BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE, CHENNAI

IN

ORIGINAL APPLICATION NO 395/2013 (SZ)

Applicant(s) : "Suo Motu" Proceedings initiated based on the representation received from Hon'ble Justice, R. Bhaskaran, (Former Judge).

Versus

Respondent(s) : The State of Kerala & others

VOLUME 1

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Dated this the 8th day of June 2021

Rema Smrithi, Advocate

ADDITIONAL STANDING COUNSEL FOR THE RESPONDENT

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UPDATED STATUS REPORT FILED BY THE ENVIRONMENTAL ENGINEER FOR AND BEHALF OF THE KERALA STATE POLLUTION CONTROL BOARD AS PER THE ORDER DATED 05.11.2020

Adv. Rema Smrith
ADDITIONAL STANDING COUNSEL FOR THE RESPONDENT

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SOUTHERN ZONE, CHENNAI

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UPDATED STATUS REPORT FILED BY THE ENVIRONMENTAL ENGINEER FOR AND ON BEHALF OF THE BOARD AS PER THE ORDER DATED 05.11.2020 IN THE ABOVE APPLICATION

I, Mini Mary Sam, 54 Years, Environmental Engineer of Legal Cell of Kerala State Pollution Control Board am authorized to submit individual status report for and on behalf of the Board. I know the facts and circumstances of the case. The factual submissions made hereunder are true and correct to the best of my knowledge, information and belief. In these circumstances, it is just and necessary that this Hon'ble Tribunal may be pleased to accept the accompanying updated status report on file and it is so humbly prayed in the interests of justice in this case.

1. This Hon'ble Tribunal vide order dated 05.11.2020 directed as follows:

"The committee as well as the respective departments and the State Government are directed to submit their respective further action taken reports and progress reports and action plan as directed by this Tribunal on or before 26.02.2021 by e-filing along with necessary hardcopies to be produced as per Rules."

2. It is humbly submitted that the actions taken by the Board on the report of the Chairman, SLMC had been reported by the Board in the earlier report filed on 02.11.2020. Necessary follow up actions were taken by the Board on notices issued earlier. Consolidated report on the follow up taken by the Board on the

KERALA STATE POLLUTION CONTROL BOARD GANDHI NAGAR COCHIN-682 020 REGIONAL OFFICE

Mini Mary Sam
Environmental Engineer(HG)

observations of the Chairman SLMC is produced herewith and marked as **Annexure 1**.

3. With respect to the orders of this Hon'ble Tribunal, for conducting inspection along the entitre stretch of River Periyar, a Combined Committee consisting of members of Supervisory Committe, Joint Committee (constituted in this O.A) and Committee constituted in O.A. 262/17 was formed. Specific monitoring stations were fixed by the Combined Committee. After the finalization of specific monitoring stations, individual teams were formed among combined committee and joint inspections and monitoring along selected stations viz. river, tributaries and drains were conducted in two phases. Copy of details of monitoring conducted along Idukki stretches are produced herewith and marked as **Annexure 2**. From the report no exceedance were identified except on the samples collected from certain drains for BOD and coliform concentration which indicate domestic pollution. Similar monitoring was carried out along lower stretches also viz. Perumbavoor, Ernakulam, Eloor and Thrissur, copies of which are produced herewith and marked as **Annexure 3, 4, 5** and **6** respectively.

4. It may also be noted that certain actions are initiated by the Board through its District offices after identifying violations committed by respective industries/establishments. Actions taken from offices (Idukki, Perumbavoor, Eloor, Ernakulam and Thrissur) are given in **Annexure 1.**

5. It is respectfully submitted that almost all Local Bodies in Idukki district had submitted replies to show cause notices issued by the Board for not assessing Environmental Compensation for violations committed as per the SWM Rules 2016. Based on their replies, these local bodies were inspected once again by the District Officer, Idukki and he assessed the percentage achievement on the effective management of solid waste. Copy of the updated status is produced herewith and marked as **Annexure 7**.

6. It is respectfully submitted that the Combined committee formed to coordinate the activities of river monitoring met twice last month and again on 05.06.2021 to discuss in detail the updated actions initiated by the Board. The Combined committee reviewed all the activities and decided to schedule the third phase

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monitoring / post monsoon monitoring after the finalisation of the first and second phase monitoring reports. Copy of the minutes of the meeting convened on 29.05.2021 is produced herewith and marked as **Annexure 8.**

7. It is humbly submitted that the Board had raised certain contentions on the formula provided for the assessment of EC for local bodies and HCFs where exorbitant rates are obtained while assessing respective ECs. Verification of all the solid/sewage management being a herculean task, percentage achievement in the management of waste has been taken into account for assessing EC. EC was assessed for the gap between total generation and treatment of waste quantities with respect to solid wastes. Copy of the criteria followed is produced herewith and marked as **Annexure 9**. Though maximum precautions are taken to find out the violations, there were opinions that the EC assessments resulted in exorbitant penalties. Idukki district, being a hilly terrain in the Western Ghats having lower population densities, a very decentralised approach of waste management is being practiced. In this scenario, the disparity of assessing EC, which is based around centralized waste management in urban cities/Class 1 towns, has been pointed out by many stake holders. It may be pertinent to note that, from the EC assessment of local bodies of Idukki District attached as a part of this report document, the Grama Panchayath named "Edamalakkudy" classified as backward is having 106 km^2 area with just 2236 people residing (Population Density-21.09/km^2). Here, a centralized plant is practically uneconomical where as decentralized methods are sufficient. Also on thorough assessment of the guidelines provided by the CPCB, it can be seen that the calculated EC is almost similar irrespective of the solid waste management acheivement (%). For illustrating this abnormality EC was calculated for various local bodies with 75 and 90 % acheivement assumed in waste management, in both scenarios the resulted EC was same (**Annexure 10 & 11**). This exemplifies that the present calculation results in exorbitant EC even if acheivement is 90% and the EC calculated is not correlating with the acheivemnets (%) or any other variables of it. It may be also seen that recommended "max-min" values for EC on Capital Cost Component is not reasonable as it is based only on centralized waste management system. In the

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light of the above facts, KSPCB proposed a modification in EC assessment and the proposal for modification of EC calculation was forwarded to the concerned division of CPCB. Though SPCB's suggestion on the reassessment is forwarded to CPCB for consideration, no instructions are received till date. It is understood that the Central agency is discussing this issue in its letter and spirit and the Board is expecting an early reply in this regard.

8. The Board had issued directions to 3 major HCFs (Rajakkad Hopsital, Al-Azhar Medical College and St. Johns Hospital) for remitting EC. Rajakkad Hospital remitted EC. Al Azhar Medical College remitted a portion of the EC. St. John's Hospital has not remitted the EC so far and they had filed case in the High Court and the case is pending. Show cause notices were issued to 127 HCFs in Idukki district on 28.10.2020. Majority of these are clinical Laboratories, dental clinics and Govt. Community Health Centers (CHC) and Public Health Centers (PHCs). It is known that some dental clinics had also filed WP. Replies to the show cause notices were received from some of them and some are returned. Inspections are to be conducted to verify the claims submitted by the HCFs. Out of the 127 HCFs in Idukki district, 37 HCFs have not submitted application for authorization so far and the inspection to these units are progressing to verify the status of these units and could not be completed due to the COVID 19 restrictions. Remaining 90 HCFs applied for authorization and the applications are under processing. The spread of second wave of COVID-19 delayed inspection to certain Health Care Institution which will be completed after the lockdown restriction are over.

9. As the EC calculated seemed not commensurate with profit gained by the health care facility through non- subscription with CBWTF, the Board had communicated to CPCB vide letter dated 21.10.2019 and 21.12.2019 to change the formula for EC calculation with revised rate and factors for small HCFs and the compensation be calculated as multiples of the cost saved by these units through non - subscription to CBWTF charges or the formula to restrict to red category HCFs only. The matter was raised in the co-ordination meeting of SPCBs held by CPCB on 25.09.2020. The CPCB minuted the matter and is looking into this issue. As decided in the meeting, a letter was again sent to

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CPCB on 20.10.2020 and the matter is under consideration of CPCB. The revision of EC calculation formula for HCFs by CPCB is expected soon and though the inspections to the remaining HCFs are progressing, individual directions to these HCFs for remittance of EC could not be served. Hence some more time may be allowed as similar action is to be taken for the HCFs and local bodies in Ernakulam district.

10. It is submitted that the spread of second wave of COVID-19 pandemic delayed all the field activities. In these circumstances, more time may kindly be allowed to complete the procedures viz. assessment of environment compensation etc. and to submit updated status report before the Hon'ble Tribunal.

Dated this the 8th day of June 2021.

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Dated this the 8th day of June 2021

RemaSmrithi, Advocate
ADDITIONAL STANDING COUNSEL FOR THE RESPONDENT

Annexure 1

Specific actions taken and proposed action plans as per the latest order dated 05.11.2020 of the Hon'ble NGT in OA 395 of 2013

The Order dated 19.08.2020 of the Hon'ble NGT IN O.A no. 395 of 2013 specifically insisted to report actions initiated on following Points *[Point 11 – "In the meantime, the Chief Secretary and the Pricipal Secretary for Environment of State of Kerala are directed to come with proper action plan for preventing such activities as projected by the State Level Monitoring Committee in the report"]*

It may be noted that these issues are explicitly related to Kochi where Eloor -Edayar area is located and Environmental Surveillance Centre is looking after monitoring and inspections etc.

1. Eloor - Edayar Stretch (Aluva - Varappuzha)

No.	Activity/ finding in SLMC Chairman's report	Comments of the Board	Action plan (Updated in May 2021)
1	Report in Hindu dated 15.03.2019 regarding green film in Periyar d/s of Regulator cum bridge; SLMC Chairman visits on 17.03.2019; directs water sample to be collected and analysed; analysis report not made available	Incidents of colour change of river water to black at the upstream side of Pathalam bund is a common phenomenon during summer season. During this season, the river turns black in colour with foul smell in the upstream portion of the bund. At the time of opening of the bund, the blackish water with sediments is flushed off to downstream causing fish death on the downstream side. This phenomenon is noted regularly while the opening of the shutters of the regulator. The Pathalam Regulator bund is constructed and	All communications including analysis reports, if any involved, will be given in writing along with copies of documents. After all, there are several units especially chemical industries along the banks of the river and there are possible chances of discharges. But all the industrial units are operating with valid consents and the effluent discharge have to conform to the standards

		operated by Irrigation Department. The bund is kept closed during summer for preventing salt water intrusion. Irrigation Department opens the bund only if there is increase in chloride content in fresh water. The level of water in the river during this season will be very low. The huge consumption of water by various industries, hospitals etc from the river cause further reduction in water level. The closing of bund in summer results in stagnation of river water and restricts the flow of entire river. Stagnation of water in the river results in the accumulation of entire waste flowing up to the bund. The restriction of environmental flow of river and stagnation results in accumulation of wastes and stratification of river water. Top layer of river water will be having abundant dissolved oxygen whereas at lower level the dissolved oxygen content will be low. Low levels of oxygen level at bottom creats anaerobic condition at the bottom. This increases the organic load in the sediments in the river which causes the blackish colour of River. The opening of bund at this stage allows the sediments and water having low oxygen level to flow downstream all of sudden creating a shock load at entire downstream area. This will result in oxygen depletion in entire downstream causing fish death	stipulated by the Board for inland water discharges. Being an industrial area there are chances for continuous operation of industrial units. Hence PCB is closely watching the units by providing a District level office there. Very recently, an officer in the rank of Senior Environmental Engineer has been appointed in the ESC for close coordination of the activities. 1. Updated actions taken by the concerned office are as follows There are only five industries having direct discharge of treated effluent to the Edayar stretch of River Periyar and all these industries are regularly monitoring by the Board. Some of these industries are connected to the Online Continuous Effluent Monitoring System (OCEMS) of the Board for the effective monitoring. Some of the industries are reusing/ recycling their treated effluent or disposing it through soak pit and

		downstream. Regular River monitoring is being conducted along this stretch of Periyar by the Board's office at Eloor. There are several analysis reports based on the monitoring conducted by the Board, which reveals high levels of organic load in the River in this area (especially in the bottom portion of the river upstream of Pathalam bund) and also low levels of Dissolved Oxygen. Organic load reaches the river through various drains originating from various townships which include discharges from domestic as well as commercial establishments. Different studies of the Board point to the need to prevent accumulation of oraganic load in the river. From the reports, it is understood that the black discoloration of River is due to high levels of organic load accumulation upstream of the shutters and oxygen depletion. The Board had conducted microbiological examination of sample of stagnated river water in the upstream side of Pathalam bund. The analysis reports reveals the presence of marine algae 'Platymonas.SP' which results the algal bloom in river causing 'Eutrophication' phenomenon. The algal bloom is mainly caused due to abundance of micronutrients	those industries are under the close observation. a) Direction was given to M/s CMRL to provide permanent line for the discharge of treated effluent to the downstream side of the bund in river and they had complied with the direction. b) It was noticed that there is a chance of industrial discharge to the irrigation canal which connects the Edayattuchal paddy fields and the River Periyar and specific directions had given to the Irrigation Department to find out the industrial discharge, if any. The follow up actions had been taken by the Irrigation department and the KSPCB. c) Regularly monitoring the stormwater drains pass through the industrial area and necessary follow up actions are being taken. 2. Directions given to industries with proofs a) Closure orders were given to the following industries in Edayar Industrial

		(mainly Nitrogen and Phosphorus) which in turn is due to the accumulation of wastes containing nutrients. In the presence of abundant sunlight and micronutrients, algal bloom occurs. This can be prevented if environmental flow is mainatined in the river irrespective of season. The flow will ensure that organic load reaching the river does not accumulate. If the environmental flow of river is not maintained in the lean period, it causes the increase in organic load in river which in turn changes the colour of river and result in recurring fish death in the future also. At the time of closing of shutters, the organic loads get accumulated upstream of the shutters creating oxygen depletion and anaerobic condition at the bottom of River which causes Hydrogen Sulfide generation which is the major reason for foul smell.	area because of the improper functioning of their ETP/ not confirming the standards specified by the Board for the discharge of treated effluent. 1. Sunrise TSR 2. Euro Polymers 3. Essar Enterprises 4. Biocon Fertilizers Pvt Ltd 5. Ambedkar Lime Industries 6. Global Traders
2	Screen shot of river depicting colour change and fish kill received by SLMC Chn from Malayala Manorama journalist on 01.04.2020; telephonic direction to CEE, EKM to inspect and take follow	The reason for colour change of river water during summer months is as explained above. The colour change occured during April in summer. After visiting the river Periyar and nearby areas as per directions of the SLMC Chn, a consolidated report was sent to Chairman SLMC on 20.04.2020. Specific details of industries which were in operation during Lockdown were illustrated in addition to certain actions already	In future also, details of specific environmental issues will be discussed with SLMC without any hindrance. The action proposed by PCB will naturally resolve the issue. The Irrigation Department shall be addressed to maintain environmental flow as ordered by the Hon'ble NGT in OA 498/2015

	up action; CEE informed that sample taken for analysis and provides same explanation as given earlier	taken to monitor the river. Environment Surveillance Centre (ESC) is being operated 24x7 basis. Regular monitoring of Periyar river is being conducted and timely actions are being taken to conduct inspection of industrial establishments from where chances for unauthorised discharges are there. On finding any abnormality or violations, specific actions are being taken which include issue of Show Cause Notices, Copies of all the communications are already forwarded to SLMC also for information. It may also be noted that the major pollution related problems in river are noted during summer season after closing of Pathalam, Manjummal and Purapallikkavu regulators. The major issues noted are change of colour of river to black upstream of the regulators, odour in river water and also sometimes fish death due to lower dissolved oxygen levels. The same issues repeatedly occur every year. Many letters/ notices were issued to Irrigation Department and also several higher-level discussions were completed with Higher Officials of the Irrigation Department to ensure minimum flow in the river so as to avoid the stagnation of river and subsequent fish kill. **The Irrigation Department has to take immediate action to solve this issue**	which is not effected till date satisfactorily. It may be also be noted that the silt deposited along the upstream part of Pathalam Bund shall be remediated immediately. 1. As and when pollution issues are observed, PCB is regularly/actively intervened and necessary actions are being taken. 2. Surveillance squad is regularly conducting inspections especially during odd hours. But second wave of COVID spread delayed such activities.

		permanently.	
3	Screen shots on - 17.04.2020 - black oil like substance near Regulator cum bridge; 27.04.2020 – Muttar Puzha; 02.05.2020 – floating paste like substance near Regulator cum bridge; telephonic direction to CEE, Ekm to inspect and take follow up action on all occasions; the ritual of taking samples, offering the same explanation and keeping mum continued on all these occasions also.	Immediate action including inspection and monitoring have been conducted. In almost all instances, reply messages after attending the complaints have been sent to the Chairman, SLMC. The main source of pollution in Edamula stream of River Periyar is leachate flow from various facilities such as Kalamassery municipal market, leachate from Solid waste dumping yard of Kalamassery Municipality, high organic load from wet lands near NAD, Kalamassery which reach river Periyar through mainly Thoombungal Thodu, Edappally thodu. Incidents of changing of river water colour to black, fish death similar to that of Pathalam Bund is also noted at Manjummal Bund. Frequent fish deaths are reported in Edamula stream even there is . The major reason is due to oxygen depletion and stagnation due to closing of shutter and accumulation of organic load. All of the pumping stations of industries and institutions are located in the Edamula stream. The restriction of Environmental flow, and intake of high quantity of water results in major decrease in water level in this stretch. About 106 Crore liters of water is drawn from Edamula stream for industries/ domestic/ commercial	In future also, appropriate actions will be initiated to see that the issues are addressed satisfactorily. The Irrigation Department shall be alerted to go by the advice of PCB and as per the order of the Hon'ble NGT in OA 498/2015 to maintain environmental flow during summer season. 1. Details of meeting discussions/inspection are as follows, a) Regular monthly meeting of District Level Technical Committee (DLTC) and follow up actions are being carried out for the rejuvenation of the polluted stretch of River Periyar from Aluva to Eloor. b) KSPCB conducted separate joint inspections with Kochi Corporation, Eloor Municipality and Kadungalloor Gramapanchayath to find out the illegal discharge of domestic wastewater from the commercial establishments and households. Follow up actions are also

		purposes. Board also conducted microbiological analysis of river water samples and noted that the same phenomenon 'Algal Bloom' in the upstream of Manjummal bund. It is also noted that at the end of summer after first rain, huge quantity to organic load containing decayed vegetations from paddy fields in Muttam yard area contributes high level of BOD to the Thumbungalthodu. Unauthorized dumping of sewage and septage is suspected to be dumped in these areas during odd hours. Reuse of this land as paddy field again can prevent water stagnation, formation of high BOD and depletion of oxygen. Natural streams in this area need to be conserved. Severity of pollution increases as water flow decreases during dry season. Fish deaths are also reported in Muttar River (Edamula) at the confluence point of Edappallythodu.	being taken.
4	Brought the issue of pollution of Periyar to the notice of Chn of KSPCB; received message that it was noted and was intending to visit the site	Affidavit has been submitted before the Hon'ble HC on "Suo motu" writ petition regading Periyar pollution. The analysis report of Board and CWRDM (samples collected on 22.04.2020) shows that there is no contamination of river with respect to heavy metals. The result reveals that the Board's findings of	It may be noted that the order of the Hon'ble High Court is specific that since the Periyar river is being monitored by experts in the field of Environment (CPCB, NEERI, SEIAA, and SPCB) no need of separate officials to further

	on 22.4.20 along with two scientists outside the board and collect samples for analysis; nothing heard about the same later	accumulation of organic matter at the upstream of Pathalam bund is correct. The CWRDM results in water samples with respect to heavy metals are found to be almost matching with KSPCB reports. It is identified that the Dissolved oxygen levels in bottom portion of the river are found to be very less compared to the surface level which is a usual phenomenon. The bottom of river is anoxic and oxygen levels increases towards surface which shows the stratification of river due to oxygen depletion by stagnation of water due to bund. These reports were submitted before the Hon'ble High Court. Specific direction of the Hon'ble NGT in OA 498 is not complied with till date to settle the issue of regular fish kill especially during summer as the minimum flow is not maintained at that time. Specific notices were issued to different officials of Irrigation department on several occasions insisting them to operate the regulator properly to ensure minimum environmental flow is maintained in the river.	monitor. 1. First and second phases of river monitoring by combined committee constituted as per the orders of the Hon'ble NGT in OA 396/2017 and OA 395 of 2013 are over and mapping is being completed. 2. Will decide schedule of monitoring for third phase of monitoring (Post monsoon) in the next meeting of the combined committee.
5	Behind Zigma, a bonemeal unit, drainage with no clue about its	Board had received complaint against the discharge of untreated effluent in the drain near the Green Earth Technology behind the M/s Sigma Fertilisers. Since, the	Board will ensure that consent is given to the unit only after satisfactory completion of ETP.

	origin was seen. The drainage is flowing through the rear side of the bonemeal unit and along the premises of Green Earth. The drainage exits at an overgrown pit in the premises of Green Earth near its southern compound wall. This drainage was found with septic, sewage and other effluents and is suspected to be leading to the upstream of the river.	industrial estate is under the ownership of the DIC, Board has given directions to Industries Department to take action for the closing of drainage immediately. Board had issued stop memo to the unit M/s Green Earth Technology directing them to stop the activities till they obtain Board's consent to operate. Meanwhile, M/s Green Earth Technology had filed a petition before Hon'ble High Court praying the revoke of stop memo. The case was disposed directing EE, ESC Eloor to inspect the industry and verify whether the industry collected the wastewater for trial run and based on inspection decision to be taken in revoking the stop memo. Based on the enquiry EE, ESC Eloor had inspected the unit and directions issued to industry that Consent to Operate will be issued only after the installation of all necessary tanks for the treatment. At present, the industry is not operational and installation of treatment units are progressing.	1. Still continuing the same procedure
6	In a reclaimed portion of the Chakkarachal paddy field, a pipe was seen laid through which reddish	Board had received many public complaints regarding the discharge of effluent to the canal/drain connecting Periyar River and Edayattuchaal paddy field. The canal is passing through the Edayar industrial area. The	Action shall be initiated to take up the matter with Irrigation Department and Industries Department 1. Joint inspections of KSPCB,

	and orange coloured thick water was seen flowing to the river. At the other end of the paddy filed no water was seen to flow through this pipe. The deduction is that udergrround pipes are laid starting from some industrial units which ultimately discharge industrial wastes illegaly to the river through this pipeline. Correlation is required through investigation	canal is laid by Irrigation Department for transport of water from Periyar river to Edayattuchaal paddy field. Since, the canal is concealed Board officials are not able to verify whether any unauthorized pipelines are laid from the industries discharging to the drain/canal. The canal is joining river Periyar at the upstream of Pathalam bund regulator. The discharge of any sewage/trade effluent to this canal will ultimately reach the river Periyar at upstream of Pathalam bund causing the diminishing of river water quality. Board had conducted detailed enquiry in the area and collected water samples from the drain. The analysis report shows presence of effluent in the canal which may be due to illegal discharges. The sources of discharges to river if any have to be identified and stopped so as to prevent river pollution and improve water quality. As the canal is concealed, at present, the Board cannot identify illegal discharges into it. Also, stringent actions need to be taken against the violating industries. Board had issued directions to Superintending Engineer, Irrigation Department to make canal/drain accessible for inspection or provide inspection chambers/manholes at definite intervals along the entire stretch of drain so as to identify unauthorized	Irrigation Department and Industries Department were conducted on 11.01.2021 and 21.01.2021 to find out the unauthorised discharge industrial effluent to the irrigation canal. Since no such discharges could be identified during the physical inspections in the inspection chambers of the canal, directions were given to the Irrigation department to make canal/ drain accessible for inspection or provide more inspection chambers/ manholes at definite intervals along the entire stretch of drain so as to identify unauthorized pipelines if any laid from the industries to the Canal. Irrigation department informed that Technical sanction was already got for the project and waiting for the Financial sanction.

		pipelines if any laid from the industries to the Canal. In this case the DIC also was instructed to provide necessary action to ensure that no such illegal discharges are occurring along the drain which is reported to be provided for lift irrigation towards the paddy filed. (But no details are received till date from any government agencies.)	
7	Yeoman Bone & Allied Products does not have ETP. Septic and sewage effluents often pumped into drain on the road along the side of the compound wall of the unit which ultimately reaches the river	M/s Yomen and Allied Products is a bone meal industry.The industry is not generating any effluent. The cooked bones are boiled and tallow separated and the bones then dried and crushed and sold. It's not an effluent generating industry. Board had found that discharge of wash water from their hand washing area to the drain. Notice issued to the unit accordingly.	Will be thoroughly checked by PCB. 1. The company was inspected and specific directions were given to provide separate Septic tank- soak pit system for the domestic wash water generated in the unit and to remove the water taps on the road side (wash water from this area were directed to the storm water drain and ultimately reaches the river). Company had complied with these directions and was verified by the Board. Now the unit is functioning satisfactorily.

8	Effluents from Premier Ferro Alloys are discharged through a pipeline to the drainage constructed on the road along the side of the compound wall of the unit which ultimately reaches the river through KuthuThodu.	M/s Premium Ferro alloy is a rolling mill unit. The industry is not an effluent generating industry. But, incident on discharge of domestic waste water from labour camps was noted in the unit. The septic tank constructed for the disposal of wash water from the bathrooms had overflown and it was discharged to the nearby drain. Board had immediately taken action to redress the issue. The industry constructed high capacity septic tank soak pit for the disposal of wash water and also constructed delay pond in their storm water outlet. Board had issued notices and several directions to the unit in this regard and also continuously monitoring the operation if the industry,	Close follow up will be ensured by PCB d) Noticed defects were rectified and now the unit is functioning satisfactorily. (Specific directions had been given to M/s Premium Ferro Alloys to stop the wastewater discharge to the stormwater drains (which reaches the River Periyar through the Kuthuthodu canal). They have provided separate Septic tank- soak pit system for Canteen wastewater and delay ponds for stormwater.)
9	No information received on follow up actions taken regarding the incident of the vehicle which was seized pumping effluents into open well.	An incident of unauthorized discharge of waste water to Periyar river occurred and the Eloor office of the Board had conducted enquiry on the complaint and also collected legal samples from the tanker. The analysis report shows that it as untreated effluent. Board had immediately provided the legal sample result to SHO, Binanipuram Police station and requested to conduct investigation to find out the violators. Police had filed case in this regard and prepared FIR.	Close follow up will be ensured **1.** Affidavit was filed in the OA and WP C in the HC. Now pending with HC and Tribunal
10	Criminal complaint filed	Case is still pending at Lower Court	Case is progressing

	by the Board against Kalamassery Municipality; no follow up action on the part of the board to bring this matter to the attention of the Court.		
11	KMML – pollution due to acidic leachate not followed up Material balance study		
12	No follow up action regarding pollution from CMRL Material balance study	M/s CMRL is a rutile manufacturing unit. The unit is discharging their treated effluent to River Periyar at the downstream of Pathalam bund. There were complaints from the environmentalists against the discharge and other pollution from the units at the upstream portion of Pathalam Bund. Board had found that the pipeline laid by the industry for discharge of treated effluent is leaking and treated effluent is seen leaked near the pipeline area. Board had given directions to the unit to replace the old pipeline and also to replace the flexible hose laid to discharge treated effluent. The Board's directions, have been complied with.	Continuous monitoring and surveillance shall be ensured by PCB 1. The unit had completed permanent treated effluent discharge pipes to downstream of Pathalam Bund 2. Another unit named M/s TMS Leathers was issued with a closure intention notice for not complying with the direction and the Board is planning to issue closure order to this unit for their inactions.

13		**Other matters** As per the order of the Hon'ble NGT in OA 606 of 2018 several meetings of SLMC were convened and decided to select model cities to bring them under the status of fully compliance of the environmental related Rules. Since the Board is facing acute shortage of permanent staffs especially technical officers and laboratory staffs, a decision was taken to appoint temporary technical assistants on contract basis for the inventory preparation of insdustries and establishments located in these LSGDs which are selected as model cities. Actually the time allowed was for six months. Thereafter, though on contract basis sufficient number of technical staffs were appointed in each district office as the Hon'ble Tribunal specifically insisted that all the units which are coming under the regime of different environmental Rules shall be brought to the consent purview. Unfortunately, the restrictions imposed due to the outbreak of pandemic COVID – 19 delayed all such activities. However, the Board is now effectively entrusted all the district level officers to bring all the industries/establishments under the purview of consent/authorizations. However as per the recent order in OA 395 of 2013 the	

		Hon'ble Tribunal entrusted the Supervised Committee in OA 396 to close monitoring of Periyar issues. Since three Committees (For OA 396, OA 262 &OA 395) are there to address the issues of Periyar Pollution, as decided meeting was convened on 22.10.2020 at Regional Office, Ernakulam to coordinate the activities and decided to inspect entire stretch of Periyar river immediately and a time line is fixed.	

2. Idukki Stretch (Idukki-Munnar-Neriamangalam).

It may be noted that the OA 395 of 2013 was originated from these area where rampant dumping of Hospital and slaughterhouse wastes were observed. Specific actions with respect to implementation of rules are initiated and on identifying continuous violations, EC was assessed and reported to Member Secretary for actions. Details submitted by the Environmental Engineer, Idukki as updated status are attached as **Annexure 1(1)**

3. Perumbavoor Stretch (Neriamangalam-Marampilly)

Stretch is starting from Neriamangalam and ending at Marampilly. The Environmental Engineer is reporting that no specific discharges are found except sewage from local body areas.

4. Ernakulam Stretch (Marampilly–Aluva)

The Periyar stretch from Marampilly to Kalamassery comes under the purview of District Offie-1 Ernakulum (Ernakulam Area). The major sources of pollution at this area are mainly the contamination of untreated sewage generated from the town ships, hotels, flats etc. However

some industries such as rice mills, Ankamaly industrial estates are also present which may indirectly reach the river through various drains. There are about 136 no. of establishments are identified which directly linked with river.

There are about 50 establishments including industries, hotels, hospitals and flats identified banks of river Periyar. Apart from this, rice mill industries are also operating which is indirectly linked to river. This office had initiated steps to control pollution problems in the river.

Action taken

1. Inspected M/s Petunia tower at Aluva Desam. STP of the apartment not operational. Operating without Board's consent and adequate STP. Notice issued to the builder for violation.

2. Inspected lulu mall. STP operating. STP meeting standards.

3. Closure direction issued to Elite Foods, Kalamsesery for discharging untreated effluent to the Periyar. Now, they had rectified the defects ETP operating. Inspected the unit and verified the compliance.

4. Notice issued to M/s Cake House, industrial estate Kalamassery for discharge of untreated effluent to the drain reaching Periyar river. The company had taken steps to install ETP.

5. The ETP installed at market not operational. Inspected and direction issued to the Secretary, Kalamssery municipality for making ETP operational. The matter was also informed to the SEE, ESC Eloor and Sup Engineer, Irrigation since; it is one of action in Periyar river action plan.

6. SFS aqua green lat inspected and the ensured STP operating effectively.

7. M/s Alwaye rubex, Athani inspected and verified the operation of ETP. ETP operating and meeting standards.

8. All rice mill units inspected and notice issued to all defaulters where ETP found non operational. Meeting also conducted with rice mill units and directed them to take steps to make ETP operational.

9. Conducted public hearing in connection with KMRL project on integrated water transport system which include installation of common STPs.

5. Thrissur Stretch (Kottappuram- Munambam)

The river stretch in Thrissur district starting from Kottappuram to Azhikode is about 5 km. The flow of the river in this stretch is affected by high tides and low tides. Reverse flow could be observed at the time of high tide during the time of monitoring. The water is generally saline in nature. Hence it is not used for other purposes.

In compliance with the NGT order in OA 395/2013, a survey was conducted, and identified 56 effluent generating industries situated in the vicinity of tributaries and drains leading to Periyar river and the details were uploaded in the ENVICLEAN app. The establishments which were found working without the consent of the Board were issued direction to apply for the consent of the Board and those which were working without adequate treatment facilities were directed to provide the same.

During the inspection no direct discharge to drains/ tributaries were observed from these units. Out of the 56 units 42 units now possess valid consent of the Board. The application submitted by the 13 units are under processing. The local bodies through which these drains are passing are,

a. Kodungallur Municipality,

b. Mala,

c. Kuzhoor,

d. Annamanada

e. Eriyad panchayths.

Kodungallur Municipality is having centralised facility like aerobic and windrow composting for treating biodegradable waste from public places and decentralised facilities in households. Door to door collection is arranged for collecting segregated dry waste. At present 85% of houses and

30% of establishments are covered under this project. There are 44 temporary working MCF in Municipal area and one RRF with a capacity of 2 MTD. Construction of 2 RRF each having capacity of 2 MTD and 7 MCF and 22 temporary MCF are attaining completions. In the case of panchayaths, the non compliance in implementing the rules has been brought to the notice of the DLMC, and the DLMC chairman entrusted DDP to take initiative in this regard.

It may also be noted that there are specific actions initiated by the Government to clean up certain streams in addition to other streams which are flowing through the city. The "Intergrated Urban Regenerated Water Transport Project" (IURWTS) is a creative proposal by the Government details of which are as follows,

"The project involves rejuvenation of 5 canals running through the heart of the urban fabric of Kochi Corporation and occupying nearly one-third of the corporation area. The overall objective was to improve inland Transport in the canal systems and have an intermodal connectivity with an integration of the Rail Metro and Water Metro. The restoration of canals and urban regeneration is aimed at restructuring the urban fabric and renewal of the urban economy and thereby overall improvement of city's image".

More details are as follows,

"Kochi Metro Rai1 Limited (KMRL) have been entrusted the work of Integrated Urban Regeneration and Water Transport System (IURWTS) in Kochi by the Government of Kerala. The proposed project envisages the development of the Edappally Canal (11.2"3 km), Thevara — Perandoor Canal (9.8 km), Chilavanoor Canal (11.15 km), Thevara Ca nal (1.405 km) and Market Canal (0.664 km) in Kochi. The major aim of the project is to regenerate the urban area in and around the canals, rehabilitate the slum dwellers, and make use of the commercial area in the vicinity of the canal along with creation of tourism destinations and navigation through the canals.

As a part of the project the following activities are proposed to be carried out Cleaning of Canals

- *Dredging & Cutting*
- *Bank Protection*
- *Reconstruction of Cross Structures and Foot Over Bridges*
- *Sanitary Sewer Line & STPs*
- *Sanitation Facilities*
- *Jetties*
- *Infrastructure Development*
- *Beautification of canals including Tourism & Sports Park*

On successful implementation of the proposed project will lead to Cleaner and Greener Environment, better drainage, sewage & rain water harvesting systems, effective and enhanced connectivity from various locations, improved landscape around the facility, reduced risk of potential flooding near the canals, properly treated and reused the sewage water from the facilities and circulate the treated water etc".

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KERALA STATE POLLUTION CONTROL BOARD

DISTRICT OFFICE, IDUKKI
ESSAREN BUILDING, AANAKOODU JN, THODUPUZHA, IDUKKI – 685 584

PCB/IDK/GEN/10/NGT585OF2018/2019 Date:5/06/2021

From
The Environmntal Engineer
District office ,Idukki

To
The Chief environmental engineer
Regional office ,Ernakulam

Sub:OA585 reg.
Ref:Joint inspection conducted on 18/11/2020,19/11/2020 and 20/11/2020

Sir,

During the joint inspection conducted by the supervised committee to the establishments near the banks of river periyar and its tributaries, STP/ETP of seventeen number of establishments were found not working and not maintaining properly .Hence show cause has been issued to these units.The list of the units are furnished below.

Sl.No.	Name of establishment	Remarks
1	Sujatha Inn , Munnar	
2	Eastern condiments,Adimaly	Reply received on 18/01/2021
3	Rivulet,Chithirapuram,Munnar	Reply received on 13/01/2021
4	Shristy charitable trust,Nullathanni,Munnar	
5	HotelC7, Munnar	Reply received on 30/01/2021
6	Silvertips ,Munnar	Reply received on 15/01/2021
7	Dhanya sree hotels and resorts ,Munnar	
8	Red star holidays,Munnar	Reply received on 13/01/2021
9	VMJ Dwellings ,munnar	Reply received on 5/01/2021

10	7”sTM cottage,Munnar	
11	Sri Venkiteswara Inn,Munnar	Reply received on 19/01/2021
12	Jays Inn,Munnar	Reply received on 12/01/2021
13	Red sparrow misha holidays,Munnar	Reply received on 18/01/2021
14	SN tourist home, Munnar	
15	Sree Annapurni restaurant, Munnar	Reply received on 15/01/2021
16	Abad copper castle,Pothamedu, Munnar	
17	Cliff valley, near attukad water falls,Chithirapuram, Munnar	Reply received on 13/01/2021

Inspections conducted to Munnar to verify the compliance of the direction issued. But it was noticed that most of the units were found closed and the remaining units were operational having very low occupancy. Hence it was unable to collect the treated water sample and verify the performance of STP. Further inspection will be conducted when the COVID restrictions are over.. This is for favor of information and further necessary action in this regard.

Yours faithfully

EBY VARGHESE

Digitally signed by EBY VARGHESE
Date: 2021.06.05 13:10:55 +05'30'

ENVIRONMENTAL ENGINEER.

Annexure 2

PERIYAR MONITORING [IDUKKI STRETCH]																						ANNEXURE 1
			Identification No./Station Name/concentration																			
			T1D1N	T1D1ND	T1D2MV	T1D2BD	T1D3P	T1D3K	T1D3PR	T1D3T	T1D3DR	T1D3R	T2D1R1	T2D1R2	T2D1R3	T2D1R4	T3D3R1	T3D3R1D2	T3D3R1D1	T3D1R1	T3D2R2	T2D3R3	T2D3R4
SI NO.	PARAMETER	UNIT	Nallathanni River near Srishti Charitable Trust	Nadayar Drain near Silver Spoon Restaurant,Munnar	Muthirappuzhayar near Avondale cottages	Drain Behind Broad Bean Resort	Periyar at Panamkutty Bridge	Kambilikandam Thodu at Panamkutty	Perinjankuttyar at Konnathady	Thottiyar at Kandamalipadi palam	Deviyar at Deviyar Bridge	Periyar at Kanjiraveli	Nallathanni River Near Pentecost Church	Kundala River at a Bridge connecting two parallel roads,Munnar	Kannimala River,Munnar	Muthirappuzha River at head works(KSEB), Munnar	River Periyar at Upputhara Bridge	Chottuparathodu at Vandiperiyar	Drain at River Periyar near Springdale Resort Vandiperiyar	Stream at backside of Edassery Eastend (Pankaj Cottage)	Uppar River at Ellackal Bridge	Periyar at Karimban old bridge	Deviyar River near confluence point of Thalamali thodu and Polinjapalam thodu
1	**pH**	---	6.7	6.6	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	6.7	6.7	7.4	6.8	7.5	7.5	7.5	7.5	7.5	7.5	6.5
2	**Turbidity**	NTU	0.5	0.4	0.2	0.5	0.4	0.6	0.3	0.5	0.4	0.3	0.4	0.5	0.4	0.3	0.3	0.3	0.4	0.3	0.5	0.3	0.3
3	**Electrical Conductivity**	µmhos/cm	12.2	80.5	54.2	72.3	54.2	0.2	48.7	0.2	0.3	54.2	94.2	48.5	123.2	69.1	103.4	0.9	0.6	138.2	23.2	46.2	0.1
4	**DO**	mg/l	6.2	6.8	7.9	7.7	7.7	7.6	7.9	7.9	7.4	7.4	6.6	7.5	7.5	8.3	8.2	6.5	6.4	7.1	7.9	7.9	5.9
5	**BOD**	mg/l	4.7	6.6	1	1.8	1.3	0.7	1	3.2	2.7	1.4	4.4	2.4	1.9	2.8	2.9	3.7	5.4	4.6	3.8	1.7	2.7
6	**COD**	mg/l	43.14	54.9	11.76	23.52	19.61	15.69	23.53	11.76	3.92	23.53	39.22	15.69	23.52	19.6	7.84	3.85	11.54	27.45	62.75	3.85	238.45
7	**Total coliforms**	CFU/100ml	1200	1600	7800	8400	4100	4700	3600	3800	1600	2700	4800	12000	4400	8700	1600	1400	4200	15000	8600	3800	4900
8	**Fecal Coliforms**	CFU/100ml	400	400	2400	4800	800	900	800	700	600	400	2400	7300	3700	6300	500	600	2200	12000	5000	1300	1700
9	**Strepto cocci**	CFU/100ml	200	100	NIL	200	NIL	100	NIL	NIL	NIL	NIL	100	100	100	NIL	NIL	100	NIL	300	100	NIL	NIL
10	**Ammoniacal Nitrogen**	mg/l	0.16	0.16	0.54	0.071	0.19	0.26	0.13	0.15	0.09	0.08	0.11	1.98	0.1	0.12	0.1	0.34	0.1	0.22	0.15	0.31	0.32
11	**Nitrate -N**	mg/l	1.2	1.26	0.29	0.24	0.26	0.25	0.32	0.4	0.14	0.34	2.06	0.69	0.53	1.12	0.31	1.97	1.05	1.91	1.26	0.95	0.84
12	**Chloride**	mg/l	14.35	9.9	7.42	9.4	2.2	2.1	2.8	1.9	1.5	1.7	3.5	6.43	5.94	8.41	2.3	11.38	15.84	11.88	12.37	14.85	9.4
13	**Phosphate**	mg/l	0.024	0.00013	0.00041	0.00083	0.00083	BDL	0.00013	0.012	0.00027	0.017	0.2	0.017	0.00069	0.00083	0.00069	0.017	0.26	0.00041	0.00041	0.00083	0.03
14	**Total hardness**	mg/l	26	17	18	15	19	17	24	14	14	13	22	16	23	15	20	37	29	19	14	24	15
15	**Sodium**	mg/l	5.27	3.26	1.72	2.12	3.21	2.72	3.76	3.72	2.13	2.23	2.12	2.23	3.12	3.26	3.17	1.27	3.22	1.27	2.17	2.97	2.36
16	**Boron**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
17	**Sodium absorption ratio**	SAR	0.45	0.34	0.024	0.23	0.32	0.29	0.33	0.43	0.24	0.28	0.21	0.25	0.29	0.36	0.29	0.1	0.26	0.14	0.24	0.27	0.26
18	**Calcium**	mg/l	7.21	4.01	2	4.01	5.61	3.21	3.21	2.81	4.81	3.61	6.81	2.81	2.41	3.61	3.61	4.81	6.81	6.01	4.01	3.61	4.01
19	**Magnesium**	mg/l	1.94	1.7	3.16	1.22	1.22	2.19	3.89	1.7	0.49	0.97	1.22	2.19	4.13	1.46	2.67	6.08	2.92	0.972	0.972	3.65	1.22
20	**Fluoride**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
21	**Sulphate**	mg/l	2	2	BDL	BDL	BDL	2	BDL	1	2	1	1	BDL	BDL	BDL	1	BDL	2	3	BDL	BDL	3
22	**Cyanides**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
23	**Mercury as Hg**	mg/l	BDL	BDL	0.004	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.002	BDL	BDL	BDL	0.001	0.003	BDL	0.002	BDL	0.029
24	**Arsenic as As**	mg/l	BDL	0.01	BDL	BDL	BDL	BDL	0.007	BDL	BDL	BDL	BDL	BDL	0.005	BDL	0.007	BDL	BDL	BDL	BDL	BDL	0.009
25	**Lead as Pb**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.011	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
26	**Copper as Cu**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.01	BDL	BDL	BDL
27	**Chromium as Cr**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
28	**Zinc as Zn**	mg/l	0.05	0.07	0.021	0.033	0.145	0.016	0.044	0.034	0.082	0.06	0.169	0.065	0.072	0.103	0.061	0.03	0.013	0.061	0.01	0.061	0.134
29	**Nickel as Ni**	mg/l	BDL	BDL	BDL	BDL	0.063	0.011	0.032	BDL	0.093	0.055	0.026	BDL	BDL	0.025	BDL	BDL	BDL	0.025	BDL	BDL	BDL
30	**Cadmium as Cd**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
31	**Manganese as Mn**	mg/l	0.181	0.09	0.023	0.053	0.052	0.02	0.043	0.075	0.131	0.178	0.091	0.11	0.027	0.057	0.019	0.101	0.059	0.3	0.047	0.05	0.198
32	**Iron as Fe**	mg/l	3.87	0.233	0.368	0.798	0.569	0.327	0.556	0.708	0.384	0.47	0.777	1.63	0.311	0.538	0.308	1.192	0.732	0.511	0.49	0.377	1.048
33	**Antimony as Sb**	mg/l	BDL	BDL	0.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
34	**Molybdenum as Mo**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
35	**Cobalt as Co**	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
36	**DDT OP**	µg/L				0.01				1.48													
37	**DDT PP**	µg/L				NIL				0.29													
38	**DDE PP**	µg/L				0.012				0.461													
39	**DDD PP**	µg/L				0.018				0.561													
40	**Chlor Pyrifos**	µg/L				0.012				NIL													
41	**Endosulfan sulphate**	µg/L				0.021				NIL													
42	**Dicofol**	µg/L				0.036				0.031													

Monitoring in connection with OA 395/2013,396/2013 &262/2017

Annexure 3

Office : KSPCB, District Office II, Perumbavoor

Date : 15.12.2020

Sl.No	Station	Sample code	pH	DO (mg/l)	TDS (mg/l)	Electrical Conductivity	Colour (Hazen)	Temperature °C	Chloride (mg/l)	Nitrate (mg/l)	Sulphate (mg/l)	Phosphate (mg/l)	Hardness (mg/l)	COD (mg/l)	BOD (mg/l)	TC Cfu/100 ml	FC Cfu/100 ml	FS Cfu/100 ml
1	Neriamangalam, Sastha Temble Ghat	G/DO-2/PBR-01	6.53	7.9	60.6	78.73	3	26	25	0.29	BDL	BDL	7	4	1.6	Nil	Nil	Nil
2	Neriamangalam Bridge	G/DO-2/PBR-02	6.51	7.9	47.7	71.6	3	26	24	0.07	BDL	BDL	8	4	1.8	37	6	1
3	Avolichal near pumping station	G/DO-2/PBR-03	7.31	6.9	49.9	69.85	3	27	25	2.4	BDL	BDL	9	8	3.1	1	Nil	Nil
4	Inchathotty hanging bridge	G/DO-2/PBR-04	6.52	8	43.8	70.12	3	28	24	0.02	BDL	BDL	9	16	6.1	8	4	Nil
5	Thattekkad Bridge, Velielchal	G/DO-2/PBR-05	6.53	9.24	42.8	68.22	2	28	24	BDL	BDL	BDL	8	8	3	14	8	Nil
6	KWA Pumping station, Kuttampuzha	G/DO-2/PBR-06	6.51	6	22	28.55	3	28	12	BDL	BDL	BDL	4	4	1.3	86	12	4
7	Manikandachal, Pooyamkutty	G/DO-2/PBR-07	6.51	8.6	17.7	24.84	2	28	14	BDL	BDL	BDL	6	12	3.9	Nil	Nil	Nil
8	Vettampara Pumping station	G/DO-2/PBR-08	6.52	8.3	27.9	41.79	3	29	17	BDL	BDL	BDL	4	4	0.7	16	8	Nil
9	Paniyeliporu, Near Whispering w	G/DO-2/21	6.43	8.8	31.7	41.26	3	26	15	0.05	BDL	BDL	7	12	3.5	Nil	Nil	Nil
10	Thottuva- Near River view Resort Kodanad	G/DO-2/22	7.35	6.7	64.5	90.24	3	27	28	0.07	BDL	0.02	10	8	2.9	2000	68	8
11	Near kalady Bridge	G/DO-2/23	7.41	7.4	31.6	47.45	1	28	19	0.03	2.71	BDL	4	4	1.6	Nil	Nil	Nil
12	Vallom Angadikadavu- Near T P Hassan Memmorial Hall	G/DO-2/24	6.82	8.7	33.2	53.17	3	29	19	0.03	0.69	0.006	8	16	4.2	Nil	Nil	Nil
13	Mudickal Near Pump House	G/DO-2/25	7.31	3.7	88.4	123.7	2	30	38	0.12	2.71	BDL	10	8	3.5	Nil	Nil	Nil
14	Kunnuvazhi –Near Universal Education Trust	G/DO-2/26	7.32	8.8	91.8	146.8	2	28	43	0.19	BDL	BDL	12	8	2.2	Nil	Nil	Nil
15	Marambilly – Near Bank Of India, Aluva –Munnar Road	G/DO-2/27	7.24	8.4	62.5	93.68	3	28	32	0.06	BDL	BDL	6	16	4.6	4	Nil	Nil

BDL:Below Detection Limit,BLQ:Limit of Quantification

O&G (mg/l)	Flouride(mg/l)	Cyanide(mg/l)	Heavy Metals																	
			Arsenic As (mg/l)	Antimony as Sb(mg/l)	Chromium as Cr (mg/l)	Copper as Cu (mg/l)	Cadmium as Cd (mg/l)	Iron as Fe (mg/l)	Lead as Pb (mg/l)	Manganese as Mn (mg/l)	Molybdenum as Mo (mg/l)	Mercury as Hg (mg/l)	Nickel as Ni (mg/l)	Zinc as Zn (mg/l)	Cobalt as Co(mg/l)	Endosulfan Sulphate (ug/l)	Alpha - BHC (ug/l)	Beta BHC (ug/l)	Gamma - BHC (ug/l)	Aldrin (ug/l)	Dieldrin (ug/l)
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.39	BDL	0.044	BDL	BDL	BDL	0.038	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.322	BDL	0.047	BDL	BDL	BDL	0.017	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.242	BDL	0.031	BDL	BDL	BDL	0.076	BDL	–	–	–	–	–	–
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.155	BDL	0.063	BDL	BDL	BDL	0.112	BDL	–	–	–	–	–	–
BDL	BDL	BDL	BDL	0.002	BDL	BDL	BDL	0.179	BDL	0.023	BDL	BDL	BDL	0.188	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.246	BDL	0.04	BDL	BDL	BDL	0.102	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.248	BDL	BDL	BDL	BDL	BDL	0.024	BDL	–	–	–	–	–	–
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.264	BDL	0.148	BDL	BDL	BDL	0.226	BDL	–	–	–	–	–	–
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.237	BDL	0.022	BDL	BDL	BDL	0.017	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.059	BDL	0.238	BDL	BDL	BDL	0.033	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.259	BDL	0.051	BDL	0.001	BDL	0.067	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.459	BDL	0.079	BDL	BDL	BDL	0.311	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	0.044	BDL	0.968	BDL	0.219	BDL	0.006	0.015	0.4	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.638	BDL	0.101	BDL	BDL	BDL	0.035	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.252	BDL	0.062	BDL	BDL	BDL	0.027	BDL	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

Pesticides																		
Alpha Endosulfan (ug/l)	Beta Endosulfan (ug/l)	DDD-p,p' (ug/l)	DDE-p,p' (ug/l)	DDT-o,p' (ug/l)	DDT-p,p' (ug/l)	Alachlor (ug/l)	Butachlor (ug/l)	Chlorpyriphos (ug/l)	Ethion (ug/l)	Iprobenphos (ug/l)	Parathion methyl (ug/l)	Phorate (ug/l)	Dicofol (ug/l)	Heptachlor (ug/l)	Chloroform (ug/l)	Trichloro Ethylene (ug/l)	Hexachloro benzene (ug/l)	Monocrotophos (ug/l)
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.012	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BLQ	BLQ	0.024	BLQ	BLQ	BLQ	BLQ	BLQ	0.012	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.011	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.012	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
0.011	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

SARANYA DAS.K

ASSISTANT SCIENTIST

Annexure 4

PeriyarRiver (Ernakulam Stretch) - General/Heavymetal/Pesticides

PARAMETERS	UNIT	T1R1	T1R2	T1R3	T1R4	T26	T27	T28	T29	T210	T3R14	T3R15	T3R16	T3R17 (KB)
		RIVER ARATTUKADAVU	RIVER NEAR OLD MALAYATTOOR	RIVER KALLUKADAVU, NEELEESWARAM	RIVER WATER FROM MEKKALADY	RIVER NEAR MADASSY MANA TEMPLE	RIVER PARAPPURAM VALLAM KADAVU	STREAM THADIKKAKKADAVU BRIDGE	STREAM ANGADIKKADAVU ROAD-MANJALI THODU BEFORE	STREAM MADHURAMPURAM BRIDGE AFTER IDA,ANGAMALY	RIVER CHEMBAKASSERY KADAV	RIVER ALUVA MANAPPURAM	RIVER ULIYANNUR BRIDGE	RIVER KALAMASSERY BRIDGE
pH	-	6.8	7.1	6.9	6.4	7.3	7.3	7.2	7.1	6.8	6.4	6.8	7	6.9
DO	mg/l	7.5	7.7	7.5	7.6	9.6	8.5	6.7	6.2	3.5	6.4	8.3	8.3	6.9
TDS	mg/l	28	33	34	40	30	33	31	47	56	59	29	27	33
Conductivity	µS/cm	45.9	44.8	55.2	60.8	44.4	47	45.9	74.6	86.5	91.6	43	41.3	49
Color	Hazen	10	10	10	10	10	10	10	10	40	10	10	10	10
Fluoride	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloride	mg/l	6	6	11	11	6	9	6	13	17	11	9	9	9
Nitrate	mg/l	0.31	0.38	0.31	0.37	0.36	0.52	0.46	0.5	0.15	0.65	0.44	0.35	0.43
Sulphate	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2
Phosphate	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hardness	mg/l	12	10	16	14	12	12	14	18	20	36	12	12	12
COD	mg/l	8	12	16	24	8	16	12	8	8	20	16	4	8
BOD	mg/l	BDL	3.2	0.3	0.2	0.5	0.8	0.4	0.3	0.4	1.1	0.3	0.5	1.1
Oil & Grease	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cyanide	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total Coliform	cfu/100 ml	800	380	2200	6200	190	24	480	1700	500	8000	8000	700	7800
Fecal coliform	cfu/100 ml	160	100	380	2000	40	NIL	120	450	145	2500	2400	140	4400
Fecal streptococci	cfu/100 ml	10	8	16	30	6	NIL	8	32	4	44	26	NIL	16
Arsenic	mg/l	BDL	BDL	0.013	0.005	BDL	BDL	BDL	_	BDL	BDL	BDL	BDL	BDL
Antimony	mg/l	BDL	BDL	BDL	0.001	BDL	BDL	BDL		BDL	BDL	BDL	BDL	BDL

Hexavalent Chromium	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Copper	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	_	BDL	BDL	BDL	BDL	BDL
Cobalt	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	_	BDL	BDL	BDL	BDL	BDL
Cadmium	mg/l	BDL	BDL	BDL	0.001	BDL	BDL	0.001	_	BDL	BDL	BDL	BDL	BDL
Iron	mg/l	0.168	0.212	0.381	0.607	0.23	1.192	0.187	_	1.523	1.016	0.258	0.197	0.211
Lead	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	_	BDL	BDL	BDL	0.024	BDL
Manganese	mg/l	0.029	0.023	0.131	0.095	0.026	0.126	0.027	_	0.201	0.093	0.038	0.059	0.034
Molybdenum	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	_	BDL	BDL	BDL	BDL	BDL
Mercury	mg/l	BDL	BDL	0.001	0.002	0.001	BDL	BDL	_	0.001	BDL	BDL	0.001	BDL
Nickel	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	_	BDL	BDL	BDL	BDL	BDL
Zinc	mg/l	0.032	0.047	0.023	0.064	0.027	0.071	0.053	_	0.018	0.757	0.208	0.213	0.128
TOC	_	_	_	_	_	_	_	_	_	_	_	_	_	_
α - BHC	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
β -BHC	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
γ - BHC	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Aldrin	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Dieldrin	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
α - Endosulfan	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
β - Endosulfan	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
DDT-o,P'	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
DDT-p,p'	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
DDE-p,p'	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_

DDD-p,p'	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Chloroform	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
TCE	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Hexachlorobenzene	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
BTEX	µg/l		_			_	_	_	_	_	_		_	_
Alachlor	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Butachlor	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Chloropyrifos	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Ethion	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Iprobenfos	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Parathion Methyl	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Endosulfan Sulfate	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Monocrotophos	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Heptachlor	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Dicofol	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	BLQ	_	_
Phorate	µg/l	BLQ	_	BLQ	BLQ	_	_	_	_	_	_	0.025	_	_

			Ernakulam Drain - Water sample																									
		T11	T12	T13	T14	T15	T16	T17	T18	T19	T110	T111	T21	T22	T23	T24	T25	T31	T32	T33	T34	T35	T36	T37	T312	LOTUS	PKD	DNGFR	ET
PARAMETERS	UNIT	DRAIN -1 INSIDE FOREST THUNDA MTHODU	DRAIN-2 INSIDE FOREST	DRAIN PERUNT HODU	DRAIN ILLITH ODU	DRAIN ARATTUK ADAVU KADAPPA RA	DRAIN MALAY ATTOOR THAZHE PALLI THODU	DRAIN NEELEESWA RAM THODU	DRAIN MOOKK ADA THODU	DRAIN CHENGA L THODU	DRAIN NEAR ULIYAN NOOR BRIDGE	DRAIN ARATTU KADAVU THODU KALAMA SSERY	DRAIN KANJOO R THODU	DRAIN PARAPPU RAM-ARANKA VU	DRAIN NEDUV ANNOO R-DESAM-CHENG AMANA D	DRAIN VAPALAS SERY-ANGAMA LY SOUTH-MANJALI THODU	DRAIN ANGADIK KADAVU ROAD-MANJALI THODU BEFORE IDA,ANGA MALY	DRAIN THOTTU MUGAM CANAL	DRAIN CHALAK KAL CANAL	DRAIN ARRAK KA CANAL	DRAIN KAROTTU PURAM CANAL	DRAIN ASHRA MAM ROAD	DRAIN ALUVA MARKET/JE WEL RIVER WOODS FLAT	DRAIN NEAR HOTEL PERIYAR	DRAIN THOOM BUNGAL THODU	DRAIN SHANTI LOTUS	DRAIN PUTHALAM KADAVU	DRAIN NEAR TO GLASS FACTORY ROAD	DRAIN EDAPALLY THODU
pH	-	7	6.8	6.9	7.2	6.8	7.2	6.9	7	6.9	6.7	6.4	6.5	6.8	7	6.9	7.1	7.2	7.1	6.9	6.9	6.7	6.9	6.8	6.8	6.8	6.7	6.8	6.9
DO	mg/l	8.3	7.3	6.6	8.5	7.9	7.4	5.4	7.5	7.5	NIL	2.8	5	6.5	5.9	8.8	4.8	8.6	8	5.5	8.3	5	4.2	2.6	6.5	6.6	0.9	1.2	6.1
TDS	mg/l	50	28	31	28	30	38	51	49	100	192	132	59	62	41	82	42	31	39	65	34	130	138	205	33	46	414	162	37
Conductivity	µS/cm	68.1	43.1	45.2	43.3	50.1	53.9	82.5	74.6	152.1	266	207	87.7	93.2	59.8	131.1	67.5	47.2	56.6	100	53.3	201	209	299	48	71.7	598	253	59.4
Color	Hazen	10	10	10	10	10	10	10	10	10	10	10	10	10	10	30	20	10	10	10	10	10	10	20	10	10	50	10	10
Fluoride	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloride	mg/l	9	11	6	4	9	6	11	13	15	30	32	17	15	9	23.4	13	9	9	15	9	26	26	34	11	11	11	34	11
Nitrate	mg/l	0.34	0.18	0.32	0.7	0.74	0.59	0.42	0.4	0.25	0.09	0.28	0.92	1.38	0.18	0.52	0.65	0.25	0.3	1.08	0.61	2.63	2.15	0.29	0.27	0.33	1.61	0.09	0.37
Sulphate	mg/l	4	4	3	BDL	BDL	BDL	BDL	BDL	BDL	16	11	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4	17	12	4
Phosphate	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.1	0.21	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2	0.22	0.01
Hardness	mg/l	8	10	12	12	8	12	14	18	34	62	38	18	28	10	24	16	12	18	24	12	46	62	68	14	12	14	48	16
COD	mg/l	4	8	11.4	4	8	8	12	20	8	36	13.5	12	4	20	12	4	12	12	8	8	12	12	120	16	20	164	36	8
BOD	mg/l	BDL	BDL	1.2	0.5	0.4	0.7	1.4	0.25	1.3	10.6	4.8	2.2	1.2	1.7	0.9	0.4	0.6	0.9	0.6	0.9	0.4	1.8	13.5	0.5	0.1	44.5	10.5	0.2
Oil & Grease	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.1	BDL	BDL	BDL
Cyanide	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total Coliform	cfu/100 ml	520	440	300	640	1000	4000	5200	3850	4000	40000	800000	880	240	1100	800	640	1040	540	3600	120	7400	4400	260000	680	350	250000	150000	4000
Fecal coliform	cfu/100 ml	185	24	10	180	200	600	250	2500	1750	4400	8000	260	120	400	240	280	320	100	400	36	1750	2000	8000	200	100	8000	7600	2700
Fecal streptococci	cfu/100 ml	NIL	NIL	NIL	8	28	36	NIL	30	16	75	130	22	6	70	8	10	8	4	6	12	36	200	110	NIL	NIL	200	28	14
Arsenic	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.007	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	BDL

Antimony	mg/l	0.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	0.001
Hexavalent Chromium	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	BDL
Chromium as Cr	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.012	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	BDL
Copper	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	0.021	BDL
Cobalt	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	BDL
Cadmium	mg/l	BDL	BDL	BDL	0.001	BDL	0.001	BDL	BDL	BDL	BDL	BDL	BDL	0.001	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	BDL
Iron	mg/l	0.553	0.596	0.989	0.142	0.299	0.248	1.1	0.799	2.34	25.2	0.546	1.126	0.818	0.519	0.942	1.13	0.332	0.515	0.775	BDL	0.541	3.351	1.942	0.659	_	9.28	3.225	0.347
Lead	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL		BDL	0.013	BDL
Manganese	mg/l	0.019	0.047	0.074	0.05	0.044	0.124	0.123	0.102	0.252	0.3	0.28	0.143	0.112	0.044	0.144	0.112	0.066	0.078	0.044	BDL	0.11	0.191	0.097	0.026	_	0.322	0.116	0.152
Molybdenum	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	–	BDL	BDL	BDL
Mercury	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.001	0.001	BDL	BDL	0.001	BDL	BDL	BDL	BDL	BDL	0.001	BDL	BDL	–	BDL	0.001	BDL
Nickel	mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL		BDL	BDL	BDL
Zinc	mg/l	0.028	0.028	0.191	0.168	0.074	0.115	0.056	0.046	0.032	0.487	0.462	0.027	0.019	0.276	0.031	0.141	0.124	0.294	0.148	0.013	0.282	0.521	0.452	0.102	–	1.01	0.292	0.694
TOC	µg/l	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
α - BHC	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
β -BHC	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
γ - BHC	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
Aldrin	µg/l	0.006	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
Dieldrin	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
α - Endosulfan	µg/l	0.018	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
β - Endosulfan	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
DDT-o,P'	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
DDT-p,p'	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
DDE-p,p'	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–
DDD-p,p'	µg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	–	–	BLQ	–	BLQ	–	–	–	–	–	–	–	BLQ	BLQ	–	–	–	–	–	–	–	–

Chloroform	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
TCE	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Hexachlorobenzene	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
BTEX	**µg/l**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Alachlor	**µg/l**	**BLQ**	**BLQ**	**0.016**	**BLQ**	**0.027**	**0.026**	–	–	**BLQ**	–	**0.017**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Butachlor	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Chloropyrifos	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Ethion	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Iprobenfos	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Parathion Methyl	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Endosulfan Sulfate	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Monocrotophos	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Heptachlor	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Dicofol	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–
Phorate	**µg/l**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	**BLQ**	–	–	**BLQ**	–	**BLQ**	–	–	–	–	–	–	–	**BLQ**	**BLQ**	–	–	–	–	–	–	–	–

Annexure 5

		Periyar Monitoring (Eloor Stretch) -- General Sample																							
		Parameters/Concentration																							
Sl No	Location	Sample ID	pH	Turbidity (NTU)	CONDUCTIVITY (µs/cm)	DO (Mg/L)	BOD (Mg/L)	COD (Mg/L)	TC (Cfu/100ml)	FC (Cfu/100ml)	Strepto Cocci (Cfu/100 ml)	Ammoniacal Nitrogen (mg/L)	NITRATE (Mg/L)	CHLORIDE (Mg/L)	PHOSPHATE (Mg/L)	HARDNESS (Mg/L)	Sodium Absorption Ratio(SAR)	Cyanides (mg/l)	TDS (Mg/L)	COLOUR (Hazen)	TEMPERATURE(°c)	FLUORIDE (Mg/L)	SULPHATE (Mg/L)	Oil and Grease (Mg/L)	FS (Cfu/100ml)	Arsenic as As (mg/l)
			6.5-8.5		1000	4								120					500	300						
1	Eloor ferry	EF	6.6	-	21850	6.5	1.1	5.7	2900	600	-	-	BDL	1250	BDL	350	-	BDL	14203	15	29.1	BDL	52	BDL	NIL	BDL
2	Unthithodu confluence point	UT	6.6	-	8840	5.2	1.9	6.8	4200	800	-	-	BDL	750	BDL	140	-	BDL	5746	15	29.1	BDL	28	BDL	NIL	BDL
3	Methanam Bridge	MTBR	6.6	-	15890	7.1	0.9	5.1	2600	400	-	-	BDL	1250	BDL	260	-	BDL	10329	10	28.9	BDL	44	BDL	NIL	BDL
4	Vettukadavu	VK	6.5	-	17890	6.5	1.1	5.9	3200	500	-	-	BDL	1000	BDL	300	-	BDL	11629	10	29	BDL	58	BDL	NIL	BDL
5	Pathalam bund down stream	PTB-DS	6.6	-	17950	6.5	1.2	6.1	3000	500	-	-	BDL	1250	BDL	280	-	BDL	11668	15	29.1	BDL	56	BDL	NIL	0.005
6	Manjummal bridge	MJBR	6.6	-	591	6	1.7	7.2	2300	300	-	-	BDL	50	BDL	40	-	BDL	384	10	29.1	BDL	3	BDL	NIL	BDL
7	Manjummal bund down stream	MJB-DS	6.5	-	574	5.7	1.9	6.6	2500	300	-	-	BDL	50	BDL	70	-	BDL	373	15	28.7	BDL	2	BDL	NIL	BDL
8	Manjummal bund up stream	MJB-US	6.4	-	493	6.4	1.5	6.2	2400	200	-	-	BDL	50	BDL	30	-	BDL	320	10	28.7	BDL	2	BDL	NIL	BDL
9	Pathalam bridge	PTBR	6.3	-	470	6.6	1.3	6	1100	100	-	-	BDL	50	BDL	30	-	BDL	306	15	29	BDL	2	BDL	NIL	BDL
10	Pathalam bund up stream	PTB-US	6.5	-	561	6.6	1.4	6.2	1900	200	-	-	BDL	50	BDL	30	-	BDL	365	15	28.9	BDL	2	BDL	NIL	BDL
11	Puthalam kadavu	PK	6.6	-	503	6.7	1.3	6.1	2700	400	-	-	BDL	50	BDL	30	-	BDL	327	10	28.7	BDL	2	BDL	NIL	0.006
12	Purappillykavu bridge	PKBR	6.4	-	30880	5.8	1.8	6.5	1800	200	-	-	BDL	2250	BDL	520	-	BDL	20072	10	28.7	BDL	71	BDL	NIL	-
13	Manjaly Bridge	MJLBR	6.5	-	12070	5.5	2.1	7.2	500	NIL	-	-	BDL	1000	BDL	130	-	BDL	7846	10	28.7	BDL	35	BDL	NIL	BDL
14	Puthanvelikkara Bridge	PVBR	6.7	-	54270	6.7	1	6.1	1700	100	-	-	BDL	3500	BDL	1060	-	BDL	35276	10	28.7	BDL	144	BDL	NIL	0.007

	Periyar Monitoring (Eloor Stretch) -- Heavy metals					
	WATER SAMPLE					
Sl no	Station	Id No	Arsenic as As (mg/l)	Antimony as Sb(mg/l)	Chromium as Cr(mg/l)	Copper as Cu(mg/l)
1	Eloor ferry	EF	BDL	BDL	BDL	BDL
2	Unthithodu confluence point	UT	BDL	BDL	BDL	BDL
3	Methanam Bridge	MTBR	BDL	BDL	BDL	BDL
4	Vettukadavu	VK	BDL	BDL	BDL	BDL
5	Pathalam bund down stream	PTB-DS	0.005	0.002	BDL	BDL
6	Manjummal bridge	MJBR	BDL	BDL	BDL	BDL
7	Manjummal bund down stream	MJB-DS	BDL	BDL	BDL	BDL
8	Manjummal bund up stream	MJB-US	BDL	BDL	BDL	BDL
9	Pathalam bridge	PTBR	BDL	BDL	BDL	BDL
10	Pathalam bund up stream	PTB-US	BDL	BDL	BDL	BDL
11	Puthalam kadavu	PK	0.006	BDL	BDL	BDL
12	Purappillykavu bridge	PKBR	-	-	-	-
13	Manjaly Bridge	MJLBR	BDL	BDL	BDL	BDL
14	Puthanvelikkara Bridge	PVBR	0.007	0.003	BDL	BDL

s

(Heavy metals)

Parameter/Concentration

Cadmium as Cd(mg/l)	Iron as Fe(mg/l)	Lead as Pb(mg/l)	Manganese as Mn(mg/l)	Molybdenum as Mo(mg/l)	Mercury as Hg(mg/l)	Nickel as Ni(mg/l)	Zinc as Zn(mg/l)	Cobalt as Co(mg/l)
	300			**73**	**0.026**		**30**	
0.002	0.367	BDL	0.097	BDL	BDL	BDL	1.068	BDL
BDL	0.27	BDL	0.031	BDL	BDL	BDL	0.112	BDL
0.003	0.47	BDL	0.735	BDL	BDL	BDL	1.218	BDL
0.006	0.24	BDL	0.129	BDL	BDL	BDL	1.963	BDL
0.002	0.229	BDL	0.063	BDL	BDL	BDL	0.337	BDL
BDL	0.3	BDL	0.033	BDL	BDL	BDL	0.105	BDL
0.001	0.396	BDL	0.035	BDL	BDL	BDL	0.1	BDL
BDL	0.266	BDL	0.027	BDL	BDL	BDL	0.05	BDL
BDL	0.182	BDL	0.036	BDL	BDL	BDL	0.099	BDL
BDL	0.221	BDL	0.032	BDL	BDL	BDL	0.076	BDL
0.001	0.411	BDL	0.077	BDL	BDL	BDL	0.086	BDL
-	-	-	-	-	-	-	-	-
0.001	0.367	BDL	0.047	BDL	BDL	BDL	0.109	BDL
BDL	0.193	BDL	0.051	BDL	BDL	BDL	0.095	BDL

Periyar Monitoring (Eloor Stretch) -- Pesticides

Sl No		Parameter	Water Sample																			Residue in Water							
			Pesticides																			Pesticides							
			Alpha - BHC (ug/l)	Endosulfan Sulphate (ug/l)	Beta BHC (ug/l)	Gamma - BHC (ug/l)	Aldrin (ug/l)	Dieldrin (ug/l)	Alpha Endosulfan (ug/l)	Beta Endosulfan (ug/l)	DDD-p,p' (ug/l)	DDE-p,p' (ug/l)	DDT-o,p' (ug/l)	DDT-p,p' (ug/l)	Alachlor (ug/l)	Butachlor (ug/l)	Chlorpyriphos (ug/l)	Ethion (ug/l)	Iprobenphos (ug/l)	Parathion methyl (ug/l)	Phorate (ug/l)	Dicofol (ug/l)	Heptachlor (ug/l)	Chloroform (ug/l)	Trichloro Ethylene (ug/l)	Hexachlorobenzene (ug/l)	Monocrotophos (ug/l)	Arsenic as As (mg/kg)	Antimony as Sb(mg/kg)
	Standards			0.003			0.004						0.001	0.001			0.002						0.01	1.8				5	
1	Eloor ferry	EF	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
2	Unthithodu confluence point	UT	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	0.012	0.022	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
3	Methanam Bridge	MTBR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.018	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.021	BDL	BDL
4	Vettukadavu	VK	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	-	-
5	Pathalam bund down stream	PTB-DS	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
6	Manjummal bridge	MJBR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
7	Manjummal bund down stream	MJB-DS	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	2.29	3.45
8	Manjummal bund up stream	MJB-US	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
9	Pathalam bridge	PTBR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
10	Pathalam bund up stream	PTB-US	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	0.022	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
11	Puthalam kadavu	PK	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.022	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
12	Purappillykavu bridge	PKBR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
13	Manjaly Bridge	MJLBR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BDL	BDL
14	Puthanvelikkara Bridge	PVBR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.011	BDL	BDL

ELOOR DRAIN - WATER SAMPLE (Heavy metals)

	Location	Location coordinates (Latitude,Longitude)	Sample ID	Arsenic as As (mg/l)	Antimony as Sb(mg/l)	Chromium as Cr(mg/l)	Copper as Cu(mg/l)	Cadmium as Cd(mg/l)	Iron as Fe(mg/l)	Lead as Pb(mg/l)	Manganese as Mn(mg/l)	Molybdenum as Mo(mg/l)	Mercury as Hg(mg/l)	Nickel as Ni(mg/l)	Zinc as Zn(mg/l)	Cobalt as Co(mg/l)
									300			**73**	**0.026**		**30**	
1	**Drai between alpha crumb rubber and Malayarubtec**	**10.079882, 76.315165**	**DBAM**	BDL	BDL	BDL	0.016	BDL	4.536	BDL	0.318	BDL	BDL	BDL	0.703	BDL
2	**Drain joining at upstream near to navigation channel of pathalam bund**	**10.077014, 76.309036**	**NCBU**	BDL	BDL	BDL	BDL	BDL	0.659	BDL	0.113	BDL	BDL	BDL	0.147	BDL
3	**drain near to Marksmen marine products**	**10.077041, 76.308574**	**DNMM**													
4	**Storm water drain of Indogerman**	**10.077735, 76.308308**	**DIGW**													
5	**Edayattuchal**	**10.091864, 76.301330**	**SEDL**	BDL	BDL	BDL	BDL	BDL	1.752	BDL	0.589	BDL	0.001	BDL	0.593	BDL
6	**Stream joining upstream of methanam bridge**	**10.097650, 76.29417**	**SUMB**	BDL	0.003	BDL	BDL	0.002	0.457	BDL	0.1	BDL	BDL	BDL	0.84	BDL
7	**Ongithodu**	**10.099478, 76.290155**	**MOTD**	BDL	BDL	BDL	BDL	BDL	1.1	BDL	0.049	BDL	BDL	BDL	0.169	BDL
8	**Stream near Adichilikadavu**	**10.093642, 76.279846**	**SARV**	BDL	BDL	BDL	BDL	0.002	0.464	BDL	0.114	BDL	BDL	BDL	0.623	BDL
9	**D-Drain Fact UD**	**10.076326, 76.302124**	**DFAD**	BDL	BDL	BDL	0.014	BDL	0.769	BDL	0.864	BDL	0.006	BDL	0.242	BDL
10	**C-Drain Fact UD**	**10.078280, 76.300171**	**DFAC**	BDL	BDL	0.035	0.012	BDL	8.845	BDL	0.565	BDL	0.001	BDL	2.917	BDL
11	**O4-TCC ,Storm water drain**	**10.075508,76.306378**	**DTCB**	BDL	BDL	BDL	0.016	BDL	0.246	BDL	0.09	BDL	BDL	BDL	0.161	BDL
12	**Drain at pathalam bridge**	**10.080979, 76.31786**	**DPBE**	BDL	BDL	0.04	BDL	BDL	66.34	0.017	1.18	BDL	BDL	0.048	4.383	0.015
13	**E-drain Fact PD**	**10.070065, 76.290716**	**DFAE**	BDL	BDL	BDL	0.05	BDL	9.91	BDL	BDL	BDL	BDL	0.013	0.242	BDL
14	**B-drain Fact PD**	**10.069773, 76.290753**	**DFAB**	BDL	BDL	BDL	0.014	BDL	0.74	0.016	0.329	BDL	BDL	BDL	BDL	BDL
15	**IRE Drain**	**10.082553, 76.298483**	**DIRE**	BDL	BDL	BDL	0.034	BDL	2.25	BDL	0.347	BDL	0.006	BDL	0.779	BDL
16	**Drain at Manjaly Bridge**	**10.152197,76.269673**	**DMBR**													
17	**Drain at Pazhampillythuruthu bridge**	**10.175390,76.237151**	**DPLB**													
18	**Drain near to Ryan school**	**10.153982,76.288956**	**DRYS**	BDL	BDL	BDL	BDL	0.001	1.214	BDL	0.07	BDL	BDL	BDL	0.109	BDL

19	**Well of Sreesakthi paper mill**		**CELLA WELL**	BDL	BDL	BDL	BDL	1.001	5.318	BDL	2.308	BDL	0.003	BDL	1.524	BDL
20	**Unthithodu**	**10.070904, 76.285396**	**SUTD**	BDL	BDL	BDL	BDL	BDL	0.436	BDL	0.05	BDL	BDL	BDL	0.166	BDL
21	**Drain at Amrutha sag pharma -Eloor**	**10.074615, 76.311985**	**SASP**	BDL	BDL	BDL	BDL	BDL	2.718	BDL	0.084	BDL	BDL	BDL	0.158	BDL
22	**Drain at Eloor ferry road near to ferry**	**10.073233, 76.284346**	**DEFR**	BDL	BDL	BDL	BDL	BDL	0.704	BDL	0.091	BDL	BDL	BDL	0.173	BDL
23	**Drain at Periyar road,Verapoli**	**10.078261, 76.286128**	**DPRV**	BDL	BDL	BDL	BDL	0.001	0.962	BDL	0.24	BDL	BDL	BDL	0.384	BDL
24	**Palliyattukara kadavu**	**10.0766186, 76.2844846**	**SPKV**	BDL	BDL	BDL	BDL	0.001	0.319	BDL	0.081	BDL	BDL	BDL	0.38	BDL
25	**Drain near to Popular lime shell**	**10.065061, 76.294538**	**DPLS**	BDL	BDL	BDL	BDL	BDL	1.818	BDL	0.194	BDL	BDL	BDL	0.092	BDL

ELOOR DRAIN - WATER SAMPLE (Heavy metals)

	Location	Location coordinates (Latitude,Longitude)	Sample ID	Arsenic as As (mg/l)	Antimony as Sb(mg/l)	Chromium as Cr(mg/l)	Copper as Cu(mg/l)	Cadmium as Cd(mg/l)	Iron as Fe(mg/l)	Lead as Pb(mg/l)	Manganese as Mn(mg/l)	Molybdenum as Mo(mg/l)	Mercury as Hg(mg/l)	Nickel as Ni(mg/l)	Zinc as Zn(mg/l)	Cobalt as Co(mg/l)
									300			**73**	**0.026**		**30**	
1	**Drai between alpha crumb rubber and Malayarubtec**	**10.079882, 76.315165**	**DBAM**	BDL	BDL	BDL	0.016	BDL	4.536	BDL	0.318	BDL	BDL	BDL	0.703	BDL
2	**Drain joining at upstream near to navigation channel of pathalam bund**	**10.077014, 76.309036**	**NCBU**	BDL	BDL	BDL	BDL	BDL	0.659	BDL	0.113	BDL	BDL	BDL	0.147	BDL
3	**drain near to Marksmen marine products**	**10.077041, 76.308574**	**DNMM**													
4	**Storm water drain of Indogerman**	**10.077735, 76.308308**	**DIGW**													
5	**Edayattuchal**	**10.091864, 76.301330**	**SEDL**	BDL	BDL	BDL	BDL	BDL	1.752	BDL	0.589	BDL	0.001	BDL	0.593	BDL
6	**Stream joining upstream of methanam bridge**	**10.097650, 76.29417**	**SUMB**	BDL	0.003	BDL	BDL	0.002	0.457	BDL	0.1	BDL	BDL	BDL	0.84	BDL
7	**Ongithodu**	**10.099478, 76.290155**	**MOTD**	BDL	BDL	BDL	BDL	BDL	1.1	BDL	0.049	BDL	BDL	BDL	0.169	BDL
8	**Stream near Adichilikadavu**	**10.093642, 76.279846**	**SARV**	BDL	BDL	BDL	BDL	0.002	0.464	BDL	0.114	BDL	BDL	BDL	0.623	BDL
9	**D-Drain Fact UD**	**10.076326, 76.302124**	**DFAD**	BDL	BDL	BDL	0.014	BDL	0.769	BDL	0.864	BDL	0.006	BDL	0.242	BDL
10	**C-Drain Fact UD**	**10.078280, 76.300171**	**DFAC**	BDL	BDL	0.035	0.012	BDL	8.845	BDL	0.565	BDL	0.001	BDL	2.917	BDL
11	**O4-TCC ,Storm water drain**	**10.075508,76.306378**	**DTCB**	BDL	BDL	BDL	0.016	BDL	0.246	BDL	0.09	BDL	BDL	BDL	0.161	BDL
12	**Drain at pathalam bridge**	**10.080979, 76.31786**	**DPBE**	BDL	BDL	0.04	BDL	BDL	66.34	0.017	1.18	BDL	BDL	0.048	4.383	0.015
13	**E-drain Fact PD**	**10.070065, 76.290716**	**DFAE**	BDL	BDL	BDL	0.05	BDL	9.91	BDL	BDL	BDL	BDL	0.013	0.242	BDL
14	**B-drain Fact PD**	**10.069773, 76.290753**	**DFAB**	BDL	BDL	BDL	0.014	BDL	0.74	0.016	0.329	BDL	BDL	BDL	BDL	BDL
15	**IRE Drain**	**10.082553, 76.298483**	**DIRE**	BDL	BDL	BDL	0.034	BDL	2.25	BDL	0.347	BDL	0.006	BDL	0.779	BDL
16	**Drain at Manjaly Bridge**	**10.152197,76.269673**	**DMBR**													
17	**Drain at Pazhampillythuruthu bridge**	**10.175390,76.237151**	**DPLB**													

18	**Drain near to Ryan school**	**10.153982,76.288956**	**DRYS**	BDL	BDL	BDL	BDL	0.001	1.214	BDL	0.07	BDL	BDL	BDL	0.109	BDL
19	**Well of Sreesakthi paper mill**		**CELLA WELL**	BDL	BDL	BDL	BDL	1.001	5.318	BDL	2.308	BDL	0.003	BDL	1.524	BDL
20	**Unthithodu**	**10.070904, 76.285396**	**SUTD**	BDL	BDL	BDL	BDL	BDL	0.436	BDL	0.05	BDL	BDL	BDL	0.166	BDL
21	**Drain at Amrutha sag pharma -Eloor**	**10.074615, 76.311985**	**SASP**	BDL	BDL	BDL	BDL	BDL	2.718	BDL	0.084	BDL	BDL	BDL	0.158	BDL
22	**Drain at Eloor ferry road near to ferry**	**10.073233, 76.284346**	**DEFR**	BDL	BDL	BDL	BDL	BDL	0.704	BDL	0.091	BDL	BDL	BDL	0.173	BDL
23	**Drain at Periyar road,Verapoli**	**10.078261, 76.286128**	**DPRV**	BDL	BDL	BDL	BDL	0.001	0.962	BDL	0.24	BDL	BDL	BDL	0.384	BDL
24	**Palliyattukara kadavu**	**10.0766186, 76.2844846**	**SPKV**	BDL	BDL	BDL	BDL	0.001	0.319	BDL	0.081	BDL	BDL	BDL	0.38	BDL
25	**Drain near to Popular lime shell**	**10.065061, 76.294538**	**DPLS**	BDL	BDL	BDL	BDL	BDL	1.818	BDL	0.194	BDL	BDL	BDL	0.092	BDL

ELOOR DRAIN WATER SAMPLE (Pesticides)																						Pesticides					
	Location	Location coordinates (Latitude,Longitude)	Sample ID	Endosulfan	Alpha - BHC	Beta BHC	Gamma - BHC	Aldrin (ug/l)	Dieldrin (ug/l)	Alpha Endosulf	Beta Endosulf	DDD-p,p'	DDE-p,p'	DDT-o,p'	DDT-p,p'	Alachlor (ug/l)	Butachlor (ug/l)	Chlorpyriphos	Ethion (ug/l)	Iprobenphos	Parathion methyl	Phorate (ug/l)	Dicofol (ug/l)	Heptachlor (ug/l)	Chloroform (ug/l)	Trichloro	Hexachlorobenze	Monocrotophos
				0.003				0.004										0.002						0.01	1.8			
1	Drain between alpha crumb rubber and Malayarubtec	10.079882, 76.315165	DBAM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Drain joining at upstream near to navigation channel of pathalam bund	10.077014, 76.309036	NCBU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	drain near to Marksmen marine products	10.077041, 76.308574	DNMM																									
4	Storm water drain of Indogerman	10.077735, 76.308308	DIGW																									
5	Edayattuchal	10.091864, 76.301330	SEDL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Stream joining upstream of methanam bridge	10.097650, 76.29417	SUMB	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
7	Ongithodu	10.099478, 76.290155	MOTD	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	BLQ	BLQ	BLQ	0.01	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
8	Stream near Adichilikadavu	10.093642, 76.279846	SARV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	D-Drain Fact UD	10.076326, 76.302124	DFAD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	C-Drain Fact UD	10.078280, 76.300171	DFAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	O4-TCC ,Storm water drain	10.075508,76.306378	DTCB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Drain at pathalam bridge	10.080979, 76.31786	DPBE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	E-drain Fact PD	10.070065, 76.290716	DFAE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	B-drain Fact PD	10.069773, 76.290753	DFAB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	IRE Drain	10.082553, 76.298483	DIRE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Drain at Manjaly Bridge	10.152197,76.269673	DMBR																									
17	Drain at Pazhampillythuruthu bridge	10.175390,76.237151	DPLB																									
18	Drain near to Ryan school	10.153982,76.288956	DRYS	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Well of Sreesakthi paper mill		CELLA WELL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Unthithodu	10.070904, 76.285396	SUTD	0.031	BLQ	BLQ	0.034	BLQ	BLQ	BLQ	BLQ	0.033	0.017	0.049	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.076	BLQ	BLQ	BLQ	BLQ	BLQ
21	Drain at Amrutha sag pharma -Eloor	10.074615, 76.311985	SASP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Drain at Eloor ferry road near to ferry	10.073233, 76.284346	DEFR	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.01	BLQ	BLQ	BLQ	0.012	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Drain at Periyar road,Verapoli	10.078261, 76.286128	DPRV	0.02	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	0.023	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Palliyattukara kadavu	10.0766186, 76.2844846	SPKV	0.019	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

Periyar Monitoring (Thrissur Stretch) Annexure 6

PARAMETER (WATER)	UNIT	Limit	Identification No./station Name/concentration									
			PR1	PR2	PR3	PR5	PR6	PR7	PR8	PR9	PR10/PRR	KPB
GENERAL PARAMETERS			Vijayan Thodu	Drain under KPB	Manimukkam Thodu	Edamukku Thodu	Mankuzhi Thodu	Padanna Thodu	Chungam Thodu	Final Sampling Point (Confluence of Thodu)	Reference point	Kotappuram Bridge
pH	---	6.5-9	7.3	6.5	6.8	7.2	6.9	6.9	7.3	7.6	6.8	7.6
Colour	Hazen	5	0.2	0.1	0.1	0.1	0.1	0.1	0.8	0.1	0.2	0.2
Electrical Conductivity	**µs/cm**	**2,250**	**32940**	**23230**	**10130**	**26420**	**29130**	**29170**	**34260**	**34080**	**12400**	**28330**
Total Dissolved Solids	**mg/l**	**2100**	**27094**	**16692**	**6426**	**21030**	**1433**	**21853**	**31985**	**24641**	**7757**	**21204**
Total Suspended Solids	mg/l	Narrative	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total Hardness	mg/l		4500	3070	1192	3640	304	4020	5040	4660	1260	3900
Chloride	**mg/l**	**120**	**14341**	**9891**	**3561**	**11275**	**890**	**12660**	**15726**			
Chloride	**mg/l**	**600**								**15330**	**4748**	**12363**
Total Residual Chlorine	mg/l		BDL	4	3	BDL	0.7	BDL	BDL	BDL	BDL	BDL
Fluoride	**mg/l**	**0.12**	**BDL**	**0.2**	**0.14**	**0.35**	**0.12**	**0.3**	**BDL**	**BDL**	**0.05**	**BDL**
Phosphate	mg/l		BDL	0.2	0.14	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Free Ammonia	**mg/l**	**0.019**	**BDL**	**0.01**	**BDL**	**0.04**	**BDL**	**0.001**	**BDL**	**0.022**	**BDL**	**0.02**
Nitrate as N	mg/l	13	0.16	BDL	0.06	0.3	0.3	0.3	0.8	0.14	0.3	BDL
Boron	mg/l	1.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Sulphate	mg/l	-	562	24	492	17	79	344	111	596	450	710
Sodium	mg/l		693	4518	1927	421	297	4724	700	843	3293	608
Dissolved Oxygen	mg/l	-	6	5.6	6	6.5	6	7.6	5.3	6.2	7.8	5.6
Biochemical Oxygen Demand	mg/l		1.2	1	0.6	0.4	0.2	1.7	0.2	0.5	0.7	0.8

Chemical Oxygen Demand	mg/l		40	280	16	96	72	416	688	192	8	16
SAR	mg/l	**26**	4.5	35.45	24.26	3.03	7.4	32.4	4.3	5.4	**40.3**	4.2
Oil &grease	mg/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Total Coliforms	CFU/100ml	-	400	300	2500	500	1600	Nil	Nil	100	500	500
Fecal Coliforms	CFU/100ml	-	100	100	1000	200	800	Nil	Nil	Nil	200	200
Fecal Streptococci	CFU/100ml		Nil	Nil	40	40	40	Nil	Nil	Nil	Nil	Nil
CYANIDES AND HEAVY METALS		**Limit**	**PR1**	**PR2**	**PR3**	**PR5**	**PR6**	**PR7**	**PR8**	**PR9**	**PR10/PRR**	**KPB**
Cyanides	mg/l	0.005	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexa valent chromium	mg/l	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic as As	**mg/l**	**0.005**	**0.006**	**0.009**	**BDL**	**0.013**	**BDL**	**0.01**	**0.005**	**0.012**	**0.013**	**BDL**
Antimony as Sb	mg/l	-	BDL	BDL	BDL	BDL	BDL	0.003	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Copper as Cu	mg/l	Eqn	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	Eqn	BDL	0.001	BDL	BDL	BDL	BDL	BDL	BDL	0.001	BDL
Iron as Fe	**mg/l**	**0.3**	**0.209**	**1.706**	**0.835**	**0.262**	**0.619**	**0.178**	**0.159**	**0.167**	**0.232**	**0.231**
Lead as Pb	mg/l	Eqn	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	-	0.108	0.248	0.166	0.091	0.302	0.088	0.121	0.055	0.288	0.216
Molybdenum as Mo	mg/l	73	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mercury as Hg	**mg/l**	**0.000026**	**0.011**	**0.02**	**0.006**	**0.002**	**0.004**	**0.007**	**0.016**	**0.017**	**0.007**	**0.006**
Nickel as Ni	mg/l	Eqn	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc as Zn	**mg/l**	**0.03**	**0.101**	**0.226**	**0.213**	**0.117**	**0.268**	**0.091**	**0.122**	**0.058**	**0.151**	**0.037**
Cobalt as Co	mg/l	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

PESTICIDES	**Limit**	**PR1**	**PR2**	**PR3**	**PR5**	**PR6**	**PR7**	**PR8**	**PR9**	**PR10/PRR**	**KPB**

Endosulfan Sulphate	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Alpha - BHC	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Beta - BHC	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Gamma - BHC	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Aldrin	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dieldrin	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Alpha Endosulfan	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Beta Endosulfan	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DDD - p,p'	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DDE - p,p'	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DDT - o,p'	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DDT - p,p'	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Alachlor	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Butachlor	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chlorpyriphos	**ug/l**	**0.002**	**0.013**	**0.014**	**0.019**	**0.016**	**0.018**	**0.021**	**0.013**	**0.016**	**0.015**	**0.018**
Ethion	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Iprobenphos	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Parathion Methyl	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Phorate	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dicofol	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Heptachlor	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloro Ethylene	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Hexachlorobenzene	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Monocrotophos	ug/l		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Annexure 7

PERCENTAGE ACHIEVEMENTS SOLID WASTE MANAGEMENT (Idukki)

Sl No	Grama Panchayath/Municipality	% Achievement(Based on inspection conducted)
1	Adimaly Grama Panchayath	71
2	Alakode Grama Panchayath	50
3	Arakkulam Grama Panchayath	24
4	Ayyappankoil Grama Panchayath	25
5	Bysonvalley Grama Panchayath	34
6	Chakkupallam Grama Panchayath	53
7	Chinnakkanal Grama Panchayath	42
8	Devikulam Grama Panchayath	36
9	Edamalakudy Grama Panchayath	Not inspected
10	Edavetty Grama Panchayath	45
11	Elappara Grama Panchayath	30
12	Erattayar Grama Panchayath	41
13	Kamakshy Grama Panchayath	25
14	Kanchiyar Grama Panchayath	23
15	Kanjikuzhy Grama Panchayath	33
16	Kanthalloor Grama Panchayath	29
17	Karimannoor Grama Panchayath	50
18	Karimkunnam Grama Panchayath	29
19	Karunapuram Grama Panchayath	21
20	Kodikulam Grama Panchayath	43
21	Kokkayar Grama Panchayath	26
22	Konnathady Grama Panchayath	21
23	Kudayathoor Grama Panchayath	45
24	Kumaramangalam Grama Panchayath	53
25	Kumily Grama Panchayath	74
26	Manakkad Grama Panchayath	46

27	Mankulam Grama Panchayath	51
28	Marayoor Grama Panchayath	38
29	Mariapuram Grama Panchayath	45
30	Munnar Grama Panchayath	29
31	Muttom Grama Panchayath	43
32	Nedumkandam Grama Panchayath	68
33	Pallivasal Grama Panchayath	26
34	Pampadumpara Grama Panchayath	26
35	Peerumedu Grama Panchayath	54
36	Peruvanthanam Grama Panchayath	22
37	Purappuzha Grama Panchayath	45
38	Rajakkad Grama Panchayath	30
39	Rajakumary Grama Panchayath	50
40	Santhanpara Grama Panchayath	50
41	Senapathy Grama Panchayath	21
42	Udumbanchola Grama Panchayath	30
43	Udumbannoor Grama Panchayath	37
44	Upputhara Grama Panchayath	26
45	Vandanmedu Grama Panchayath	35
46	Vandiperiyar Grama Panchayath	53
47	Vannappuram Grama Panchayath	36
48	Vathikudy Grama Panchayath	27
49	Vattavada Grama Panchayath	26
50	Vazhathoppu Grama Panchayath	47
51	Vellathooval Grama Panchayath	52
52	Velliamattom Grama Panchayath	48
53	Thodupuzha Muncipality	60
54	Kattappana Grama Panchayath	59

Annexure 8

Minutes of the meeting of "Combined Committee" constituted for coordinating the activities of committees in O.A No. 395/2013 and O.A. No. 396/2013 held on 29.05.2021

Meeting commenced at 12.30 PM.

The following members of the Committee and officials of KSPCB attended the meeting through V.C

1. Sri. Baiju M.A, Chief Environmental Engineer, KSPCB, Regional Office, Ernakulam (Member Convenor, Joint committee, O.A 395/2013)
2. Sri. Vivek. K, SEE/Scientist D, CPCB, Regional Directorate, Bengaluru (Nodal Officer, CPCB supervised committee in O.A No. 396/2013)
3. Dr. G. Saravanan, Sr. Scientist, NEERI (Member, CPCB supervised committee)
4. Dr. K Jayachandran, Member of SEIAA (Member, CPCB supervised committee)
5. Smt. Vinaya K S, Senior Environmental Engineer, KSPCB, ESC, Eloor (Member, CPCB supervised committee)
6. Dr. Deepesh V, Scientist C, CPCB, Regional Directorate, Bengaluru (Member, joint committee in O.A No. 395/2013)
7. Sri.Shajahan S,Deputy Collector,Disaster Management(Member, CPCB supervised committee)
8. Smt. Suseela V Nair, Environmental Engineer, District Office. Thrissur
9. Sri. Dinesh K S, Environmental Engineer, District Office-2, Ernakulam
10. Smt. Sreelakshmy P B, Environmental Engineer, District Office-1, Ernakulam
11. Sri. Eby Varghese, Environmental Engineer, District Office, Idukki
12. Smt. Rameena V V, Assistant Environmental Engineer, District Office-2, Ernakulam
13. Smt. Shahana M A, Assistant Environmental Engineer, Regional Office, Ernakulam

The Chief Environmental Engineer welcomed all officials and explained about the actions pending before the committee. He pointed out that the

timelines committed to the Hon'ble NGT for the monitoring of the Periyar river, inspections in the industries/establishments along the banks of Periyar river and for the preparation of action plan could not be adhered due to various reasons.The proposed monitoring and inspection for the third phase could not be carried out due to the spread of second wave of COVID-19 pandemic in the country. He also opined that an interim report need be submitted before the Hon'ble Tribunal incorporating the details of first and second phase monitoring results conducted during November 2020 to January 2021, details of monitoring by CPCB supervised committee along the Aluva-Eloor stretch of Periyar and the results of the monitoring conducted by the Board during the month of April 2020. The CEE also added that the DLTC constituted as per the order in OA 606 of 2018 had also initiated lot of actions in the implementation of different environmental rules along the polluted river stretches ie, Periyar (Aluva-Eloor Stretch), Chithrapuzha and Kadambrayar.

Sri. Vivek K, SEE/Scientist D, CPCB, the nodal officer in his introductory remarks opined that even though it was decided to conduct re-monitoring in some locations of first and second phase along with third phase monitoring, the same could not be conducted due to the unimaginable spread of second wave COVID-19 pandemic. Since the situation is yet to return to normalcy and with the onset of monsoon in Kerala, it may not be possible to conduct the proposed monitoring within one or two months. Hence it may be appropriate to submit an interim report before the tribunal incorporating the updated status, first and second phase monitoring reports and results and requesting adequate time line for completion of the monitoring and action plan preparation. He also requested SPCB to update the status of additional works done in this matter.

Dr. K Jayachandran, Member of SEIAA, and Dr G Saravanan, Sr. Scientist, NEERI enquired about the status of the tendering procedure for the remediation of Kuzhikkandam thodu, one of the major concerns of the Supervised Committee.

Chief Environmental Engineer, KSPCB informed that in the first meeting of the committee constituted for technical sanction, there were

queries with respect to acquisition of 74 cents of land from HIL towards installation of ETP for 10 years and procurement of balance amount of approximately 13 Crores. CEE also informed that the Government of Kerala has very recently passed an order to transfer HIL land for the purpose and SPCB is following up the matter closely with Revenue Department and HIL.

In response to the SPCB query regarding the analysis results of the sediment samples taken as a counter check during the second phase, Sri. Deepesh V, Scientist C, CPCB informed that the values of the heavy metals obtained are higher compared to that obtained from the third-party laboratory. Since heavy metal contamination is found inside the forest also, the possibility of contamination due to some natural sources or historical accumulation also cannot be ruled out. He informed that there are study reports by some other agencies also where similar observations have been made.

Dr. G. Saravanan, Sr. Scientist, NEERI, opined that in order to verify the possibility of contamination by natural sources, soil samples from one or two points outside the river bed may be collected and get analysed. He also added the need to collect the sediment samples at the points from where abnormal values were observed. It was decided that the committee will finalize such stations during next meeting.

After discussion, the Nodal Officer concluded the meeting with the following decisions.

1. A draft model for interim report shall be prepared by the CPCB and it shall be shared with the Committee members for further modifications and finalization.
2. Third phase monitoring and re-monitoring/post monsoon monitoring shall be scheduled after the finalisation of the first and second phase monitoring reports. A model report shall be shared by CPCB within one or two days.

3. SPCB shall submit the updated status of remediation of Kuzhikkandam thodu project with relevant supporting documents before the Committee

4. The next meeting of the Committee shall be conducted in the next week itself after preparation of draft interim report.

The meeting ended at 1PM.

(Vivek.K,)
SEE/Scientist D,
CPCB,

(Dr. G. Saravanan)
Sr. Scientist, NEERI,

(Dr. K. Jayachandran)
Member of SEIAA

(Sri.Baiju M A)
Chief Environmental Engineer,KSPCB

(Smt. Vinaya K S) Senior, Environmental Engineer, KSPCB

Dr. Deepesh V,
Scientist C, CPCB

Sri.Shajahan S,
Deputy Collector,
Disaster Management

Annexure 9

SOLID WASTE MANAGEMENT SCORES LSGDS (PERCENTAGE ACHIEVEMENT & SCORING PATTERN)		
SL NO	PRIORITIES	MARKS
1	Harithakarmasena	19(Max)
a	Formation	5
b	Training, Id card , Uniform issued, Safety	4
c	Activities (D/D collection, Segregation at Source)	5
d	Street sweeping	5
2	Dry waste (Plastic waste/E waste)	33(Max)
a	Collection (Shop,House&Road)	8
b	Segregation&Temporary storage	6
c	MCF	3
d	MRF	3
e	Plastic squad formed, activities, fine imposed	3
f	Notice issued (ban on carry bag)	1
g	EPR Alternatives	2
h	Alternatives provided(cloth bag)	1
i	Other activities (sign board, awareness programme, appointing staffs etc)	3
j	E waste collection/Domestic Hazardous waste	3
3	Wet waste	38(Max)
a	Door to Door Collection of Segregated Waste (shop&house)	10
b	Decentralized Facility(House Hold)	5
c	Sufficient Cluster facilities, vermi compost or ring compost or biogas plant or pipe compost, Thumboormoozhy models provided with houses	5
d	Centralized Facility	15
e	Anaerobic digestors (Centralized)	3
4	Vehicles	10(Max)
a	GPS mounted	5
b	Covering/Leachate protection etc.	5
5	Grand Total	100

Annexure 10

EC Assessed for LSGDs (75% Achievement)

City	Thodupuzha	Kattappana	Adimaly	Alakode	Arakulam	Ayyappancovil	Bisonvalley	Chakkupallam	Chinnakanal	Devikulam
Population (2011)	52,045	42,646	40593	11182	24876	34267	13941	21936	11553	29734
Area in Sq. Km	35.43	52.77	271.5	22.64	192.64	42.68	44.03	41.71	66.74	215
Population Density	1,468.95	808.15	149.51	493.9	129.13	802.88	316.63	525.92	173.1	138.3
%Achievement	**75**	**75**	**75**	**75**	**75**	**75**	**75**	**75**	**75**	**75**
Class	Class-II	Class-III	Class-III	Class-IV	Class-III	Class-III	Class-IV	Class-III	Class-IV	Class-III
Waste Generation (kg. per person per day)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Waste Generation (TPD)	15.61	12.79	12.18	3.35	7.46	10.28	4.18	6.58	3.47	8.92
Waste Disposal (TPD)	11.71	9.6	9.13	2.52	5.6	7.71	3.14	4.94	2.6	6.69
Waste Management Capacity Gap (TPD)	3.9	3.2	3.04	0.84	1.87	2.57	1.05	1.65	0.87	2.23
Calculated EC (capital cost component) in Lacs. Rs.	9.37	7.68	7.31	2.01	4.48	6.17	2.51	3.95	2.08	5.35
Minimum and Maximum values of EC (Capital Cost Component) recommended by the Committee (Lacs Rs.)	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000
Final EC (capital cost component) in Lacs. Rs.	100	100	100	100	100	100	100	100	100	100
Calculated EC (O&M Component) in Lacs. Rs./Day	0.078	0.064	0.061	0.017	0.037	0.051	0.021	0.033	0.017	0.045
Minimum and Maximum values of EC (O&M Cost Component) recommended by the Committee (Lacs Rs./Day)	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0
Final EC (O&M Component) in Lacs. Rs./Day	0.125	0.105	0.1	0.1	0.113	0.154	0.1	0.1	0.1	0.114
Calculated Environmental Externality (Lacs Rs. Per Day)	0.0002	0.00016	0.00015	0.00004	0.00009	0.00013	0.00005	0.00008	0.00004	0.00011
Minimum and Maximum value of Environmental Externality recommended by the Committee (Rs.per day)	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10
Final Environmental Externality (Rs. per day)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
EC to be collected in Lacs. Rs.	184.18	174.56	172.15	172.15	178.4	198.12	172.15	172.15	172.15	178.88

Municipal Solid Waste Management Capacity Gap (TPD)	Environmental Externality (Rs. per ton per day)	Minimum and Maximum value of Environmental Externality recommended by the Committee (Rs.per day)
Upto 500	5	Min. 5000 Max. 10000
500-5000	10	Min. 10000 Max. 15000
5000-10000	15	Min. 20000 Max. 30000

Annexure 11

EC Assessed for LSGDs(90% Achievement)

City	Thodupuzha	Kattappana	Adimaly	Alakode	Arakulam	Ayyappancovil	Bisonvalley	Chakkupallam	Chinnakanal	Devikulam
Population (2011)	52,045	42,646	40593	11182	24876	34267	13941	21936	11553	29734
Area in Sq. Km	35.43	52.77	271.5	22.64	192.64	42.68	44.03	41.71	66.74	215
Population Density	1,468.95	808.15	149.51	493.9	129.13	802.88	316.63	525.92	173.1	138.3
%Achievement	90	90	90	90	90	90	90	90	90	90
Class	Class-II	Class-III	Class-III	Class-IV	Class-III	Class-III	Class-IV	Class-III	Class-IV	Class-III
Waste Generation (kg. per person per day)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Waste Generation (TPD)	15.61	12.79	12.18	3.35	7.46	10.28	4.18	6.58	3.47	8.92
Waste Disposal (TPD)	14.05	11.51	10.96	3.02	6.72	9.25	3.76	5.92	3.12	8.03
Waste Management Capacity Gap (TPD)	1.56	1.28	1.22	0.34	0.75	1.03	0.42	0.66	0.35	0.89
Calculated EC (capital cost component) in Lacs. Rs.	3.75	3.07	2.92	0.81	1.79	2.47	1	1.58	0.83	2.14
Minimum and Maximum values of EC (Capital Cost Component) recommended by the Committee (Lacs Rs.)	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000	Min. 100 Max. 1000
Final EC (capital cost component) in Lacs. Rs.	100	100	100	100	100	100	100	100	100	100
Calculated EC (O&M Component) in Lacs. Rs./Day	0.031	0.026	0.024	0.007	0.015	0.021	0.008	0.013	0.007	0.018
Minimum and Maximum values of EC (O&M Cost Component) recommended by the Committee (Lacs Rs./Day)	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0	Min. 0.1 Max. 1.0
Final EC (O&M Component) in Lacs. Rs./Day	0.125	0.105	0.1	0.1	0.113	0.154	0.1	0.1	0.1	0.114
Calculated Environmental Externality (Lacs Rs. Per Day)	0.00008	0.00006	0.00006	0.00002	0.00004	0.00005	0.00002	0.00003	0.00002	0.00004
Minimum and Maximum value of Environmental Externality recommended by the Committee (Rs.per day)	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10	Min. 0.05 Max. 0.10
Final Environmental Externality (Rs. per day)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
EC to be collected in Lacs. Rs.	184.18	174.56	172.15	172.15	178.4	198.12	172.15	172.15	172.15	178.88

Municipal Solid Waste Management Capacity Gap (TPD)	Environmental Externality (Rs. per ton per day)	Minimum and Maximum value of Environmental Externality recommended by the Committee (Rs.per day)
Upto 500	5	Min. 5000 Max. 10000
500-5000	10	Min. 10000 Max. 15000
5000-10000	15	Min. 20000 Max. 30000