KERALA STATE POLLUTION CONTROL BOARD
ACTION PLAN FOR GREATER KOCHI AREA

EXECUTIVE SUMMARY

The Greater Kochi Area (GKA) ranks 24th (with CEPI score of 75.08) amongst the critically polluted areas (CPA) in the country. The State Pollution Control Board was instructed by the CPCB to evolve a time bound action plan for improving the environmental quality in the CPA. It was stated that external resource persons/institutions identified by CPCB/MoEF would be made available for this purpose. Such external guidance is still anticipitated. Meanwhile the Kerala Board, in consultation with the stakeholders in GKA, has chalked out an action plan for Greater Kochi Area.

The main pollution sources of concern are industries, municipal solid waste, biomedical waste, e-waste and domestic waste. The action plan hence includes mainly proposals for upgradation of existing pollution control facilities in the critically polluted area, common facilities such as CETPs, CTSDF, STPs, common biomedical waste management facility, municipal solid waste management, e-waste management and sewage and septage management.

GKA is on the verge of large scale development in the very near future. The establishment of Vallarpadam Container Terminal at Ernakulam, introduction of LNG terminal and gas distribution system, development of NTPC station with LNG as fuel to four times the present capacity so as to make Kerala a power surplus State, development of the State as a tourist (particularly a health tourist) destination (with 26% of the hospital beds of India already being in Kerala) point to the urgent need of substantial enhancement of safe guards and facilities for environmental protection. It is also a hub of the IT boom. Kerala, as a whole, is educationally forward. GKA contains the maximum number of educational institutions, compared to the rest of Kerala. The cent per cent literacy of the State implies high level of awareness and media attention, resulting in higher expectation of maintenance of environmental wholesomeness.

The action plan is envisaged to address the environmental issues of industries in the industrial clusters within Greater Kochi. Greater Kochi encompasses Kochi Corporation, 6 Municipalities and 25 Grama Panchayats with a total area of 631.68 km^2 and a population of 16,02,392 (2001 Census). The population is expected to cross 25 lakhs by 2025. GKA is bound by Kochi estuary, which is a part of

Vembanadu backwater system (a Ramsor site). The land is criss-crossed by a network of canals with linkage to the backwater system. Periyar river is the life line providing fresh water for the entire region. There are 83 red category (including 17 category) industries in GKA. Out of the 83, industries (ie, 95% of the total) fall within the industrial clusters at Eloor, Edayar and Ambalamugal which together constitute 17.4 km^2 or 2.8 % of Greater Kochi Area. Because Eloor and Edayar are situated on the left and right banks of River Periyar, Eloor–Edayar area is considered together. Ambalamugal is areawise bigger than Eloor-Edayar but the major part of the area is occupied by just four large scale industries. The action plan consists of short and long term measures. Map of GKA is given as Annexure 1, that of Eloor-Edayar industrial cluster as Annexure 2 and that of Ambalamugal industrial cluster as Annexure 3.

To implement the action plan, several steps are to be taken in a synchronised manner. Various departments, institutions, authorities and agencies are involved for its implementation. The following Table shows the activities – individual/common – and the expected cost.

Sl. No.	Action	Project Cost (Rs. Lakhs)
Short Term Measures		
1	**Industrial Pollution Control**	18241 *
2	**Monitoring Arrangement**	10
3	**Demarcation of Area**	10
Long Term Measures		
1	**Common Effluent Treatment Plant**	850
2	**Common Pipeline for Treated Effluent**	3000
3	**Electricity Supply Improvement**	2500
4	**Continuous Water Quality Monitoring**	100
5	**Continuous Ambient Air Quality Monitoring**	150
6	**Telemetric Linkage**	25
7	**Mobile Air & Water Quality Monitoring Unit**	250
8	**Patrolling – cum – Emergency Response Squad**	150
9	**Sewerage and Sewage Treatment Plant for Kakkanad**	4000
10	**Sewerage and sewage treatment system for GKA**	72000

11	**Rejuvenation of canals**	2700
12	**Remediation of contaminated sites**	7500
13	**Water supply to Eloor - Edayar area**	500
14	**Health study**	30
15	**Construction of two bridges at north and south of Ernakulam city**	30000
16	**Incinerator for CTSDF**	100
17	**E – Waste Treatment and Disposal at CTSDF**	1000
18	**Municipal Solid Waste Management**	1500
19	**Biomedical Waste Treatment Facility**	500
20	**Liquified Natural Gas-bunks and vehicles**	1000
21	**Green Belt Development**	50
22	**Augmentation of Infrastructure of the Board**	130
TOTAL		**1,46,296**

** In addition, the industries have agreed to spend Rs. 150 crore of their own for pollution control measures*

The implementation of the proposed action plan would enable us to address the environmental related issues in Greater Kochi Area in a more effective manner and make it a model.

JEYAPRASAD S.D.
CHAIRMAN

PREFACE

The Central Pollution Control Board in collaboration with Indian Institute of Technology (IIT), Delhi and with 15 other institutes has formulated criteria for Comprehensive Environmental Pollution Index (CEPI). According to the environmental assessment carried out in this regard, the industrial cluster in the Greater Kochi Area (GKA) has been identified as one of the critically polluted area in the country with CEPI score of 75.08. The Ministry of Environment and Forest, Government of India has, vide office memorandum No. J -11013/5/2010-IA.II (I) dated 13.1.2010, declared GKA as critically polluted area and the State Pollution Control Board was entrusted to evolve a time bound action plan for improving the environmental quality in the identified clusters. The Kerala State Pollution Control Board, in consultation with the industries located in GKA, has chalked out an action plan on industrial clusters in Greater Kochi area, to control and prevent pollution in accordance with the Terms of Reference suggested by the CPCB. The points suggested by Er. R. S. Kori, Additional Director, CPCB during discussion that I had with him and those points which emerged during the discussion on the presentation before the Steering Committee at the CPCB on 13/7/2010 have also been included in the plan.

The main pollution sources of concern are industries, municipal solid waste, biomedical waste, e-waste and domestic waste. The action plan hence includes mainly proposal for upgradation of existing pollution control facilities in the industrial cluster areas, common facilities such as CETPs, CTSDF, STPs, common biomedical waste management facility, municipal solid waste management, e- waste management, sewage and septage management etc.

The present scenario is only indicative of the large scale development expected in the very near future. The establishment of Vallarpadam Container Terminal at Ernakulam, introduction of LNG terminal and gas distribution system, development of NTPC with LNG as fuel to four times the present capacity, making Kerala a power surplus State, Development of the State as a tourist (particularly a health tourist) destination (with 26% of the hospital beds of India already homed in Kerala) point at the need of adequate safe guards and facilities for environmental protection. The cent per cent literacy of the State implies high level of awareness and media attention, resulting in higher expectation of maintenance of environmental wholesomeness.

For the effective implementation of the action plan an integrated effort by the stake holders is required. It is earnestly hoped that the implementation of the proposed action plan would enable us to address and solve the environmental related issues in Greater Kochi Area.

24/07/2010

JEYAPRASAD S.D.
CHAIRMAN
KERALA STATE POLLUTION CONTROL BOARD

CONTENTS

1. INTRODUCTION

1.1. BASIC INFORMATION

The Central Pollution Control Board (CPCB), in association with the Indian Institute of Technology (IIT), New Delhi has developed a Comprehensive Environmental Pollution Index (CEPI) based on pollution potential, with the aim of identifying polluted industrial clusters and prioritizing planning needs for intervention to improve the quality of environment. According to the environmental assessment carried out in this regard the industrial cluster in Greater Kochi Area (GKA) has been identified as one of the critically polluted area in the country with CEPI score of 75.08. Ministry of Environment and Forest, Government of India, vide office memorandum No. J -11013/5/2010-IA.II (I) dated 13.1.2010, has declared GKA as critically polluted area and the State Pollution Control Board was entrusted to evolve a time bound action plan for improving the environmental quality in the identified clusters. Kerala State Pollution Control Board, in consultation with the stakeholders located in GKA, has chalked out an action plan to reduce the pollution.

1.2. PROJECT AREA

The action plan is envisaged to address the environmental issues of industries in the industrial clusters within Greater Kochi with due alteration to associated sources of pollution/ environmental degradation.

Greater Kochi encompasses Kochi Corporation, 6 Municipalities and 25 Grama Panchayats with a total area of 631.68 km^2 and a population of 16,02,392 (2001 Census). It is adjoining Kochi estuary, which is a part of Vembanadu backwater system (a Ramsor site). The land is criss-crossed by a network of canals forming a linkage to the backwater system. Periyar river is the life line providing fresh water for the entire region.

There are 83 red category (including 17 category) industries in Greater Kochi area. Out of that 79 industries (ie, 95% of the total) fall within the industrial clusters at Eloor-Edayar and Ambalamugal which together constitute 17.4 km^2 or 2.8 % of Greater Kochi Area. Because Eloor and Edayar are situated on the left and right banks of River Periyar, Eloor –Edayar area is considered together. Ambalamugal is area wise bigger than Eloor-Edayar but the major part of the area is occupied by just four large scale industries. The whole project area is shown as Annexure 1. The project area at Eloor- Edayar area is shown as Annexure 2. The project area at Ambalamugal area is shown as Annexure 3.

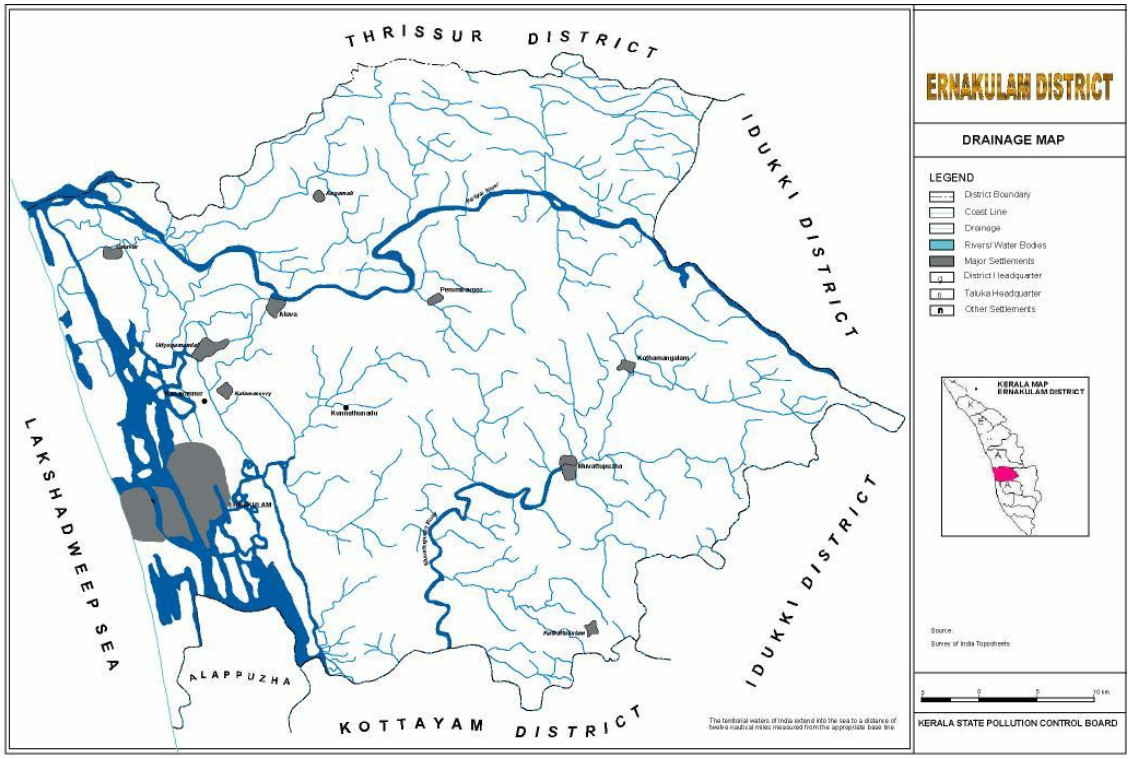
2. ANALYSIS OF CAUSES OF POLLUTION

2.1. WATER ENVIRONMENT

The water bodies of the area are listed in the table below. The water bodies even outside the industrial clusters are included here as they are inter connected and form a common network.

Canals		Rivers
Adimurithod	Changadom pokkuthod	Chithrapuzha
Koithara canal	Khareethodu	Periyar
Mullassery canal	Edappallythodu	Kadambrayar
Karayakkodam thodu	Thevara canal	
Perndoor canal	Punjathathod	
Kochi canal		

The drainage map of Ernakulam district is shown below.



All the industries in GKA are having in situ effluent treatment plants. Periyar river is the main source of water in the entire area including Kochi Corporation, Aluva Municipality and Paravoor Municipality and number of panchayaths like Kadamakudi and Puthencruz. The Board, under the National Ambient Water Quality Monitoring Programme (NWMP), is carrying out water quality monitoring for maintaining and restoring the quality of the natural resources. There are 7 sampling stations as

mentioned below in Periyar located in the upper, middle and lowest stretches through all its branches and tributaries.

Sl. No.	Station Name	Latitude Longitude	Average Depth (m)	Monitoring Commencement	Type	Monitoring Frequency	Station Code	Class
1	Eloor	10^0 04'22" 76^0 16'56"	3-6	01/08/1980	Impact	Monthly	0017	E
2	Kalady	10^0 09'40" 76^0 26'31"	3-6	01/08/1980	Trend	Monthly	0018	B
3	SDP Aluva	10^0 05'45" 76^0 20'36"	3-6	03/02/1988	Trend	Monthly	1338	C
4	Pathalam	10^0 05'15" 76^0 17'55"	3-6	01/07/2008	Impact	Monthly	2334	E
5	Kalamaserry	10^0 03'48" 76^0 19'06"	3-6	07/01/2008	Impact	Monthly	2335	C
6	Purapallikadavu	10^0 08'41" 76^0 16'56"	1-3	01/07/2008	Trend	Monthly	2336	C
7	Muppathadam	10^0 05'30" 76^0 20'02"	1-3	01/7/2008	Trend	Quarterly	2333	C

There is a monitoring station in Chithrapuzha at Irumpanam. The data pertaining to the year 2009 are as follows.

2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	6.8	179	2.6	3	1.2	1.2	1700	920
Min	6	65	0.3	1.2	0	0	280	50
Mean	6.30	125.46	1.34	2.18	0.43	0.12	954	344
Std dev:	0.21	38.77	0.73	0.70	0.36	0.33	408.93	264.47
Lmt:	6.5- 8.5	2250						

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The river water quality data of Periyar for the year 2009 is shown below

Eloor (Kadungallore Panchayath)			Monthly monitoring		Class E			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	7.6	10200	7.7	2.2	3.06	0.3	4770	850
Min	6	59	0.06	0.6	0.1	0	20	10
Mean	6.61	1427.33	5.48	1.60	0.69	0.07	1208	284
Std dev	0.44	2862.72	2.08	0.53	0.78	0.10	1243.69	237.66
Lmt .	6- 8.5	2250						

Kalady (Kalady Panchayath)			Monthly monitoring		Class B			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	7.4	60	7.9	2	0.4	0.2	6120	880
Min	6.4	31	0.6	0.1	0.1	0	110	80
Mean	6.79	41.33	6.35	0.75	0.21	0.02	1503	260
Std dev	0.30	8.02	2.08	0.50	0.09	0.06	1635.47	228.45

Aluva (Aluva Municipality)			Monthly monitoring		Class C			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	7.2	64	7.9	2.1	0.4	0.1	1100	350
Min	6.3	36	5.6	0.2	0	0	100	20
Mean	6.61	49.25	6.48	1.03	0.24	0.02	598	152
Std dev.	0.25	7.82	0.68	0.64	0.13	0.04	316.25	86.77
Lmt.	6.5-8.5		4	3			5000	

Pathalam (Kadungallore Panchayath)			Monthly monitoring		Class E			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	7	7010	7.1	2.8	0.8	0.9	2380	420
Min	5.9	38	4	0.3	0.1	0	170	100
Mean	6.51	861.17	5.78	1.47	0.36	0.15	873	196
Std dev.	0.31	1969.95	1.21	0.68	0.20	0.25	609.07	112.44
Lmt.	6- 8.5	2250						

Code2335 Kalamasserry(Kalamassery Muncipality)			Monthly monitoring		Class C			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	7.6	7010	6.4	2.5	0.8	0.2	5550	1210
Min	6.2	43	3.5	0.7	0	0	70	40
Mean	6.57	647.75	4.66	1.82	0.33	0.06	1052	214
Std dev.	0.37	2003.65	0.93	0.45	0.22	0.06	1539.50	320.66
Lmt.	6.5-8.5		4	3			5000	

Code2336 Purapallikadavu(Chengamanadu Panchayath			Monthly monitoring		Class C			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	7.1	12970	7.9	2	0.5	0.13	1600	370
Min	6.1	50	3.9	0.4	0.06	0	30	10
Mean	6.63	1201.42	6.58	1.18	0.24	0.02	664	176
Std dev.	0.36	3708.74	1.11	0.53	0.16	0.04	483.67	99.59
Lmt	6.5-8.5		4	3			5000	

Code2333 Muppathadam(Kadungallore Panchayath)			Monthly monitoring		Class C			
2009	pH	Cond:	DO	BOD	Nitrate N	Amm-N	TC	FC
Unit		µmhos/cm	mg/l	mg/l	mg/l	mg/l	no/100ml	no/100ml
Max	6.8	83	7.2	1.9	0.95	0.4	950	110
Min	6.5	57	4.3	1.5	0.1	0	60	45
Mean	6.70	70.00	5.75	1.70	0.50	0.11	427	74
Std dev.	0.14	11.11	1.22	0.18	0.38	0.20	378.54	28.10
Lmt .	6.5-8.5		4	3			5000	

Kadambrayar and Chitrapuzha are also the rivers in the area. The monitoring station of the Board in Kadambrayar is at Brahmapuram and Manackakadavu .The details data are given below.

Brahmapuram *Based on 6 months data									
	Temp	pH	Cond.	DO	BOD	Nitrate	Nitrite	TC	FC
Max	30	6.8	390	6.2	4	1.2	1	5200	2080
Min	28	5.9	60	0.4	1.8	0.1	0	980	40
Mean	28.75	6.17	180.50	1.68	3.03	0.45	0.18	2208.33	671.67
Des: [illegible]		6.5-8.5	-	4	3			5000	
Manackakadavu *Based on 6 months data									
Max	29.5	6.5	120	6.8	3.2	0.3	0.2	1920	480
Min	28	6	61	1.4	1.3	0.1	0	830	170
Mean	28.83	6.10	80.17	3.02	1.95	0.13	0.08	1240	268.33
Des: Limit		6.5-8.5	-	4	3			5000	

The river quality data show that Periyar and Chitrapuzha rivers are meeting designated water quality parameters except for DO at Brahmapuram and Manackakadavu. The high coliform count at Kalady and the lowering of DO at Brahmapuram, Manackakadavu and Irumpanam are influenced by non industrial sources. Eventhough 95 % of household in Kerala have toilet facilities, only 1.1 % are connected to common sewerage system. The rest of the householders and institutions are depending on on-site sanitation, the inadequacies of which also contribute to the pollution. The lowering of DO is attributable to agglomeration of residential buildings and high rise apartment buildings in and around Kakkanad, which houses the District administration Head quarters and many IT industries and also due to the stagnation caused due to silt deposition due to run off from agricultural farms. The area has no sewerage coverage. Provision of sewerage and sewage treatment for the fast developing residential area is an urgent necessity.

2.2. AIR ENVIRONMENT

The major air quality parameters of concern in this area are SPM, VOC, CO, SO_2, NH_3, NOx from Kochi Refinery and other petrochemical industries & fertilizers industries. All the industries have provided air pollution control measures to control the emission at the source itself. Most industries use furnace oil as fuel which contains around 3% sulphur. To mitigate the air pollution problems, KSPCB has give direction to draw action plan by individual units. Several ongoing construction activities and upcoming developmental projects including the Vallarpadam Container Terminal are taking place in the industrial cluster area, giving rise to dust pollution.

Proposed Vallarpadam Container Terminal

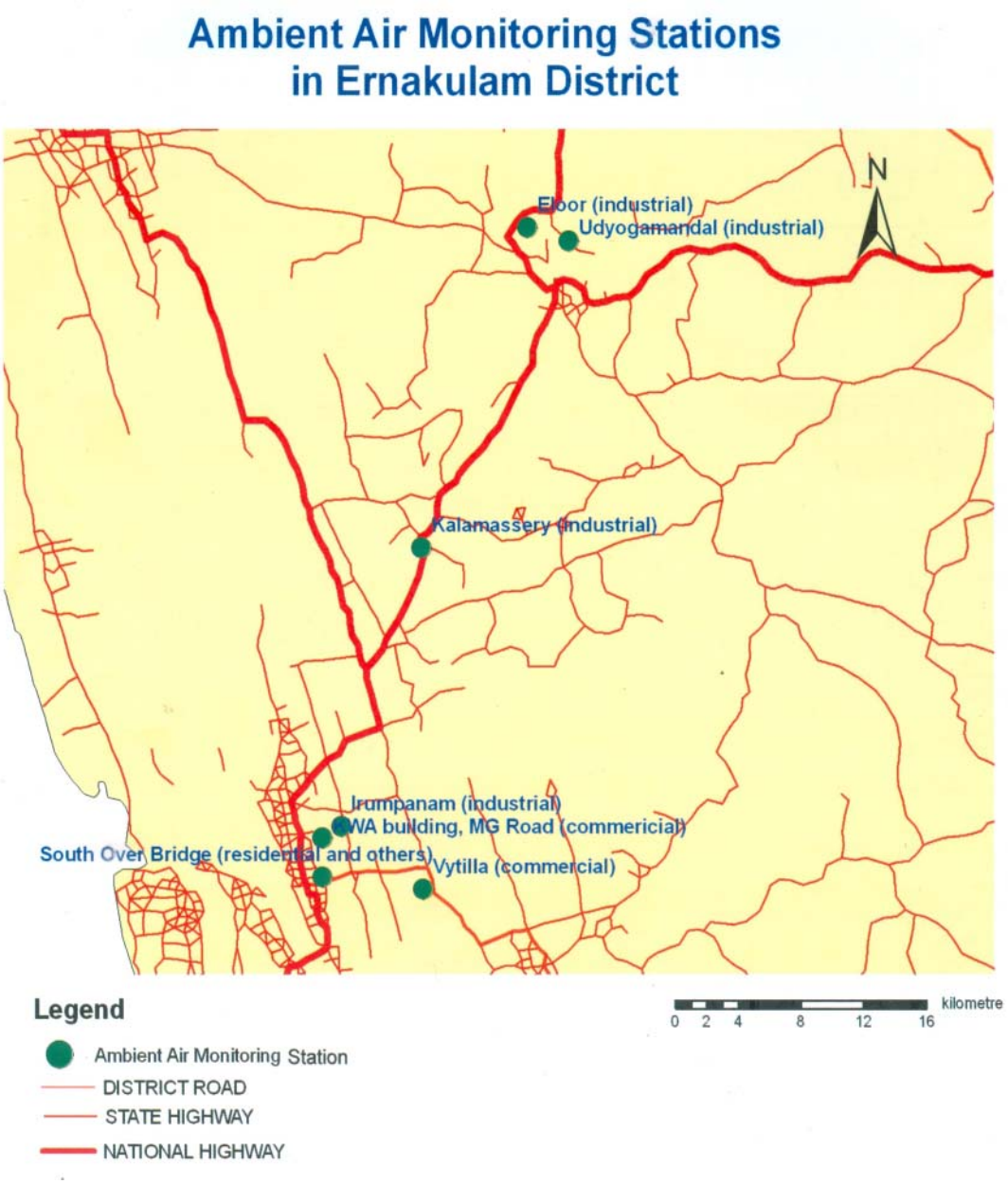
Vehicular pollution in connection with these projects also contributes to a certain extent to the air pollution problem in the area.

Vallarpadam container transshipment terminal 4 lane road construction at Manjummel, Eloor

KSPCB is monitoring the ambient air quality in the GKA area under National Ambient Air Quality Monitoring (NAAMP) program at the following seven stations .

1. M.G. Road
2. South Overbridge
3. Vyttila
4. Irumpanam

5. Kalamassery
6. Eloor
7. Udyogamandal



The ambient air quality monitoring data in the above stations pertaining to the year 2009 is presented below.

STATION AT KWA BUILDING, M.G.ROAD — Category: Commercial

Parameter	Sulphur Dioxide µg/m³	Nitrogen Oxides µg/m³	Respirable Suspended Particulate Matter µg/m³	Suspended Particulate Matter µg/m³

24 h average	Limit: 80 µg/m³, max.				80 µg/m³, max.				100 µg/m³, max.				200 µg/m³ , max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	4.6	10	9	4.5	15.6	26	9	45	73	167	9	64	130	330	9
February	2	3.6	11	9	9	17.3	40	9	41	58	95	9	56	97	190	9
March	2	3.8	8	9	9	15.3	28	9	27	38	54	9	35	64	95	9
April	2	3.1	7	9	9	15.1	35	9	18	35	94	9	23	59	174	9
May	2	4.3	11.6	9	9	18.4	39.1	9	12	23	43	9	17	40	80	9
June	2	5.1	19.8	9	9	21.8	41.4	9	14	22	54	9	16	43	100	9
July	2	3.5	8.2	9	9	17.3	30	9	30	48	64	9	45	74	98	9
August	2	3.2	8.5	9	9	12.4	21.5	9	10	16	29	9	9	33	56	9
Sept	2	3.2	6.2	9	9	10.7	16.9	9	9	16	31	9	10	32	73	9
Oct	2	3.3	10.5	9	9	12.8	21.7	9	11	35	81	9	16	51	109	9
Nov	2	3.5	19.4	9	9	14.7	26.1	9	12	35	87	9	15	55	107	9
Dec	2	4.8	14.7	9	9	16.9	29.2		20	51	101	9	25	75	170	9

Annual average	3.8 µg/m³	15.7 µg/m³	m³	63 µg/m³
	Limit: 60 µg/m³,max.	60 µg/m³, max.	60 µg/m³, max.	140 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

STATION AT SOUTH OVERBRIDGE

Category: Commercial

Parameter	Sulphur Dioxide µg/m³	Nitrogen Oxides µg/m³	Respirable Suspended Particulate Matter µg/m³	Suspended Particulate Matter µg/m³

24 h average	Limit: 80 µg/m³, max.				80 µg/m³, max.				100 µg/m³, max.				200 µg/m³, max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	5.8	14.2	9	13	21.6	44	9	18	63	138	9	57	115	200	9
February	2	3.6	7	9	9	24.6	48	9	26	61	91	9	59	125	255	9
March	2	4.4	10	9	9	17.5	32	9	34	48	75	9	41	97	140	9
April	2	4.2	10.9	9	9	19.4	38	9	16	37	66	9	35	71	120	9
May	2	4	10.5	9	9	18.7	35.7	9	24	33	77	9	34	68	167	9
June	2	5	17.4	9	11.7	27	56.1	9	10	27	44	9	18	52	110	9
July	2	4.4	10.9	9	11	19.4	32	9	22	47	76	9	40	81	141	9
August	2	3.1	7.8	9	9	13.5	22.9	9	10	24	55	9	14	50	111	9
September	2	3.2	6.2	9	9	12.6	27.8	9	12	19	45	9	14	41	92	9
October	2	3.9	13.6	9	9	14.6	29.4	9	15	42	102	9	19	76	186	9
November	2	3.6	12.8	9	9	18.4	34.8	9	18	47	93	9	32	82	163	9
December	2	4	8.9	9	9	14.8	31.4	9	10	44	87	9	24	72	186	9

Annual average	4.1 µg/m³	18.5 µg/m³	41 µg/m³	78 µg/m³
	Limit: 60 µg/m³, max.	60 µg/m³, max.	60 µg/m³, max.	140 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

STATION AT FCI OEN CONNECTORS BUILDING, VYTILLA
Category: Commercial

Parameter	Sulphur Dioxide µg/m³	Nitrogen Oxides µg/m³	Respirable Suspended Particulate Matter µg/m³	Suspended Particulate Matter µg/m³

24 h average	Limit: 80 µg/m³, max.				80 µg/m³, max.				100 µg/m³, max.				200 µg/m³ , max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	5.8	22	9	9	15.3	26	9	46	71	107	9	72	104	155	9
February	2	4.6	13.2	9	9	16.1	32.4	9	43	63	105	9	64	98	160	9
March	2	4.5	10.4	9	9	15.1	30.2	9	31	46	68	9	49	76	192	9
April	2	3.1	7.4	9	9	13.5	28.2	9	15	34	68	9	43	57	87	9
May	2	4.3	8.9	9	9	15.9	41.4	9	15	27	49	9	18	42	73	9
June	2	4.7	22.9	9	9	17.4	41.9	9	18	25	52	9	20	34	56	9
July	2	4.1	9.4	9	9	15.5	32.2	9	20	38	72	9	48	67	97	9
August	2	3.3	8.1	9	9	11.1	17.9	9	12	19	36	9	18	28	46	9
September	2	3.1	8.1	9	9	11.5	18.9	9	12	18	30	9	18	33	46	9
October	2	3.6	8.5	9	9	11.6	20.7	9	15	38	84	9	19	49	103	9
November	2	4.3	12.4	9	9	11.8	29.2	9	15	47	94	9	22	60	109	9
December	2	6.7	16.3	9	9	17.2	33.4	9	16	60	99	9	23	78	122	9

Annual average	4.3 µg/m³	14.3 µg/m³	41 µg/m³	61 µg/m³
	Limit: 60 µg/m³, max.	60 µg/m³, max.	60 µg/m³, max.	140 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

STATION AT IRUMPANAM

Category: Industrial

Parameter	Sulphur Dioxide µg/m³				Nitrogen Oxides µg/m³				Respirable Suspended Particulate Matter µg/m³				Suspended Particulate Matter µg/m³			
24 h average	Limit: 120 µg/m³, max.				120 µg/m³, max.				150 µg/m³, max.				500 µg/m³, max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	5.1	26.5	9	9	13.4	30.2	9	40	65	96	9	59	90	126	9
February	2	3.8	11.4	9	9	13.3	25.4	9	18	57	86	9	23	88	156	9
March	2	3.5	7.4	9	9	10.7	24.2	9	15	37	60	9	11	57	93	9
April	2	2.6	4	9	9	11.9	26.3	9	11	30	145	9	17	62	226	9
May	2	3.3	7.4	9	9	10.5	21.6	9	9	22	38	9	19	36	86	9
June	2	3.8	7.8	3	9	11.2	19.1	3	11	15	22	3	19	28	43	3
July	2	3.3	7.4	9	9	10.5	22.2	9	18	38	58	9	21	57	93	9
August	2	3.0	9.3	9	9	8.4	15.1	9	8	19	48	9	11	31	127	9
September	2	3.2	5.2	9	4.5	6.1	14.1	9	6	22	47	9	10	29	57	9
October	2	3.0	5.4	9	9	8.4	13.5	9	9	38	73	9	15	49	100	9
November	2	4.0	9.7	9	4.5	11.9	23.9	9	18	44	100	9	26	58	115	9
December	2	4.4	8.1	8	9	11.5	15.5	8	23	54	82	8	42	76	105	8

Annual average	3.5 µg/m³	10.6 µg/m³	37 µg/m³	55 µg/m³
	Limit: 80 µg/m³, max.	80 µg/m³, max.	120 µg/m³, max.	360 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

STATION AT KALAMASSERY Category: Industrial

Parameter	Sulphur Dioxide µg/m³	Nitrogen Oxides µg/m³	Respirable Suspended Particulate Matter µg/m³	Suspended Particulate Matter µg/m³

24 h average	Limit: 120 µg/m³, max.				120 µg/m³, max.				150 µg/m³, max.				500 µg/m³, max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	4.4	8.9	9	9	14.1	35.3	9	18	56	140	9	32	102	192	9
February	2	3.9	13	9	9	13.8	28.4	9	20	39	68	9	38	74	178	9
March	2	4.5	10	9	9	11.3	21	9	11	28	83	9	22	43	103	9
April	2	5	2.7	9	4.5	10.6	30	9	12	37	93	9	27	71	136	9
May	2	3.2	6.2	9	4.5	13	28.1	9	14	33	68	9	21	52	103	9
June	2	4.3	11.2	9	4.5	13.4	28.5	9	10	33	112	9	12	46	132	9
July	2	5	12.1	9	9	12.3	28	9	15	31	88	9	28	50	110	9
August	2	3.7	11.3	9	9	11.4	20.5	9	8	24	83	9	12	37	99	9
September	2	4.3	15.5	9	4.5	9.2	14.5	9	8	25	108	9	14	37	129	9
October	2	4.2	7.8	9	4.5	10.4	20.1	9	9	46	94	9	15	60	116	9
November	2	5.1	10.1	9	9	13.3	20.5	9	27	51	79	9	40	66	98	9
December	2	7.4	15.1	9	9	17.2	30.6	9	40	74	162	9	49	98	190	9

Annual average	4.5 µg/m³	12.5 µg/m³	40 µg/m³	61 µg/m³
	Limit: 80 µg/m³, max.	80 µg/m³, max.	120 µg/m³, max.	360 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

STATION AT ELOOR

Category: Industrial

Parameter	Sulphur Dioxide µg/m³	Nitrogen Oxides µg/m³	Respirable Suspended Particulate Matter µg/m³	Suspended Particulate Matter µg/m³

24 h average	Limit: 120 µg/m³, max.				120 µg/m³, max.				150 µg/m³, max.				500 µg/m³, max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	2	2	7	4.5	6.7	13.5	7	6	59	171	7	45	128	248	7
February	2	2	2	5	4.5	5.1	9.2	5	27	170	691	5	47	264	821	5
March	2	2	2	6	4.5	6.8	14.1	6	17	106	314	6	99	237	603	6
April	2	2	2	8	4.5	8.1	13.2	8	35	77	184	8	51	146	326	8
May	2	2.2	5.6	8	4.5	8.8	16.4	8	15	63	232	8	64	120	305	8
June	2	2	4.1	8	4.5	6.1	13.3	8	13	21	47	8	40	58	120	8
July	2	2	2	8	4.5	5.7	19.2	8	12	29	286	8	21	63	377	8
August	2	2	2	8	4.5	5.7	10.1	8	10	12	27	8	17	32	56	8
September	2	2	2	8	4.5	5.4	13.4	8	8	13	22	8	29	53	168	8
October	2	2	2	8	4.5	6.3	10.1	8	7	10	21	8	8	23	42	8
November	2	2	2	8	4.5	7.4	16.2	8	7	20	38	8	34	66	192	8
December	2	2	4.1	8	4.5	6.8	13.4	8	15	25	50	8	48	62	129	8

Annual average	2 µg/m³	6.5 µg/m³	51 µg/m³	104 µg/m³
	Limit: 80 µg/m³, max.	80 µg/m³, max.	120 µg/m³, max.	360 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

STATION AT UDYOGAMANDAL

Category: Industrial

Parameter	Sulphur Dioxide µg/m³	Nitrogen Oxides µg/m³	Respirable Suspended Particulate Matter µg/m³	Suspended Particulate Matter µg/m³

24 h average	Limit: 120 µg/m³, max.				120 µg/m³, max.				150 µg/m³, max.				500 µg/m³, max.			
	min	mean	max	n	min	mean	max	n	min	mean	max	n	min	mean	max	n
January	2	2	2	7	4.5	6.1	13.2	7	21	87	329	7	51	184	477	7
February	2	2	2	5	4.5	5.3	11.2	5	18	131	388	5	55	304	928	5
March	2	2	2	6	4.5	7.5	14	6	19	99	246	6	89	203	412	6
April	2	2	2	8	4.5	8.5	14.8	8	15	82	287	8	42	169	776	8
May	2	2	2	8	4.5	8.6	14.4	8	12	79	463	8	48	210	657	8
June	2	2	2	8	4.5	7.1	14	8	8	24	66	8	41	73	209	8
July	2	2	2	8	4.5	5.7	11.2	8	6	19	63	8	22	60	182	8
August	2	2	2	8	4.5	5.7	10	8	7	13	22	8	24	36	78	8
September	2	2	2	8	4.5	5.1	10	8	7	14	39	8	18	50	107	8
October	2	2	2	8	4.5	6.1	10.4	8	5	10	22	8	7	25	38	8
November	2	2	2	8	4.5	6.7	10	8	7	14	34	8	28	54	154	8
December	2	2	2	8	4.5	5.4	11.2	8	10	18	43	8	28	58	114	8

Annual average	2 µg/m³	6.4 µg/m³	49 µg/m³	118 µg/m³
	Limit: 80 µg/m³, max.	80 µg/m³, max.	120 µg/m³, max.	360 µg/m³, max.

n : number of days monitoring conducted

µg/m³ : microgram per cubic metre

The ambient air quality data pertaining to seven stations in Ernakulam District show that Sulphur dioxide and Nitrogen oxides are consistently within limits. Measurement of VOC, CO and NH_3 are also with in limits. The parameters found in excess are SPM and RSPM in the non - monsoon months. As the PM emission from the industrial stacks is normally within limits, the excess of PM in the ambient air can be attributed mainly to the ongoing construction activities in the industrial, residential and transportation sector. Roads are also dug up for pipe and cable laying. The heavy traffic density in the congested roads causes the dust to get scattered and air borne.

2.3. HAZARDOUS WASTE DISPOSAL FACILITY

The following industries in the area have put up secured landfill facility for hazardous wastes.

Binani Zinc Ltd.

Sud-chemie India Ltd.

Hindustan Insecticides Limited.

Merchem India (P) Ltd.

FACT-CD

Cochin Minerals and Rutile Ltd.

Hindustan Organic Chemicals Ltd.

Phillips Carbon Black Ltd.

The used/waste oil generated in the industries is disposed to one or the other of the following re-refiners.

1. Excel Petrochemicals, Edayar, Aluva, Ernakulam (Transfer oil only)
2. CEE JEE Lubricants, Binanipuram, Aluva, Ernakulam
3. Southern Refineries, Kuzhinjanvila, Parassala, Thiruvananthapuram

A common Treatment, Storage and Disposal Facility with 50000 tonne /year secured landfill capacity is established at Ambalamedu, Ernakulam.

The CTSDF comprise the following facilities:

- Storage Shed, Laboratory equipments for comprehensive analysis
- Waste Treatment & Stabilization Facility
- Secured landfill
- Leachate collection and treatment facility
- Multiple effect evaporator

The estimated annual generation of hazardous waste in the State is 66,558 tonne of which 45,370 tonne is landfillable, 230 tonne is incinerable and 20,958 tonne is re-cyclable / re-refinable.

Out of the incinerable quantity of 230 tonne/year, 133 tonne is generated by Hindustan Insecticides Ltd. and 48 tonne by units in Cochin Special Economic Zone. Captive incinerators are functional in both the places. The CTSDF has been instructed to collect and safely keep the balance 49 tonne of incinerable wastes generated per year in the State.

2.4. MUNICIPAL SOLID WASTE

The two industrial clusters of Eloor-Edayar and Ambalamugal come within Kochi Corporation and the Grama Panchayats of Eloor, Varapuzha, Cheranallor, Kadamakkudy and Kadungalloor. The Grama Panchayats are also practically urbanized and the total MSW generation in the said Corporation and Panchayats areas would be around 270 tonne per day. Kochi Corporation has a MSW plant (250 t/day) but it needs large scale renovation. The Panchayats need also be provided with MSW management facilities.

2.5. SEWAGE

In the absence (except for less than 5 % coverage in GKA) of sewerage, the households depend on on-site sanitation-mostly septic tank and soak pit. But as the area is mostly flat with water table as high as 1 m below ground level, soaking and dispersion of the outflow from septic tanks is not practicable. Hence a significant part of the outflow stagnates and get mixed in surface and sub- surface water. The problem is worsened by the fact that many of the septic tanks are improperly designed and constructed without conforming to IS 2470 (Part I): 1984. The treatment obtained in such septic tanks is much below desired level. As a result, the tanks need be desludged quite often. It is estimated 500 m^3 of septage is collected per day in Greater Kochi area. The operators dump the septage in water bodies and relatively less populated areas. GKA is having a population of 16.1 Lakhs as per 2001 census. Based on a per capita generation of 150 lit/day of waste water per day and a projected population of 20 lakh by 2025, the effluent generation would be 240 million litre of waste water per day. At present there is only a sewerage and sewage treatment plant of 4.5 MLD capacity. Sewerage and STP for the balance effluent generation of 235.5 MLD is an urgent need of GKA. A solution to the problem is envisaged in the chapter on action plan.

2.6. INDUSTRIES

Industries are mentioned last in the analysis of causes of pollution not because they are less significant but because the other causes ought not be lost sight of. Of the eighty three red category industries situated in Greater Kochi area, 79 are situated in Eloor-Edayar

and Ambalamugal industrial cluster and hence those clusters are concentrated upon. It is a matter of credit that all the said industries have adopted pollution control measures. But there is need and scope for making the measures more effective individually and collectively. The status of pollution control measures adopted in the individual industries, action plan for improvement of preparedness and performance of each industry and collective measures that need be adopted by the industrial community are examined in the chapter on action plan.

3. ACTION PLAN

The action plan consists of short term and long term measures.

3.1. SHORT TERM MEASURES

3.1.1. INDUSTRIAL POLLUTION CONTROL

All the 79 red category industries (including 17 category) under consideration have installed pollution control measures but those, in general, need be made better. The status quo of pollution control in these industries and time targeted action plan for individualistic measures are given in the table attached (Annexures 2.A and 2.B). Common or combined measures required are indicated there and are dealt within the table. The amount indicated includes that to be borne by the industries and that to be funded under this plan. The total expenditure required to be invested by the industries is Rs. 150 crore. In addition to that, expenditure to the tune of Rs. 182.41 crore need be made in the industrial sector, for which help need be extended.

3.1.2. MONITORING ARRANGEMENT

KSPCB is monitoring the ambient air quality in the GKA area under National Ambient Air Quality Monitoring (NAAMP) program at the seven stations viz., M.G. Road, South Overbridge, Vytila, Irumpanam, Kalamassery, Eloor and Udyogamandal. The Board, under the National Ambient Water Quality Monitoring Programme (NWMP), is carrying out water quality monitoring for maintaining and restoring the quality of the natural resources. There are 7 sampling stations in Periyar located in the upper, middle and lowest stretches through all its branches and tributaries. Kadambrayar and Chitrapuzha are other river stretches in the area. The monitoring stations of the Board in Kadambrayar are at Brahmapuram and Manackakadavu. As part of action plan it is proposed to adopt short term measures to strengthen the monitoring by including additional 3 water monitoring stations and 3 air monitoring stations. The expenditure required for the purpose is Rs 10 lakh.

3.1.3. DEMARCATION OF AREA

The area has been demarked as per the drawing in Annexure 1. The actual project area will be demarked more minutely with the support of Land Use Board and field survey. The approximate expenditure would be Rs 10 lakh.

3.2. LONG TERM MEASURES

3.2.1. COMMON EFFLUENT TREATMENT PLANT

A CETP for nearly 194 industries in Edayar area has been designed. It is primarily meant for small scale industries with option for medium scale industries to join in. Medium scale industries will not be eligible for any subsidy but their involvement will enhance the sustainability of the project as the running cost will be met mostly by them. The project can take off as soon as Government land is allocated for that. The estimated cost is Rs. 8.5 crore. The project period is 2 years.

3.2.2. COMMON PIPELINE FOR TREATED EFFLUENT

Earlier there had been complaints that River Periyar was assuming different colours on different days due to pollution from various industries. It was also used to be observed that fish availability was poor in the river. Now-a-days, the river is not exhibiting the colour changes and is flowing with natural colour consistently. Chinese fish nets have, after a very long period, reappeared on the banks downstream of the industrial belt because of abundance of fish. The improvement is painstakingly achieved. Its maintenance is difficult as any upset anywhere in the reach can spoil the situation. It is proposed to have a common pipeline to convey all treated industrial effluents to the sea. The pipeline would be nearly 25 km long and can be laid along the river, with a marine outfall. All the influent streams to the pipeline will have delay ponds and on-line monitoring system to ensure that the effluent is adequately treated. The estimated cost is Rs. 90 crore. The project period is 3 years. Eventhough the project cost, in the current scenario, comes to Rs. 90 crore, it is proposed to reduce the amount by minimising the quantity of effluents. The project cost would then come down to 1/3rd of Rs. 90 crore. This is proposed to be achieved by providing tertiary treatment units in individual large scale industries and CETP to maximise the recycling of treated water. Then the size of the pipe can be reduced and the project cost of pipe line would be reduced to Rs. 30 crore.

3.2.3. ELECTRICITY SUPPLY IMPROVEMENT

Pollution occurs mostly when there is failure or fluctuation in power supply. Continuous, consistent power supply with better power factor will have a beneficial impart on pollution control system improvement. It is expected to cost Rs. 25 crores. The project time would be 3 years.

3.2.4. CONTINUOUS WATER QUALITY MONITORING

The KSPCB is doing regular monitoring of water quality at various locations. It is necessary to have round the clock automated vigil of quality of water in River Periyar, River Chithrapuzha and River Kadambrayar. Continuous monitoring system need be located at three stations for that. The anticipated expenditure is Rs. 1 crore. The project period would be 1 year.

3.2.5. CONTINUOUS AMBIENT AIR QUALITY MONITORING

At present, there is one continuous ambient air quality monitoring station at Eloor (maintained by FACT), and two stations at Ambalamugal (maintained by Kochi Refineries). The Board need to have one station of its own in Kochi city. The estimated cost of the new station with five years maintenance and operation contract is Rs. 1.5 crore. The project period would be 5 years.

3.2.6. TELEMETRIC LINKAGE

Many industries have installed on-line stack monitoring and effluent monitoring systems. Data is also generated by installing ambient air monitoring stations. Ambient water monitoring stations are also proposed. For timely action on the data, real time data have to be available at the Board Offices. A telemetric data linking system is planned. The expected cost is Rs. 25 lakh. The project period is one year. As a first phase it is proposed to have linkage with large and medium scale industries in red category / 17 categories.

3.2.7. MOBILE AIR & WATER QUALITY MONITORING UNIT

Localised problems need to be attended to and solved promptly. Mobile monitoring laboratories with continuous reading equipment, one each for air and water quality, need be procured. The anticipated cost is Rs. 2.5 crore.

3.2.8. PATROLLING-CUM-EMERGENCY RESPONSE SQUAD

In case of accidents or other unforeseen events, the Board team has to reach the site promptly and make pollutant identification and measurement using such equipments as toxic gas analysers, pocket monitors, portable chromatograph, pH meter, specific ion meter, etc. A mobile unit has to be kept ready for that. The expected expenditure is Rs. 150 lakh.

3.2.9. SEWERAGE AND SEWAGE TREATMENT PLANT FOR KAKKANAD

As already explained in para 2.1, the water quality in Chitrapuzha river is meeting designated water quality parameters except DO at Brahmapuram, Manackakadavu and Irumpanam. This is caused by non industrial sources. The lowering of DO is attributable to agglomeration of residential buildings and high rise apartment building in and around Kakkanad, which houses the District administration Head quarters and many IT industries and also due to the stagnation caused by silt deposition from run off from agricultural farms. The area has no sewerage coverage. Provision of sewerage and sewage treatment for the fast developing residential, administration and industrial area is an urgent necessity. It requires a 10 MLD plant for 1 lakh population. The estimated cost thereof is Rs. 40 crore.

3.2.10. SEWERAGE AND SEWAGE TREATMENT SYSTEM FOR GKA

GKA is having a population of 16.1 Lakhs as per 2001 census. Based on a per capita generation of 150 lit/day of waste water per day and a projected population of 20 lakh by 2025, the effluent generation would be 240 million litre of waste water is anticipated/day.

At present there is only a sewerage and sewage treatment plant (STP) of 4.5 MLD capacity. Sewerage and STP for the balance effluent generation of 235.5 MLD is an urgent need of GKA.

Under the directive of Ministry of Urban Development of Govt of India, GTZ is already working with Kochi Corporation for the formulation of a city sanitation plan for Kochi. Kochi Corporation forms a part of GKA. The project report is expected by the end of August 2010.

The Kochi Corporation has already prepared a master plan covering just the entire corporation area, relevant portions of which are cited below.

MASTER PLAN OF SEWERAGE NETWORK FOR KOCHI CITY

Master Planning of sewerage for Kochi Municipal Corporation has been done based on the design population of 700,000 persons in year 2041 and an average per capita water supply of 150 lpcd.

Kochi Municipal Corporation has been broadly divided into seven major sewerage zones depending on geography, existing sewerage and sanitation for planning purpose. This will also decentralise the collection, transportation and treatment.

Zone – I: West Kochi Area comprising of ward no. 1 to 10, 24 to 28 and a part of ward no -11 (30%).

Zone – II: West Kochi Area comprising ward no. 12 to 23 and part of ward no – 11 (70%)

Zone – III: Willington Island comprising of ward no – 29 and 30

Zone – IV: Central Kochi comprising of ward no – 52 to 54, 59 to 62, 64, part of ward no. 63 (90%) and 65 (20%)

Zone – V: West Kochi comprising of ward no – 31 to 38, 40, 66 to 71 and part of 39 (70%), 41(10%), 63 (10%) and 65 (80%).

Zone – VI: East Kochi comprising of 42 to 48, 51 and part of 41 (90%)

Zone – VII: South Kochi comprising of ward no 49, 50, 55 to 58

Zone – I and zone II covering Fort Kochi, Mattanchery and Palluruthy area separated from mainland of Kochi by large water bodies. This part of Kochi is densely populated. It is not techno-economically feasible to prepare an integrated sewerage scheme for this part of Kochi with the main land. Therefore, it is proposed to prepare independent system of collection, transportation and treatment for this part. Zone – I and Zone – II have design a population (2041) of 165, 151 and 134,634 respectively. Total sewage generated from these two zones will be in the order of 38 MLD considering water supply at the rate of 150 lpcd and other factors like ground water infiltration, floating population and institutional demand. The sewage is proposed to be treated at the 38 MLD (FAB Technology) Sewage Treatment Plant proposed at Mundamveli before letting in to the Pandarachal Canal.

Zone – III is an island mostly occupied by Indian Navy, separated from main land by large water bodies, ultimate projected population of this zone is 6794. Therefore, a treatment plant of 1.2 MLD based on Sequential Batch Reactor technology is suggested.

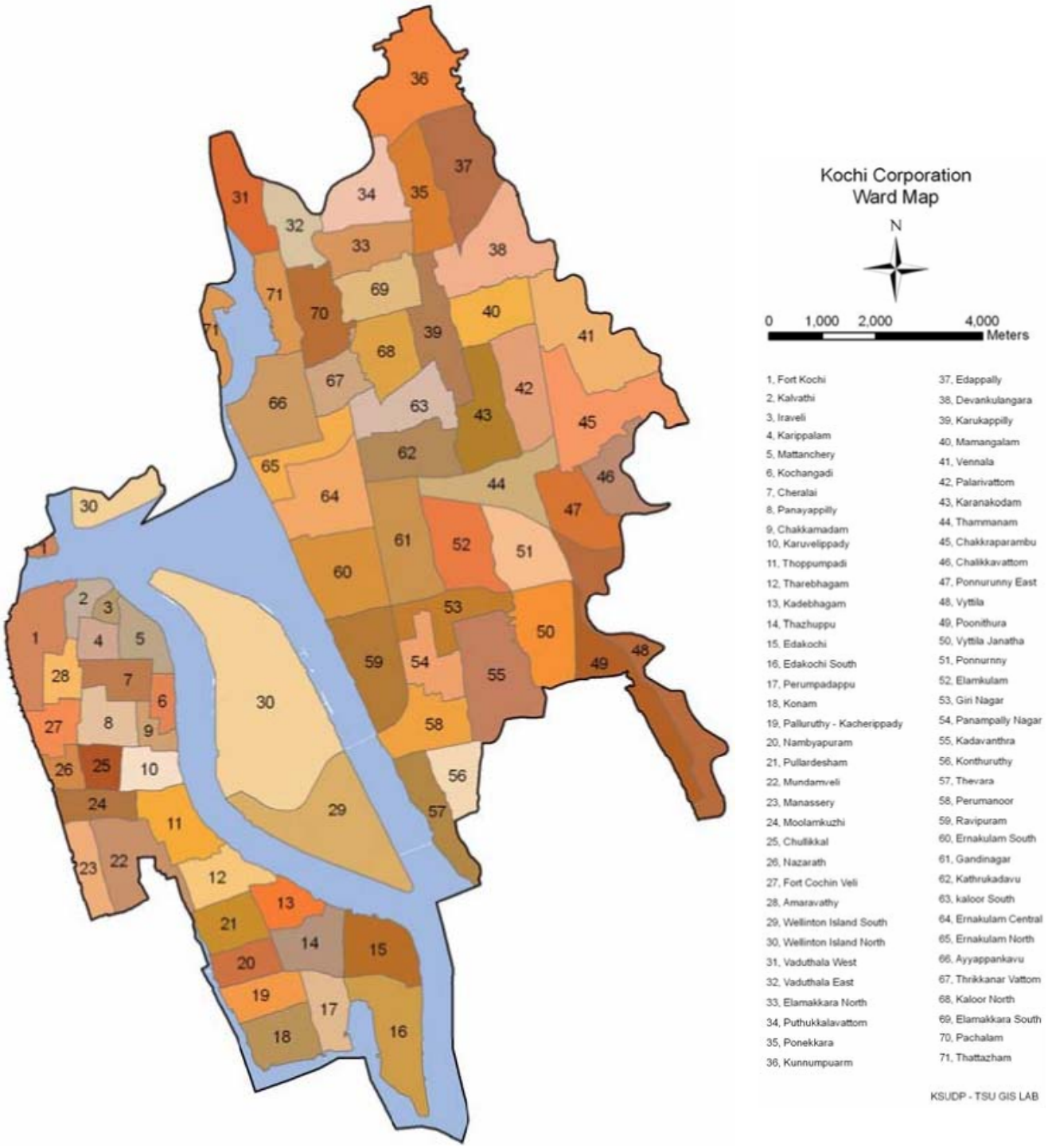
Zone – IV is Central Kochi, some portion of this zone has been covered under sewerage scheme, ultimate population of this zone is 87, 894, and sewage generation from this zone will be in the order of 14.50 MLD, out of which 4.5 MLD is already treated in the existing STP at Ernakulam, it is proposed to expand the present STP for accommodation of additional units of 10 MLD STP based on FAB technology.

Zone – V is the West Kochi covering Kaloor, Edappally and part of Vennala, this area is of relatively low population density. Ultimate population of this zone is 151,329 and sewage generation from this zone will be around 28 MLD. A private land has been identified at the north end of Amritha Institute of Medical Science for treating sewage generated from this zone.

Zone - VI is East Kochi with ultimate population of 86, 543 and sewage generation from this zone will be in the order of 15 MLD. it will be economical to construct a STP in the ward no. 45 nearer to Edapally Thodu.

Zone – VII is the South Kochi area comprising of Thevara. Ultimate population of this zone is 52, 676 and sewage generation will be in the order of 9 MLD. As this zone covers a wide area, it will be economical to construct a STP in the ward no. 55 nearer to Chilavannoor area.

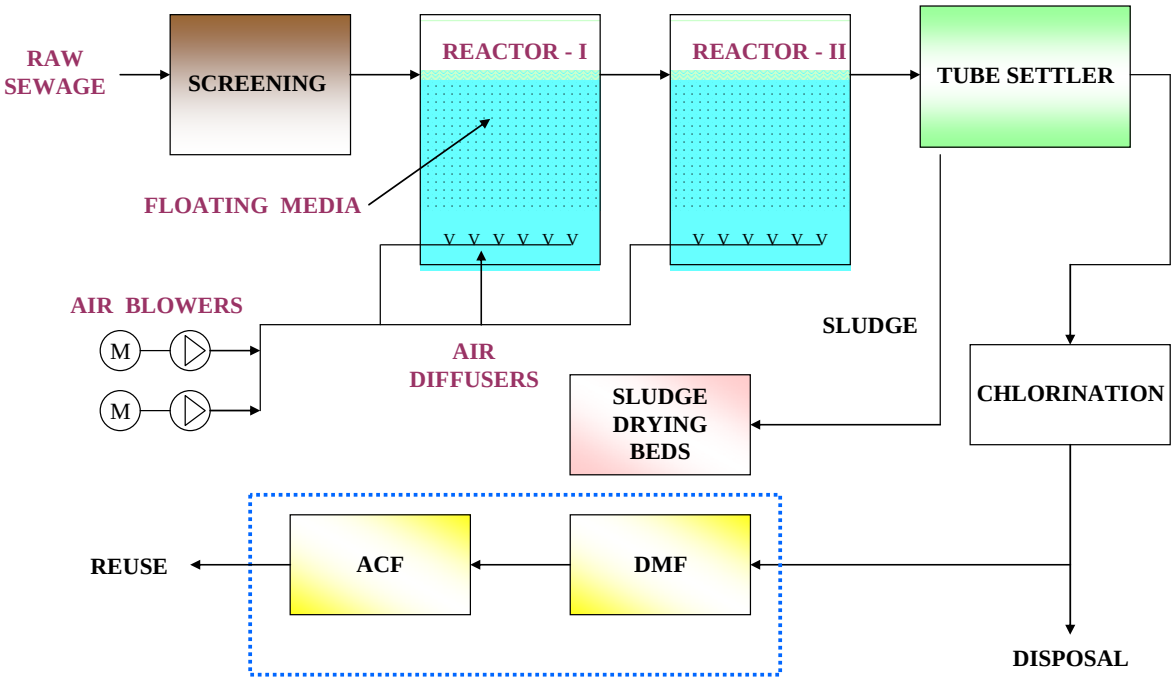
Ward map of Kochi Corporation is shown next.



Ward map of Kochi Corporation

PROPOSED TREATMENT SCHEME

FAB REACTOR BASED TREATMENT SYSTEM



SEWAGE TREATMENT PLANT FOR WEST KOCHI

Sanitary (Dry weather flow) @ 121 lpcd for 1,80,179 persons	=	21.80 MLD
Loading from Institutional establishments	=	0.43 MLD
Infiltration @ 5000 L/km day for 90 Kms	=	0.45 MLD
Total	=	22.68 say 23 MLD

Hence, a 23 MLD capacity STP based on Fluidized Aerobic Bioreactor Process (FAB) is proposed near Mundenveli.

DESIGN BASIS

This Technical Proposal to treat the sewage is based on the following;

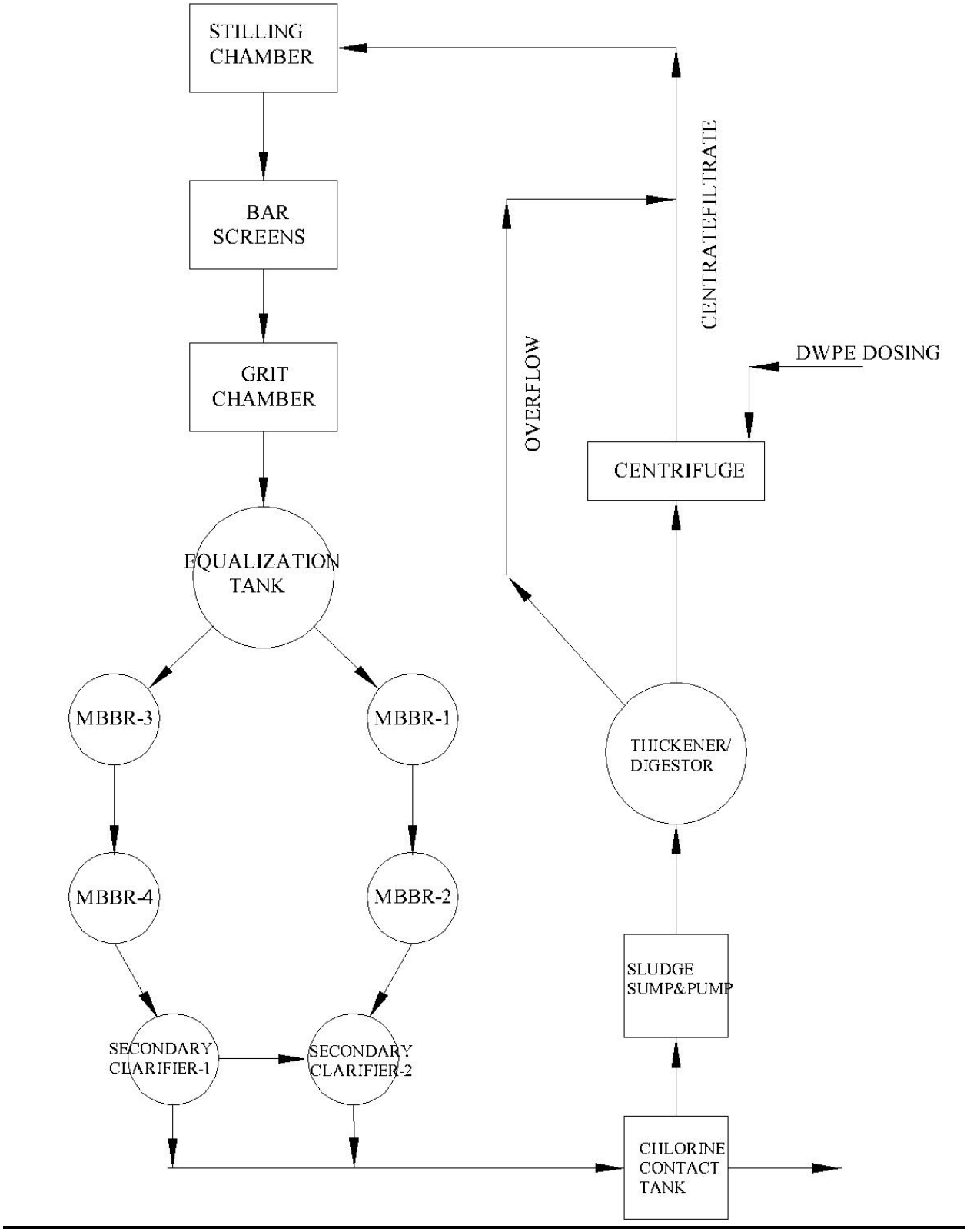
Parameter	Units	Values
Flow	m^3/d	23 MLD
Peak Factor	-	2.25 x Average
pH	-	6.0 – 9
BOD	mg/l	250
COD	mg/l	500
Total Suspended Solids	mg/l	400
Total nitrogen as N	mg/l	20 to 40
Total phosphates as P	mg/l	4 to 8
Coliform Count	MPN /100 ml	$10^6 – 10^7$

Treated Waste Water Quality

Parameter	Units	Tolerance Limit
pH	-	7.0 – 8.0
BOD	mg/l	≤ 30
COD	mg/l	≤ 100
Total nitrogen as N	mg/l	2 to 4
Total phosphates as P	mg/l	1 to 2
Total Suspended Solids	mg/l	≤ 50

S T P SITE AT MUNDENVELI

PROCESS FLOW DIAGRAM



PROCESS DESCRIPTION

The raw sewage is first collected in a raw sewage sump & then for further treatment, into three distinct parts:

1. **Pre-treatment**, which comprises of screening and grit removal,
2. **Biological treatment** comprising of moving bed aerobic bioreactors, followed by clarification, and
3. **Tertiary treatment** comprising of addition of chlorine to remove the E- coli.

Detailed description of each step of treatment is given below:

1) PRE-TREATMENT

Inlet Screens & Pumps (Optional)

The screen channel is provided at the inlet to Receiving Sump. The coarse screen is installed in the channel for removal of large floating matters. The raw sewage is then collected in the Receiving sump from which the sewage is pumped to the Stilling Chamber.

Screen & Grit Removal

The sewage is received in the Stilling Chamber .The quiescent flow conditions are achieved in the stilling chamber & the Raw Sewage then follows through Bar Screens for removal of floating matter. Removal of such floating / coarse matter is essential because it can otherwise choke pipelines / pumps etc, and hinders the normal operation of the treatment plant. The mechanical screen is made of steel bars, placed at equal intervals. The inclination of bars is kept such that raking becomes easy. A manual standby screen is also provided. The screenings are conveyed through the conveyors up to the suitable loading point from where it can be transported using trolley by client. The screened sewage is now made to pass through the grit chamber**.** The grit present in the raw sewage represents sand / dirt collected in the sewerage system. This must be removed, in order to keep the channels / pipes clean. Grit has high settling velocity, and can be easily removed in the Grit Chamber. The grit removal provided here is a Mechanical grit removal system. As the sewage is made to pass through this system the grit settles on the floor. The grit shall be collected in a trolley to be provided by client.

2) BIOLOGICAL TREATMENT

The main pollutants in the raw sewage are represented in the form of Bio-chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). The bacterial ability to synthesize the organic matter to harmless end products like carbon di-oxide and water molecules is utilized to treat the raw sewage.

The bio-reactions are carried out in controlled environment in the Moving Bed Bio-Reactor (MBBR). The bioreactor comprises of a tank, fitted with aeration grid. The bacterial activity needs dissolved oxygen, to synthesize the organic matter. This is supplied by passing air in form of small bubbles. The air is passed at the bottom of the tank, so that complete volume of tank is utilized. Oxygen dissolves in liquid, which can now be used by the bacteria. The bacterial population is present on the media, which forms an integral part of the reactor system. The media is made of small plastic elements. Millions of such pieces are present in the reactor. A very large surface area is available for the bacterial population to grow. The bacteria grow on the plastic media, by using the organic content in the raw sewage, and the dissolved oxygen available. Due to constant aeration, the media is set in whirling motion, so that continuous mixing takes place.

The bacterial layer growth on the media surface increases to a certain extent, and then gets sloughed off after a specific period. This phenomenon is called sloughing. This creates new surface for further bacterial growth. Sloughing takes place only after complete growth and subsequent dyeing – off of the bacterial layer and hence the sloughed off material is completely digested. The bacterial reaction is carried out in two stages, for maximizing the BOD removal efficiency. Hence, two such reactors are provided in series. Within the reactors, arrangements are made to retain the plastic media in place.

Air supply is done through perforated stainless steel pipes. Use of stainless steel pipes ensures that no maintenance is required.

3) TERTIARY TREATMENT

The sloughed biomass must be removed before the treated sewage can be disposed off. Hence solids will be separated in Secondary Claritubesettler. The secondary claritubesettler is equipment in which the Bio-Mass is removed and suspended solids are settled & scraped mechanically.

The treated sewage is then added with chlorine to kill the E-Coli coliforms, so that it becomes fit for disposal. The chlorine being a very strong oxidizing agent, a small dose is enough to achieve desired levels of dis-infection. Small residual chlorine (of the order of 0.2 – 0.25 mg / l) also ensures that there is no re-growth of E-coli, till the final disposal point.

4) SLUDGE HANDLING

The Sludge formed in the process of bio-degradation is collected in the Sludge Sump & is pumped to the Sludge Thickener for gravity thickening. The thickened sludge is the pumped to the Centrifuge for mechanical dewatering. The dewatered sludge can be used as a soil conditioner. Overflow from thickener & centrate from centrifuge will be transferred to the feed chamber of Claritubesettler.

5) FUND REQUIREMENT

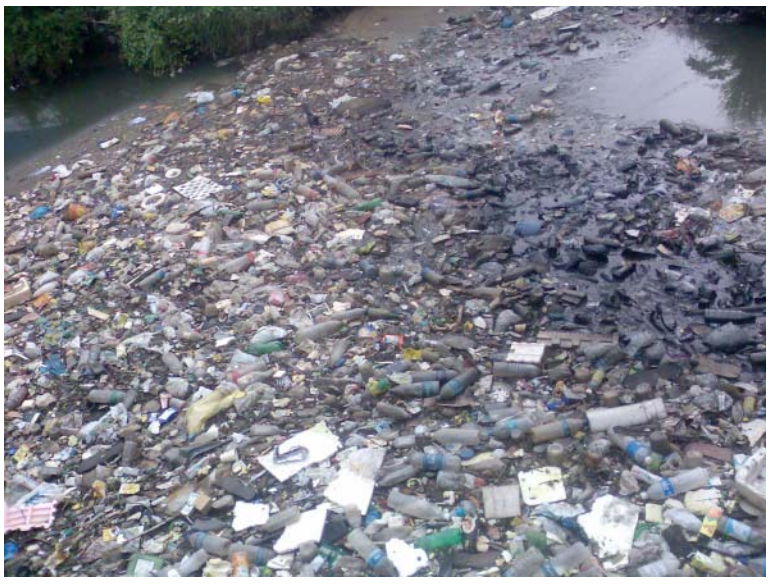
GKA is expected to generate 240 MLD of sewage per day by 2025. The plants already under construction/consideration are 15 MLD plant at Elamkulam (under JNNURM), 35 MLD plant at Mundenveli (under Kerala Sustainable Urban Development Project) and 10 MLD plant at Kakkanad (proposed under 3.2.9 of this Action Plan). Hence the net additional requirement is a 240-(15+35+10) = 240-60 =180 MLD. The estimated cost is Rs. 720 crore.

3.2.11. REJUVENATION OF CANALS

Kochi is a coastal settlement interspersed with backwater system and fringed on the eastern side by laterite capped low hills from which a number of streams originate forming a canal network and drain into the backwater system. The western part of the area is a flat coastal zone, which forms a part of the coastal plains of Kerala, and the eastern low hills are part of the midland region.

The Western flat land comprises of 52 drainage units covering an area of 115 km^2 and islands in the backwater system with a total area of 56.4 km^2. The backwater extending to an area of 72.6 km^2 also comes within this zone. The eastern low hills, covering an area of 291 km^2, comprises of 21 stream basins or micro catchments, each with independent watershed area. These 21 major streams originating from the eastern low hills run mostly west in between the low hills and drain into the tidal canals with a linkage to the back water system.

The domestic sewage from Kochi city and its satellite towns ends up in the tidal canals and the estuary. Mullassery Canal, Thevara canal, Perandoor canal, Karanakkodam thodu, Koithara thodu, Edappally thodu, Poorni Puzha, Changadampok thodu, Kharee thodu and Punchathod are the canals heavily polluted by urban waste but having fresh water for some part of the year. In the absence of sewerage system and efficient solid waste management system, the effluents from commercial establishments in the city ends up in the canal network together with the sludge left in the canals by tidal effects. The water body get stagnated resulting in putrification and eutrophication. A few pictures depicting the situation are given next.



The canal network need be made functional by de-silting, side wall protection, induced flow generation and providing alternatives to dumping of solid and liquid wastes into it. Platforms with mechanical system at intervals for the entire canal network with standby motors can help churn the bottom zone for improving the water quality and for inducing flow. Added benefit will be the substantial reduction of mosquitoes, which cause repeated onslaughts of Dengue, Chikun Guinea, Malaria and Filariasis.

Sewerage and sewage treatment plant coverage required is stated in 3.2.10 and is not repeated here. Sullage collection and treatment, side wall protection, gradient correction, desilting, flow inducement and beautification works need be done. The approximate cost is Rs 90 lakhs per km. For the network of 30 km to be covered, the total cost estimated is Rs. 27 crore.

3.2.12. REMEDIATION OF CONTAMINATED SITES

The SCMC had identified Kuzhikandamthodu, a narrow creek of nearly 2.7 km length as the depositary of hazardous wastes over decades from some chemical industries situated in Eloor area and directed that it be cleaned up. As the downstream areas of the creek were being used for prawn cultivation, disturbance of the sediments in the creek had to be done with utmost care. The Board was and is of the opinion that not only Kuzhikandamthodu but its adjoining/adjacent areas in Eloor (including Ammanthuruthu) need remediation. Eloor is on one side of River Periyar and across the river is Edayar, another industrial area. Similar areas in Edayar (including Chakkarachal and Edayattuchal) need remediation. This is a huge task beyond the capacity of the State. At the Central Board's suggestion, GTZ- the German technical cooperation agency - stepped in. They, with the assistance of the State Board, have collected samples from the creek and adjoining areas at different depths and are analysing samples and processing the data. The GTZ furnished their preliminary investigation report on 31.3.2009. Further studies are being carried out by them, in co-operation with the Board. It is expected that an action plan would be ready by the end of 2010. The total cost may be around Rs. 75 crore.

3.2.13. WATER SUPPLY TO ELOOR- EDAYAR AREA

As per SCMC direction, some areas of Eloor Grama Panchayat is provided with water supply with support of four industries HIL, FACT, IRE and Merchem Ltd. The water is being supplied from the water supply scheme of FACT temporarily. As the scheme of Kerala Water Authority is not likely to be implemented soon, it may be considered to continue the scheme under the proposed action plan by providing an assistance to the tune of Rs. 1 crore/year. Thus for a project period of 5 years the amount would be Rs. 5 crore.

3.2.14. HEALTH STUDY

Considering the industrialisation and commercialisation of Eloor -Edayar area so far and also taking into consideration of the apprehension of the public that the local people are suffering from various ill effects due to the pollution, an authentic study on the health effects on the people in the area, if undertaken, could analyse the reality of situation. There is a wide spread public perception that the area is extensively polluted and the local community is suffering from ill effects of industrialisation.

A study, first of its kind in the area, was conducted by an agency appointed by the Government, on request of public, in nine wards in Eloor Grama Panchayath (affected area) and Pindimana Grama Panchayath (reference area). The study report recommended a comprehensive study by a competent agency regarding the occupational health problems among workers in the industries of Eloor area. The report also recommended introducing a health insurance package for the residents. It is also suggested to extent the survey to the other industrial area of Ambalamugal area. Regular medical camps shall also be arranged as part of this scheme. The expenditure would come to Rs 30 lakh.

3.2.15. CONSTRUCTION OF TWO BRIDGES AT NORTH AND SOUTH OF ERNAKULAM CITY

Kochi being the commercial hub of Kerala has plans for new developmental projects like IT parks, container terminal, LNG terminal, gas pipeline projects, Airport, Special Economic Zone etc. Hence large scale transportation network has to be supported to this development. The present network roads are just 15 m wide, resulting in traffic congestion and consequent automobile pollution. Inadequate public transport in the routes has led to people traveling to the city in cars, autorickshaws and two-wheelers, causing more congestion on the roads. Provision of two flyovers or bridges near north and south railway stations would reduce the congestion considerably and would also enable evacuation of the city in case of any calamity. The proposed METRO would also help in reducing the traffic congestion. The two flyovers, each 1.5 km long, would cost about Rs. 300 crore.

3.2.16. INCINERATOR FOR CTSDF

A common Treatment, Storage and Disposal Facility with secured landfill capacity of 50,000 tonne/year is established at Ambalamedu, Ernakulam. The Kerala Enviro Infrastructure Ltd. is the operator of the facility.

The CTSDF comprise the following facilities:

- Storage shed, laboratory equipments for comprehensive analysis
- Waste treatment and stabilization facility

- Secured Landfill
- Leachate collection and treatment facility
- Multiple effect evaporator

The estimated annual generation of hazardous waste in the State is 66,558 tonne, of which 45,370 tonne is landfillable, 230 tonne is incinerable and 20,958 tonne is re-recyclable.

The CTSDF is now keeping some quantity of incinerable wastes under safe storage. The CTSDF need be augmented to handle incinerable wastes. The anticipated expenditure is Rs. 1 crore. The project period would be 1 year.

3.2.17. E – WASTE TREATMENT AND DISPOSAL AT CTSDF

Assuming a very modest rate of 5 kg of e-waste generation per person per year, the e-waste generation in Kerala would come to 1,50,000 t/year. The quantity may be still come higher due to high consumerism and standard of living and higher influx of IT industries. There is no e-waste treatment and disposal facility in Kerala. To augment the CTSDF to cater to the need for storage, handling, treatment and disposal facility, financial assistance would be required. Also a collection on system has to be built up. The anticipated expenditure is Rs. 10 crore. The project period would be 1 year.

3.2. 18. MUNICIPAL SOLID WASTE MANAGEMENT

The MSW management in Kochi Corporation is grossly inadequate. Proposals for improvement are under consideration. The neighboring municipalities and urbanized panchayats are in worse state. Conventional systems are impracticable due to acute scarcity of land. Methodologies favouring substantial volume reduction need be adopted. It is proposed to have such systems in Kalamassery Municipality, Aluva Municipality and Thrikkakkara Grama Panchayat. The total estimated cost is Rs. 15 crore.

3.2.19. BIOMEDICAL WASTE TREATMENT FACILITY

There is only one common biomedical waste treatment facility in the State of over 600 km length. As transportation to bring the wastes from all over the State to the common facility is costly and difficult, it would be better to have one more common facility, preferably at Kochi which lies almost in the centre of the State. This may be planned as an addendum to CTSDF at Ernakulam. The estimated cost is Rs. 5 crore. Land is available and hence its cost is not included. .

3.2.20. LIQUIFIED NATURAL GAS BUNKS AND VEHICLES

In order to convert the diesel fuelled vehicles to those run by LNG and to have uninterrupted supply of LNG, it is proposed to have LNG fuelled public transport system and LNG bunks. As a LNG terminal is coming up at Vallarpadam, there is scope for the project. An initiative may be made by providing 10 LNG fuelled buses in the public sector and 10 LNG dispensation bunks. It is expected to provide impetus to the private sector to follow suit. The expected cost is Rs. 10 crore.

3.2.21. GREEN BELT DEVELOPMENT

The greenery for which Kerala is famous is yielding to a concrete jungle. It is proposed to restore and improve greenery with the support of Social Forestry Dept. of Govt. of Kerala and participation of student volunteers from National Service Scheme, Bhoomithrasena, National Cadet Corps and National Green Corps. A provision of Rs. 50 lakh is proposed for GKA.

3.2.22. AUGMENTATION OF INFRASTRUCTURE OF THE BOARD

For implementing the action envisaged above, the Board need be strengthened in terms of manpower and equipments. The Regional Office, two District Offices, one Environmental Surveillance Centre and the Laboratory at Ernakulam are to be strengthened in this connection. The staff requirement may be supported for five years. An amount of Rs. 20 lakhs per annum is required for the purpose, totally Rs. 1 crore for five years. For laboratory and office augmentation, Rs. 30 lakh is expected to be needed.

4. SUMMING UP

To implement the action plan, steps are to be taken in an integrated manner. Different organizations are to be involved in the implementation process. The main organisations are as following:

I. Kerala State Pollution Control Board
II. Local Self Government Department
III. Revenue Department
IV. Industries Department
V. Environment Department
VI. Forest Department (Social Forestry)
VII. Public Works Department
VIII. Industries

The following Table shows the activities - individual / common - and the expected cost.

Sl. No.	Action	Project Cost (Rs. Lakhs)
Short Term Measures		
1	**Industrial Pollution Control**	18241 *
2	**Monitoring Arrangement**	10
3	**Demarcation of Area**	10
Long Term Measures		
1	**Common Effluent Treatment Plant**	850
2	**Common Pipeline for Treated Effluent**	3000
3	**Electricity Supply Improvement**	2500
4	**Continuous Water Quality Monitoring**	100
5	**Continuous Ambient Air Quality Monitoring**	150
6	**Telemetric Linkage**	25
7	**Mobile Air & Water Quality Monitoring Unit**	250
8	**Patrolling – cum – Emergency Response Squad**	150
9	**Sewerage and Sewage Treatment Plant for Kakkanad**	4000
10	**Sewerage and sewage treatment system for GKA**	72000
11	**Rejuvenation of canals**	2700

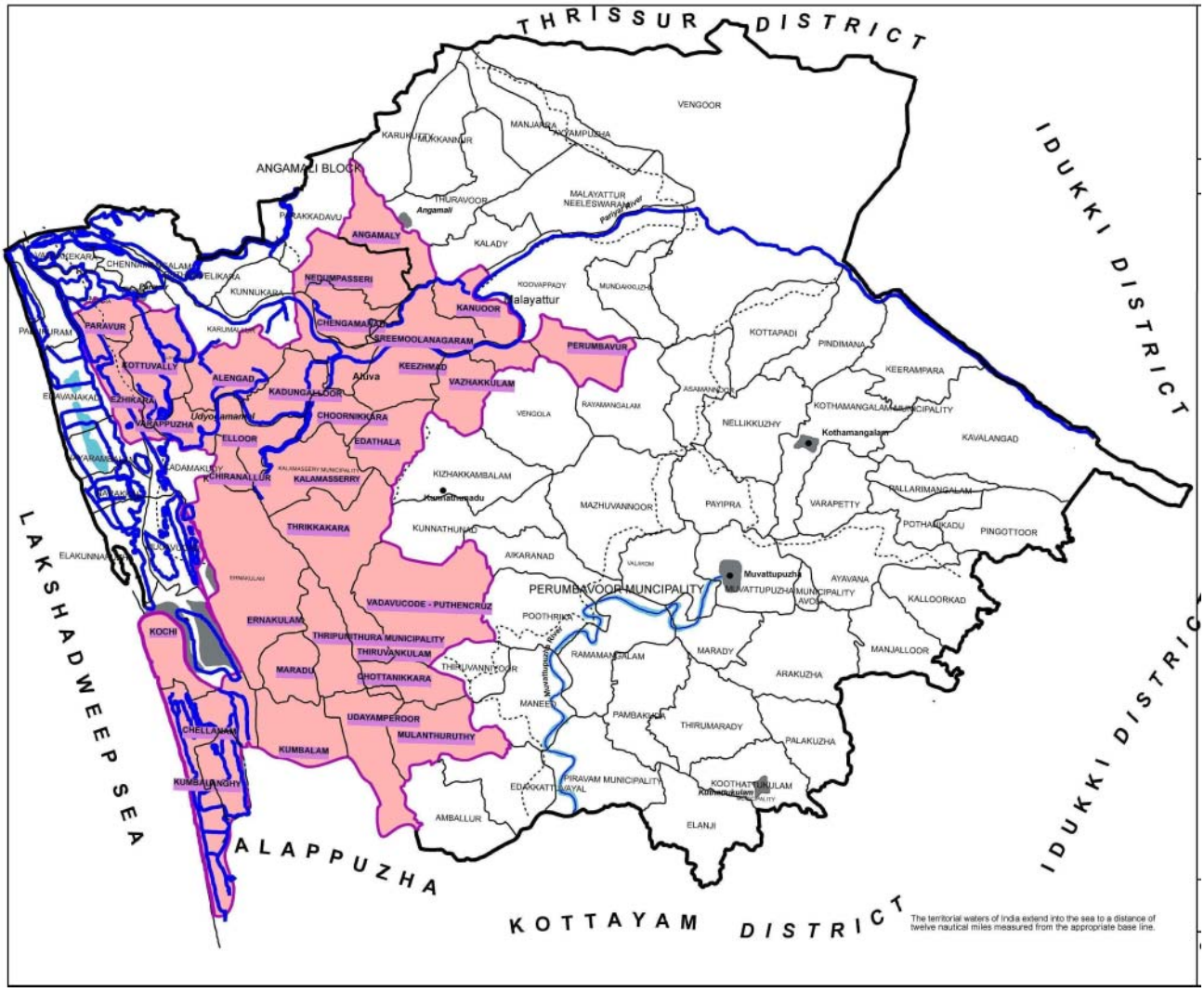
12	**Remediation of contaminated sites**	7500
13	**Water supply to Eloor- Edayar area**	500
14	**Health study**	30
15	**Construction of two bridges at north and south of Ernakulam city**	30000
16	**Incinerator for CTSDF**	100
17	**E – Waste Treatment and Disposal at CTSDF**	1000
18	**Municipal Solid Waste Management**	1500
19	**Biomedical Waste Treatment Facility**	500
20	**Liquified Natural Gas Bunks and vehicles**	1000
21	**Green Belt Development**	50
22	**Augmentation of Infrastructure of the Board**	130
TOTAL		**1,46,296**

* In addition, the industries have agreed to spend Rs. 15000 lakh of their own for pollution control measures.

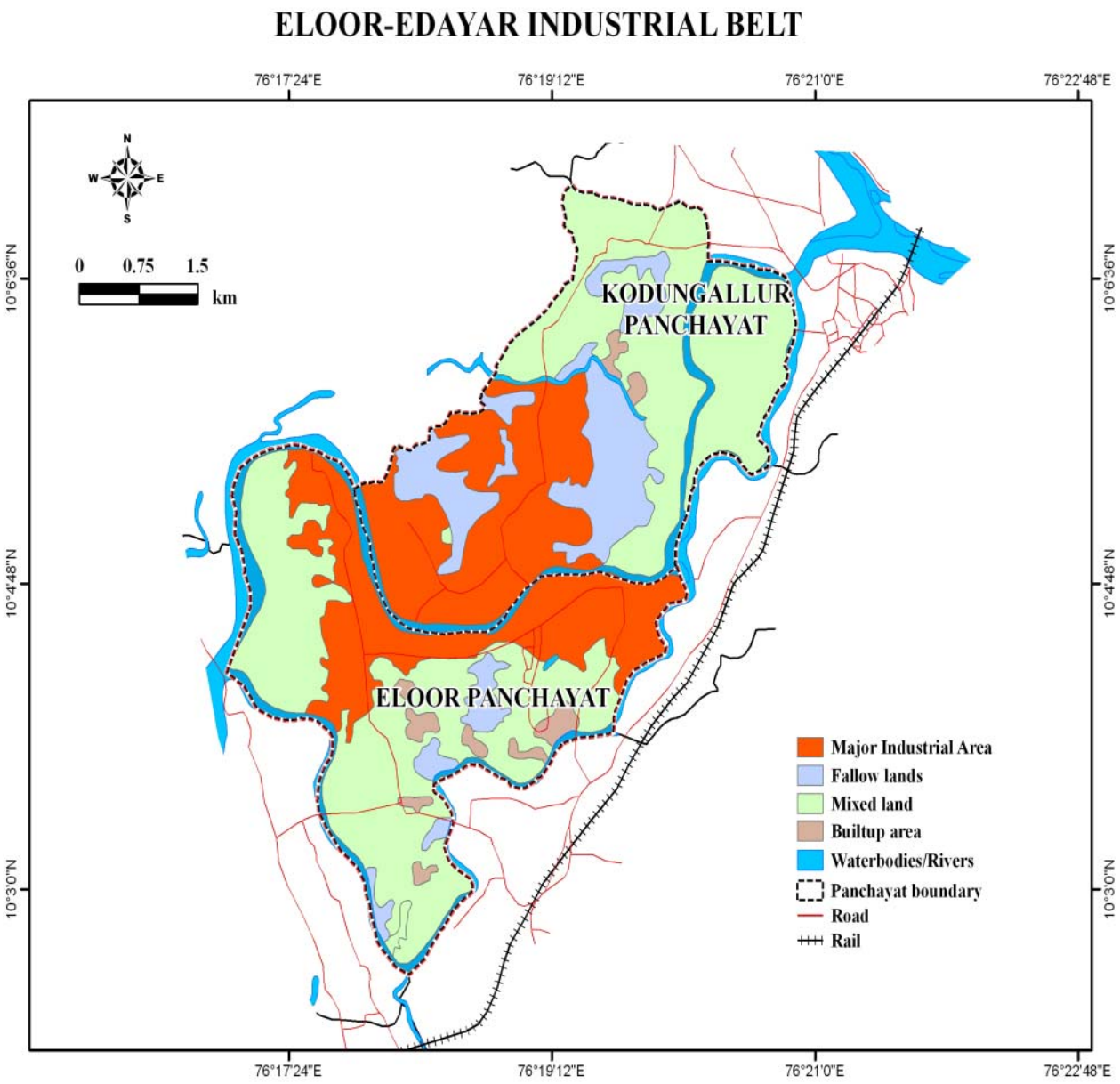
ANNEXURES

Annexure 1

MAP SHOWING THE WHOLE PROJECT AREA

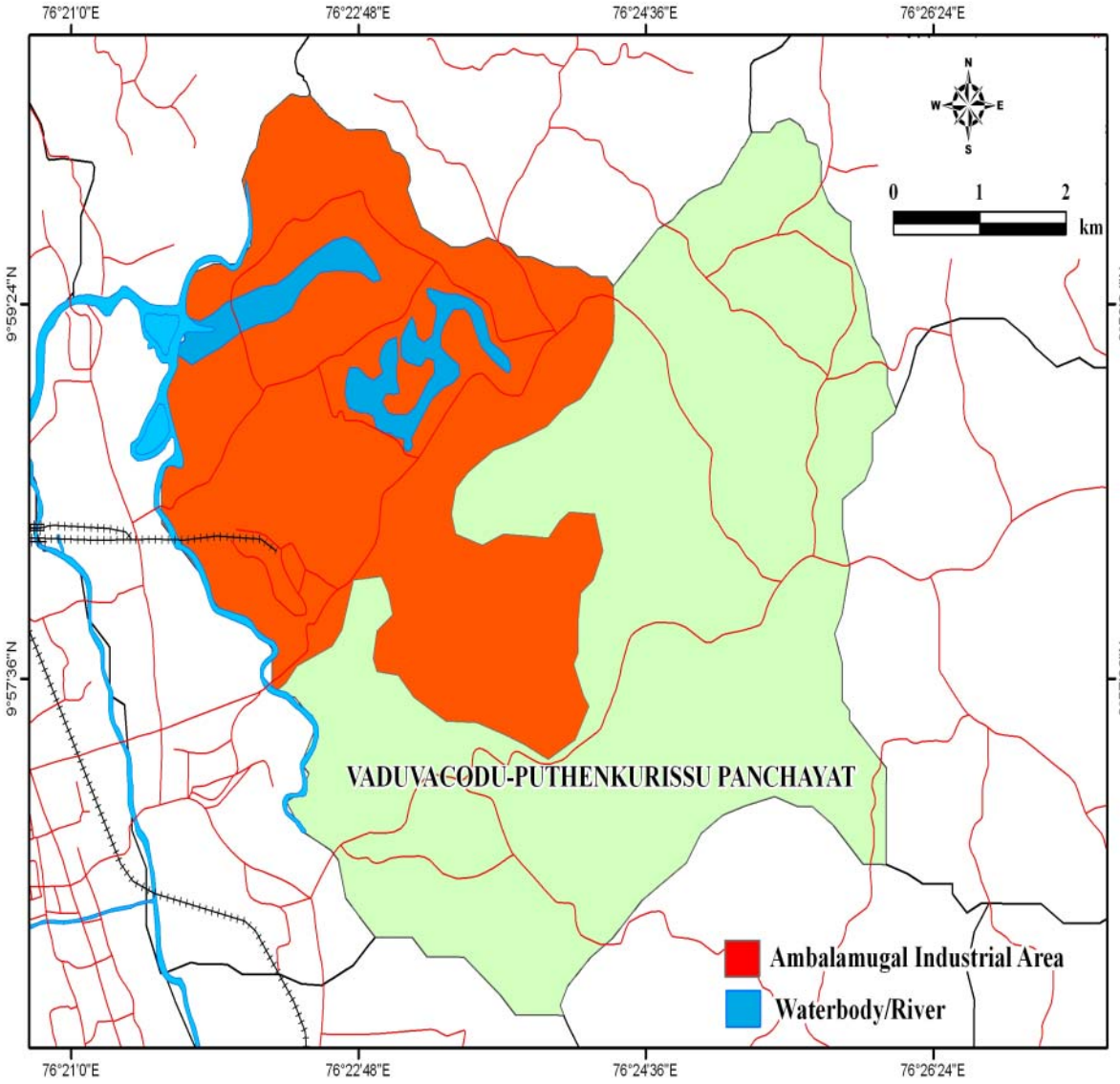


Annexure 2


ELOOR-EDAYAR INDUSTRIAL BELT
76°17'24"E
76°19'12"E
76°21'0"E
76°22'48"E
10°6'36"N
10°4'48"N
10°3'0"N
N
W
E
S
0 0.75 1.5
km
KODUNGALLUR PANCHAYAT
ELOOR PANCHAYAT
Major Industrial Area
Fallow lands
Mixed land
Builtup area
Waterbodies/Rivers
Panchayat boundary
Road
Rail

Annexure 3.

AMBALAMUGAL INDUSTRIAL AREA



INDUSTRIES IN AMBALAMUGAL AREA **ANNEXURE – 2A**

1 **BPCL Kochi Refinery, Ambalamugal, Ernakulam – 682 302**

Product	**Pollution Control Status**						**Action Plan, Target date & cost**		
Licensed Capacity (t/yr) as per the consent	**AIR**	**WATER**	**HW**				**individualistic**		
			Hazardous waste	**Quantity**	**Storage**	**Mode of disposal/ treatment**	**Action plan**	**Date of completion**	**Cost in Rs.**
Liquefied Petroleum Gas Liquefied Petroleum Gas - 500000 PIB - 6300 MS - 1000000 Naphtha - 1440000 Benzene - 87200 Toluene - 50000 Rubber solvent- 10000 ATF - 220000 Kerosene - 1200000 HSD - 3720000	Ambient air as well as stack emission quality conforms to the standard level.	There are three ETP consists of surge pond, API separator, TPI separator, Flash mixer, Clariflocculator, Trickling filter, Aeration Tank, Dissolved Air Floatation Unit, Final clarifier, Sludge drying beds, etc. Treated effluent coming out of the system is stored in Fire ponds I and II.	Oil sludge /emulsion	180 t/y	Impervious tank with proper roof	Sludge reprocessing	a) Facility for bringing the product quality to Euro 3 equivalent standards (Sulphur level in diesel to 350 PPM and in petrol to 150 PPM)	October 2010.	3250 Crore
	Ambient air quality status	Quality of the treated effluent conforms to the standards as below	FCCU Catalyst fines	90 t/y	Stored in secured place	Storage in secured landfill	b) Addition of new sulphur recovery unit will be completed	October 2010	150 crore

	FO - 2250000 Sulphur - 41000 Bitumen - 350000 Bitumen Emulsion - 50000 Rubberised Bitumen - 65000 Jet Propulsion Fuel - 12000 Diesel Additives - 5000 MTO - 60000 Hydrogen -1000 LDO - 50000 <u>Bitumen blowing unit</u> Viscosity graded bitumen VG10 - 1135.2 t/day VG 20 - 1135.2 t/day VG 30 - 924 t/day VG 40 - 660 t/day Penetration graded bitumen: S-35 - 840 t/day S-60 - 960 t/day S-90 - 840 t/day	Parameter	min	max	Parameter	min	max	Reformer/ Hydrogen/ DHDS/NHDS/KHDS/ Spent catalyst	309 t/y	Stored in secured place/sale	Disposal in hazardous waste secured landfill/ sale as per guidelines of the CPCB	c) Installation of Energy meters for ETPs will be completed	October 2010	10 Lakh
								Chemical sludge from waste water treatment	15 t/y	Stored in secured place	Disposal in secured landfill	d) Partial replacement of fuel oil by LNG will be implemented	March 2012	57 Crores
		(PM) (mg/Nm^3)	586.33	615.67	pH	6.37	7.03	PIB waste oil	3.8 t/y	Stored in secured place	Reprocessing	e) Linking of ambient air monitoring data with the Central Pollution Control Board. Electronic Data Bank (EDB) can be implemented subject to	March 2012	
		(SO2) (mg/Nm^3)	98.17	110.67	TSS mg/l	8.5	12.16							
		Stack Emission Status			BOD mg/l	5.49	13.47	Spent molecular sieves	10 t/y	Stored in secured place	Disposal in secured landfill			
		Parameter	min	max	Sulphide mg/l	0.35	0.48							
		SO2 (mg/Nm^3)	6.93	9.18	Phenol mg/l	0.14	0.41							

	S-135 - 1135.2 t/day Multigraded bitumen MGB -55-25 - 600 t/day MGB 45-35 840t/day	NOx (mg/Nm^3)	37.82	42.08	Oil & grease	1.44	6.27					technical feasibility.		
		SPM (mg/Nm^3)	108.73	148.05										

2	**Phillips Carbon Black Limited Brahmapuram P.O, Karimugal, Kochi – 682 303**									
	Product	**Pollution Control Status**						**Action Plan, Target date & cost**		
	Carbon Black -150 MT/day	**AIR**	**WATER**	**HW**				**Action plan**	**Date of completion**	**Cost In Rs.**
		Ambient air as well as stack emission quality conforms to the standard level.	ETP system consists of oil separators deemulsifier, primary settling tank, flocculator clarifier, sand filters, treated water collecting tanks and storm water ponds. Treated effluent from the ETP is used 100 % recycle and reused in the process and zero effluent discharge status is maintained. The capacity of ETP is 150	**Hazardous waste**	**Quantity**	**Storage & Mode of disposal/treatment**	Continuous ambient air monitoring facility	December 2010	70 Lakhs

<table>
<tr><td></td><td></td><td colspan="4"></td><td colspan="3">m^3/day. The average effluent quantity 75 m^3 /day.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td colspan="4">Ambient air quality status</td><td colspan="3">Quality of treated effluent conforms to the standard as below</td><td>Used oil</td><td>460 ltr</td><td>Stored in plastic kept on concrete floor under the roof</td><td rowspan="3">Water cooled reactor technology for reducing emission from one reactor</td><td rowspan="3">Installed on April</td><td rowspan="3">100 Lakhs</td></tr>
<tr><td></td><td></td><td>Parameter</td><td>min</td><td>max</td><td>Parameter</td><td>max</td><td>min</td><td>ETP sludge</td><td>128.58 MT</td><td>Stored in secured land fill</td></tr>
<tr><td></td><td></td><td>SPM (ug/m^3)</td><td>82.11</td><td>82.35</td><td>pH</td><td>6.95</td><td>7.37</td><td colspan="3">Non Hazardous</td></tr>
<tr><td></td><td></td><td>SO2 (ug/m^3)</td><td>15.31</td><td>16.82</td><td rowspan="5">SS</td><td rowspan="5">5.8</td><td rowspan="5">19.33</td><td rowspan="5">Used filter bag</td><td rowspan="5">5219 kg</td><td rowspan="5">Stored in impervious concrete pit.</td><td rowspan="5">Replacement of fuel by LNG</td><td rowspan="5">March, 2012</td><td rowspan="5">100 lakhs</td></tr>
<tr><td></td><td></td><td>H2S (ug/m^3)</td><td>4.12</td><td>4.31</td></tr>
<tr><td></td><td></td><td>CO (mg/m^3)</td><td colspan="2">0</td></tr>
<tr><td></td><td></td><td>Sound (dBA)</td><td>50.11</td><td>52.7</td></tr>
<tr><td></td><td></td><td colspan="4">Stack Emission quality for the past three years are as follows</td></tr>
<tr><td></td><td></td><td colspan="2">Stack No.</td><td>Parameter</td><td>Min (ug/m^3)</td><td>Max (ug/m^3)</td><td colspan="7"></td></tr>
</table>

		3.1 VBC	PM	46.33	49.15	BOD	17.17	24.52						
			SO_2	157.33	170				Paper waste	1 MT/year	Collected in bins and disposed by tendering.	Rain water harvesting facility	completed	5 Lakhs
			H_2S	0										
			CO	38.29	42.1									
		3.3 Dryer	PM	58.79	68.65									
			SO_2	807.33	827.33	COD	37.17	46.67						
			H_2S	0	0									
			CO	37.71	39.97									
		3.4 Incinerator	PM	45.71	66.32									
			SO_2	142.66	165.33				Scrap iron	30 MT/year	Disposed by tendering	Increase the power generation from 2.5 to 10 MW using the existing gas	March, 2011	50 Crores
			H_2S	0	0									
			CO	38.82	38.89	Oil&grease	0.32	0.76						
		3.5 CPP	PM	62.42	66.42									
			SO_2	767.33	784									
			H_2S	0	0									

			CO	39.31	41.19									

3.	**Hindustan Organic Chemicals Ltd, Ambulamughal p.O, Ernakulam-682 302**							
	Product	**Pollution Control Status**					**Action Plan, Target date & cost**	
	Phenol - 121 MT/day H2O2(50%) - 32 T/day Co-Product Aceton - 75MT/day	**AIR**	**WATER**	**HW**			**individualistic**	
				Hazardous waste	**Quantity in ton/year**	**Storage**	**Mode of disposal/treatment**	**Action plan**	**Date of completion**	**Cost**
		i) A flare stack with continuous flare is taking care of any emission of gaseous hydrocarbon from the process plant vents.	Mixing tank,effluents from cumene, cumox, fractionation and tankage sections are collected in the raw effluent equalisation tank (REET). The effluent from the propylene recovery unit is collected in MEA sump. The effluents from DM plant, boiler section, cooling tower and hydrogen peroxide plant are collected in a pit near DM plant. All the effluents from mixing tank, REET, MEA sump and DM plant sump are mixed in raw	CPP sludge & used oil (Waste category 5.0 – Schedule -I)	155	Drums kept in concrete floor with proper roof	Disposed to parties who had valid authorisation from KSPCB and registration from Ministry of Env. & Forest for purchasing Category No. 5	To Conserve fuel and reduce the emission by 5 % reduction in the consumption of fuel.	Modifications already completed by April 2010	10 lakhs.

			effluent sump. The combined effluent is then taken to API oil separator. After the removal of the oil, the effluent is then taken to the clariflocculator through flash mixer. Clarified water, free from oil and suspended particles, flows along with sufficient urea to the trickling filter for biological treatment. The treated effluent from the trickling filter is pumped to aerator for the second stage of biological treatment. The treated effluent from aeration tank taken through the over flow weir to the final clarifier. The clear over flow from the final clarifier is collected in the final disposal tank							
		ii) Benzene tanks are provided floating roof to minimise the emission.	Quality of the treated outlet water for the past three years is as follows			Spent catalyst from Cumene reactor (Waste category C5 – Schedule -II)	40	Stored in secured place	Disposed to CTSDF	
		iii) Fugitive emission from pump seals and compressors are minimised by using double mechanical seals.	Parameter	Flue gas cleaning residue (Waste category 34.1-Schedule – I)	min					

<table>
<tr><td rowspan="11"></td><td rowspan="11"></td><td colspan="4" rowspan="2">iv) Refrigerator water-cooled condensers are provided for all the acetone vent lines.</td><td>pH</td><td>8.41</td><td>8.05</td><td rowspan="2">Flue gas cleaning residue (Waste category 34.1-Schedule – I)</td><td rowspan="2">4</td><td rowspan="2">Stored in secured place</td><td rowspan="2">Disposed CTSDF</td><td rowspan="10"></td><td rowspan="11"></td><td rowspan="11"></td></tr>
<tr><td rowspan="2">BOD (3days @ 27^{o}C mg/l</td><td rowspan="2">3.25</td><td rowspan="2">2.58</td></tr>
<tr><td colspan="4" rowspan="2">v) Low sulphur furnace oil is used as a fuel in Boiler and Hot oil furnace.

Hydrogen peroxide plant</td></tr>
<tr><td rowspan="2">i) Solvent recovery system with activated hydrocarbon adorbers to recover the solvent and to recirculate the recovered solvent back to the system.</td><td rowspan="2">COD mg/l</td><td rowspan="2">34</td><td rowspan="2">30</td><td rowspan="4">Asbestos (waste category B.21-Schedule –II)</td><td rowspan="3">1</td><td rowspan="3">Stored in secured place</td><td rowspan="3">Disposed CTSDF.</td></tr>
<tr><td colspan="4" rowspan="2">Stack Emission status:</td></tr>
<tr><td rowspan="2">Phenol mg/l</td><td rowspan="2">0.17</td><td rowspan="2">0.14</td></tr>
<tr><td>Stack</td><td>Parameter</td><td>Maximum in mg/Nm^3</td><td>Minimum in mg/Nm^3</td><td rowspan="3">Total suspended solids mg/l</td><td rowspan="3">12</td><td rowspan="3">BDL</td></tr>
<tr><td rowspan="2">Boiler</td><td>SPM</td><td>135</td><td>122</td><td rowspan="2">Chemical Sludge from ETP(waste category 34.3 – Schedule – I)</td><td rowspan="2">16</td><td rowspan="2">Stored in secured place</td><td rowspan="2">Disposed CTSDF</td></tr>
<tr><td>SO2</td><td>299</td><td>109</td></tr>
<tr><td rowspan="2">Hot Oil Furnace</td><td>SPM</td><td>119</td><td>96</td><td>Sulphide (as S) mg/l</td><td>BDL</td><td>BDL</td></tr>
<tr><td>SO2</td><td>311</td><td>82</td><td>Fluoride (as F) mg/l</td><td>0.17</td><td>BDL</td></tr>
</table>

			CO	321	74	Cyanide (as CN) mg/l	BDL	BDL							
		Ambient air quality status				Hexavalent chromium (as Cr) mg/l	BDL	BDL	Residue/ Sludge containing Phenol (Waste Category 19.1 – Schedule I)	1	Stored in secured place	Disposed CTSDF			
		Parameters		Maximum	Minimum	Total Chromium (as Cr) mg/l	BDL	BDL							
		NOx, mg/m3		39	7										
		SO2, mg/m3		55	13										
		CO, mg/m3		2259	183										
		SPM, mg/m3		66	24	Oil & Grease mg/l	BDL	BDL							
		RSPM, mg/m^3		30	27										
		THC, ppm		2.13	0.08										

4.	**The Fertilizers and Chemicals Travancore Ltd (FACT - CD) ,Cochin Division, Ambalamedu, Ernakulam - 682 303**								
	Product	**Pollution Control Status**						**Action Plan, Target date & cost**	
	Ammonia - 18,000 ton/month Phosporic Acid - 10,800 ton/month Urea	**AIR**	**WATER**	**HW**				**individualistic**	
				Hazardous waste	**Quantity in ton/year**	**Storage**	**Mode of disposal/treatment**	**Action plan**	**Date of completion** / **Cost**

<table>
<tr><td></td><td>- 30,000 ton/month NP 20:20
- 60,000 ton/month</td><td colspan="4">Stack Emission status</td><td colspan="3">The treated effluent quality conforms to the standards. The ETP units consists of Urea Hydrolyser, Ammonia stripper, Delay pond, Automatic pH controller. ETP units in plant 2 consits of Equilisation tank, NPK flash mixer, NPK, Flocculator, Fluoride flocculator, Phosphate clari flocculator, Gypsum settling tanks, Delay tanks and Automatic pH controller</td><td>Used/ Waste oil</td><td>100</td><td rowspan="6">Stored in impervious storage area having proper enclosure and roofing</td><td rowspan="6">Disposed CTSDF</td><td rowspan="6">To Conserve fuel and reduce the emission by 5 % reduction in the consumption of fuel</td><td rowspan="6">Modifications of plant by 2011</td><td rowspan="6">Rs. 10 lakh</td></tr>
<tr><td rowspan="5"></td><td>Stack</td><td>Parameter</td><td>Max in mg/Nm^3</td><td>Mini in mg/Nm^3</td><td>Parameter</td><td></td><td>min</td><td rowspan="2">Lead Scrap</td><td rowspan="2">3.5</td></tr>
<tr><td rowspan="4">NPK PLANT</td><td>SPM</td><td>71</td><td>32</td><td>pH</td><td>7.9</td><td>6.6</td></tr>
<tr><td>NO_x</td><td>BDL</td><td>BDL</td><td>Arsenic mg/l</td><td>BDL</td><td>BDL</td><td rowspan="2">Arsenic containing filter material</td><td rowspan="2">20</td></tr>
<tr><td>Ammonia</td><td>90</td><td>16</td><td>Suspended Solids mg/l</td><td>92</td><td>54</td></tr>
<tr><td>Fluoride</td><td>10</td><td>3.2</td><td>Free Ammonia mg/l</td><td>1.22</td><td>BDL</td></tr>
</table>

		Phosphoric Acid Plant	SPM	140	12	Ammoniacal Nitrogen mg/l	65	5	ETP Sludge	400				
			HF	BDL	BDL	Phosphate as P mg/l	4.9	0.2						
			Fluoride	20.3	2	Fluoride (as F) mg/l	1.4	0.2						
		Sulphuric Acid Plant	SO_2	1182	486	Cyanide (as CN) mg/l	BDL	BDL	Spent Catalyst (V_2O_5)	275				
			Acid Mist/ SO_3	10	3.2	Hexavalent chromium (as Cr) mg/l	BDL	BDL						
		Ambient air as well as Stack emission quality conforms to the standard level				Total Chromium (as Cr) mg/l 2	BDL	BDL	Sulphurmuck (Residue, Dust) Sulphurmuck (Residue, Dust)	1200		Disposed through approved agencies as per norms		
		Parameters	pH			Oil & Grease mg/l	7	2						
		Ammonia	Arsenic mg/l	BDL		Vanadium mg/l	0.07	0.03						

		Lead	BDL	BDL	Total Nitrogen mg/l	66	3						
		Oxides of Nitrogen	13	6									
		SO2	76	3	Nitrate Nitrogen mg/l	1	0.8						
		RPM	42	2									
		CO	320	30									
		SPM	99	5									

INDUSTRIES IN ELOOR – EDAYAR AREA **ANNEXURE – 2B**

<table>
<tr><th rowspan="3">Sl.No.</th><th rowspan="3">Industry</th><th rowspan="3">Product</th><th colspan="4">Pollution Control Status</th><th colspan="3">Action plan, Target date & cost</th></tr>
<tr><th rowspan="2">Air</th><th rowspan="2">Water</th><th rowspan="2">HW</th><th colspan="2">Individualistic</th><th rowspan="2">Estimated Cost</th></tr>
<tr><th>Action plan</th><th>Date of completion</th></tr>
<tr><td rowspan="8">1.</td><td rowspan="8">Travancore Cochin Chemicals Ltd., Udyogamandal P.O. Pin – 683 501</td><td rowspan="8">Sodium Hydroxide - 175 t/day

Chlorine - 48 t/day

HCl - 376 t/day

Sodium Hypochlorite - 45 t/day</td><td colspan="3">Adequate height for stack, cyclone separator, alkali scrubbing system; satisfactory</td><td rowspan="3">Settling tank, pH correction, septic tank and soak pit for sewage, membrane cell process; satisfactory.</td><td rowspan="8">Waste oil sold to recyclers</td><td rowspan="3">Regular Transfer of $BaSO_4$ waste to TSDF commenced</td><td rowspan="3">Accumulated $BaSO_4$ waste disposed safely</td><td rowspan="3">11 lakhs/year</td></tr>
<tr><td colspan="3">Ambient air as well as stack emission quality conforms to the standard level</td></tr>
<tr><td colspan="3">Ambient Air Quality status</td></tr>
<tr><td>Parameter</td><td>Min.</td><td>Max.</td><td rowspan="4"></td><td rowspan="4">Modification of existing godowns for a leak proof storage for Barium Sulphate/</td><td rowspan="4">31.12.2010</td><td rowspan="4">50 lakhs</td></tr>
<tr><td>Hcl. (mg/Nm^3)</td><td>3</td><td>33</td></tr>
<tr><td>PM (mg/Nm^3)</td><td>116</td><td>140</td></tr>
<tr><td>SO_2 (mg/Nm^3)</td><td>815</td><td>958</td></tr>
</table>

			NOX (mg/Nm^3)	60	83				Sodium Chloride		
			Chlorine	Nil	Nil						
2.	M/s. FACT Ltd., Udyogamandal Division, Udyogamandal	Ammonium Phosphate -148500 t/year Ammonium Sulphate -225000 t/year Ammonia -297000 t/year Sulphuric Acid -255750 t/year	Adequate height for stacks, scrubbing system; satisfactory.			Primary collection, aeration, clarifier, trickling filter, pH correction, denitrification. Most often comply with the standards.			Own SLF at Ambalamedu. Hazardous waste is being transferred to their own facility	Time bound proposal for attaining zero effluent discharge status combined with FACT (PD)	31.12.2011	62 crores
			Ambient air as well as stack emission quality conforms to the standard level			Quality of treated effluent conforms to the standard level as below						
			Ambient Air Quality status			Parameter	Min.	Max.				
			Parameter	Min.	Max.	pH	6.3	8.3				
			SO_2 (mg/Nm^3)	14	578	SS	15 0 mg/l	172				
						Oil & Grease	BDL	BDL				
			Acid mist (mg/Nm^3)	1.9	3	Ammoniacal Nitrogen	13.2 mg/l	37.5		reduce the water consumption by 10%	15.12.2010	80 lakhs
						TKN	2 mg/l	42				
		SO_2 -80520 t/year	NH_3 (mg/Nm^3)	26	187	Nitrate Nitrogen	2.66 mg/l	119				
						Cyanide	BDL	BDL				
			PM	38	144	Vanadium	BDL	BDL				

		Phosphoric Acid -33000 t/year Steam -2880 t/day	(mg/Nm^3)			Arsenic	BDL	BDL				
						Phosphate	0.12 mg/l	0.2				
						Fluoride	.09 mg/l	1				
			F (mg/Nm^3)	2.4	6.8	Hex. Chromium	BDL	BDL				
						Total Chromium	BDL	BDL				
3.	M/s. FACT Ltd., Petrochemical Division, P.B.No – 17 Udyogamandal Pin – 683 501	Caprolactum - 180 t/day	Adequate height for stacks, scrubbing system; satisfactory.			Primary collection, aeration, clarifier, trickling filter, pH correction, denitrification. Most often comply with the standards.			Hazardous waste is disposed to their SLF facility at Ambalamedu.	time bound proposal for attaining zero effluent discharge status combined with FACT (UD)	31.12.2011	Combined with FACT, UD no separate cost
			Ambient air as well as stack emission quality conforms to the standard level			Quality of treated effluent conforms to the standard level as below						
			Ambient Air Quality status			Parameter	Min.	Max.		reduce the water consumption by 10%		
			Parameter	Min.	Max.	PH	5.9	8.8				
			SO_2 (mg/Nm^3)	82.7	582	Total SS	12 mg/l	89				
						BOD	2 mg/l	41.2				
		Ammonium	NOx	47	171	COD	48 mg/l	208				

<table>
<tr><td></td><td></td><td>Sulphate - 900 t/day
Nitric Acid - 23 t/day

Soda Ash - 30 t/day</td><td>(mg/Nm^3)</td><td></td><td></td><td>Oil & Grease</td><td>BDL</td><td>BDL</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td rowspan="3">Ammonia (mg/Nm^3)</td><td rowspan="3">24</td><td rowspan="3">136</td><td>Nitrate Nitrogen</td><td>4.67 mg/l</td><td>319</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Ammoniacal Nitrogen</td><td>.1mg/l</td><td>40</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td rowspan="2">PM (mg/Nm^3)</td><td rowspan="2">108</td><td rowspan="2">128</td><td>Total Kjedhal Nitrogen</td><td>0.9 mg/l</td><td>45</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Phenolic compounds</td><td>0.02 mg/l</td><td>0.08</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td>Hindustan Insecticides Ltd., Udyogamandal</td><td>(Qty/month)
DDT (TECHNICAL) – 112 t/m
DDT (50%WDP) – 224 t/m
Endosulphan (technical) – 133t/m
Endosulphan (35% EC)</td><td colspan="3">Scrubber for process stacks.
Ambient air as well as stack emission quality conform to the standards
Ambient Air Quality status
Parameter | Min. | Max.
SO_2 (mg/Nm^3) | 56 | 95</td><td colspan="3">Settling, Equalisation, lime treatment, clarifier, cascade aeration, sand filter, carbon treatment, delay pond, neutraliser.
Quality of treated effluent conforms to the standard level as below
Parameter | Min. | Max.
pH | 2.8 | 7.6</td><td>Provided own SLF; hazardous waste incinerator is not working in full swing. Hazardous waste management is not satisfactory.</td><td>submit proposal for zero effluent discharge

Provide treatment for canteen & bathroom effluent</td><td>30.06.2011

31.12.2010</td><td></td></tr>
</table>

		– 160kL/m Dicofol (technical) – 12.5t/m Dicofol 18.5EC – 60kl/m Mancozeb formulation – 95t/m HCl (By product) – 80kl/m, Hcl(DDT Plant) 52.5t/m H_2SO_4 (DDT plant)– 150t/m	HCl (mg/Nm^3)	4.5	9	SS	12 mg/l	74		Transfer the accumulated hazrdous waste from the secured landfills and the lagoons to TSDF	31.03.2011	5 crores
			PM (mg/Nm^3)	26	42	Chloride	140 mg/l	5800 mg/l				
			Chlorine (mg/Nm^3)	1.6	8.5	Sulphate	111 mg/l	3602 mg/l				
			CO (mg/Nm^3)	68	78	TDS	626 mg/l	20960				
						O&G	BDL	BDL				
						Phenolic Compounds	0.09 mg/l	0.94		Install new stack for the incinerator	31.08.2010	
						BHC	.1mg/l	15.86				
						DDT	0.27 mg/l	55.12 mg/l				
						Endosulphan	0.06 mg/l	37.7 mg/l				
						Quality of treated effluent conforms to the standards						
						Parameter	Min.	Max.				
						pH	4.5	7.4				
						SS	14 mg/l	22 mg/l				
						Sulphide	BDL	BDL				
						Hex. Chromium	BDL	BDL				
						O&G.BDL	BDL					
						BOD	1.8 mg/l	21				
						Total Chrom.	.08 mg/l	0.16				

				Chloride	21 mg/l	940 mg/l				
				Quality of treated effluent conforms to the standard level as below						
				Parameter	Min.	Max.				
				pH	5.2	7.5				
				SS	12 mg/l	15				
				Sulphide	BDL	BDL				
				Hex.Cr.	BDL	BDL				
				O&G	BDL	BDL				
				BOD	1.8 mg/l	20 mg/l				
5	Cochin Leathers Pvt. Ltd., Edayar	Dressed Hides 2000 kg/day	NA	Chromium recovery, solar evaporation, equalisation , flocculation, settling, aeration, sludge settling, sludge drying.			Problems related to delay pond			rectified
				Quality of treated effluent conforms to the standards						
				Parameter	Min.	Max.				
				pH	4.5	7.4				
				SS	14 mg/l	22 mg/l				
				Sulphide	BDL	BDL				
				Hex. Chromium	BDL	BDL				
				O&G.BDL	BDL					
				BOD	1.8 mg/l	21				
				Total Chrom.	.08 mg/l	0.16				

<table>
<tr><td></td><td></td><td></td><td colspan="3"></td><td>Chloride</td><td>21 mg/l</td><td>20 mg/l</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="8">6</td><td rowspan="8">Binani Zinc Ltd., Edayar, Binanipuram P.O.</td><td>Zinc metal – 110 t/d</td><td colspan="3">Cyclone separator, ESP, Bag filter and scrubber. Adequate stack height provided.</td><td colspan="3">Equalisation tank, neutralisation tank, clariflocculator, collection tank, final pH correction.</td><td rowspan="3">Provided their own SLF. Facility setup for converting the jarosite to jarofix and is disposed to CTSDF.</td><td>Facility for canteen effluent treatment</td><td>Completed by April 2010</td><td>1.0 Lakh</td></tr>
<tr><td>Zinc alloy – 54 t/d</td><td colspan="3">Ambient air as well as stack emission quality conform to the standard</td><td colspan="3">Quality of treated effluent conforms to the standard level as below</td><td rowspan="2"></td><td></td><td></td></tr>
<tr><td>H_2SO_4 – 194t/d</td><td colspan="3">Ambient Air Quality status</td><td>Parameter</td><td>Min.</td><td>Max.</td><td>Reduction in quantity of effluent</td><td>20% reduction achieved. 50% reduction by 31.12.2010</td><td>9.85 Lakh</td></tr>
<tr><td rowspan="5">Cadmium metal – 220kg/d</td><td>Parameter</td><td>Min.</td><td>Max.</td><td>pH</td><td>6.2</td><td>7.7</td><td rowspan="5"></td><td rowspan="5"></td><td rowspan="5"></td><td rowspan="5"></td></tr>
<tr><td>SO_2</td><td>32.54 mg/Nm^3</td><td>131.01 mg/Nm</td><td>SS</td><td>8 mg/l</td><td>24</td></tr>
<tr><td>PM</td><td>95.24 mg/Nm^3</td><td>538 mg/Nm^3</td><td>Sulphate</td><td>462 mg/l</td><td>2823</td></tr>
<tr><td rowspan="4"></td><td rowspan="4"></td><td rowspan="4"></td><td>Cadmium</td><td>0.038 mg/l</td><td>0.2</td></tr>
<tr><td>Fluoride</td><td>0.1 mg/l</td><td>15.5</td></tr>
<tr><td>Led</td><td>0.138 mg/l</td><td>0.8</td></tr>
<tr><td>Zinc</td><td>0.31 mg/l</td><td>0.893</td></tr>
</table>

7	Indian Rare Earths Ltd., Rare Earths Division, Udyogamandal Ernakulam 683 501	Thorium oxalate – 11 t/d Rare Earth Flouride – 0.3t/d Cerium Oxide – 0.3t/d Cerium Hydrate – 0.1t/d Cerium Nitrate – 0.01t/d Didymium Carbonate – 0.15t/d Didymium Oxide – 0.1t/d Didymium Fluoride – 0.03t/d Thorium Oxide – 0.03t/d Ammonium Diuranate – 0.15t/d	Chimney height provided is adequate. Scrubbing facility provided.	Effluent treatment plant consists of settling tank , acedic effluent pre-treatment tank alkaline effluent pre-treatment tank flash mixtures with chemical addition clarifloculator sludge storage tank filtration.	Hazardous waste is stored in impervious area. Not at transferred to CTSDF.	Rectify leakages in the storage trenches of the radioactive material	Action completed	
						Provide adequate measures for safe storage & dispoasl of ETP sludge	Action completed	

8	Premium Ferro Alloys Limited, VI/565-F, IDA, Edayar, Binanipuram P.O.	Steel ingot – 800t/m TMT bars – 800t/m Steel scrap (by product) – 25 t/m	Adequate stack height provided.	No water pollution.	NA			
9	Kunnath Chemicals Pvt. Ltd., V/776, Development Area, Edayar, Muppathadom P.O.	Bleaching powder - 2250kg/d	Stack height provided is adequate	No water pollution.	NA			
10	HINDALCO Industries, Alupuram Smelter, P.B. No. 30, Kalamassery	Aluminium alloy billets (casting operation only) – 100t/d	Stack height provided is adequate	Cooling water is recirculated.	Hazardous waste is transferred to CTSDF.			
11	Vinayaka Industries, Industrial Development Area,Edayar, Muppathadom (PO)	U.F.Resin 600 kg/day Grease 250 kg/day	Adequate stack height provided.	Oil trap and filter system or storm water drain provided.	NA			

12	AMCOSXL PAINTS (INDIA) PVT.LTD., Unit – I, V/688, (C&G), Bund Road, Industrial Development Area, Edayar, Aluva-683 110	Oil paint, Water paint, Cement paint and Other paint allied products - 1110 hk/day	NA	Provided collection tank, mixing channel, Settling tank and sand filter.	Hazardous waste stored in HDP bags in a room having impervious floor and roof. Disposal of ETP sludge to CTSDF	31.12.2010		
13	Usha Industries, Pathalam, Alupuram Pin-683 504	Rubber moulding goods - 13kg/day	Provided enclosure to industry	Cooling water is recirculated.	NA			
14	Galilea Chemicals, VI/574 – A, Industrial Development Area, Edayar, Binanipuram P.O., 683 502	Web O/s colour ink 200kg/day Web O/s Black 150kg/day	NA	NA	NA			
15	Panchami Agro Industries VI/588,589 Industrial Development Area, Edayar Binanipuram P.O. – 683 502	Bone Meal 35 mt/day	Plant is fully enclosed.	NA	NA			

16	AMCOSXL PAINTS (INDIA) PVT.LTD., Unit – II, V/698, (C & D), Industrial Development Area, Edayar, Aluva-683 110	Water, oil based and cement paint, wall putty and other fillers 490kg/day	NA	They have to join common ETP.	Disposal of ETP sludge to CTSDF	31.12.2010		
17	AES Industries, V/598 A, Industrial Development Area, Edayar Binanipuram Pin – 682 030	Crushed bone 2100kg/day Bone meal 700 kg/day Tallow 50 kg/day Hoofs & Horns 250 kg/day	Plant is closed.	NA	NA			
18	Vijay Associates Industrial Development Area, Edayar Muppathadom P.O.	¾" metal 23000cft/m ¼" metal 2000cft/m 1½" metal 1500cft/m Dust 1000cft/m						

19	Kochi Castings And manufacturing Pvt. Ltd. Industrial Development Area, Edayar Muppathadom P.O. Pin – 683 110	Moulded Castings 5½ tonne/month	Adequate stack height provided.	NA	NA			
20	Hill Rock Metals, Industrial Development Area, Edayar Muppathadom P.O.	Crushed Metal (20mm) 80 t/day	Control measures provided as per Board's norms	NA	NA			
21	Indo German Carbon Ltd. 57/3, Old Mosque Road Industrial Development Area, Edayar Binanipuram P.O. Aluva Pin – 683 502	Activated Carbon 12 tonne/day	Adequate stack height provided. Dust collector provided.	Oil trap and Septic tank provided.	Hazardous waste is sold to recyclers.			

22	Minar Chemical Industries, Industrial Development Area, Edayar Muppathadom P.O. Aluva	Sodium Silicate 9.00 mt/day	Adequate stack height provided	NA	NA			
23	Yeoman Bone And allied Products Industrial Development Area, Edayar Binani Zinc Road, Edayar	Crushed bone 7 t/day Bone meal 2.5 t/day Tallow 120 kg/day Sinews 150 kg/day Organic Fertilizer 1 t/week	Provided control measures as per Boards norms.	Tallow waste is converted to manure.	NA			

24	Sterling Industrial Chemicals & Allied Industries Pvt. Ltd., 5/450, Industrial Development Area, Edayar Binanipuram P.O. Pin – 683 502	Acetic Acid 500 l/d Xylene 500 l/d Benzene 500 l/d Isopropyl Alcohol 500 l/d Hexane 500 l/d Toluene 500 l/d Pathalic Acid 500 l/d Ammonia Solution 500 l/d	NA	Recirculated.	NA			
25	National Battery Industries, Industrial Development Area, Edayar, Muppathadom P.O., Aluva Pin – 683 110	Lead Acid Battery 900 Nos/Year Battery Lead Plates 36000 Nos/Year Lead scrap 4 t/Year	Adequate stack height provided with scrubbing facilities	No satisfactory facility provided.	Hazardous waste management is not satisfactory.			
26	Bright Coats, Binanipuram Muppathadom P.O. Pin – 683 502 Ernakulam	Colour coating 60 items/m	NA	Not satisfactory. They have to join the common ETP	ETP sludge 2kg/d stored in closed leak proof tank. Not satisfactory			

27	Southern Composites (P) Ltd. Industrial Development Area, Edayar Binanipuram P.O. Pin – 683 502	Polyester Resins 2000 kg/day PVA Emulsion 10 kg/day	Adequate chimney height provided.	NA	NA			
28	Cee Jee Lubricants VI/592, Industrial Development Area, Edayar Binanipuram P.O. Pin – 683 502	Refined Oil 9.5 KL/day (limited to 3000 KL/y) Recycled fuel oil 15 KL/day (limited to 6000 Kl/annum max)	Adequate stack height provided.	Neutralisation cum settling tank provided	Joined common TSDF			

29	Cochin Minerals and Rutile Ltd. Industrial Development Area, Edayar Muppathadom Pin – 683 101	Synthetic Rutile 120 t/day Ferrous Chloride (100%) 60 t/day Ferric Chloride (100%) 24 t/day Off Grade TiO_2 6 t/day Iron Hydroxide (100%) 36 t/day	Adequate stack height provided Scrubbing facility provided.	Chemical treatment Clarifloculator, Neutralisation tank, Equalisation tank, Flash mixture Thickner Secondary clarifier Vaccum belt filter Filter press 2nos. Clarifiers, Satisactory.	Used oil sold to recyclers.	Non haz.waste. Accumulated sludge to be transferred to TSDF or to be stored in a properly roofed impervious storage area	15.06.2010	
30	Excel Petrochemicals,Industrial Development Area, Edayar Muppathadom P.O. Aluva Pin – 683 110	Reclaimed transformer oil 1200 L/day	Provide adequate 30m height stack.	They have to join common ETP.	Joined CTSDF.			

31	Sigma Fertilizers Industrial Development Area, Edayar Muppathadom P.O. 683 110	Crushed Bone 4200 kg/day Bone meal 2100 kg/day Hoofs & Horns 280 kg/day Fat 420 kg/day	Enclosure provided to factory building	They have to join common ETP.	NA	
32	Sud Chemie India Private Limited Industrial Development Area, Edayar Binanipuram P.O. Pin – 683 502	HT Shift Catalyst 120 t/m LT Shift Catalyst 125 t/month Zinc Oxide Catalyst 90 t/month Dechlorination Catalyst 90 t/month Hydro Desulphurisation catalyst 20 t/month NBA Catalyst 10 t/month	Stack of adequate height. Scrubbing facility provided.	Neutralisation, Oil trap ,equalisation tank, flash mixture clarifier, Sand filter.	Waste transferred to CTSDF. Waste oil to recyclers.	

		Methanol Steam Reforming Catalyst 25 t/month C116 Sulphuric Acid Catalyst 60 t/month T2470B/KOH on Carbon 2.08 t/month				
		G32J/C8 – 7 2.08 t/month Actisorb 900/C18 – 5 2.08 t/month G66B 2.08 t/month C54Cs 2.08 t/month				
33	National Industries, Industrial Development Area, Edayar Muppathadom P.O. Pin – 683 110	Crushed bone 3120 kg/day Bone meal 900 kg/day Horns & Hooves 300 kg/day Fat 180 kg/day	Plant closed fully	Tallow slurry converted to manure	NA	

34	Lakshmi Acetylene Private Limited VI/549A, Industrial Development Area, Edayar Binanipuram P.O.	Acetylene 200m^3/day Lime (by-product) 1 mt/day	NA	Settling tank provided and recycled	NA	
35	St. George Induistries, Industrial Development Area, Edayar Binanipuram P.O. Pin – 683 502	MS – Rack, Coat, Gate Grill, Powder coating works (Job works approximate ly 25 kg/day)	Water scrubbing facility provided for air vent.	Neutralisation tank Settling tank	Not satisfactory	
36	National Granites Industrial Development Area, Edayar Muppathadom P.O. Pin – 683 110	¾ metal 70 t/day 3/8 metal 30 t/day Metal Powder 12 t/day	Provided control measures as per Board's norms	NA	NA	

37	Suraj Chemical Company, Industrial Development Area, Edayar Muppathadom P.O.	Chemical Dispersal 250 kg/day	NA	They have to join common ETP	NA	
38	Power Controls, V/681 B, Industrial Development Area, Edayar Muppathadom	Tubular Battery Plate +ve 4500/month Tubular Battery Plate –ve 5400/month Tubular Battery 100/month	NA	Neutralisation tank collection tank final pH correction	Not satisfactory	
39	Travancore Ammonia (P) Ltd. Industrial Development Area, Edayar Binanipuram P.O.	Ammonia In Aqueous solution 27000 L/day	NA	Cooling water recirculated.	NA	

40	Organo Fertilizers (India) Pvt. Ltd. Industrial Development Area, Edayar Muppathadom P.O., Aluva Pin – 683 110	Crushed bone 7.5 t/day Bone meal 3 t/day Sinew and Tallow 13 kg/day Hoof and Horns 80 kg/day Organic manure 10 kg/day	Plant fully enclosed. Adequate stack height provided.	Biogas plant provided	NA	
41	G.K. Gases and Chemicals, V/809, Industrial Development Area, Edayar Muppathadom P.O.	Ammonium Hydroxide 2000 L/day	NA	Cooling water recirculated.	NA	
42	Southern Minerals & Chemicals V/656,A, B, Industrial Development Area, Edayar Muppathadom P.O.	Rubber Grade Sulphur 21 t	Plant fully enclosed.	NA	NA	
43	Mary Matha Meat Stall, Cheranalloor	Animal Meat 200 kg/week	NA	Not satisfactory.	NA	

44	Biocon Organics (P) Ltd., Industrial Development Area, Edayar Binanipuram P.O. – 683 502	Crushed bone 2100 kg/day Bone meal 700 kg/day	Plant fully enclosed and adequate stack height provided.	Biogas plant provided.	NA	
45	Kiran Global Chems Limited, Industrial Development Area, Edayar Muppathadom P.O.	Sodium Silicate 10 t/day	Adequate stack height provided.	Equalisation tank, neutralisation tank collection tank, pH correction. They have to join common ETP.	Used oil to recyclers	
46	Nelkadir Bone Industries, V/264, Industrial Development Area, Edayar Muppathadom P.O.	Crushed bone 40000 kg/m Bone meal 19000 kg/m Hooves and Horns 2500 kg/m Screws -2000 kg/m	Plant enclosed properly.	They have to join common ETP.	NA	
47	Shine Star Lubes, VI/5920, Industrial Development Area, Edayar Binanipuram P.O., Aluva Pin – 683 502	Lubricating oil 10 KL/day Rubber process oil 10 KL/day Pine tar 10 KL/day	Adequate stack height provided.	NA	NA	

48	Kemo Gravures, VI/598 C, Industrial Development Area, Edayar Binanipuram P.O. – 683 502	Printing Rollers 5 Nos/day	NA	Not satisfactory. They have to join common ETP.	Not satisfactory.	
49	Cochin Chemical Industries, VI/590 A, Industrial Development Area, Edayar Binanipuram P.O. – 683 502	Potassium Nitrate 1.67 t/day Magnesium Chloride 1.5 t/day	Adequate stack height provided	NA	NA	
50	M.O. Philips Industries, Industrial Development Area, Edayar Binanipuram P.O. Aluva Pin – 683 102	Rubber Grade Sulphur 5 t/days	NA	NA	NA	
51	HINDALCO Industries Ltd. Alupuram Extrusion P.B.No.1, Kalamassery Ernakulam Pin – 683 104	Aluminium Extruded sections 33.7 t/day	NA	STP provided.	Waste oil - to recyclers.	

52	Kiran Pondy Chems Ltd., Industrial Development Area, Edayar Muppathadom P.O.	Sodium Silicate 10 MT/day	Adequate stack height provided.	They have to join common ETP.	NA	
53	Ramanand Electrocoats, 5/800A, Industrial Development Area, Edayar	Powder Coating Coating of 1800 sqft. Area of sheet metals by consuming an average quantity of power of 30 kg/day	NA	Provided ETP. They have to join common ETP.	Not joined CTSDF.	
54	Periyar Polymers (P) Ltd.,Industrial Development Area, Edayar Muppathadom P.O.	Flexible Polyurethane Foam- 71.408 t/day	Adequate stack height provided.	NA	NA	
55	Cochin Petromins Pvt. Ltd., IV/147 B, Devikripa FACT Road, North Kalamassery	Thinner I, II, III 38,000 L/m CM Turpentine 38,000 L/m	NA	NA	NA	

56	Slaughter house owned by Shri. Abdul Vahid P.A Purayekal Akathootu U.C. College P.O., Aluva Pin – 683 102	Animal Meat 150 kg Chicken 20 Nos Duck Meat 4 Nos	NIL	Not satisfactory.	NIL			
57	Copper Blues, Industrial Development Area, Edayar Binanipuram P.O.	Copper Sulphate 955.2 kg/day	Adequate stack height provided.	NA	NA			
58	Merchem Ltd., 111/107 A, Muthinagam Road, Eloor North, Udyogamandal P.O., Ernakulam	Thiazoles and Sulphenamides 130 t/m Antioxidant 90 t/m Sodium Sulphide (by-product) 20 t/m	Stack height provided is adequate. Scrubbing facility provided.	Tripple effect evaporator provided	Provided SLF. HW Management is not satisfactory.	Complete the construction of boundary wall	31.10.2010	8 Lakhs
						Reclamation of marshy land	30.06.2010	25 Lakhs
						modify the delay pond by enhancing its capacity and install online pH meter in delay pond	31.12.2010	
						Transfer of hazardous waste from secured landfill to TSDF	30.09.2010	1.75 Lakhs

59	Durocoat Paints Pvt. Ltd., 5/704, Industrial Development Area, Edayar Muppathadom P.O. Pin – 683 110	Alkyd Products 135 kg/day Emulsion 160 kg/day	NA	They have to join common ETP.	Not satisfactory			
60	Njavallil Latex Pvt. Ltd.,(Crepe unit), Industrial Development Area, Edayar Binanipuram P.O. – 683 502	Crepe Rubber 250 kg/day	NA	Chemical treatment with ASP. Working satisfactorily.	Not joined TSDF.			
61	Arjuna Natural Extracts Ltd., Infdustrial Development Area, Edayar Binanipuram P.O.	Pomegranate Extract 0.5 t/m Green Tea Extract 1.8 t/m Boswellia Serrata Extract 2 t/m Kokkam Butter Extract 2 t/m	Adequate stack height provided.	They have provided evaporator.	Waste oil and spent carbon. Disposal not satisfactory.			

62	Ankur Paints and Coatings, V/698 (C), Industrial Development Area, Edayar Aluva, Pin – 683 110	Water and oil based paints, Cement Paint Wall putty and other fillers Total - 490 kg/shift	NA	They have to join common ETP.	Not satisfactory.			
63	Evershine Powder Coatings, Industrial Development Area, Edayar Binanipuram P.O.	Powder coated products (Fabricated aluminium section) – 500 kg/day	Not satisfactory	They have to join common ETP.	Not satisfactory.			
64	Sree Sakthi Paper Mills Ltd.Unit II, Industrial Development Area, Edayar Muppathadom P/O., Aluva Pin – 682 016	Kraft Paper 70000 t/annum	Adequate stack height provided.	Present ETP is not satisfactory. Proposal for zero effluent discharge system submitted.	Not satisfactory.	Achieve 50% reduction in effluent discharge	31.12.2010	256 Lakhs
						Provide additional clarifier	31.12.2010	
						Removal of Dumped plastic waste	30.09.2010	33 Lakhs

65	A.K. Chemicals V/584 B, Industrial Development Area, Edayar Binanipuram P.O., Aluva	Sulphur Powder 30 MT/day	NA	NA	NA			
66	BSES Kerala Power Ltd., Eloor, Pathalam, Udyogamandal P.O. Ernakulam Pin – 683 501	Electricity 3.96 MW	Scrubbers provided. Adequate stack height provided.	Oil trap and neutralisation tank provided.	Hazardous waste is sold to recyclers.			
67	Cochin Chemicals, IV/2-4, Industrial Development Area, Edayar Muppathadom P.O., Aluva Pin – 683 102	Envirofloc 30 Kl/day	NA	They have to join common ETP.	Not satisfactory.			
68	R.S. Compounds, Industrial Development Area, Edayar Binanipuram P.O.	Ferric Alum 4 t/day	Adequate height of chimney provided	NA	NA			

69	Slaughter house owned by Shri. V.A. Muhammed, Vettimuttam House, Cheranalloor P.O.	Animal Meat 100 kg/day	NA	No facilities provided.	NA			
70	Active Char Products Pvt. Ltd., 63/9B Industrial Development Area, Edayar Binanipuram P.O.– 683 502	Steam Activated Carbon 10 t/day	Dust collector provided also adequate stack height provided.	NA	Waste oil sold to recyclers.			
71	Cochin Surfactants (P) Ltd., Plot No: 63,Edayar, Binanipuram P.O.	Activated Carbon 6 MT/day	Dust collector provided, adequate chimney height provided.	They have to join common ETP.	Waste oil sold to recyclers.			
72	Eminent Composites Pvt. Ltd., Industrial Development Area, Edayar Muppathadom P.O.	Acrylic bath tub 10 Nos/day Acrylic Shower Tray 1 No/day	NA	NA	NA			

<table>
<tr><td>73</td><td>South Indian Fertilizers,Industrial Development Area, Edayar Binanipuram P.O.</td><td>Castor Bone Complex 6 t/day</td><td>Building properly enclosed.</td><td colspan="4">NA</td><td>NA</td><td></td><td></td><td></td></tr>
<tr><td>74</td><td>Ashan Exports and Furnishers, Industrial Development Area, Edayar, Muppathadom P.O.</td><td>Melted Ghee 0.1 t/day</td><td>Adequate stack height provided with scrubbing facility</td><td colspan="4">They have to join common ETP.</td><td>NA</td><td></td><td></td><td></td></tr>
<tr><td>75</td><td>TMS Leathers, Edayar,</td><td>Wet blue hides – 800hides/day</td><td>NA</td><td colspan="4">Chromium recovery, solar evaporation equalisation tank, settling tank, aeration tank and sludge drying bed.
Quality of treated effluent conforms to the standard level as below</td><td>Hazardous waste is disposed to CTSDF.</td><td></td><td>Removed to CTSDF</td><td></td></tr>
<tr><td colspan="4"></td><td>Parameter</td><td>Min.</td><td>Max.</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td>pH</td><td>5.2</td><td>7.5</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td>SS</td><td>12 mg/l</td><td>15</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td>Sulphide</td><td>BDL</td><td>BDL</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td>Hex.Cr.</td><td>BDL</td><td>BDL</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td>O&G</td><td>BDL</td><td>BDL</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td>BOD</td><td>1.8 mg/l</td><td>20 mg/l</td><td colspan="4"></td></tr>
</table>