

CONTROL OF URBAN POLLUTION
SERIES : CUPS/68/2007

Evaluation Of Operation And Maintenance Of Sewage Treatment Plants In India-2007



CENTRAL POLLUTION CONTROL BOARD

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FOREWORD

A predominant cause of water pollution in India is the discharge of a large amount of untreated sewage into the water bodies. This happens mainly due to the inadequate arrangement for treatment of wastewater. Discharge of untreated sewage not only pollutes the surface water but also is main cause of groundwater pollution in our country. The large gap between generation and treatment of domestic wastewater in India arises not only because of the adequacy of treatment capacity but also due to the inadequate operation and maintenance of treatment plants. Several Sewage Treatment Plants (STPs) have been established under the centrally funded National River Action Plan. However, their operation and maintenance is generally not satisfactory. If the sewage treatment plants are not properly operated, the entire investment becomes futile. In order to ensure that these STPs function properly, it was felt necessary to carry out a study to evaluate their performance and identify main problems, both technical and administrative, in order to remedy the situation. CPCB with the help of a consultant initiated this detailed study of the STPs. The study included individual plant visit, discussions with the operating staff and evaluation of technological & management aspects in order to bring out the major causes of the observed poor performance.

The CPCB study team, comprising Shri K.B.Tandon, Consultant and Shri A.K.Sinha, Scientist 'C' visited the STPs to get first hand information, technical as well as management, on their functioning. The present report is the outcome of this Study. Several technical and managerial problems have been identified in each of the STPs studied. I hope, the findings of the Study will help in taking remedial measures and improving the situation by all concerned.

1st January, 2008

(J. M. Mauskar)

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CONTENTS

Chapter	Page No.
1.0 Introduction	01-02
2.0 Methodology	03-12
3.0 Observations	13-50
4.0 Conclusions and Recommendations	51-56
Annexure	57-63

CHAPTER 1

Introduction

Urbanization has encouraged the migration of people from villages to the urban areas in India. With exponential growth in urbanization, a number of environmental problems have emerged. For improving standards of life, running water-supply has been established in most of the cities/towns and even in some villages over the past three decades in India. This has, in turn, led to flush-latrines and much large use of water in homes for bathing, washing of clothes utensils etc, generating significant amount of wastewater. Use of soaps, detergents and amounts of various food materials going to the sink have also grown with improved life standards. Unfortunately, due to paucity of resources sewerage or improved sanitation did not get much attention. Hence sewerage has lagged far behind water supply. A large number of the cities/towns either do not have any sewerage system or the sewerage system is overloaded or defunct. Even where sewers exist, they often leak or overflow, releasing their contents to storm-water or other surface drains or percolate in to soil to reach ground-water. Thus a bulk of pollution gets retained on land to percolate, leach or get washed-off to streams or groundwater.

Central Pollution Control Board, an apex organization for control of pollution in India carries out regular inventory of water supply, wastewater generation and its disposal. As per the latest information, out of 33,000 million litre of wastewater generated every day from Class-I cities (cities with population >100,000) and class -II towns (population 50,000-100,000), of which only about 30% is collected and treatment capacity exists for less than 20%. Thus a large gap exists between generation and treatment of wastewater. The smaller towns and rural areas do not contribute significant amounts of sewage due to low per capita water supply. It was observed that most of the cities do not have adequate organized water supply, as well as wastewater collection and treatment facilities. Out of which about 7000 mld of wastewater gets some kind of treatment. It was also observed that Maharashtra, Delhi, Uttar Pradesh, West Bengal and Gujarat are the major contributors of wastewater (63%). The facilities constructed to treat wastewater do not function properly and remain closed most of the time due to improper design and poor maintenance, together with a non-technical and unskilled approach. STP Capacity and its Utilization in Delhi is provided at Annexure-II. The wastewater generated in these areas normally percolates in the soil or evaporates. The uncollected wastes accumulate in the urban areas cause unhygienic conditions and release significant amount of nutrients on their decomposition, which leaches to surface and groundwater and pollute them. There are evidence of gradual increase in nitrate concentration in groundwater in the urban areas. The problem is more severe in large urban areas.

Discharge of untreated sewage is single most important cause for pollution of surface & ground water since there is a large gap between generation and treatment of domestic wastewater in India. The problem is not only of adequacy of treatment capacity but also operation and maintenance of treatment plants. Several sewage treatment plants are established under centrally funded National River Action Plan. However, their operation and maintenance is generally not satisfactory. If massive investment is done on establishing sewage treatment plants and not

properly operated, the entire exercise becomes futile. In order to ensure that these STPs function properly, it was felt necessary to carry out study to evaluate their performance and identify main problems both technical and administrative to remedy the situation. CPCB with the help of a consultant initiated a detailed study of the STPs in India. The study includes individual plant visit, discussion with operating staff, evaluating technological aspects & management aspects to bring out the major cause of poor performance.

The study was planned keeping following main objectives in mind:

- 1 Questionnaire survey to identify major problems in the treatment plants in the country.
- 2 Visit selected sewage treatment plants in the country to get first hand information.
- 3 Discuss with the operating and management staff to understand the problems being faced.
- 4 To evaluate the adequacy of the treatment plant.
- 5 To evaluate the performance of different units.
- 6 To identify the major deficiencies in the treatment plant.
- 7 Identify the remedial measures

CHAPTER 2

Methodology

There are 234 STPs existing in India. In order to assess their performance a questionnaire was prepared (Annexure-1) and circulated to all the agencies responsible for operation of the STPs. The survey was carried out at the all India level by a team comprising of Sh. K.B. Tandon and Sh A.K. Sinha.

The work of survey of STPs for their performance evaluation in all the states, including those funded under NRCP by the Ministry of Environment and Forests, was initiated in July, 06. 175 no. of STPs located in metropolitan, Class I cities and Class II towns (96 nos.) were identified for their performance evaluation by

- (i) Getting information on a prescribed format (Annexure I) from the State Govts./implementing/ O&M agencies, and
- (ii) Physical inspection through random checking at STP sites.

During this period, out of 175 no. of identified STPs (**Table 2.1**), 68 STPs (including Powai lake in Mumbai) located in 30 towns in 9 states were visited for their inspection by the team of CPCB (**Table 2.2**). Five states e.g. West Bengal, Punjab, Andhra Pradesh, Karnataka & Madhya Pradesh have not submitted information for any STP/town, where as information for U.P. has been received for 4 STPs only out of a total of 26 existing STPs. Also, in some of the cases, information received appears to be either incomplete or incorrect. Due to these reasons, some of the information could not be included in this report.

Observations on the status of O&M of individual STPs on the basis of their physical inspection, and information given at site by operating staff/officers, have been prepared and provided in **Chapter-III**. Performance of STPs visited has been categorized into 4 grades i.e. good, satisfactory, poor and very poor. Recommendations to improve performance of STPs, on the basis of physical inspection and information given by operating staff/officers are provided in **Chapter-IV**.

Table 2.1 : Details of STPs identified for their performance evaluation

S.No.	State	Town		STPs Identified
1	Andhra Pradesh	Mancharial	1	I - (2.50/WSP)
			2	II - (2.50/WSP)
2	Bihar	Chapra	1	(2.00/OP)
		Patna	2	I-Karmali (4.00/OP)
			3	II-(45.00/ASP)
			4	III-(35.00/ASP)
			5	IV-(25.00/AL)
		Munger	6	13.50/AL
		Bhagalpur	7	11.00/AL
		Buxar	8	2 mld
3	Delhi		1	Sen Nursing Home (10mld)
			2	Delhi Gate (10mld)
			3	Okhla (634.44mld)
			4	Vasant Kunj (23.63mld)
			5	Mehrauli (22.73 mld)
			6	Keshopur (327.31mld)
			7	Pappankala (90.92mld)
			8	Najafgarh (22.73mld)
			9	Nilothi (181.84 mld)
			10	Rithala (363.68 mld)
			11	Narela (45.46mld)
			12	Coronation Piller (181.84mld)
			13	Timarpur (27.27mld)
			14	Rohini (68.19mld)
			15	Ghitorni (22.73mld)
			16	Kondli (204.57mld)
			17	Yamuna Vihar (90.92mld)
			18	Bakarwala(3.0mld)
			19	Moloarband(3.0mld)
			20	Holambi (2.0mld)
			21	Tikrikhurd (2.0mld)
			22	Micro STPs

Table 2.1 : Details of STPs identified for their performance evaluation

S.No.	State	Town		STPs Identified
4	Goa	Panaji	1	1 no.
5	Gujarat	Ahmedabad	1	I-(106.0/UASB)
			2	II-(126.0/UASB)
			3	III-(181.8mld)
			4	IV-(75.8mld)
		Surat	5 to 10	6 nos.
		Rajkot	11	1 no.
		Bhavnagar	12	1 no.
		Nadiad Distt. Kheda	13	1 no.
		Borsad Distt. Anand	14	1 no.
		Unjha Distt. Mahesana	15	1 no.
6	Haryana	Yamuna Nagar	1	I-(10.0/UASB)
			2	II-(25.0/UASB)
		Karnal	3	I-(40.0/UASB)
			4	II-(8.0/OP)
		Panipat	5	I-(10.0/UASB)
			6	II-(35.0/UASB)
		Sonepat	7	30.0(UASB)
		Gurgaon	8	30.0(UASB)
		Faridabad	9	I-(20.0/UASB)
			10	II-(45.0/UASB)
		Panchkula	11	1 no.
		Gurgaon (HUDA)	12	67 mld
		Gharaunda	13	3.00/OP
		Gohana	14	3.5/OP
		Palwal	15	9.0/OP
		Chandigarh	16	1 no.
7	Karnataka	Bhadravati	1	5.83/WSP
		Davanagore	2	19.45/WSP
		Harihara	9	8.84/WSP
		K. R. Nagar	4	1.45/WSP
		Sri Ranagapatha	5	1.36/WSP
		Manglore Distt. Dakshina Kannada	6	1 no.
		Iikal-Distt. Bagalkot	7	1 no.
		Yalahanka Distt. Banglore	8	1 no.
		Dandeli Disttl. Uttara Kannada	9	1 no.

Table 2.1 : Details of STPs identified for their performance evaluation

S.No.	State	Town		STPs Identified
8	Maharashtra	Karad	1	280/OP
		Nasik	2	78.0/UASB
			3	22.0/ mld
		Nanded	4	26.0 mld
		Trimbakeshwar	5	1.0/OP
		Mumbai	6 to 13	8 nos. (including Powai Lake)
		Pune	14	Erandwane (50.0 mld)
			15	Bhairoba (130.0 mld)
			16	Tanajawadi (17.0mld)
			17	Bopadi (18.0 mld)
		Solapur	18	1 no.
		Aurangabad	19	5.0 mld
		Nasik	20	Panchak (7.5 mld)
			21	Untoodi (2.2 mld)
			22	Morvadi (4.5 mld)
			23	Bhyival Farm (12.0 mld)
		Kamptee Distt. Nagpur		1 no.
		Lonwala Distt. Pune		1 no.
		Karad Distt. Satara		1 no.
		Hinganghat Distt. Wardha		1 no.
9	Madhya Pradesh	Chapra	1	1.2 mld
		Indore	2	78.0 mld
		Kedari	3	0.75 mld
		Nagda	4	9.0 mld
		Ujjain	5	52.0 mld
10	Orissa	Cuttack	1	33.0 mld
		Bhubnashwar	2	1 no.
		Puri	3	1 no.
11	Punjab	Phillaur	1	2.60 mld
		Sultanpur Lodhi	2	2.60 mld
		Mohali	3	1 no.

Table 2.1 : Details of STPs identified for their performance evaluation

S.No.	State	Town		STPs Identified
12	Tamil Nadu	Erod	1	20.0 mld
		Kuwarapalli	2	I- 6 mld
			3	II- 5.17 mld
		Trichy (old)	4	28.0 mld
		Chennai	5	I-60.0 mld
			6	II-110.0 mld
			7	III-54.0 mld
			8	IV-40.0 mld
			9 to 12	4 nos.
		Tirunelveli	13	1 no.
		Kancheepuram	14	1 no.
		Coimbatore	15	1 no.
		Chindamlaran Distt. Kadwar	16	1 no.
13	Uttar Pradesh	Farukhabad	1	3.96 mld
		Kanpur	2	I-36.0 mld
			3	II-13.0 mld
			4	III-5.0 mld
		Allahabad	5	60.0 mld
		Mirzapur	6	14.0 mld
		Varanasi	7	I-9.8 mld
			8	II-80.0 mld
			9	III-12.0 mld
		Saharanpur	10	38.0mld
		Muzaffar Nagar	11	32.5 mld
		Ghaziabad	12	73.0mld
			13	56mld
		Noida	14	I-34.0 mld
			15	27.0+9.0 mld
		Vrindawan	16	4.0 mld
			17	0.5mld
		Mathura	18	14.5mld
			19	12.5mld
		Agra	20	78.0mld
			21	10.0mld
			22	2.25mld
		Etawa	23	10.0mld
		Lucknow	24	42.0mld
		Sitapur	25	1 no.

Table 2.1 : Details of STPs identified for their performance evaluation

S.No.	State	Town		STPs Identified
14	Uttrakhand	Haridwar	1	I-18.0mld
			2	II-6.0mld
		Rishikesh	3	0.33mld
15	West Bengal	Chandannagar	1	22.7mld
		Behrampore	2	4.0mld
		Nabadip	3	4.0mld
		Kalyani	4	17.0mld
		Bhatpara	5	I-10.0mld
			6	II-23.0mld
		Titagarh	7	I-18.5mld
			8	II-4.5mld
		Panihati	9	12.0mld
		Baranagar Kamahati	10	40.0mld
		Gardenreach	11	47.0mld
		South Subarkam	12	30.0mld
		Howrah	13	45.0mld
		Serampore	14	18.9mld
		Bally	15	30.0mld
		Cossipore Citpur	16	45.0mld
		Champadi	17	12.0mld
		Gayeshpur	18	6.0mld
		Garulia	19	7.9mld
		Mahestala	20	3.93mld
		Durgapur Distt. Bardhman	21	1 no.

Table 2.2 : List of STPs inspected for their Performance Evaluation

S. No	Name of Town/State	IA/O&M Agency	Location of STP	Capacity of STP (mld)	Process/ Technology
1.	Delhi	DJB	Delhi Gate	10.0	Physico-chemical followed by high rate Biological filters (Biofor)
		DJB	Sen Nursing Home	10.0	Physico-chemical followed by high rate Biological filter(Biofor)
2	Delhi	DJB	Okhla	634.44(54.55,72.73,136.38,168.20,204.57)	All Activated Sludge Process.
			Mehrauli	22.73	Extended Aeration
			Vasant Kunj	10.0,13.63	Extended Aeration
3	Delhi	DJB	Yamuna Vihar	Ph.I - 45.46 Ph.II - 45.46	Activated Sludge Process Activated Sludge Process
			Kondli	Ph.I - 45.46 Ph.II - 113.65 Ph.III - 45.46	Activated Sludge Process Activated Sludge Process Activated Sludge Process
4	Noida, UP	UPJN/ NOIDA	Sect.-54	27.0 9.0	UASB WSP
			Sect.-50	34.0	UASB
5	Faridabad, Haryana	PHED	Zone-I (Badshahpur) Zone-II	20.0 45.0	UASB UASB
	Gurgaon, Haryana	PHED	Gurgaon	30.0	UASB
		HUDA	Gurgaon	69.0	ASP
6	Mathura, U.P.	UPJN/ Mathura Municipality	Trans Yamuna	14.5	WSP
			Masani Nala	13.59	WSP
	Varindavan, U.P.	UPJN/Varin davan Municipality	Varindavan	4.0	WSP

Table : 2.2 List of STPs inspected for their Performance Evaluation

S. No	Name of Town/State	IA/O&M Agency	Location of STP	Capacity of STP (mld)	Process/ Technology
7	Agra, U.P.	UPJN	Cis-Yamuna	78.0	UASB
			Peela khar	10.0	WSP
8	Delhi	DJB	Keshopur	Ph-I - 54.55 Ph-II - 90.92 Ph-III - 181.84	All ASP
			Nilothi	181.84	ASP
9	Delhi	DJB	Pappankala	90.92	ASP
			Najafgarh	22.73	ASP
10	Delhi	DJB	Rithala	Ph.I - 181.84 Ph.II - 181.84	ASP ASP
			Coronation Pillar	Ph-I - 45.46 Ph-II - 90.92 Ph-III - 45.46	TF ASP ASP
11	Panipat, Haryana	PHED	Panipat	35.0	UASB
			Karnal	40.0	UASB
12	Muzaffarnagar, U.P.	UPJN/Muzaffarnagar Municipality	Muzaffarnagar	32.5	WSP
13	Saharanpur, U.P.	UPJN	Saharanpur	38.0	UASB
14	Hardwar, Uttranchal	Uttranchal Peyjal	Jagjitpur,	18.0	UASB
			Lakarghat,	6.0	WSP
15	Lucknow, U.P.	UPJN	Daulatganj	42.0	FAB
16	Kanpur, U.P.	UPJN	Jajmau	5.0 36.0 130.0	UASB UASB(CETP) ASP
17	Allahabad, U.P.	UPJN	Naini	60.0	ASP
18	Patna, Bihar	BRJP	Saidur	4.5 40.5	ASP ASP
			Beur	35.0	ASP
19	Patna, Bihar	BRJP	Pahari	25.0	AL

Table : 2.2 List of STPs inspected for their Performance Evaluation

S. No	Name of Town/State	IA/O&M Agency	Location of STP	Capacity of STP (mld)	Process/ Technology
20	Bhagalpur, Bihar	BRJP	Bhagalpur	11.0	AL
21	Pune, Maharashtra	Pune Municipal Corporation	Erandwane	50.0	Modified ASP
			Bhairoba	130.0	ASP
			Tanajiwadi	17.0	Biotowers followed by ASP
			Bopadi	18.0	Extended Aeration
22	Mumbai, Maharashtra	Mumbai Municipal Corporation	Bandra	1500.0	Marine outfall
			Varsova	50.0	AL
23	Panaji, Goa	PWD	Panaji	12.0	C-Tech Process
24	Mumbai, Maharashtra	Mumbai Municipal Corporation	Ghatkopar	300.0	AL
			Bhandup	280.0	AL
25	Mumbai, Maharashtra	Mumbai Municipal Corporation	Powai	Powai Lake	Bio - remedial measures
26	Nasik, Maharashtra	Nasik Corporation	Tapowan	78.0	UASB
			Chehadi	22.0	UASB
			Panchak	7.5	ASP
27	Trimbkeshwar, Maharashtra	Trambak Municipal Council	Trimbkeshwar	1.0	FAB
28	Delhi	MCD(S & JJ)	Molar Band	3.0	FAB
			Tikrikhurd	2.0	SAF
			Hastal (Micro STPs)	-	Micro STPs

Table : 2.2 List of STPs inspected for their Performance Evaluation

S. No	Name of Town/State	IA/O&M Agency	Location of STP	Capacity of STP (mld)	Process/ Technology
29	Kolkata, West Bengal	KMDA	Cossipore Chitpur	45.0	ASP
			South Suburban(W) + Garden Reach	47.5	ASP
		KMDA	Maheshtala	3.9	WSP
30	Bhardreshwar, West Bengal	KMDA	Bhardreshwar	7.6	WSP
	Chandan Nagar, West Bengal	KMDA	Chandannagar	4.5 18.5	WSP TF
	Bally North Howrah, West Bengal	KMWSA	Kona	40.0	WSP
	Howrah, West Bengal	KMWSA	Howrah	45.0	TF
31	Kolkata, West Bengal	Director of Industries	CETP Bhangore, Kolkata	20.0	Physico-chemical followed by ASP
32	Chennai, TamilNadu	CMWSA	Koyembedu	60.0 34.0	ASP ASP
	Kancheepuram Tamil Nadu	Kancheepuram, Municipality	Kancheepuram	9.0	OP
33	Chennai, TamilNadu	CMWSA	Perungudi	54.0	ASP
34	Coimbatore, Tamil Nadu	Coimbatore Municipal Corporation	Vellulur/Ukkadam	41.0{26.0, (6.0+9.0)}	Sewage Farming (guinea grass) and lagoons
35	Ghaziabad (U.P.)	UPJN/ Ghaziabad Municipal Corporation	Indrapuram, THA	56.0	UASB
			Dundahera, CHA	73.0 (70.0, 3.0)	UASB/Agro - forestry

CHAPTER 3

Observations

The study brought out large number of technological & managerial problems in operation of these STPs. Out of 175 total identified STPs spread over 15 States (**Fig. 3.1**), the present report has included only 84 STPs of 13 different technologies (**Table 3.1**) spread over 9 States of India (**Table 3.2**). Information in the prescribed format has been received for 79 STPs from different agencies (**Table 3.3**). The overall performance of 45 STPs has been found poor or very poor. Out of 84, performance of only 8 STPs has been rated good, while that of 30 of these have been rated satisfactory (**Fig. 3.2**). Capacity utilization in general was inadequate. Sludge handling appears to be most neglected area in STPs operation. Alternate power supply facility is not available in most of the cases. Utilization of biogas generated from UASB reactors or sludge digesters is also not adequate in most of the cases. In this Chapter, an attempt has been made to bring out the facts on technological and managerial problems in operation of the STPs in India.

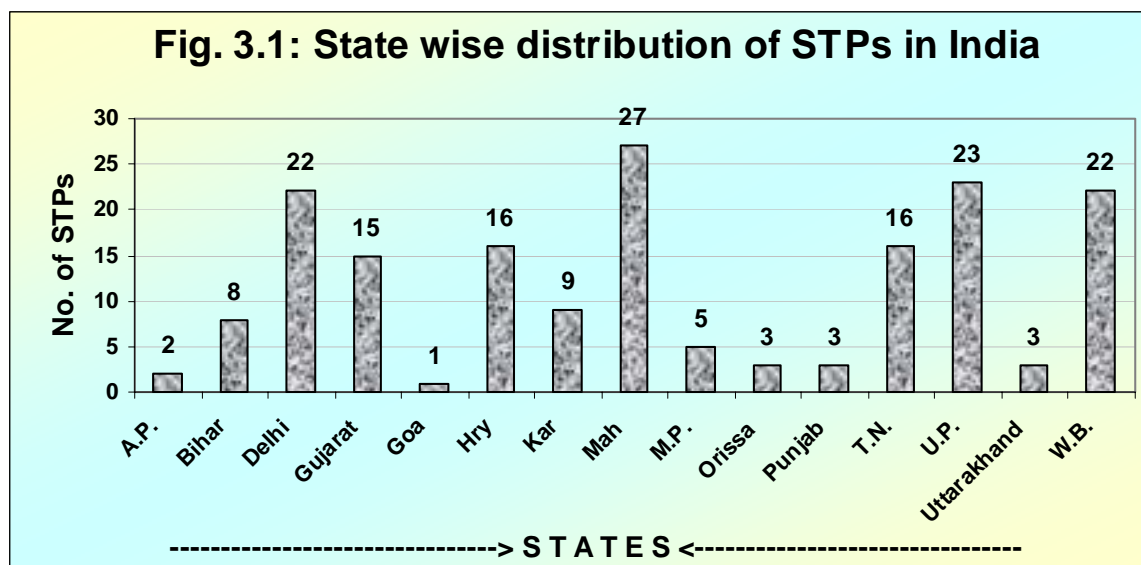


Table 3.1 : Technology wise information on STPs covered

S.No.	Main technology	Number of STPs visited
1.	Activated Sludge Process (ASP) (conventional)	36
2.	Activated Sludge Process (ASP) (extended aeration)	3
3.	Fluidized Aerobic Bed (FAB) (Denseg)	3
4.	Fluidized Aerobic Bed (FAB)	3
5.	Trickling Filters	2
6.	SAF	1
7.	UASB + Aerated Lagoons	2
8.	UASB	1
9.	Aerated Lagoons	6
10.	SBR	1
11.	Waste Stabilization Ponds	12
12.	UASB + Polishing Ponds	12
13.	Micro STPs	2
	Total	84

Table 3.2 : State wise number of STPs visited

S.No.	State	Number of STPs visited
1.	Bihar	4
2.	Delhi	30
3.	Goa	1
4.	Haryana	6
5.	Maharashtra	11
6.	Tamil Nadu	5
7.	U.P.	17
8.	Uttrakhand	2
9.	West Bengal	8
	Total	84

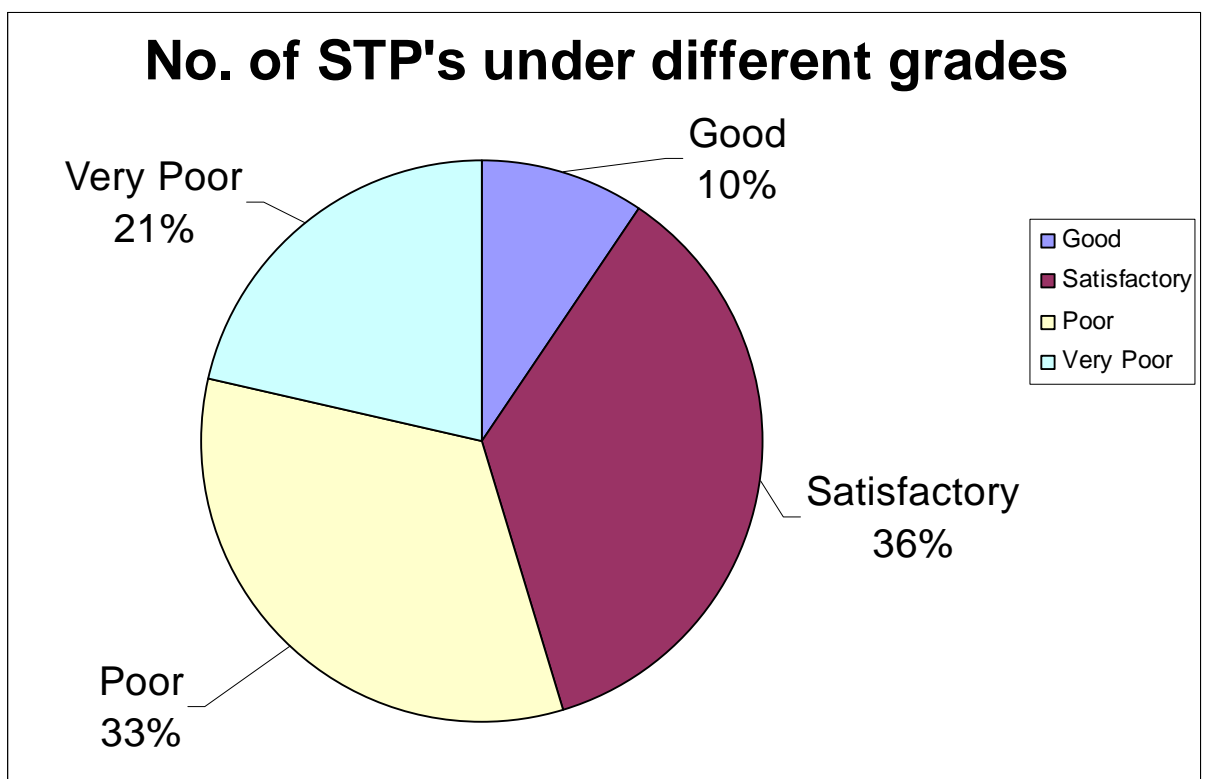
Table 3.3 : Details of information received from State Govts./Implementing Agencies in prescribed format

Sl. No.	State	Total No. of STPs identified	Information received on prescribed format (No. of STPs)	No. of STPs visited	Remarks
1	Andhra Pradesh	2	-	-	
2	Bihar	8	6	4	
3	Delhi	22	19	16	includes Micro STPs
4	Gujarat	15	12	-	
5	Goa	1	1	1	
6	Haryana	16	14	6	
7	Karnataka	9	-	-	
8	Maharashtra	27	7	13	Includes Powai lake in Mumbai
9	Madhya Pradesh	5	-	-	
10	Orissa	3	1	-	
11	Punjab	3	-	-	
12	TamilNadu	16	12	4	
13	Uttar Pradesh	23	4	14	
14	Uttarakhand	3	3	2	
15	West Bengal	22	-	8	Includes CETP in Kolkata
	Total	175	79	68	

Overall performance of STPs covered

1. Total scenario of STPs performance is dismal, as overall performance of 46 STPs has been found Poor or Very Poor. Performance of only 8 STPs has been rated Good while that of 30 other has been rated Satisfactory.

Fig. 3.2 : Performance rating of STPs visited



2. Capacity utilization of the STPs observed is in general inadequate. Information on capacity utilization was collected from 55 STPs. Out of 55 STPs only 18 STPs (i.e 33%) were operating at normal flow (90 to 110% design flow) whereas rest 37 (i.e.67%) were either under-loaded or over-loaded.
3. Sludge removal / treatment / handling appears to be the most neglected area in STPs operation.
4. In 43 STPs based on ASP technology or other high rate aeration systems, sludge-handling facilities were found mostly out of order.

5. Similarly, in 28 STPs based on Waste Stabilization Pond or where Ponds have been employed in treatment schemes, cleaning of accumulated sludge was not regularly done in 24 cases.
6. Utilization of biogas generated from UASB reactors or sludge digesters is also not adequate in most of the cases.
7. It was observed that there was no gas generation and utilization in 13 plants in spite of having anaerobic reactors/digesters.
8. In 14 STPs the gas generated is being flared and not being utilized.
9. In 8 STPs the gas generated is only partly utilized mostly flared.
10. Only in 12 STPs the gas generated was being utilized as domestic fuel (5 STPs) or as fuel for gas engine (4 STPs) or dual fuel generator, DFG (3 STPs)
11. Alternate power supply facility is not available in most of the cases. Out of 84 STPs, only 13 STPs were having operational alternate power supply facility, 12 having DFG and 1 having DG Set. Six other STPs were also having alternate power supply facility but were not able to utilize this due to funds constraints.
12. Fund shortage is an important factor in poor operation and maintenance of STPs and has been reported in 26 cases. The problem of fund shortage is mostly reported from States of Bihar, Haryana, U.P., and West Bengal. This trend shows that the root of problem lies in less priority being given to sewage treatment.
13. Lack of proper laboratories at site is another area that needs attention. In case of 42 STPs the testing is reportedly done at common departmental laboratories. In case of another 16 STPs the testing is done through contract with some laboratory. In all these cases, day-to-day testing is normally not done that could enable proper control on plant's performance. Samples are collected and analyzed by departmental/external labs once in a month or week.
14. In majority of the cases, operation of the STPs is looked after by contractors. These contractors generally depute unqualified or less qualified staff at site, which is also an important factor responsible for poor operation of STPs. This indicates that terms and condition of operation contracts are not adequately framed to check this situation.

O&M of STPs

BIHAR

1. Saidpur, Patna

Augmentation of existing STP with conventional activated sludge process has been done to a capacity of 45 mld under GAP-I in the year 1992. O&M of the plant is being done by BRJP. At present the plant is under-utilized as it is receiving only about 25 mld of wastewater on account of i) sludge digester capacity is not fully operational – 2 out of 3 digesters are under heavy repairs and ii) intermediate pumping stations at Antaghat and R. K. Avenue are not pumping sewage to the STP. Sludge drying beds are not working effectively as filtrate pump is out of order. Filter media in the sludge drying beds has not been changed since beginning. Weirs/V-notch in the secondary settling tank are damaged and need replacement. There is no gas production as the hood of the one digester, which is in working condition, is also non-

functional. Treated effluent is discharged into river Phunphun/Ganga through open drain/Badshahi Channel. Treated effluent mixes with untreated wastewater which also flows into the open drain from areas inhabited along it. As per testing done by BRJP departmentally in their laboratory, treated effluent is just meeting the design standards for BOD & SS, may be due to less discharge being received at the STP for treatment. There is no alternative power arrangement during power failure/cut. O&M of the plant is not satisfactory mainly due to funds constrain. All the staff engaged are unqualified/unskilled labor on daily wages.

Grade: Very poor

2. Beur, Patna

Augmentation of existing STP with conventional activated sludge process has been done to a capacity of 35 mld under GAP-I in the year 1992. O&M of the plant is being done by BRJP. At present, plant is under utilized as it is receiving only an average of about 20 mld of wastewater on account of i) pumping plants installed at intermediate (9 nos.)/main pumping stations are mostly out of order and ii) unauthorized connections made by public in the rising mains conveying sewage to the STP. There is no standby arrangement in case of power cut. Mechanical screens (2 nos.) and flow meters installed in the two streams at the STP are out of order and defunct. Mechanical horizontal traveling grit removal system in both the streams is defunct. Baffle plate/V-notch in the two PSTs need to be replaced. There is no gas production as one of the two digesters is out of order and the other is being used for sludge storage only, as its gas control system is not functional. Treated effluent is pumped into Badshahi nalah discharging into Phunphun/Ganga river. There is no revenue from treated effluent and sludge. As per testing done by BRJP, treated effluent is meeting the design standard for BOD & SS, may be due to less discharge being received at the STP. All the staff engaged to run the plant are unqualified/unskilled labor on daily wages. O&M of the plant is not satisfactory mainly due to funds constrain.

Grade: Very poor

3. Pahari, Patna

Aerated lagoons (2nos) with one fish pond have been constructed under GAP-I in the year 1994 to treat 25 mld of wastewater being pumped from Kankarbagh open drain (Kutchha) from a distance of about 4.5 Km. O&M of the plant is being done by BRJP. M.S. railing, platform etc. of the pretreatment units are rusted/broken. Mechanical horizontal grit removal systems are out of order and non functional for the last three years. Out of 6 number of floating aerators fixed in each of the 2 lagoons, a total of 7 aerators are out of order for the last 3 years. Brick pitching on the inside slope of embankments of the lagoons is settled/broken. All over the footpath and outside slopes of the embankments, weeds/plants are growing. Desludging of the aerated lagoons is required as these are mostly filled with sludge/silt. Fish is grown in the fish pond which has been given on contract but no record of quantity of fish production is available. Boundary wall constructed all around the STP is damaged at some places. All the staff engaged for operating the plant are unqualified unskilled labor on daily wages. Due to shortage of staff/funds, plant is run only in two shifts of 8 hours each since 1995. Plant is receiving very low strength sewage and no testing of BOD is being done as the incubator in the

laboratory is out of order. There is no standby arrangement during power failure. Main reason for poor maintenance of the plant is funds constrain.

Grade: Very poor

4. Bhagalpur

Aerated lagoons (2nos.) with one fish pond have been constructed to treat 11 mld wastewater under GAP-I in the year 1990. O&M of the plant is done by BRJP. Plant is receiving only 4 mld of wastewater and is thus under utilized. At the time of inspection, the plant was not running due to non availability of power for the last 12 hours. No D.G. sets have been provided at the intermediate/main pumping stations and STP. M. S. staircase, railings etc. installed in pretreatment units are all rusted/broken. There are plants/trees growing all around the pretreatment units making it difficult to approach the same. Mechanical grit removal system along with electric cable is out of order. Flow meter installed at STP is out of order and abandoned. Proportionate weir/rectangular notches installed are rusted and there is no calibration to facilitate flow measurement. 2 out of 4 nos. of aerators fixed in the lagoons are not in working condition. There is grass/weed growing on the slopes and pathways of the lagoons. Sludge/scum has been accumulated on the sides and corners of the lagoons resulting in short circuiting. In the fish ponds, no fish was found to grow. Treated effluent does not seem to meet the design standard for BOD & SS. BOD test is not performed on account of non-availability of continuous power. No regular sampling/testing is done by any institute. O&M of the plant is not satisfactory mainly due to funds constrain.

Grade: Very poor

DELHI

5. Sen Nursing Home Nalah

10 mld capacity STP has been constructed at Sen Nursing Home Nalah under YAP-I in the year 1995. Process of treatment, known as Densadeg treatment, consists of physico-chemical treatment followed by biological treatment for 10 mld wastewater out of about 60-70 mld flowing into the Nalah. Balance untreated wastewater continues to flow into the Nalah which is discharging into river Yamuna. O&M of the STP is being done by M/s PPCL in lieu of the treated effluent taken by them for their power plant. Plant was found shut during inspection for want of power due to closure of PPCL power plant for non-availability of gas due to floods. Lot of debris/floating matter was found in the Nalah at the interception point which needs to be regularly cleaned/desilted. Flow meter installed to measure discharge has been lying defunct since long. A demonstration plant (2 mld capacity) set up for coliform removal using UV radiation was found abandoned and no results/outcome of the same could be made available by DJB. Regular sampling/testing of effluent is being done departmentally at STP as well as by DPCC. Treated effluent is meeting the design standards for BOD & SS. Sludge produced is being sold for use as manure.

Grade: Satisfactory

6. Delhi Gate Nalah

10 mld capacity STP has been constructed at Delhi Gate Nalah under YAP-I in the year 1995. Process of treatment, known as Densadeg treatment, consists of physico-chemical treatment followed by biological treatment for 10 mld waste water out of about 40-50 mld flowing into the Nalah. Remaining untreated waste water continues to flow into the Nalah which is discharging into river Yamuna. O&M of the STP is being done by M/s PPCL in lieu of the treated effluent taken by them for their power plant. Plant was found shut during inspection for want of power due to closure of PPCL power plant for non-availability gas due to floods. Lot of debris/floating matter was found in the nalah at the intake point which requires regular cleaning/desilting. Daily status report for all the parts, units, equipments, machinery etc. in respect of their condition/running is not available. Screening material is not being disposed properly and is being dumped along the compound of STP. Flow meter installed to measure discharge has been lying defunct. Sludge pipes are found to be choked and are under repair. Regular testing is being done in the lab located at Sen Nursing Home Nalah STP departmentally as well as by DPCC. Treated effluent is meeting the design standards for BOD & SS. Sludge produced is being sold for use as manure.

Grade: Poor

7. Mehrauli

22.73 mld capacity STP with extended aeration process has been constructed by Delhi Jal Board in the year 2003 for treatment of wastewater generated in Mehrauli catchment area in outer Delhi. O&M of the plant is being done by DJB departmentally. STP is receiving only about 8 mld of wastewater. STP is under utilized on account of scarcity of water in the catchment area. No PST has been provided. Wastewater after treatment in preliminary units flows to aeration/secondary settling tank. As there is no PST, digesters & gas holders have not been provided. During inspection, plant was found shut due to power cut/failure, since there is no standby arrangement during power cut. There is shortage of operating staff at STP. Weekly testing of the effluent is being done by DJB in their lab. at Okhla as well as monthly by DPCC. Lab. constructed at the STP site is not functional due to staff constrain. Treated effluent is meeting design standards for BOD & SS. Part of the treated effluent is used by DDA for horticulture and the remaining is discharged into nalah which also carries untreated wastewater and ultimately joins river Yamuna near Nizamuddin Bridge. There is lot of scope for plantation of trees which has not been taken up on full scale.

Grade: Satisfactory

8. Vasant Kunj

23.64 mld capacity STP with extended aeration process has been constructed by Delhi Jal Board in two phases, namely Ph.-I 10 mld and Ph.-II 13.64 mld in the year 1992 and 1998 respectively for treatment of wastewater generated in Vasant Kunj catchment area in south Delhi. O&M of the plant is being done by DJB departmentally. STP is receiving about 21 mld of wastewater. STP is slightly under utilized mainly because of scarcity of water in the catchment area. No PST has been provided in both the plants. As there is no PST, digesters & gas holders have not been provided. Wastewater after treatment in preliminary units flows to aeration/secondary settling tank. During inspection, plant was found shut due to

power cut/failure, since there is no standby arrangement during power cut. Mechanical grit removal system with reciprocating raking mechanism is damaged and lying defunct. MS railing, platform etc are getting rusted. There is lot of greenery within the STP campus but house keeping and preventive maintenance appears to be poor. There is shortage of operating staff at STP. Sludge from sludge drying beds is sold to be used as manure. Weekly testing of the effluent is being done by DJB in their lab. at Okhla as well as monthly by DPCC. Treated effluent is meeting design standards for BOD & SS. Treated effluent is being used by DDA for horticulture.

Grade: Poor

9. Okhla

636.44 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board separately in five phases, namely Ph-I 54.55 mld, Ph-II 72.74 mld, Ph.-III 136.38 mld, Ph.-IV 168.20 mld and Ph.- V 204.57 during 1937 to 1990 for treatment of wastewater generated in ring road catchment area in north Delhi, central Delhi and part of south Delhi. O&M of the plant is being done by DJB departmentally. Raw sewage inlet chamber is common for all the phases from where it is distributed after screening for treatment under different phases. STP is receiving about 545 mld of sewage. STP is under utilized mainly for want of rehabilitation of ring road trunk sewer and silting/under utilization of gravity ducts from Pumping Stations to Okhla STP. Out of 5 nos. of flow measuring devices installed in the inlet channels under each phase, only one is in working order. 168.20 mld plant has been modernized for automation recently which is under trial operation. In Ph.- I of the plant, one out of four mechanical screens is under repair. Surface aerators provided originally are proposed to be replaced by diffused aerators. There is no standby arrangement for running the plant during power cut/failure. Out of 28 nos. of sludge digesters, one is not in operation for want of repairs. Part of bio-gas produced in digesters is recycled for mixing the contents of 6 nos. of 72.74 mld plant digesters with the help of compressors (6 nos.) and the remaining bio-gas is supplied to nearby areas through pipe lines to be used as domestic fuel gas. An average of 5 lac cu.ft. of bio- gas produced per day at the STP, which is fully utilized as domestic fuel through 3500 nos. of connections. Sludge produced in sludge drying beds (139 nos.) is sold for use as manure. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. There is shortage of staff for proper operation of the STP. Treated effluent from the plant is meeting design standards for BOD and SS. 45.46 mld of treated effluent is being given to CPWD for horticulture, 13.36 mld to Minor Irrigation department for irrigation and the rest is discharged into Agra canal. It is proposed to augment the capacity of the STP by constructing an additional plant with 136.38 mld capacity under YAP-II, which is under implementation with JBIC funding.

Grade: Satisfactory

10. Yamuna Vihar

90.92 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board separately in two phases, namely Ph-I 45.46 mld in the year 1998 and Ph-II 45.46 mld in the year 2002 for treatment of sewage generated in part of Trans Yamuna area of East Delhi. O&M of the plant is being done by DJB departmentally. STP is receiving

about 20 mld of sewage in Ph.-I and 13 mld in Ph.-II and is thus under utilized. There is no stand-by arrangement for running the plant during power cut. STP is under utilized for want of house sewer connections/sewer lines in the catchment area. In Ph.-I of the plant, both the bar screens (mechanical) provided are not working since April, 06 and 3 of the 8 gas compressors are not working since Jan., 06. In Ph.-II of the plant, baffle plates/V-notches provided in one of the two SSTs are not existing and stolen. There is huge scope for providing plantation in Ph.-II area. Part of the bio- gas produced in the digesters is recycled for mixing the digester contents with the help of compressors and remaining gas flared. No engines are installed for generating electric power. Sludge produced in sludge drying beds is sold for use as manure. There is shortage of operating staff at STP. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is meeting design standards for BOD & SS. Treated effluent is being discharged into Shahadara drain which also carries untreated wastewater and joins river Yamuna at U/s of Okhla Barrage. Treated effluent pumping station along with 7 Km long force mains (2 nos., 1500 mm dia) is under construction for discharging the treated effluent directly into river Yamuna.

Grade: Satisfactory

11. Kondli

204.57 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board separately in three phases, namely Ph-I 45.46 mld in the year 1979, Ph-II 113.65 mld in the year 1990 and Ph.-III 45.46 mld in the year 1995 for treatment of sewage generated in part of Trans Yamuna area of East Delhi. O&M of the plant is being done by DJB departmentally. STP is receiving about 205 mld of sewage as per design capacity. There is no standby arrangement for running the plant during power cut. In Ph.-I of the plant mechanical grit removal mechanism is out of order and digesters, gas holders and drying beds constructed under Ph.-II are not yet commissioned. Part of the bio- gas produced in the digesters in Ph.-III of the plant is recycled for mixing the digester contents with the help of compressors and remaining gas flared. There is no gas production in Ph.-I and Ph.-II of the plant. No engines are installed for generating electric power. Sludge produced in sludge drying beds is sold for use as manure. There is shortage of operating staff at STP. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is meeting design standards for BOD & SS. Treated effluent is being discharged into Shahadara drain (near Chilla regulator) which also carries untreated wastewater and joins river Yamuna U/s of Okhla Barrage.

Grade: Satisfactory

12. Nilothi

181.84 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board in the year 2002 for treatment of wastewater generated in North of Najafgarh drain area in west Delhi. Operation of the plant is being done through contract and its maintenance & repairs by DJB departmentally. STP is receiving only about 45 mld of wastewater. STP is under utilized for want of house sewer connections/sewer lines. Two streams provided are being used alternatively only at an interval of 45 days. Even after 4

years of commissioning, the plant is yet to be run for treatment of sewage on full load i.e. design flow of 181.84 mld. Part of the bio-gas produced is recycled for mixing the digester (10 nos.) contents with the help of compressors and remaining gas flared. DFGs (3 nos., 526 KW each) have been installed for generation of electric power from bio-gas but these are not in use since beginning. There is no standby arrangement for running the plant during power cut. Sludge drying beds (72 nos.) are found filled with mud/sludge and appeared as if not being used since long, as plants/trees are found growing within the sludge drying beds. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is meeting design standards for BOD & SS, may be due to less quantity of sewage being treated at the STP. Treated effluent is being discharged into Najafgarh drain which also carries untreated wastewater and joins river Yamuna at D/s of Wazirabad Barrage.

Grade: Poor

13. Keshopur

327.31 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board separately in three phases, namely Ph-I 54.55 mld in the year 1956, Ph-II 90.92 mld in the year 1976, and Ph.-III 81.84 mld in the year 1986 for treatment of wastewater received from Keshopur zone catchment area in west Delhi. No treatment is being done in Ph.-I of the plant which is abandoned and requires major renovation of all the units. O&M of Ph.-II and III of the plant is being done by DJB departmentally. STP is receiving a total combined quantity of about 227 mld of wastewater in all the three phases. STP is under utilized mainly for want of rehabilitation of trunk sewers. MS railing, stairs are getting rusted for want of painting. 20 mm mechanical (2 nos.) and manual (1 no.) screens have been provided at the inlet chamber of Ph.-II of the plant. Fine screens of 6 mm size need to be provided in order to arrest large size floating matter entering the STP. Flow meters installed are not in working order, quantity of flow being treated is estimated on the basis of pumping hours at the MPS. Whenever there is power cut, larger quantity of scum/foam is formed on the surface of aerators due to silting of sludge in the aeration channels. There is no stand by arrangement for running the plant during power cut. Baffle plate /V-notches in the SST are not being cleaned off floating sludge /solids regularly. There is no gas production as all the 4 digesters are structurally damaged and not in working order. In phase III of the plant, out of 24 aerators provided in aeration tanks, 7 are under repair. One of the two SSTs is not in operation due to damage of central rotating arm/scrapper. No gas is produced in Ph.-III also, as all the 10 digesters are structurally damaged. No engines are installed for generating electric power under any of the phases. Sludge produced in sludge drying beds is sold for use as manure. There is shortage of operating staff at STP. No trained/dedicated and experienced staff is available for running the STP properly. O&M of the plant is not satisfactory though there should be no shortage of funds in DJB. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is not meeting design standards for BOD & SS. Treated effluent is being discharged into Najafgarh drain which also carries untreated wastewater and joins river Yamuna at D/s of Wazirabad Barrage. Augmentation/renovation of the whole plant is proposed to be done under YAP-II, which is under implementation with JBIC funding.

Grade: Poor

14. Pappankala

90.92 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board in the year 2002 for treatment of wastewater generated in Pappankala area in the south west Delhi. O&M of the plant is being got done through contract with the construction agency. STP is receiving only about 36 mld of wastewater. STP is under utilized for want of house sewer connections/sewer lines and scarcity of water in the catchment area. Both the mechanical bar screens provided at the inlet chamber are out of order and not working. Ultrasonic flow meter installed is also out of order and is to be replaced. Out of 24 nos. of surface aerators provided in the aeration tanks, 3 are under repair. Part of the bio-gas produced is recycled for mixing the digester (8 nos.) contents with the help of compressors (8 nos.) and the remaining gas is flared. There is no standby arrangement for running the plant during power cut. Sludge drying beds (50 nos.) have been provided and dried sludge is sold for use as manure. There is shortage of operating staff at STP. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is meeting design standards for BOD & SS. Treated effluent is being discharged into Najafgarh drain which also carries untreated wastewater and joins river Yamuna at D/s of Wazirabad Barrage.

Grade: Satisfactory

15. Najafgarh

22.73 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board in the year 2000 for treatment of wastewater generated in Najafgarh area in west Delhi. O&M of the plant is done by DJB departmentally. STP is receiving only about 9 mld of wastewater. STP is under utilized for want of house sewer connections/sewer lines. Both the mechanical bar screens provided at the inlet chamber are out of order and not working. Cleaning of manual screens is also found to be not properly done and there is heading of sewage U/s of the screens due to clogging. Screenings taken out from the screen chamber are dumped/spread haphazardly below the intake structure. Out of 2 nos of mechanical grit removal chambers, rotating/reciprocating mechanism in one of the chambers is out of order. Ultrasonic flow meter installed is also out of order. Out of 16 nos. of aerators provided in the aeration tank, only 10 are running and the rest are under repair. Sludge/algae is found floating at surface of the SST. There is no standby arrangement for running the plant during power cut. Sludge drying beds (12 nos.) have been provided but due to weak sewage very little quantity of sludge is produced which is disposed off for use as manure. There is shortage of operating staff at STP. Maintenance of STP is very poor due to shortage of funds as well as skilled/trained labour and staff. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is meeting design standards for BOD & SS, may be due to less quantity of sewage being treated at the STP. Treated effluent is being discharged into Najafgarh drain which also carries untreated wastewater and joins river Yamuna at D/s of Wazirabad Barrage.

Grade: Very poor

16. Rithala

363.68 mld capacity STP with conventional activated sludge process has been constructed by Delhi Jal Board separately in two phases, namely Ph-I 181.84 mld in the year 1990 and Ph-II 181.84 mld in the year 2002 for treatment of wastewater generated in Rithala-Rohini catchment area in west Delhi. O&M of Ph.-I of the plant is being done by DJB departmentally and of Ph.-II through contract (M/s. Degremont Ltd.). Phase –I of the STP is receiving about 68 mld and Phase –II about 118 mld of wastewater. STP is under utilized for want of house sewer connections/sewer lines in the catchment area. In Ph.- I of the plant, out of four mechanical screens, one screen is under repair. In Ph.-II, PST is not provided. Aeration is being done through diffused aerators before treatment in SSTs/bio - filters. Foam/bubbles containing grease & other harmful substances are observed to be formed in SSTs which need to be controlled by providing proper sprinkler/spray arrangement. Bio-gas produced in Ph.-I as well as in Ph.-II of the plant is used for power generation through imported (Austrian) gas engines (3 nos., 890 KW each) installed under Ph.-II. Phase -I of the plant is being run through grid power only. About 75 % of power requirement for running all the units of Ph.-II of the plant is met through gas engines. Sludge drying beds have been provided under Ph.-I and II of the plant alongwith mechanical filter presses (4 nos.) to be used during monsoons. All the filter presses are defunct and are not in use since beginning. Sludge produced in sludge drying beds is sold for use as manure. There is shortage of operating staff at STP. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent from Ph.-I of the plant is meeting design standards which are of 30 & 50 mg/l for BOD & SS but in case of Ph.-II it is falling short of design standards which are 15 and 20 mg/l respectively. Treated effluent is being discharged into Najafgarh drain which also carries untreated wastewater and joins river Yamuna at D/s of Wazirabad Barrage.

Grade: Poor

17. Coronation Pillar

181.84 mld capacity STP with conventional activated sludge process/trickling filter has been constructed by Delhi Jal Board separately in three phases, namely Ph-I 45.46 mld with trickling filter in the year 1957, Ph-II 90.92 mld with activated sludge process in the year 1999, and Ph.-III 45.46 mld with activated sludge process in the year 2001 for treatment of wastewater received through sewer lines/nalah tapings in Coronation zone in west Delhi. O&M of Ph.-I and II of the plant is being done by DJB departmentally and that of Ph.-III through contract. STP is receiving a total combined quantity of about 122 mld of wastewater in all the three phases. STP is under-utilized for want of house sewer connections/sewer lines in the catchment area and also due to insufficient capacity of irrigation channel in which treated effluent is being discharged. There is no standby arrangement for running the plant during power cut. One of the SSTs under phase II is not in use as its floor is settled. Two nos. of gas holders are under trial. No gas is being produced due to weak sewage as it is being tapped from drains also. 9 nos. of existing digesters are being used for sludge storage only. No engines are installed for generating electric power. Sludge produced in sludge drying beds is sold for use as manure. There is shortage of operating staff at STP. Regular sampling/testing of the effluent is being done by DJB in their departmental lab. as well as by DPCC. Treated effluent is meeting

design standards for BOD & SS. Treated effluent is being discharged into Najafgarh drain which also carries untreated wastewater and joins river Yamuna at D/s of Wazirabad Barrage.

Grade: Satisfactory

18. Molarband, Badarpur

A mini STP of 3 mld capacity using FAB process of technology has been set up under YAP – I in the year 2003 to treat domestic wastewater being discharged from community toilet complexes constructed in the resettlement colony. O&M of the plant is being got done by MCD (S&JJ) through M/s Thermax for a period of 5 years who have constructed the plant also. Plant is receiving only about 1.0 mld of wastewater. It is under utilized on account of the fact that the area/plots are not fully developed as yet and also there is scarcity of water in the area. Daily status report in respect of condition/running of different parts, units, equipment etc. is not prepared and maintained at site. Three blowers, including one as standby, have been installed for supply of air to the reactors (2 nos.) but no testing/analysis is done for the sewage in the reactors to assess the optimum time required for running the blowers to supply the air. Chlorination is being done for removal of fecal coliform. Sludge from the filter press is being used as manure for horticulture by MCD. Treated effluent is being used (by gravity/pumping) for development of parks in the nearby area and also disposed to Yamuna through open drains. D.G. set (1 no., 100 KVA) has been set up for use during power cut. Weekly sampling/testing of effluent is being done through DJB at Okhla STP. Quantity of sludge production seemed to be very less as during inspection of filter press, it appeared that the same is scarcely run – no record of filter press running hours and quantity of sludge production is maintained. Treated effluent is meeting the design standards for BOD, SS & fecal coliform, may be due to weak sewage and less quantity of sewage being treated.

Grade: Poor

19. Tikri Khurd, Narela

A mini STP of 2 mld capacity using SAF process of technology has been set up under YAP – I in the year 2003 to treat domestic wastewater being discharged from community toilet complexes constructed for resettlement colony. O&M of the plant is being got done by MCD (S&JJ) through M/s Geo Miller for a period of 5 years who have constructed the plant also. Daily status report in respect of condition/running of different parts, units, equipment etc. is not prepared and maintained at site. Mechanical screen is found out of order and manual screen also not properly cleaned. Lot of floating matter/solids were seen in the first SAF reactor. M.S. railing, staircase etc. are getting rusted for want of paint/repair. Ultrasonic flow meter fixed at throat of parshall flume is out of order and removed from site. Large quantities of foam is formed in tube settler which may be on account of under loading, improper DO level in reactors or detergents/industrial discharge coming in the effluent. As the STP is located in residential area, nylon jali has been put to arrest the foam and avoid nuisance to the nearby residents. As the nylon jali appeared to be less effective, sprinklers can be fixed around the tube settler to further arrest the foam. Two blowers, including one as standby, have been installed for supply air to the SAF reactors (2 nos.) but no testing/analysis is done for the sewage in the reactors to assess the optimum time required for running the blowers to supply air. Chlorination is being done for removal of fecal coliform. Sludge from the filter press is being used as manure for horticulture by DDA. 25% of the treated effluent is used for development of parks in the nearby area by

DDA and remaining is disposed off in wet lands. D.G. set (1 no., 125 KVA) has been set up for use during power cut. Weekly sampling/testing of effluent is being done through private DJB approved lab. As per test results, treated effluent is meeting the design standards for BOD, SS & fecal coliform. O&M of the plant is not satisfactory due to poor house keeping as well as poor preventive maintenance.

Grade: Poor

20. Micro STPs, Hastal

Micro STPs to treat the wastewater being discharged from 10 nos. of the community toilet complexes (CTCs) have been constructed under YAP-I in the year 2002. 2 nos of these Micro STPs installed in block – A, Hastal (CTC No. 883 & 884) were inspected. Micro STPs are being maintained by DEMS, MCD. Upto March, 06, these were being maintained by M/s Sulabh. It is observed that MCD has not engaged any staff for operating these Micro STPs as well as the respective CTCs. These are being run by the residents of the area of their own. No proper electric power connection exists to run the Micro STPs/CTCs. M/s Sulabh was operating these Micro STPs with unauthorized power connection. At present the Micro STPs are just operating as storage/septic tanks and effluent being discharged into the Najafgarh Drain. Blowers (2 nos.) installed for supply of air to the reactors of the two micro STPs are out of order. It was also informed by MCD staff that out of 10 nos of Micro STPs constructed in the year 2002, two are yet to be made operational. It is observed that after taking over these 10 nos. of Micro STPs/CTCs from M/s Sulabh in March, 06, no proper maintenance is being done by MCD because of non availability of electric power connection and maintenance staff.

Grade: Very poor

GOA

21. Panaji

12 .5 mld capacity STP with C-Tech system has been constructed under NRCP in the year 2005. C-Tech is the most advanced Cyclic Effluent Treatment process which is based on activated sludge process adapted to Sequential Batch Reactor technology. Complete biological operation of C-Tech system takes place in a batch reactor mode comprising of three basic phases i.e. a) Fill - Aeration b) Settlement and c) Decanting. During the period of a cycle, the effluent is filled in the reactor to a set water level. Aeration blowers are started for aeration of the effluent. After the aeration cycle, the biomass settles under perfect settling conditions. Once settled, the supernatant is removed on the top using a decanter. Solids are wasted from the reactor during decanting phase. One cycle is fixed for completion in 180 minutes (90+45+45). It uses all under water metal parts in stainless steel and nonmetallic parts in imported PVC, thus increasing the plant life with little maintenance cost. Complete system is capable of handling variable flow and load conditions. The system automatically adjusts to the new feed condition by changing cycle times, aeration intensity etc. Complete plant operation is controlled automatically through a PLC system, which is a major factor in reducing operating cost. All key functions like RAS, Sludge wasting, Aeration intensity, Cycle time control, Decanting rate etc. are automatically controlled as well as data logged. O&M of the plant is being done by PWD and is included in the contract of construction of the plant for a period of 5 years. Mechanical grit removal system with rotating and reciprocating raking mechanism is found to

be less effective due to high velocity of flow/less detention time in the grit chamber. Chlorination is being done for coliform removal. Treated effluent is being discharged into Mandavi river and sludge from drying beds is being used for filling low-lying areas as there is no demand for its use as manure. As per the latest analysis in PWD lab., the corresponding values for BOD, SS and FC for the treated effluent are 0.53, 14 and 43 respectively. The plant is well maintained with high quality of treated effluent.

Grade: Good

HARYANA

22. Karnal

UASB process with polishing pond (1 no.) has been provided to treat 40 mld of sewage under YAP-I in the year 2000. An average of about 35 mld of sewage reaches the STP. O&M of the plant is being done through contract. At the time of inspection, there was power cut and the plant was being run with the help of DFG. DFG is operated only during power cut because of funds constrain, as running of DFG requires excess quantity of diesel consumption (about 40 %) which works out to be costlier. Mostly, the bio-gas produced is being flared. Unequal flow is observed through V-notch/weir along with closing of feed inlet pipes which need to be more regularly cleaned. Polishing pond has been cleaned 2 years back. Growth of weeds/plants at some places at the water surface on the embankments and scum/algae accumulation on the corners/sides of ponds is observed. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. There is no regular training programme for operators/supervisory staff. A demonstration plant with bio-tower of 1.0 mld capacity DHS (Down Flow Hanging Sponge) in the form of R&D project has been set up to further treat/compare the treated effluent from polishing pond. But the results of the same were not made available. Treated effluent is meeting the design standards for BOD and SS and there is lot of greenery/plantation inside the STP.

Grade: Satisfactory

23. Zone-II, Faridabad

45mld UASB process with one no. polishing pond has been provided under YAP-I in the year 1998 but the STP capacity is under utilized as only about 30 mld of discharge is reaching the STP. This is on account of poor planning and O&M of the sewerage system - sewer lines are often choked and sewage overflows into the open drains/ canal which ultimately lead to Yamuna river. Mech. Screens are found out of order and the polishing pond is silted to more than 50 cm depth. Floating layer of scum/algae is formed on surface of the reactors due to high organic loading rate which needs to be regularly removed to improve the efficiency of the plant. Scum/algae accumulated on the surface of pond is resulting in short-circuiting of the flow. Proportionate weir/V-notch provided for measurement of flow needs to be repainted and calibrated. MS railing, staircase etc are getting rusted. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Daily status report in respect of condition/running of different parts, units, equipments etc is not prepared and maintained. DFG is operated only during power failure, being uneconomical due to excess consumption of diesel (40 %). Mostly the surplus gas is flared. O&M of the plant is being carried out on contract basis. Testing of effluent is being done departmentally. Treated effluent is meeting the design standards for BOD & SS, may be due to

less discharge being received at STP. Treated effluent is being used for irrigation. No regular O&M training has been provided to the operating/supervisory staff.

Grade: Poor

24. Zone-I, Faridabad

20 mld UASB process with one no. polishing pond has been provided under YAP-I at Badshehpur under YAP-I in the year 1998. Mech. Screens are out of order and proportionate weir/V- notch/calibration for measurement of flow need to be repainted. Reactor surfaces are fully covered with floating layer of scum/algae due to high organic loading rate which should be regularly removed for improving the efficiency of the plant. Daily status report in respect of condition/running of different parts, units, equipments etc is not prepared and maintained. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Waste water reaching the STP appears to contain industrial discharges which need to be checked by HPCB at ETPs constructed by individual industries, so that it does not influence the pH of the influent and UASB process. DFG is operated only during power cut, being uneconomical due to excess consumption of diesel (40%). Mostly bio-gas produced in flared. O&M the plant is being carried out on contract basis. Testing of effluent is being done departmentally. Treated effluent is meeting the design standards for BOD & SS. Treated effluent is being used for irrigation. Polishing pond is largely silted and needs to be cleaned. No O&M training has been provided to the operating/supervisory staff.

Grade: Poor

25. 30 mld STP, Gurgaon

UASB process with one polishing pond has been provided under YAP-I in the year 1998. Reactor surfaces are mostly covered with floating layer of scum/algae which need to be regularly removed in order to improve efficiency of the plant. Lot of solids/floating matter are found to flow along with the influent. More realistic solution of mesh screens after ordinary manual screens need to be adopted. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Checking of sludge and its withdrawal from the UASB reactors is neither fully understood nor records properly maintained. This may result in sludge flowing into polishing pond and unsatisfactory quality of treated effluent. Scum/algae is largely accumulated at the surface of the polishing pond and need to be removed to avoid shortening of detention time and thereby prevent deterioration of treated effluent quality. No O&M manual is available at STP. Daily status report in respect of condition/running of different parts, units, equipments etc is not prepared and maintained. No regular training has been provided to the operating/supervisory staff about. DFG is operated during power failure only, being costlier due to excess quantity of diesel consumption (40%) and insufficient funds for purchase of diesel. Mostly, the bio-gas produced is flared. Regular sampling/testing is being done in the lab. departmentally. Treated effluent is not meeting the design standards for BOD. Treated effluent is discharged into Najafgarh drain. Sludge is being sold for use as manure.

Grade: Poor

26. Gurgaon – HUDA

68 mld STP with conventional activated sludge process has been constructed by HUDA in the year 2001 to cater to HUDA areas. O&M of the plant is being done on contract basis through the same contractor who has earlier constructed the main plant. Plant is being maintained in good condition but there is no utilization of the biogas produced in the sludge digesters. At present 100% of the gas produced is flared. Implementation of component of the power generation from biogas being produced at the STP is at planning stage. It is proposed to put pure gas engines instead of dual fuel generators. There is no revenue from digested sludge as manure, since there is hardly any demand. Sampling/testing of effluent is being done departmentally. Treated effluent is meeting the design standards for BOD & SS. Treated effluent is being used for land application within the STP compound and in nearby fields.

Grade: Good

27. Panipat

UASB process with one polishing pond has been provided under YAP-I in the year 2000 to treat 35 mld of sewage. Plant is run overloaded having maximum quantity of influent as 45 mld. Wastewater from textile/dyeing units also reaches to the STP which needs to be checked for improved performance of STP. O&M of the plant is being done through contract. O&M manual is not available and the operating staff does not seem to be familiar with procedures/steps to be followed for running, maintenance, frequency for operation/testing etc for various units/equipments of the plant. Mech. screens are out of order. Mesh/fine screens (6 mm) need to be put after 12 mm manual screens to further arrest floating matter. Sewage is found to overflow from common chamber to the standby grit channel (back flow). Proportionate weirs installed at the end of grit channels need to be painted/calibrated a-fresh as these have been largely damaged. V-notches and surface of the aerators need to be more regularly cleaned off floating layer of scum/algae for uniform flow and improved efficiency. Gas pipes installed on the reactors are getting damaged and need to be fibre coated again. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Polishing pond has sludge/silt accumulated to an average of 40% of water depth and has not been cleaned since commissioning. Gas domes have been cleaned of large quantity of sludge/silt recently. Sampling/testing is being done by BHEL, Hardwar. Treated effluent is just meeting the design standards for BOD & SS. No training is provided to operating/supervisory staff. Treated effluent is discharged into river Yamuna through Panipat Drain No.II.

Grade: Poor

MAHARASHTRA

28. Erandwane, Pune

50 mld capacity STP has been constructed with modified activated sludge process followed by anaerobic digestion at Erandwane in Dec., 2004 by Pune Municipal Corporation. Aeration with the help of diffusers and settling with the help of inclined tube settlers are the salient features of this modified process. Total plant is planned and constructed in a very small area of about 0.8 hectares. O&M of the plant is being done by Pune Municipal Corporation through the contractor M/s Gharpure Engg. & Const. (P) Ltd. who have constructed the plant also. About 46 mld of wastewater is being received at STP for treatment. Sampling/testing of the effluent is being done departmentally and report sent to SPCB who also get the testing done off and on. Treated effluent is meeting design standards for BOD & SS. Chlorination is being done for

coliform removal but no test is being performed to check the results. Treated effluent is being discharged into the river Mutha. Sludge from the centrifuge is being given to farmers free of cost for use as manure. STP is giving high quality of treated effluent (BOD 12 to 16 & SS 10 to 20 mg/l).

Grade: Good

29. Bhairoba, Pune

130 mld capacity STP has been constructed with conventional activated sludge process at Koregaon park in July, 2003. O&M of the plant is being done by Pune Municipal Corporation through contract. About 115 mld of wastewater is being received at STP for treatment. Plant is under utilized because of frequent power cut. Two nos. of DFGs (170 KVA) have been installed but these are not generally used, being uneconomical due to excess amount of diesel consumption (40 %). In place of DFGs, Municipal Corporation is planning to install pure gas engines to run with bio-gas being produced. Sampling/testing of the effluent is being done departmentally and report sent to SPCB who also get the testing done off and on. Treated effluent is meeting design standards for BOD & SS. Chlorination is being done for coliform removal with treated effluent having fecal coliform as 80 to 90 MPN per 100 ml. Treated effluent is being discharged into the river Mula - Mutha. A proposal to sell 40 mld of treated wastewater from STP to irrigation department is under consideration. Sludge from the centrifuge is being given to farmers free of cost to be used as manure. STP is giving high quality of treated effluent.

Grade: Good

30. Tanajiwadi, Pune

17 mld capacity STP has been constructed with two stage biological process i.e. i) bio-towers and ii) aeration tanks with diffused aeration system at Tanajiwadi in April, 2004. O&M of the plant is being done by Pune Municipal Corporation through contract. Almost 17 mld of wastewater is being received for treatment as per design capacity of STP. Aluminium weir plates provided in secondary settling tanks are slightly displaced from their position at some places. Being only aerobic process of treatment of sewage, no gas is produced and no provision for power generating units is made. Sampling/testing of the effluent is being done departmentally and report sent to SPCB who also get the sampling/testing done off and on. Treated effluent is meeting design standards for BOD & SS. Chlorination is being done for coliform removal but no tests are being performed to check the results. Treated effluent is being discharged into the river Mutha. Sludge from the centrifuge is being given to farmers free of cost for use as manure. STP is giving good quality of treated effluent.

Grade: Good

31. Bopodi, Pune

18 mld capacity STP has been constructed with extended aeration process (2 tanks) near Harris Bridge, Bopodi in June, 2003. O&M of the plant is being done by Pune Municipal

Corporation through contract. Almost 18 mld of wastewater is being received for treatment as per design capacity of STP. Semi- rotary (mechanical) fine screens (2 nos. including 1 standby) and 6 mm hydraulic screen (6 mm) have been provided. One of the rotary fine screen is under repair. Fixed type slow speed surface aerators, 6 nos. in each aeration tank, are provided for keeping the liquor completely mixed in the tanks. Out of a total of 12 aerators, 3 aerators are under repair. Baffle plate in the aeration tanks is damaged at some places which needs repair/replacement. BOD reduction in extended aeration tanks is to the extent of 98 %. Being only aerobic process of treatment of sewage, no gas is produced and no provision for power generating units is made. Sampling/testing of the effluent is being done departmentally and report sent to SPCB who also get the sampling/testing done off and on. Treated effluent is meeting design standards for BOD & SS. Chlorination is being done for coliform removal but no tests are being performed to check the results. Treated effluent is being discharged into the river Mula. Sludge from the centrifuge is being given to farmers free of cost for use as manure. STP is giving good quality of treated effluent.

Grade: Good

32. Bandra, Mumbai

A marine out fall has been constructed for disposal of domestic wastewater generated in Bandra zone through dilution and dispersement into sea water after preliminary treatment in the form of screening and degritting. Effluent is discharged into sea through a no. of small discharge pipes at the end near sea shore. Natural hydro - dynamic and biological process in the sea disperses and treats the sewage to maintain desired water quality near the shore. Influent pumping station of 1500 mld capacity has been constructed for pumping the wastewater (from out fall inlet shaft having invert level about 35 m below ground level) into the treatment facilities through 8 nos. pumping plants (each 3 cu. m per second, 51 m head coupled to 1500 kw motor) and 3500 mm dia, 3 km long force main. At the treatment facilities, 8 nos. mechanically raked screens and 4 nos. mechanically operated (cranes) grit removal tanks have been provided. During high flows coinciding with high tides, effluent is pumped to the sea with the help of 5 nos. of axial flow pumps at the effluent pumping station through 3500 mm dia out fall. During low flows/tides, the treated effluent is discharged into the sea by gravity through 8 nos. of penstocks and 3500 mm dia auxiliary out fall. O&M of the treatment facilities is being done by BMC through contact. All the units of treatment facilities were found to be working and well maintained. Regular sampling/testing near the diffuser at the out fall point is being done regularly by Municipal Corporation of Greater Mumbai departmentally as well as by SPCB. Treated effluent is meeting the design standards for bio assay test on fish with 100% survival in 96 hours as per consent given by SPCB.

Grade: Good

33. Versova, Mumbai

90 mld capacity STP with aerated lagoons (2 streams of 45 mld each) have been constructed for treatment of wastewater generated in Versova zone by Municipal Corporation of Greater Mumbai in the year 1998. Each stream of lagoon is divided into 3 cells in series i.e. i) AAL: Aerobic aerated lagoon (15 aerators, 37 KW each), 6 m deep with 1.4 days detention time, ii) FAL-I : Facultative aerated lagoon (9 aerators , 15 KW each) 7 m deep with 1.8 days detention time and iii) FAL-II : Facultative lagoon (2 aerators, 15 KW each) 7 m deep with 1.1 day

detention time. First lagoon is fully aerobic reactor, second is partially mixed facultative reactor and the third lagoon acts as a polishing pond. O&M of the plant is done by Municipal Corporation through contract. Desilting of the lagoons has not been done since beginning and sludge accumulated varies from 0.25 m to 0.75 m depth. Scum/sludge is found deposited at some places on the corners/side of the embankments which need to be regularly cleaned. There is some odour nuisance at STP campus which need to be controlled by planting more trees all round the lagoons. Treated effluent is being discharged into the adjoining creek. Regular sampling/testing of the effluent is being done by Municipal Corporation departmentally as well as by SPCB. Treated effluent is meeting the design standards for BOD & SS.

Grade: Satisfactory

34. Ghatkopar, Mumbai

300 mld capacity STP with aerated lagoons (4 nos. of 75 mld each in parallel) have been constructed for treatment of wastewater generated in Ghatkopar area by Municipal Corporation of Greater Mumbai in the year 2003. Each lagoon (4.5 m deep) is having 16 nos. of aerators with a detention time of 1.8 days. O&M of the plant is being done by Municipal Corporation departmentally. 230 mld of wastewater is being received for treatment and the STP is thus under utilized. Inlet chamber at the STP was found overflowing which appeared to be on account of too much silt deposition in the chamber. Scum/sludge is found deposited on the corners/side of the embankments at some places which needs to be regularly cleaned. Treated effluent is being discharged into the Thane creek through an open channel. Regular sampling/testing of the effluent is being done by Municipal Corporation departmentally as well as by SPCB. Treated effluent is meeting the design standards for BOD & SS.

Grade: Satisfactory

35. Bhandup, Mumbai

280 mld capacity STP with aerated lagoons (4 nos. of 70 mld each in parallel) have been constructed for treatment of wastewater generated in Bhandup zone by Municipal Corporation of Greater Mumbai in the year 1998. Each lagoon (4.3 m deep) is having 14 nos. of aerators with a detention time of 1.8 days. O&M of the plant is being done by Municipal Corporation departmentally. 280 mld of wastewater is being received for treatment at the STP as per its design capacity. One of the lagoons is not in use as the treated effluent pipe from this lagoon is settled/damaged, which is being relaid. Scum/sludge is found deposited on the corners/sides of the embankments at some places which needs to be regularly cleaned. A small quantity of treated effluent from one of the lagoons is used for watering the plants/trees after treatment in chlorination/filtration plant set up within the STP campus. Remaining treated effluent is being discharged into the Thane creek through an open channel. Regular sampling/testing of the effluent is being done by Municipal Corporation departmentally as well as by SPCB. Treated effluent is meeting the design standards for BOD & SS.

Grade: Satisfactory

36. Powai Lake, Mumbai

Conservation of Powai lake through eco development with bio - remedial measures had been taken up by Mumbai Municipal Corporation (BMC) through M/s Wockhardt Co. under NLCP in the year 2002 - 03 along with maintenance by the firm for three years i.e. up to April, 06. O&M of the lake for its conservation is now being done by BMC themselves. It was observed that wastewater still enters the lake through storm water drains as well as outfalls/diversions which are not in operation for 4 months during rains. 5 nos. of floating platforms have been provided at different points in the lake where 6 nos. of compressors unit (5 to 40 hp.) have been installed for providing aeration through diffusers. It appeared that compressors are not in use and thus, the diffused aeration system is not in operation. Motor boats provided under the project are not in working order. Floating platforms in the lake are not approachable as the Corporation has no boats even for maintenance of the lake. Lot of water hyacinth, weeds, plants have again started growing in the lake in large area. Garbage/solid waste is being dumped on the bank of the lake by BMC trucks itself – BMC staff informed that this is being allowed during Ganesh Pooja. No record/status report for operation of the system was available during inspection at site. Also, tests results for DO, BOD, COD, Phosphate, Nitrate, E – coli etc. were not made available by BMC staff.

Grade: Very poor

37. Tapovan, Nashik

UASB process followed by facultative aerated lagoons and polishing ponds has been provided to treat 78 mld of wastewater under NRCP in the year 2003. It was observed that STP has been receiving an average of about 90 mld of sewage and is thus overloaded. O&M of the plant is being done through contract. Mechanical fine (Jash) screens of 6 mm size have been installed in the screen chamber which is working effectively. Bio-gas produced from the STP is being used for generation for electric power through 2 nos. of DFGs (63 KVA each). However, DFGs are only run during power cut, being uneconomical due to excess consumption of diesel (40 %). Accumulation of sludge/scum on the surface of reactor is being regularly removed. In addition to 2 nos. of polishing ponds, 2 nos. of facultative aerated lagoons (with six aerators in each lagoon) have been provided ahead of the polishing ponds for improved efficiency and due to land constrain. It was observed all the aerators are being run simultaneously in the lagoon without observing the quality of sewage. Aerators can be run alternatively in installments to meet design standards so as to save power. Formation of foam in the treated effluent was observed due to presence of detergents in the influent to the STP which can be controlled by providing sprinklers. Sludge from sludge drying beds is being sold for use as manure. Treated effluent is discharged to river Godavari nearby. Sampling/testing of the influent/effluent is being done by CPCB approved lab fortnightly. No testing is being done for fecal coliform. Chlorination plant is under construction for removal of fecal coliform. Treated effluent is having good quality and meeting the design standards for BOD & SS.

Grade: Satisfactory

38. Chehadi, Nashik

UASB process followed by facultative aerated lagoon and polishing pond has been provided to treat 22 mld of wastewater under NRCP in the year 2006. Plant has been commissioned in

April, 06 and is under stabilization. It is taking more time for stabilization on account of prolonged rains. Plant is being run by the construction contractor during one year of maintenance period. One no. manual screen (stainless steel) and one no. Mechanical (Jash) screen (6mm) has been provided at the screen chamber. Reactors (2 nos.) are being filled with sewage alternatively for 15 days. Withdrawal of sludge has not started as sludge blanket is yet to be formed in the reactors. It was observed that STP has been receiving an average of about 22 mld of sewage. Bio-gas produced from the STP is proposed to be used for power generation through 2 nos. of DFGs (20 KVA each). Treated effluent is being discharged to river Tarna nearby. Chlorination plant is under construction for removal of fecal coliform.

Grade: Satisfactory

39. Panchak, Nashik

7.5 mld capacity STP has been constructed with conventional activated sludge process at Panchak by Nashik Municipal Corporation in the year 2004. O&M of the plant is being done by Pune Municipal Corporation through contract. About 8 mld of wastewater is being received at STP for treatment. One mechanical and one manual screen has been provided in the screen chamber but mechanical screen is under repair. MLSS in the reactor are being maintained as 1500 mg/l but no record of DO is maintained. Sludge is being digested in primary and secondary tanks and bio-gas produced is being flared - being a small plant there is no provision for power generation. Sampling/testing of the effluent is being done departmentally and report sent to SPCB who also get the testing done off and on. Treated effluent is meeting design standards for BOD & SS. Chlorination is not being done for coliform removal. It is proposed to augment the capacity of the STP by additional 15 mld and provide chlorination for total augmented flow of 22.5 mld. Treated effluent is being discharged into the river Godavari. Sludge from the sludge drying beds is being sold for use as manure. STP is giving good quality of treated effluent.

Grade: Good

40. Trimbakeshwar, Nashik

1.0 mld capacity STP with FAB process of technology has been constructed by Maharashtra Jeevan Pradhikaran under NRCP in the year 2003. Plant is being maintained by Trambak Municipal Council through contract. Sludge is found accumulated in the sump well of MPS as the same has not been desilted since commissioning. C. I. pipe from reactor to tube settler is found broken and leaking. Filter press provided for sludge drying is not working for the last more than 6 months. 2 nos. of blowers have been installed for supply of air to the 2 reactors – first stage and the second stage but no data/norm/criteria is maintained/available and followed for regulating the supply of air to the reactors. Chlorination is provided for coliform removal but no testing is being for fecal coliform removal. Sampling/testing of the effluent is being done through MoEF approved cooperative society fortnightly as well as off and on by SPCB. Treated effluent is just meeting the design standards for BOD & SS.

Treated effluent is being discharged into the river Godavari. No regular training has been provided to operators/supervisory staff. Moreover, availability of competent/qualified personal in the Municipal Council for O&M of the STP is doubtful.

Grade: Poor

TAMILNADU

41. Koyembedu, Chennai

a) 60 mld capacity STP (New)

60 mld capacity STP with conventional activated sludge process has been constructed under NRCP in the year 2005. O&M of the plant is being done by CMWSSB for a period of 10 years through contract with M/s Enviro Control Associates who have constructed the plant also. Plant is receiving 60 mld of domestic wastewater which is as per its design capacity. Mechanical screen provided at the inlet channel of the STP is under repair. Out of 2 nos. of rectangular grit removal chambers, in one, the reciprocating raking mechanism is under repair and in the other, central rotating mechanism. All railings, platforms, screens (manual) etc. are constructed in stainless steel. In the sludge re-circulation pump house, joints/glands are found leaking - house keeping needs to be improved. Plant is normally run through power generated by bio-gas being produced in the plant with the help of one no. 625 KVA gas engine. Grid power and D.G. sets (2 nos. 400 KVA) are installed and used as standby only for running the plant. Chlorination is being done for coliform removal. Treated effluent is being discharged into Cooum river. Sludge from the centrifuge (2 nos.) is being dumped in low lying areas in the STP compound as it has no demand as manure. Sampling/testing of the effluent is being done by SPCB and Anna University monthly. Treated effluent is meeting the design standards for BOD, SS & fecal coliform.

Grade: Satisfactory

b) 34 mld capacity STP (Old)

34 mld capacity STP with conventional activated sludge process was constructed by Madras Corporation in the year 1978. Operation of the plant is being done by CMWSSB through contract and repair & maintenance departmentally. Plant is receiving about 50 mld of wastewater, 16 mld is being diverted to the balancing tank. Old M.S. manual screens (2 nos.) have been changed to stainless steel. Out of 2 nos. of grit removal chambers, the reciprocating raking mechanism of one is under repair. Out of 2 nos. of SSTs, one is out of order – central drum/scrapper arms are under repair. Bio-gas produced in digesters (primary & secondary) is being flared. Chlorination is being done for coliform removal. Treated effluent is being discharged into Cooum river. Expenditure on O&M of the plant is being met by CMWSSB from the revenue obtained by sale of treated effluent from Kodungaiyur STP to refineries e.g. CPCL, MFL and MPL. Sludge from the sludge drying beds is being dumped in low lying areas in the STP compound as it has no demand as manure. Sampling/testing of the effluent is being done by SPCB and Anna University monthly. Treated effluent is meeting the design standards for BOD, SS & fecal coliform.

Grade: Satisfactory

42. Kanchipuram

9 mld capacity STP with oxidation ponds (3 nos., 1.2 m. deep) were constructed in the year 1979 by Kanchipuram Municipality for treatment of domestic wastewater of the town. Due to poor O&M, all the ponds are filled with sludge/silt to about 80 cm depth. Weeds/plants are growing on the surface of the water in most parts of the ponds. Plant is lying abandoned since 2004. Renovation/augmentation of sewerage system and STP for 14.5 mld capacity has now been taken up by Kanchipuram Municipality by having Waste Stabilization Ponds system with grant/loan from World Bank/State Government. This is targeted for completion in Dec., 2007.

Grade: Very poor

43. Perungudi, Chennai

54 mld capacity STP with conventional activated sludge process has been constructed under NRCP in the year 2005. O&M of the plant is being done by CMWSSB for a period of 10 years through contract with M/s VA Tech Wabag Ltd. who have constructed the plant also. Plant is receiving about 75 mld of domestic wastewater and is thus overloaded. All railings, platforms, screens (manual) etc. are constructed in stainless steel. Ultrasonic flow meter with Parshall Flume has been provided for measurement of flow but flow meter is not working due to electric cable fault – at some places electric cables laid are found submerged in water on the ground due to rain/flooding in the area. Reciprocating raking mechanism of both the mechanical grit removal chambers is also under repair due to cable fault. Plant at present is normally run (75 %) through power generated by bio-gas being produced with the help of one no. 800 KVA gas engine. Grid power and D.G. sets (1 nos. 1000 KVA) are installed and used as stand by for running the plant during power cut or when the load required is not sufficient. Excess bio-gas produced is being flared. Chlorination is being done for coliform removal. Treated effluent is being discharged into Buckingham Canal through pumping/forcemain. Sludge from the centrifuge (2 nos.) is being dumped in low lying areas in the STP compound as it has no demand as manure. Sampling/testing of the effluent is being done by SPCB and Anna University monthly. Treated effluent is meeting the design standards for BOD, SS & fecal coliform. No boundary wall has been constructed for the STP which is essential from security/safety point of view. For starting the gas engine, every time grid power is essential – ‘Block Starter’ can be installed in the system to avoid use of power grid for starting the gas engine. There is no surface drainage system within the STP campus which needs to be planned and implemented so that approach to different units of the STP is possible during rains/floods. More greenery/landscaping etc. is yet to be done by providing plants/trees etc. so as to have soothing environment within the STP campus.

Grade: Satisfactory

44. Vellur/Ukkadam, Coimbatore

Lagoon (4 nos. – 2 streams in parallel) with 21 mld capacity were constructed by Coimbatore Municipal Corporation at Vellur in the year 1994. Balance domestic wastewater generated (21 mld) in the town is being used for sewage farming by growing guinea grass in about 100 acres of land at Ukkadam. Effective Micro-organism (EM) solution is being spread on the surface of the lagoons at Vellur in order to control odour and further help in BOD removal in the lagoons. It was observed that lagoons are not being maintained properly. Large quantities of weeds, plants, trees are growing on the slopes/footpaths of embankments as well as on the surface of lagoons so that even the approach through walk ways around the ponds is not possible. Lagoons have never been cleaned/desilted since commissioning - all the lagoons appeared to be

filled with sludge/silts to more than 60 % of the depth. Similarly, pre – treatment units provided at Ukkdam are mostly out of order and inlet channels/tanks filled with silt/sludge. Treated effluent from aerated lagoons is being discharged into open wet lands in the landfill area and from Ukkdam sewage farm into Noyyal river. No sampling/testing is being done for the raw as well as treated effluent.

Grade: Very poor

UTTAR PRADESH

45. Sector – 54, Noida

a) 27 mld capacity

27 mld capacity STP with UASB process along with polishing ponds besides 9 mld capacity oxidation ponds (2 streams having 2 ponds in series) has been constructed under YAP - I in the year 2000. Pre-treatment units for UASB cater for the additional 9mld flow to oxidation ponds. STP is receiving about 35 mld of wastewater which is as per its design capacity. Labor for O&M of the STP is being provided through contract and repair/maintenance is being done by Noida departmentally. Neither O&M manual is available at site nor any details about steps, procedures, frequency of testing etc. are provided in the O&M agreement. Mech. screens, SDBs and filtrate pump are not in use due to defect/repairs. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Daily status report for all the parts, units, equipments etc in respect of their condition/running is not prepared. Treated effluent in/from polishing ponds was found to have greenish/algae colour. DFG is being used during power cut only, being uneconomical due to excess (40%) consumption of diesel. Bio-gas produced is generally flared. Sampling/testing is being done by O&M contractor without any supervision/checking by department. Treated effluent is just meeting the design standards for BOD & SS. Sludge from sludge drawing beds is being used as manure for horticulture. No training is provided to operating/supervisory staff. Competence of supervisory staff in respect of their qualification and experience for O&M of STPs is also doubtful.

Grade: Poor

b) 9 mld capacity

9 mld capacity oxidation ponds, which were renovated under YAP-I in the year 1999, are again in dilapidated condition and don't seem to be operated/maintained. Embankments as well as most of the water surface in the ponds are covered with the growth of weeds, grass & plants etc. Ponds appear to have silted to a depth of about more than 60%. RCC inlet chamber/pipes etc are all broken/leaking - hardly any sewage is entering the ponds. Untreated sewage overflows into the drain/canal leading to river Yamuna along with treated effluent from UASB plant. Though there may not be any funds constrain yet the O&M of the plant by Noida is very poor.

Grade: Very poor

46. Sector – 50, Noida

34 mld capacity STP with UASB process has been constructed under YAP-I in the year 2000. Labor for O&M of the STP is being provided through contract and repair/maintenance is being done by Noida departmentally. STP is under utilized as about 27 mld of sewage is being

received for treatment at the STP. Neither O&M manual is available at site nor any details about steps, procedures, frequency of testing etc. are provided in the O&M agreement. Daily status report for all the parts, units, equipments etc in respect of their condition/running is not prepared. A floating layer of scum/algae is found accumulated on the surface of the reactors which need to be regularly removed for improved efficiency. Sludge profile is not observed in the reactors and the sludge is being withdrawn/pumped from the reactors arbitrarily – sludge being withdrawn/pumped was observed to be very thin. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Grass/weeds are found growing at some places on the embankments inside the ponds at water level. DFGs (400 KVA & 63 KVA) are being used during power cut only, being uneconomical due to excess (40%) consumption of diesel. Bio-gas produced is generally flared. Sampling/testing is being done by O&M contractor without any supervision/checking by department. Treated effluent is just meeting the design standards for BOD & SS, may be due to less discharge being received at the STP. Treated effluent is being discharged into irrigation canal and the sludge is being used as manure for horticulture. No training is provided to operating/supervisory staff. Competence of supervisory staff in respect of their qualification and experience for O&M of STPs is also doubtful.

Grade: Poor

47. Trans Yamuna, Mathura

14.5 mld capacity STP with Waste Stabilization Ponds system has been constructed under YAP-I in the year 2000. Plant has been handed over by UPJN to Mathura Municipality for O&M in June, 06. No O&M manual has been prepared and available. O&M of the plant is being done through contract. Proper O&M of the plant has not been possible by UPJN/Municipality due to funds constrain. RCC inlet pipes to anaerobic ponds, RCC slab, gate, screens, V-Notch/calibration etc. at the inlet channel need to be repaired/painted. Embankments/slopes are covered by deposition/growth of scum, sludge, plants & weeds. Ponds have scum/sludge accumulated at corners/side. All the ponds have sludge/silt deposition up to 30 to 40% of water depth. Lab. constructed at the STP site is closed and no testing is being done. Sampling/testing is being done by SPCB once a month. At the inlet of STP, lot of solids/floating matter was observed. Industrial waste also reaches the STP along with domestic wastewater, thus effecting the performance of ponds system. Plant generally remains closed during power failure, as D.G. sets provided at the pumping stations remain out of order or are not run for want of diesel due to funds constrain. Treated effluent is not meeting the design standards for BOD & SS tests. No testing is being done for fecal coliform. Treated effluent is partially used for land application in nearby fields and the remaining discharged into river Yamuna. No regular training has been provided to operators/supervisory staff. Moreover, availability of competent/qualified personal in the Municipality for O&M of the STP is doubtful.

Grade: Very poor

48. Masani Nalah, Mathura

13.59 mld capacity STP with Waste Stabilization Ponds system has been constructed under YAP-I in year 2000. Plant has been handed over by UPJN to Mathura Municipality in June, 06. O&M of the plant is being done through contract. No O&M manual has been prepared and available. No lab facilities are available at the STP site and so no sampling/testing is being done departmentally. Sampling/testing is being done once a month by SPCB. At the inlet of the

STP, lot of solids/floating matter was observed. Industrial waste also reaches the STP along with domestic wastewater, thus effecting the performance of the STP. Most parts of the ponds/embankments have been covered by deposition/growth of scum, algae, plants & weeds. At some places the embankments have settled. Plant generally remains closed during power failure, as D.G. sets provided at pumping stations remain out of order or not run for want of diesel due to funds constrain. Treated effluent is not meeting the design standards for BOD & SS. No testing is done for fecal coliform. Proper O&M of the plant has not been possible due to funds constrain. No regular training has been provided for operators/supervisory staff. Moreover, availability of competent/qualified personal in the Municipality for O&M of STP is doubtful.

Grade: Very poor

49. Vrindavan

4.0 mld capacity STP with Waste Stabilization Ponds system has been provided under YAP-I in the year 1999. Plant has been handed over by UPJN to Mathura Municipality in June, 06. O&M the plant is being done through contract. No O&M manual has been prepared and available. O&M of the plant is extremely poor as no attention appears to have been given for its up-keep. M.S. screens/gates/V-notch plate provided in the inlet/grit channel at the STP are rusting/damaged. Screens/grit channels are not regularly cleaned. RCC inlet/connecting pipes to the ponds are badly clogged/damaged. Embankments/slopes/walkways are covered with grass plants and weeds. Pond surfaces have scum/algae accumulated and at some places the inside of ponds are fully filled with sludge/silt so that weeds/plants are growing over it. There is obnoxious odour, flies & other insects all over the the ponds surface. Lot of sludge is flowing with the treated effluent. No sampling/testing of the effluent is being done by department. Sampling/testing is being done by SPCB once a month. Treated effluent is not meeting the design standards for BOD & SS. No tests are done for fecal coliform. It was informed that due to funds constrain plant is almost becoming non-operative. No regular training has been programmed for operators/supervisory staff. Moreover, availability of competent/qualified personal in the Municipality for O&M of STP is doubtful.

Grade: Very poor

50. Cis Yamuna, Agra

UASB process with polishing ponds has been provided to treat 78 mld wastewater in Cis-Yamuna area under YAP-I in the year 2001. O&M of the plant is being done by UPJN through contract. One of the Mech. screen at the inlet of STP is out of order. Influent to the inlet contains lot of detergent/industrial discharge. Silt/screenings are dumped at site and not regularly removed. M.S. railing etc is getting rusted for want of regular/painting. FRP gutter/baffle plates provided in the reactors are displaced/distorted so that uniform flow is not possible through the V-notch/gutters. Thickness of FRP material for gutters/baffle plates provided is 6 mm which should not have been less than 8 mm. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Polishing ponds have silt/sludge deposition to a depth of about 40% of water depth. O&M manual available is not comprehensive, it does not contain any specific instructions/procedures for running, maintenance, frequency of operation/testing etc for various units/equipments of the plant. DFGs (2Nos) are mostly used during power cut only because of funds constrain, as running of DFGs requires excess quantity of diesel consumption (40%) which works out to be uneconomical. Mostly biogas produced is being flared. Treated effluent does

not meet the design standards for BOD & SS. No testing is being done for fecal coliform. Treated effluent is being used for land application in nearby fields. Treated effluent is found to contain sludge/mud in the form of floating clouds. Lot of foam is being generated in the treated effluent channel due to presence of detergents in the influent. It was informed that due to funds constrain, it is not possible to improve O&M of the STP.

Grade: Poor

51. Peelakhar, Agra

10 mld capacity STP with Waste Stabilization Ponds system has been provided under YAP-I in the year 2000. No O&M manual has been prepared. O&M of the plant is being done by UPJN through a contract. Influent to the plant contains lot of detergent/industrial discharge. During power failure, STP does not receive any influent as the DG sets provided for running the pumping plants are not run because of non-availability of diesel due to funds constrain. Sampling/testing of the effluent for BOD & SS is being done weekly at 78 mld STP lab. No testing is done for fecal coliform. IIT, Roorkee also tests the effluent quality monthly for BOD & SS. Proportionate weir installed at grit channels is not used for flow measurements as the flow calibrations have been damaged. Regular cleaning of scum/algae accumulated on the corners/sides of ponds is required. All the ponds have large deposits of sludge/silt which are not being cleaned due to funds constrain. No regular training has been provided to the operating/supervisory staff. Treated effluent is just meeting the design standards for BOD & SS. Treated effluent is discharged into river Yamuna flowing nearby through nalah.

Grade: Poor

52. Muzaffarnagar

32 mld capacity STP with Waste Stabilization Ponds system has been constructed under YAP-I in the year 2000. Plant has been handed over by UPJN to Muzaffarnagar Municipality for its O&M in 2005. No manual has been prepared and is available. O&M of the plant is being done through contract. DG sets provided at the pumping stations (3 nos.) & STP are not being run for the last about two years because of non-availability of diesel due to funds constrain. STP does not receive any wastewater during power cuts. Screens provided at the inlet channel are rusted/broken. C.I. gates provided at the channels/distribution chamber are broken/stolen. Proportionate weir/V-notch provided at the end of inlet channels need to be repainted/calibrated. Lot of floating matter such as pouches, polythene, plastics etc. enter the pond through the screens. Solids, scum, algae etc. are accumulated on the water surface at the corners/sides of the ponds. All the ponds are filled with sludge/silt, primary tanks are silted more than 60% of water depth and in one of the ponds an island has been formed inside the pond with the deposition of sludge and growth of plants/weeds over it. Ponds have not been cleaned since commissioning. Fencing provided all round the STP is broken, RCC posts stolen. Brick pitching provided on the inner slopes of embankments is getting loose/settled and falling down. Full pitching of the embankments along with the pathway need to be replaced/repared to protect the embankments and damage to the shape of earthen embankments. Treated effluent is not meeting the design standard for BOD & SS. Sampling/testing is being done through IIT, Roorkee once a month. No testing is done for fecal coliform. There is some revenue from pisci culture but quality of fish cultivation is not so good. It was informed by the staff at the site that proper O&M of the STP has not been possible due to funds constrain. No regular training has been

provided to operators/supervisory staff. Moreover, availability of competent/qualified personal in the Municipality for O&M of STP is doubtful.

Grade: Very poor

53. Saharanpur

UASB process with polishing ponds has been provided to treat 38 mld of wastewater under YAP-I in the year 2000. STP is receiving 44 mld of sewage and is thus overloaded. O&M of the plant is being done through contract. No O&M manual is available at site. DG sets at intermediate pumping stations/MPS are not run during power cut due to non-availability of diesel because of funds constrain. DFG at the STP is only run during power cut, being costlier due to excess consumption of diesel (40 %) and funds constrain. FRP gutters in the reactors are displaced/nut bolts broken so that these are not in level at some places. There is a floating layer of scum/algae on the surface of reactors at some places which needs to be more regularly removed. One of the polishing pond has not been cleaned off sludge/silt since beginning and is silted to about 2/3rd of water depth. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. No regular training has been provided to operators/supervisory staff. Sampling/testing is being done by IIT Roorkee once a month. Treated effluent is meeting the design standards for BOD & SS. No testing is being done for fecal coliform.

Grade: Satisfactory

54. Daulat Ganj, Lucknow

42 mld capacity STP with FAB process of technology has been constructed under Gomti Action Plant in the year 2002. As per State Government orders, the plant is supposed to have been handed over to Municipal Corporation in May, 06. But Corporation has not actually taken over the plant at site till date and the plant has not been running since 20th July, 06 on account of i) floods (wastewater is discharged directly into the river during rains), ii) litigation by O&M contractor in High Court for want of payment of his bills and iii) Corporation's reluctance in taking over the plant. A few days before the inspection, UPJN had started running the plant but it will take a week more for stabilization. 5 nos. of compressors (including one standby) have been installed for supply of air to the reactors (3 parallel streams having 2 reactors each, first stage and the second stage) but no data/norm/criteria is maintained/available/followed for regulating the supply of air to the reactors in each stream. Generally 4 nos. of compressors are used for supply of air to the reactors. Mechanical grit removal rotating and raking mechanism in two grit chambers is defunct. Large quantity of foam is observed on the surface of reactors as well as secondary settling tanks/launders which may be due to under loading of the reactors, improper DO level or dying/industrial waste coming in the influent for treatment. Though sprayers/sprinklers have been installed to arrest the foam formation but these are mostly out of order. Chlorination is provided for coliform removal but has not been working for want of chlorine gas. Sludge drying beds have been provided with a design period of 6 days due to space constrain. Mechanical filter press is planned to be installed in the proposed future augmentation of STP capacity by 14 mld. Sampling/testing of effluent is being done by ITRC, Lucknow. No test results are available after March, 06. Treated effluent is discharged into the river Gomti and the digested sludge is used for dumping in low-lying areas as there is no scope for sale of sludge as manure. It was informed by the staff at the site that proper O&M of the STP has not

been possible due to funds constrain. No regular training has been provided to operators/supervisory staff.

Grade: Poor

55. Jajmau, Kanpur

a.) 5 mld UASB STP

A pilot plant of 5 mld capacity using UASB technology with polishing pond was constructed under GAP-I in the year 1988 for treatment of combined wastewater i.e., domestic and tannery waste and later exclusively for domestic wastewater only. Based on the limited experience of the pilot plant studies, UASB was the most preferred option under YAP-I initially and subsequently, under NRCP. Pilot plant is being maintained by UPJN and the biogas produced is being flared. Treated effluent is not meeting the design standards for BOD & SS. Testing for coliform reduction is not done. Treated effluent is being discharged nearby into the river and sludge from drying beds is being used for dumping in low low-lying areas.

Grade: Poor

b) 36 mld CETP

A combined effluent treatment plant (CETP) for treatment of municipal sewage and tannery effluent (in proportion of 3:1 respectively) with UASB technology was set up under GAP-I with 100% central funding in the year 1994. O&M of the plant and other ancillary works is being done by UPJN and annual expenditure on O&M is shared 50:50 between Municipal Corporation/State Government & Tanners. Common sump for pumping combined flow to the reactors is found filled with solids/floating matter and pump well filled with sewage/sludge from leaking joints/glands of centrifugal pumping plants. A floating layer of scum/algae is found on the surface of reactors which needs to be regularly removed for improved efficiency. FRP gutters/V-notch weirs provided in the reactors are not in level so that flow is not uniform. M.S. railing, platforms etc are getting rusted. DFGs (225 KVA, 3 nos.) installed for generation of power from biogas are out of order since 1998 due to paucity of funds. As per testing done in departmental lab., treated effluent is generally not meeting the design standard for SS but meeting the BOD standard. It was informed by staff at site that proper O&M of the works is not possible due to funds constrain. Regular funds are not received by UPJN from State Government/ Municipal Corporation. Moreover, Tanners are also not fully contributing towards their share of O&M expenditure. At some places tanners are discharging untreated tannery effluent in the conveyance system or have unauthorizedly punctured the conveyance system to discharge their untreated waste containing lot of solids, fibre material, chrome liquor etc. thus risking damage to the pumping machinery and other equipments and adversely effecting treatment efficiency of the plant.

Grade: Very poor

c) 130 mld STP

130 mld capacity STP with conventional activated sludge process has been constructed under GAP-I in the year 1996 for treatment of domestic waste being pumped from common main pumping station (CMPS) at Jajmau. At present only about 68 mld wastewater is being received at the STP and thus the plant is under utilized. O&M of the plant is being done by UPJN. 3 nos. of mechanical screens installed originally have been replaced by manual screens but screenings are not removed from site regularly. Clarifiers in 3 no. of PSTs are getting damaged/rusted but are in working order. One out of two gas digesters is damaged and non-functional. DFGs (625 KVA, 5 nos.) installed for generation of power from biogas are not being run since 2003, being uneconomical due to excess consumption of diesel (about 40%) and funds constrain. Gas produced is stored into gas holders (2 nos.) and flared. Dome roof of one of the gas holders is heavily damaged. Gas meter installed for measurement of quantity of gas production is defunct. Centrifuge (4 nos.) installed for dewatering of sludge are defunct for the last 4-5 years resulting in shortfall in the capacity of SDBs. 5 out of 11 nos. of treated effluent pumping plants are out of order. Daily status report in respect of condition/running of different parts, units, equipment is not prepared and maintained. As per testing done departmentally, treated effluent is not meeting the design standard for SS but meeting BOD standard. It was informed by the staff that it is not possible to run the plant properly because of funds constrain. No regular training is provided to the operators/staff.

Grade: Very poor

56. Naini, Allahabad

60 mld capacity STP with conventional activated sludge process has been constructed under GAP – I in the year 1999. Normally, plant receives an average of 90 mld of wastewater resulting in 30 mld being bypassed. O&M of the plant is being done by UPJN through contract. No flow measurement instrument has been installed/recorded though Parshall Flume has been provided in the common channel after grit chambers. Flow measurements can also be done by providing proportional weir/V-notch with calibration for depth of flow in the channel. Most of the M.S. fittings such as railings, platform etc. are getting rusted and the screenings/grit removed from the plant are dumped haphazardly and not disposed regularly. In one of the grit removal tank, reciprocating raking mechanism is out of order. Weir/V-notches in the secondary settling tanks are getting rusted, broken and not in level resulting in uneven flow over the weir plates. DFG engines (400 KW, 3 nos.) installed are rarely used to run the plant, being costlier due to excess consumption of diesel (40 %) and funds constrain. Mostly bio-gas produced is flared. No device has been provided for measurement of bio-gas produced. Lot of weeds, grass, plants are growing in between various units and within the plant – house keeping appears poor. It was informed by the staff at site that the proper up keep/maintenance of the plant is not possible due to funds constrain. Treated effluent along with the untreated wastewater, which is being bypassed, is being used for land irrigation in Dandi and Naini fields and revenue thereof, going to Allahabad Municipal Corporation. Sludge produced is being sold for use as manure. Sampling/testing of the effluent of the effluent is being done departmentally in lab. at STP. Treated effluent is just meeting the design standards for BOD & SS.

Grade: Poor

57. Indirapuram, THA Ghaziabad

UASB process with polishing ponds (2 nos.) has been provided to treat 56 mld wastewater at Indirapuram under YAP-I in 2001. Plant has been handed over by UPJN to Ghaziabad Municipal Corporation for its O&M in Sept., 06. Plant generally receives an average of 65 mld of wastewater and is thus overloaded. In view of rapid development of Indirapuram and adjoining areas, expansion of the STP may be required very soon. Operation of the plant is being done through contract and repair/maintenance departmentally. Mechanical screens (2 nos.) installed at the inlet of STP are getting rusted. Manual screens of 10 mm size have been provided through which lot of floating matter, solids, plastics etc. are passing into the reactors. Smaller size of screens i.e. 6 mm can also be provided. M.S. railing, platform etc. are getting rusted. Proportionate weir/V-notch plates at the end of the grit channels are getting damaged and need to be recalibrated. A floating layer of scum/algae is found on the surface of reactors and the weir/V-notches provided in the effluent FRP gutter are also blocked by floating matter/sludge at some places. Large pieces of sludge were floating on the surface of the reactor at some places, as if, sludge blanket is getting disturbed. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. Some of the FRP baffle plates are found to be twisted/bent. Reactors have not been cleaned so far since commissioning. No O&M manual is available at site. DFGs (63 KVA, 2Nos) are mostly used during power cut only. Bio-gas produced is just sufficient to run the DFGs during power cut. Gas meter has been installed to measure the quantity of gas being produced but no record of the same is available. Sampling/testing of the effluent is being done through IIT Roorkee. Treated effluent is meeting the design standards for BOD & SS. Treated effluent is being discharged into river Hindon. Sludge from sludge drying beds is being sold for use as manure or fuel in brick kilns. It was informed that due to funds constrain it is not possible to improve O&M of the STP. No regular training has been provided to operators/supervisory staff. Moreover, availability of competent/qualified personal in the Corporation for O&M of the STP is doubtful.

Grade: Poor

58. Dundahera, CHA Ghaziabad

UASB process with polishing ponds (2 nos.) for treatment of 70 mld wastewater and agro-forestry for treatment of 3 mld wastewater have been provided at Doondahera under YAP-I in 2001. Under agro-forestry, 18000 nos. of eucalyptus trees had been planted in an area of six hectares at the STP site which are well grown and proposed to be cut in the year 2008. STP has been handed over by UPJN to Ghaziabad Municipal Corporation for its O&M in Sept., 06. Plant generally receives an average of 55 mld of wastewater and is thus under utilized. Further discharge is not reaching the STP due to choking of sewer lines/manholes and their unauthorized connection in open drains. Operation of the plant is being done through a contract and repair/maintenance departmentally. Mechanical Screens (2 nos.) installed at the MPS constructed in the STP campus are out of order for the last 3 years. As there is no provision of manual screens at the MPS, lot of floating matter, solids etc. are entering the MPS and subsequently reaching the reactors. Manual screens of 10 mm size had been provided through which also lot of floating matter, solids, plastics etc. pass into the reactors. Smaller size of screens i.e. 6 mm can also be provided. M.S. railing, platform etc. are getting rusted. Proportionate weir/V-notch plates at the end of the grit channels are getting damaged and need to be recalibrated. A floating layer of scum/algae is found on the surface of reactors and the FRP gutters/weir plates are displaced or are not in level at some places so that flow is not

uniform through weir plates. As preventive maintenance, UASB reactors should be put out of operation, emptied, cleaned and repaired every five years which is already due. No O&M manual is available at site. Two nos. of DFGs (63 KVA, and 320 KVA) have been installed for running MPS and STP through bio-gas. These are being run with diesel only during power cut as there is no gas production/collection for the last more than 3 years. All the gas produced leaks away through blended gas pipes and their joints with gas dome/main gas pipes (headers). Sampling/testing of the effluent is being done through IIT Roorkee. Treated effluent is just meeting the design standards for BOD & SS. Treated effluent is being discharged into Dasna drain joining river Hindon at a distance about 11 Km. Dasna drain was found to carry raw sewage as well as industrial waste and it appeared to be silted at the point of disposal of treated effluent from the STP. Dasna drain needs to be desilted and made into a pucca channel for a length 500 m to avoid the risk of back flow of water from Dasna drain to the STP. Sludge from sludge drying beds is being sold for use as manure or fuel in brick kilns. It was informed that due to funds constrain it is not possible to improve O&M of the STP. No regular training has been provided to operators/supervisory staff. Moreover, availability of competent/qualified personal in the Corporation for O&M of the STP is doubtful.

Grade: Poor

UTTRAKHAND

59. Lakkarghat, Rishikesh

Oxidation ponds established in the year 1996 were augmented under GAP-I in the year 1989 to a design capacity of 6 mld with a water depth of 1.5 m in each pond (5 nos.). Plant is running at about 100 % over loading with 10 to 12 mld of wastewater reaching the system. O&M of the plant is being done through contract. No O&M manual has been prepared. 40mm screens have been provided in the inlet channel which is very much on higher side. No grit chamber/channel has been provided which is essential for arrest of silt coming with the influent. Lot of floating matter such as pouches, polythene, plastics etc. enter the ponds through the screens. Large quantity of sludge/solids are accumulated on the water surface at the corners/sides of the ponds. All the ponds are filled with sludge/silt, especially, first pond of the system which had been desilted in the year 2001. There are large quantities of weeds/grass/plants growing on the pathways as well as slopes of embankments. Embankments in the last two ponds are getting loose and settled, resulting in damage to the shape of the earthen embankments. Treated effluent was initially pumped and used for land application but since 2003 irrigation land has been transferred for rehabilitation/resettlement from Tehri Dam site. At present the treated effluent is being discharged into Saung River by gravity. Treated effluent pumping station along with D.G. set which was installed under GAP-I in 1989 is lying idle since 2003. Sampling/testing of effluent is being done by PCRI, BHEL and SPCB once a month. Treated effluent is just meeting the design standards for BOD & SS. Though there should be no funds constrain yet the STP is not properly maintained.

Grade: Poor

60. Jagjitpur, Hardwar

18 mld capacity STP with conventional activated sludge process has been constructed under YAP-I in the year 1991 for treatment of domestic waste being discharged through sewers as well as interception of drains/nalah tapings. Plant is receiving about 22 mld of sewage and is thus overloaded. O&M of the plant is being done through contract. One out of three nos. of

mechanical screens is under repair. Gas production is sufficient but DFGs are only run for 2 hours daily on account of excess consumption of diesel (about 40 %) and funds constrain. No facility is provided to measure the quantity of bio-gas being produced daily. Regular sampling/testing of effluent is being done departmentally as well as by PCRI, BHEL. Treated effluent is meeting the design standards for BOD & SS. Revenue is being generated by sale of treated effluent for irrigation and sludge for use as manure. Lot of greenery/plants have been grown inside the STP campus.

Grade: Satisfactory

WEST BENGAL

61. Cossipore Chitpur, Kolkata

45 mld capacity STP with conventional activated sludge process has been constructed under GAP-I in the year 1998 for treatment of domestic wastewater being discharged through interception/tapping of Bagjola canal. Operation of the plant is done by KMDA through contract and repair/maintenance is done departmentally. Plant generally receives about 20 – 25 mld of wastewater and is thus under utilized. No record of daily flow is being maintained. Also, daily status report in respect of condition/running of different parts, units, equipment etc. is not prepared and maintained at site. All M.S. parts e.g. railing, platforms etc. are getting rusted/damaged. Similarly, most of the civil/RCC works are also damaged for want of repairs. Scrapper arm of clarifier in one of the two PSTs is damaged and is not working. Uniform flow is not observed through weir/V-notches in the PSTs due to breakage/blockage by floating sludge/algae. Out of 14 nos. of aerators installed in the reactors (2 nos.), 3 no. are out of order. Aerators are being run arbitrarily irrespective of quantity/quality of sewage and without taking into consideration the MLSS and DO levels in the reactors. In the SSTs (2 nos.), most part of the weir/V-notches are damaged and need replacements. Due to weak quality of influent in terms of BOD & SS, gas digesters are not in use and no gas is produced. Similarly, centrifuge machines (3 nos.) installed for sludge drying are not in use. Treated effluent is being discharged back into Bagjola Canal leading to river Ganga. Sampling/testing of the effluent is being done by AIIPHE and Kalyani Krishi Vishwa Vidhalaya one a month. Treated effluent is able to meet the design standards for BOD & SS because of low strength and less quantity of sewage being received. A lot of greenery/landscaping has been done within the STP campus. It was informed by the staff that proper O&M the plant is not possible due to funds constrain.

Grade: Poor

62. Maheshtala

3.9 mld capacity STP with Waste Stabilization Ponds system has been constructed under GAP-II in the year 2005 for treatment of domestic wastewater being discharged through interception/tapping of Nungi Abadi Canal. O&M of the plant is being done by KMDA departmentally. No O&M manual has been prepared. During inspection, plant had been shut due to power cut. No standby arrangement exists for running the plant during power cut/failure. No funds have been made available for O&M of the plant by State Government since commissioning, KMDA is maintaining the plant through its own staff/funds. Scum/algae deposits are found at the corners and side of the ponds, resulting in short circuiting of flow in the

ponds. Treated effluent is being discharged into river Ganga through Mirpur Canal. No agency has been earmarked for sampling/testing by NRCDC. Samples are being sent to West Bengal Pollution Control Board weekly by KMDA for testing of raw sewage (influent) and treated effluent. No sampling/testing is being done for influent and effluent in individual ponds e.g. anaerobic, facultative and maturation ponds. Also, no testing is being done for coliform removal. No test results were made available by the staff at site.

Grade: Poor

63. Garden Reach – South Suburban (West), Kolkata

47.5 mld capacity STP with conventional activated sludge process has been constructed under GAP-I in the year 1998. Operation of the plant is done by KMDA through contract and repair/maintenance is done departmentally. Plant generally receives about 30 mld of wastewater and is thus under utilized. There is no device for measurement of quantity of flow being received in the STP and so no record of daily flow is maintained. Also, daily status report in respect of condition/running of different parts, units, equipment etc. is not prepared and maintained at site. Mechanical screens (1 nos.) installed at the inlet channel is out of order and is not in use. Rectangular grit removal tanks (2 nos.) are almost filled with grit/sludge and are not in use. Rotating mechanism and the reciprocating raking/conveying mechanism in both the chambers are totally defunct. All M.S. parts e.g. railing, platforms etc. are getting rusted/damaged. PSTs (2 nos) are literally not functioning as the clarifiers/scrapers in both the tanks are defunct. Out of 16 no. of aerators installed in the reactors (2 nos.), 4 nos. are out of order. Aerators are being run arbitrarily irrespective of quantity/quality of sewage and without taking into consideration the MLSS and DO levels in the reactors. In the SSTs (2 nos.), most part of the weir/V-notches are damaged and need replacements. Sludge thickeners are defunct as these are totally filled with sludge/silt and algae growing on the surface. Due to weak quality of influent in terms of BOD & SS, gas digesters are not in use and no gas is produced. Similarly, centrifuge machines installed for sludge drying are not in use. Sampling/testing of the effluent is being done in house by O&M contractor without any supervision by KMDA staff. Sampling/testing is also being done through AIIPHE Kolkata. Treated effluent is being discharged into Manikali Canal leading to river Ganga. Treated effluent is able to meet the design standards for BOD - may be due to weak and less quantity of sewage reaching the STP. Treated effluent hardly meets the design standards for SS. A lot of greenery/land escaping has been done at the STP campus but the areas in between various units of the plant are covered with weeds/grass/jungle, thus making it difficult even to approach various units. It was informed that proper O&M the plant is not being done due to funds constrain and also, STP being in the process of handing over to KMC for augmentation under ADB loan.

Grade: Very poor

64. Bhardeshwar

7.6 mld capacity STP with aerated lagoons followed by maturation ponds (5 nos.) in series has been constructed under GAP-II in the year 2005. O&M of the plant is being done by KMDA through contract. No O&M manual has been prepared. Plant is receiving about 5 mld of wastewater only and is thus under utilized. 4 nos. of mechanical horizontal cage rotors (4 nos. in series) have been installed on the surface of the lagoons (4 parts in series) for aeration/mixing of

the wastewater. Embankment slopes of lagoons constructed in cement blocks are getting damaged/broken. Large quantities of weeds/grass is growing on the slope of earthen embankments/footpath and these are getting eaten up by rats resulting in damage to the shape of the earthen embankments/maturation ponds. Side walls/slopes of treated effluent channel outside the campus leading to river Ganga is getting damaged/broken. No agency has been earmarked for sampling/testing by NRCD. Sampling/testing is being done by SPCB monthly. No sampling/testing is being done for influent and effluent in individual ponds i.e. aerated lagoon and maturation ponds. Treated effluent is meeting the design standards for BOD, SS and fecal coliform. Fish are being grown in the maturation pond. Treated effluent is being discharged into river Ganga flowing nearby.

Grade: Satisfactory

65. Chandannagar

Augmentation of existing STP (4.5 mld capacity oxidation ponds) by construction of 18.5 mld additional capacity STP with tickling filter (1 nos.) has been done under GAP-I in the year 1990. Due to power cut in the town on the eve of Jagatgharti Pooja/Immersion, plant was shut and no sewage was being received in the STP. There is no standby arrangement during power cut. Operation of the plant is being got done by KMDA through contract and repairs/maintenance of the plant is being done departmentally. Sludge/silt is found to be deposited in the outer circular channel of PST which needs to be cleaned. Due to weak sewage not much sludge is produced so that sludge digester is not in use. Similarly, gas holder is also not in use as there is no gas production. Treated effluent is meeting design standards for BOD & SS. Fish is being grown in oxidation ponds (1.0 m deep). Lot of greenery/gardening/nursery and land escaping has been done along with development of amusement park for the children, boating as well as picnic spots and other entertainment in the STP campus. Sufficient revenue is being generated through ticketing for entry in the park, boating etc. with pleasant and soothing environment created at STP site.

Grade: Satisfactory

66. North Howrah – Bally

30 mld capacity STP with Waste Stabilization Ponds system was constructed under GAP-I in the year 1995 at Kona. Plant has been renovated and augmented to 40 mld capacity by changing the configuration/size/depth of ponds and putting stone pitching in the slopes of the embankments of ponds. Augmentation of the plant to 40 mld has been done by State Govt. to treat additional wastewater being generated from newly developed Kolkata West International area. Plant has been commissioned in 8/06 after renovation/augmentation. During the period of renovation/augmentation (2/05 to 8/06), plant was shut. O&M of the plant is being done by KMWSA departmentally. There is no standby arrangement during power cut. Lot of floating matter, solids, plastics, water hyacinth etc. is found deposited at the mouth of intake to the MPS. Even after recent renovation, lot of grass, weeds, plants have started growing inside the ponds. Treated effluent is being discharged into river Ganga through Howrah main drainage channel. Sampling/testing of effluent is being done through AIIPHE, Kolkata. No sampling/testing is being done for influent and effluent in individual ponds e.g. anaerobic, facultative and maturation ponds. Also, no testing is being done for coliform removal. Recent test results are not made available by the staff at site.

Grade: Poor

67. Howrah

Augmentation of existing STP to a capacity of 45 mld with trickling filter process has been under GAP-I in the year 1989. Operation of the plant is done by KMWSA through contract and repair/maintenance departmentally. Plant generally receives about 20 mld of wastewater and is thus under-utilized. There is no standby arrangement during power cut. There is no device i. e. proportionate weir, parshall flume/flow meters in working order for measurement of flow and so no record of daily flow is being maintained. Out of 2 nos. of rectangular grit removal tanks, 1 no. is defunct as the rotating mechanism and the reciprocating raking/conveying mechanism is out of order. All M.S. parts e.g. railing, platforms etc. are getting rusted/damaged. Out of 2 nos. of PSTs, 1 no. is not in use due to settlement of the floor of the tank. Other PST is in use but the baffle plates, central as well as peripheral, are displaced and rusted/damaged. In the SSTs (2 nos.), weir plates/V-notches are blocked/damaged/broken at some places. These are literally not functioning as the clarifiers/scrapers in both the tanks are defunct. Out of 2 nos. of trickling filters, 1 no. is not in use due to repair of its arms, plates etc. As most of the influent to the STP comes from individual septic tanks, it is very weak in terms of BOD & SS. Gas digesters are not in use and no gas is produced. Sampling/testing of the effluent is being done through AIIPHE fortnightly at the lab. within the STP campus. Treated effluent is able to meet the design standards for BOD - may be due to weak and less quantity of sewage reaching the STP. Treated effluent is being discharged into Howrah Drainage main channel leading to river Ganga. Lot of grass and trees (jungle) are growing all over the STP campus as well as in between various units so that the branches of trees/bushes are obstructing even running of the moving parts in some of the units such as PST, TF etc. and also making it difficult to approach various units. Proper preventive maintenance as well as house keeping is not being done. It was informed by the staff at site that proper O&M the plant is not being done due to funds constrain.

Grade: very poor

68. CETP, Kolkata

20 mld capacity CETP (4 modules of 5 mld capacity each) for treatment of tannery waste from relocated/newly constructed tanneries in Calcutta Leather Complex (CLC) has been constructed under NRCP in the year 2006. O&M of the plant is being done by CLC Tanners Association Ltd. About 130 nos. of Tanneries (90 relocated and 40 new) are in production and about 12 mld wastewater is being generated for treatment in the CETP. Due to sulphur action, some of the Iron/M.S. parts installed in various units have started rusting. Mechanical grit removal/raking system installed is not in use as the size of grit reaching the STP is much lower as compared to the provision made in the design. Due to back flow in treated effluent disposal pipe, SSTs (2 nos.) were overflowing with sludge/effluent and spread over the ground at site, creating unhygienic/hazardous conditions. It was informed by the staff at the site that back/overflow is on account of non-construction of effluent pumping station which is yet to be sanctioned by the Ministry. Sludge from filter press is being dumped at site only as the component of sanitary land fill/solid waste management is yet to be sanctioned. Mobile CCRP units (4 nos.) are in operation for chrome recovery - as the main CCRP constructed is yet to be commissioned. It was observed that the water in the surface drains meant for use by tanners in their production units is getting polluted due to overflow of tannery discharge from manholes provided in the conveyance system. This appeared to be on account of choking of conveyance

system due to lack/absence of preliminary treatment by individuals tanners. Sampling/testing of the effluent at CETP is being done by the West Bengal Pollution Control Board and the treated effluent is meeting the design standards for all the parameters e. g. TSS, BOD, Total Chromium etc.

Grade: Satisfactory

CHAPTER 4

Conclusions and Recommendations

1. Mostly influent to the STP was found to contain lot of solid wastes including plastics, pouches etc. which may cause wear and tear of pumps & machinery and reduced efficiency of treatment, specially in case of UASB process where the feeding pipes and overflow weirs/V-notches in division boxes/effluent gutters, are choked/obstructed, thus also resulting in reduced STP capacity. It is, generally, observed that mechanical screens installed in STPs/PSS are out of order, mainly because of the reason that these are not regularly sun and also clue to poor maintenance. Comprehensive scheme for providing solid waste management in all the towns including public awareness, institutional strengthening etc. need to be implemented. As an immediate solution to the problem, specially in UASB process, fine/mesh screens can be put in place of ordinary bar screens. Larger size of feeding pipes with more frequent cleaning can also solve this problem.
2. Staff/officers/engineers engaged for O&M at some STPs are not fully familiar and aware of the subject of sewage treatment. They are not trained in the O&M of the STPs. Proper training programme needs to planned & implemented for all the engineering level staff/officers who are deputed for O&M of STPs. This should be followed by training for operators as well as chemists who perform sampling/testing work.
3. At most of the STPs, either O&M manual is not prepared or it is not available/used, or it is not comprehensive enough to include various steps /procedures to be followed in day to day O&M of the plants as per design so as to have desired quality of treated effluent. O&M manual should spell out the procedure of reporting and recording of all the data/parameters including quality of waste water in various units of the plants.
4. Polishing ponds (in case of UASB process) and Waste Stabilization Ponds (WSPs) are mostly found accumulated with sludge resulting in reduced capacity/detention time in the tank. This also effects the quality of treated effluent due to sludge flowing out with it. Sludge levels should be checked regularly and the ponds should be cleaned off deposited sludge accordingly.

- 5 In case of polishing ponds or WSPs, it is found that single unit of these ponds have been provided in some STPs. In such cases, it is very difficult to clean off the accumulated sludge /silt without closing the STP. So it is important that at least two units of such ponds are provided at each STP. Also, in case of big ponds/channels wide and long partition/baffle wall need to be provided for easy access for inspection/repairs.
- 6 Sludge in UASB reactors are not withdrawn regularly based on its level and concentration in the reactors which results in sludge flowing with the effluent in polishing ponds and thus poor quality of treated effluent. Regular checking of sludge level and its concentration in the reactors is essential for proper sludge withdrawal.
- 7 Due to improper removal of filtrate from sludge drying beds, subsequent removal/withdrawal of sludge from sludge drawing beds/reactors is not possible in a desired manner, as the capacity of sludge drying beds is reduced. Hence, filtrate from the beds and sludge from the reactors/sludge drying beds need to be taken out regularly in a proper way.
- 8 It is important to prepare daily status report so as to record occurrence of problems in respect of running, functioning, repair, maintenance etc. of all the equipments, units, facilities etc. installed in each STP, so that the problems, if any, can be solved as and when applicable. This will also serve as feed back for future planning & execution as well as tool for monitoring the performance of STPs at a higher level.
- 9 Some of the STPs don't have sufficient baffle walls and also, sufficient length of overflow weirs at their final outlets in case of UASB polishing ponds and WSPs, resulting in poor effluent quality. Baffle walls should be constructed for whole length the pond width so that scum/sludge does not flow out with the effluent. Similarly, longer overflow weirs will ensure less approaching velocity of flow and subsequently, efficient solid liquid separation.
- 10 In view of frequent rusting/damage of iron/MS parts/accessories installed in STPs/PSs due to sulphur action, such items e.g. railings, screens, platforms etc., as far as possible, should be manufactured in stainless steel, as seen in case of STPs being constructed/renovated in TamilNadu, Maharashtra etc. Moreover, small electric installations such as motors, flow meters, starters, etc put up for operation of aerators, screens, grit removal mechanism, gates etc. should be covered with temporary sheds (PVC) to protect against rain water, dust etc.
- 11 It is observed that in most of the towns specially, in UP, Bihar and even Delhi, where there is acute shortage of power supply, standby arrangement during power cut/failure does not generally exists to meet the power requirement for running the plant.

Frequent & long power cuts and subsequent sudden discharge into the STP also causes shock load to various units of STP, even in UASB and WSP processes, thus adversely effecting the efficiency of treatment. Hence, alternative standby arrangement in the form of generators along with sufficient funds for fuel need to be provided to ensure continuous operation of STPs. Intermittent operation of STPs will not help in achieving the desired quality of treated effluent and thus minimizing the river water pollution. In addition, unless continuous power supply is available effluent quality parameters specially, BOD etc can not be tested accurately.

- 12 Majority of State Govts./implementing agencies are not able to provide sufficient and regular funds for O&M of STPs resulting in their unsatisfactory performance. The annual const of O&M of sewerage system and STPs in a town varies from 5 to 10 %, depending on the quantum of pumping (stations) and type /size of STP. It is also observed that the revenue from STPs is negligible or far less than the expenditure required to be incurred for proper O&M of the STPs in all cases. In case of STPs constructed with central funding under NRCP by Ministry of Env. & Forests, O&M cost is to be borne by the State Govts. If the amount for O&M of STPs can not be provided on regular basis by the State Govts., the matter needs to be looked into at the highest level, whether further new works should be taken up under the programme.
- 13 Sometimes, the staff/engineers engaged in O&M of the STPs are frequently transferred so that their experience and know-how does not get transferred to their successors & is thus not available for O&M of the STP. So the O&M staff/engineers should be deputed at a plant for sufficient no. of years and their experience and know-how transferred to their successors in a planned & systematic manner. In case O&M is being got done privately through an annual contract, the agreement should be such that the same contractor continues after initial period of one year, subject to its satisfactory performance. As a matter of fact, O&M of a STP should be included in the main construction contract for a period of at least 5 to 10 years. This arrangement is found to be giving good results in case of some of the STPs, namely at Chennai, Panji, Nasik etc. where this practice has been adopted.
- 14 Mostly the result of tests for effluent quality being carried out by various independent agencies are not fed back to the staff managing the O&M of the STPs. As a matter of fact the results of the tests, especially, if they are adverse, should be informed to the operating staff as soon as possible so that corrective measures can be taken at site accordingly. Also, testing of effluent for fecal coliform is not being done in most of the plants which is one of the most important indicator in abatement of pollution of rivers.
- 15 In some of the states, specially in UP, O&M of the STPs in some towns is being done by local bodies which do not have qualified, experienced and knowledgeable staff who can supervise the O&M of the STPs. Local bodies have engaged private agencies on contract for O&M of these STPs but their performance is very much unsatisfactory. This arrangement of O&M of STPs by local bodies, where competent

staff is not available, may not last long. In such cases, if it is essential for O&M to be done by local bodies only, staff/engineers with experience in O&M of STPs should be got transferred/appointed from the implementing agency, namely UPJN who have constructed the plant.

- 16 A holistic approach for abatement of pollution of rivers need to be adopted as on one hand population and other human activities are increasing & on the other hand the problem further gets compounded due to declining minimum flow, as a significant quantity of water is abstracted upstream of a town for irrigation/drinking purposes. This is specifically applicable in case of Yamuna in Delhi where all the water is withdrawn from the river upstream of Wazirabad barrage.

- 17 It is estimated that out of 3267 mld of sewage generated in Delhi, 2376 mld treatment capacity exists. But only 1530 mld of total sewage generated is treated at the STPs. Thus only 64.37% of treatment capacity of STPs is utilized. (**Appendix - I**). Under utilization of capacity of treatment is on account of (i) deficiency in sewerage not work (settlement/silting of trunk sewers) and (ii) improper O&M of conveyance system and pumping stations. Also, it is important to note that treated sewage is mostly discharged into storm water drains (17 nos.) which carry untreated sewage and join river Yamuna. Storm water drains carry sewage from unsewered areas, overflow from manholes/pumping stations and treated/untreated industrial wastewater. In order to have desired quality of river water in Yamuna at Delhi, the following immediate measures need to be taken :-
 - a. Rehabilitation/desilting of trunk sewers.
 - b. Provision of sewerage net work in unsewered areas.
 - c. Augmentation of treatment capacity of STPs as per requirement.
 - d. Use of treated effluent for irrigation & other purposes.
 - e. Proper O&M of the sewerage system & STPs.

- 18 Sewage treatment with WSPs (anaerobic, facultative and maturation ponds) is most economical in terms of capital as well as O&M cost and is suitable for small towns where sufficient land is easily available. But certain basic precautions e. g. providing proper weir length and baffle wall(s) at the outlet of ponds during construction; and proper O&M in respect of cleaning of sludge deposited in ponds at suitable intervals (6 to 12 months) and arresting algal/hyacinth growth are minimum requirements which have to be kept in mind for achieving desired results.

- 19 Conventional treatment process, namely ASP/trickling filter is very much suitable in case of large towns, where land is scarce, provided there is no shortage of power and

- funds to meet capital and O&M costs. In some of the large towns UASB process has been provided under NRCP, as it is economical in respect of O&M as compared to ASP. But it is observed that in some cases desired results are not achieved as O&M agencies are not paying importance to the intricacies involved in the treatment process, namely uniform feeding to the plant/reactor, proper grit removal & withdrawal of sludge from UASB reactors, regular cleaning of accumulated sludge from polishing ponds etc. Improper O&M of these plants is giving a bad impression about UASB technology, which otherwise appears to be quite appropriate for sewage treatment for most of the towns in our country.
- 20 In places, where land availability is very scarce, sewage treatment using FAB (Fluidized Aerobic Bed) reactor, in which biomass grows on small elements (media) that move along with the water in the fluidized bed state, can be the most appropriate choice. The movement is caused by bubbling air at the bottom of the reactor. The system has been provided in a few towns under NRCP but poor O&M might give a negative signal in adoption of this process of treatment.
- 21 Schemes for providing interceptors with nala-tapings and main/trunk sewers along with STPs (down stream works) are being implemented under NRCP by Ministry of Env. & Forests in various towns which are situated on the bank of different rivers and are polluting the river waters. Upstream works i.e. internal/branch sewers including house connections etc. for a town need to be taken up by the State Govts. through their own resources so as to have a holistic approach in abatement of pollution of rivers. This will also help in solving the problem of weak sewage reaching the STPs for treatment. Besides, it is also observed that sewerage schemes in various towns are being sanctioned/implemented by different agencies/departments under different Central/State plans e.g. NRCP by Ministry of Env. & Forests, NURM by MOUD etc. Unless proper coordination exists between different agencies/departments, implementation of sewerage schemes may lead to defective planning/execution and duplication of works, without achieving the desired goal. Thus, as far as possible, all the sewerage schemes for a town should be sanctioned/implemented under a single funding agency/Ministry.
- 22 Out of 68 no. of STPs inspected for their performance evaluation, it is observed that O&M in case of 40 no. of STPs is found to be poor or very poor for various seasons. There is no mechanism for physical monitoring of the performance of STPs constructed and commissioned under NRCP by Ministry of Env. & Forests. These are seldom visited by higher officers of NRCD in Ministry of Env. & Forests for their inspection so as to get first hand information on the status of O&M of STPs by the State Govts./implementing agencies. Moreover, the scope of work of Project Management Consultants (PMC), appointed by the Ministry for implementation of YAP - II, includes monitoring of O&M all the STPs constructed in Delhi, UP & Haryana under YAP – I. But it is understood that no action has been taken by NRCD

in this respect since the appointment PMC two years back. Regular monitoring of all the STPs for their performance evaluation at central level (CPCB) twice a year by having own independent sampling/testing of wastewater need to be carried out for bringing improvement in O&M of STPs and get the desired quality of treated effluent.

- 23 It is understood that projects based on generation of electric power from biogas, which is being produced as a result of digestion of sludge in STPs, are eligible for CDM (Clean Development Mechanism), as it will help in reducing and stabilizing the emissions due to methane which is a green house gas. Based on the potential of biogas/power generation from STPs, expenditure on O&M can be offset by earning 'carbon credits' on recurring basis. It is, therefore, recommended that a feasibility study should be got done for taking up a CDM project in case of any one of the STPs by DJB in Delhi as it can be a perennial source of revenue generation.

In view of importance of abatement of pollution and preservation of rivers and other water bodies, proper sewage treatment, its O&M and subsequently, optimum utilization of treated sewage for irrigation and other purposes needs to be given higher priority by Central/State Govts. urgently. Looking into the overall situation of O&M of the STPs, it can be concluded that sewerage and sewage treatment is generally not considered a priority item by the State Govts./local authorities/implementing agencies. So, unless importance/priority is given by them, the situation may become bad to worse.

**CHECK LIST FOR MONITORING OF PROFORMANCE OF SEWAGE
TREATMENT PLANTS (STPs) by C P CB.**

A. General information for the Town

1. Name of Town/ City and population :
2. Total water supply (MLD) and per capita water supply (LPCD) :
3. Waste water generation (MLD) :
4. Whether wastewater collection and sewerage system exists
5. Waste water treatment (MLD) and number of STPs
6. Mode of sewage disposal (Treated sewage) and % used for irrigation.

B. Details of Sewage Treatment Plants (Plant- wise)

1. Name / Location of STP and design capacity/year :
2. Estimated cost (excluding land cost) :
3. Date of approval :
4. Funding Pattern/Agency :
5. Year of construction/completion and commissioning :
6. Completion cost :
7. Land required (Hectares) :
8. Total cost of land for STP :

9. Process of Sewage Treatment :
 - ASP - Activated sludge process
 - TF - Trickling filter
 - AL - Aerated lagoon
 - UASB - Upflow anaerobic sludge blanket
 - OP - Oxidation pond/waste stabilization ponds

10. Flow sheet of STP(to be attached) :

11. Unit-wise capacity :
 - a) Primary settling tank (PST)
 - HRT
 - Adequacy
 - b) Aeration tank
 - HRT
 - DO level (mg/l) (8 hourly)
 - F/M ratio
 - Aeration capacity(number of aerators and HP)
 - Sludge volume index (SVI)
 - c) Secondary settling Tank (SST)
 - HRT

12. Raw sewage characteristics :
 - (COD, BOD, SS, Fecal coliform & streptococci)
 - COD
 - BOD
 - SS
 - Fecal coliform
 - Streptococci

13. Effluent Characteristics of PST, Aeration tank and SST for inlet and outlet (COD, BOD, SS, Fecal coliform & sterptococci) with three hourly composite flow :

based sampling.

a) Primary settling tank (PST)

COD

BOD

SS

Fecal coliform

Streptococci

b) Aeration tank

COD

BOD

SS

Fecal coliform

Streptococci

c) Secondary settling Tank
(SST)

COD

BOD

SS

Fecal coliform

Streptococci

14. Actual flow (MLD) (on hourly basis for 24 hours) :

i) Raw sewage flow

ii) Treated sewage

15. Sludge drying beds and their capacity :

i) Sludge drying beds

ii) Capacity

16. Biogas produced, if any and its composition :

17. Gas digester (Operational status and gas utilization) :

18. Power generation, if any :

19. %reduction of BOD, COD,SS and Fecal coliform
COD :

BOD
SS
Fecal coliform

20. Reasons for under utilization of capacity of STPs if any :
21. Point of treated sewage disposal (river / lake / irrigation / land and disposal/ pisciculture/ aquaculture / any other) :
22. Additional sewage treatment required, if any :
- a) Plan
 - b) Capacity proposed
23. Details of bypass arrangement at STPs, if any :

C. Resource recovery and revenue generation

1. Method of sludge disposal
Land application :
Sale of sludge
Revenue earned

D. Operation and maintenance of Sewage Treatment Plant

1. Agency for operation and maintenance of Sewage :

Treatment Plant (U.P. Jal Nigam/ Bihar Rajya Jal Parishad / West Bengal PHE/Municipality concerned/ any other agency)

2. Power requirement :
 - i) Plant
 - ii) STP compound
3. Status of power availability for uninterrupted and continuous running of STP and standby arrangement for power, if any :
4. Commitment of funds, actual release and shortfall if any , for operation and maintenance of STP from respective State Govt. or municipality concerned (for the last 3 years) :
5. Status of Skilled/Trained Manpower :
6. Availability of spare parts :
7. Difficulties in transfer of assets from implementing agency to O&M agency, if any. :
8. Institutional mechanism for O&M :
9. Training provided to O&M, if any :
10. Manpower available/as per norms- (Mechanical, Electrical, public health, chemical, unskilled) :
11. Annual expenditure on O&M & STP (Salary, power, chemical etc.) for the last 3 years :
12. Consent from State Pollution Control Board or not :

13. Amount of water cess paid, if any :
14. Volume of industrial waste being discharged in to STPs, if any. :
15. Feasibility of private participation :

SIGNATURE OF COMPETENT AUTHORITY

Note:-The check list gives indicated list of items which are essential for monitoring performance of ASP. Any additional information or information related in case of units/processes for other type of plants e.g., trickling filter, USAB, waste stabilization ponds etc. may be given by the O&M agencies accordingly.

Remarks of Inspection Team

Annexure-II

STP Capacity and its Utilization in Delhi

Sl. No.	STP Location	Design Capacity (MGD)	Capacity Utilization (MGD)	Disposal of treated sewage
1	Yamuna Vihar	20.0 (10+10)	7.5	Into Shahadara drain
2	Kondli	45.0(10+25+10)	45.0	Into Shahadara drain near chilla regulator
3	Coronation Pillar	40.0(10+20+10)	27.0	Into Najafgarh drain
4	Timarpur	6.0	2.5	Into Najafgarh drain
5	Keshopur	72.0	50.0	Into Najafgarh drain
6	Nilothi	40.0	10.0	Into Najafgarh drain
7	Okhla	140.0(12+16+30+37+45)	120.0	10 mgd to CPWD for horticulture, 2.5 mgd to Minor Irritation Dept. and rest to Agra canal
8.	Vasant Kunj	5.2(2.2+3)	4.8	To DDA for horticulture
9	Ghitorni	5.0	0.0	Not commissioned
10	Delhi Gate	2.2	2.2	To Pragati Power Corporation Ltd. For their plant
11	Sen Nursing Home	2.2	2.2	To Pragati Power Corporation Ltd. For their plant
12	Papan Kala	20.0	8.0	Into Najafgarh drain
13	Rohini	15.0	4.0	Into Nangloi supplementary drain
14	Nazafgarh	5.0	2.0	Into Najafgarh drain
15	Narela	10.0	2.5	Into Najafgarh drain
16	Mehrauli	5.0	1.7	Partly to DDA for horticulture and rest into outfall drain
17	Rithala	80.0(40+40)	41.0	Into Najafgarh drain
18	Bakarwala (Mini STP)	3.0	1.0	Partly for horticulture and rest into outfall drain
19	Molarband (Mini STP)	3.0	1.0	Partly for horticulture and rest into outfall drain
20	Holambi (Mini STP)	2.0	2.0	Partly for horticulture and rest into outfall drain
21	Tikrikhurd (Mini STP)	2.0	2.0	Partly to DDA for horticulture and rest into outfall drain
	Total	522.6 i.e. 2375.74 mld say 2376 mld	336.4 i.e. 1529.27 say 1530 mld	

Overall capacity utilization of STPs = **64.37 %**