APPENDIX 15.5

SPECIMEN FORM FOR SHORT BACTERIOLOGICAL EXAMINATION OF WATER

Name and Address
of the Laboratory:

Name and Address of Sender

Sender's No.

Date of Collection.....

Date and time of receipt at laboratory .....

Laboratory Ref. No.

Date and time of commencing of examination .....

1. Raw water
2. Filtered water
3. Chlorinated Water
4. Distribution system.

Time of collection of sample			1	2	3	4
	Bacteriological	*Expressed as*				
1	Plate count	Colonies/ml				
	a) 20^0 C					
	b) 35^0 C					
2	Coliform Organisms	MPN/100ml				

Remarks:

Date: *Officer-in-charge*

In addition, common glassware and accessories like beaker, conical flask, burette, pipette, volumetric flask etc. will be required.

APPENDIX 15.8

EQUIPMENT NEEDED FOR BACTERIOLOGICAL EXAMINATION

1. Hot Air Oven — Upto 200^{0}C
2. Autoclave Or Pressure Cooker
3. Incubator 37^{0}C or 44^{0}C (Water/Air-Jacketed)
4. pH Meter
5. Pipette Box (Stainless Steel)
6. Wooden Racks/Aluminium Racks
7. Wire Baskets
8. Cotton/Aluminium Foils
9. Brown paper
10. Twine
11. Burners (Bunsen) With Pilot Lamp
12. Suction Flask (1 Litre Cap)
13. Suction Pump
14. Sampling Bottles (Reagent Bottles Of 250 ml. Capacity)

BACTERIOLOGICAL MEDIA

1. M. Endo Broth (dehydrated)
2. Lactose or Lauryl Tryptose broth
3. Mac Conkey broth
4. Brilliant Green Bile Lactose Broth
5. Total Plate Count Agar
6. Peptone/Triyptone Water

APPENDIX 15.9

TEST TO BE DONE BY WATER WORKS LABORATORIES

Sl. No.	Name of Test	Category of water works laboratory		
		I	II	III
1	Turbidity	√	√	√
2	Colour	√	√	√
3	Odour	√	√	√
4	Conductivity	√	√	√
5	Alkalinity	√	√	√
6	Residual Chlorine	√	√	√
7	pH	√	√	√
8	Iron	√	√	√
9	Chloride	√	√	√
10	Hardness	√	√	X
11	Total solids	√	X	X
12	*Volatile solids	√	X	X
13	*Suspended solids	√	X	X
14	*Free and saline ammonia	√	X	X
15	Albuminiod nitrogen	√	X	X
16	Nitrites(qualitative)	√	√	√
17	Nitrates	√	X	X
18	*Fluorides	√	√	√
19	Metals other than iron	√	√	√
20	Jar test for determining alum dose	√	√	X
21	Chlorine demand	√	√	√
*22	Complete mineral analysis	√	X	X
23	Total count in nutrient agar	√	X	X
24	Presumptive coliforms	√	√	√
25	Confirmed test , BGB	√	√	√
*26	Completed test	√	X	X
*27	Research into media, etc	√	X	X
28	Microscopy	√	X	X

* where applicable

APPENDIX 17.1

AVERAGE INCREMENT COST PER 1000 LITERS

Year	Quantity Of water Sold	Discounted Value (at 8.5%)	Capital Cost	O & M Cost	Total Cost	Discounted Value (at 8.5%)
		(....kld.....)			(.Rs.million)	
1985-86	-	-	1.0050	-	1.0050	0.9063
86-87	-	-	0.6770	-	0.6770	0.5761
87-88	396	310	-	0.0679	0.0679	0.6532
88-89	411	297	-	0.0683	0.0683	0.0493
89-90	423	231	-	0.0674	0.0674	0.0448
90-91	435	267	-	0.0677	0.0677	0.0415
91-92	470	266	-	0.0686	0.0686	0.4386
92-93	474	247	-	0.0687	0.0687	0.0353
93-94	479	230	-	0.0689	0.0689	0.0331
94-95	484	214	-	0.0690	0.0690	0.0365
95-96	491	200	-	0.0692	0.0692	0.0232
1996-97	2485	784	0.1669(A)	0.3475	0.5144	0.1723
to 2000-01	(497 x 5)			(0.0695 x 5)		
2001-02	2780	594	-	0.3560	0.3560	0.0751
to 2005-06	(556 x 5)			(0.0712 x 5)		
2006-07	3080	438	-	0.3655	0.3655	0.0519
to 2010-11	(616 x 5)			(0.0731 x 5)		
2011-12	656	72	-	0.0741	0.0741	0.0962
2013-14	656	67	-	0.0741	0.0741	0.0076
2013-14	656	67	-	0.0741	0.0741	0.0070
2014-15	25230	762	2.7520(B)	2.3940	4.5660	0.3122
to 2043-44	(841 x 30)			(0.0798 x 30)		
Total		5111				2.6919

*excludes price contingencies and land cost.

(A) Cost of replacement of pumpsets and chlorinator in the year 1996-97

(B) Project cost at 31st year

Average Incremental Cost per 1000 liters = Rs. 24,91,911 / (5111 x 365)= Rs. 1.34

APPENDIX 17.2

NET PRESENT WORTH AND BENEFIT COST RATIO OF THE PROJECT AT DISCOUNT RATE 8.5% AND INTERNAL RATE OF RETURN

Sl No	Year	Capital cost * + O & M Cost	Discounted Value		Revenue	Discounted Value	
			at 8.5%	at 2%		at 8.5%	at 2%
		(.....Rs. million.....)					
1	1985-86	0.9490	0.8747	0.9304	-	-	-
2	86 -87	0.6370	0.5411	0.6123	-	-	-
3	87-88	0.0679	0.0532	0.0640	0.1176	0.0921	0.1100
4.	88-89	0.0683	0.0493	0.0631	0.1220	0.0880	0.1127
5	89-90	0.0674	0.0448	0.0610	0.1259	0.0837	0.1140
6.	90-91	0.0677	0.0415	0.0601	0.1289	0.0790.	0.1145
7.	91-92	0.0686	0.0388	0.0597	0.1409	0.0796	0.1227
8.	92-93	0.0687	0.0358	0.0586	0.1418	0.0738	0.1210
9.	93-94	0.0689	0.0331	0.0577	0.1430	0.0686	0.1197
10.	94-95	0.0690	0.0305	0.0566	0.1444	0.0639	0.1185
11.	95-96	0.0692	0.0282	0.0557	0.1467	0.0590	0.1180
12.	1996-97	0.4893	0.1629	0.3753	0.7421	0.2340	0.5627
16	to 2000-01	(0.0695*5+0.1418(A)					
17.	2001-02	0.3560	0.0761	0.2445	0.8316	0.1777	0.5711
21.	to 2005-06	(0.0712*5)					
22.	2006-07	0.3655	0.0519	0.2273	0.9255	0.1315	0.5757
26.	to 2010-11	(0.0731*5)					
27.	2011-12	0.0741	0.0082	0.0434	0.1949	0.0215	0.1142
28.	2012-13	0.0741	0.0076	0.0426	0.1950	0.0199	0.1120
29.	2013-14	0.0741	0.0070	0.0417	0.1951	0.0183	0.1099
	Total	-	2.0847	3.0540	-	1.2914	3.0975

* excludes price `contingencies , land cost and taxes and duties .

(A) Cost of replacement of pumpsets and chlorinator in the year 1996-97

Benefit Cost Ratio = 0.62

Net Present worth (Rs. million) = (-) 0.7933

Internal rate of Return (%) = (2 x (8.5 - 2.0) x 0.0435)/ (0.0435 + 0.7933)
= 2.34%

APPENDIX 17.3

ASSUMPTIONS FOR FINANCIAL FORECASTS

A. Income And Expenditure Statement (Appendix 17.4)

1. The number of anticipated house service connections after 1987-88 have been estimated on the basis of new houses constructed in the area during the last three years.
2. Fees for service connections are not taken into account.
3. Revenue includes water tax of 25% of house tax. Income under sanitation is also included in the Revenue.
4. The house tax is based on the annual rental value of the houses which are normally revised every five years under the present administrative procedure. In respect of this town, the last revision was made in the year 1975-76 .An increase of 25% over the previous year's demand has been assumed once in five years for the future period beginning from the revision made in 1983-84. It is also assumed that there will be 1% increase in the house tax due to new houses every year and that 25% house tax will be made over to the water supply account as water tax. The demand of house tax for the last year available viz., 1981-82 was Rs. 21,497.
5. The tariff for water is assumed to be Rs. 12.60 per month per connection for domestic consumption from the year 1987-88 and Rs. 1.90 and Rs. 2.85 per 1,000 liters for Commercial & Industrial purposes respectively .The domestic tariff is also assumed to be increased by 10% once in 5 years and commercial and industrial tariffs are assumed to increase by 10% once in three years.
6. Water supplied through public fountains are charged at 25% of the domestic water tariff.
7. The revenue collected by the local body under "Sanitation" is assumed to increase by 1% per annum on the basis of new houses expected to be constructed every year.
8. Operation and maintenance expenditure also includes establishment charges and other expenses, if any, under Sanitation.
9. Establishment charges relating to water supply and sanitation are assumed to increase by 3% annually.
10. Costs of power and chemicals are calculated in proportion to the volume of water produced. The tariff for power is assumed to increase by 10% once in three years. The cost of chemicals is assumed to increase by 7.5% annually in 1984-85 and by 7% annually in 1985-86 and by 6% annually from 1986-87 onwards.
11. Repairs and renewal charges are calculated as 0.5% of total project cost and assumed to be increased by 6% annually.

12. Administrative charges are calculated as 2% of the total establishment charges, power, chemicals and repairs and renewals for the first two years.
13. Depreciation is calculated as 2.5% of the total project cost (including interest).
14. Other charges are calculated as 1% of the total establishment charges, power, chemicals, and repairs and renewals.

(B) SOURCES AND APPLICATION OF FUND STATEMENTS (APPENDIX 17.6)

1. Increase in account payable is the difference of the amount in the two consecutive years as shown in the projected balance sheet.
2. The loan period is assumed to be 24 years inclusive of moratorium period of 4 years during which interest is to be paid but capital repayment is deferred.
3. It is assumed that the government will have to pay 75% of total sub project cost as grant.
4. Compound interest at 8.5% per annum during the moratorium period viz., 1985-86, 1986-87,1987-88 and 1988-89 is calculated for the loan and added to it. The interest thus calculated every year is added to fixed assets and shown in balance sheet.
5. The first loan is received during the year 1985-86 and 6 months' interest is calculated for this year.
6. Repayment of annuity at 8.5% (Rs. 0.0602 million every year) begins in 1989-1990. The capital recovery factor for 20 years at 8.5% is 0.1057.
7. Increase in accounts is receivable in the difference of amount in two consecutive years as given in the projected balance sheet.

(C) BALANCE SHEET (APPENDIX 17.9)

1. No provision is made for the bed debts.
2. 20 percent of the sales revenue is shown as accounts receivables every year.
3. No figures are assumed for inventories.
4. 10 percent of operating and maintenance expenditure is shown as accounts payables every year.
5. Approximate values are given to old assets under the sectors.

APPENDIX 17.4

INCOME AND EXPENDITURE STATEMENT OF WATER SUPPLY AND SEWERAGE/SANITATION PROJECT

	HISTORICAL					FORECAST				
	1982-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
1. Water produced (kld)	-	-	-	-	-	495	514	529	544	588
2. Water sold (kld)	-	-	-	-	-	396	411	423	435	470
3. Revenue (Rs. million)										
A. Water Supply	-	-	-	-	-	0.1326	0.1375	0.1437	0.1513	0.1655
B. Sanitation	-	-	-	-	-	-	-	-	-	-
Total Revenue (A+B)	-	-	-	-	-	0.1326	0.1375	0.1437	0.1513	0.1655
4. Operating Expenses (Rs. million)										
A. Water Supply										
i. Estt. Charges	-	-	-	-	-	0.0510	0.0625	0.0541	0.0557	0.0574

	HISTORICAL					FORECAST				
	1982-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
ii. Power	-	-	-	-	-	0.0116	0.0131	0.0135	0.0139	0.0168
iii. Chemicals	-	-	-	-	-	0.0011	0.0012	0.0013	0.0013	0.0014
iv. Repair and Renewals	-	-	-	-	-	0.0088	0.0093	0.0099	0.0105	0.0111
v. Royalty charges	-	-	-	-	-	0.0004	0.0004	0.0004	0.0004	0.0004
vi. Other (specify)	-	-	-	-	-	0.0007	0.0008	0.0008	0.0006	0.0009
vii. Administrative Expenses	-	-	-	-	-	0.0015	0.0015	-	-	-
Sub Total (A)	-	-	-	-	-	0.0751	0.0782	0.0800	0.0826	0.0860
B. Sewerage/Sanitation	-	-	-	-	-	-	-	-	-	-
i. Estt. charges	-	-	-	-	-	-	-	-	-	-
ii. Power	-	-	-	-	-	-	-	-	-	-

1962 11AE/97—ABB

	HISTORICAL					FORECAST				
	1982-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
iii. Chemicals	-	-	-	-	-	-	-	-	-	-
iv. Administrative expenses	-	-	-	-	-	-	-	-	-	-
v. Others(specify)	-	-	-	-	-	-	-	-	-	-
Sub Total (B)	-	-	-	-	-	-	-	-	-	-
Total Operating Expenses (A+B)	-	-	-	-	-	0.0751	0.0788	0.0800	0.0826	0.0880
5. Income before Depreciation and interest (Rs. million)	-	-	-	-	-	0.0575	0.0587	0.0637	0.0687	0.0775

	HISTORICAL					FORECAST				
	1982-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92
6. Depreciation (Rs. million	-	-	-	-	-	0.0452	0.0463	0.0474	0.0474	0.0474
7. Income before interest (Rs. million)	-	-	-	-	-	0.0123	0.0124	0.0163	0.0213	0.0301
8. Interest (Rs. million)	-	-	-	-	-	-	-	0.0434	0.0474	0.0463
9. Income after interest (Rs. million)	-	-	-	-	-	0.0123	0.0124	0.0321	0.0261	0.0162
10. Operating Ratio**	-	-	-	-	-	0.57	0.57	0.89	0.86	0.81

**Operating Ratio = Total O & M Cost and Interest/ Total Revenue

APPENDIX 17.4(Contd.)

	FORECAST									
	92-93	93-94	94-95	95-96	96-97 to 2000-01	01-02 to 05-06	06-07 to 10-11	11-12	12-13	13-14
1. Water produced (kld)	593	599	605	614	621	695	770	820	820	820
2. Water sold (kld)	474	479	484	491	497	556	615	656	656	656
3. Revenue (Rs. million)										
A. Water supply	0.1772	0.1836	0.1876	0.1908	1.0619	1.3410	1.6937	0.3809	0.4027	0.4030
B. Sanitation	-	-	-	-	-	-	-	-	-	-
Total Revenue(A+B)	0.1772	0.1836	0.1876	0.1908	1.0619	1.3410	1.6937	0.3809	0.4027	0.4030
4. Operating Expenses(Rs. million)										
A. Water Supply										
i. Estt. Charge	0.0591	0.0609	0.0627	0.0646	0.3533	0.4097	0.4748	0.1037	0.1068	0.1100
ii. Power	0.0168	0.0170	0.0189	0.0191	0.1060	0.1380	0.1823	0.0413	0.0453	0.0453
iii. Chemicals	0.0015	0.0016	0.0017	0.0018	0.0134	0.0178	0.0286	0.0068	0.0072	0.0076
iv. Repairs & Renewals	0.0118	0.0125	0.0132	0.0140	0.0839	0.1122	0.1500	0.0356	0.0378	0.0401
v. Royalty charges	0.0004	0.0004	0.0004	0.0004	0.0025	0.0025	0.0030	0.0006	0.0006	0.0006
vi. Others (specify)	0.0009	0.0009	0.0010	0.0010	0.0055	0.0069	0.0084	0.0019	0.0020	0.0020

	FORECAST									
	92-93	93-94	94-95	95-96	96-97 to 2000-01	01-02 to 05-06	06-07 to 10-11	11-12	12-13	13-14
vii. Administrative expenses	-	-	-	-	-	-	-	-	-	-
Sub total (A)	0.0905	0.0932	0.0979	0.1009	0.5646	0.6871	0.8471	0.1899	0.1997	0.2056
B. Sewerage / Sanitation										
i. Estt. charge	-									
ii. Power	-	-	-	-	-	-	-	-	-	-
iii. Chemicals	-	-	-	-	-	-	-	-	-	-
iv. Administrative expenses	-	-	-	-	-	-	-	-	-	-
v. Others (specify)	-	-	-	-	-	-	-	-	-	-
vi. Sub Total (B)	-	-	-	-	-	-	-	-	-	-
Total Operating Expenses (A+B)	0.0905	0.0932	0.0979	0.1009	0.5646	0.6371	0.8471	0.1849	0.1997	0.2056
5. Income before depreciation and interest(Rs. Million)	0.0867	0.0904	0.0897	0.0899	0.4973	0.6539	0.8466	0.1910	0.2030	0.1974

	FORECAST									
	92-93	93-94	94-95	95-96	96-97 to 2000-01	01-02 to 05-06	06-07 to 10-11	11-12	12-13	13-14
6. Depreciation (Rs.million)	0.0474	0.0474	0.0474	0.0474	0.2370	0.2370	0.2370	0.0474	0.0474	0.0474
7. Income before interest(Rs.million)	0.0393	0.0430	0.0423	0.0425	0.2603	0.4169	0.6096	0.1436	0.1556	0.1500
8. Interest (Rs. million)	0.0451	0.0438	0.0424	0.0409	0.1771	0.1148	0.0284	-	-	-
9. Income after interest(Rs. Million)	0.0058	0.0008	0.0001	0.0016	0.0832	0.3021	0.5812	0.1436	0.1556	0.1500
10. Operating Ratio**	0.77	0.75	0.75	0.74	0.70	0.60	0.52	0.50	0.50	0.51

** Operating Ratio = Total O &M Cost and Interest /Total Revenue

APPENDIX 17.5

Funding Pattern

	Description	Ist year (1985-86)	II year (1986-87)	Total
			(Rs. in million)	
1	Loan Component	0.2585	0.1835	0.4420
2	Grant in aid from GTN	0.7755	0.5505	1.3260
	Total	1.0340	0.7340	1.7680

APPENDEIX 17.6

PROJECT SOURCES AND APPLICATION OF FUNDS (CASH FLOW) STATEMENT

	Historical							Forecast				
	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94
	(Rs. million)											
I. Sources												
1. Net income after depreciation	-	-	-	-	-	0.0123	0.0124	0.0163	0.0213	0.0301	0.0393	0.0430
2. Depreciation	-	-	-	-	-	0.0452	0.0463	0.0474	0.0474	0.0474	0.0474	0.0474
3. Increase in accounts payable	-	-	-	-	-	0.0076	0.0003	0.0001	0.0003	0.0005	0.0002	0.0003
4. Increase in other current liabilities(interest capitalised)	-	-	-	0.0140	0.0309	0.0410	0.0445	-	-	-	-	-

	Historical					Forecast						
	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94
	(Rs. million)											
5. Increase in long term loan	-	-	-	0.2585	0.1835	-	-	-	-	-	-	-
6. Increase in grant in aid	-	-	-	0.7755	0.5505	-	-	-	-	-	-	-
7. Others(specify)	-	-	-									
Total Sources	-	-	-	1.0450	0.7649	0.1061	0.1035	0.0638	0.0690	0.0780	0.0869	0.0907
II. Applications												
1. Increase in fixed assets	-	-	-	1.0450	0.7449	0.0410	0.0445	-	-	-	-	-
2. Increase in current assets	-	-	-	-	-	-	-	-	-	-	-	-
3. Increase in accounts receivables	-	-	-	-	-	0.0265	0.0010	0.0012	0.0016	0.0028	0.0023	0.0013
4. Decrease in current liabilities	-	-	-	-	-	-	-	-	-	-	-	-