	3.30	0.43	0.57	
2009	152	1,136	2.1	10.5	0.1	4.4	4.47		0.0	3.33	0.45	0.70	
2010	157	1,170	2.1	10.6	0.1	4.5	4.65		0.0	3.37	0.47	0.82	
2011	160	1,199	2.1	10.7	0.1	4.7	4.82	12.0	1.2	3.40	0.48	(0.26)	
2012	164	1,229	2.2	10.8	0.1	4.9	4.99	56.0	5.6	3.43	0.50	(4.54)	
2013	169	1,260	2.2	10.9	0.1	5.0	5.16	177.0	17.7	3.47	0.52	(16.52)	
2014	313	1,389	2.2	11.0	0.3	5.6	5.85		0.0	4.14	0.59	1.13	
2015	435	1,449	2.2	11.2	0.4	5.9	6.25		0.0	4.28	0.63	1.35	
2016	553	1,508	2.3	11.3	0.5	6.2	6.66		0.0	4.43	0.67	1.56	
2017	675	1,569	2.3	11.4	0.6	6.5	7.08		0.0	4.57	0.71	1.80	
2018	691	1,606	2.3	11.5	0.6	6.7	7.32	54.0	5.4	4.62	0.73	(3.43)	
2019	709	1,645	2.3	11.6	0.6	7.0	7.57		0.0	4.66	0.76	2.15	
2020	726	1,684	2.3	11.7	0.6	7.2	7.83		0.0	4.71	0.78	2.34	
2021	715	1,725	2.4	11.8	0.6	7.5	8.07		0.0	4.76	0.81	2.51	
2022	763	1,766	2.4	12.0	0.7	7.7	8.38		0.0	4.81	0.84	2.73	
2023	770	1,795	2.4	12.1	0.7	7.9	8.59		0.0	4.85	0.86	2.88	
2024	770	1,795	2.4	12.2	0.7	8.0	8.68		0.0	4.85	0.87	2.96	
2025	770	1,795	2.5	12.3	0.7	8.1	8.77		0.0	4.85	0.88	3.04	
2026	770	1,795	2.5	12.4	0.7	8.2	8.85		0.0	4.85	0.89	3.12	
2027	770	1,795	2.5	12.6	0.7	8.2	8.94		0.0	4.85	0.89	3.20	
2028	770	1,795	2.5	12.7	0.7	8.3	9.03	24.9	2.5	4.85	0.90	0.79	
2029	770	1,795	2.6	12.8	0.7	8.4	9.12		0.0	4.85	0.91	3.36	
2030	770	1,795	2.6	13.0	0.7	8.5	9.21		0.0	4.85	0.92	3.44	
2031	770	1,795	2.6	13.1	0.7	8.6	9.31		0.0	4.85	0.93	3.53	
2032	770	1,795	2.6	13.2	0.7	8.7	9.40		0.0	4.85	0.94	3.61	
2033	770	1,795	2.7	13.3	0.8	8.7	9.49	54.0	5.4	4.85	0.95	(1.71)	
2034	770	1,795	2.7	13.5	0.8	8.8	9.59		0.0	4.85	0.96	3.78	
2035	770	1,795	2.7	13.6	0.8	8.9	9.68		0.0	4.85	0.97	3.87	
2036	770	1,795	2.7	13.7	0.8	9.0	9.78		0.0	4.85	0.98	3.95	
2037	770	1,795	2.8	13.9	0.8	9.1	9.88		0.0	4.85	0.99	4.04	
2038	770	1,795	2.8	14.0	0.8	9.2	9.98		0.0	4.85	1.00	4.13	
2039	770	1,795	2.8	14.2	0.8	9.3	10.08		0.0	4.85	1.01	4.22	
2040	770	1,795	2.9	14.3	0.8	9.4	10.18		0.0	4.85	1.02	4.31	
2041	770	1,795	2.9	14.5	0.8	9.5	10.28		0.0	4.85	1.03	4.40	
2042	770	1,795	2.9	14.6	0.8	9.6	10.38		0.0	4.85	1.04	4.49	
2043	770	1,795	2.9	14.7	0.8	9.7	10.49	24.9	2.5	4.85	1.05	2.10	
2044	770	1,795	3.0	14.9	0.8	9.8	10.59		0.0	4.85	1.06	4.68	
2045	770	1,795	3.0	15.0	0.8	9.9	10.70		0.0	4.85	1.07	4.78	
2046	770	1,795	3.0	15.2	0.9	10.0	10.80		0.0	4.85	1.08	4.87	
2047	770	1,795	3.1	15.3	0.9	10.1	10.91		0.0	4.85	1.09	4.97	
2048	770	1,795	3.1	15.5	0.9	10.2	11.02	54.0	5.4	4.85	1.10	(0.33)	
2049	770	1,795	3.1	15.6	0.9	10.3	11.13		0.0	4.85	1.11	5.17	
2050	770	1,795	3.2	15.8	0.9	10.4	11.24	(43.2)	(4.3)	4.85	1.12	9.59	2.07%

- Note: 1. 1 % annual tariff increase in real terms.
2. Unit tariff of Non Domestic User is 5 times of Domestic User.
3. 90 % subsidy for capital investment.
4. Overhead is assumed to be 10% of Revenue.
5. Investment Cost in 2050 is assumed salvage value.

Table A17.3.5

**Pro Forma Financial Statements (M Rs.) Case 1 100 % subsidy
Nuwara Eliya Sewerage Project (F/S) 1.0 % tariff increase in real terms**

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026						
Fund Flow Table																											
Annual Sales	0.0	0.0	0.0	0.0	1.3	3.0	5.1	7.8	9.0	10.3	11.8	13.5	15.0	16.7	18.5	20.6	22.9	25.4	28.3	31.4	34.9	38.8	43.1	47.8	53.1	59.0	65.6
Subsidy from GSL	0.0	62.6	136.2	442.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% interest)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	62.6	136.2	442.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Annual Loan Repayment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O & M	0.0	0.0	0.0	0.0	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.3	15.8	17.3	19.1	21.0	23.1	25.4	27.9	30.7	33.8	37.2	40.9	45.0	49.5
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.8	0.9	1.0	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3.1	3.5	3.9	4.3	4.8	5.3	5.9	6.6
Net Cash Inflow	0.0	0.0	0.0	0.0	(2.0)	(1.7)	(1.3)	(0.7)	(0.5)	(0.2)	0.0	0.4	0.5	0.7	0.9	1.2	1.5	1.9	2.4	2.9	3.5	4.2	5.0	5.9	6.9	8.2	9.6
Working Capital Burden																											
Cumulative cash deficit	0.0	0.0	0.0	0.0	(2.0)	(3.7)	(5.1)	(5.7)	(6.2)	(6.4)	(6.4)	(6.0)	(5.5)	(4.8)	(3.9)	(2.7)	(1.2)	0.8	3.1	6.0	9.5	13.6	18.6	24.5	31.4	39.6	49.2
10% interest on above	0.0	0.0	0.0	0.0	(0.2)	(0.4)	(0.5)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)	(0.5)	(0.4)	(0.3)	(0.1)	0.1	0.3	0.6	0.9	1.4	1.9	2.4	3.1	4.0	4.9
Own Interest Payment	0.0	0.0	0.0	0.0	(0.2)	(0.6)	(1.1)	(1.6)	(2.3)	(2.9)	(3.6)	(4.2)	(4.7)	(5.2)	(5.6)	(5.9)	(6.0)	(5.9)	(5.6)	(5.0)	(4.0)	(2.7)	(0.8)	1.6	4.8	8.7	13.6
Income Statement																											
Annual Sales	0.0	0.0	0.0	0.0	1.3	3.0	5.1	7.8	9.0	10.3	11.8	13.5	15.0	16.7	18.5	20.6	22.9	25.4	28.3	31.4	34.9	38.8	43.1	47.8	53.1	59.0	65.6
O & M	0.0	0.0	0.0	0.0	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.3	15.8	17.3	19.1	21.0	23.1	25.4	27.9	30.7	33.8	37.2	40.9	45.0	49.5
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.8	0.9	1.0	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3.1	3.5	3.9	4.3	4.8	5.3	5.9	6.6
Annual Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Income	0.0	0.0	0.0	0.0	(2.0)	(1.7)	(1.3)	(0.7)	(0.5)	(0.2)	0.0	0.4	0.5	0.7	0.9	1.2	1.5	1.9	2.4	2.9	3.5	4.2	5.0	5.9	6.9	8.2	9.6
Balance Sheet																											
Cash	0.0	0.0	0.0	0.0	(2.0)	(3.7)	(5.1)	(5.7)	(6.2)	(6.4)	(6.4)	(6.0)	(5.5)	(4.8)	(3.9)	(2.7)	(1.2)	0.8	3.1	6.0	9.5	13.6	18.6	24.5	31.4	39.6	49.2
Capital Investment	30.6	166.8	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7
Less Accum. Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	62.6	198.7	641.6	639.6	639.6	637.9	636.6	635.9	635.4	635.2	635.2	635.6	636.1	636.8	637.7	638.9	640.4	642.4	646.0	650.9	656.4	663.5	672.5	683.4	696.3	711.4	728.1
Loan Balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant from GSL	62.6	198.7	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6	641.6
Reserved Fund	0.0	0.0	0.0	0.0	(2.0)	(3.7)	(5.1)	(5.7)	(6.2)	(6.4)	(6.4)	(6.0)	(5.5)	(4.8)	(3.9)	(2.7)	(1.2)	0.8	3.1	6.0	9.5	13.6	18.6	24.5	31.4	39.6	49.2
Total Liab. & Capital	62.6	198.7	641.6	637.9	639.6	637.9	636.6	635.9	635.4	635.2	635.2	635.6	636.1	636.8	637.7	638.9	640.4	642.4	646.0	650.9	656.4	663.5	672.5	683.4	696.3	711.4	728.1

Table A17.3.5

Pro Forma Financial Statements (M Rs.)
Case 1 100 % subsidy
1.0 % tariff increase in real terms
Nuwara Eliya Sewerage Project (F/S)

Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Fund Flow Table																								
Annual Sales	72.9	81.0	90.0	99.9	111.0	123.4	137.0	152.3	169.2	187.9	206.8	232.0	257.7	286.3	318.1	353.4	392.7	436.2	484.7	538.5	598.2	664.6	738.4	820.4
Subsidy from GSL	0.0	0.0	0.0	0.0	0.0	0.0	1,517.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,339.1	0.0	0.0
Loan (10% Interest)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment																								
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,339.1	0.0	0.0
Annual Loan Repayment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O & M	54.4	59.9	65.8	72.4	79.7	87.6	96.4	106.0	116.6	128.3	141.1	155.2	170.8	187.8	206.6	227.3	250.0	275.0	302.5	332.8	366.0	402.7	442.9	487.2
Overhead (10 % of Sales)	7.3	8.1	9.0	10.0	11.1	12.3	13.7	15.2	16.9	18.8	20.9	23.2	25.8	28.6	31.8	35.3	39.3	43.6	48.5	53.8	59.8	66.5	73.8	82.0
Net Cash Inflow	11.2	13.0	15.1	17.5	20.3	23.4	27.0	31.0	35.6	40.8	46.8	53.5	61.2	69.9	79.7	90.8	103.4	117.6	133.7	151.9	172.4	195.5	221.7	251.1
Working Capital Burden																								
Cumulative cash deficit	60.3	73.4	88.5	106.0	126.3	149.7	176.6	207.6	243.2	284.1	330.9	384.4	445.6	515.5	595.2	686.0	789.3	907.0	1,040.6	1,192.5	1,364.9	1,560.4	1,782.1	2,033.2
10% interest on above	6.0	7.3	8.8	10.6	12.6	15.0	17.7	20.8	24.3	28.4	33.1	38.4	44.6	51.5	59.5	68.6	78.9	90.7	104.1	119.2	136.5	156.0	178.2	203.3
Cum. Interest Payment	19.7	27.0	35.9	46.5	59.1	74.1	91.7	112.5	136.8	165.2	198.3	236.8	281.3	332.9	392.4	461.0	539.9	630.6	734.7	853.9	990.4	1,146.4	1,324.6	1,528.0
Income Statement																								
Annual Sales	72.9	81.0	90.0	99.9	111.0	123.4	137.0	152.3	169.2	187.9	206.8	232.0	257.7	286.3	318.1	353.4	392.7	436.2	484.7	538.5	598.2	664.6	738.4	820.4
O & M	54.4	59.9	65.8	72.4	79.7	87.6	96.4	106.0	116.6	128.3	141.1	155.2	170.8	187.8	206.6	227.3	250.0	275.0	302.5	332.8	366.0	402.7	442.9	487.2
Overhead (10 % of Sales)	7.3	8.1	9.0	10.0	11.1	12.3	13.7	15.2	16.9	18.8	20.9	23.2	25.8	28.6	31.8	35.3	39.3	43.6	48.5	53.8	59.8	66.5	73.8	82.0
Annual Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Income	11.2	13.0	15.1	17.5	20.3	23.4	27.0	31.0	35.6	40.8	46.8	53.5	61.2	69.9	79.7	90.8	103.4	117.6	133.7	151.9	172.4	195.5	221.7	251.1
Balance Sheet																								
Cash	60.3	73.4	88.5	106.0	126.3	149.7	176.6	207.6	243.2	284.1	330.9	384.4	445.6	515.5	595.2	686.0	789.3	907.0	1,040.6	1,192.5	1,364.9	1,560.4	1,782.1	2,033.2
Capital Investment	972.9	972.9	972.9	972.9	972.9	972.9	972.9	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5	2,490.5
Less Accum. Depreciation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	1,065.2	1,078.3	1,093.4	1,110.9	1,131.2	1,154.6	1,184.6	1,220.1	1,260.7	1,306.5	1,357.3	1,413.3	1,474.6	1,541.4	1,613.6	1,691.4	1,774.9	1,863.6	1,957.8	2,057.9	2,164.4	2,277.4	2,396.6	2,521.6
Loan Balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grant from GSL	1,004.9	1,004.9	1,004.9	1,004.9	1,004.9	1,004.9	1,004.9	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4	2,522.4
Reserved Fund	60.3	73.4	88.5	106.0	126.3	149.7	176.6	207.6	243.2	284.1	330.9	384.4	445.6	515.5	595.2	686.0	789.3	907.0	1,040.6	1,192.5	1,364.9	1,560.4	1,782.1	2,033.2
Total Liab. & Capital	1,065.2	1,078.3	1,093.4	1,110.9	1,131.2	1,154.6	1,184.6	1,220.1	1,260.7	1,306.5	1,357.3	1,413.3	1,474.6	1,541.4	1,613.6	1,691.4	1,774.9	1,863.6	1,957.8	2,057.9	2,164.4	2,277.4	2,396.6	2,521.6

Table A17.3.6

Calculation of FIRR
Nuwara Eliya Sewerage Project (F/S)
Case 1

Year	Volume		Tariff		Revenue			Investment	O&M	OII	Net Inflow	FIRR
	Dom	Non-Dom	Dom	Non-Dom	Dom	Non-Dom	Total					
	cum/d	cum/d	Rs./cum	Rs./cum	M Rs./Y	M Rs./Y	M Rs./Y	M Rs.	M Rs.	M Rs.	M Rs.	
2000												
2001								47.0		0.00	0.00	
2002								93.0		0.00	0.00	
2003								275.0		0.00	0.00	
2004	33	244	2.0	8.0	0.0	0.7	0.74		1.79	0.07	(1.13)	
2005	68	505	2.0	8.1	0.1	1.5	1.54		2.28	0.15	(0.89)	
2006	104	779	2.0	8.2	0.1	2.3	2.40		2.77	0.24	(0.61)	
2007	143	1,070	2.1	8.2	0.1	3.2	3.33		3.27	0.33	(0.28)	
2008	148	1,103	2.1	8.3	0.1	3.4	3.46		3.30	0.35	(0.18)	
2009	152	1,136	2.1	8.4	0.1	3.5	3.60		3.33	0.36	(0.09)	
2010	157	1,170	2.1	8.5	0.1	3.6	3.75		3.37	0.37	0.00	
2011	161	1,205	2.1	8.6	0.1	3.8	3.90		3.40	0.39	0.11	
2012	162	1,211	2.2	8.7	0.1	3.8	3.96		3.43	0.40	0.13	
2013	162	1,211	2.2	8.7	0.1	3.9	4.00		3.43	0.40	0.17	
2014	162	1,211	2.2	8.8	0.1	3.9	4.04		3.43	0.40	0.20	
2015	162	1,211	2.2	8.9	0.1	3.9	4.08		3.43	0.41	0.24	
2016	162	1,211	2.3	9.0	0.1	4.0	4.12		3.43	0.41	0.28	
2017	162	1,211	2.3	9.1	0.1	4.0	4.16		3.43	0.42	0.31	
2018	162	1,211	2.3	9.2	0.1	4.1	4.20	54.0	3.43	0.42	0.35	
2019	162	1,211	2.3	9.3	0.1	4.1	4.24		3.43	0.42	0.39	
2020	162	1,211	2.3	9.4	0.1	4.1	4.29		3.43	0.43	0.43	
2021	162	1,211	2.4	9.5	0.1	4.2	4.33		3.43	0.43	0.47	
2022	162	1,211	2.4	9.6	0.1	4.2	4.37		3.43	0.44	0.50	
2023	162	1,211	2.4	9.7	0.1	4.3	4.41		3.43	0.44	0.54	
2024	162	1,211	2.4	9.8	0.1	4.3	4.46		3.43	0.45	0.58	
2025	162	1,211	2.5	9.9	0.1	4.4	4.50		3.43	0.45	0.62	
2026	162	1,211	2.5	10.0	0.1	4.4	4.55		3.43	0.45	0.66	
2027	162	1,211	2.5	10.1	0.1	4.4	4.59		3.43	0.46	0.70	
2028	162	1,211	2.5	10.2	0.2	4.5	4.64		3.43	0.46	0.75	
2029	162	1,211	2.6	10.3	0.2	4.5	4.69		3.43	0.47	0.79	
2030	162	1,211	2.6	10.4	0.2	4.6	4.73		3.43	0.47	0.83	
2031	162	1,211	2.6	10.5	0.2	4.6	4.78		3.43	0.48	0.87	
2032	162	1,211	2.6	10.6	0.2	4.7	4.83		3.43	0.48	0.92	
2033	162	1,211	2.7	10.7	0.2	4.7	4.88	54.0	3.43	0.49	0.96	
2034	162	1,211	2.7	10.8	0.2	4.8	4.93		3.43	0.49	1.00	
2035	162	1,211	2.7	10.9	0.2	4.8	4.97		3.43	0.50	1.05	
2036	162	1,211	2.7	11.0	0.2	4.9	5.02		3.43	0.50	1.09	
2037	162	1,211	2.8	11.1	0.2	4.9	5.07		3.43	0.51	1.14	
2038	162	1,211	2.8	11.2	0.2	5.0	5.13		3.43	0.51	1.18	
2039	162	1,211	2.8	11.3	0.2	5.0	5.18		3.43	0.52	1.23	
2040	162	1,211	2.9	11.4	0.2	5.1	5.23		3.43	0.52	1.28	
2041	162	1,211	2.9	11.6	0.2	5.1	5.28		3.43	0.53	1.32	
2042	162	1,211	2.9	11.7	0.2	5.2	5.33		3.43	0.53	1.37	
2043	162	1,211	2.9	11.8	0.2	5.2	5.39		3.43	0.54	1.42	
2044	162	1,211	3.0	11.9	0.2	5.3	5.44		3.43	0.54	1.47	
2045	162	1,211	3.0	12.0	0.2	5.3	5.50		3.43	0.55	1.52	
2046	162	1,211	3.0	12.2	0.2	5.4	5.55		3.43	0.56	1.57	
2047	162	1,211	3.1	12.3	0.2	5.4	5.61		3.43	0.56	1.62	
2048	162	1,211	3.1	12.4	0.2	5.5	5.66	54.0	3.43	0.57	1.67	
2049	162	1,211	3.1	12.5	0.2	5.5	5.72		3.43	0.57	1.72	
2050	162	1,211	3.2	12.6	0.2	5.6	5.78	(43.2)	3.43	0.58	1.77	9.30%

- Note: 1. 1 % annual tariff increase in real terms.
2. Unit tariff of Non Domestic User is 4 times of Domestic User.
3. 100 % subsidy for capital investment.
4. Overhead is assumed to be 10% of Revenue.
5. Investment Cost in 2050 is assumed salvage value.

Table A17.3.7

**Pro Forma Financial Statements (M Rs.) Case 2 90 % subsidy
Nuwara Eliya Sewerage Project (F/S) 1.0 % tariff increase in real terms**

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Fund Flow Table																											
Annual Sales	0.0	0.0	0.0	0.0	1.6	3.8	6.5	10.0	11.6	13.4	15.5	17.9	20.2	22.7	25.4	28.5	32.0	35.9	40.3	45.2	50.7	56.9	63.8	71.6	80.4	90.2	101.2
Subsidy from GSL	0.0	56.3	122.5	398.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	327.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loan (10% Interest)	0.0	6.3	13.6	44.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Investment	0.0	62.6	136.2	442.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	363.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Interest Payment (10%)	0.0	0.6	2.0	6.4	6.3	6.0	5.7	5.4	5.1	4.8	4.5	4.3	4.0	3.7	3.4	3.1	2.8	2.5	6.3	6.0	5.6	5.1	4.6	4.1	3.6	3.2	2.8
Annual Loan Repayment	0.0	0.0	0.0	0.3	0.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	4.8	4.8	4.8	4.8	4.5	3.9	
O & M	0.0	0.0	0.0	0.0	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.3	15.8	17.3	19.1	21.0	23.1	25.4	27.9	30.7	33.8	37.2	40.9	45.0	
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.2	0.4	0.7	1.0	1.2	1.3	1.5	1.8	2.0	2.3	2.5	2.9	3.2	3.6	4.0	4.5	5.1	5.7	6.4	7.2	8.0	9.0	10.1
Net Cash Inflow	0.0	(0.6)	(2.0)	(6.7)	(8.8)	(9.6)	(8.1)	(6.0)	(5.0)	(3.8)	(2.5)	(1.0)	0.3	1.7	3.4	5.2	7.2	9.5	8.0	10.9	12.4	16.3	20.7	25.6	31.1	37.5	45.0
Working Capital																											
Cumulative cash deficit	(0.6)	(0.6)	(2.6)	(9.3)	(18.0)	(27.6)	(35.7)	(41.7)	(46.7)	(50.6)	(53.1)	(54.1)	(53.8)	(52.1)	(48.7)	(43.5)	(36.3)	(26.8)	(18.8)	(8.0)	4.5	20.8	41.5	67.0	98.1	135.6	180.6
10% interest on above	(0.1)	(0.1)	(0.3)	(0.9)	(1.8)	(2.8)	(3.6)	(4.2)	(4.7)	(5.1)	(5.3)	(5.4)	(5.4)	(5.2)	(4.9)	(4.4)	(3.6)	(2.7)	(1.9)	(0.8)	0.4	2.1	4.1	6.7	9.8	13.6	18.1
Cum. Interest Payment	0.1	0.2	0.2	0.7	(1.1)	(3.8)	(7.4)	(11.6)	(16.2)	(21.3)	(26.6)	(32.0)	(37.4)	(42.6)	(47.5)	(51.8)	(55.5)	(58.2)	(60.0)	(60.8)	(60.4)	(58.3)	(54.2)	(47.5)	(37.7)	(24.1)	(6.0)
Income Statement																											
Annual Sales	0.0	0.0	0.0	0.0	1.6	3.8	6.5	10.0	11.6	13.4	15.5	17.9	20.2	22.7	25.4	28.5	32.0	35.9	40.3	45.2	50.7	56.9	63.8	71.6	80.4	90.2	101.2
O & M	0.0	0.0	0.0	0.0	3.2	4.4	5.9	7.7	8.6	9.5	10.6	11.7	13.0	14.3	15.8	17.3	19.1	21.0	23.1	25.4	27.9	30.7	33.8	37.2	40.9	45.0	49.5
Overhead (10 % of Sales)	0.0	0.0	0.0	0.0	0.2	0.4	0.7	1.0	1.2	1.3	1.5	1.8	2.0	2.3	2.5	2.9	3.2	3.6	4.0	4.5	5.1	5.7	6.4	7.2	8.0	9.0	10.1
Annual Depreciation	0.0	0.1	0.3	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Interest Payment (10%)	0.0	0.6	2.0	6.4	6.3	6.0	5.7	5.4	5.1	4.8	4.5	4.3	4.0	3.7	3.4	3.1	2.8	2.5	6.3	6.0	5.6	5.1	4.6	4.1	3.6	3.2	2.8
Net Income	0.0	(0.7)	(2.3)	(8.1)	(9.7)	(8.7)	(7.5)	(5.8)	(4.9)	(3.9)	(2.9)	(1.6)	(0.5)	0.7	2.1	3.6	5.3	7.2	3.1	5.5	8.4	11.7	15.3	19.4	24.0	29.2	35.0
Balance Sheet																											
Cash	(0.6)	(2.6)	(9.3)	(18.0)	(27.6)	(35.7)	(41.7)	(46.7)	(50.6)	(53.1)	(54.1)	(53.8)	(52.1)	(48.7)	(43.5)	(36.3)	(26.8)	(18.8)	(8.0)	4.5	20.8	41.5	67.0	98.1	135.6	180.6	
Capital Investment	30.6	166.8	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7	609.7
Less Accum. Depreciation	0.1	0.4	2.1	3.8	5.4	7.1	8.8	10.5	12.1	13.8	15.5	17.2	18.9	20.5	22.2	23.9	25.6	29.4	33.1	36.9	40.7	44.4	48.2	52.0	55.7	59.5	63.2
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	61.9	195.7	630.2	619.8	608.5	598.8	591.1	584.4	578.9	574.7	572.0	572.0	570.6	570.7	572.4	575.9	581.4	589.2	586.7	583.8	580.5	576.5	571.9	566.7	561.5	555.7	549.4
Loan Balance	6.3	19.9	63.9	63.0	60.1	57.1	54.2	51.3	48.4	45.5	42.6	39.6	36.7	33.8	30.9	28.0	25.1	22.2	19.3	16.4	13.5	10.6	7.7	4.8	1.9	(1.0)	(2.1)
Grant from GSL	56.3	176.8	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4	577.4
Reserved Fund	(0.7)	(3.0)	(11.1)	(20.6)	(29.0)	(35.8)	(40.6)	(44.3)	(46.9)	(48.2)	(48.0)	(46.5)	(43.5)	(38.9)	(32.5)	(24.0)	(13.5)	(6.2)	3.8	17.3	34.6	56.3	82.9	115.0	153.2	198.4	250.0
Total Liab. & Capital	61.9	195.7	630.2	619.8	608.5	598.8	591.1	584.4	578.9	574.7	572.0	572.0	570.6	570.7	572.4	575.9	581.4	589.2	586.7	583.8	580.5	576.5	571.9	566.7	561.5	555.7	549.4

Table A17.3.7

Pro Forma Financial Statements (M Rs.)
Case 2 90 % subsidy
1.0 % tariff increase in real terms
Nuwara Eliya Sewerage Project (F/S)

Year	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Fund Flow Table																								
Annual Sales	113.5	127.4	142.9	160.4	179.9	201.9	226.5	254.1	285.1	319.9	358.9	402.7	451.9	507.0	568.8	638.2	716.1	803.5	901.5	1,011.5	1,134.9	1,273.3	1,428.7	1,603.0
Subsidy from GSL	0.0	0.0	0.0	0.0	0.0	0.0	1,365.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5,705.2	0.0	0.0
Loan (10% Interest)	0.0	0.0	0.0	0.0	0.0	0.0	151.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	633.9	0.0	0.0
Capital Investment	0.0	0.0	0.0	0.0	0.0	0.0	1,517.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6,339.1	0.0	0.0
Interest Payment (10%)	2.6	2.4	2.2	2.1	1.9	1.7	18.7	18.5	17.5	16.6	15.6	14.6	13.7	12.7	11.7	10.9	10.2	9.4	8.6	7.8	7.0	78.1	77.3	73.3
Annual Loan Repayment	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
O & M	54.4	59.9	65.8	72.4	79.7	87.6	96.4	106.0	116.6	128.3	141.1	155.2	170.8	187.8	206.6	227.3	250.0	275.0	302.5	332.8	366.0	402.7	442.9	487.2
Overhead (10 % of Sales)	11.4	12.7	14.3	16.0	18.0	20.2	22.6	25.4	28.5	32.0	35.9	40.3	45.2	50.7	56.9	63.8	71.6	80.3	90.2	101.1	113.5	127.3	142.9	160.3
Net Cash Inflow	54.6	63.2	73.0	84.0	96.5	110.7	109.5	127.7	141.3	165.4	192.5	223.2	257.7	296.8	340.8	392.2	448.1	511.3	582.6	663.1	754.0	784.3	900.6	1,002.0
Working Capital Burden																								
Cumulative cash deficit	235.2	298.5	371.4	455.4	551.9	662.6	772.1	895.9	1,041.1	1,206.5	1,399.0	1,622.2	1,879.9	2,176.7	2,517.5	2,909.7	3,357.8	3,869.1	4,451.6	5,114.7	5,868.7	6,683.5	7,554.1	8,556.2
10% interest on above	23.5	29.8	37.1	45.5	55.2	66.3	77.2	90.0	104.1	120.6	139.9	162.2	188.0	217.7	251.7	291.0	335.8	386.9	445.2	511.5	586.9	665.3	755.4	855.6
Cum. Interest Payment	17.5	47.3	84.5	130.0	185.2	251.5	328.7	418.7	522.8	643.4	783.3	945.5	1,133.5	1,351.2	1,603.0	1,893.9	2,229.7	2,616.6	3,061.8	3,573.3	4,160.1	4,825.5	5,580.9	6,436.5
Income Statement																								
Annual Sales	113.5	127.4	142.9	160.4	179.9	201.9	226.5	254.1	285.1	319.9	358.9	402.7	451.9	507.0	568.8	638.2	716.1	803.5	901.5	1,011.5	1,134.9	1,273.3	1,428.7	1,603.0
O & M	54.4	59.9	65.8	72.4	79.7	87.6	96.4	106.0	116.6	128.3	141.1	155.2	170.8	187.8	206.6	227.3	250.0	275.0	302.5	332.8	366.0	402.7	442.9	487.2
Overhead (10 % of Sales)	11.4	12.7	14.3	16.0	18.0	20.2	22.6	25.4	28.5	32.0	35.9	40.3	45.2	50.7	56.9	63.8	71.6	80.3	90.2	101.1	113.5	127.3	142.9	160.3
Annual Depreciation	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
Interest Payment (10%)	2.6	2.4	2.2	2.1	1.9	1.7	18.7	18.5	17.5	16.6	15.6	14.6	13.7	12.7	11.7	10.9	10.2	9.4	8.6	7.8	7.0	78.1	77.3	73.3
Net Income	41.4	48.6	56.8	66.1	76.6	88.6	76.3	91.7	110.0	130.6	153.8	180.1	209.8	243.3	281.1	323.7	371.8	426.2	487.7	557.3	635.8	616.3	716.7	833.3
Balance Sheet																								
Cash	235.2	298.5	371.4	455.4	551.9	662.6	772.1	895.9	1,041.1	1,206.5	1,399.0	1,622.2	1,879.9	2,176.7	2,517.5	2,909.7	3,357.8	3,869.1	4,451.6	5,114.7	5,868.7	6,683.5	7,554.1	8,556.2
Capital Investment	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9	972.9
Less Accum. Depreciation	63.3	67.0	70.8	74.6	78.3	82.1	85.9	89.7	93.5	97.3	101.1	104.9	108.7	112.5	116.3	120.1	123.9	127.7	131.5	135.3	139.1	142.9	146.7	150.5
Land	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9	31.9
Total Assets	1,176.9	1,236.3	1,305.5	1,385.8	1,478.5	1,585.4	1,700.0	1,831.5	2,000.0	2,200.0	2,430.0	2,680.0	2,950.0	3,250.0	3,580.0	3,940.0	4,330.0	4,750.0	5,200.0	5,680.0	6,190.0	6,730.0	7,300.0	7,900.0
Loan Balance	21.4	19.5	17.6	15.7	13.9	12.0	10.1	8.2	6.3	4.4	2.5	0.6	1.3	2.0	2.7	3.4	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0
Grant from GSL	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4	904.4
Reserved Fund	251.1	312.4	383.5	465.6	560.2	669.0	787.9	916.9	1,056.0	1,206.0	1,367.0	1,539.0	1,722.0	1,916.0	2,121.0	2,337.0	2,564.0	2,802.0	3,051.0	3,311.0	3,582.0	3,864.0	4,157.0	4,461.0
Total Liab. & Capital	1,176.9	1,236.3	1,305.5	1,385.8	1,478.5	1,585.4	1,700.0	1,831.5	2,000.0	2,200.0	2,430.0	2,680.0	2,950.0	3,250.0	3,580.0	3,940.0	4,330.0	4,750.0	5,200.0	5,680.0	6,190.0	6,730.0	7,300.0	7,900.0

Table A17.3.8

Calculation of FIRR
Nuwara Eliya Sewerage Project (F/S)
Case 2

(1998 Price)													
Year	Volume		Tariff		Revenue			Investment	10% of Inv.	O&M	OH	Net Inflow	FIRR
	Dom	Non-Dom	Dom	Non-Dom	Dom	Non-Dom	Total						
	cum/d	cum/d	Rs./cum	Rs./cum	M Rs./Y	M Rs./Y	M Rs./Y	M Rs.	M Rs.	M Rs.	M Rs.	M Rs.	
2000													
2001								47.0	4.7		0.00	(4.70)	
2002								93.0	9.3		0.00	(9.30)	
2003								275.0	27.5		0.00	(27.50)	
2004	33	244	2.0	10.0	0.0	0.9	0.9		0.0	1.79	0.09	(0.97)	
2005	68	505	2.0	10.1	0.1	1.9	1.9		0.0	2.28	0.19	(0.56)	
2006	104	779	2.0	10.2	0.1	2.9	3.0		0.0	2.77	0.30	(0.09)	
2007	143	1,070	2.1	10.3	0.1	4.0	4.1		0.0	3.27	0.41	0.45	
2008	148	1,103	2.1	10.4	0.1	4.2	4.3		0.0	3.30	0.43	0.57	
2009	152	1,136	2.1	10.5	0.1	4.4	4.5		0.0	3.33	0.45	0.70	
2010	157	1,170	2.1	10.6	0.1	4.5	4.7		0.0	3.37	0.47	0.82	
2011	161	1,205	2.1	10.7	0.1	4.7	4.8		0.0	3.40	0.48	0.96	
2012	162	1,211	2.2	10.8	0.1	4.8	4.9		0.0	3.43	0.49	0.99	
2013	162	1,211	2.2	10.9	0.1	4.8	5.0		0.0	3.43	0.50	1.04	
2014	162	1,211	2.2	11.0	0.1	4.9	5.0		0.0	3.43	0.50	1.08	
2015	162	1,211	2.2	11.2	0.1	4.9	5.1		0.0	3.43	0.51	1.13	
2016	162	1,211	2.3	11.3	0.1	5.0	5.1		0.0	3.43	0.51	1.17	
2017	162	1,211	2.3	11.4	0.1	5.0	5.2		0.0	3.43	0.52	1.22	
2018	162	1,211	2.3	11.5	0.1	5.1	5.2	54.0	5.4	3.43	0.52	(4.13)	
2019	162	1,211	2.3	11.6	0.1	5.1	5.3		0.0	3.43	0.53	1.31	
2020	162	1,211	2.3	11.7	0.1	5.2	5.3		0.0	3.43	0.53	1.36	
2021	162	1,211	2.4	11.8	0.1	5.2	5.4		0.0	3.43	0.54	1.41	
2022	162	1,211	2.4	12.0	0.1	5.3	5.4		0.0	3.43	0.54	1.46	
2023	162	1,211	2.4	12.1	0.1	5.3	5.5		0.0	3.43	0.55	1.50	
2024	162	1,211	2.4	12.2	0.1	5.4	5.5		0.0	3.43	0.55	1.55	
2025	162	1,211	2.5	12.3	0.1	5.4	5.6		0.0	3.43	0.56	1.60	
2026	162	1,211	2.5	12.4	0.1	5.5	5.6		0.0	3.43	0.56	1.65	
2027	162	1,211	2.5	12.6	0.1	5.6	5.7		0.0	3.43	0.57	1.70	
2028	162	1,211	2.5	12.7	0.2	5.6	5.8		0.0	3.43	0.58	1.76	
2029	162	1,211	2.6	12.8	0.2	5.7	5.8		0.0	3.43	0.58	1.81	
2030	162	1,211	2.6	13.0	0.2	5.7	5.9		0.0	3.43	0.59	1.86	
2031	162	1,211	2.6	13.1	0.2	5.8	5.9		0.0	3.43	0.59	1.91	
2032	162	1,211	2.6	13.2	0.2	5.8	6.0		0.0	3.43	0.60	1.97	
2033	162	1,211	2.7	13.3	0.2	5.9	6.1	54.0	5.4	3.43	0.61	(3.38)	
2034	162	1,211	2.7	13.5	0.2	6.0	6.1		0.0	3.43	0.61	2.08	
2035	162	1,211	2.7	13.6	0.2	6.0	6.2		0.0	3.43	0.62	2.13	
2036	162	1,211	2.7	13.7	0.2	6.1	6.2		0.0	3.43	0.62	2.19	
2037	162	1,211	2.8	13.9	0.2	6.1	6.3		0.0	3.43	0.63	2.24	
2038	162	1,211	2.8	14.0	0.2	6.2	6.4		0.0	3.43	0.64	2.30	
2039	162	1,211	2.8	14.2	0.2	6.3	6.4		0.0	3.43	0.64	2.36	
2040	162	1,211	2.9	14.3	0.2	6.3	6.5		0.0	3.43	0.65	2.41	
2041	162	1,211	2.9	14.5	0.2	6.4	6.6		0.0	3.43	0.66	2.47	
2042	162	1,211	2.9	14.6	0.2	6.5	6.6		0.0	3.43	0.66	2.53	
2043	162	1,211	2.9	14.7	0.2	6.5	6.7		0.0	3.43	0.67	2.59	
2044	162	1,211	3.0	14.9	0.2	6.6	6.8		0.0	3.43	0.68	2.65	
2045	162	1,211	3.0	15.0	0.2	6.6	6.8		0.0	3.43	0.68	2.71	
2046	162	1,211	3.0	15.2	0.2	6.7	6.9		0.0	3.43	0.69	2.77	
2047	162	1,211	3.1	15.3	0.2	6.8	7.0		0.0	3.43	0.70	2.84	
2048	162	1,211	3.1	15.5	0.2	6.8	7.0	54.0	5.4	3.43	0.70	(2.50)	
2049	162	1,211	3.1	15.6	0.2	6.9	7.1		0.0	3.43	0.71	2.96	
2050	162	1,211	3.2	15.8	0.2	7.0	7.2	(43.2)	(4.3)	3.43	0.72	7.35	1.47%

- Note: 1. 1 % annual tariff increase in real terms.
2. Unit tariff of Non Domestic User is 5 times of Domestic User.
3. 90 % subsidy for capital investment.
4. Overhead is assumed to be 10% of Revenue.

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