



KERALA ENGINEERING RESEARCH INSTITUTE

കേരള എഞ്ചിനീയറിംഗ് റിസർച്ച് ഇൻസ്റ്റിറ്റ്യൂട്ട്

An Institution of Irrigation Department Under Ministry of Water Resources, Govt of Kerala



ANNUAL REPORT 2023-24



Kerala Engineering Research Institute
Peechi

ANNUAL REPORT

2023-24

KERALA
ENGINEERING
RESEARCH INSTITUTE

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PREFACE

The Kerala Engineering Research Institute (KERI), established in 1960 under the Water Resources Department, continues to play a pivotal role in advancing research and providing technical support in civil and water resource engineering. The 2023–24 Annual Report outlines the Institute’s activities across its multiple divisions, with emphasis on scientific investigation, consultancy services, and capacity development.

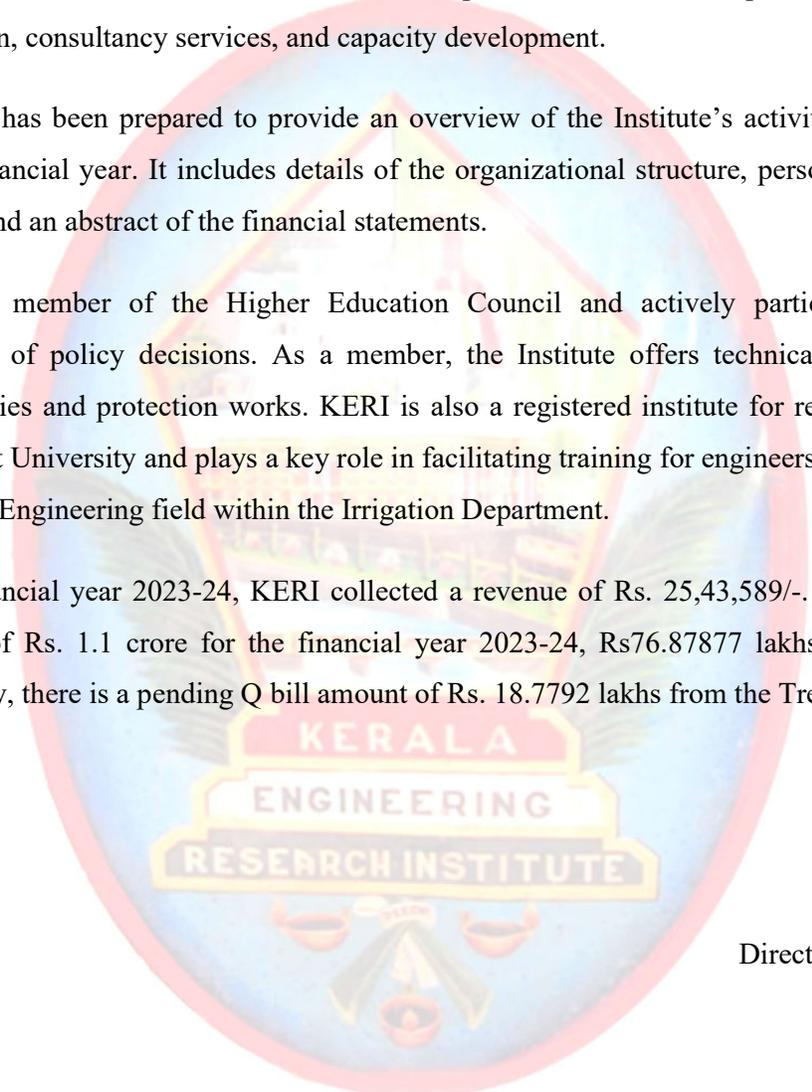
This report has been prepared to provide an overview of the Institute’s activities during the 2023-24 financial year. It includes details of the organizational structure, personnel, division activities, and an abstract of the financial statements.

KERI is a member of the Higher Education Council and actively participates in the formulation of policy decisions. As a member, the Institute offers technical guidance on coastal studies and protection works. KERI is also a registered institute for research studies with Calicut University and plays a key role in facilitating training for engineers and overseers in the Civil Engineering field within the Irrigation Department.

For the financial year 2023-24, KERI collected a revenue of Rs. 25,43,589/-. Out of a total allocation of Rs. 1.1 crore for the financial year 2023-24, Rs76.87877 lakhs was utilized. Additionally, there is a pending Q bill amount of Rs. 18.7792 lakhs from the Treasury .

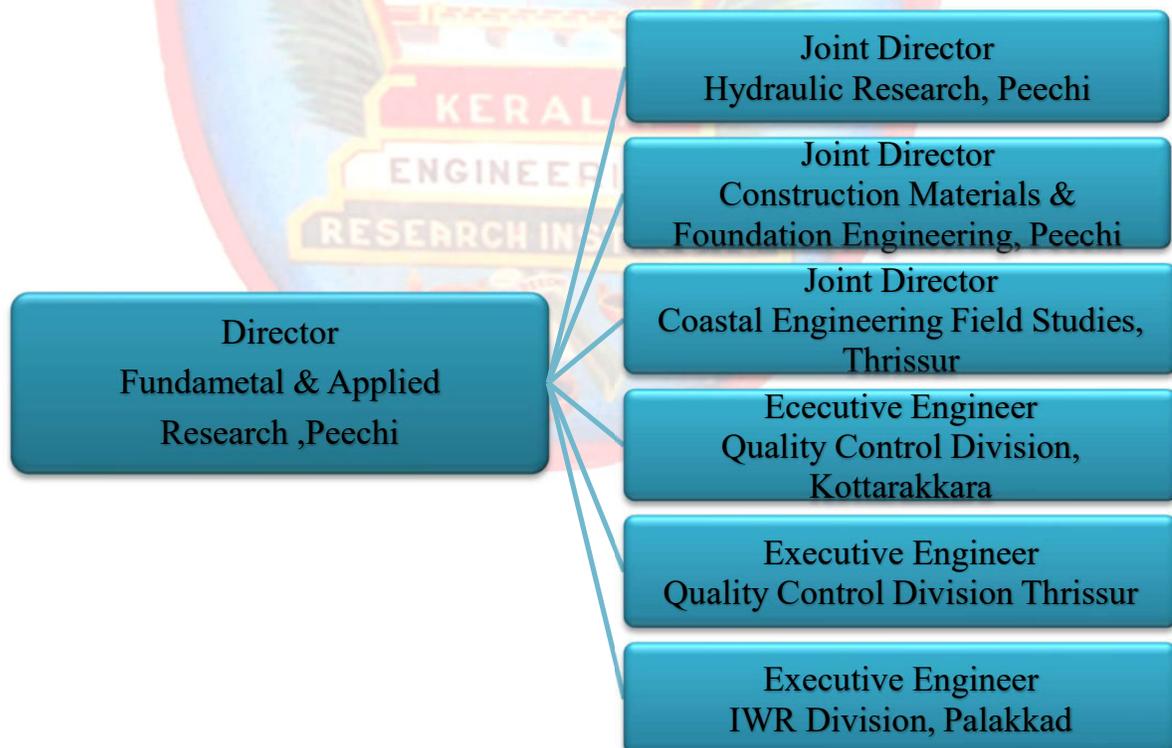
Peechi

Director



1. ORGANISATIONAL SET UP

The KERI is headed by a Director, Fundamental & Applied Research (F&AR) under which six divisions (Hydraulic Research, Construction Materials & Foundation Engineering, Coastal Engineering Field Studies division, Investigation for Water Resources division and Quality control divisions), 18 sub-divisions and 27 sections are working. Executive Engineer/Joint Director has the charge of each division. Presently, KERI is taking up investigation works for the planning and design of various water resources related projects and provides quality improvement programmes for the technical staffs of the department. Moreover, KERI is the authority of monitoring shoreline of coastal stretch of Kerala state corresponding data collection and serves as a backbone for Research & Development activities and engineering consultancy works. The investigation and research activities are done in a departmental execution mode in the institute. A library having plenty of valuable textbooks, journal articles, technical reports and magazines is present in the institute. The works carried out by each division is documented in the library and digitalization of old technical reports and journal articles into a cloud platform is under progress. The institute has attained NABL accreditation of Construction Materials and Soil Mechanics laboratories, and is in the process of acquiring Centre of Excellence.



I. Joint Director, Hydraulic Research

1. Hydraulics Division
2. Sedimentation Division
3. Coastal Engineering Division

II. Joint Director, CM&FE

1. Construction Materials Division
2. Soil Mechanics and Foundations Division
3. Instrumentation Division
4. Publications Division

III. Joint Director, Coastal Engineering Field Studies, Thrissur

1. Coastal Erosion studies Subdivision, Kozhikkode
2. Coastal Engineering Studies Subdivision, Ernakulam
3. Coastal Engineering Studies Subdivision, Kollam

IV. Executive Engineer, Quality Control Division, Thrissur

1. Quality Control Sub Division, Kannur
2. Quality Control Sub Division, Kozhikkode
3. Quality Control Sub Division, Palakkad
4. Quality Control Sub Division, Thrissur
5. Quality Control Sub Division, Muvattupuzha

V. Executive Engineer, Quality Control Division, Kottarakkara

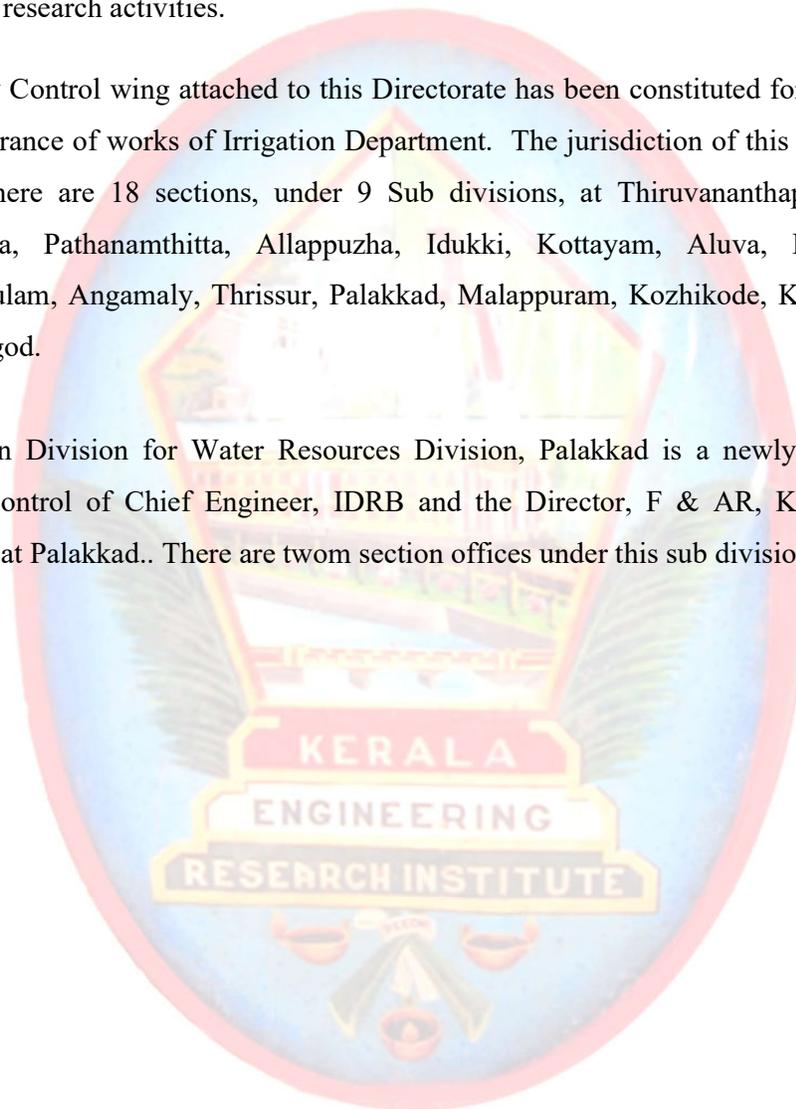
1. Quality Control Sub Division, Kottayam
2. Quality Control Sub Division, Alappuzha
3. Quality Control Sub Division, Kottarakkara
4. Quality Control Sub Division, Thiruvananthapuram

VI. Executive Engineer, Investigation for Water Resources Division

The first three divisions are doing research works, laboratory testing and collection of field data related to their respective fields and present valuable results and also analyses results having significant implications in different fields of Civil Engineering and Water Resources Management. Each subdivision has a Deputy Director in the rank of an Assistant Executive Engineer as its head and one or two Assistant Directors in the rank of Assistant Engineer to assist in the research activities.

The Quality Control wing attached to this Directorate has been constituted for the purpose of quality assurance of works of Irrigation Department. The jurisdiction of this wing is all over Kerala. There are 18 sections, under 9 Sub divisions, at Thiruvananthapuram, Kollam, Kottarakkara, Pathanamthitta, Allappuzha, Idukki, Kottayam, Aluva, Moovattupuzha, Koothattukulam, Angamaly, Thrissur, Palakkad, Malappuram, Kozhikode, Kalpetta, Kannur and Kasaragod.

Investigation Division for Water Resources Division, Palakkad is a newly formed office, under the control of Chief Engineer, IDRIB and the Director, F & AR, KERI, Peechi, is functioning at Palakkad.. There are twom section offices under this sub divisions.



2. PERSONNEL

The Institute saw multiple changes in leadership during the reporting period, with notable transitions across director-level and assistant director positions. Despite vacancies, especially in technical staff and workers, the teams demonstrated commendable dedication in completing all assigned works.

The Executive Officers who headed the various officers under KERI drawing the Financial year 2023-2024			
Director, Fundamental and Applied Research, KERI, Peechi			
Sl No	Designation	Name (PEN)	Periode
1	Director	Suprabha.N (599028)	01-04-2023 to 30-06-2023
2	Director	Shini.K.K(F A C) (606227)	01-07-2023 to 02-07-2023
3	Director	Sreekala.C.K (600878)	03-07-2023 to 13-03-2024
4	Director	Shini.K.K(F A C) (606227)	14-03-2024 to 31-03-2024
5	Assistant Director	Naveen.C.L (680217)	01-04-2023 to 31-03-2024 onwards
I	Joint Director, Hydraulic Research, KERI, Peechi		
Sl No	Designation	Name (PEN)	Period
1	Joint Director	Shini. K.K (606227)	01-04-2023 to 31-03-2024
2	Deputy Director	Sina P Raveendran (601090)	28-01-2023 to 31-03-2024
3	Deputy Director	Raji.Thamban (493555)	01-04-2023 to 20-11-2023

4	Deputy Director	Siji. T.V (441872)	20-11-2023 to 31-03-2024
5	Deputy Director	Divya. C. J (493538)	01-04-2023 to 31-03-2024
6	Assistant Director	Jayasree . K.V (912094)	01-04-2023 to 31-03-2024
7	Assistant Director	Saji George (605716)	01-04-2023 to 31-03-2024
8	Assistant Director	Devarajan. K (802483)	01-04-2023 to 31-03-2024
9	Assistant Director	Roshni. S.S(609864)	01-04-2023 to 08-01-2024
10	Assistant Director	Sheena .A.R (757381)	24-02-2024 to 31-03-2024
11	Assistant Director	Ganaraj.K (891334)	01-04-2023 to 13-07-2024
12	Assistant Director	Maya.P.P (804614)	27-02-2024 to 31-03-2024
13	Assistant Director	Harikumar .M (434483)	07-03-2024 to 31-03-2024
14	Assistant Director	Anoop.R (807285)	01-04-2023 to 30-09-2023
15	Assistant Director	Nisha Antony (800581)	01-04-2023 to 31-03-2024
II	Joint Director, Constrection Materials and Foundation Engineering, KERI,Peechi		
1	Joint Director	Geetha ES (605206)	From 25.02.2022 onwards
2	Deputy Director	Sufeera OB (613616)	From 01.02.2022 onwards
3	Assistant Director	ARUN K A (911924)	From 06.07.2021 onwards
4	Assistant Director	Swathi K D (940101)	From 30.08.2024 onwards
5	Assistant Director	Joyal Scaria (819507)	From 12.08.2017 onwards
6	Assistant Director	Priya R (476340)	From 06.09.2024 onwards

7	Assistant Director	Lakshmi S (935607)	From 06.10.2010 onwards
8	Assistant Director	Renjith V R (814714)	From 24.02.2024 onwards
III	Joint Director, Coastal Engineering Field Studies, Thrissur		
Sl No	Designation	Name (PEN)	Period
Coastal Engineering Field Studies, Thrissur			
1	Joint Director	Beena N (599127)	2023-24
2	Assistant Director	Suneer K M (470992)	2023-24
Coastal Erosion Studies Sub Division, Kozhikode			
1	Deputy Director	Abbas. M T (703805)	04/02/2022 F.N - 31/05/2023
2	Deputy Director	Kamal Roy. K. V (598917)	10/04/2023 - 31/03/2024 (FAC)
Coastal Erosion Studies Section, Kozhikode			
1	Assistant Director	Jithin. P (807631)	01/04/2023 - 23/02/2024 (FAC)
2	Assistant Director	Sharmila. K (474004)	24/02/2024 - 31/03/2024
Coastal Erosion Studies Section, Thalassery			
1	Assistant Director	Jithin. P (807631)	2023-24
Coastal Erosion Studies Section, Parappanangadi			
1	Assistant Director	Jithin. P (807631)	2023-24 (FAC)
Coastal Engineering Sub Division, Ernakulam			
1	Deputy Director	Kamal Roy. K. V (598917)	2023-24
Coastal Engineering Section, Ernakulam			
1	Assistant Director	Deepu S (911603)	2023-24
Coastal Engineering Section, Cherthala			
1	Assistant Director	Clament Roy K R (381651)	2023-24
Coastal Engineering Section, Chavakkad			
1	Assistant Director	Ajantha V D (474209)	01.04.2023 to 11.08.2023

2	Assistant Director	Deepu S (911603)	11.08.2023 to 25.02.2024 (FAC)
3	Assistant Director	Sreejaya V K (471051)	26.02.2024 to 31.03.2024
Coastal Engineering Sub Division, Kollam			
1	Deputy Director	Sugesh Krishna C.P (613076)	2023-24
Coastal Engineering Section, Kollam			
1	Assistant Director	Shiji P.R (123758)	2023-24
Coastal Engineering Section, Thiruvananthapuram			
1	Assistant Director	Anusree.A (870828)	2023-24
Coastal Engineering Section, Thottappally			
1	Assistant Director	Fathima.R (911766)	2023-24
IV	Executive Engineer, Information for Water Resources, Palakkad		
Sl No	Designation	Name (PEN)	Period
1	Executive Engineer	Geetha E S (605206) Addl. Charge	28/02/2023 AN to 17/04/2023 FN
2	Executive Engineer	T Sandhya (599009)	17/04/2023 FN to 30/06/2023 FN
3	Executive Engineer	Geetha E S (605206) Addl. Charge	30/06/2023 FN to 06/07/2023 FN
4	Executive Engineer	Heleena Susan (598366)	6/7/2023 FN to 12/09/2024 AN
5	Technical Assistant	Suma P B (431364)	25/01/2023 FN to 04/08/2023 AN
6	Technical Assistant	Deepa R (605809) Addl. Charge	04/08/2023 AN to 17/11/2023 FN
7	Technical Assistant	Bindu N P (608011) Addl. Charge	17/11/2023 FN to 01/01/2024 FN
8	Technical Assistant	Raji C T (696639) Addl. Charge	01/01/2024 FN to 23/01/2024 FN
9	Technical Assistant	Savitha P V (708700)	23/01/2024 FN to 17/03/2025 AN

10	Assistant Engineer ,Section 1/1 Palakkad	Padmakumar C (912110)	08/07/2021 FN to 11/05/2023 AN
11	Assistant Engineer,Section 3/2 Malappuram	Riswana Pulikkuth (759964)	06/06/2022 FN to 31/10/2023 FN
12	Assistant Engineer	Arun K A (31/10/2023 FN to.....
13	Divisional Accounts Officer	Sudeep Sukumaran P (614995)	02/04/2022 FN to 07/03/2024 FN
14	Divisional Accounts Officer	Nandakumaran K (373808)	07/03/2024 FN to till now
V	Executive Engineer, Quality Control Division, Kottarakkara		
Sl No	Designation	Name (PEN)	Periode
QUALITY CONTROL DIVISION KOTTARAKKARA			
1	EXECUTIVE ENGINEER	ANJANA G S - 689558	02.11.2022 AN to 04.01.2025
QUALITY CONTROL SUB DIVISION KOTTARAKKARA			
2	ASSISTANT EXECUTIVE ENGINEER	Ajaya Kumar .K -613617	16.01.2023 FN to 01.02.2024
3	ASSISTANT EXECUTIVE ENGINEER	Deepa.P - 613193	01.02.2024 to continuing....
QUALITY CONTROL SECTION KOTTARAKKARA			
4	ASSISTANT ENGINEER	Neaha Yohannan - 951238	29.03.2023 AN to continuing....
QUALITY CONTROL SUB DIVISION THIRUVANANTHAPURAM			
5	ASSISTANT EXECUTIVE ENGINEER	Leenakumari.P.S 644778 Quality Control Subdivision Tvm	26/01/23 to 20/12/2023 FN
6	ASSISTANT EXECUTIVE ENGINEER	Sheeja S Nair 618518 Quality Control Subdivision Tvm	20/12/2023 FN onwards
QUALITY CONTROL SECTION THIRUVANANTHAPURAM			

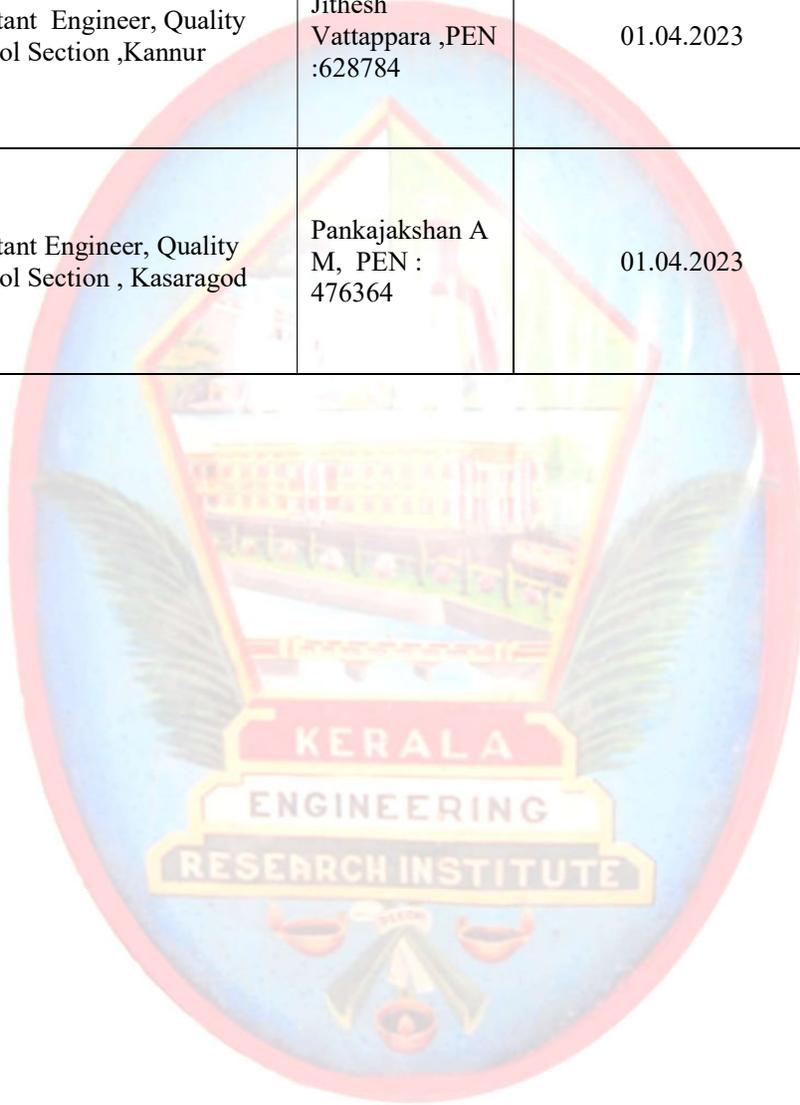
7	ASSISTANT ENGINEER	Ambili.I 494716	31/05/2023 to 30/09/2025
QUALITY CONTROL SECTION KOLLAM			
8	ASSISTANT ENGINEER	Rajeena.M 708071	Nov 2022 to Nov 2024
QUALITY CONTROL SUB DIVISION ALAPPUZHA			
9	ASSISTANT EXECUTIVE ENGINEER	Jessy Thomas- 707367	25.05.2020 to 31.05.2024
QUALITY CONTROL SECTION ALAPPUZHA			
10	ASSISTANT ENGINEER	Anjana .S - 476269	29.07.2020 to 29.08.2024
QUALITY CONTROL SECTION PATHANAMTHITTA			
11	ASSISTANT ENGINEER	Deepa.B - 599170	26.02.2021 to 30.04.2025
QUALITY CONTROL SUB DIVISION KOTTAYAM			
12	ASSISTANT EXECUTIVE ENGINEER	Merin Thomas - 608008	07.09.2020 to 22.11.2023
13	ASSISTANT EXECUTIVE ENGINEER	Jomy G Jose - 928069- (Assistant Engineer Full additional charge)	23.11.2023 to 30.11.2023
14	ASSISTANT EXECUTIVE ENGINEER	Anithakumary S - 707014	01.12.2023 to continuing....
QUALITY CONTROL SECTION KOTTAYAM			
15	ASSISTANT ENGINEER	Jayadev P S - 914567	11.01.2021 to 20.10.2023
16	ASSISTANT ENGINEER	Jomy G Jose - 928069	21.10.2023 to 29.02.2024
QUALITY CONTROL SECTION IDUKKI			
17	ASSISTANT ENGINEER	Jomy G Jose - 928069	21.01.2022 to 29.02.2024

Executive Engineer, Irrigation Quality Control Division, Thrissur					
VI	SI No	Designation	Name (PEN)	Period	
	1	Executive Engineer	Sajeevkumar V S (706425)	01.04.2023	26.04.2023
	2	" (TA FAC)	Deepa R (605809)	27.04.2023	14.05.2023

3	Executive Engineer	Sajeevkumar V S (706425)	15.05.2023	15.02.2024
4	Executive Engineer (FAC)	Beena N (599127)	16. 02.2024	29.02.2024
5	Executive Engineer	Sajeevkumar V S (706425)	01.03.2024	31.03.2024
Irrigation Quality Control Sub Division Muvattupuzha				
1	Assistant Executive Engineer (Addl. charge)	Kamal Roy K V (PEN 598917)	01.04.2023 FN	22.05.2023 AN
2	Assistant Executive Engineer (Addl. charge)	Merin Thomas (PEN-608008)	23.05.2023 FN	02.08.2023 AN
3	Assistant Executive Engineer	Litty Augustine (PEN-613211)	03.08.2023 FN	31.03.2024 Continuing
Irrigation Quality Control Section No.I, Muvattupuzha				
1	Assistant Engineer	Gopu N (PEN 474593)	01.04.2023	26.02.2024 AN
2	Assistant Engineer	Stephen Ashok Kumar (PEN- 435378)	27.02.2024 FN	31.03.2024
Irrigation Quality Control Section No.II, Koothattukulam				
1	Assistant Engineer	Aswathy Vijayan (PEN- 860934)	01.04.2023	31.03.2024 Continuing
Irrigation Quality Control Section No.III, Angamaly				
1	Assistant Engineer	Sabna Thomas B L (PEN- 890486)	01.04.2023	31.03.2024 Continuing
Irrigation Quality Control Sub Division Palakkad				
1	Assistant Executive Engineer	Raji. C.T (696639)	01.04.2023	31.03.2024 Continuing
Irrigation Quality Control Section, Palakkad				
1	Assistant Engineer	Christina Jose (Additional Charge)	01.04.2023	24/06/2023

2	Assistant Engineer	Rahna. U.A (Additional Charge)	24-06-2023	30-06-2023
3	Assistant Engineer	Christina Jose (Additional Charge)	30-06-2023	06-01-2024
4	Assistant Engineer	Nirish. P.P (Additional Charge)	06-01-2024	15-01-2024
5	Assistant Engineer	Christina Jose (Additional Charge)	15-01-2024	24/02/2024
6	Assistant Engineer	Jobi Lazar. M (133275)	24-02-2024	31.03.2024 Continuing
Irrigation Quality Control Section, Malappuram				
1	Assistant Engineer	Haniya (911214)	01.04.2023	13-10-2023
2	Assistant Engineer	Jobi Lazar. M (133275) (Additional Charge)	13-10-2023	25-11-2023
3	Assistant Engineer	Nirish. P.P (Additional Charge)	25-11-2023	27/02/2024
4	Assistant Engineer	Suresh Kumar (Additional Charge)	27-02-2024	31.03.2024
Irrigation Quality Control Sub Division Kozhikode				
1	Assistant Executive Engineer	Leena.V.K (438631)	01.04.2023	31.03.2024 Continuing
1	Assistant Engineer	NIRISH.P. (471207)	01.04.2023	27.02.2024
		Sureshkumar.A (438179)	27.02.2024	31.03.2024
2	Assistant Engineer	Vishnu.K (912885)	01.04.2023	31.03.2024
Irrigation Quality Control Sub Division Kannur				
1	Assistant Executive Engineer, Quality Control Subdivision , Kannur	Sahadevan Chadayan, PEN : 606018	01-04-2023	06-11-2023

	Assistant Executive Engineer(I/C), Quality Control Subdivision , Kannur	Leena V K , PEN : 438631	07-11-2023	31.03.2024
1	Assistant Engineer, Quality Control Section ,Kannur	Jithesh Vattappara ,PEN :628784	01.04.2023	31.03.2024
2	Assistant Engineer, Quality Control Section , Kasaragod	Pankajakshan A M, PEN : 476364	01.04.2023	31.03.2024



3. HUMAN RESOURCES

The human resources of KERI comprise of both technical and non-technical personnel. During its prime, majority of the engineers working in KERI were post graduates in different disciplines of Civil Engineering. The number of fundamental researches was carried out during the period, bear witness to this. KERI was well known all over India and abroad for the research works and experimental studies carried out in this institute, especially in the field of Coastal engineering. In the past three decades, no significant fundamental studies have been carried out and the labs have gradually degenerated to the status of mere testing centres.

At present, out of the fourteen posts of Assistant Engineers, One post is lying vacant. The number of supporting technical staff in the category of draftsman is Twenty One against a sanctioned strength of twenty-five. In the workers category, as it happens to be a vanishing category, just two workers are available at present. Workers are hired on contract basis or on daily wages as per requirement.

However, a sincere and commendable effort is being made by the staff to take up all the projects assigned to it. The vacancy position of KERI is attached as Appendix – I.

4. FUNCTIONING OF THE INSTITUTE

The Kerala Engineering Research Institute consists of seven divisions functioning at Peechi as well as Coastal Engineering and Field studies Division at Thrissur and Quality Control wing of the Irrigation Department. Generally, the activities of each division can be categorized as falling under Routine activities, Fundamental studies and Revamping and Modernization. The routine activities and fundamental studies conducted by each division are enumerated in this chapter.

5. MAJOR TECHNICAL ACHIEVEMENTS

Hydraulics Division:

- Conducted detailed physical model studies of **Kuttiyadi Dam Spillway** and **Banasurasagar Dam**, in line with safety and interstate water-sharing requirements.
- Proposed a state-of-the-art **Current Meter Calibration Facility** in collaboration with CWPRS, Pune, estimated at ₹4.97 crore.

- Maintained and operated a fully functional **Meteorological Station** and managed the iconic **3D model of Kerala**, enhancing public engagement and infrastructure awareness.

Coastal Engineering Division:

- Utilized **Leica GS18T Smart Station** for high-precision **topographical investigations** for hydraulic structures across Kerala.
- Undertook significant projects such as:
 - i) Bandhara cum Causeway on Mundanad River (Palakkad),
 - ii) VCB cum Bridge on Maruthapuzha River (Malappuram),
 - iii) Water-level sensor site mapping in **Kurumali River Basin**, a flood preparedness initiative.

Soil Mechanics & Foundation Division.

- Accredited by the National Accreditation Board Testing and Calibration Laboratories (NABL) in accordance with the international standards

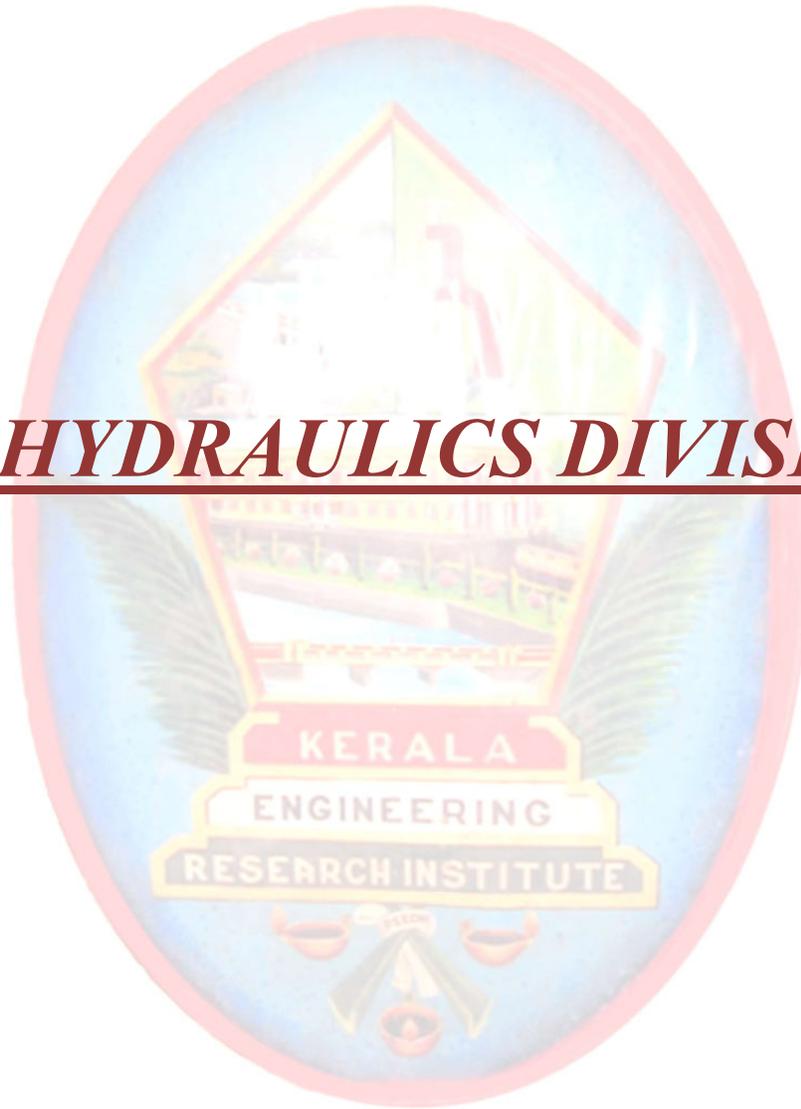
Construction Materials Division.

- Accredited by the National Accreditation Board Testing and Calibration Laboratories (NABL) in accordance with the international standards

Quality Control Divisions:

- Continued quality assurance activities across major irrigation works.
- Maintained statewide operational coverage, supporting infrastructure development through regular inspections and material testing.

A. HYDRAULICS DIVISION



HYDRAULICS DIVISION

1. INTRODUCTION

Hydraulics Division works under the Joint Director, Hydraulic Research, KERI, Peechi. Studies on various problems in Applied Hydraulics and Irrigation Engineering are taken up by Hydraulics division and solutions are proposed for the same. The division conducts the model studies for various hydraulic structures. The studies are conducted on a wide range of parameters related to spillways, sluices, chutes, energy dissipating arrangement, hydraulic behavior of canal structures, river training works etc. From these studies hydraulically sound and economically viable solutions are provided to various problems associated with projects.

There are two model areas under this division which accommodate a number of previous extensive project models. The maintenance of this model area is done by this division. The hydraulic models in these model areas help the students to study about dams and also increase possibility of tourism. The division also maintains a three-dimensional model of Kerala and it is a centre of attraction for the tourists in Peechi.

Hydraulics Division had the facility for calibration of the current meter and it was stopped long years ago due to damage of the testing facility. A new setup for calibration of current meter is under proposal in collaboration with CWPRS, Pune. The division has notch calibration facility also. The duty of operating internet infrastructure facilities of all offices in KERI is entrusted with this office.

Apart from the hydraulic studies, the division maintains a meteorological station. It is located on the west bank of Peechi dam, near Peechi House. From the station, measurements of weather parameters such as atmospheric pressure, temperature (Min & Max), humidity, rainfall, evaporation, wind speed, wind direction and sunshine are observed using manual meteorological observations. The monthly weather data as obtained is submitted to the Joint Director, Director and Superintending Engineer Hydrology, every month.

2. STAFF PATTERN

The division is headed by a Deputy Director and the technical cadre comprises of two Assistant Directors, two Research Assistants, one Second Grade Overseer and one Third Grade Overseer. The total sanctioned strength of the office is 9. The present staff details are given below

Deputy Director	:	Er. Sina P Raveendran (From 28/01/2022 Onwards)
Assistant Director	:	1. Er. Nisha Antony (from 25/01/2019 Onwards) 2. Er. Maya (01/03/2024 - 31/08/2024)
Research Assistant	:	1. Smt. Rejula (05/04/23 – 28/06/24) 2. Sri. Bineesh (03/05/23 – 26/06/24)
Second Grade Overseer	:	Smt. Divya M A (15/02/24 Onwards)
Third Grade Overseer	:	Smt. Prabini V K (from 17/02/2022 onwards)
Clerk cum Typist		Smt. Radha. M.V
Part time sweeper		Vacant

3. ACTIVITIES OF THE YEAR 2023-24

During the year 2023-24, with sanctioned budget of Rs.16.7 lakhs, following were the major activities of the division

1. Hydraulic studies
 - Model study of Kuttiyadi Dam stage II
 - Model studies of banasurasagar dam
 - Design and development of current meter calibration facilities
2. Lab Infrastructure
 - Renovation of Kerala model and hydraulic division office and model in model area
 - Renovation of office Joint Director's hydraulic research and Director's office – Phase II

3. Instrumentation

- Purchasing equipments for model study purpose and hydraulic lab instrumentation

4. Routine works of the division

- Routine works of Hydraulic division office, Joint Director's & Director's Office
- Routine Maintenance of Kerala Model and model study of dams
- Routine maintenance of Meteorological stations
- Routine maintenance of Model area 1 and II
- Routine maintenance of Internet system and annual charge of FTTH

3.1 Initial setup and Physical Model Study of Kuttiyadi Dam

Based on the recommendation of the committee on dam safety it was decided to modify the spillway of the Kuttiyadi dam. Chief Engineer, IDRB, Thiruvananthapuram (Vide Lr. No. No: 675/DAMS-AD6/1987/IDRB-Part File I dated 30.04.2018) directed KERI to undertake the physical modelling of the proposed modification of spillway of Kuttiyadi dam.

The study involves verifying the flow characteristics of the proposed modification of spillway and stilling basin for energy dissipation in the dam and Examination of pressure variation along the spillway profile and the sufficiency of the provisions of stilling basin for effective energy dissipation. Based on the details supplied by the Irrigation Design and Research Board (IDRB) on the modified design of the spillway, the physical model of the prototype spillway was simulated in the hydraulics laboratory of KERI, and the model analysis continuing.

3.1.1 Details of Kuttiyadi Dam

It is a straight gravity masonry dam constructed across Kuttiyadi River in Kozhikode district. It utilizes the tailrace discharge of the Kuttiyadi power house at its upstream. The masonry dam has a length of 171 m. The spillway is located in the masonry dam and has 4 vents of size 12.20m x 6.10m with radial shutters. The Full Reservoir Level (FRL) is +44.41m and the crest level of spillway is +38.44m. The top level of the dam is +46.85m. The details of the dam are given below in table 1.

Description	Reduced Level
Maximum water level	+44.640 m
Full reservoir level	44.410 m
Crest level of dam	38.440m
Dam height	27.75 m
Length of dam	171 m
No of spillways	4
Maximum discharge	1584 m ³ /s

3.1.2 Details of the model

The two-dimensional model of the modified spillway and stilling basin of Kuttiyadi dam was constructed to a geometric scale of 1: 60 in the Hydraulics laboratory in Hydraulics Division, KERI. Out of four bays, an undistorted model of two bays was constructed at two different downstream bed levels representing one end and one central span in the prototype. Among the two bays, the bottom levels corresponding to the left bay is at +15.00 m and right bay is +16.50 m as shown in Fig. 1& 2 From the observed values of flow parameters in the model, corresponding values for the prototype for all four bays of the spillway are calculated. Following the Froude's model law, scaling of the parameters for the model was done in order to achieve dynamic similarity between the model and prototype.

An Ogee type of spillway model with stilling basin and energy dissipater corresponding to the prototype was constructed according to the scaled `dimensions in model. Though spillway is provided with shutters so as to control the flow of water from the reservoir to the downstream, free flow condition is taken up for the study as instructed by the consultants. The reservoir with facilities for maintaining the head and discharge measurements, pressure head measurement, velocity measurements, flow profile plotting along the spillway flow path also exist in the model. The discharge measurement was done using a calibrated V - notch. The model set up along with elevation of the spillway with the piezometer tapings (Sp1 to Sp15) provided to measure the pressure head is shown in Fig. 1 & 2. Model is run with discharges corresponding to full, three-fourth, half and one-fourth of the design discharge given by IDR B

(Design discharge = 1584 m³/s). Flow simulation was carried out following the tail water depth to be maintained in the river for the different discharges as specified by IDR B.

Four cases have been studied till now as per modifications suggested by the consultants as well as the higher authorities, in meetings held on 03/02/2023 regarding Model study of Kuttiyadi dam.

Case 4: By the expert's team suggestion one more trial was conducted by again extending the length of stilling basin by 10m (total extension- 20 m from the existing end sill in the site). In this trial, there have been no significant changes in parameters and the values of velocity, Froude's number, percentage of energy dissipation are more or less same compared to the previous trial. The horizontal length of hydraulic jump extends up to 41.68 m in right bays from 10 m extension provided in previous condition for highest discharge and 11.50m for lowest discharge (31.68 m for highest discharge from 1.50 m for lowest discharge from 20 m extension in present condition).



Model details

The flow simulation through the Ogee spillway was carried out for different discharges between the minimum to the maximum corresponding to the maximum water level in the prototype, with the corresponding tail water levels. Several trials were done and flow characteristics were observed.

The actual discharge corresponding to different head values over the spillway crest was measured using the calibrated V notch. For the spillway having effective length L_e and the head over the crest H , the discharge co-efficient C in the discharge equation for the spillway $Q = C L_e H^{3/2}$ were estimated for different discharges. Based on the theoretical and the actual discharge values corresponding to different water levels, the co-efficient of discharge

of the spillway is estimated. The initial depth of flow and the sequent depth for the hydraulic jump and the velocity at the salient points of jump were estimated. An observation of the jump in the stilling basin was done to see the flow pattern and energy dissipation. The horizontal distance from the 10 m extension end sill for full energy dissipation in hydraulic jump to occur corresponding to the left bay and right bay. The velocity of flow, Froude's Number and energy loss were also estimated before and after the jump for different discharges.

3.1.3 Discussion

By simulating site conditions, a physical observation of the jump in the stilling basin was done to see the flow pattern and energy dissipation.

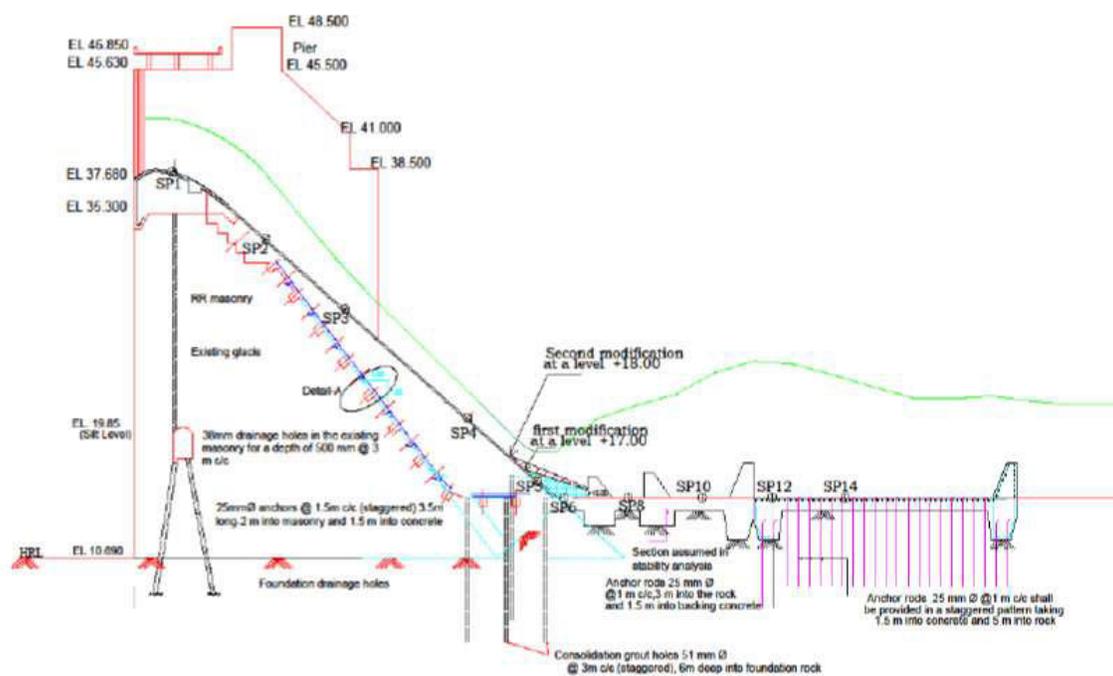


Figure 1: Flow profile in right bay (RL of bed = +15.0 m) for discharge 1591.80 m³/s

8. The Froude's number after the jump varies from 0.18 for lower discharges to 0.49 for the highest discharge tested which indicates subcritical flow.

9. Considerable improvement in the behaviour of jump is noticed in this case. However the length of jump goes beyond the end of the stilling basin provided in the present case. By the suggestion from the experts is that to carry out a new case with basin blocks (2 rows, staggered) at the location of existing end sill in the site. All the parameters are kept same as in the earlier set up.

3.2 Model studies of banasurasagar dam

For the implementation of the Final Order of CWDT as modified by the Honorable Supreme Court, Government of India had constituted "Cauvery Water Management Scheme, 2018", consisting of Cauvery Water Management Authority (CWMA) and Cauvery Water Regulation Committee (CWRC). For the effective management of water resources in Cauvery basin, the integrated operation of 8 designated reservoirs was mandated. For the standardization of calculation of discharge through various hydraulics structures of the designated reservoirs, it was decided to conduct model studies for the required structures.

During the discussion in the 75th meeting of CWRC held on 03.02.2023 for conducting "Physical and Mathematical model studies for computation of discharge through river sluices and spillways in dams in Cauvery basin" and in the follow-up discussions and meeting of CWRC and subgroup members, Kerala has also expressed its willingness to conduct the model studies with the in-house facilities available in Kerala Engineering Research Institute (KERI), Peechi, Thrissur

Based on the visit of CWRC members and subsequent deliberations, the subgroup came out with the view that the facilities available at KERI, Peechi are adequate for carrying out the model studies for the Banasurasagar Dam in Cauvery basin in Kerala (vide the inspection report of the Director, CWRC, Bengaluru).

In this regard, KERI has prepared the Techno-Financial proposal of 6.50 Crore for conducting the model studies of Banasurasagar Dam. It encompasses both physical and mathematical model studies of the Banasurasagar Dam.

3.3 Design and development of current meter calibration facilities

Based on the field visit and site conditions available, plan for developing current meter calibration facility for KERI is developed by CWPRS, Pune.

In this project the KERI will be provided with an advanced state of art velocity calibration setup utilizing automatic light weight moving trolley with remote control from the control room.

The complete system is monitored and controlled with a state of art PLC/ RTU based programmable SCADA, which will allow the user to configure the system as per choice and generate the calibration graphical report in a near real time mode or in manual mode. The estimated cost of this state-of-the-art facility is Rs. 4.97 Crore. Once this facility is installed, KERI will be the first and foremost centre in Kerala with current meter calibration facility of top-notch standard.

3.4 Meteorological Station, KERI, Peechi

Weather observations are necessary to improve meteorological services in the state and enhance the predictive capability of short and long-term information for weather forecasts and climatic changes. The weather data is used for the real-time preparation of weather analysis, forecasts and severe weather warnings, for the study of climates, for local weather dependent operations, for hydrology and agricultural meteorology and for research in meteorology and climatology. The meteorological Station under K E R I, Peechi is located on the west bank of Peechi Dam, near the Peechi House at a latitude of 10° 31'30'' N, longitude 76° 21' 59'' E and height above MSL +96.03 m. The station is equipped with instruments for manual weather observations for recording different weather parameters. The weather parameters are observed and recorded daily at 8.30 AM. The station is equipped with the instruments for measuring manually the weather parameters namely Atmospheric Pressure, Temperature, Humidity, Rainfall, Evaporation, Wind speed, Wind direction and Bright Sunshine.

3.4.1 Manual Weather Station

Manual measurements of meteorological data are done using the following instruments.

- Temperature – Max & Min Thermometers & Bimetallic Thermograph
- Relative Humidity – Psychrometer (Dry & Wet bulb) & Hair Hygrometer
- Rainfall – Standard Rain Gauge, Self Recording Rain gauge

- Evaporation – Land Pan Evaporimeter
- Wind Direction – Wind Vane
- Wind Speed – Cup Anemometer
- Bright Sunshine – Sunshine Recorder



PSYCHROMETER



HAIR HYGROMETER



BIMETALLIC THERMOGRAPH



FLOAT TYPE SELF RECORDING RAIN GAUGE



STANDARD RAIN GAUGE



LANDPAN EVAPORIMETER



WIND VANE

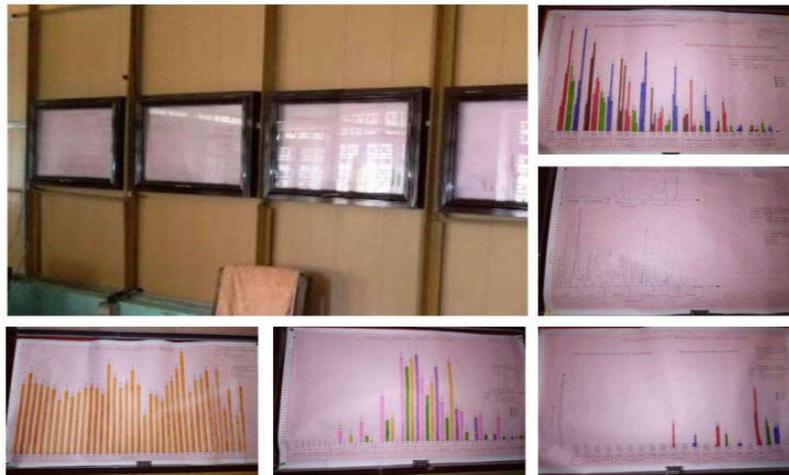


CUP ANEMOMETER



SUNSHINE RECORDER

Weather Station- Instruments for manual recordings of weather data



Graph for temperature, annual rainfall, 10 days chart for rainfall, monthly chart for rainfall etc.

3.5 Maintenance of 3D model of Kerala and the building housing the model

The Relief map of Kerala (Kerala model) at K.E.R.I. is a three-dimensional model of Kerala and it is a centre of attraction of tourists in Peechi. Routine maintenance of the building had been done by this office regularly. Now this building is rectified and beautified.



കേരളത്തിലെ നദികളുടെ വിവരങ്ങൾ

നദി	കിഴക്കൻ	തെക്കൻ	കിഴക്കൻ
1. പമ്പാ	100	100	100
2. പമ്പാ	100	100	100
3. പമ്പാ	100	100	100
4. പമ്പാ	100	100	100
5. പമ്പാ	100	100	100
6. പമ്പാ	100	100	100
7. പമ്പാ	100	100	100
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17. പമ്പാ	100	100	100
18. പമ്പാ	100	100	100
19. പമ്പാ	100	100	100
20. പമ്പാ	100	100	100

കേരളത്തിലെ നദികൾ

നദി	കിഴക്കൻ	തെക്കൻ	കിഴക്കൻ
1. പമ്പാ	100	100	100
2. പമ്പാ	100	100	100
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18. പമ്പാ	100	100	100
19. പമ്പാ	100	100	100
20. പമ്പാ	100	100	100



Kerala 3D Model after renovation

3.6 Maintenance and routine works of the Hydraulics division

The division conducted the routine works of Hydraulics division office, meteorological stations, routine maintenance of Kerala model & building housing model and routine

maintenance of model area I & II for the year 2023-24. The routine works include office maintenance, maintenance and service of instruments at meteorological station, maintenance and repair works for 3D Kerala model and maintenance and clearing of model areas etc. As part of the development of lab infrastructure for model study, maintenance and repair works of the of the instrumentation building was done by the division.

Kerala Engineering Research Institute consists of various offices located in the KERI campus. High speed and stable internet connection is essential for smooth functioning of these offices and their activities as most of the processes of the Department are being switched over to the web platform. The payment of the annual charges for internet provided by BSNL and the routine maintenance and repair works of the internet facility is managed by this office.

3.7 Calibration of notches

Notches are used for measurement of discharge through open channels by placing or constructing them across the stream or channel. The discharge over notch is measured by measuring the head acting over the notch. The actual discharge and theoretical discharge will be equated using a suitable coefficient of discharge and a factor for the head of flow. The process of assessing these constants is called calibration. Once the equation relating discharge and head of flow over the notch is established by calibration experiment, the discharge at any point in a channel can be estimated by fixing the notch across the channel and measuring the head of flow.



Notch Calibration Facility

The notch calibration tank situated at outdoor Model Area I is generally used for the calibration of notches received from various irrigation projects of Kerala. Notch calibrations have done for model study in this year.





B. COASTAL ENGINEERING
DIVISION, KERI, PEECHI

COASTAL ENGINEERING DIVISION, KERI, PEECHI

1 INTRODUCTION

Coastal Engineering Division is one of the sub units of Kerala Engineering Research Institute (KERI) and has been started functioning from the beginning of KERI. This sub division was established for the purpose of conducting research works on the behavior of Kerala Coast. Several research works on the coastal protection measures, experimental study of wave run up on beaches, experiments to evolve suitable artificial blocks, study on waves and currents, mud banks, wave action on beaches, littoral drifts, artificial nourishment, model study of fishing gaps, design of fishing harbours like Mopla bay, Ponnani, Vizhinjam etc. had been conducted by this division during 1970's and 1980's. Collection of wave data and observation of beach characteristics have been carried out at several stations along the Kerala coast in the new moon day of all months for assessing the changes of Kerala Coast over years. Among these stations, observations at two stations ie. at Padinjare Vemballore and Anchangadi in Kodungallur Taluk have been carried out by this division till December 2013. After wards, these works have been transferred to Coastal Engineering Field Studies Division, Thrissur. Since then this division is engaged in the Topographical investigation works with the aid of GNSS/RTK DGPS for various irrigation projects. The detailed topographical investigation report includes layout plan, contour map, cross sections, longitudinal section details and colour contours. The drawings are prepared using software such as Civil 3D, AutoCAD, QGIS, Arc GIS, Google Earth and e-survey CAD.

As part of modernization of Kerala Engineering Research Institute (KERI), a Smart Station from Leica Geosystems has been procured in the financial year 2013-14 and transferred to this division as per the order of the Chief Engineer (IDRB), Thiruvananthapuram. Smart station is a new revolutionary surveying system in which a high performance Total Station (TS11) and a powerful GNSS Receiver (GS14 satellite receiver) are perfectly integrated. The main components of Smart Station are Base station GNSS and Smart Antenna, RTK Rover GNSS with Pole and Antenna, CS10 Field Controller (Smart Pole) and Total station with back sight Tripod kit. Leica GS14 has been upgraded to Leica GS 18 T model in 2019-20.

Presently, Coastal Engineering Division is entrusted with topographic investigation surveying for the design of various hydraulic structures, fixing alignment of irrigation canals, quantification of capacity of water retaining structures, planning of various projects (Micro-

irrigation schemes, Lift irrigation schemes) and flood related studies associated with Irrigation Department, Government of Kerala. Topographical investigation works of other departments are being carried out as Deposit works. Since most of the investigations are executed departmentally using most modern survey instruments with high precision and accuracy, high quality of work can be assured. Works are being carried out under various Head of Accounts as per the nature of works and availability of funds.

2 FEATURES OF GS 18T SMART STATION

Leica GS 18T is GNSS RTK rover and is a part of the Leica Geosystems self-learning GNSS series with advanced signal tracking technologies. With more constellation and L band, GS18T will have more satellites in canopy area. GS18T is fitted with Inertial Measurement Unit (IMU) based tilt sensor, so that no magnetic field can affect the positioning. This can work close to bigger concrete structures with larger reinforcement, Electrical installations etc. Due to the tilt compensating function, it is not required to hold the survey pole in vertical position, that is there is no need to level the bubble for measuring and staking of points. In this the sensor accurately and reliably measures the pole tilt and together with RTK or Smart Link, provides an accurate tilt compensated position. There is savings up to 20 per cent over conventional surveying practices due to the fact that no time is wasted by levelling the bubble. The IMU-based tilt-compensating RTK is applicable at large tilt angles of more than 30 degrees, where a 3D positioning accuracy of 2 cm is still achievable.

Leica GS 18T is integrated with a new Cinterion cellular modem that supports LTE (4G) as well as all existing networks. In Leica GS 18T, a self-learning GNSS sensor is being used, hence the best satellite signals and the best available correction data is chosen automatically. This in turn leads to the achievement of best possible position accuracy and quality. By incorporating sensor heading into 3D visualization of the surroundings, the user can easily orientate himself in the surveying environment, which improves productivity and user experience. The measurement engine in GS 18T is ME7 (measurement engine generation 7). This gives an ultimate performance in GNSS positioning.



GS14 Base



*Rover Unit with
Controller*



Total Station



GS-18 T Base/Rover



Leica GS18 T GNSS RTK rover with CS20 Field controller.

It includes latest features such as 555 channels, Multi-frequency, Multi constellation, L-band service etc. This allows tracking more satellites compared to GS14 in parallel channels. This sensor is supplied with most modern controller of Leica CS20 with specialized package software called Captivate. Captivate is the most field worthy software with more land survey features compared to CS10 controller.

3 WORKS UNDER THE HEAD OF ACCOUNT-4701-80-800-99-00-34-03-(PV)-DEVELOPMENT OF KERALA ENGINEERING RESEARCH INSTITUTE (KERI) STAGE II

Works under the above head of account consists of works viz. Fundamental studies using Smart Station, Purchase of Drawing Software, its installation and conducting trainings, Routine maintenance of Survey instruments, model area, Engineering Museum etc., and included in the Action Plan of Coastal Engineering Division for the financial year 2023-24.

3.1 Fundamental Studies using Smart Station for the year 2023-24- for Various Topographical Investigation works

The topographical investigation works related to Irrigation Department, Government of Kerala are carried out using Smart Station by utilizing the fund under this head of account. The works are included in this category based on priority and departmental execution is adopted for executing these works. Topographical surveying results are used for the design of hydraulic structures, fixing alignment of canals, estimation of quantity of silt deposition in rivers, preparing flood inundation maps, finding submergence area of dams, rehabilitation of structures, implementation of Lift Irrigation schemes and Micro Irrigation schemes, Master Plan preparation etc. Highlights of works taken up by this division during the year 2023-24 are as follows:

3.1.1 Topographic Investigation for the Construction of Bandhara cum Causeway across Mundanad River in Thachampara Grama Panchayath in Palakkad District- 2023-24

Topographic Investigation for the Construction of Bandhara cum Causeway across Mundanad River in Thachampara Grama Panchayath in Palakkad District was taken up by this division as per the letter No: D1-IRR/IA/EST/7216 dated 08/02/2023 of the Executive Engineer, Minor Irrigation Division, Palakkad. The total amount of estimate comes to Rs. 1,16,000/-. The investigation survey includes taking the cross section details of the river and bank at the proposed Bhandhara cum Causeway location as well as upstream and downstream of the same at particular intervals as per the design requirements. For this work, survey has been

conducted in river and bank for every 15 m interval upstream and downstream from the proposed location for a distance of 60m, 50m interval for the upstream 500m and 100m interval for the balance upstream and downstream length. A contour map at an interval of 1m was also prepared. Layout Plan, Contour Plan, Cross sections and longitudinal sections were plotted. The softwares used are Civil 3D, AutoCAD, QGIS, Arc GIS, Google Earth and e-survey CAD.

The site is situated at Mundanad, in Thachampara Grama Panchayath of Palakkad district. The location for Bandhara cum Causeway was identified by the Project authorities. Tharuppappathy Bridge is located at 1.5 Km upstream of the proposed location of the structure and Irumbutty Causeway is located at 1.0 Km downstream of the proposed location of Bandhara cum Causeway. DGPS/Total station is used for taking river cross sections depending on the satellite signal availability. DGPS RTK method is adopted where satellite signals are available and total station is used for the area having jungle or canopy where signal transmissions to the DGPS receivers are interrupted.

Survey Highlights:

- The proposed Bandhara cum Causeway is located at ward no. 9 in Thachampara Grama Panchayath in Palakkad District.
- Survey was conducted up to Komban Chola, Tharuppappathy Forest area on upstream side and existing Causeway at Irumbutty on the downstream side of the proposed location of the structure.
- The Temporary Bench Mark (TBM) for the survey work was transferred from the Kanjirappuzha dam top level.
- Survey was conducted in the Mundanad river and its both banks by taking cross sections at particular intervals (at 15m interval for a length of 60m u/s and d/s of the proposed check dam location, 50m interval for the next 500m u/s, 100m interval for remaining u/s and d/s length)
- River bank was also surveyed for ascertaining enough bank height for water storage.
- Layout Plan, Cross sections, longitudinal section and contour map at 1m contour interval were prepared as per the design requirements.
- The longitudinal section was plotted by connecting the points having minimum elevation in each cross section.
- Roads and other permanent structures are plotted in the layout plan.
- The lowest river bed level at the proposed location of the structure is +143.189m



3.1.2 Topographic Investigation for the Construction of VCB cum Bridge across Maruthapuzha River near Marutha in Vazhikkadavu Grama Panchayath in Malappuram District- 2023-24

Topographical investigation for Construction of VCB cum Bridge across Maruthapuzha river near Marutha in Vazhikkadavu Grama Panchayath in Malappuram District was taken up by this division as per letter No: D2-General/2022 dated 24/12/2022 of the Executive Engineer, Minor Irrigation Division, Malappuram. The total amount of estimate comes to Rs. 92,000/-. The investigation survey includes taking the cross-section details of the river and bank at the proposed location as well as upstream and downstream of the proposed structure at particular intervals as per design requirements. For this work, survey has been conducted in river and

bank for in every 15 m interval for the upstream and down-stream 60m, 50m interval for the next upstream 500m and 100m interval for the balance upstream and downstream. A contour map at an interval of 1m was also prepared. Layout Plan, Contour Plan, Cross sections and longitudinal sections were plotted. The softwares such as Civil 3D, AutoCAD, QGIS, Arc GIS, Google Earth and e-survey CAD were used.

The site is situated at Marutha, in Vazhikkadavu Grama Panchayath of Malappuram district. Maruthapuzha River drains into Punnapuzha River which is a tributary of Chaliyar River. The location for check dam was identified by Minor Irrigation authorities. Maruthakkadavu VCB is located at 2 Km upstream of the proposed location of check dam and Mekkurava VCB is located at 0.50 Km downstream of the proposed location of check dam.

Highlights of Survey work are as follows:

- Maruthakkadavu VCB is situated at 2 Km upstream of the proposed check dam location.
- Another VCB namely Mekkurava is existing at 0.5 Km downstream of the proposed location of the structure. So the survey extent was fixed up to the existing VCBs on the upstream and downstream sides.
- The Temporary Bench Mark (TBM) for the survey work was transferred from the TBM established by KERI near Nilambur town during the work “Sand budgeting of Chaliyar River” (Ref: Survey of India BM at Kuttippuram).
- Survey has been conducted in the Maruthapuzha river and its both banks by taking cross sections at particular intervals (at 15m interval for a length of 60m u/s and d/s of the proposed check dam location, 50m interval for next 500 m u/s, 100 m interval for remaining u/s and d/s length).
- River bank was also surveyed for ascertaining enough bank height for water storage.....
- Layout Plan, Cross sections, longitudinal section and contour maps at 1m interval were prepared as per the design requirement.
- The longitudinal section was plotted by connecting the points having minimum elevation in each cross-section.
- Roads and other permanent structures are plotted in the layout plan.
- The lowest river bed level at the proposed check dam location is +50.4104m.



3.1.3 Topographic Investigation for connecting various locations in Kurumali river basin in Thrissur District for the year 2023-24

This work was taken up as a continuation of the work “Topographic Investigation for connecting various locations for fixing water level sensors in Chalakudy and Karuvannur river basins in Thrissur District for the year 2022-23” which was executed in last financial year as a part of a start up project to monitor the water levels of Chalakudy and Karuvannur rivers. The water level sensors were planned to fix at various critical locations such as pump houses, bridges and regulator cum bridges in the Kurumali river as a part of this startup research project. The idea is to correlate the water level measured by the sensor at various critical locations with the inundation happening at various low lying areas near this river.

Based on developing such correlation, evacuation process shall be done well prior to the floods and thus minimizing the loss of lives and property. In order to develop such correlation, it is necessary to determine the latitude, longitude and RL of various critical locations using topographic surveying.

The total amount of estimate comes to Rs. 32,000/- The fly leveling was started with TBM available at Peechi dam for the Kurumaly river basin and positions of various critical locations were determined and the corresponding details are given in Table 1.

Table 1: Details and RLs of locations selected for placing sensors in Kurumaly basin

Sl. No.	Location	Feature	Easting	Northing	RL (m)
1.	Kurumaly Bridge	Survey of India Temporary Bench Mark	639258.836	1151230.090	10.894
		Joint between pillar and footpath on south end of bridge	639279.111	1151210.239	10.912
		Joint between pillar and footpath on north end of bridge	639234.061	1151254.995	10.979
2.	Kurumaly Pump House	Bottom level of sunshade	639164.8858	1151186.4760	10.2656
		Point on wall	639165.2020	1151185.9615	8.5455
		High Flood Level (HFL) 2018	639154.6458	1151171.7301	6.958
3.	Hydrology wing river gauge station at Kurumaly	Top of basement of Bench Mark point	639362.6732	1151363.3175	6.3483
4.	Water Authority Pump House at	Sunshade top level	647553.6254	1152496.6977	14.3012

	Pound, Varandarappally	HFL 2018	647553.4446	1152496.7189	14.9394
		Normal flood level	647552.8382	1152496.6828	12.1664
		Point on the wall	647553.4751	1152496.1014	12.2364
5.	Palazhy LIS pump house	Parapet bottom level	636058.8974	1152191.5357	6.6269
		HFL 2018	636059.0745	1152190.9164	6.1672
		Building corner bottom level	636051.3914	1152191.9537	6.6156
		Nearby building top slab corner	636050.9962	1152191.4169	6.5360
		Nearby building top slab corner	636046.8276	1152191.7240	6.5254
6.	Manjamkuzhy RCB	North end road level	636486.759	1151355.422	9.428
		North end road level	636491.280	1151353.418	9.410
		Platform floor level	636493.247	1151350.942	13.674
		South end road level	636451.585	1151280.539	9.448
		South end road level	636456.122	1151278.455	9.504
7.	Thottippal LIS Pump House	Parapet bottom level	636510.3931	1150963.6996	8.1099
		Parapet bottom level	636512.0210	1150957.6145	8.0309
		HFL 2018	636509.9974	1150963.0134	6.8676
		Private pump house parapet top level	636519.2675	1150960.2294	8.7784
		Private pump house basement	636519.5069	1150959.6367	6.2356

		corner level			
		Point on wall	636509.9802	1150962.9985	7.9395
8.	Nellayi LIS Pump House	Parapet top corner	640633.9061	1149807.0413	9.7489
		Basement top corner	640633.866	1149806.2478	7.6090
		HFL 2018	640630.2650	1149800.7249	8.3202
9.	Panthalloorpadam LIS Pump House	Top level of basement	642612.4396	1148744.8150	8.7050
		Top corner of wall	642607.8226	1148743.4004	11.1934
		Top right corner of phalakam	642608.6829	1148740.5431	10.1030
		HFL 2018	642607.8447	1148743.2569	9.6297
10.	Chengaloor Melekkayam LIS Pump House	Point on the wall	639903.3095	1151207.3346	8.5826
		HFL 2018	639903.2388	1151211.7671	7.9102
		Floor level	639902.8679	1151211.3151	7.5369
		Right pillar slab outer corner	639906.3802	1151213.7901	10.272
		Right pillar slab joint inner corner	639905.9604	1151213.5298	10.2747
		Middle pillar slab joint outer corner	639904.3424	1151212.5700	10.2943
		Middle pillar slab joint inner corner	639904.0784	1151212.4005	10.2881
11.	Snehapuram Rendamkallu LIS Pump House	Slab wall joint	640760.8272	1150643.3731	10.3774
		HFL 2018	640760.1390	1150649.2017	8.2123
		Basement	640760.1291	1150649.2448	7.9791

		corner			
		Slab wall joint	640760.1006	1150649.2202	10.3879
		Slab wall joint	640763.4948	1150646.0139	10.3906
		Slab wall joint	640763.4948	1150646.0139	13.3906
12.	Manakkalakkadavu LIS Pump House	Top corner of parapet	641986.2091	1149469.2510	10.3158
		Joint between pillar and slab	641982.4430	1149463.3949	10.2775
		Joint between pillar and slab	641982.6635	1149462.9639	10.2756
		Joint between pillar and slab	641984.5469	1149459.6780	10.2592
		Joint between pillar and slab	641984.7915	1149459.2575	10.2455
13.	Nandipulam LIS Pump House	HFL 2018	643909.0674	1149098.6775	9.8163
		Parapet bottom level	643857.6695	1149075.3561	12.2624
		Handrail top level	643866.4115	1149071.3038	9.7913
		Parapet top level	643858.2044	1149074.7321	12.7859
		Basement top level	643857.6894	1149076.0014	9.5673
14.	Attappilly RCB	Pillar outer corner Varandarappally side	644686.3927	1148191.7536	12.1809
		Road level Varandarappally side	644686.5964	1148192.0526	12.1655
		Road level Varandarappally side	644680.3905	1148196.3931	12.1706

		Platform top level	644707.8468	1148221.8834	15.7870
		Pillar outer corner Mattathoor side	644721.5571	1148241.2533	12.1274
		Road level Mattathoor side	644721.3270	1148240.9370	12.1506
15.	Attappilly Pump House	KWA water tank top level near Attappilly Pump House	644763.8116	1148105.6936	12.2369
		Top level of pillar of Attappilly Pump House	644759.9850	1148122.1323	11.4721
		HFL 2018	644760.0144	1148122.2380	11.3799
		Top level of basement of Attappilly Pump House	644760.8448	1148125.5169	8.5194
		Point 5 (Point on basement)	644760.5796	1148124.3446	8.0531
16.	Ooramkulam additional Pump House	Point 7 in front of Pump House	643277.718	1149310.971	6.690
17.	Kerala Water Authority Kalkkuzhi Pump House	Bottom level of slab	649769.3239	1152318.0138	15.8291
		Top level of handrail	649769.3542	1152317.5855	14.4108
		Top level of first slab	649768.7886	1152318.3970	13.6916
18.	Thottumugham LIS Pump House	Wall top corner at east side	646699.5071	1152056.4245	13.5780
		Top level of parapet	646695.8807	1152060.8428	14.9272

		Centre of pillar slab joint of second pillar from east side	646690.6317	1152060.3883	14.7417
		Centre of pillar slab joint of first pillar from east side	646695.1012	1152061.1640	14.7424
19.	Kacherikkadavu Bridge	Road edge (intersection of road with foot path) north side	647070.8249	1151989.0788	13.4839
		Road edge (intersection of road with foot path) south side	647063.5956	1151991.2058	13.4706
		Top level of handrail	647044.0257	1151927.1947	13.5161
		Top level of handrail	647051.2859	1151924.9762	13.5166
		Top level of barrier wall	647065.8414	1151967.4131	14.7497



3.2 Purchase of Drawing Software, Installation and Conducting Training

The work includes the procurement of various drawing software like Civil 3D and Esurvey Cad required for the preparation of drawings related to the topographical investigation works undertaken by this Division. The Coastal Engineering Division has procured a new work station under the work “Physical Infrastructure Development of Coastal Engineering Division” in the previous financial year. EsurveyCadd is comprehensive and compact software which helps in creating contours, calculating earthwork quantities, preparing cross-sections, longitudinal sections and the conversion of point data into drawing file in Auto CAD. Civil 3D software is an integral part of the investigation works conducted under this office. The total estimate amount comes to Rs. 3,70,000/-.

3.3 Routine maintenance of Coastal Engineering Division office for the year 2023-24

This work was included in the action plan for meeting the routine activities of the Coastal Engineering Division office. The items of this work include purchase and maintenance of computer and related accessories, purchase and maintenance of stationary items, maintenance of plumbing and electrical components, repair of existing damaged wave flume in the model area under this division as a part of revamping the model area and shifting and rearranging the old furnitures, files and facilities of the office of Coastal Engineering Division. These repair activities can come up at any time in a year. The total estimate amount comes to Rs.1,00,000/-

3.4 Maintenance of the model area of the Coastal Engineering Division for the year 2023-24

The model area where physical model studies related to Kerala Coast has been conducted in the previous years is maintained by this division. All works such as clearing the bushes, routine cleaning of model trays and Engineering museum, overall upkeep of model sheds for keeping this area spick and span were included in this work.

3.4 Annual Maintenance and purchase of accessories for Smart Station for the year 2023-24

This work is for the annual maintenance of Smart station and for the purchase of its accessories and any spare parts if required. As the Smart station is sophisticated electronic equipment, annual calibration and maintenance is essential so as to ensure the accuracy of the position data measured by the instrument. Provisions for these items are included in the estimate for Annual Maintenance Contract charges of the Total Station TS11. Batteries are one of the essential accessories for effective progress of the survey. Any damage in batteries will delay the work. Hence as a precautionary measure, provision for the purchase of additional batteries are included in this work. A lumpsum provision is also given for the purchase and maintenance of any spare parts of the instrument, consumables and miscellaneous items for survey if required in emergency.

4) WORKS UNDER THE HEAD OF ACCOUNT -4701-80-800-88- FORMATION OF RIVER BASIN ORGANIZATION

4.1 Sand Budgeting in Chaliyar River Basin

Director, KERI has submitted a proposal specifying the necessity of a methodological framework for the assessment of the quantity of sand which can be safely mined from a river as per the direction of Chief Engineer, IDRB during the year 2017-18. The objectives of this study

are (i) to ensure that the sand and gravel extraction is carried out in a sustainable way and (ii) to maintain the river equilibrium with the application of sediment transport principles which elucidate the locations, period and quantity of sediments to be extracted. Chaliyar river is considered for the pilot study since it doesn't get dried up even during the drought seasons. Many other rivers in Kerala get dried up during the summer seasons. In this study, an attempt is made to develop a framework to perform sand auditing and to estimate the amount of mineable sand with specific reference to the Chaliyar River in Kerala by performing hydrologic, hydraulic and sediment transport modelling. Although, the Chaliyar River has been considered in this study, the proposed framework can be applied to the other rivers as well. Methodology followed for sand auditing includes modelling of watershed, ascertaining the pristine conditions of river channels, sediment sampling, development of sediment transport models and analysis of the model results. The results comprises of spatial variation of sediment deposits, time series plots of sediment deposits and variation of cross-sections of river channels.





Since KERI is new to the field of Sediment Transport Modelling, this portion of the proposal is decided to outsource. NIT Calicut has already been involved in the sediment transport modelling works. KERI has discussed this matter with NIT Calicut and they have expressed their willingness to collaborate with our Institution for a pilot study, which includes capacity building of our Engineers. MoU has been signed between Director, KERI and Director, NIT Calicut on 28th November 2019. Hydro- meteorological data, land use map, soil map pertaining to the study area etc. were collected and made available to NIT Calicut. Shape files marked with tentative locations for taking cross sections of river along with the locations of sand mining kadavu of Chaliyar River were prepared by this division after conducting a reconnaissance survey.

Numerical modelling part of the study has been started using the above data. Survey work for taking cross sections of Chaliyar river has been completed. Bench mark is transferred to the work site from GTS bench mark at Kuttippuram. The outputs from sediment transport model include estimates of suspended sediment concentrations, rates of sediment erosion and deposition and sediment transport pathways.

Suspended sediment sampling was conducted from 06/09/2021 to 28/02/2023. Two stations (locations) were selected for the suspended sampling process. One station is at Edavanna and another one is at Karimpuzha. The samples are collected on weekly basis and tested in the laboratory of NIT Calicut for grain size analysis. A temporary gauging station for measuring water level and discharge was established at Edavanna. Whereas, monitoring station of Hydrology wing is already present in the Karimpuzha river from which the discharge and water level data can be collected. The water levels were taken on daily basis from these two

stations. The water levels, discharge and sediment characteristics are used for modelling the flow and sediment transport in the Chaliyar river.

As a part of capacity building of engineers of KERI in numerical modelling of flow and sediment transport processes, physical and online training programmes were conducted with the principal investigator of this project from NIT Calicut (Prof. Santosh Thampi, Head of Department, Department of Civil Engineering) as the resource person. Physical training was conducted from 27/12/2021-29/12/2021 at KERI, 29/04/2022-30/04/2022 at KERI, 23/06/2022-24/06/2022 at KERI, 17/07/2022 at NITC, 31/08/2022 at NITC and 08/11/2023 at KERI. Online trainings were conducted on 02/11/2021, 04/12/2021 and 31/01/2022 respectively. In the training programmes, basic modules of Arc GIS, Hydrologic Engineering Centre-Hydrologic Modelling Software (HEC-HMS) and Hydrologic Engineering Centre-River Analysis System (HEC-RAS) were taught.

During the series of training programmes with the guidance from the resource persons, hydrologic, hydraulic and sediment transport models were developed using HEC-HMS and HEC-RAS softwares respectively. The watershed was delineated in the Arc GIS software and the basin and river networks were converted into the format suitable for the HEC-HMS package using Hec-GeoHMS plug-in available in Arc GIS software. The rainfall run-off model was developed in HEC-HMS software using the watershed exported from Arc GIS, rainfall, river cross-sections, evapotranspiration and water level data. The HEC-HMS model was successfully calibrated and validated. The sediment erosion from the catchment was modelled using Modified Universal Soil Loss Equation (MUSCLE) model and sediment was routed using uniform equilibrium method. The calibrated discharge data was used for modelling the sediment erosion and routing. The hydraulic model was developed using HEC-RAS software with the calibrated discharge data from the HEC-HMS software. The hydraulic model was successfully calibrated and validated in HEC-RAS software. Using the calibrated HEC-RAS model, sediment transport model was developed. From the sediment transport model, quantity of sediment deposition and mineable sand at various locations were calculated. Although the hydro-meteorologic, streamflow and sediment data were made available at few locations in the river basin, it could not be much used in this study because of the short duration of data availability/ intervening periods with missing data etc. The proposed framework can be looked up on as a starting point towards the development of a scientific approach that would facilitate a better understanding of sediment dynamics in the rivers of Kerala and assessment of the amount of mineable sand in these rivers. It is expected that the

Kerala Engineering Research Institute (KERI), Peechi, and its parent Department, i.e., Department of Water Resources, Govt. of Kerala, would be able to further develop on this framework using systematically collected hydro-meteorologic, streamflow, and sediment data at appropriate locations in this river basin and in other river basins supplemented by periodically collected river cross section and bed profile data. Hydrologic and sediment transport modelling target complex natural processes and hence refining the framework and the modelling approach is an evolutionary process. It is sincerely hoped that this study will serve its ultimate purpose of developing a scientific approach to sand auditing of the rivers, specifically those in Kerala.



5) WORKS UNDER THE HEAD OF ACCOUNT 4700-80-005-99-02-00- VINVESTIGATION OF MAJOR IRRIGATION SCHEMES

Works under this category are mainly devoted for engineering investigations for rehabilitation of existing structures under Kerala Irrigation Department. The highlights of works conducted under this category during the year 2023-24 by the Coastal Engineering division are given below:

5.1 Topographical Investigation for the Reconstruction of Tholur Chira across Wadakkanchery River in Thrissur District.

Conducting topographical investigation for the reconstruction of Tholur Chira across Wadakkanchery River in Thrissur District was taken up by this division based on the letter no. D10 (D4)-584/11 Vol II dated 13.12.2023 of Superintending Engineer, Irrigation Central Circle, Thrissur. Due to ageing, the existing structure is deteriorated and wide spread signs of ageing are visible on the structure and reconstruction is required for facilitating irrigation in nearby areas.

The estimate for topographical survey is prepared by including provisions for surveying 1.46 Km length (792.00m length in u/s up to Chorotha Bridge and 663.00 m length d/s of the proposed location for reconstruction of structure) along the river and 30m width for both banks on either sides of river. The investigation survey includes taking the cross section details of the river including the tributaries if any and banks on the upstream and downstream of the proposed location for reconstruction of the structure at particular intervals as per the design requirements. The width of river at the proposed survey area is varying from 15 m to 60 m. The total amount of the estimate comes to Rs. 1,05,000/-.

The site is situated near Annakara Chirakkal temple in Mullassery Grama Panchayath of Thrissur district. The left bank belongs to Tholur Grama Panchayath. The right bank of the river belongs to Annakara Grama Panchayath. The proposed location for the reconstruction of Tholur Chira was identified by the project authorities. Chorotha bridge is located on the upstream of the proposed location for the reconstruction of the structure. The main highlights of the survey work are as follows:

- The Temporary Bench Mark (TBM) for the survey work was transferred from the TBM established by KERI at Raja Island. The TBM from Raja Island is transferred to the top of a building near the site for the survey work.

- Survey was conducted in the Aloor river and its both banks by taking cross sections at particular intervals (at 15m interval for a length of 60m u/s and d/s of the proposed location for the reconstruction of the structure, 50m interval for the next 500m u/s, 100m interval for the remaining u/s and d/s length)
- River bank was also surveyed for ascertaining enough bank height for water storage.....
- Layout Plan, Cross sections, longitudinal sections and contour map at 1m contour interval were prepared as per the design requirements
- The longitudinal section was plotted by connecting the points having minimum elevation in each cross section
- Roads, buildings and permanent structures are plotted in the layout plan
- The lowest river bed level at the proposed location for the reconstruction of the structure is +0.644m



5.2 Engineering Investigations allied with the rehabilitation of existing hydraulic structures and various water resources related problems

Kerala Engineering Research Institute (KERI) is entrusted with various works related to the rehabilitation of existing hydraulic structures and various critical issues connected with the water resources sector of the State. As a part of these investigations, it is necessary to determine the alignment or profile of structures, relative settlement of foundation of the structures, measurement of deformations or rotations of structural members and topographical features of the study area. The analysis and inference of the investigated data require expert guidance and suggestions from the faculty of other institutions and various Engineering colleges. Moreover, provision should be made for accommodating taxi charges for the site visit of officers. Therefore, an estimate of Rs. 2,00,000/- was prepared for meeting expenses of engineering investigations, honorarium for expert guidance and taxi charges for field visit of the officers. The Administrative and Technical Sanctions were accorded for this estimate and presently the work is going-on.

6) WORKS UNDER THE HEAD OF ACCOUNT -2701-80-005-93-00-00- PV MODERNISATION OF DESIGN WING

6.1 Hiring of Vehicle for Coastal Engineering Division

KERI undertakes various studies and investigation works all over Kerala state. Topographical investigation works, soil investigation works, NDT, pile integrity test, tomography etc. are included in these works and studies. Extensive Transportation of equipments and officials to work sites require vehicle having cubic capacity 1500 cc or above. The department vehicles available under KERI cannot be availed by different divisions since simultaneous execution of works on departmental execution mode is undertaken by all divisions. Hence, the proposal for hiring of vehicle is included in this head for Rs. 2,00,000/.

6.2 Purchasing of Software for GIS and Topographic Survey

The Centralized GIS lab is established and good work stations (computers) are procured for the Lab in the previous financial year. ArcGIS is a geospatial software to view, edit, manage and analyze geographic data. Esri develops ArcGIS for mapping on desktop, mobile, and web. It is an integral part of all modern GIS labs. A single Perpetual License of Indo ArcGIS Desktop Advanced 10.8.2 and Indo ArcGIS Desktop Extension Spatial Analyst 10.8.2 are required to be purchased during this financial year for this laboratory. Civil 3D software is an integral part of the preparation of drawings of the investigation works conducted under this

office. It is used for generating and creating contour maps, cross section profiles, longitudinal section profiles etc. which required to be submitted along with the investigation reports. Hence, the latest version of this software is required along with the recent updates. The estimate for an amount of Rs. 17,50,000/- (Rupees Seventeen Lakhs Fifty Thousand only) is prepared for the purchase of Arc GIS and Civil 3D software.

6.3 Training of Smart Station

This work was proposed for conducting training to the Engineers of Irrigation Department about Smart station instrument in the Coastal Engineering Division and its relevance in the field of topographical surveys. The sessions include specialized training on Smart Station instrument with theory and working of the instrument. During this year, two day workshop on Drone and LiDAR technology for topographical surveying of various projects was conducted for all engineers of KERI. In the workshop sessions, introduction to LiDAR Technology, demonstration of LiDAR equipment, software used for data acquisition, on field data acquisition using photogrammetry and LiDAR, LiDAR photogrammetry data processing and final data comparison were taught. The workshop sessions were handled by the subject experts from DRONIMAGINATION Pvt. Ltd., No. 6/858-M, Valamkottil Towers, Judgemukku, Kakkanad, Kochi. The estimate cost for this workshop was Rs. 70,000/-.

7) DEPOSIT WORKS

The highlights of works conducted under this category during the year 2023-24 by the Coastal Engineering division are given below:

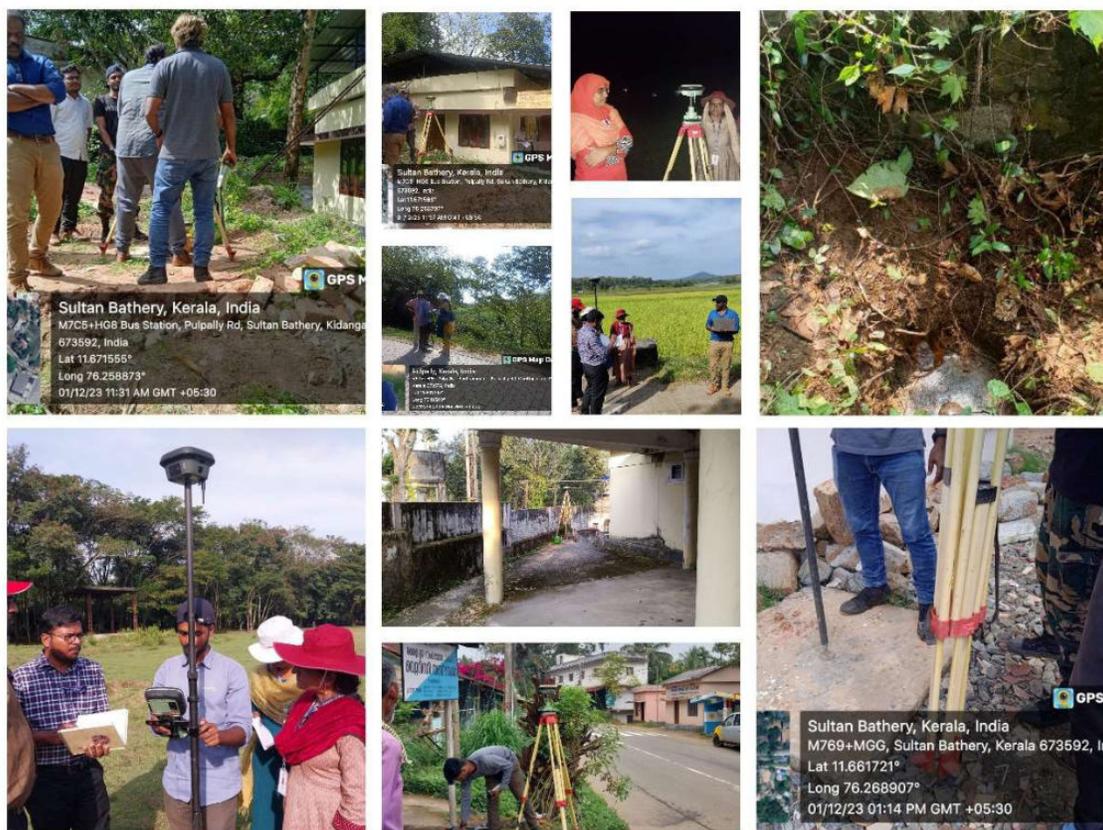
7.1 Topographic Survey of selected Ground Control Points Established at Kadamanthodu Dam Project Area in Wayanad District - 2023-24

Topographic Survey of selected Ground Control Points established at Kadamanthodu Dam Project Area in Wayanad District was taken up by this division as per the Letter No. D1-PG 520/2018 dated 06.11.2023 of the Executive Engineer, Cauvery Division, Sulthan Bathery, Letter No.D3-373/2021 dated 09.11.2023 of the Superintending Engineer, Project Circle, Kannur. The position details (latitude, longitude and RL) of the 15 numbers of Ground Control Points were determined by transferring the Bench Mark of Survey of India available at Koyilandi with highest accuracy. LiDAR survey was completed for the Kadamanthodu dam project and 80 numbers of GCPs were established using the DGPS instrument. The GCPs were established based on the SOI BM located at Koyilandy. The project authorities

have requested KERI to conduct topographical survey to determine the position details of GCPs, so that they can confirm the accuracy of GCPs established during LiDAR surveying.

As per the requirements of the project authorities, it is necessary to transfer the SOI BM from Koyilandi to Sulthan Bathery and to conduct the fly leveling using Smart Station or DGPS to determine the location (latitude and longitude) and Reduced Level (RL) details of various GCPs. The highest accuracy of the topographical surveying work can be ensured by employing Real Time Kinematic (RTK) method available in smart station (high performance total station and powerful GPS receiver are perfectly integrated). In the estimate, provisions were included to transfer the SOI BM located at Koyilandi to Sulthan Bathery using static surveying method of RTK technique and to carry out the fly leveling of 15 numbers of GCPs from among the 80 GCPs established for this project. Considering the distance between Koyilandi and Sulthan Bathery and to ensure highest accuracy from the RTK method, three intermediate stations need to be established between Koyilandi and Sulthan Bathery. Provisions were included in the estimate for determining the location and RL details of these three intermediate stations using the static surveying method of RTK technique. Provisions were also included for transferring the BM points to the locations adopted for static surveying using Total station wherever satellite signals for DGPS is not available due to either the nearby buildings or canopy.

Kadamanthode Irrigation Project is one among the projects proposed in Kabini sub-basin of Cauvery basin in Wayanad district. As part of implementing the various stages of project, Cauvery Division Project Authorities have performed the task of Survey using LiDAR technology at Kadamanthode project area and Ground Control Points were established at various locations in the project area. Subsequently, the Project Authorities approached Kerala Engineering Research Institute, Peechi to validate some of the above mentioned Ground Control Points using the facilities available at KERI so as to ascertain the accuracy of LiDAR survey. Accordingly, topographic survey of 15 numbers of GCPs as specified by the project authorities was carried out by KERI using Differential Global Positioning System (RTK method) integrated with Total Station. The position details of the 15 numbers Ground Control Points were determined with highest accuracy. The estimate amount comes to Rs.89,000/-.



7.2 Conducting Topographic survey for assessing gradient/ slope of Perandoor canal rejuvenated under AMRUT scheme in Kochi Corporation in connection with performance audit of Accountant General

This estimate is prepared for determining the gradient/slope of the Perandoor canal rejuvenated under the AMRUT scheme in Kochi Corporation in connection with the performance audit of Principal Accountant General (Audit I) as per the letter No. Audit I/AMG I/DP Cell/PA-AMRUT/2023-23 dated 16-10-2023. Perandoor canal starts near the Perandoor channel railway bridge and ends at the location where Thevara canal joins with Edakochikayal. The length of this reach was found to be around 10.890 Km. The sides of most parts of this canal reach are protected by fencing at least for a height around 3m which need to be removed temporarily during the surveying for taking the bed levels at regular intervals. The initial portions of this reach have large width in the range between 27m-103m. The total amount of the estimate comes to Rs.1,18,000/-. The work will be executed on transferring the fund to KERI.

7.3 Conducting Topographic survey for assessing gradient/ slope of selected drains constructed under AMRUT scheme in Thiruvananthapuram Corporation in connection with performance audit of Accountant General

This estimate is prepared for determining the gradient/slope of selected drains constructed under the AMRUT scheme in Thiruvananthapuram Corporation in connection with the performance audit of Principal Accountant General (Audit I) as per the letter No. Audit I/AMG I/DP Cell/PA-AMRUT/2023-23 dated 16-10-2023. A drain along Thaliyal Thelungu Chettitherue road in Karamana ward which was newly constructed under the AMRUT scheme and the existing drains on both sides of SS Kovil road in Thampanoor ward which was reconstructed under the AMRUT scheme were considered in this work. The former drain has a length around 142m while the latter has a length around 682m respectively. The complete length of both the side drains are covered by the RCC slabs which needs to be temporarily removed during the surveying for taking the bed levels at regular intervals. Moreover, the wastes and sediments in the drains need to be removed for completion of the surveying work in a fast and smooth manner. The total amount of the estimate comes to Rs.45,000/-. The work will be executed on transferring the fund to KERI.

7.4 Conducting Topographic survey for assessing gradient/ slope of selected drains constructed under AMRUT scheme in Thrissur Corporation in connection with performance audit of Accountant General

This estimate is prepared for determining the gradient/slope of selected drains constructed under the AMRUT scheme in Thrissur Municipal Corporation in connection with the performance audit of Principal Accountant General (Audit I) as per the letter No. Audit I/AMG I/DP Cell/PA-AMRUT/2023-23 dated 16-10-2023. Existing drain of Kuttumukku-Vadakkevettuvazhi Road (work 68 in phase 3) and that of the road opposite to Cheroor Police Academy (Kerala Police Academy) (work 67 in phase 3) were considered in this work. The former drain has length around 273m while the latter has a length around 450m respectively. The most parts of both the side drains are covered by RCC slabs which need to be temporarily removed during the surveying for taking bed levels at regular intervals. The total amount of the estimate comes to Rs. 24,000/-. The work will be executed on transferring the fund to KERI.

7.5 Conducting Topographic survey for assessing gradient/ slope of selected drains constructed under AMRUT scheme in Palakkad Municipality in connection with performance audit of Accountant General

This estimate is prepared for determining the gradient/slope of selected drains constructed under the AMRUT scheme in Palakkad Municipality in connection with the performance audit of Principal Accountant General (Audit I) as per the letter No. Audit I/ AMG I/DP Cell/PA-AMRUT/2023-23/46 dated 08-09-2023. The existing drain of Robinson Road foot path and Chakkanthara-Kaikuthuparambu (Venkiteswara Garden) rain water drain were considered in this work. The former drain has length around 286.50m while the latter has a length around 353.75m respectively. The former drain is fully covered with RCC slabs and foot path tiles were laid over it for the major stretch with handrails fixed on the sides. Whereas the latter drain is in fully open condition. A network of interlinked drains is also observed on both sides of the roads in the locations considered for this work. The layout of concerned area showing exact chainages of both the drains in which gradient/slope to be determined need to be made available to KERI and the RCC slabs need to be temporarily removed during the topographical surveying for taking bed levels of the drains at regular intervals. The total amount of the estimate comes to Rs.28,000/-. The work will be executed on transferring the fund to KERI.

7.6 Topographical Investigation for the proposed Check Dam across Thoothapuzha at Muriyankanni in Thachanattukara Gramapanchayath, Palakkad District (Jal Jeevan Mission)

This estimate is prepared for conducting the topographical investigation for proposed Check Dam at Muriyankanni across Thoothapuzha in Thachanattukara Gramapanchayath, Palakkad District under Jal Jeevan Mission based on the letter no. DB3/PROJ/MPM/KMV/GENERAL dated 25.10.2023 of the Executive Engineer, Kerala Water Authority, Project Division, Malappuram. KWA has proposed a check dam to ensure water availability at Muriyankanni area for the Water Supply Scheme to Keezhattur, Melattur, Vettathur Grama Panchayaths.

The estimate for topographical survey is prepared by including provisions for surveying 4 Km length (2 Km u/s of first proposed location just u/s of bridge and 0.5 Km d/s of third location which is 1 Km d/s of bridge, 0.50 Km for tributaries) along the river. The investigation survey includes taking the cross section details of the river including the tributaries if any and banks upstream and downstream of the proposed Check dam location at particular intervals as per the design requirements. The width of river at the proposed survey area is varying from 100m to 350m. The total amount of the estimate comes to Rs. 5,70,000/-. The work will be executed on transferring the fund to KERI.

8) ENGINEERING MUSEUM

The Engineering Museum of KERI is in charge of the Coastal Engineering division. The models of Irrigation Dams, Bridges and river systems are displayed in the Engineering Museum. During the financial year 2023-24, the Engineering Museum was visited by more than 200 people.

9) INTERNSHIP PROGRAMMES

Being a research institute in Water Resources Sector, students from several Engineering Colleges, Polytechnic Institutions and Industrial Training Centres have visited KERI for internship trainings and exposure visits as a part of their curriculum for M Tech, B Tech, Diploma and ITI courses. Training sessions were arranged in this office for getting an overview of Topographical Surveying methods using Global Navigation Satellite systems.

Sl No	Name of College	Course	Number of Students
1.	Malabar College of Engineering & Technology	B. Tech	20
2.	Vidya Academy of Science and Technology	B. Tech	15
3.	Government Engineering College Thrissur	B. Tech	5
4.	Government Engineering College Thrissur	M. Tech	1

TECHNICAL PERSONNELS

Deputy Director:

1. Raji Thampan 01.04.2023 to 20.11.2023
2. Siji .T.V. 20.11.2023 onwards

Assistant Director I

1. Anoop R. (01.04.2023 to 30.9.2023)
2. Harikumar. M (07.03.2023 onwards)

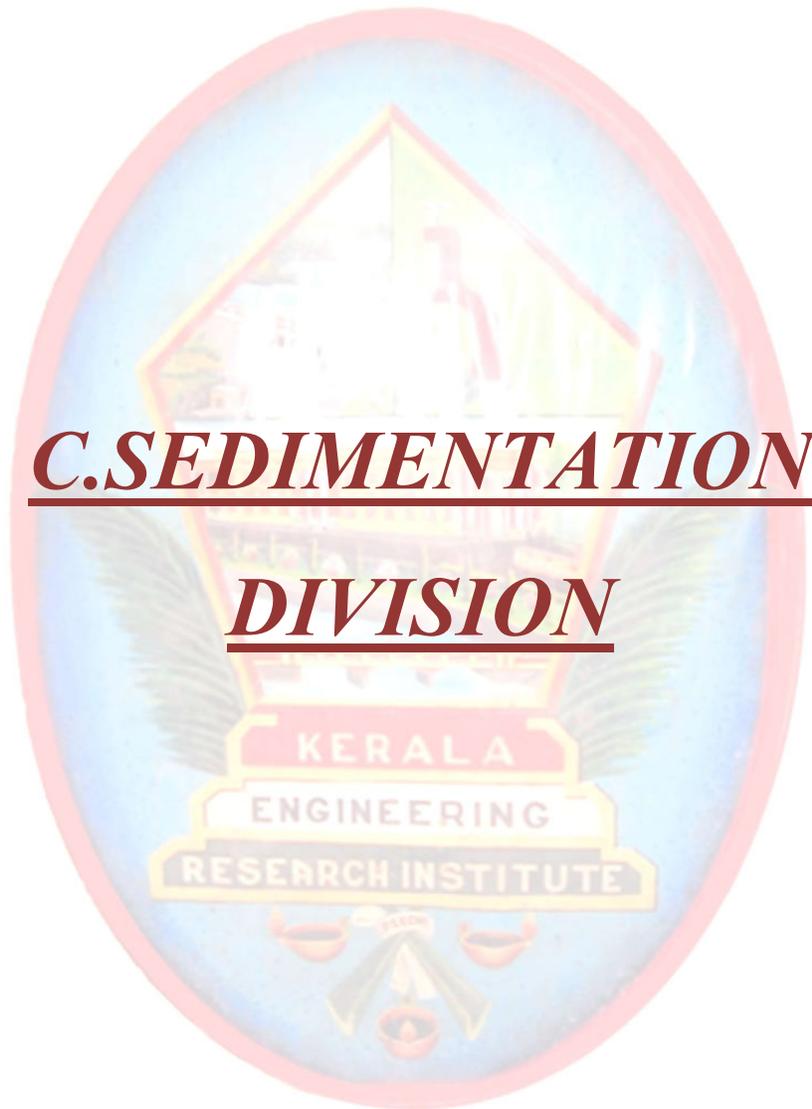
Assistant Director II

1. Devarajan K. (01.04.2023 onwards)

LIST OF OTHER PERSONNELS- 2023-24

1. Jishi A. A. Research Assistant I from 01.04.2023 onwards
2. Sreejith S. Research Assistant II from 01.8.2023 onwards
3. Sureshkumar S. Overseer Grade II from 10.04.2023 onwards
3. Deepa M. B. Overseer Grade II from 18.8.2023 onwards
4. Biji C. J. Overseer Grade III from 01.04.2023 onwards





C.SEDIMENTATION

DIVISION

SEDIMENTATION DIVISION

INTRODUCTION

Sedimentation Division conducts studies to compute the present capacity of reservoirs and other water bodies. Such studies are conducted using modern electronic method called 'Integrated Bathymetric System'(IBS). In order to ascertain the underwater profile of the sediment layer another sophisticated instrument called 'Sub Bottom Profiler' is used. From 2004 onwards, this division has completed 63 studies using IBS which includes Kallada Reservoir, Malampuzha Reservoir, Neyyar Reservoir Mullaperiyar, Vembanad Lake and Kattampally Wetland etc. Sub Bottom profiler was used for 30 of the above studies.

Relevance of the study

- To estimate the present capacity of the reservoirs
- To manage the reservoir operations based on the present actual capacity
- Vital role in the ongoing Desiltation work of reservoirs for the capacity improvement
- To observe the influence of the heavy floods in the reservoir sedimentation

THE SURVEY TEAM OF THE YEAR 2023-24

Directors	Er. Suprabha (upto 30/06/2023) Er.Sreekala (03/07/2023 to 13/03/2024) Er Shini K K (addl charge)
Joint Director	Er.Shini K K
Deputy Director	Er.Divya C J
Technical Team	
Er.Roshni S S	Assistant Director
Er. Jayasree K V	Assistant Director
Er. Sheena A R	Assistant Director
Mansoor N. K	Research Assistant
Suramya Raj	Second Grade Overseer
Divyesh V B	Third Grade Overseer

Crew

Udayan P K	Departmental Boat Driver
Jayakumar T R	Boat Driver (on HR basis)
Sudheesh K C	Departmental Jeep Driver
Anitha M M	Office Attendant

EQUIPMENTS OF SURVEY

A. INTEGRATED BATHYMETRIC SYSTEM (IBS)

The components of IBS are

- FRP boat
- DGPS –MX-610
- Echosounder
- Survey P C
- Helmsman display

FRP BOAT

Fiber reinforced Plastic (FRP) boat having two 60 HP petrol out board engines, dimension of 7.5m X 2.66m X 1.20m and 8persons capacity with the equipment is used for the survey. For the power supply, two solar panels of 80 watt each are mounted on the roof of the boat.



FRP Boat

DGPS SIMRAD MX-610

DGPS SIMRAD MX- 610 is highly reliable and it receives correction from a permanent reference station, which is approved by Govt. of India, Dept. of Light house and Light ship. It can also track up to 12 satellites to achieve maximum positional accuracy. The received position is transferred to Echo Sounder and Sub Bottom Profiler data collection laptop.



MX610 Navigation System

MIDAS SURVEYOR ECHOSOUNDER

The MIDAS Surveyor is a revolution of small boat survey work with an integral GPS receiver. It logs and displays DGPS position data in WGS 84 or Local Grid. This Echo-sounder is designed to measure under water depth up to 1200m. Accuracy of instrument is 1centimeter. The dual frequency echo-sounder is specified to distinguish between fluff top depth and the consolidated bottom. The high frequency (200 KHz) is used to detect the top of the mud/sediment. Under favorable conditions the low frequency signal (33 KHz) can penetrate into the bottom and reveal information about the bottom structure.



MIDAS Surveyor Echo Sounder

SURVEY PC

The Qinsy survey software is installed in the laptop for data collection and processing.

All the position data collected using DGPS and the depth of water collected using echosounder are recorded in computer and are further processed.

HELMS MAN DISPLAY

This is an extension monitor of the survey PC for guidance of boat driver.

Mobile station set up for data collection is shown below.



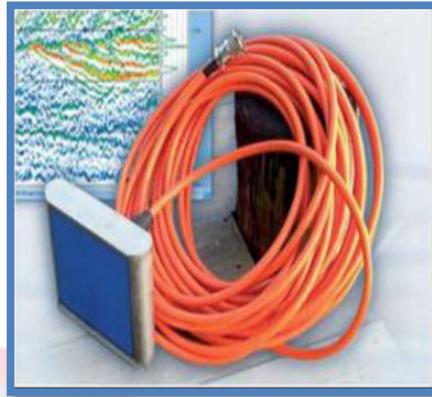
Equipment Set up inside the Boat

B SUB BOTTOM PROFILER

The system SES-2000 sub-bottom profiler, which is a mobile parametric sediment sounder, was used for bathymetric and sub-bottom profiling survey. The SES- 2000 hardware component and transducers are shown in Figures below. High frequency signal (HF -100 kHz) and the secondary low frequency signal (LF -6 to 12kHz) are used. The spatial distribution of sediment in each cross section can be analyzed



Top- side Unit



Transducer

SOFTWARES USING FOR THE SURVEY

- QINSY SOFTWARE

This software is used for data collection and processing in IBS survey. The Bathymetric software supports NMEA 0183 compatible devices. Local grid UTM (WGS-84) is the projection supported by this software.

- SESWIN

This software is used for the data collection in Sub Bottom Profiler.

- I.S.E. 2.9.2

This is the post processing software used for analyzing the data collected from Sub Bottom Profiler.

- Surfer software

Surfer is a graphic program used for calculating the volume based on the logged data from the IBS and Sub Bottom Profiler.

DATA COLLECTION

The mobile station consists of the DGPS and its antenna, Echo sounder, Sub Bottom Profiler and the transducers etc which are mounted on the FRP boat. The transducer of Sub Bottom Profiler is permanently fixed at the center of the boat. The transducer of Echo sounder is connected to the left side of the boat and is detachable. Proper connections are made between these equipment and the laptops for the data collection. By using the **Planning and**

presentation menu in **Qinsky software**, chart is prepared by taking UTM co-ordinate at two known points. With these co-ordinates of two points reference lines are drawn. Segment lines are drawn parallel to this reference line at a particular interval such that the entire reservoir area can be covered. The boat is sailed along the planned track with a speed of 3 to 4 knots. The data from the Echo sounder and Sub Bottom Profiler is collected simultaneously through two laptops. For IBS Survey, the laptop loaded with QINSY survey software is used. For Sub Bottom Profiler, the data is collected using laptop installed with SESWIN software. There are three modules in the QINSY Software: Data Acquisition, Data export/import.



Data Collection inside the Boat

The system **SES-2000**(Sediment Echo Sounder) Sub Bottom Profiler is a parametric (non-linear) dual frequency echo sounder. The instrument simultaneously transmits two signals of slightly different high frequencies; their interaction creates a new low frequency signal. It has a large bandwidth and a short signal length, which allows good use in very shallow water and results a high (~15 - 20 cm) vertical resolution at acceptable sub-bottom penetration up to 10 m or more. Some favorable near sub-bottom seismic and geological conditions permit to achieve a vertical resolution up to 10 cm. Parametric (non-linear) sound generation allows designing acoustical systems with small transducer dimensions and narrow sound beams at low frequencies. An Innomar SES-2000 parametric transducer has an active area of 20 x 20 cm and provides a beam width of less than four degrees (at 3dB), valid for all adjustable low frequencies between 5kHz and 15 kHz. The transmit directivity of the parametric sound beam does not show any significant side lobe characteristic, which reduces ambiguities during the interpretation of individual reflectors. Short transmit signals of single sinusoidal cycles without any ringing and high ping rates of up to 50 pings per second are further advantages. They contribute to a high spatial resolution of this acoustical system and permit to apply it in a shallow basin. Innomar's software tool ISE provides near real-time processing of the

collected SES data. The operation procedure can be tuned on-line. A value of the sound velocity in water is used to convert sound travel time to the depth. The depth values are screened online.

ACTIVITIES OF THE DIVISION DURING THE YEAR 2023-24

- The reports of the bathymetric studies of Sholayar reservoir (under KSEB), Asurankundu and Pathazhakkundu reservoirs, which were conducted during the financial year 2022-23, has been completed during this year.
- The reports of the bathymetric studies of Idukki reservoir (near Anchuruli), near Cheruthoni dam and Ponmudi reservoir which have been carried out for Kerala Water Authority in connection with the construction of floating pump house by Jala Jeevan Mission (JJM) has been completed during this year.
- The bathymetric survey of Bhoothathankettu Reservoir has been conducted during the year 2023-24.
- Bathymetric study of Mattupetti reservoir using IBS have been carried out for Kerala Water Authority in connection with the construction of floating pump house by Jala Jeevan Mission (JJM)
- Apart from that the routine upkeep of the office, survey equipment etc has been done in this financial year too.
- Draft preparation for the work "Eco friendly Master plan Preparation for "KERI as a center for Excellence" and Beautification of Peechi Dam – Phase I has been completed in this financial year
- M.G University Kottayam has been assigned to conduct Training on reservoir sedimentation analysis using remote sensing methods under the head of Modernization of Design wing

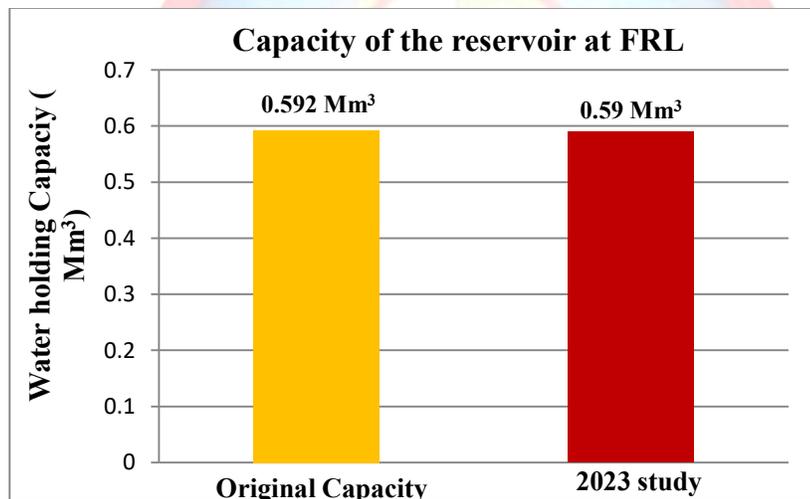
The details of the completed reports are as follows:

Sedimentation study of Asurankundu reservoir using Integrated Bathymetric System (IBS) & Sub Bottom profiler

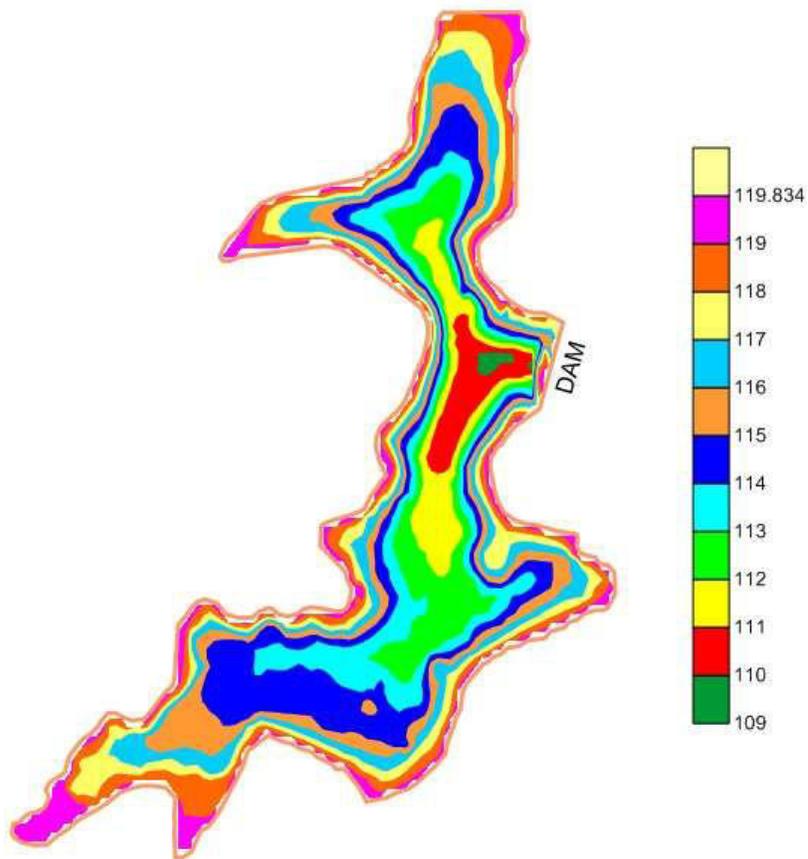
CAPACITY ESTIMATION

The bathymetric survey is conducted at present water level of +4.98 m. The FRL of the reservoir (+10.00m) is connected to MSL using smart station survey by transferring the level from the established bench mark at Poomala reservoir. The FRL of the reservoir with respect to MSL is +119.834m and the present level is +114.814m.

The bathymetric study was conducted at the present available water level of +114.814m and the remaining water spread area upto full reservoir level (+119.834m) was conducted by topographical survey using smart station. From the bathymetric survey data and topographical survey data, the present water holding capacity and the corresponding water spread area is estimated as 0.590 Mm³ and 0.127 Sq.km respectively. The original water holding capacity and water spread area of the reservoir at FRL as per the elevation-capacity chart and elevation-water spread area chart given by project authorities is 0.592 Mm³ and 0.129 km² respectively. As per the current study the water holding capacity of the reservoir is reduced by 0.002 Mm³. Fig 6.1 shows the graphical representation of the original capacity at FRL and the capacity obtained from the current study.



Variations in Reservoir Capacity



Contour Map based on Survey

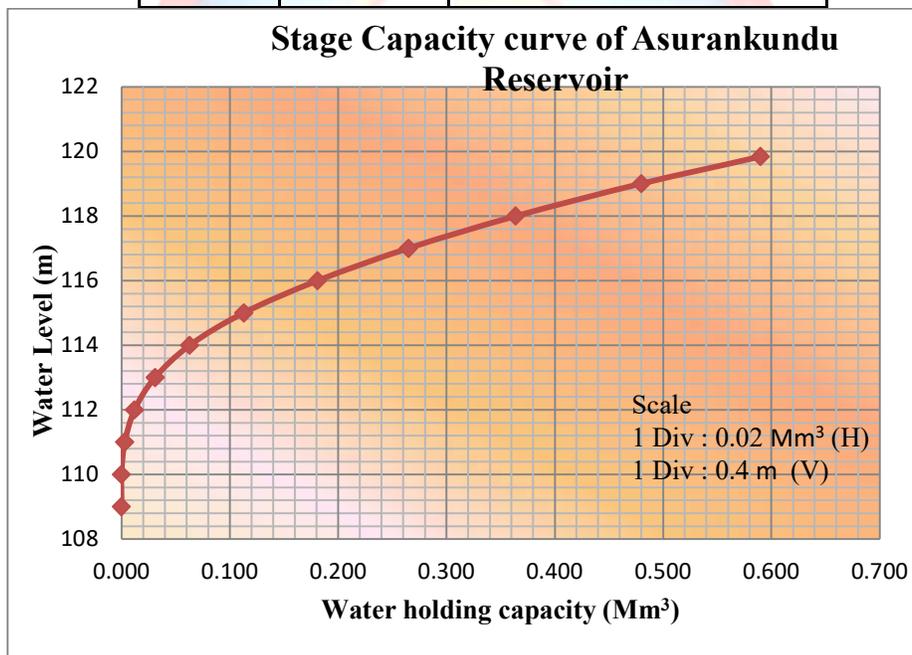
CAPACITY AT DIFFERENT WATER LEVELS

Reservoir volume at different water levels can be found out by using Surfer software from the survey data. The present capacity obtained at different levels is shown in Table

Reservoir capacity at different water levels

<i>Sl. No.</i>	<i>Water Level (m)</i>	<i>Water Holding Capacity as per Present survey (Mm³)</i>
1	119.834	0.5940
2	119	0.480
4	118	0.364
5	117	0.265

6	116	0.181
7	115	0.113
8	114	0.063
9	113	0.031
10	112	0.012
11	111	0.003
12	110	0.000
13	109	0.000



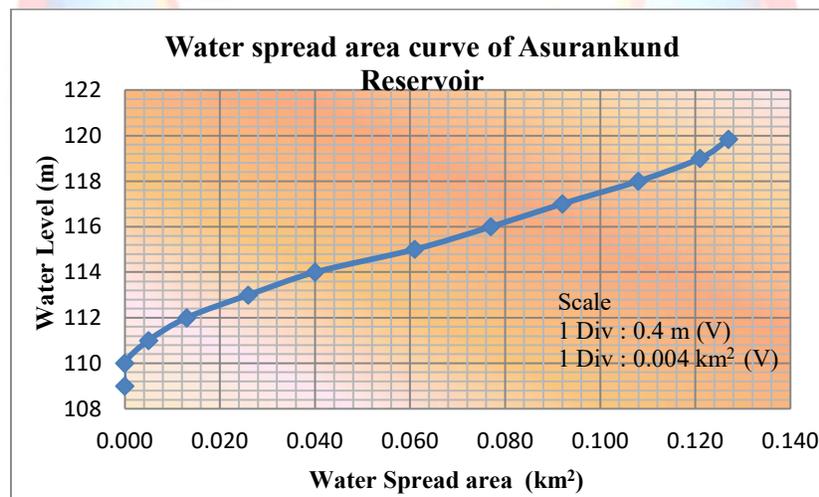
WATER SPREAD AREA AT DIFFERENT WATER LEVEL

The present water spread area at different water level is obtained from the present survey is shown in Table.

Water spread area at different water levels

<i>Sl. No.</i>	<i>Water Level (m)</i>	<i>Water Spread Area as per Present Survey (km²)</i>
1	119.834	0.127

2	119	0.121
4	118	0.108
5	117	0.092
6	116	0.077
7	115	0.061
8	114	0.040
9	113	0.026
10	112	0.013
11	111	0.005
12	110	0.000
13	109	0.000



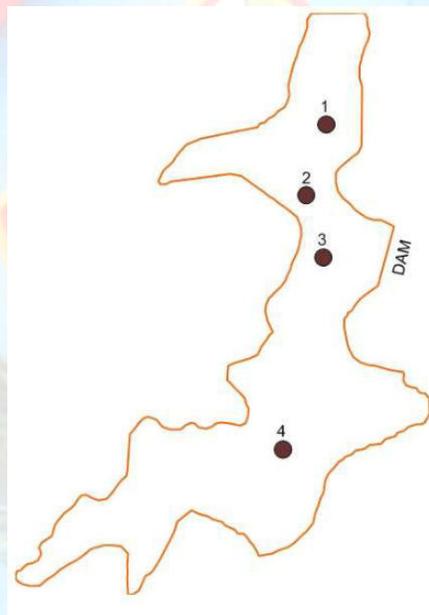
Water level v/s Water spread area curve

SOIL SAMPLE COLLECTION

Disturbed soil samples were collected using grab type mud sampler (only surface soil) from 4 locations in the reservoir. The sample collection method and sample locations are shown in below Plate and Figure. Undisturbed samples cannot be collected using this type of sampler. These soil samples were analyzed in the lab of Soil Mechanics and Foundation Division, KERI, Peechi.



Soil sample collection



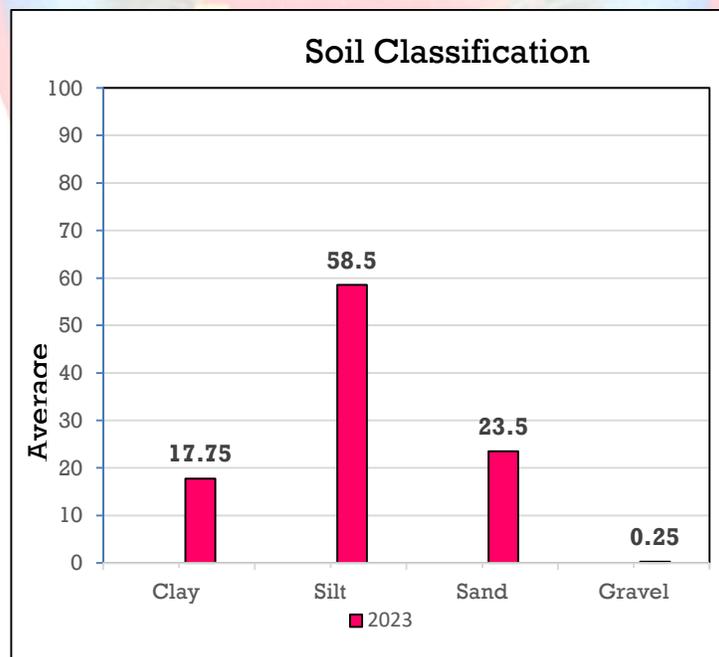
Location of Soil samples collected

ANALYSIS OF SOIL SAMPLES

In this study 4 Nos of disturbed soil samples were analyzed. The result of soil sample analysis is shown in Table. The graphical representation of average percentage of Clay, Silt, Sand and Gravel is shown in the form of bar chart.

Soil Sample Analysis Result

Sl. no.	Sample Position	Depth of Sample taken in m	Nature of sample	Soil Texture	Colour	% of Various size of Soil Particle			
						Clay	Silt	Sand	Gravel
1	N- 1181787.711 E- 641715.336	2.00	Disturbed	Clayey silt	Light Brown	24	63	13	0
2	N- 1181688.478 E- 641687.135	2.42	Disturbed	Clayey silt	Light Brown	19	73	8	0
3	N- 1181602.925 E- 641711.415	3.92	Sandy silt	Sandy clay	Mixture of Slate Grey and Golden Brown	19	57	24	0
4	N-1181338.815 E-641656.405	2.10	Disturbed	Silty sand	Mixture of Slate Grey and Light Brown	9	41	49	1

*Soil particle distribution*

The percentages of soil particles are only indicative and not accurate. For accurate assessment of contents in the soil, core sample analysis must be done.

RESULT AND DISCUSSION

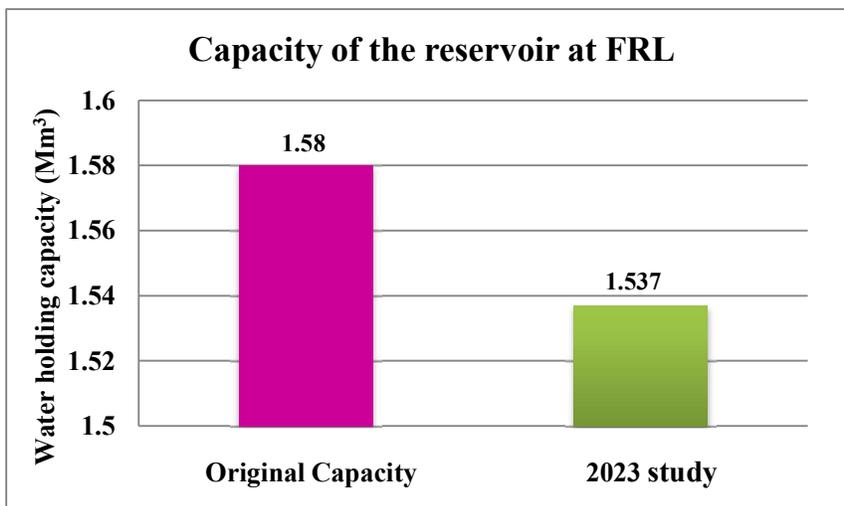
The survey is carried out at FRL of +10.00m (+119.834 m). The original water holding capacity and water spread area of the reservoir at FRL is 0.592 Mm³ and 0.129 Sq.Km respectively. As per the current study, the water holding capacity at FRL is estimated as 0.590 Mm³ and the corresponding water spread area is 0.127 Sq.km. The water holding capacity of the reservoir is reduced by 0.002 Mm³ and the water spread area is reduced by 0.007 Sq.Km. Within the last 46 years the capacity is reduced by 0.34% of the original capacity. Reduction in the capacity may be due to the deposition of sediments in the sides and bottom of the reservoir.

Sedimentation study of Pathazhakundu reservoir using Integrated Bathymetric System (IBS) & Sub Bottom profiler

CAPACITY ESTIMATION

The bathymetric survey using IBS equipment is conducted at present water level of +8.96 m. The survey of remaining portion upto FRL of +14.0m has been conducted by using Smart Station. A permanent bench mark w r t MSL was already established in March 2018 by Coastal Engineering Division, KERI, Peechi in near the compound wall of security building using smart station survey by transferring the level from the bench mark point of Southern railway near Punkunnam. Thus the FRL of the reservoir with respect to MSL(corresponding to the maximum scale reading of +14.0m) is +129.05 m and the present level is +124.01m.

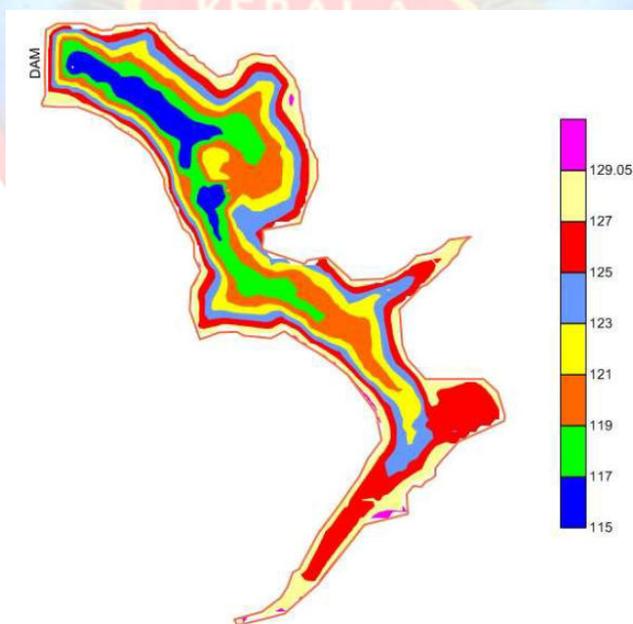
Thus, the bathymetric study was conducted at the present available water level of +124.01m and the remaining water spread area upto full reservoir level (+129.05m) was conducted by topographical survey using smart station. From the bathymetric survey data and the topographical survey data, the present water holding capacity and the corresponding water spread area is estimated as 1.537 Mm³ and 0.234 Sq.km respectively. The original water holding capacity at FRL as per salient features is 1.58 Mm³. The water holding capacity of the reservoir is reduced by 0.043 Mm³ (2.72%) in 45 years. Fig shows the graphical representation of the original capacity and the capacity obtained from current study at FRL.



Variations in Reservoir Capacity

Capacity of the reservoir at FRL

Year of Study	Capacity of the reservoir at FRL(Mm³)	Reduction in Capacity w.r.t original Volume(1.58 Mm³)	
		Mm³	%
2023	1.537	0.043	2.72



Contour Map based on Survey

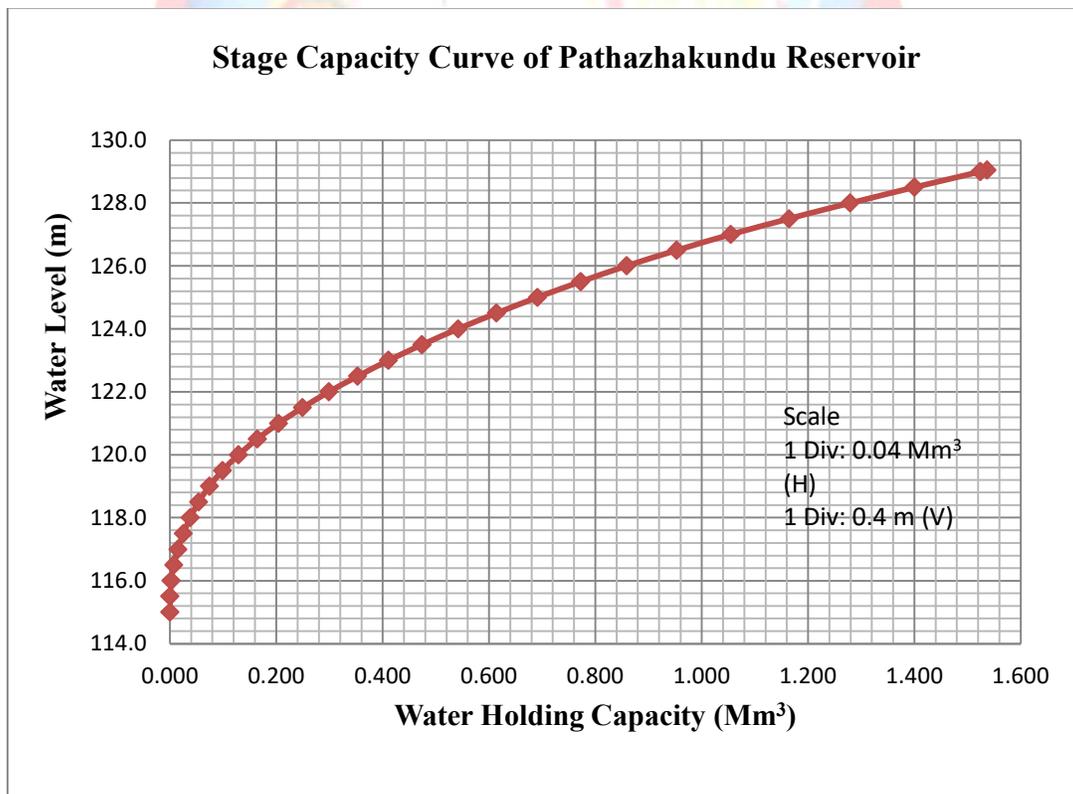
CAPACITY AT DIFFERENT WATER LEVEL

Reservoir volume at different water levels can be found out by using Surfer software from the data collected. The present capacity at different levels obtained from survey is shown in Table

Reservoir capacity at different water levels

<i>Sl. No.</i>	<i>Water Level (m)</i>	<i>Water holding Capacity as per Present survey(Mm³)</i>
1	129.05(corresponding to max scale reading +14.0m)	1.537
2	129	1.524
4	128.5	1.400
5	128	1.279
6	127.5	1.164
7	127	1.055
8	126.5	0.953
9	126	0.859
10	125.5	0.772
11	125	0.691
12	124.5	0.614
13	124	0.542
14	123.5	0.474
15	123	0.411
16	122.5	0.353
17	122	0.299
18	121.5	0.249
19	121	0.204
20	120.5	0.164
21	120	0.129

22	119.5	0.099
23	119	0.074
24	118.5	0.054
25	118	0.038
26	117.5	0.025
27	117	0.015
28	116.5	0.007
29	116	0.002
30	115.5	0.000
31	115	0.000



Stage - Capacity curve

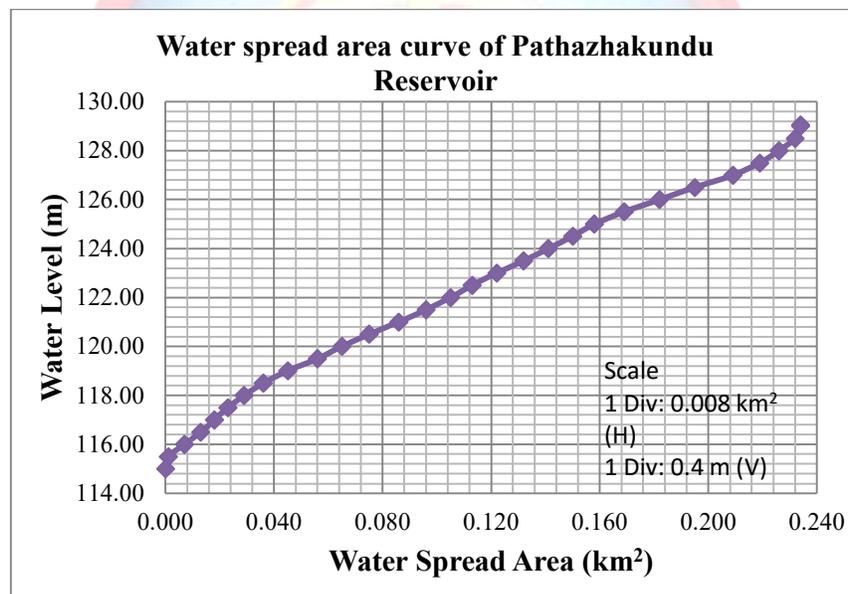
WATER SPREAD AREA AT DIFFERENT WATER LEVEL

The present water spread area at different water level is obtained from the present survey is shown in Table

Water spread area at different water levels

<i>Sl. No.</i>	<i>Water Level (m)</i>	<i>Water Spread Area as per Present Survey (km²)</i>
1	129.05	0.234
2	129	0.234
4	128.5	0.232
5	128	0.226
6	127.5	0.219
7	127	0.209
8	126.5	0.195
9	126	0.182
10	125.5	0.169
11	125	0.158
12	124.5	0.150
13	124	0.141
14	123.5	0.132
15	123	0.122
16	122.5	0.113
17	122	0.105
18	121.5	0.096
19	121	0.086
20	120.5	0.075
21	120	0.065
22	119.5	0.056
23	119	0.045

24	118.5	0.036
25	118	0.029
26	117.5	0.023
27	117	0.018
28	116.5	0.013
29	116	0.007
30	115.5	0.001
31	115	0.000

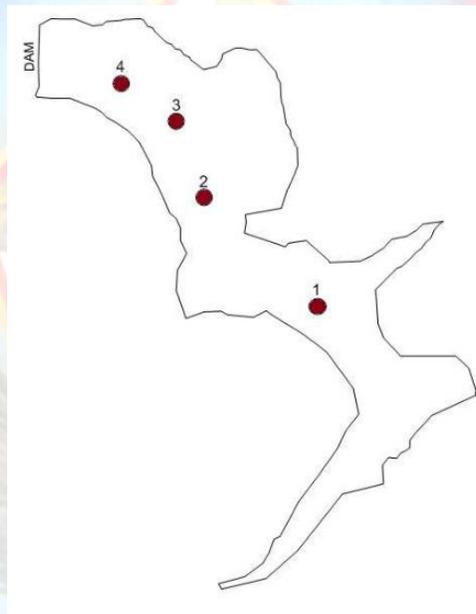


SOIL SAMPLE COLLECTION

Disturbed soil samples were collected using grab type mud sampler (only surface soil) from 4 locations in the reservoir. The sample collection method and sample locations are shown in Plate and Fig respectively. Undisturbed samples cannot be collected using this type of sampler. These soil samples were analyzed in Soil Mechanics and Foundation Division, KERI, Peechi.



Soil sample collection



Location of Soil samples collected

ANALYSIS OF SOIL SAMPLES

In this study 4 Nos of disturbed soil samples were analyzed. The result of soil sample analysis is shown in Table. The graphical representation of average percentage of Clay, Silt, Sand and Gravel is shown in the form of bar chart

Soil Sample Analysis Result

<i>Sl. no.</i>	<i>Sample Position</i>	<i>Depth of Sample taken in m</i>	<i>Nature of sample</i>	<i>Soil Texture</i>	<i>Colour</i>	<i>% of Various size of Soil Particle</i>

						Clay	Silt	Sand	Gravel
1	N- 1173731.662 E- 635834.418	4.45	Disturbed	Silty sand	Mixture of Slate Grey and Light Brown	9	33	56	2
2	N- 1173948.511 E- 635610.268	6.40	Disturbed	Silty sand	Mixture of Slate Grey and Light Brown	9	29	62	0
3	N- 1174096.503 E- 635556.342	7.92	Disturbed	Silty sand	Mixture of Ash Grey and Light Brown	8	26	63	3
4	N-1174169.324 E-635448.993	8.26	Disturbed	Silty sand	Mixture of Ash Grey and Light Brown	7	21	67	5



Soil particle distribution

The percentages of soil particles are only indicative and not accurate. For accurate assessment of contents in the soil, core sample analysis must be done.

RESULT AND DISCUSSION

The survey is carried out at FRL level of +14.0m (+129.05 m). The original water holding capacity at this level is 1.58 Mm³. As per the current study, the water holding capacity at this level is estimated at 1.537 Mm³ and the corresponding water spread area is 0.234 Sq.km. ie; water holding capacity of the reservoir is reduced by 0.043 Mm³ in 45 years. Reduction in capacity may be due to the sedimentation occurred in the reservoir.

Sedimentation Study of Poomala Reservoir Using Integrated Bathymetric System

The Executive Engineer, Minor Irrigation Division, Thrissur requested vide Lr. No.D3-GL/2022 dated.29/12/2022 to conduct the bathymetric survey of Poomala Reservoir. The study has been conducted from 10th February 2023 to 20th February 2023 in the financial year 2022-23 using IBS in order to assess the present water holding capacity and water spread area of the reservoir.

Bathymetric study of Poomala reservoir has been carried out using Integrated Bathymetric System (IBS). The water level in the reservoir during the bathymetric survey using survey boat was +24 ft, which was very much lower than Full Reservoir Level of +30 ft. Hence, in order to access the capacity of reservoir at FRL, topographic survey using Smart station was conducted in the reservoir area which was not covered in bathymetric survey using boat and having reduced level between present water level and FRL.

The draft report of the work has been submitted to the project authorities. As some clarifications regarding FRL and the capacity have to be obtained from the project authorities, the report is not finalized.

Sedimentation study of Sholayar reservoir using Integrated Bathymetric System (IBS) & Sub Bottom profiler

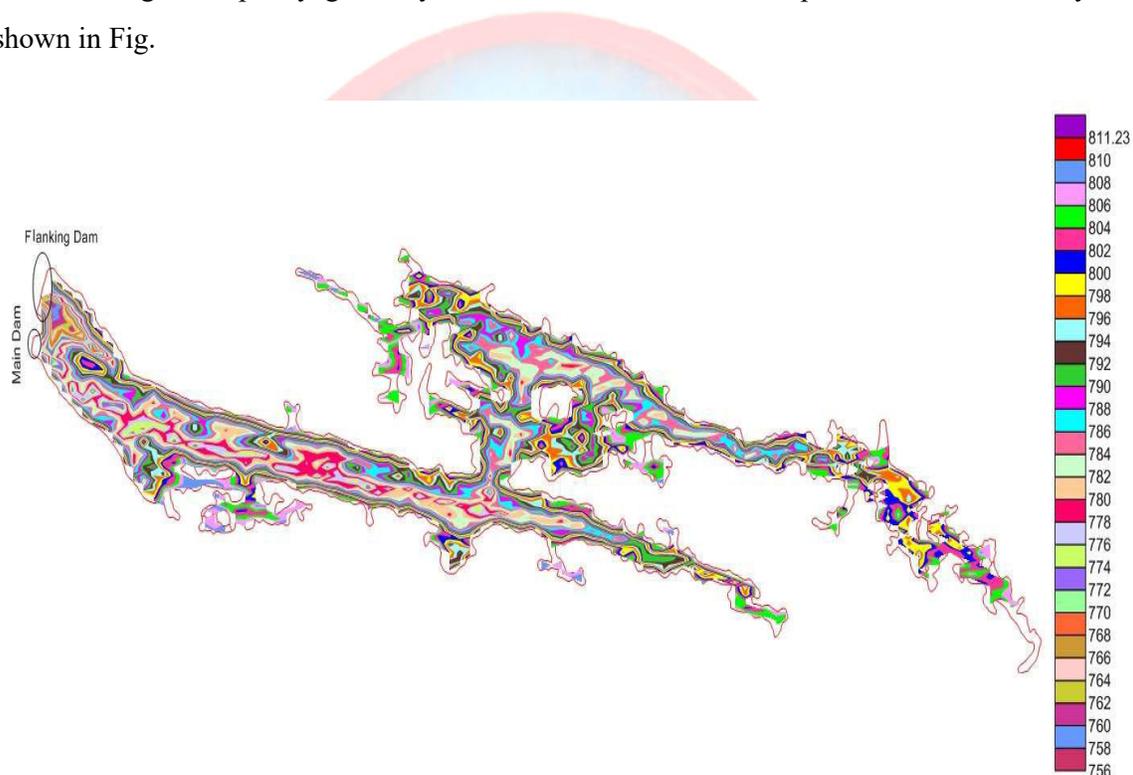
CAPACITY ESTIMATION

The survey is carried out at the water level of +811.23 m. The original water holding capacity at this level is 149.342 Mm³. As per the current IBS study, the water holding capacity at this level is estimated as 168.696 Mm³ and the corresponding water spread area is 7.656 Sq.km. Since the capacity of the reservoir obtained by the bathymetric survey is 19.354 Mm³ higher

than the original capacity given by the project authorities, capacity is also calculated by using Average area method, ArcGIS, Civil 3D software etc.

Capacity and Water spread area by IBS survey

Reservoir volume at different water levels is found out by using Surfer software from the IBS data collected through QINSY software. The present capacity at different level is compared with the original capacity given by KSEB officials. Contour map based on IBS survey is shown in Fig.



Contour Map based on IBS Survey
Reservoir capacity at different water levels

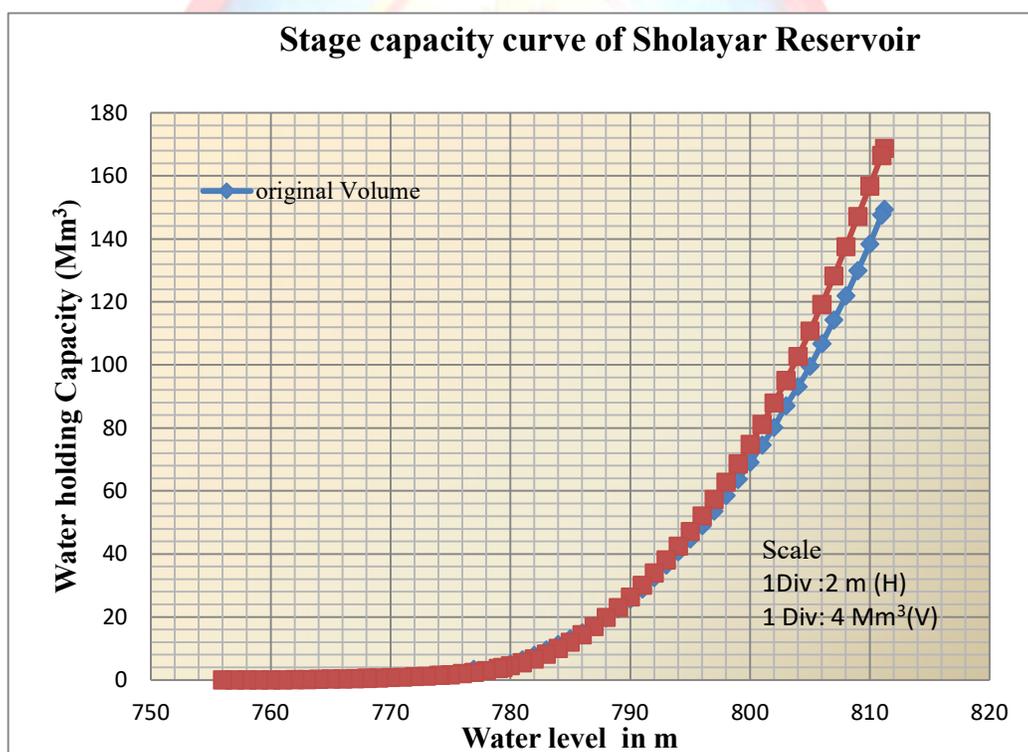
Water Level	Water Holding Capacity	
	Original	IBS Survey 2022
(m)	(M. Cub. m)	(M. Cub m)
811.23	149.342	168.696
811	147.544	166.465
810	138.383	156.766

809	129.917	147.073
808	121.903	137.488
807	114.187	128.161
806	106.754	119.208
805	99.505	110.687
804	93.048	102.640
803	87.017	95.058
802	80.193	87.905
801	74.515	81.140
800	69.064	74.706
799	63.593	68.600
798	58.511	62.806
797	53.598	57.310
796	48.959	52.099
795	44.754	47.161
794	40.634	42.488
793	36.523	38.070
792	32.474	33.907
791	28.846	30.001
790	25.675	26.359
789	22.670	22.973
788	19.793	19.840
787	17.132	16.968
786	14.934	14.365
785	13.026	12.024
784	11.208	9.958
783	9.520	8.190
782	7.849	6.705

781	6.349	5.477
780	5.080	4.466
779.374	4.257	3.931
779		3.641
778		2.975
777		2.436
776.94	3.330	2.407
776		2.006
775		1.671
774.192	1.580	1.459
774		1.414
773		1.201
772		1.036
771		0.888
770		0.758
769		0.643
768.096	0.530	0.549
768		0.539
767		0.446
766		0.361
765		0.283
764		0.213
763		0.152
762	0.120	0.100
761		0.058
760		0.029
759		0.011
758		0.003

757		0.0001
756		0.000

The original storage capacity curve is compared with the same obtained from the IBS survey 2022 as shown in Fig. From the results it was observed that capacity obtained from the present study is more than the original capacity for the top levels (above water level +787.00). For the water level below +787.00 m the capacity of the reservoir obtained from present survey is less than the original capacity.



Stage - Capacity curve

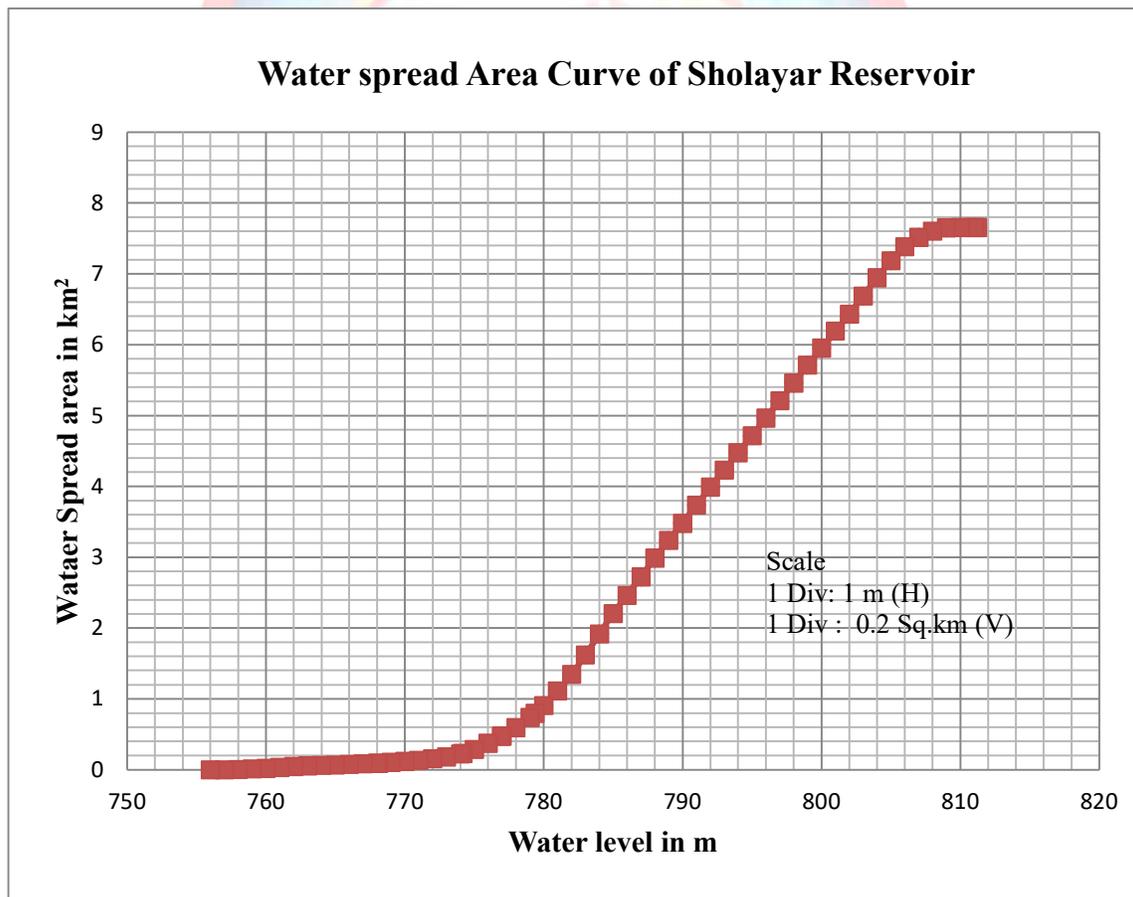
The water spread area at different water level is obtained from the present IBS survey is shown in Table.

Water spread area at different water levels

<i>Water Level</i>	<i>Water Spread Area as per IBS Survey 2022</i>
(m)	(km ²)
811.23	7.656
811	7.655
810	7.654
809	7.653
808	7.603
807	7.516
806	7.386
805	7.188
804	6.946
803	6.690
802	6.432
801	6.193
800	5.952
799	5.711
798	5.460
797	5.212
796	4.967
795	4.716
794	4.475
793	4.233
792	3.989
791	3.738
790	3.481
789	3.239

788	2.989
787	2.725
786	2.462
785	2.205
784	1.916
783	1.621
782	1.346
781	1.113
780	0.906
779.374	0.800
779	0.740
778	0.594
777	0.478
776.94	0.472
776	0.377
775	0.288
774.192	0.234
774	0.224
773	0.182
772	0.155
771	0.134
770	0.118
769	0.105
768.096	0.095
768	0.094
767	0.085
766	0.078
765	0.070

764	0.062
763	0.054
762	0.045
761	0.034
760	0.022
759	0.013
758	0.005
757	0.001
756	0.000



Water level v/s water spread area curve

Capacity by Average Area method

Water holding capacity of the reservoir was also found out by average area method from water spread area values obtained from IBS survey. Reservoir water holding capacity at WL

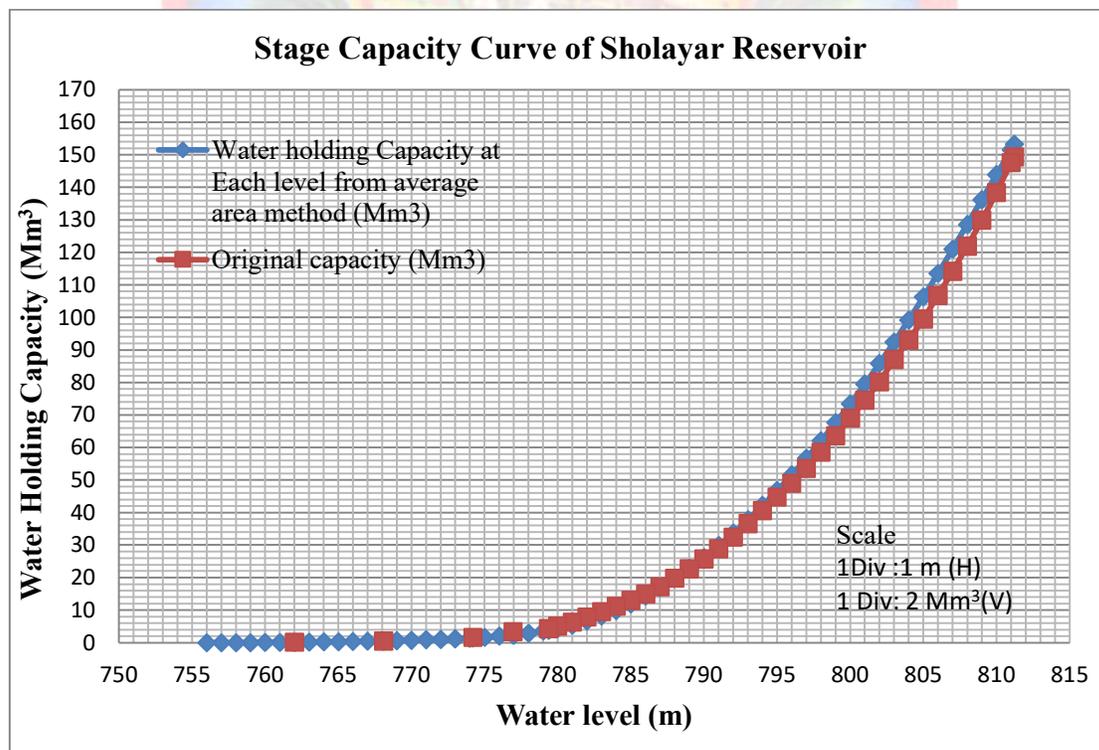
of +811.23 m is estimated as 153.261 Mm³. Table shows water holding capacity at each level of the reservoir obtained by Average area method. This is shown in stage –capacity curve obtained from average area method.

Water holding capacity at each level of the reservoir by Average area method

<i>Water Level (m)</i>	<i>Water spread Area (km²)</i>	<i>Average area of consecutive water levels (km²)</i>	<i>Volume in between consecutive levels (Mm³)</i>	<i>Water holding Capacity below each level(Mm³)</i>	<i>Original capacity (Mm³)</i>
811.23	7.656	7.656	1.761	153.261	149.342
811	7.655	7.655	7.655	151.500	147.544
810	7.654	7.654	7.654	143.846	138.383
809	7.653	7.628	7.628	136.192	129.917
808	7.603	7.560	7.560	128.564	121.903
807	7.516	7.451	7.451	121.005	114.187
806	7.386	7.287	7.287	113.554	106.754
805	7.188	7.067	7.067	106.267	99.505
804	6.946	6.818	6.818	99.200	93.048
803	6.690	6.561	6.561	92.382	87.017
802	6.432	6.313	6.313	85.821	80.193
801	6.193	6.073	6.073	79.508	74.515
800	5.952	5.832	5.832	73.436	69.064
799	5.711	5.586	5.586	67.604	63.593
798	5.460	5.336	5.336	62.019	58.511
797	5.212	5.090	5.090	56.683	53.598
796	4.967	4.842	4.842	51.593	48.959
795	4.716	4.596	4.596	46.752	44.754
794	4.475	4.354	4.354	42.156	40.634
793	4.233	4.111	4.111	37.802	36.523
792	3.989	3.864	3.864	33.691	32.474

791	3.738	3.610	3.610	29.828	28.846
790	3.481	3.360	3.360	26.218	25.675
789	3.239	3.114	3.114	22.858	22.670
788	2.989	2.857	2.857	19.744	19.793
787	2.725	2.594	2.594	16.887	17.132
786	2.462	2.334	2.334	14.294	14.934
785	2.205	2.061	2.061	11.960	13.026
784	1.916	1.769	1.769	9.900	11.208
783	1.621	1.484	1.484	8.131	9.520
782	1.346	1.230	1.230	6.648	7.849
781	1.113	1.010	1.010	5.418	6.349
780	0.906	0.853	0.534	4.409	5.080
779.374	0.800	0.770	0.288	3.875	4.257
779	0.740	0.667	0.667	3.587	
778	0.594	0.536	0.536	2.920	
777	0.478	0.475	0.028	2.384	
776.94	0.472	0.425	0.399	2.355	3.330
776	0.377	0.333	0.333	1.956	
775	0.288	0.261	0.211	1.624	
774.192	0.234	0.229	0.044	1.413	1.580
774	0.224	0.203	0.203	1.369	
773	0.182	0.169	0.169	1.166	
772	0.155	0.145	0.145	0.997	
771	0.134	0.126	0.126	0.853	
770	0.118	0.112	0.112	0.727	
769	0.105	0.100	0.090	0.615	
768.096	0.095	0.095	0.009	0.525	0.530
768	0.094	0.090	0.090	0.516	

767	0.085	0.082	0.082	0.426	
766	0.078	0.074	0.074	0.345	
765	0.070	0.066	0.066	0.271	
764	0.062	0.058	0.058	0.205	
763	0.054	0.049	0.049	0.147	
762	0.045	0.040	0.040	0.097	0.120
761	0.034	0.028	0.028	0.058	
760	0.022	0.017	0.017	0.030	
759	0.013	0.009	0.009	0.012	
758	0.005	0.003	0.003	0.003	
757	0.001	0.000	0.000	0.000	
756	0.000	0.000	0.000	0.000	



Stage –capacity curve from average area method

For top levels, capacity obtained from this method is also higher than the original capacity.

Capacity Calculation using ArcGIS and Civil 3D software

Capacity was also calculated using ArcGIS and Civil 3D software. Water holding capacity obtained at different water levels using ArcGIS Software is given in Table. Using Civil 3D software, capacity of the reservoir at water levels 811.00, 810.00, 809.00 & 808.00 was obtained as 153.455 Mm³, 144.812 Mm³, 136.17 Mm³ and 127.527 Mm³ respectively. For all these levels, capacity obtained is greater than the original capacity. As above methods water holding capacity obtained from ArcGIS and Civil 3D software is also higher than the original capacity of the reservoir.

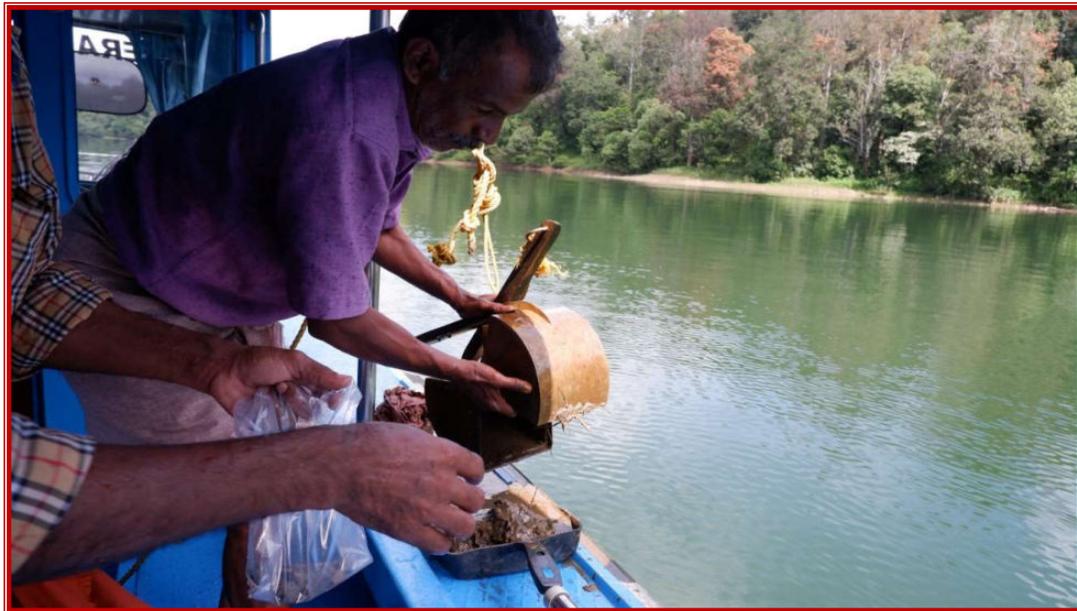
Water holding capacity obtained from ArcGIS Software

<i>Water Level</i>	<i>Water Holding Capacity</i>	
	<i>Original</i>	<i>ArcGIS</i>
(m)	(Mm ³)	(Mm ³)
811.23	149.342	
811	147.544	154.449
810	138.383	146.150
809	129.917	137.951
808	121.903	129.897
807	114.187	122.039
806	106.754	114.417
805	99.505	107.074
804	93.048	99.996
803	87.017	93.209
802	80.193	86.704
801	74.515	80.473
800	69.064	74.500
799	63.593	68.770
798	58.511	63.296

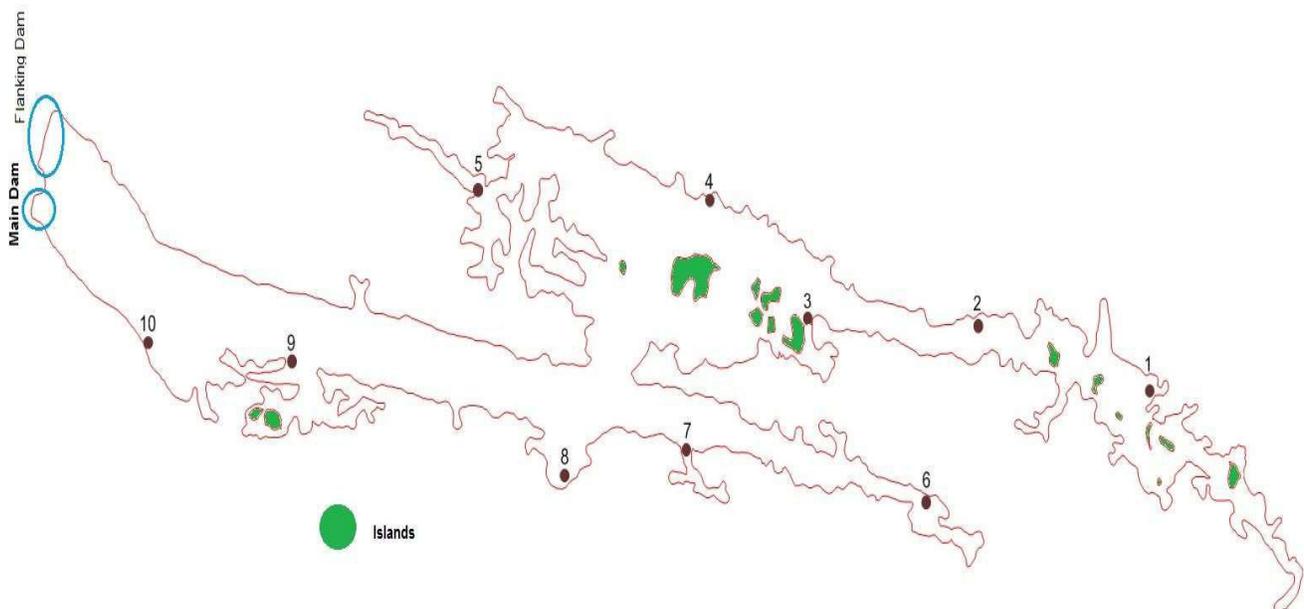
797	53.598	58.067
796	48.959	53.080
795	44.754	48.333
794	40.634	43.822
793	36.523	39.547
792	32.474	35.504
791	28.846	31.690
790	25.675	28.110
789	22.670	24.765
788	19.793	21.658
787	17.132	18.787
786	14.934	16.147
785	13.026	13.734
784	11.208	11.556
783	9.520	9.639
782	7.849	7.990
781	6.349	6.592
780	5.080	5.430
779.374	4.257	4.814

SOIL SAMPLE COLLECTION

Disturbed soil samples were collected using grab type mud sampler (only surface soil) from 10 locations in the reservoir. The sample collection method and sample locations are shown in below Plate and Figure. Undisturbed samples cannot be collected using this type of sampler. These soil samples were analyzed in Soil Mechanics and Foundation Division, KERI, Peechi.



Soil sample collection



Location of Soil samples collected

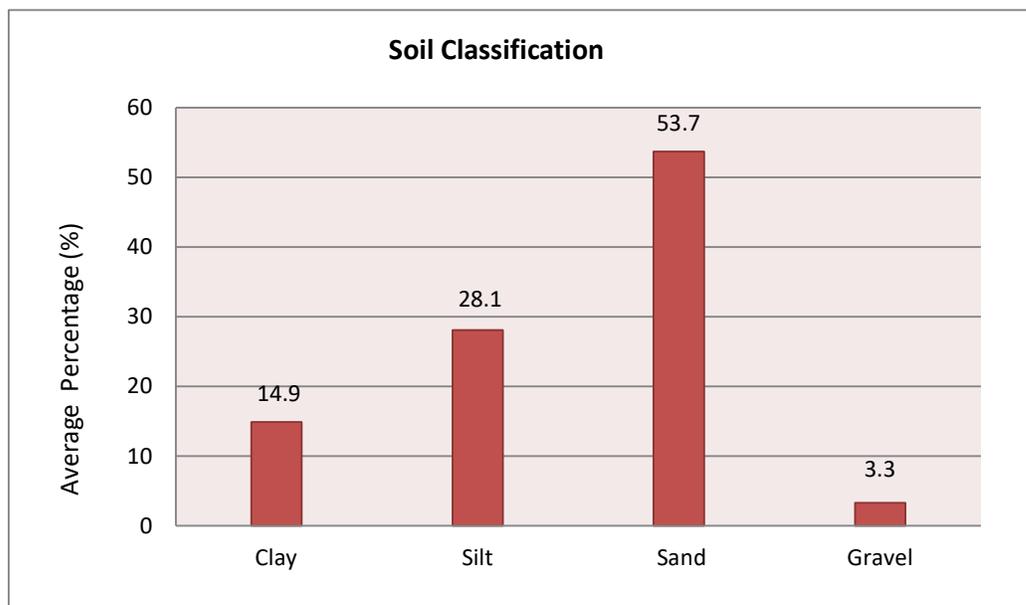
ANALYSIS OF SOIL SAMPLES

In this study 10 Nos of disturbed soil samples were analyzed. The result of soil sample analysis is shown in Table. The graphical representation of average percentage of Clay, Silt, Sand and Gravel is shown in the form of bar chart

Soil Sample Analysis Result

Sl no.	Sample Position	Depth of Sample taken in m	Nature of sample	Soil Texture	Colour	% of Various size of Soil Particle			
						Clay	Silt	Sand	Gravel
1	N- 1139858 E- 700649	11.9	Disturbed	Clayey silt	Slate Grey	18	70	12	0
2	N- 1140286 E- 698900	13.3	Disturbed	Silty sand	Slate Grey	16	34	50	0
3	N- 1140336 E- 697367	9.10	Disturbed	Sandy soil	Slate Grey	7	24	53	16
4	N-1141114 E-696421	7.3	Disturbed	Silty soil	Light Buff	20	44	35	1
5	N- 1141179 E- 694192	9.5	Disturbed	Silty soil	Golden Brown	31	38	31	0
6	N-1139132 E-698497	13	Disturbed	Silty sand	Light Brown	13	15	69	3
7	N-1139474 E-696196	11	Disturbed	Silty sand	Light Brown	15	18	64	3
8	N-1139300 E-695025	9.80	Disturbed	Silty Sand	Light Brown	15	19	62	4
9	N-1140057 E-692400	12.5	Disturbed	Silty Sand	Slate Grey	9	12	79	0

10	N-1140175 E-691017	11.8	Disturbed	Sandy soil	Slate Grey	5	7	82	6
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Soil particle distribution

The percentages of soil particles are only indicative and not accurate. For accurate assessment of contents in the soil, core sample analysis must be done.

The Bathymetric study of Sholayar reservoir is conducted using Integrated Bathymetric system (IBS) and Sub bottom profiler. Echo-sounder and transducer having accuracy of 1 cm is used for the data collection in IBS system. The full reservoir level of Sholayar reservoir is 811.69 m. The present study was conducted at the water level of 811.23 m. The original capacity of the reservoir corresponding to this level is 149.342 Mm³. Present water holding capacity of the reservoir is found out from IBS survey data using Surfer Software, by average area method, by ArcGIS software and by using Civil 3D software. Capacity of the reservoir obtained from all the above methods are tabulated and shown in Table. As the present capacity obtained from all the methods are higher than the original capacity, repeat study of the reservoir is recommended to finalize the results.

Comparison of capacity obtained by various methods

<i>Water Level</i>	<i>Water Holding Capacity</i>				
	<i>Original</i>	<i>IBS Survey 2022</i>	<i>IBS Survey 2022 from average area method</i>	<i>ArcGIS</i>	<i>Civil 3D</i>
<i>(m)</i>	<i>(Mm³)</i>	<i>(Mm³)</i>	<i>(Mm³)</i>	<i>(Mm³)</i>	<i>(Mm³)</i>
811.23	149.342	168.696	153.261		
811	147.544	166.465	151.500	154.449	153.455
810	138.383	156.766	143.846	146.150	144.812
809	129.917	147.073	136.192	137.951	136.170
808	121.903	137.488	128.564	129.897	127.527
807	114.187	128.161	121.005	122.039	
806	106.754	119.208	113.554	114.417	
805	99.505	110.687	106.267	107.074	
804	93.048	102.640	99.200	99.996	
803	87.017	95.058	92.382	93.209	
802	80.193	87.905	85.821	86.704	
801	74.515	81.140	79.508	80.473	
800	69.064	74.706	73.436	74.500	
799	63.593	68.600	67.604	68.770	
798	58.511	62.806	62.019	63.296	
797	53.598	57.310	56.683	58.067	
796	48.959	52.099	51.593	53.080	
795	44.754	47.161	46.752	48.333	
794	40.634	42.488	42.156	43.822	
793	36.523	38.070	37.802	39.547	
792	32.474	33.907	33.691	35.504	
791	28.846	30.001	29.828	31.690	
790	25.675	26.359	26.218	28.110	

789	22.670	22.973	22.858	24.765
788	19.793	19.840	19.744	21.658
787	17.132	16.968	16.887	18.787
786	14.934	14.365	14.294	16.147
785	13.026	12.024	11.960	13.734
784	11.208	9.958	9.900	11.556
783	9.520	8.190	8.131	9.639
782	7.849	6.705	6.648	7.990
781	6.349	5.477	5.418	6.592
780	5.080	4.466	4.409	5.430
779.374	4.257	3.931	3.875	4.814

DEPOSIT WORKS BY WATER AUTHORITY

The reports of the following deposit works of Water Authority (JJM works) were submitted during this year.

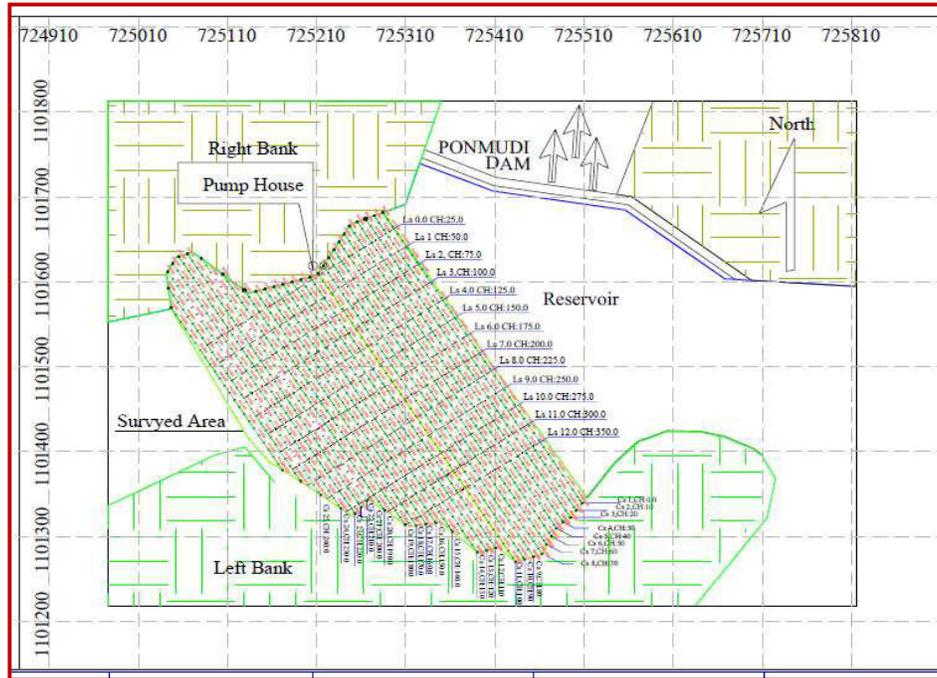
Bathymetric study of Ponmudi reservoir using IBS in connection with the construction of a floating pump house by Jala Jeevan Mission

The Executive Engineer (Water Authority), Project Division, Kattappana vide Letter no.AEE II/JJM/KNTDY/UDBCL/2021 dated. 02/07/2022 had requested KERI, Peechi to conduct ground profile study of Ponmudi reservoir in Idukki district so as to fix the exact location of the proposed floating pump house. Hence the Bathymetric study of Ponmudi reservoir has been conducted as a deposit work. The estimated cost for the study is Rs.2,30,000 /-. After obtaining necessary permissions from KSEB and Forest & Wildlife officials, the survey has been conducted on 19/01/2023 and 20/01/2023.

RESULT, DISCUSSION AND CONCLUSION

The survey has been conducted in an area of 0.115 km² surrounding the location suggested by Water Authority officials. The data collection has been done in the presence of the JJM coordinator and the contour map of the surveyed area is generated using CIVIL 3D software.

The cross sections of the surveyed area along the width of the river are drawn at 10m interval and the profiles along the direction of flow are drawn at 25m interval. The cross sections, longitudinal sections, contour drawing and the plan showing the cross sections are attached as Annexure. Figure below shows the surveyed area with plotted sections.



Surveyed area with plotted sections

The present study is conducted at the water level of +706.00m. As per the information by the project authorities the lowest water level recorded in the history is 680 m at the time of Panniyar penstock tragedy during 2007. The lowest level recorded in the past 10 years history during the drought season is 690m. The following results are observed based on the bathymetric study conducted in the reservoir:

- The depth available comparing to the most vulnerable situation of 680m water level is 26m below the present water level.
- The lowest bed level in the cross section corresponding to the location suggested by the project authorities is 663.85m and the corresponding water depth is 42.15m (CS No.11 at CH.100.00 shown in the annexure, at a distance of 120m from the point located at left bank). The latitude and longitude values of the point are 9.958 and 77.055 respectively.
- Considering the previous history, a water depth of 16.15m will be available even in the worst condition of 680m water level.

- It is known from the Water Authority officials that a minimum of 3m clearance from the bed is essential for installing the floating pump house. In that context, the depth of 16.15m is sufficient for installing the floating pump house.
- More water depth than the maximum depth in the suggested cross section is observed in the downstream side cross sections.
- The maximum lowest bed level available in the surveyed portion is 656.74m and the corresponding water depth based on water level of 706m is 49.26m. This is observed in the cross section CS no.2 (CH 10.00). The latitude and longitude values of the point are 9.959 and 77.056 respectively.

Conclusion

As per the results obtained the points mentioned above are suitable for installing the floating pump house. The details of the available water depth at various other locations in the surveyed area corresponding to the water level of 706.00m are shown in the cross section drawings (CS1 to CS 25) and Longitudinal section drawings (LCS 1 to LCS 11) which are attached as Annexure.

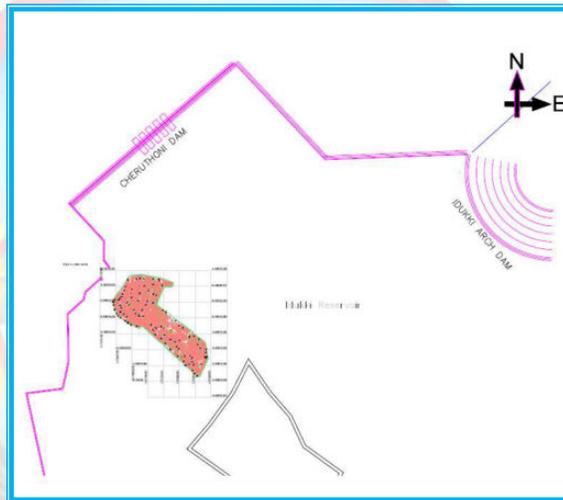
Bathymetric study of Idukki reservoir (near Cheruthoni boat landing area) using IBS in connection with the construction of a floating pump house by Jala Jeevan Mission

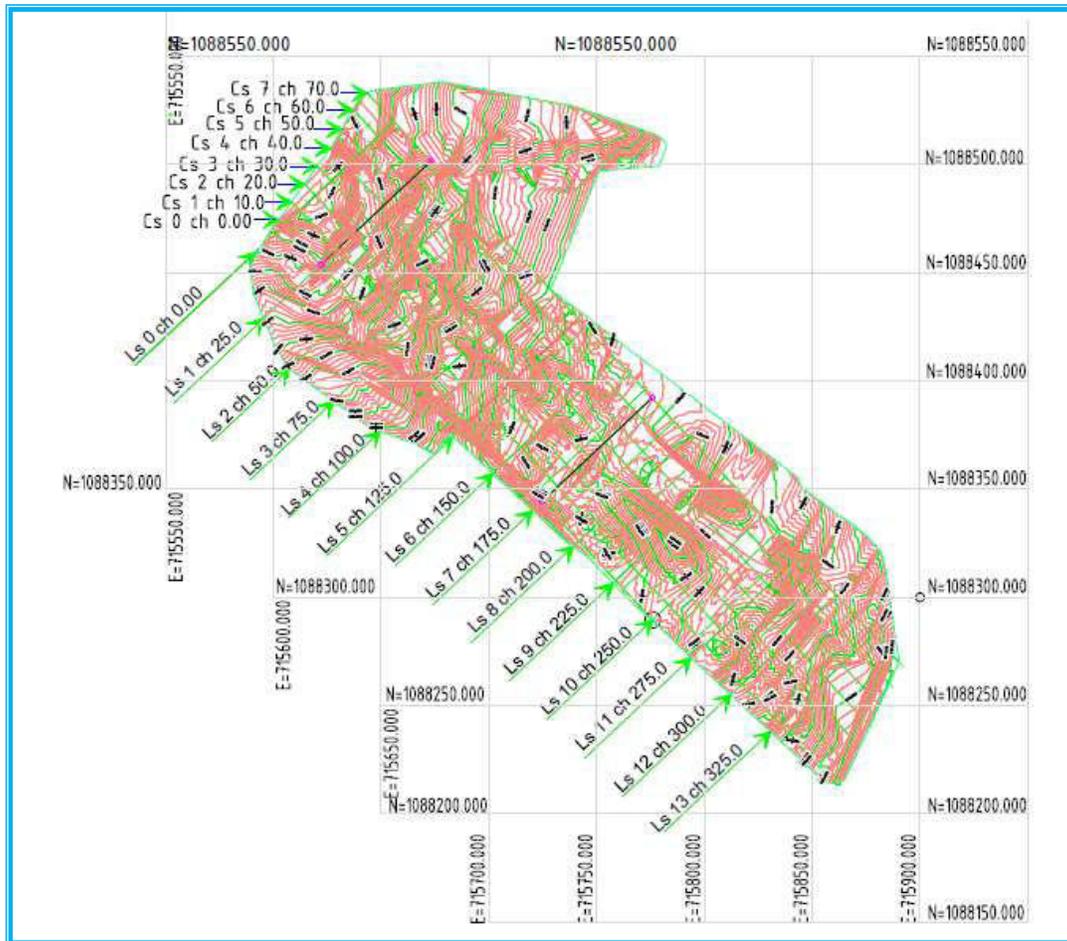
The Executive Engineer (Water Authority), Project Division, Kattappana vide Letter no.620/DB1/2022/Pr.D-KTPA-MTPZA dated. 21/10/2022 had requested KERI, Peechi to conduct ground profile study of Idukki reservoir near Cheruthoni boat landing area in Idukki district so as to fix the exact location of the proposed floating pump house. Hence the Bathymetric study of Cheruthoni reservoir has been conducted as a deposit work. The estimated cost for the study is Rs.1,15,000/- (Rupees One Lakh Fifteen Thousand only). After obtaining necessary permissions from KSEBL (vide Lr no.RD2/DB-23/2022-23/1075 Dated.19/01/2023 of the Executive Engineer, Research and Damsafety Division No.II, Vazhathoppe, Idukki) and Forest & Wildlife officials (vide Lr no.KFDHQ-455/2023/CWW/WL4 Dated.21/01/2023 of the Principal Chief Forest Conservator (Wildlife) & Chief Wildlife warden, Kerala, the survey has been conducted on 21/01/2023 and 22/01/2023.

Result, Discussion and Conclusion

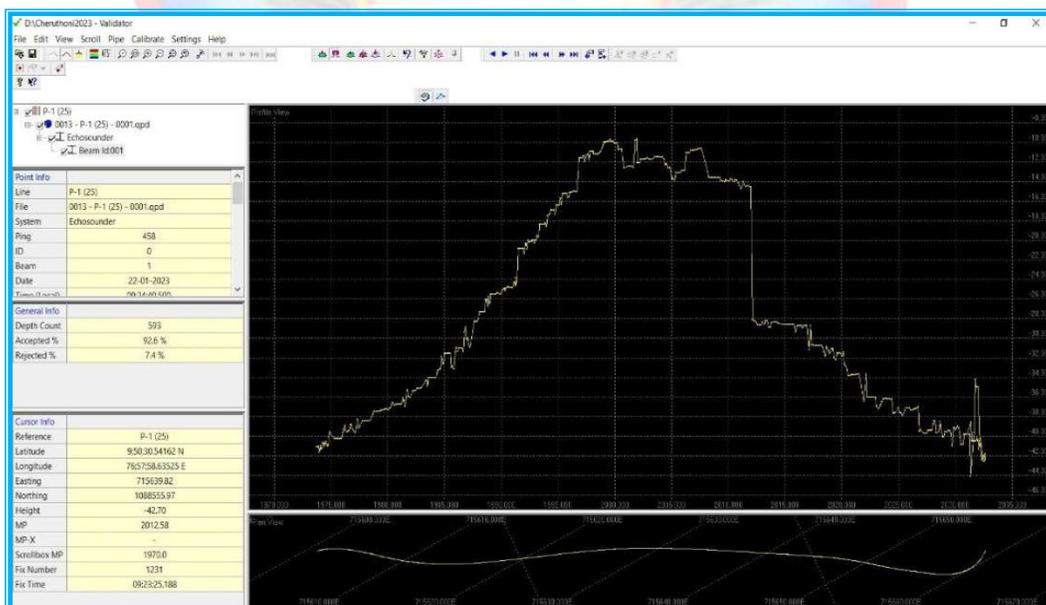
The bathymetric survey has been conducted in Idukki reservoir for an area of 0.04km² surrounding the location suggested by Water Authority officials near Cheruthoni boat landing

area. The data collection has been done in the presence of the JJM coordinator and the Forest and Wildlife officials. The details of water depth, latitude and longitude of the various points under water are taken using Echosounder and DGPS. Using this field data, the contour map of the surveyed area is generated using CIVIL 3D software. The cross sections of the surveyed area along the width of the river are drawn at 10m interval and the profiles along the direction of flow are drawn at 25m interval. The cross sections, longitudinal sections, contour drawing and the plan showing the cross sections are plotted to know the ground profile (under water) of the area. Figure shows the surveyed area with plotted sections.





Surveyed area with plotted sections



Profile 1-1 in IBS {(E715588.96, N1088452.97),(E715648.46, N1088534.53)}

Even though we have requested for the water level details of the day on which survey is conducted and the lowest water level recorded in the recent history, the details are not yet obtained. The water level of the survey day obtained from KSEB dam safety organization website is +721.937m. It has been taken as the reference for plotting drawings and to find out the depth of water available at various locations. The following results are observed based on the bathymetric study conducted in the reservoir:

- The lowest bed level in the cross section corresponding to the location suggested by the project authorities is + 619.98 m and the corresponding water depth is 101.957 m (CS No.5 at CH.50.00 shown in the annexure, at a distance of 235 m from the starting point of the section). The latitude and longitude values of the point are 9.83990 and 76.96767 respectively.
- The maximum lowest bed level available in the surveyed portion is 618.77m and the corresponding water depth based on the water level of 721.937m is 103.167m.. This is observed in the cross-section CS no.1 (CH 10.00). The latitude and longitude values of the point are 9.83976 and 76.96723 respectively.
- Water depth of more than 100m is observed in all cross sections except CS0 (CH 0m) at a chainage range of 185 to 285 m.

Conclusion

As per the results obtained the points mentioned above are suitable for installing the floating pump house. The details of the available water depth at various other locations in the surveyed area corresponding to the water level of +721.937m are shown in the Contour drawing, Cross section drawings (CS 0 to CS 7) and Longitudinal section drawings (LS 0 to LS 13).

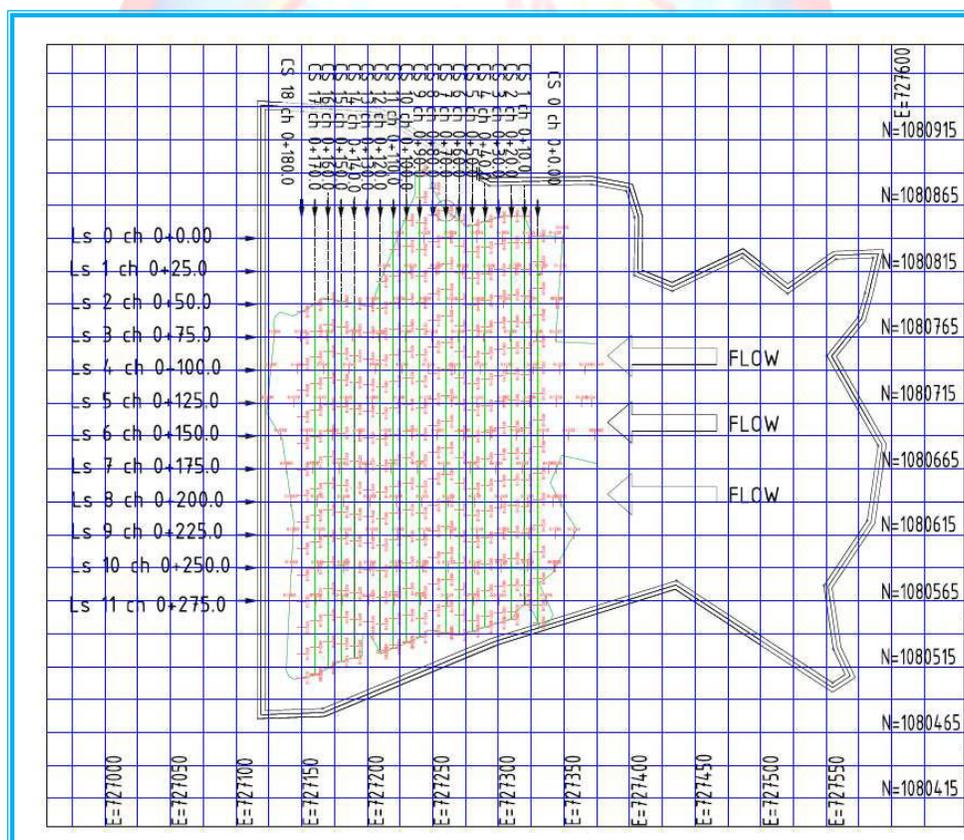
Bathymetric study of Idukki reservoir (Anchuruli area) using IBS in connection with the construction of a floating pump house by Jala Jeevan Mission

The Executive Engineer (Water Authority), Project Division, Kattappana vide Letter no.AB-JJM-571/2022/General dated. 04/07/2022 had requested KERI, Peechi to conduct ground profile study of Idukki reservoir in Idukki district near Anchuruli area so as to fix the exact location of the proposed floating pump house. Hence the Bathymetric study of Idukki reservoir has been conducted as a deposit work. The estimated cost for the study is Rs.2,50,000/-. After obtaining necessary permissions from KSEBL(vide Lr no.RD2/DB-23/2022-23/1075 Dated.19/01/2023 of the Executive Engineer, Research and Damsafety

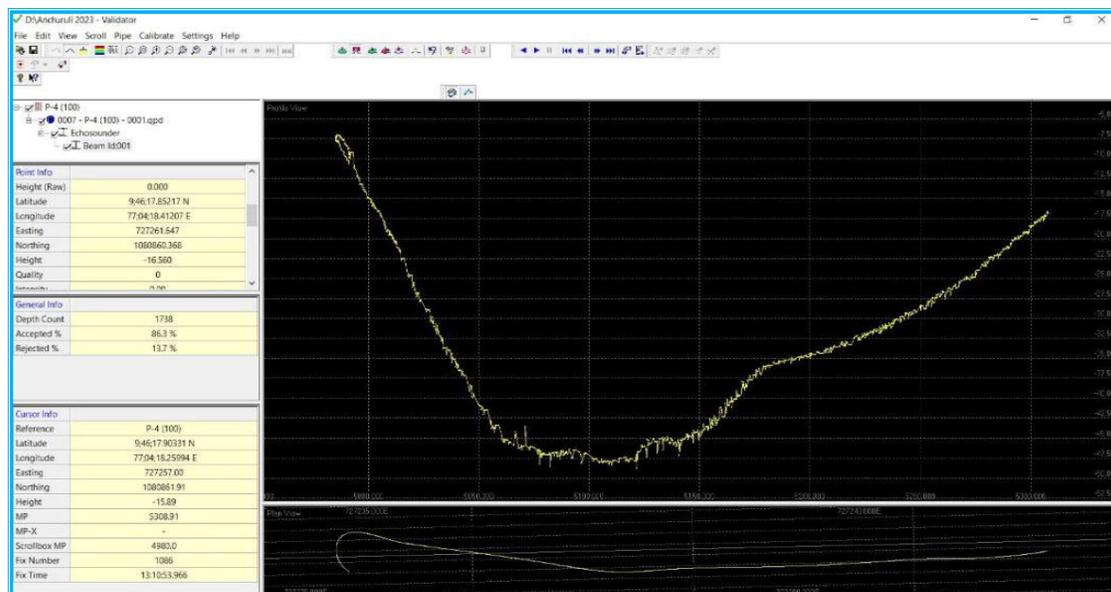
Division No.II, Vazhathoppe, Idukki) and Forest & Wildlife officials(vide Lr no.KFDHQ-455/2023/CWW/WL4 Dated.21/01/2023 of the Principal Chief Forest Conservator(Wildlife) & Chief Wildlife warden, Kerala, the survey has been conducted on 22/01/2023.

RESULT, DISCUSSION AND CONCLUSION

The survey has been conducted in an area of 0.065 km²suggested by Water Authority officials. The data collection has been done in the presence of JJM coordinator and Forest & Wildlife officials. The contour map of the surveyed area is generated using CIVIL 3D software. The cross sections of the surveyed area along the width of the river are drawn at 10m interval and the profiles along the direction of flow are drawn at 25m interval. The cross sections, longitudinal sections, contour drawing and the plan showing the cross sections are attached as Annexure. Figure shows the surveyed area with plotted sections.



Surveyed area with plotted sections



Profile 1-1 in IBS {E727264.06, N1080543.98},(E727261.64, N1080860.36)}

Even though we have requested for the water level details of the day on which survey is conducted and the lowest water level recorded in the recent history, the details are not yet obtained. The water level of the survey day obtained from KSEB dam safety organization website is +721.937m. It has been taken as the reference for plotting drawings and to find out the depth of water available at various locations. The following results are observed based on the bathymetric study conducted in the reservoir:

- The lowest bed level available in surveyed portion is + 666.73 m and the corresponding water depth is 55.207 m (CS No.18 at CH.180.00 shown in the annexure, at a distance of 90 m from the starting point of the section). The latitude and longitude values of the point are 9.770133199 and 77.0707545077 respectively.
- Water depth of more than 42 m is observed in all cross sections at a chainage range of 90 to 230 m.

Conclusion

As per the results obtained the points mentioned above are suitable for installing the floating pump house. The details of the available water depth at various other locations in the surveyed area corresponding to the water level of +721.937m are shown in the Contour drawing, Cross section drawings (CS 0 to CS 18) and Longitudinal section drawings (LS 0 to LS 11).

The details of the bathymetric surveys conducted during 2023-24 are as follows.

Bathymetric study of mattupetti reservoir using integrated bathymetric system (ibs) in connection with the construction of floating pump house by jala jeevan mission

The study was conducted at a location in the Mattupetti reservoir as requested by the KWA officials in connection with the construction of floating Pump house by Jala Jeevan Mission.

Mattupetti Dam

Mattupetti Dam (Madupetti Dam), near Munnar in Idukki District, is a storage concrete gravity dam built in the mountains of Kerala, India to conserve water for hydroelectricity. It has been a vital source of power and huge revenue for Idukki District. Construction of the dam was led by E.U. Philipose, Superintending Engineer, Kerala State Electricity Board. The height of the dam is 85.35 metre and the length is 237.74 metres. Taluks through which the release flows are Udumpanchola, Devikulam, Kothamangalam, Muvattupuzha, Kunnathunadu, Aluva, Kodungalloor and Paravur.

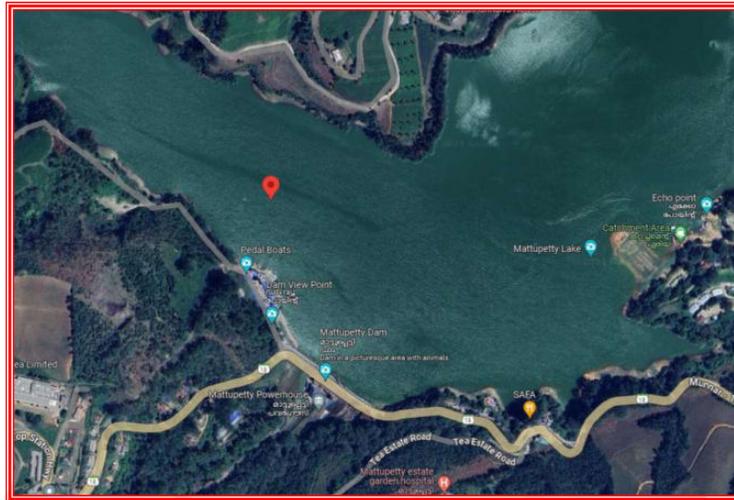
Floating Pump House - Project Proposal

The Project is aimed for providing potable drinking water to the entire area of Munnar, Pallivasal, Devikulam & Chinnakanal Panchayaths in Devikulam & Udumbanchola Taluks in Idukki District of Kerala State. The raw water source of the project is Mattupetti reservoir in Idukki district. The scheme area is situated at the North part of Idukki district of Kerala. Munnar panchayath are surrounded by Pallivasal, Mankulam, Marayoor, Kanthalloor, Vattavada, Devikulam, Chinnakanal & Bisonvalley panchayath and Pallivasal panchayath are surrounded by Munnar, Bisonvalley, Vellathooval, Adimaly & Mankulam panchayath. Devikulam panchayath are surrounded by Chinnakanal, Munnar, Marayoor, Kanthalloor, Vattavada panchayath. Chinnakanal panchayath are surrounded by Devikulam, Bisonvalley, Rajakumari, Santhanpara panchayath. Design period of the scheme is taken as 30 years from 2023 A.D. with a per capita demand of 100 lpcd. The scope of work includes Construction, trial running, commissioning and maintaining the floating pontoon in Mattupetti reservoir of Munnar, Pallivasal, Devikulam & Chinnakanal Panchayaths water supply scheme.

Source and Location of Intake Site

Mattupetti dam is the source proposed for the scheme. Proposed location of Pump house (near pedal boat area) in the reservoir as given by the project authorities is shown in the figure.

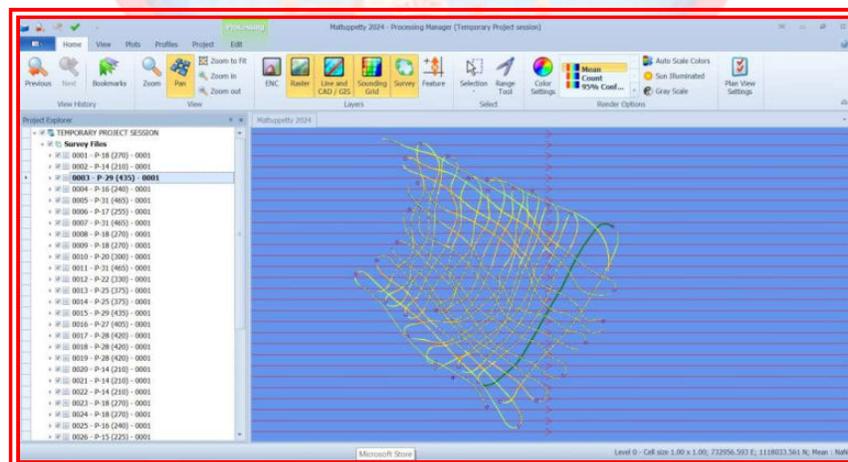
Survey is conducted in an area of 0.0789 km² around the proposed location. The co-ordinates of the proposed location are 10.109210 (Latitude) and 77.122926 (Longitude).



Proposed Location of Floating Pump house by KWA authorities

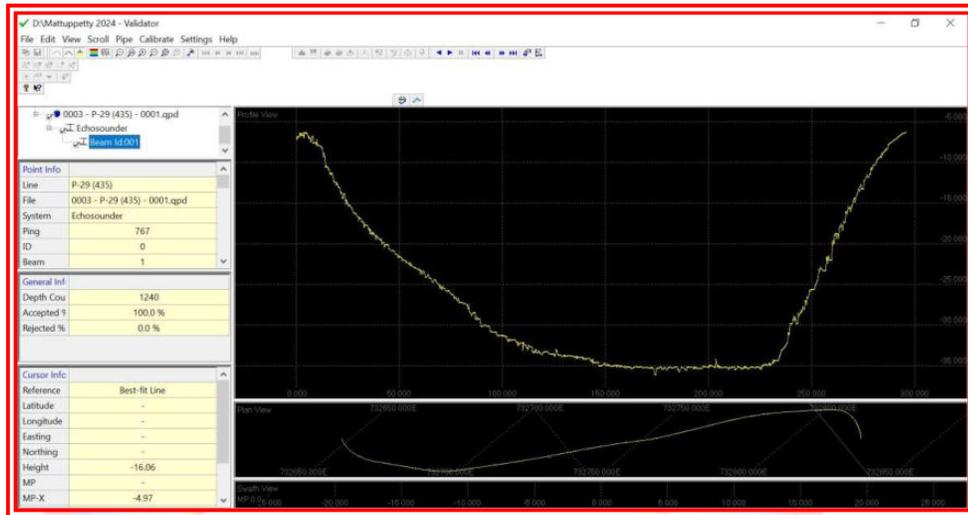
The survey was conducted along the pre-determined segment lines after setting the data logging software to record the data from the Echo Sounder at 2m intervals. The boat was sailed along the track maintaining a speed of 3 to 4 knots. The depth of water and its corresponding position is recorded simultaneously at each point. The software enables generation of depth profile and overviews using the data recorded. An extension monitor is placed in front of boat driver to move the boat at the predetermined intervals. Figure shows data acquisition in QINSY software.

The data is then edited to eliminate spurious readings caused due to violent winds waves using the data processor in QINSY.

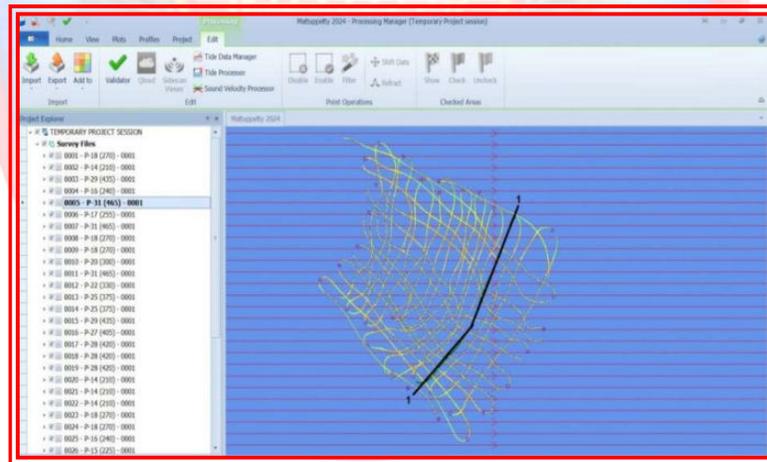


Data processing

All the validated data are exported using Data Export program and it is processed in Surfer and Civil 3D software. This exported data converts into grid data by triangulation with linear interpolation method. Using the grid data contour map is generated. Then the cross sections are drawn at 10m intervals and profiles in the direction of flow are drawn at 25 m intervals.

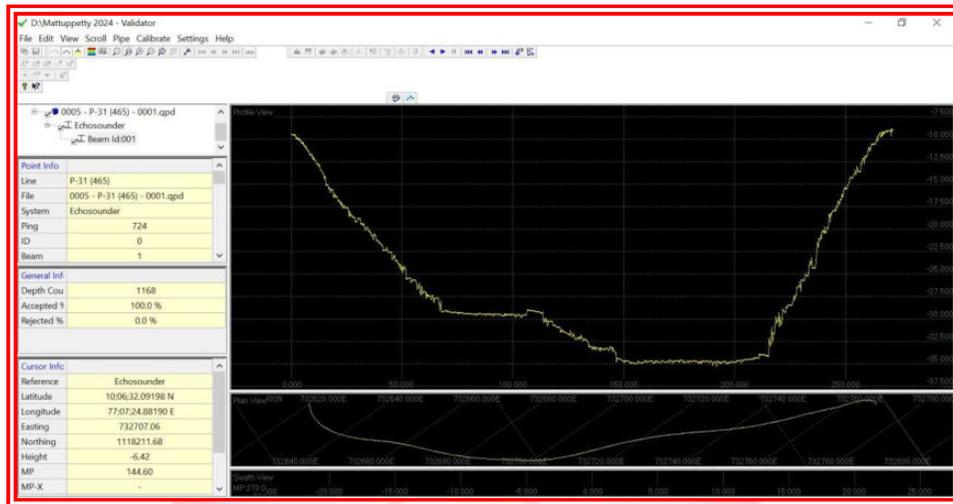


Data Validation in QINSY



Plan of Survey area showing sections surveyed

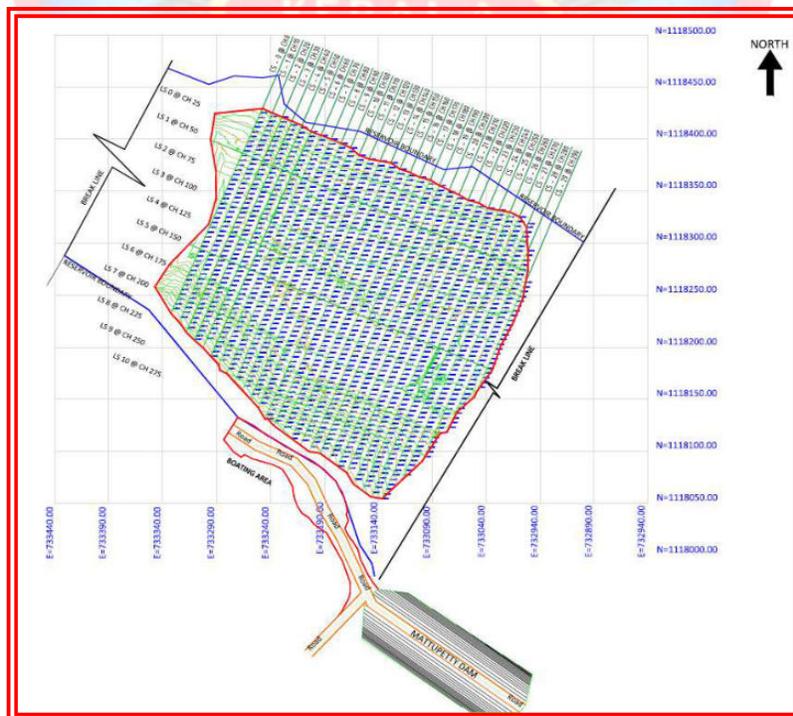
The above figure shows the plan of the survey lines covering the area around the proposed location in Mattupetti reservoir. One typical survey line 1-1 is marked in the above figure. The cross-sectional details of the above line obtained from the IBS are shown in following figure.



Profile 1-1 in IBS {(E 732769.29, N 1118344.14)-(E 732615.12, N1118129.53)}

Result, Discussion and Conclusion

The survey has been conducted in an area of 0.0789 km² as suggested by Water Authority officials. The data collection has been done in the presence of JJM coordinator and the contour map of the surveyed area is generated using CIVIL 3D software. The cross sections of the surveyed area along the width of the river are drawn at 10m interval and the profiles along the direction of flow are drawn at 25m interval. The cross sections, longitudinal sections, contour drawing and the plan showing the cross sections are attached as Annexure. Figure below shows the surveyed area with plotted sections.



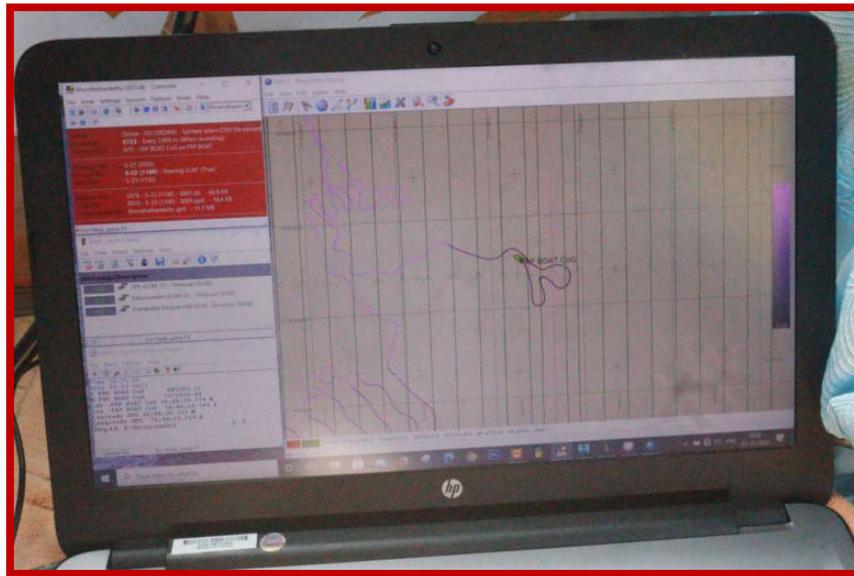
Sedimentation Study of Bhoothathankettu Reservoir Using Integrated Bathymetric System

ABOUT THE STUDY AREA

Bhoothathankettu or Putatankettu is a modern barrage regulating the river Periyar near Kotamangalam at the edge of the eastern forests of Ernakulam district in Kerala. It is situated outside the village of Pindimana, about 10km away from the town of Kothamangalam and 50km away from the main city of Kochi. It's is located at latitude $10^{\circ} 08' 16''$ N and longitude $76^{\circ} 40' 00''$ E. Thattekad and Kuttanpuzha riverine forest are situated towards the east of the barrage. At the downstream side there is another ancient structure that could be a natural rocky formation that was slightly altered through human intervention in the ancient times. Bhoothathankettu is also an **eco-tourism** destination.



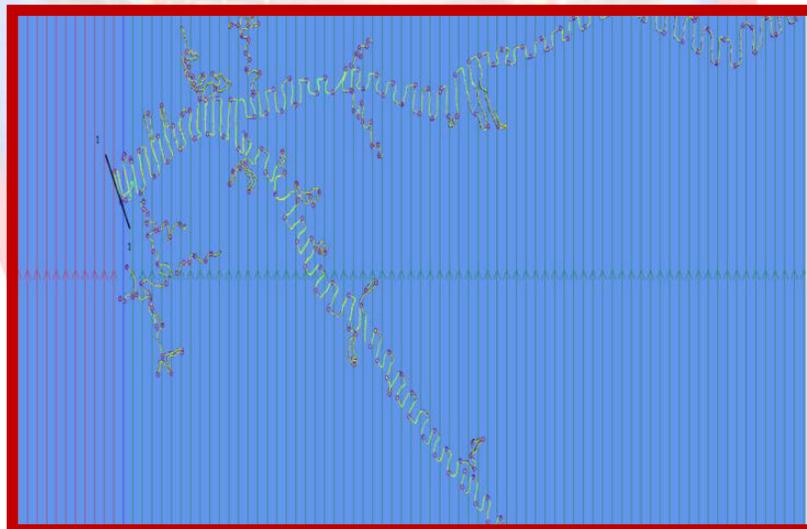
View of Boothathankettu Barrage



Data Acquisition in QINSY

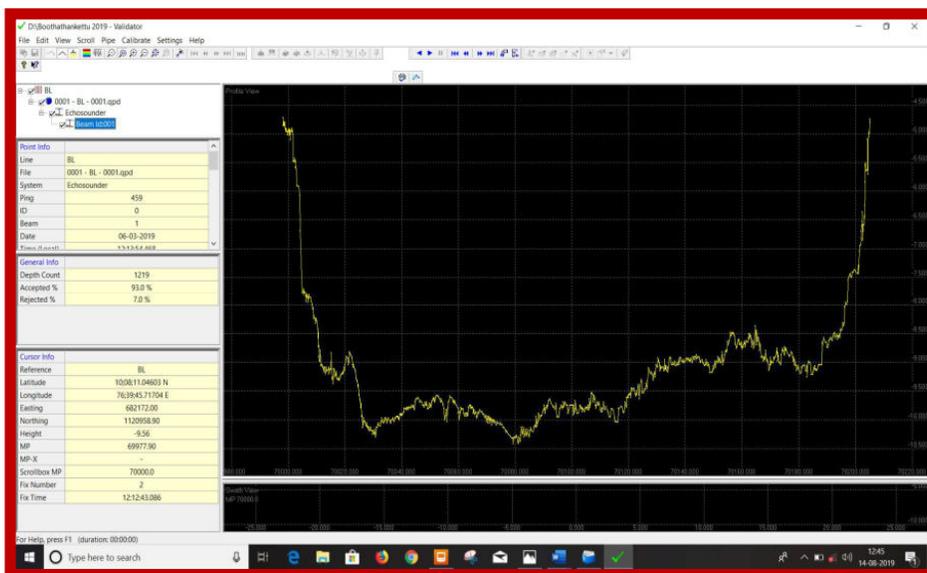
The data is then edited to eliminate spurious readings caused due to violent winds and waves using the data processor in QINSY.

The below figure shows the plan of the survey lines covering the whole area of barrage

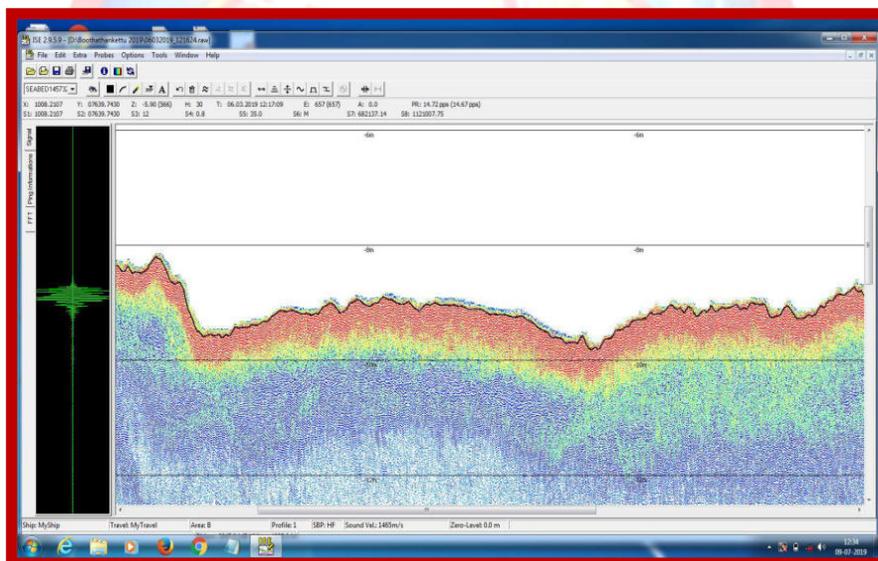


Plan of Boothathankettu Barrage showing sections surveyed

One typical survey line 1-1 is marked in the above figure. The cross-sectional details of the above line obtained from the IBS and Sub Bottom Profiler are shown in following figures.



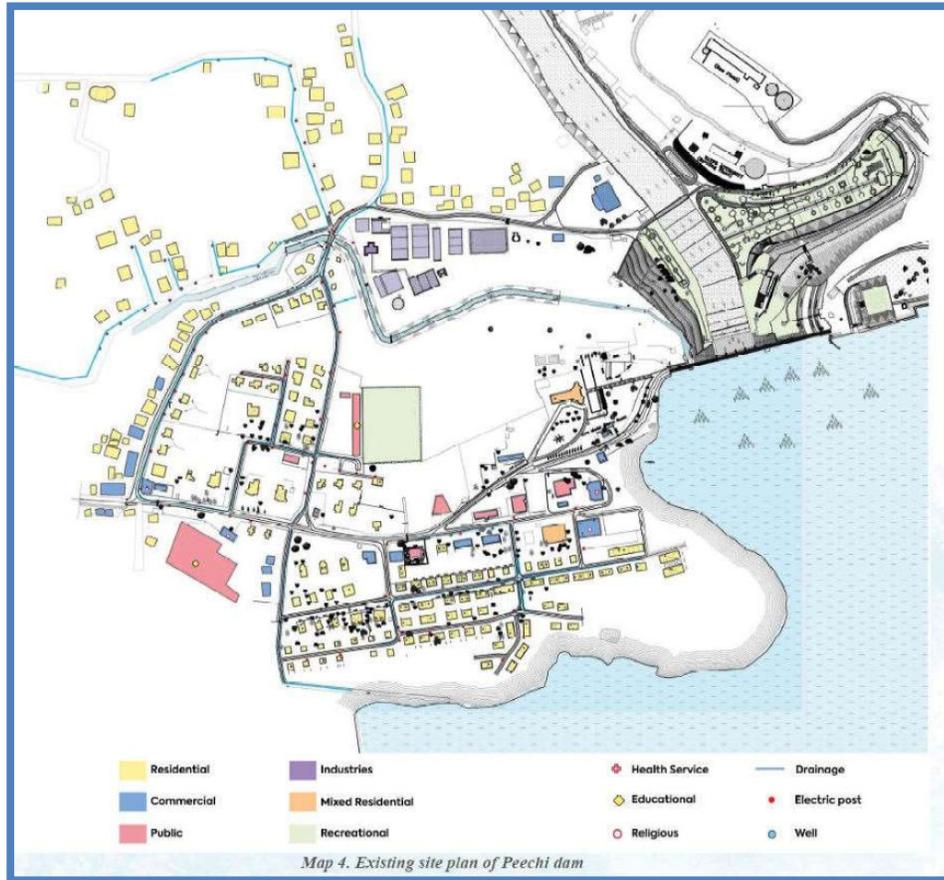
IBS Profile 1-1 (E 682145.40, N 120979.02) (E 682075.975, N 1121185.985)

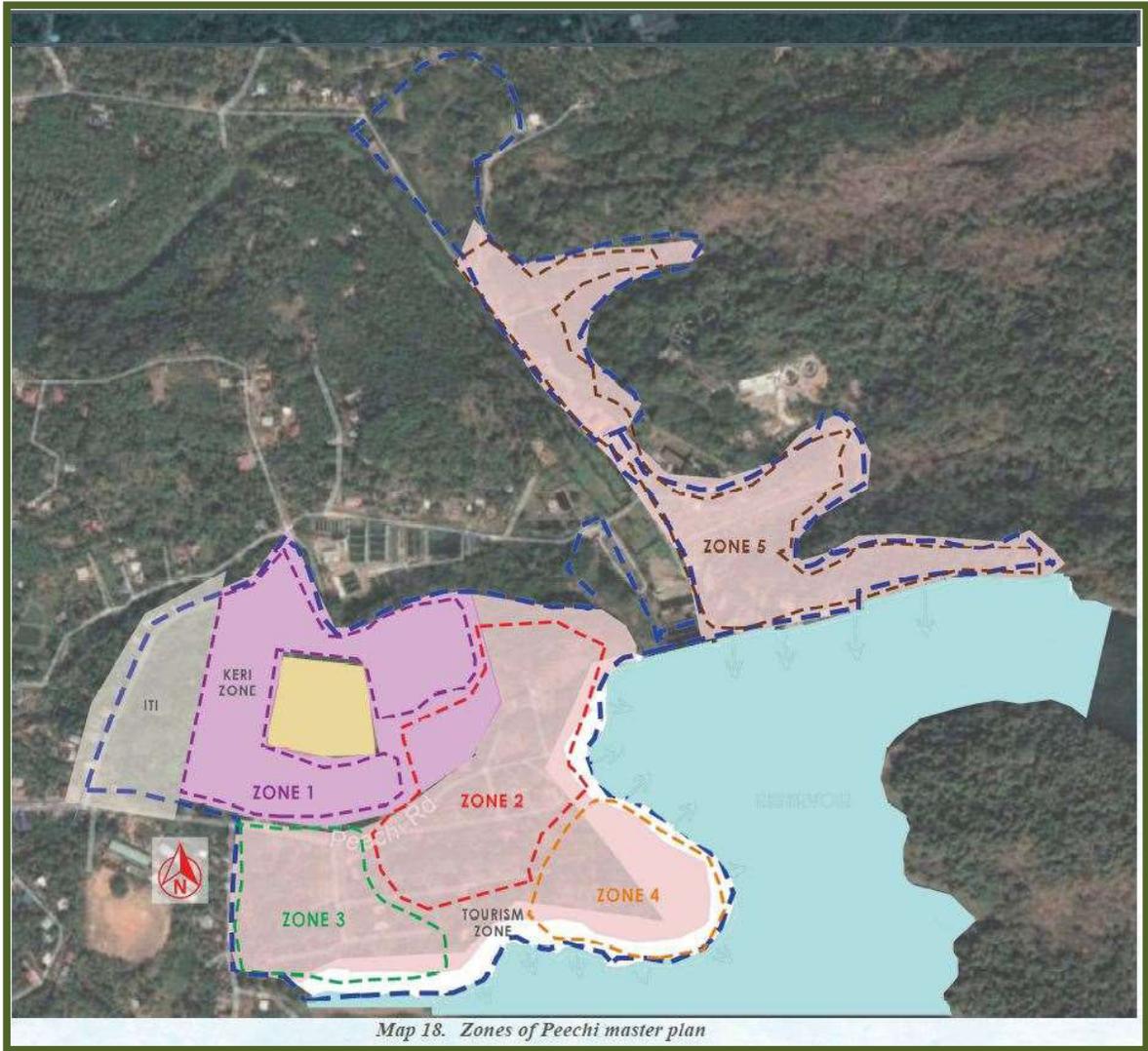


Sub Bottom Profile1-1 (E702251.461, N 1198791.267),(E 703101.658, N 1198665.040)

Eco friendly Master plan Preparation for "KERI as a center for Excellence" and Beautification of Peechi Dam

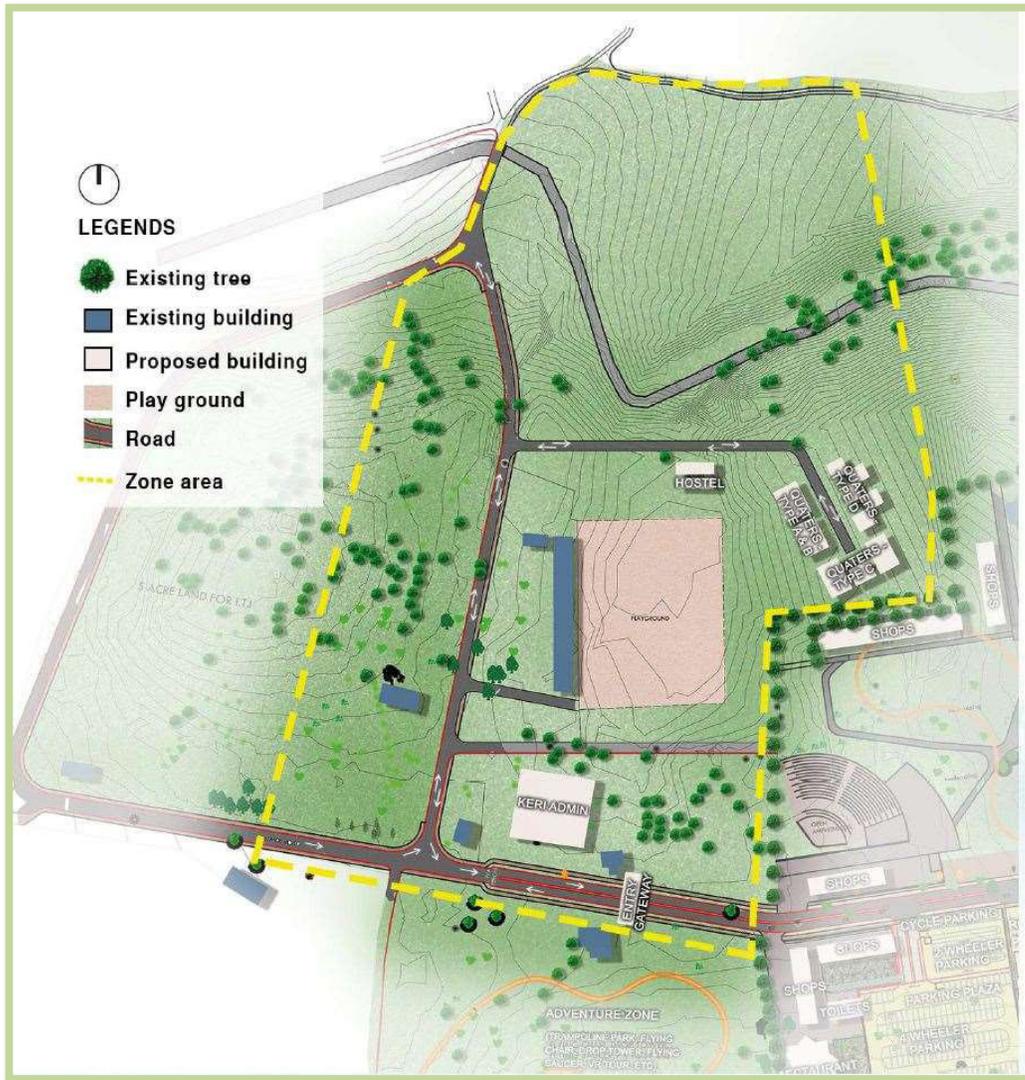
An MoU has been signed with the Architectural wing of Government Engineering College and Phase I of the above work has been completed in the financial year 2023-24. A draft master plan is prepared. Contour map, zoning map and layout map have been prepared. A plan and elevation for the administrative building of KERI are also prepared. The report is to be finalized after discussing with higher authorities and revenue officials.





Map 18. Zones of Peechi master plan







D.CONSTRUCTION

MATERIALS DIVISION

CONSTRUCTION MATERIALS DIVISION

TECHNICAL PERSONNEL

Deputy Director

1. Er. Sufeera O.B. (01-04-2023 to 31-03-2024)

Assistant Director I

1. Er. Lakshmi S. (From 01.04.2023 to 23.02.2024)
2. Er. Renjith V.R. (From 24.02.2024 to 31.03.2024)

Assistant Director II

1. Er. Lakshmi S (From 01.04.2023 to 31.03.2024)

1. INTRODUCTION

Construction Materials Division is one of the sub units of Kerala Engineering Research Institute (KERI), Peechi. This division focuses on the testing and analysis of various construction materials. It plays a vital role in ensuring the quality and durability of materials used in construction projects. The division also conducts Non-Destructive Testing (NDT), which helps in assessing the condition of structures without causing damage. Additionally, it provides expertise in forensic engineering investigations, analyzing structural failures, identifying the root causes and suggests remedial measures to prevent future issues with a view to improve the residual life of the structure. The laboratory mainly caters to Irrigation Department. Apart from that many other Government Departments, Central Government Departments, Public Undertakings and various Private agencies are utilizing the facilities of lab for ensuring quality in construction. CM Lab continued to contribute healthy revenue every year to the Government through various tests conducted for clients. The Lab is also functioning as a training centre of the Irrigation Department and providing training programs and refresher courses for the benefit of department engineers. The training facility extends to other department engineers also. Now the CM Lab is accredited by the National Accreditation Board Testing and Calibration Laboratories (NABL) in accordance with the international standards for two parameters of material testing namely (1) Compressive strength of Hardened Concrete and (2) Compressive strength of concrete Paving Blocks. The accreditation from NABL will boost up the status of the Lab and likely to increase the revenue to Government. The Lab is in a continuous process of widening the scope of accreditation to various other mechanical properties/tests conducted in lab.

2.TESTS CONDUCTED IN CM LAB.

Construction materials division of KERI deals with testing of construction materials such as cement, aggregates, steel, tiles, bricks, rock, concrete etc and design of concrete mixes. The essentials tests for getting the physical properties of above materials are carrying out at this lab. During the year 2023-24, tests were conducted for 388 samples of concrete cubes, 345 samples of steel rods, 259 samples of paver blocks, 16 samples of Aggregates, 68 rock core samples, 4 Samples of Concrete core, 45 samples of solid blocks, 17 samples of mud blocks, 17 samples of cement, 6 samples of Red Bricks, 30 samples of Fencing Materials, 9 samples of sheet piles, 3 samples of I Sections, 1 samples of WMM & GSB, and 4 samples of Roofing sheets in this lab. 23 no's Mix designs were carried out for various agencies.

The lab is equipped with NDT instruments for Pile Integrity Test and conducted tests on 61 Piles and furnished reports for the same. UPV and Rebound Hammer Tests were also carried out in various sites as per request of clients as well as a part of structural adequacy investigations of irrigation structures.

Two Hundred and Seventy two test reports were generated from this division during the Financial year 2023-24 generating a revenue of **Rs. 16,97,947/-** (Rupees Sixteen lakhs Ninety Seven Thousand Nine Hundred and Forty Seven only) including virtual revenue of **Rs. 79,602/-** .

3.Non destructive tests

Non-destructive testing (NDT) methods are quality assurance management techniques to provide an estimate of the relative strength and overall quality of concrete of an existing structure without damaging the structure. CM Lab is equipped with Pile Integrity Test, Ultrasonic Pulse Velocity Test, Rebound Hammer Test, Cover meter and Crack Microscope.

3.1 Pile Integrity Testing

Pile Integrity testing is a nondestructive testing conducted on piles as per IS 14893:2021. This is a method usually employed for the evaluation of the physical dimensions such as cross sectional variations, length, discontinuity etc. The test involves striking the top of the pile with a small hammer or an impact device to generate a low-energy wave. This wave travels down the pile and reflects back at the base. The time taken for the wave to return to the surface is recorded. Based on the characteristics of the reflected wave, an analysis is made to assess the condition of the pile. The test is fast to perform and doesn't require heavy

equipment. The pile is not damaged during the testing. The equipment being used by KERI is PET (USB version). Following pile integrity tests were carried out in 2023-24. This test provides only the qualitative information about pile integrity, it doesn't measure load-bearing capacity directly. Proper interpretation of waveforms requires expertise to identify potential defects correctly.

1. Assistant Executive Engineer, Inland Navigation Sub Division, PMG, Thiruvananthapuram, vide letter no D1-248/INSDN/TVM/2020 Vol III dated 02.05.2023 has requested to conduct Pile Echo Test (PET) on 12 numbers of pile (left bank) pertaining to the work “CSIND-Reconstruction of St. Andrews Bridge and approach road across TS canal Ch. 24.30km in Kadinamkulam Panchayath”. Accordingly, the test was performed on 15.05.2023.



2. Executive Engineer, Karapuzha Project Division, Kalpetta, Wayanad, vide letter no. D1-1271/17(Vol-II) dated 02.06.2023 has requested to conduct Pile Echo Test (PET) on 10 numbers of pile pertaining to the work “Karapuzha Irrigation Project- Construction of Padinjarevedu Branch Canal between Ch.: 710 m to 1410 m including protection walls”. Accordingly, the test was performed on 10.08.2023.



3. Assistant Engineer, M.I Section, Pulincunnu, vide letter no. MIP/P-C/1/2014 dated 01.07.2023 has requested to conduct Pile Echo Test (PET) on 10 numbers of pile pertaining to the work “Construction of Bridge across Puthenthodu between ward no. 6 at Pulincunnu Panchayath”. Accordingly, the test was performed on 15.09.2023.

4. Executive Engineer, Karapuzha Project Division, Kalpetta, Wayanad, vide letter no. D4-1573/2020(Vol-II) dated 03.11.2023 has requested to conduct Pile Echo Test (PET) on 10 numbers of pile pertaining to the work “Karapuzha Irrigation Project- Rectification of slided canal embankment at Ch:1800m of Kariambady Branch Canal at Kolampatta”. Accordingly, the test was performed on 16.11.2023.



5. Assistant Executive Engineer, Minor Irrigation Sub Division, Kasaragod vide letter no. D3-NABARD-RIDF-XXVIII/4721/2023 dated 12.01.2024 has requested to conduct Pile Integrity Test on 4 piles including a test pile pertaining to the work “Construction of SWE regulator on upstream of old Chithari SWE-RCB across Chithari River in Kasaragod District”. Accordingly, the test was performed on 29.02.2024.



6. Assistant Engineer, Irrigation Section, Malappuram vide letter no. ISMPM/4348/2020 dated 21.02.2024 has requested to conduct Pile Integrity Test on 15 piles pertaining to the work “Construction of regulator across Kadalundi river at Nambranikkadavu in Malappuram Municipality”. Accordingly, the test was performed on 18.03.2024.



3.2 UPV & Rebound Hammer Test

Ultrasonic Pulse Velocity Test and Rebound Hammer Tests are performed on concrete to assess the quality of concrete as per IS 516 (Part 5/Sec I): 2018 and IS 516 (Part 5/Sec 4): 2020 respectively. Proceq Pundit PL 200 with 54KHz transducers are used for UPV tests and Proceq Silver Schmidt N type hammer is used for Rebound Hammer test. Following works were carried out in 2022-23.

1) Renovation of Malankara Lift Irrigation Scheme in Panamaram Panchayath, Wayanad District- NDT Test on old pump house

Executive Engineer, Minor Irrigation Division, Sulthan Bathery vide Lt. no. D4-1140/2018 dated 21.08.2023 had requested to assess stability of old pump house of Malankara Lift Irrigation Scheme in Panamaram Panchayath, Wayanad District. A site visit was organised from KERI on 19-09-2023 to conduct Ultrasonic Pulse Velocity Tests and Rebound Hammer Tests on the structural elements of the existing pump house.



2) Structural Stability of GDVHSS Charamangalam and AJJM GHSS Thalayolaparambu

Sri. Sibi.K.Jose, Kannampuzha (H), Parathodu P.O, Kambilikandom, Idukki had requested the Director, Kerala Engineering Research Institute, Peechi to check the structural stability of two school buildings – GDVHSS Charamangalam, Kanjikuzhi, Mayithara, Cherthala and AJJM GHSS, Thalayolaparambu Kottayam. Accordingly a joint tem headed by Joint Director CM & FE conducted the site inspection on 13.12.2023 and inspected both the school buildings.



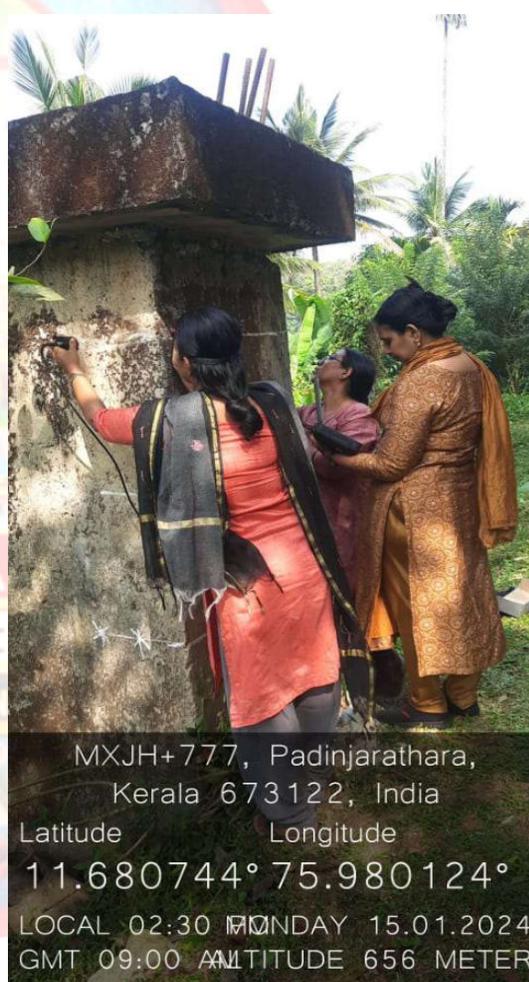
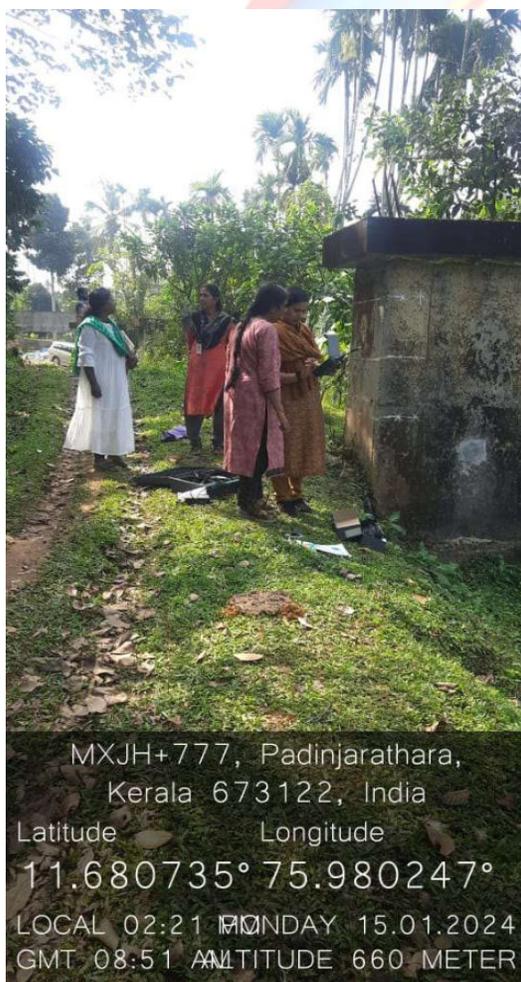
3) NDT Test : Parakadavath Bridge across Cherupuzha, Perambra LAC in Kozhikkode District

Assistant Engineer, PWD Bridges Section, Vadakara vide Lt. no. PWD/BS/VDA/PRK dated 04.01.2024 had requested to carry out Ultra Sonic Pulse Velocity Test and Rebound Hammer Test to assess the quality of concrete of P1 and P2 diaphragm walls of Parakadavath Bridge across Cherupuzha, Perambra LAC in Kozhikkode District. Accordingly a team headed by Joint Director, CM & FE including Deputy Director and Assistant Director of Construction Materials Division, KERI, Peechi visited the site and conducted the requested NDT tests on 15.01.2024 in the presence of Assistant Engineer, PWD Bridges Section, Vadakara.



4) Inspection Report – BSP-Venniyode Branch Canal Aqueduct from Ch.20m to 570m (Balance work)

Executive Engineer, Banasurasagar Project Division, Padinjarethara vide Lt. no. D1-272/2017 dated 21.12.2023 had requested to visit the site and comment on the report submitted by NIT Calicut regarding the tests conducted for strength assessment of existing structural members of Venniyode Branch Canal Aqueduct from Ch.20m to 570m of Banasura Sagar project. Accordingly a team headed by the Joint Director, CM& FE, KERI, Peechi including Deputy Director and Assistant Director of CM Division, KERI, Peechi visited the site along with project authorities on 15.01.2024.



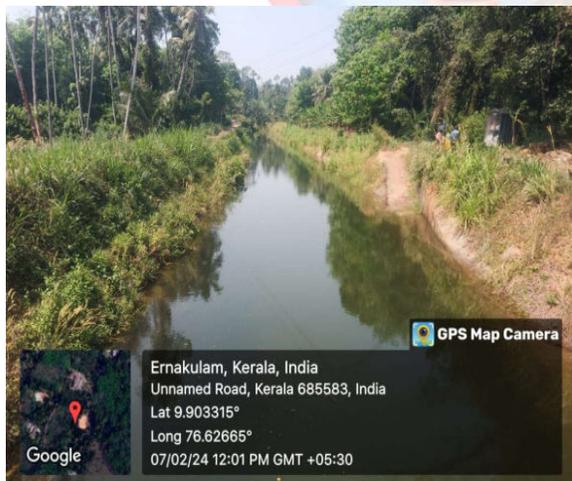
5) Inspection Report – Damaged Aqueducts of Azheekkal Branch Canal & Edakkad Branch Canal of Pazhassi Irrigation Project, Kannur.

Superintending Engineer, Project Circle, Kannur vide Lt. no. D2-4452/2021 dated 07.12.2023 informed that as part of renovation works of Pazhassi Irrigation Project , it is proposed to revive Edakkad branch canal & distributaries as well as Azheekkal branch canal & distributaries. It was also requested to conduct necessary tests for the damaged piers of the aqueducts enlisted below. Accordingly a team headed by the Joint Director, CM& FE, KERI, Peechi including Deputy Director and Assistant Director of CM Division, KERI, Peechi visited the sites along with project authorities on 16.01.2024.



6) Site Inspection: MVIP Rectification works to damaged lining portion of LBMC between Ch. 17010 to 17300 m

A team headed by Director, KERI including Joint Director, CM & FE, Deputy Director and Assistant Director of Construction Materials Division along with the project authorities visited the site on 07.02.2024 and suggested methods to quantify the seepage through the lined canal.



7) Inspection Report - Structural Stability of GHSS Pezhakkappilly

M/s.CMK Projects Private Limited, Bangalore vide Lt. no. Nil dated 07.03.2024 had requested to carryout Ultrasonic Pulse Velocity Test, Rebound Hammer test and Profometer studies on reinforced concrete members at random in the second floor of GHSS Pezhakkappilly to assess the quality of in-situ concrete, compressive strength of concrete, concrete cover & location of reinforcement respectively. Accordingly a team headed by the Deputy Director, Construction Materials Division, KERI, Peechi including Assistant Directors and Research Assistant of Construction Materials Division, KERI, Peechi visited the site along with the project authorities on 27.03.2024



4.PROCESS OF NABL ACCREDITATION

- The Construction Materials Division is now accredited by National Accreditation Board Testing and Calibration Laboratories (NABL) in accordance with the international standards for two parameters - Compressive Strength Test of Hardened Concrete & Compressive Strength of Concrete Paving Blocks.
- All lab personals are well trained to the technical specifications in the Lab tests and procedures of accreditation.
- The lab is in a continuous process of widening the scope of NABL Accreditation to various other parameters of material testing thereby cementing customer confidence and enhancing the testing capabilities of the lab.

5. INTERNSHIP PROGRAMMES

Several Engineering Colleges and Polytechnic Institutions have collaborated with CM Lab for internship trainings and exposure visits as part of their curriculum. Student's interactions and training sessions were arranged in CM Lab for testing of construction materials, mix design and Non Destructive Testing.

<i>Name of College</i>	<i>Date of visit</i>	<i>No of students</i>
Government Engineering College, Palakkad	28.06.2024 & 17.07.2024	12
Vidya Academy of Science and Technology, Thalakkottukara	11.07.2024 & 15.07.2024	28
Mahatma College of Engineering, Alappuzha	27.09.2024	17
ToCH Institute of Science & Technology (TIST) College, Arakkunnam, Kochi	05.10.2024	35

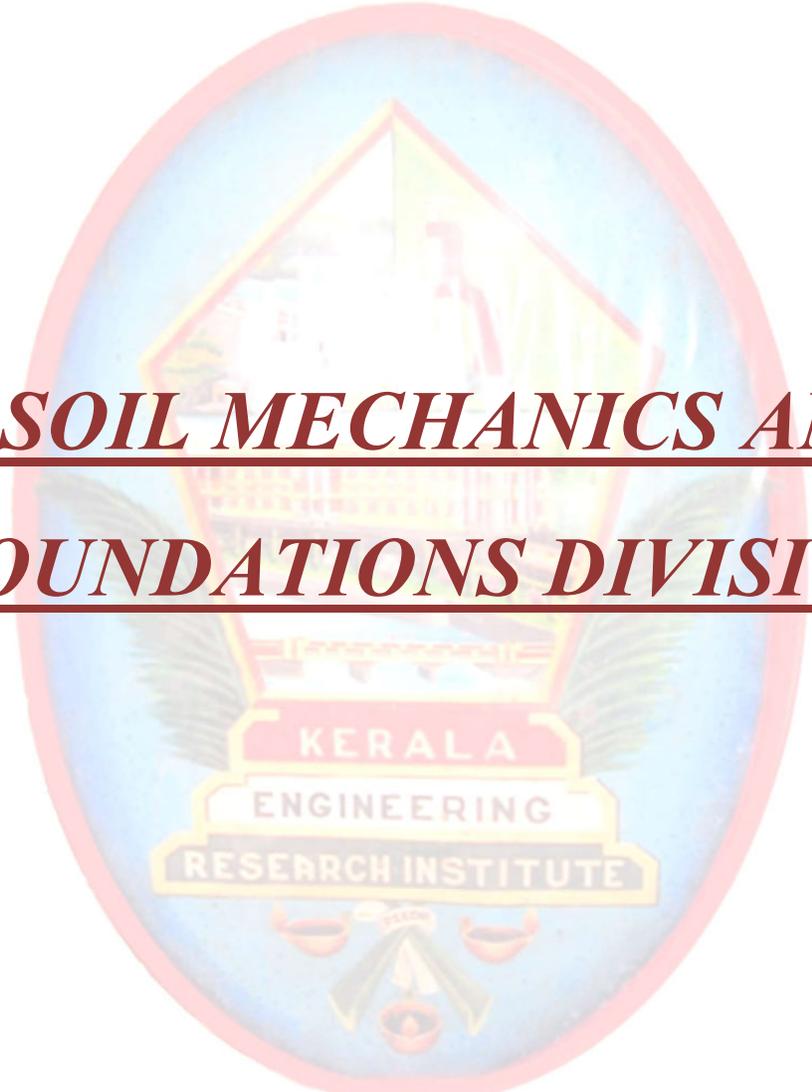
6. PROJECT ASSISTANCE

Construction Materials lab rendered testing facilities and guidance to a group of graduate engineering students of Department of Civil Engineering, Vidya Academy of Science and Technology, Thalakkottukara, Thrissur for their project work “ Study of the effect of Graphene Oxide on the mechanical performance of concrete.” This project investigates on the incorporation of Graphene Oxide in cement concrete in various proportions and studies the effect of Graphene Oxide on the strength and durability of prepared concrete cubes. The mix design of concrete, testing of compressive strength and permeability of concrete were done in lab from 21.08.2023 to 18.12.2023.



7.SNAPS OF ROUTINE LAB ACTIVITIES





E.SOIL MECHANICS AND
FOUNDATIONS DIVISION

SOIL MECHANICS AND FOUNDATIONS DIVISION

C.1.INTRODUCTION

Soil, the most unpredictable of all engineering materials also happens to be the all-important material in civil engineering because all structures need to be founded on earth. In addition to being the founding medium, soil is also used as a material of construction. As in the case of other materials, properties of soil cannot be generalized since basically soil is a combination of different constituents having different properties. Therefore the study of the technical and structural aspects of soil is all important.

Major difficulties encountered in foundation work are due to the nature of soil. The investigation for any foundation engineering problem may range from a simple examination of soil to a detailed study of the soil and ground water by means of bore holes and laboratory tests on the materials encountered. The extent of the work depends on importance and foundation arrangement of structures, the complexity of the soil conditions and already available information of existing foundations on similar type of soils.

The physical characteristics of soils can be investigated by means of laboratory tests on samples taken from boreholes or trial pits. Results from lab tests can be used to derive important parameters in the design of substructure. The results of shear strength tests can be used to calculate the ultimate bearing capacity. Soil parameters so obtained by means of investigations can be utilized to design safe structures.

Soil Mechanics Laboratory under K.E.R.I. is fully equipped to determine the index as well as the engineering properties of soil samples. The soil mechanics laboratory undertakes work from Government agency and private agencies.

During investigation, the soil samples are collected and tested in the laboratory, for finding out index properties and engineering properties like Grain Size Distribution, Atterberg's Limit, Maximum Dry Density, Optimum Moisture Content, Permeability, Shear strength parameters, Consolidation and Swelling characteristics and relevant parameters are furnished to design the proposed structures. The laboratory is assisted by the Instrumentation Division which is equipped with field testing equipment for boring to collect disturbed and undisturbed soil samples.

Soil samples received from various projects of Irrigation Department, PWD Roads and Buildings, Panchayati Raj institutions, Kerala State Electricity Board, KFRI, KAU and Non-Government bodies are being tested as per the codes of Bureau of Indian Standards.

The Lab contributes healthy revenue every year to the Government through various tests conducted for clients. The Lab is also functioning as a training centre of the Irrigation Department and providing training programmes and refresher courses for the benefit of department engineers. This lab is also provides internships for students from various engineering colleges across Kerala. Also research activities are being conducted at this division.

Tests conducted in the Lab

Soil samples were tested from various projects of Irrigation department, other departments and private agencies. During the year 2023-24, a total of 276 samples were tested across 19 different works. The total revenue, including virtual revenue from departmental execution work and actual revenue received, amounts to ₹7,62,608/- (Rupees Seven Lakh Sixty-Two Thousand Six Hundred and Eight Only). The actual revenue collected by this division for the 2023-24 financial year is ₹2,84,875/-. The details of the works are appended.



Fig - Snaps of soil testing

C.2 INFRASTRUCTURE

The important equipment's and software available in the laboratory are

- iv) Hydrometer test with accessories
- v) Atterberg's limit devices
- vi) Direct Shear apparatus
- vii) Automatic Soil Compactor
- viii) Light and Heavy compaction testing apparatus
- ix) Laboratory CBR test apparatus
- x) Digital soil cone penetrometer
- xi) Constant head permeability test apparatus
- xii) Variable head permeability test apparatus
- xiii) Static Tri-axial Testing Apparatus
- xiv) Unconfined Compression Test Apparatus
- xv) Consolidation Apparatus
- xvi) Sample extruder
- xvii) Standard set of sieves
- xviii) Riffle Sample Divider
- xix) Plaxis 2D Software

Modernizing the lab will come true with the addition of modern Instruments. This lab is equipped with Engineering Seismograph and is used for subsurface characterization by seismic refraction method. Additionally, this division is equipped with instruments for Seismic Tomography Surveys to detect and study deteriorated zones within the dam body.



Fig. Direct Shear Apparatus



Fig. Static Triaxial Testing Apparatus



Fig. Digital Soil Cone Penetrometer



Fig. Consolidation Test Apparatus



Fig. Unconfined Compression Test Apparatus



Fig. Compaction Test Apparatus



Fig. Apparatus used for Seismic Refraction Survey



Fig. Engineering seismograph

C.3 NABL Accreditation

The NABL Accreditation Audit was conducted on May 20–21, 2023. The Soil Mechanics Division successfully obtained accreditation from the National Accreditation Board for Testing and Calibration Laboratories (NABL) in accordance with international standards for the following eight parameters:

- Liquid Limit (Cone Penetration Method)
- Liquid Limit (Mechanical Method)
- Maximum Dry Density (MDD) - Heavy Compaction Method
- Maximum Dry Density (MDD) - Light Compaction Method
- Optimum Moisture Content (OMC) – Heavy Compaction Method
- Optimum Moisture Content (OMC) – Light Compaction Method
- Plastic Limit
- Water Content

The laboratory is continuously working towards expanding the scope of NABL accreditation to include additional soil testing parameters. This ongoing effort aims to strengthen customer confidence and enhance the laboratory's testing capabilities.



Fig. Snapshots from the NABL Accreditation Audit



Fig. Moments from the NABL Accreditation Audit

C.4 OTHER ACTIVITIES

C.4.1 Trainings attended

1. Er. Joyal Scaria, Assistant Director, participated in the training programme on 'Reservoir Sedimentation Assessment and Management' conducted by the National Water Academy (NWA), Pune, from 18-11-2024 to 23-11-2024.
2. Er. Joyal Scaria, Assistant Director, participated in the training programme on “Reinforced Soil Walls: Distresses and Remedies” conducted by the Indian Chapter of International Geosynthetics Society in association with the Central Board of Irrigation and Power, from 05-04-2024 to 06-04-2024.

C.4.2 Internship programmes

This division provided internship training for students from several engineering colleges and polytechnic institutions, as well as exposure visits as part of their curriculum. Student interactions and training sessions were arranged in the Soil Mechanics Laboratory, covering soil testing and geophysical methods.

The internship program was provided for the following institutions:

3. Government Engineering College, Palakkad
4. Vidya Academy of Science and Technology, Thalakkottukara
5. Mahatma College of Engineering, Alappuzha
6. Toc H Institute of Science & Technology (TIST), Arakkunnam, Kochi



Fig. Internship Training for Second Year Students of Vidya Engineering College, Thrissur

C.4.3 Visits to the Soil Mechanics Laboratory

- Sri. Ashok Kumar Singh (IAS), Secretary of the Water Resources Department, visited the Kerala Engineering Research Institute (KERI).
- Engineers from the Association of Engineers visited the Soil Mechanics Laboratory. During their visit, they observed various soil testing procedures and gained insights into geotechnical investigations conducted in the lab.



Fig. Secretary of the Water Resources Department visiting SM Laboratory



Fig. Engineers from Association of Engineers visiting SM Laboratory

C.6. TECHNICAL PERSONNEL

Deputy Director

Rameshkumar T V From 01/04/2023 to 31/03/2024

Assistant Director I

Joyal Scaria From 01/04/2023 to 31/03/2024

Assistant Director II

Jomy Joseph. From 01/04/2023 to 04/01/2024

Suneethy S. From 01/03/2024 to 31/03/2024

Research Assistant

Thulasi E C From 01/04/2023 to 31/03/2024

Sabarinath S From 01/04/2023 to 31/03/2024

Overseer GR III

Nithamol K.V. From 01/04/2023 to 31/03/2024





F. INSTRUMENTATION
DIVISION

INSTRUMENTATION DIVISION

INTRODUCTION

The Instrumentation Division of KERI, Peechi, functions under the Construction Materials and Foundation Engineering (CM&FE) Division and plays a vital role in conducting soil investigation works across the state. Its primary objective is to ensure that soil investigations are carried out efficiently and comprehensively in all regions, providing accurate and reliable data to support informed decision-making by engineers and project stakeholders.

Soil investigation, including soil exploration, is essential for evaluating the suitability of a site for proposed engineering works. It forms the foundation for developing safe, efficient, and cost-effective designs. By collecting critical information about subsurface soil and groundwater conditions, engineers are better equipped to plan, design, and construct stable and durable structures while optimizing construction methods and materials.

The most commonly adopted technique for soil investigation is boring, where boreholes with diameters ranging from 100 mm to 150 mm are drilled into the ground. A variety of tools and equipment are used in the field, ranging from simple hand-operated augers to advanced drilling machines.

The Instrumentation Division is currently equipped with hand augers and Rotary Calyx Drilling Machines. These Rotary Calyx machines are capable of drilling through soil, soft rock, and hard rock, and can achieve depths of up to 50 to 60 meters, making them highly effective for deep soil investigations.

The following field tests are conducted by this division;

1. Standard Penetration Test.
2. Collection of disturbed and undisturbed soil samples by hand auger and boring.
3. In situ Vane Shear test

The important equipment available in the Division are

- Equipment for hand augering.
- In situ Vane shear test apparatus
- Rotary Calyx drilling machines - 2 Nos.



Fig a. Rotary Calyx drilling machine mounted on Pontoon.

SOIL INVESTIGATION WORKS EXECUTED DURING THE YEAR 2023-2024

1. Preliminary Soil investigation for second phase Development of Chettuva Fishing Harbour.
2. Soil Investigation at Attappilly RCB across Kurumali River in Thrissur District.
3. Soil Investigation for desiltation of construction of RCB across Bharathapuzha at Kankakkadavu in Kuttipuram Panchayath , Malappuram District.
4. Soil Investigation Works to the Reconstruction of Mannatampara Weir Across Kadalundi River In Mooniyur And Vallikkunnu Panchayath In Malappuram District
5. Soil investigation work for the reconstruction of Tholur Chira in the Wadakkanchery River in Thrissur District.

1. Preliminary Soil investigation for second phase Development of Chettuva Fishing Harbour.

Chettuva River is one of the west flowing rivers of Kerala and starts from Anamudi. The area is located at just 1.5km west of the NH 17 and 8km south of Chavakkad in Engandiyoor Village. The latitude is 10 30'30" N and longitude is 76 02'30" E. the site is situated 48km

North of Munambam Fishery harbour and 30km south of ponnani fishery harbour. The existing wharf and Auction hall at Chettuva Fishing harbour is inadequate to meet the present day requirements. Hence extension of wharf is proposed. As there is land restrictions a two storey building is proposed for the auction hall building. In line with the above said extension, preliminary Investigation works is carried out as per letter received vide Ref. No. D1/221/2022-AEE (C) dated November 9th 2023 from the Office of the Assistant Executive Engineer, Harbour Engineering Subdivision, Chettuva to Joint Director, CM&FE, KERI.

The field investigation work at this site was carried out from 21th November 2023 to 27th November 2023. In order to conduct soil investigation for the extension of existing harbour, one borehole was decided to drill in the space provided between existing harbour and compound wall. Boring works was carried using Rotary calyx-type drilling machine. Boring was conducted up to a depth of 30m as per the requirement of preliminary study as required by the project authority. The estimated cost for the project is 1,00,531/-, and the total expenditure incurred for the work was Rs: 1,00,427/-



Fig.1- Investigation for Chettuva Fishing Harbour.

2. Soil Investigation at Attappilly RCB across Kurumali River in Thrissur District.

The Attappilly Kadavu regulator cum bridge, spanning across the Kurumali River and connecting Mattathur and Varandarappilly Grama Panchayaths in Thrissur district . It was

further requested for certain necessary additional investigations to finalize the arrangement of the exact location of proposed piles/struts, it is necessary to locate the boundary of the base slab of the existing abutment and retaining wall on the downstream side. It is also required to ascertain the thickness of the base slab over which the vertical supports will be placed. Hence, an additional 5 boreholes were decided to drill for finding the above mentioned requirements. This report is prepared based on the letter No. IDR/BB/DAMS/R&G/AD3/3274/94 dated 07/11/2023, from the Chief Engineer, IDR, Thiruvananthapuram, to the Director, F&AR, KERI.

The location of the boreholes were already decided from IDR, so that as per IDR drawing, five boreholes were set out in the approach road. The investigation included activities such as boring, collection, and testing of soil samples. For soil exploration, five boreholes were drilled between 7th December 2023 and December 18th, 2023. Rotary calyx-type drilling machine was used for the boring process, with the drilling conducted until reaching the hard rock level. The estimated cost for the work is 2,00,000/-, and the total expenditure incurred for the execution of the work was Rs: 99,585/-.



Fig.2-Soil investigation for Attappilly RCB across Kurumali River.

3. Soil Investigation for desiltation of construction of RCB across Bharathapuzha at Kankakkadavu in Kuttipuram Panchayath , Malappuram District.

Kankakkadavu, is located just 1.1 km southeast of NH 66 and 2.5 km upstream of the Kuttippuram bridge. The latitude is 10°50'21"N, and the longitude is 76°02'18"E. The investigation work is carried out as per letter No. KIIDC/1019/2020-PE21 dated 12/06/2023 from the Office of the Chief Executive Officer, KIIDC, Thiruvananthapuram, to the Director, KERI, Peechi, and the endorsement made by the Director, KERI, to JD, CM&FE, KERI, vide Edtm No. D1/KERI/General/2023 dated 16/06/2023. A site visit was conducted on July 5th , 2023, from the office of the Instrumentation division, KERI, Peechi. In order to address the obstruction of flow at Kankakkadavu, the sanction for desiltation of deposited soil was granted. As a preliminary step before the desiltation operation, a sediment analysis was proposed for samples deposited at 1 km upstream and downstream locations.

It was decided to excavate boreholes using hydraulic excavator up to a depth of around 3m. The boreholes were dug at intervals of 1m depth, reaching a maximum depth of around 3m from the current bed level. The field investigation work at this site was carried out from January 12th, 2024 to January 13th, 2024, by the Instrumentation division of the Kerala Engineering Research Institute, Peechi. Twenty boreholes were excavated using a hydraulic excavator. Samples were collected from the bed level and at depths of 1m, 2m, and up to around 3m. A total of 78 representative samples were collected from the aforementioned 20 boreholes and from different depths. The estimated amount for the work was Rs:1,68,500/- and the total expenditure incurred for the execution of work was Rs:1,48,496/-.



Fig.3- Soil investigation work for desiltation of construction of RCB across Bharathapuzha at Kankakkadavu

4. Soil Investigation Works To The Reconstruction Of Mannatampara Weir Across Kadalundi River In Mooniyur And Vallikkunnu Panchayath In Malappuram District.

The Mannatampara Weir-cum-Lock is situated at the tail end of the Kadalundippuzha, a few kilometers upstream of its confluence with the Arabian Sea. The latitude and longitude coordinates of the structure are 11.0824709 N and 75.8839265 E respectively. The existing weir is not in good condition and only foot bridge is present. As a result a RCB is necessary and hence project authorities requested a soil investigation for reconstruction of the existing Mannatampara weir. This report was prepared based on email Lr No. DB 9-2321/IVW/2022-23, dated 06/07/2022, received from the Office of the Superintending Engineer, Minor Irrigation Circle, Kozhikode, for carrying out soil investigation for the reconstruction of Mannatampara weir across Kadalundi River in Mooniyur and Vallikkunnu panchayat in Malappuram District. . As per the structural requirement 16nos of boreholes were required.

The field investigation work at this site was carried out from 27th November 2023 to 28th February 2024. Boring plant . The estimated amount for the work was Rs:9,30,000/- and the total expenditure incurred for the execution of work was Rs:7,52,752/-.



Fig.4-Soil investigation Works To The Reconstruction Of Mannatampara Weir Across Kadalundi River.

5. Soil investigation work for the reconstruction of Tholur Chira in the Wadakkanchery River in Thrissur District.

In line with the reconstruction of this Chira, an estimate for soil investigation has been prepared. based on the letter No. D10 (D4)- 584/11 vol-2 dtd 13/12/2023 of the office of suprendenting Engineer, Irrigation central circle,Thrissur and letter number D10 (D4)-584/11 vol-2 dtd 04/01/2024 of the office of suprendenting Engineer, Irrigation central circle, Thrissur to the Director, F&AR, KERI. This work was executed under the action plan 2023–2024 in the title of work "soil investigation for various works of Irrigation department.

In order to conduct soil investigation for the reconstruction of Tholur Chira in the Wadakkanchery River in Thrissur District, Ten borehole was decided to be drilled.. The field investigation work at this site was carried out from 29th February 2024 to 18th March 2024. The total expenditure incurred for the execution of work was Rs:2,07,754/-.



Fig.5-Soil Investigation work for the reconstruction of Tholur Chira.





G. PUBLICATION WING

PUBLICATION WING

The Information Bureau of the Kerala Engineering Research Institute (KERI) operates within a well-equipped technical library managed by the institute's publication wing. This library contains approximately 10,000 books along with a selection of current periodicals, offering essential technical knowledge and resources to the staff of the institute.

The publication wing also organizes lectures, training sessions, and refresher courses aimed at enhancing the skills and knowledge of both KERI employees and personnel from the Irrigation Department. These programs support continuous learning and professional development.

To ensure the library remains current and relevant, new publications on a wide range of technical subjects are regularly added. The library serves as a valuable resource not only for KERI staff but also for technical professionals from various government departments, as well as engineering and polytechnic students.

Officers associated with KERI can borrow books using an integrated library software system, while a traditional card catalog is also maintained. Reference materials are accessible to engineers from other departments and academic institutions for on-site use.



Fig 1. Library under the publication wing of KERI

The library disseminates information through multiple channels, including technical books, e-journals, printed journals, previous research reports, and other relevant materials. Among the periodicals available is the Indian Geotechnical Journal, along with several other Indian publications. These resources and training initiatives play a vital role in supporting the continuous advancement of knowledge within the department.

To ensure the smooth functioning of managing and issuing books, articles, and other materials, the library is currently operating with Koha software—an open-source Integrated Library System (ILS). Koha is actively used to automate and streamline various library operations, including cataloging, circulation, and other essential services.

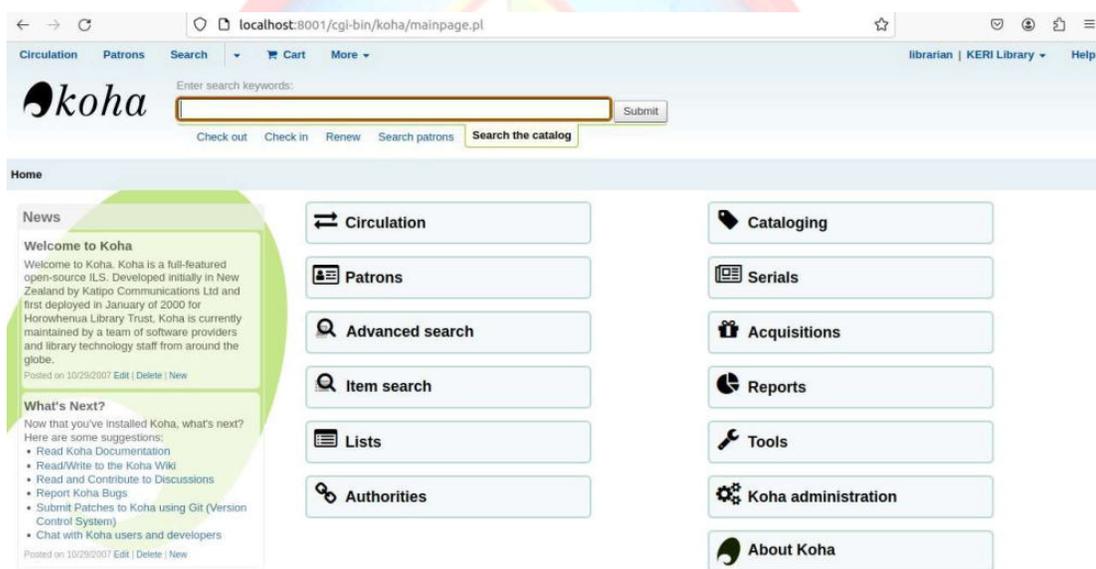


Fig 2. A screen capture view of Koha Software

As part of an initiative to make departmental documents, project reports, and other resources digitally accessible, the library has begun the process of digitalizing these materials. This effort aims to make valuable information easily available to staff across the department through online access. The digitalization process involves converting physical books, documents, and other resources into digital formats, supported by the adoption of digital tools and technologies for effective management and access. Scanning of library books and documents has been initiated, and the resulting digital copies are being uploaded to DSpace, an open-source repository software. More than 10,000 pages of KERI reports have been successfully scanned and uploaded to the DSpace platform. These digitized documents are now readily accessible to staff members, providing improved access to valuable institutional knowledge and supporting efficient information sharing across the department.

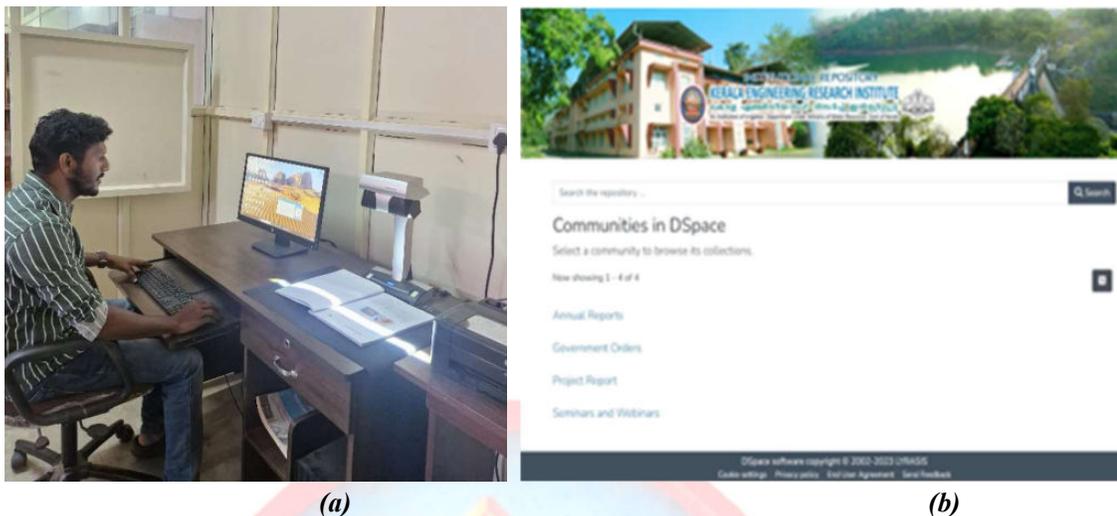


Fig. 3 (a) Process of scanning for digitilisation programme (b) screen shot of D space.

During the financial year 2023–2024, the publication wing organized several training programs aimed at enhancing the skills and technical knowledge of engineers and other staff members. These programs were designed to keep the workforce up to date with the latest industry practices and developments in their respective fields. Notably, hands-on training sessions were conducted on topics such as *Climate Change and Its Impact on Water Resources of Kerala*, along with various other online training sessions on relevant subjects. A detailed list of the training programs conducted is provided below.

- Conducted Seminar on " Climatic change and its Impact on Water Resources of Kerala" by Dr C G Madusoodhanan & Dr K G Sreeja
- Plan Fund progress 2023-24, Masterplan for KERI and costing module
- Inauguration of journal (JWS) by Publication wing

1.Topic: Climatic change and its Impact on Water Resources of Kerala

Speaker : by Dr C G Madusoodhanan (CEO & co-founder of EQUINOCT) & Dr K G Sreeja (Director Research of EQUINOCT) on 27/06/2023.

Dr C G Madusoodhanan & Dr K G Sreeja ,delivered a lecture on *Climate Change and Its Impact on Water Resources of Kerala* to raise awareness and deepen understanding of how shifting climate patterns are affecting the state's water systems. The session covered key issues such as rising temperatures, altered rainfall patterns, increased frequency of extreme weather events, and their implications for river flows, groundwater recharge, and water availability. Emphasis was placed on sustainable water management practices and adaptive

strategies to mitigate these impacts, making the lecture highly relevant for engineers and professionals working in the water resources and irrigation sectors. The session was conducted offline.



*Fig 4. Photos of session on Climatic change and its Impact on Water Resources of Kerala
by Dr C G Madusoodhanan & Dr K G Sreeja .*

2. Topic : Plan Fund progress 2023-24, Masterplan for KERI and costing module

Speaker : Sreekala C K, Director, KERI, Peechi , on 10/07/2023

A detailed discussion on the Plan Fund Progress for 2023–24, the Master Plan for KERI, and the Costing Module was conducted by the Director of KERI. The session focused on reviewing the utilization and achievements under the plan fund for the financial year, highlighting key projects and initiatives implemented. The Director also outlined the proposed Master Plan for the institute, aimed at enhancing infrastructure, research capabilities, and training facilities. Additionally, the discussion covered the introduction of a costing module to ensure better financial planning, transparency, and efficiency in project execution.

3.Topic: Inauguration of journal (JWS) by Publication wing

Speaker: Dr.Santhosh Kumar P T,Deputy Director,Instrumentation Division on 10/01/2024

Publishing a journal article plays a crucial role in academic and professional development, allowing researchers, scholars, and professionals to share new insights, ideas, and findings with the global community, thereby advancing their respective fields. In line with this objective, Dr. Santhosh Kumar P inaugurated the *Journal of Water Studies (JWS)* under the Publication Wing, marking a significant step toward promoting research and knowledge dissemination within the institute and beyond.



Fig 5. Inauguration of Journal(JWS)



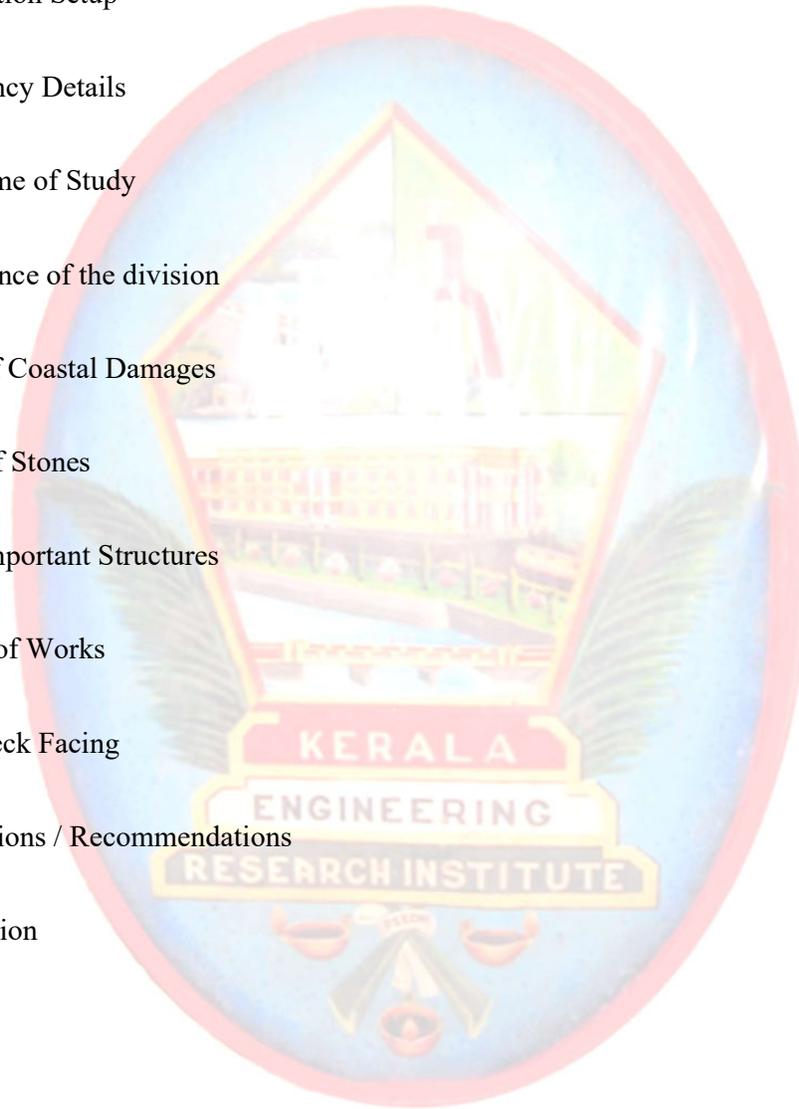
H.COASTAL ENGINEERING
FIELD STUDIES, THRISSUR

COASTAL ENGINEERING FIELD STUDIES, THRISSUR



Contents

1. Introduction
2. General Arrangements and Field Studies
3. Organization Setup
4. Incumbency Details
5. Programme of Study
6. Performance of the division
7. Photos of Coastal Damages
8. Details of Stones
9. List of Important Structures
10. Details of Works
11. Bottleneck Facing
12. Suggestions / Recommendations
13. Conclusion



I. Introduction

The Coastal Engineering Field Studies was formed in 1973 and is engaged in the collection of data and field studies on Coastal Erosion along the Kerala Coast. The coast of Kerala extending 598.1566 Km. in the south west coast of India, is Characterized by a narrow longitudinal barrier strip of low-lying land, sandwiched between the Arabian Sea and a continuous chain of lagoons and back waters with connection to sea at several points. This strip is formed of alluvial deposits. In considerable stretches, the space between the sea and the back waters is very narrow and even less than a few hundred meters at many places. Any break in this narrow strip would expose the back water to the fury of the waves and could endanger the entire disappearance of the barrier beaches.

The coastal zone has the maximum concentration of population and is even many times the State average at several places. Many of the foreign exchange earning industries, residential localities, a number of district headquarters, good number of ports, fishing harbours and extensively cultivated land also exist along this narrow coastal zone.

The coastline of Kerala is subjected to severe erosion in a major portion of its length during the monsoons, when the sea becomes rough due to consistent attack of waves. The coastline is sometimes subject to tidal overflow also, when adjoining low lying lands get submerged. Erosion is very severe in the coastal areas during the south west monsoon period. During the worst monsoon period, the highest waves average 2,3 metres and wave periods range from 9 to 12 sec. and they come mostly from west. Storm tides occur all along the coast during the monsoon season. During the monsoon, the high waves coupled with storm surges, cause overflow and flooding of the low lying backshore lands all along the coast, resulting in considerable loss of property, destruction of private and Government buildings, communications, dislocation of life of lakhs of population and disruption of other activities affecting economy. The influence of saline water through mouth of rivers also affects agriculture and industry.

New CP stones have been planted throughout the Kerala coast except about 25km length of north extreme end at Manjeswaram. The GPS Co-ordinates of all CP stones and seawalls have been recorded.

All aspects of the coastal erosion problems of the State, the necessity for immediate protection of vulnerable stretches, efforts made in collection of coastal data for long periods

in conducting studies and in getting expert advice from all over the world and achievements made so far in tackling the erosion problem.

Many experts who visited this State, to study the behavior of the coast and also for periodical evaluation of the performance of completed sea walls, were all of the same opinion that the sea wall damage, mostly due to improper maintenance is as important as the construction of sea wall.

For proper construction and to understand the performance of the sea wall during and after construction, proper monitoring is necessary. This requires consideration of the field staff with the staff engaged in coastal erosion studies. Whenever a new sea wall is to be constructed, the research staff must be informed of the different stages of construction, starting from alignment of the sea wall forming filter, core, armour layers, etc, so that the performance of it during construction and after construction can be watched.

The field staff also must keep a date-wise record of construction details starting from alignment, excavation, putting filter, forming core, armour layer, etc, as per lines and level. The distance and levels of stones in front of sea wall also must be watched regularly with the progress of construction of sea wall. All chainages of sea wall must be made with reference to the Km/C.P stone available at site

The concerned Assistant Engineers must give all relevant details to the concerned Assistant Directors in charge of Coastal Engineering field Studies from time to time, as per the above guideline and also keep a copy of the same for reference. The offices under this office are

1.Coastal Engineering Sub Division Kollam

- a) Coastal Engineering Section, Thiruvananthapuram: The jurisdiction of coastal area comprises of Kollamkode to Paravoor pozhi (CP 0000 to CP 0287)-78.873Km.This length includes the total coastal length of Thiruvananthapuram district of 74.154 km and 4.719 km length covers at Kollam district.
- b) Coastal Engineering Section, Kollam: Jurisdiction of coastal area comprises of Paravoor pozhi to Kayamkulam pozhi (CP 0288 to CP 0499)-43.047Km
- c) Coastal Engineering Section, Thottappally: Jurisdiction of coastal area comprises of Kayamkulam pozhi to Alapuzha pier. (CP 0500 to CP 0710)- 42.54Km

The total coastal area of Kollam Sub Division is **164.46 Km.(As per CP to CP distance)**

2.Coastal Engineering Sub Division Ernakulam

- a) Coastal Engineering Section, Cherthala: Jurisdiction of coastal area comprises of Alappuzha pier to South Chellanam. (CP 810 to CP 975)-
- b) Coastal Engineering Section, Ernakulam: Jurisdiction of coastal area comprises of Chellanam to Fort Kochi. (CP 975 to CP 1072)
- c) Coastal Engineering Section, Ernakulam: Jurisdiction of coastal area comprises of Vypin to Munambam. (CP 1073 to CP 1187)
- d) Coastal Engineering Section Chavakkad: Jurisdiction of coastal area comprises of Azhikode to Chetuva South. (CP 1188 to CP 1380)
- e) Coastal Engineering Section Chavakkad: Jurisdiction of coastal area comprises of Chetuva North to Ponnani. (CP 1381 to CP 1549)

The total coastal area of Ernakulam Sub Division is **151.69 Km. (As per CP to CP distance)**

3.Coastal Erosion Studies Sub Division Kozhikode

- CES Section Parappanangadi: The jurisdiction of coastal area comprises of Padinjarakkara to Kadalundi (CP 1555 to CP 1743) -37.65 Km.
- CESSection Kozhikode: The jurisdiction of coastal area comprises of Kadalundi to Mahe Poozhithala (CP 1745 to CP 2120) –75.171 Km.
- CES Section Thalassery: The jurisdiction of coastal area comprises North bank of Mahe River to Naval Academy (CP 2140 to CP 2441) –56.302 Km in Kannur District, Valiyaparamba to Manjeswaram (CP 2441 to 2750)-64.2Km and Manjeswaram to Thalappadi (Old CP No150 to 101)-27.22 Km in Kasaragode District (Total distance under the section comes to 147.722 Km)

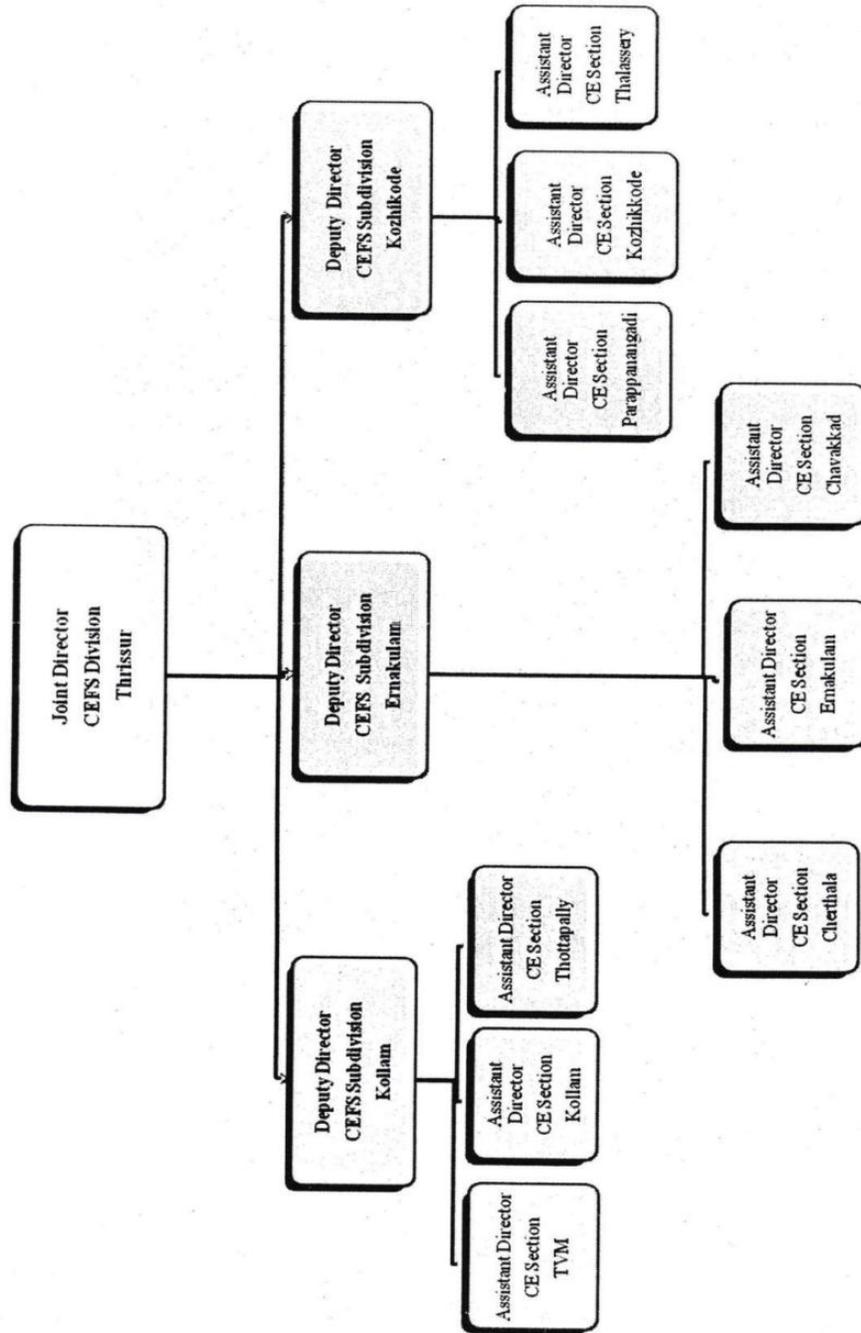
Total Coastal Area of Kozhikode Sub Division – **260.543 km. (As per CP to CP distance)**

II GENERAL ARRANGEMENTS AND FIELD STUDIES

For the detailed study of the characteristics and behavior of the beach, the 598.1566 Km of the Kerala coast is divided into three regions viz. Southern region, Central region and Northern region. Each of these regions is under the control of Deputy Directors and further sub divided into the control of Assistant Directors. The three regions come under the Coastal Engineering Field Studies, headed by Joint Director who works under the guidance of Director, Fundamental and Applied Research, Kerala Engineering Research Institute, Peechi.

III Organization Setup

ORGANISATIONAL SET UP
Name of Sub Divisions and Sections Under Coastal Engineering Field Studies Division, Thrissur



IV. Incumbency Details

COASTAL ENGG. FIELD STUDIES, THRISSUR.

1. Joint Director : Smt. Beena N.

2. Assistant Director : Sri. Suneer. K M

3. Ist Gr.Draftsman : Smt. Bindu.K.C

Smt. Beena. K. D (Full Additional charge of Smt. Rajitha K K from 28.02.2024)

Smt. Rajitha.K.K (Relived on 27.02.2024)

4.Head Clerk : Sri. Ajithkumar P K (Relived on 29.02.2024)

Smt. Rinny M D (Full additional charge from 01.03.2024)

5 Clerk : Smt. Rinny.M.D

: Smt. Mumthas A.A

7. Senior Grade Typist : Smt. Seema Jose (Relived on 23.05.2023)

Sri. Sarath T S (From 23.05.2023)

7. Driver : Sri. Denny. N.J

8..Office Attendant : Smt.Nigi T.K

C.E.S. SUB DIVISION, KOZHIKODE

1. Deputy Director : Sri. Abbas M T (Retired on 31.05.2023)

Sri. Kamal Roy K V (01.06.2023 onwards)

2. Ist Gr.Draftsman : Smt. Syamala. K P (upto 31.05.2023)

Sri.Prakasan C (upto 31.10.2023)

Sri.Asraf AP (From 09.01.2024)

3. Senior Clerk : Smt. Preetha T.K

Smt. Malavika MS (From 15.01.2024)

4.Senior Grade Typist : Smt. Prameela.K

5. Driver : Sri. Mohammed Iqbal.P

6. Office Attendant : Sri Logesh N.P.

C.E.S.SECTION, KOZHIKODE

1. Assistant Director : Sri. Jithin.P (FAC upto 24.02.2024)

Smt.Sharmila.K(From24.02.2024)

2. Ist Gr.Overseer : Smt. Nishida N P

3. IInd Gr.Overseer : Smt. Rejula.K(upto 31.03.2023)

Smt.Fasna.E(From25.03.2024)

4. Office Attendant :Smt. Seema Mol. K.C

C.E.S. SECTION, THALASSERY

1. Assistant Director : Sri. Jithin.P.

2. IInd Gr.Overseer : Smt.Athira RK (upto 01.08.2023)

Smt.Namitha.KV(from 15.06.2023 upto01.08.2023)

Smt. Aparna (From18.01.2024)

Smt.Vidya(from 24.08.2023)

3. Senior Clerk : Sri.Siju.N

4. Office Attendant : Smt.Remani.P

C.E.S.SECTION, PARAPPANANGADI

1. Assistant Director. : Sri. Jithin P (FAC 31.12.2022 onwards)

2. IInd Gr.Overseer : Smt. Shajna. P. V. (upto 31.07.2023)

Smt. Amanu Rahman (17.03.2023 onwards)

3. Office Attendant : Sri. Ashique. P (From 25.09.2023)

C.E SUB DIVISION, ERNAKULAM

1. Deputy Director : Sri. Kamal Roy K V

2. Ist Gr. Draftsman : Smt. Letha.K.V (Retired on 31.05.2023)

Sri. Giri Kumar T G (from 10.01.2024)

3 .Senior Clerk : Smt. Nisha.K.N

4 .Clerk : Smt. Suja.K.S

5. Typist : Smt. Latha K M (Retired on 31.05.2023)

Smt. Cicy Thomas (from 01.06.2023)

6. Driver : Sri.Anoop. P. G

7. Office Attendant : Smt. Alphonsa. K. X

8. Part Time Sweeper : Smt. Rugmini.N.T

C.E. SECTION, ERNAKULAM

1. Assistant Director : Smt. Anusree.A (up to 19.11.2022 FN)

Sri. Deepu S (19.11.2022 onwards)

2. Ist Gr.Draftsman : Sri. Manoj Antony K

3. 2nd Gr.Draftsman : Sri. Manoj Antony K (Full Additional Charge)

4 . Office Attendant : Sri.Saji.T.T

C.E.SECTION, CHERTHALA

1. Assistant Director : Sri. Clement Roy.K.R

2. IInd Gr.Overseer : Smt. Preethimol C M
Smt. Anjana.Prakash (Relived on 24.07.2023)
Smt. Sreemol P V (17.08.2023 onwards)
3. Senior Clerk : Sri. Ajayakumar.P
4. Office Attendant : Sri. Sunil Kumar C G.

C.E SECTION, CHAVAKKAD

1. Assistant Director : Smt. Ajantha.V.D (upto 11.08.2023)
Sri. Deepu S (12.8.2023 to 25.02.2024)
Smt. Sreejaya V K (26.02.2024 onwards)
2. 2nd Gr.Draftsman. : Smt. Sreena P S (15.12.2023 onwards)
Smt. Shabana V K (01.01.2024 onwards)
3. SENIOR CLERK : Smt. Rose Johny (upto 31.12.2022)
Smt. Suja K S (FAC 01.01.2023 to 10.01.2023)
Sri. Justine Paul P (Relived on 03.02.2024)
4. Office Attendant : Sri. Shaji.M.K

COASTAL ENGINEERING SUB DIVISION, KOLLAM

- 1 .Deputy Director : Sri. Sugesh Krishna C P
- 2 .First Grade Draftsman : Sri.SibiVarghese (upto 05.07.2023)
Smt. Sunitha L (from 06.07.2023)
- 3 Senior Clerk : Smt. Priya M. D. (FAC 09.02.2023 onwards)
- 4 Clerk : Smt. Priya.M. D.

5. Typist : Smt. Nimmi. Y. P.
6. Driver : Sri. Ajipushpangathan
7. Office Attendant : Sri. Vickraman.P

COASTAL ENGINEERING SECTION , THIRUVANANTHAPURAM

1. Assistant Director : Smt. Anusree A
2. Second Grade Draftsmen : Smt. Hema S (20.06.2023 onwards)
- Sri.Salin Kumar R.S
3. L. D. Clerk : Sri.Salin. S.S

COASTAL ENGINEERING SECTION, KOLLAM

1. Assistant Director : Smt. Shiji. P. R.
2. First Grade Draftsman : Smt. Smitha.R
3. Second Grade Draftsman : Smt. Anithakumari . S
4. Office Attendant : Smt. Shamina. S

COASTAL ENGINEERING SECTION, THOTTAPPALLY

1. Assistant Director : Smt. Fathima R
2. Second Grade Overseer : Smt. Reshma B (01.08.2023 onwards)
- : Smt. Laly. T. R.
- Smt. Geethamma R. (Retired on 31.05.2023)
3. Clerk : Smt.S. Rejani
4. Office Attendant : Sri. Reji. G

V. PROGRAMME OF STUDY

In coastal environment, waves, tides, currents and winds are the important parameters which need to be considered for any development. It is very much essential to understand the physics of these processes. Coastal erosion is the wearing away of land by the action of waves, current and wind. Coastal erosion is accompanied with landward recession of the sea shore and loss of land area. It is a common problem faced in almost all coastal areas. Only the magnitude and nature of erosion changes from place to place. Along the most part of Kerala coast, the erosion observed is seasonal in nature, that is, beach gets eroded during monsoon and regains its original profile during fair weather season. However, at some places erosion is of permanent nature.

1. Simultaneous Wave Observations

Simultaneous wave observations are being conducted at 18 specified location along Kerala Coast on all new moon days to understand characteristics of wind, wave and tide details such as width of back shore, fore shore, slope of fore shore, composition of each materials, characteristics of littoral drifts, shore history and they are recorded on standardized format.

1.1 Study of littoral drift

Littoral transport is the movement of sediments in the near shore zone by waves and currents. This transport of suspended and bed load particles are both in parallel to the sea shore and perpendicular to sea shore. This transport of suspended materials is called littoral drift. It has been ascertained from the past studies that the dominant direction of littoral drift in Kerala coast is from north to south. However the directions, an annual quantity of net and gross quantity are important in developing shore protection arrangements. Now only the direction of drift is being studied at selected at points along the shore.

1.2 Study of Wind and Waves

Winds are the natural generators of wave and their study is necessary. An understanding of the nature of the tidal phenomenon is necessary for the study of coastal behaviors. The top level of the coastal protection structures depend on the tidal level and their data must be collected.

Wave causes sand to move along the coast as well as on to or off a beach. Due to refraction, wave energy is concentrated in certain reaches of the coast where erosion became naturally severe. Hence the design of coastal protection structures primarily depend on wave

characteristics and since these studies are essential.(Predominant direction of waves is from west or north west)

2. Study of Mud banks

Mud banks, a phenomenon peculiar to the coast of Kerala are those in shore region where wave energy is dissipated completely as a result of the colloidal mud suspension mud bank protect the coast immediately near it, but causes erosion in the down-drift side due to diffraction of waves.

Many rivers in Kerala exhibit a continuous migrating tendency. Such migration influences the beach characteristics in the adjacent areas considerably.

3. Periodical measurement of shore line changes:

Periodical surveys are taken to determine the shore line changes of the coast. The offset measurement of the shore line with respect to Control point and Alignment stones are taken every month and recorded. It provides very important data to understand the shore line fluctuation of the coast.

4. Collection and Study of beach samples

Pre-monsoon (May) and post-monsoon (November), beach samples are collected from specified places for testing grain size distribution and specific gravity since the erosion and accretion of coast depends up on the nature of beach material to a certain extent. Also for natural nourishment materials can be supplemented to the beach and thereby the erosion can be reduced. Beach samples are important variables determining the beach characteristics. Study of beach materials, characteristics and sources is essential for the evolution of a long term shore protection plan.

5. Report on Coastal damages and Taking photographs

The details of damages at various places in the coastal beaches have been collected from time to time and photographs are taken to understand the details of erosion, coastal damages occurred during monsoon and drastic changes in the shore line.

6. Taking cross section profile of the beach

Cross section profiles taken using leveling instrument and leveling staff (Taken up to wading depth of waters)

7.Alignment fixation of sea walls:

The Joint Director inspected the sites for fixing alignment of sea wall (construction and reformation) with the concerned Irrigation officials, Deputy Director and Asst. Director of the Coastal Sub Division & Sections concerned, and approved the alignments of sea walls along Kerala Coast, considering the last 5 year shore line measurements and the alignment of the sea.

Alignment approval has been given to the following works by the Joint Director, Coastal Engineering Field studies, Thrissur during the year 2023-24

Sl.No	Name of sub Division	Alignment approved during 2023-24	Essentiality certificate issued during 2023-24
1	CE SubDivision, Kozhikode	Nil	Nil
2	Ernakulam CE SubDivision	4	4
3	Kollam CE SubDivision	Nil	Nil

8. Sustainable coastal protection using mangroves at Thiruvathra beach

The project “ Sustainable coastal protection using mangroves at Thiruvathra beach” has been declared in the financial year 2022-2023 for which the project implementer is KERI & executor is KFRI. This is an experimental study on establishing coastal bio-shield for 750 metre distance in between Control Points 1424 and 1436 at Puthenkadapuram(Thiruvathra) in Chavakkad Municipality, Thrissur District. Duration of work is 3 years from the date of MoU signed between KERI & KFRI on 27th January 2023. During the financial year 2023-24, as the first phase of the work about 500 saplings of bamboo, Poovarasu, tamarind, Thanni, adaka-pine, almond etc. were planted by KFRI in 3 rows at 2 m spacing in 360m south of CP 1431 on July 2023. On January 2024, a total of 606 saplings, including 100 kaita saplings and 6 saplings of Nipa palm, which grows in salt water, were planted in this area. The full cost for the project, ie, Rs. 4 Lakhs. The project will be completed by the year 2027, till then progress report of the project has to be called for from KFRI.

VI PERFORMANCE OF THE DIVISION IN THE YEAR 2023-24

Within the limitations of availability of field staff and modern instrument, this division has taken up all the possible studies in the year 2023-24. The performance can be summarized as follows.

Types of works

1. Topographic survey conducted for

Determining beach profiles	:	Nil
2. Periodical measurement of shoreline changes	:	4091.138 Km
3. Simultaneous observations	:	181 Set
4. Soil sample collected	:	46 Set.
5. Cross section profiles	:	Nil
6. Levels connected	:	Nil
7. C.P Stones planted	:	Nil
8. Alignment stones planted	:	Nil
9. Kilometre stones planted	:	Nil
10. Bench mark stones planted	:	Nil
11. Alignment fixed by Joint Director	:	4 No
12. Details of damages at various places in the		
Coastal beaches collected	:	70 Nos
13. Mud bank study	:	Nil
14. Pilot Project	:	1 No

Sub Division-wise Coastal studies performance are as follows ;

1. Topographic survey conducted

Kollam sub Division	:	Nil
Ernakulam Sub Division	:	Nil
Kozhikode Sub Division	:	Nil

2. Periodical measurement of shoreline changes

Kollam sub Division	:	1452.32 km
Ernakulam Sub Division	:	922.818km
Kozhikode Sub Division	:	1716 km

3. Simultaneous observations

Kollam sub Division	:	60 Set.
Ernakulam Sub Division	:	69 Set
Kozhikode Sub Division	:	52 Nos

4. Taking photograph

Kollam Sub Division	:	47Nos
Ernakulam Sub Division	:	23Nos
Kozhikode Sub Division	:	0 Nos.

5. Soil sample collected

Kollam sub Division	:	20 Set
Ernakulam Sub Division	:	12 Set
Kozhikode Sub Division	:	14 Set

6. Cross section profiles

Kollam sub Division	:	Nil
Ernakulam Sub Division	:	Nil
Kozhikode Sub Division	:	Nil

7. Levels connected

Kollam sub Division	:	Nil
Ernakulam Sub Division	:	Nil

Kozhikode Sub Division : Nil

8. C.P Stones planted

Kollam sub Division : Nil

Ernakulam Sub Division : Nil

Kozhikode Sub Division : Nil

9. Alignment stones planted

Kollam sub Division : Nil

Ernakulam Sub Division : Nil

Kozhikode Sub Division : Nil

10.Kilometer stones planted

Kollam sub Division : Nil

Ernakulam Sub Division : Nil

Kozhikode Sub Division : Nil

11.Bench mark stones planted

Kollam sub Division : Nil

Ernakulam Sub Division : Nil

Kozhikode Sub Division : Nil

12.Guard stones planted

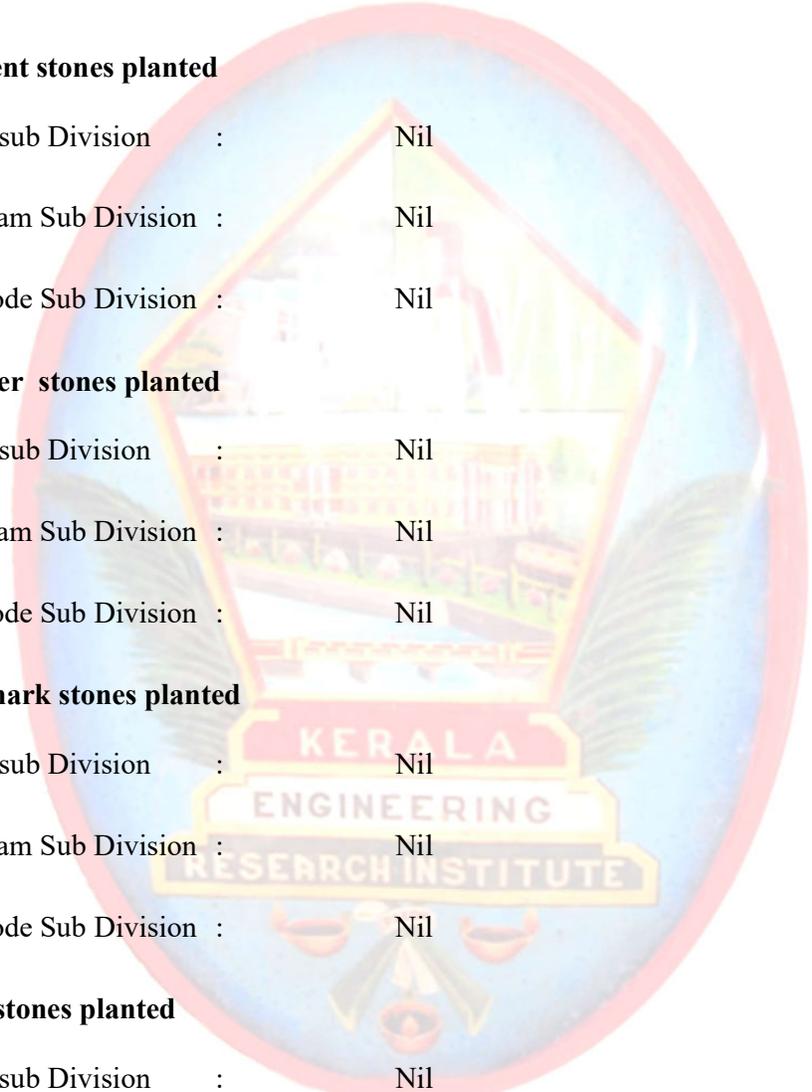
Kollam sub Division : Nil

Ernakulam Sub Division : Nil

Kozhikode Sub Division : Nil

13. Details of damages at various places in the

Coastal beaches collected



Kollam sub Division	:	47 Nos.
Ernakulam Sub Division	:	23 Nos.
Kozhikode Sub Division	:	0 Nos.

14. Study of Mudbank

Kollam sub Division	:	Nil
Ernakulam Sub Division	:	Nil
Kozhikode Sub Division	:	Nil

15. Pilot Project

Kollam sub Division	:	Nil
Ernakulam Sub Division	:	Sustainable coastal protection using mangroves at Thiruvathra Beach of Chavakkad Municipality
Kozhikode Sub Division	:	Nil

The coastal data of Periodical measurements which backs to 1990 has been digitized and the digitization of available data of sled survey.

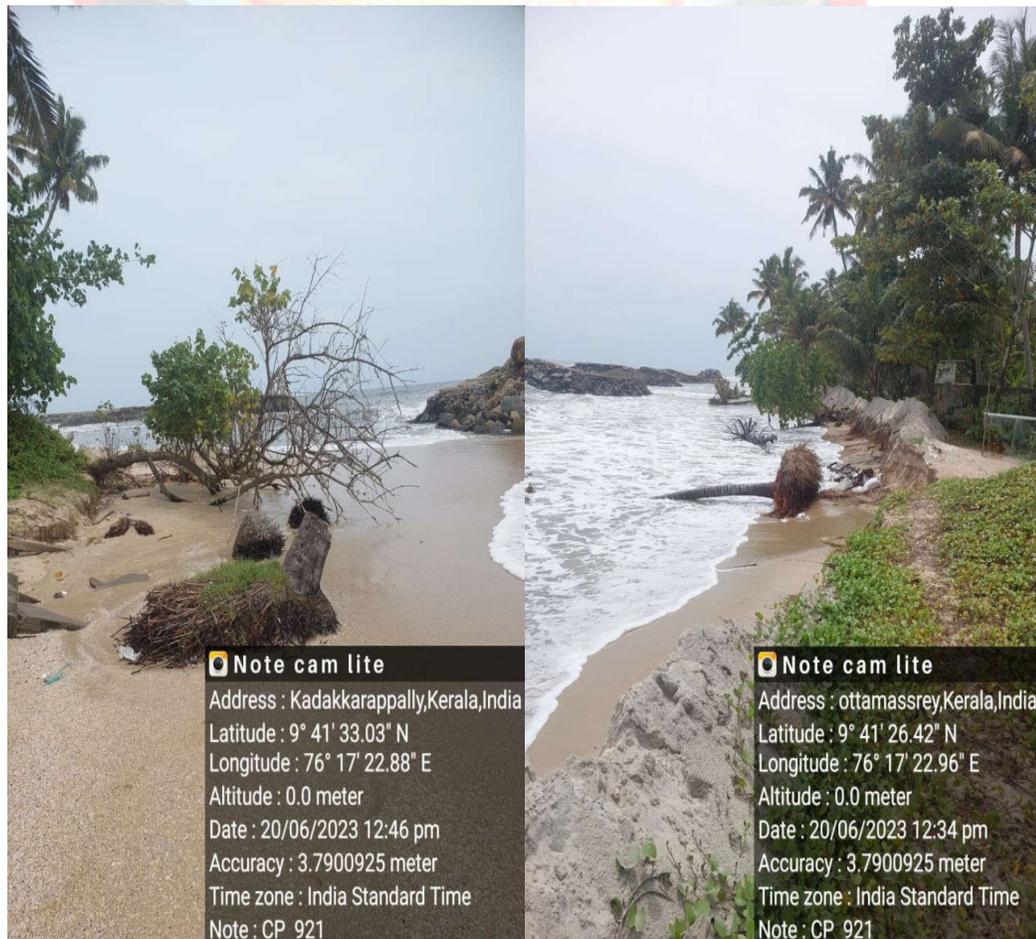
VII Photos of Coastal Damages

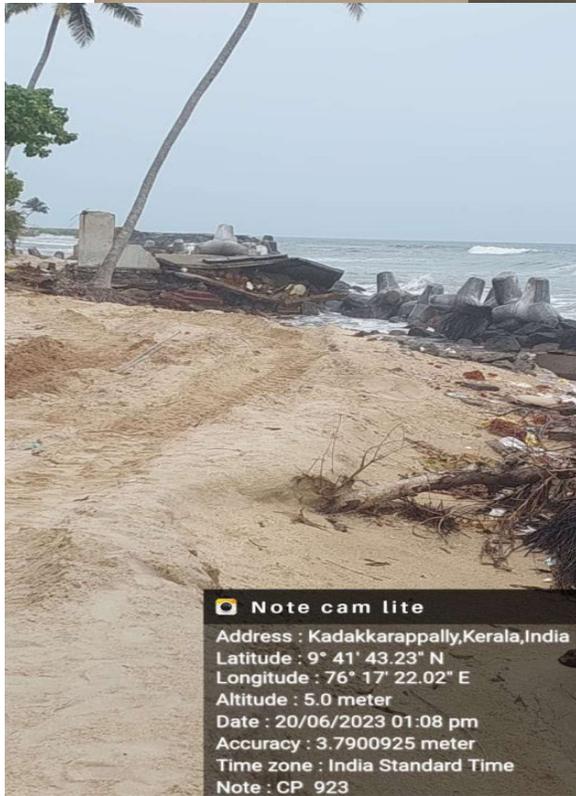
Damages under Ernakulam Sub Division

Coastal Damages occurred within the jurisdiction, were closely monitored and were reported every week during the monsoon. Details of coastal damages are reported once every month during off-monsoon months. During this year moderate coastal damages and heavy coastal erosion were reported from Chennaveli (CP 890-895) and Thanky(Ottamassery) (921-929). At Chennaveli between CP890 & CP89, one residential building underwent severe foundation soil erosion, rendering the house unfit for dwelling and more than four coconut trees overturned and fell down. At Ottamassery from CP 921 to CP 929, houses situated near the sea shore underwent serious foundation soil erosion due to overtopping waves and more than five houses partially damaged. More than 7 coconut trees overturned and fell down. Due to heavy wave attack, beaches eroded for a width of about 10 to 15m at Kattoor, Chennaveli

and Ottamassery. At Kattoor, coastal damages considerably reduced during the year. Between CP854 and CP 859 severe coastal erosion and beach loss occurred during the monsoon season. As groynes with tetrapod protection work has progressed from CP839 to CP853, beach erosion is comparatively reduced. At Chennaveli, moderate to severe coastal erosion and beach loss occurred.

At Azhikode(CP 1188-1195) beach eroded to about 15m width throughout the entire stretch and a Scarp height of approximately 0.6m formed. At Kara (1213-1224) area, Water advanced about 15m into the nearby houses and 3 houses are partially damaged. Shore is severely damaged, hence trees have fallen down. One commercial building partially damaged between CP1397 & CP1398-Achangadi. At Vadanappally (N)1354-1356 seven nos. of coconut trees fell down and seawall road completely breached at this stretch. At Eriyad (1205-1220) seawall fully damaged, Heavy overtopping above damaged seawall. Reach II(Chettuva North to Ponnani) Backshore eroding to about 3 to 4 m. At Veliyancode(1500-15012) houses are partially damaged and one old building damaged.



















Damages under Kollam Sub Division

Coastal damages occurred within the jurisdiction, were closely monitored and were reported every week during the monsoon. Details of coastal damages are reported along with the monthly reports during off-monsoon months. Sea wave attacks were reported to higher authorities along with paper cutting.

Photographs were taken during regular inspections and during high sea activities for information and reports. The reach from Thanni to Eravipuram Kakkathoppu undergo of heavy erosion during monsoon season for the past few years. The coastal road near Kakkathoppu is still in damaged condition. Seawall and groynes constructions are completed between CP 0309 to CP .0326. During the month of July 2023, seawave attack occurred along the coast of Kollam beach and Alappad Gramapanchayth (Parayakadavu to Azheekal pozhi) and caused heavy overtopping over seawall and water entered nearby land and houses. The damages under the reaches of shore from Paravur pozhi to Kayamkulam pozhi, has already

been reported with sufficient Photographs. The tetrapods placed on the head of Groynes between CP300 & CP 310 are scattered due to wave attack. The Erosion at the Simultaneous Observation point CP 0327 is increased at very fast rate, CP stones and bench mark have been completely fell into the sea due to seawave attack, the coastal road near CP327 was also damaged. The simultaneous observation is now taing from CP332 instead of CP 327 sand bags placed beteen CP 326 and CP 327. Kovilthottam light house foundation scoured and cracks formed, outer compound wall also heavily damaged between CP 408 and CP 409 . Photographs of damages were taken and reported regularly.

Photographs were taken of the coastal damages during high waves along the sea coast and have been presented in the form of a report. Due to the unexpected cyclone and surge waves phenomenon (April and may 2024) damages occurred in between Valiazheekkal and Alappuzha pier, 2 no. of houses were damaged. 1 sawmill of woodwork was damaged. Roads are filled with sand and the transportation were blocked. 10 numbers of casuarina trees fell down near CP 679 and CP 680 at Punnapra.



Fig.: Transportation blocked at CP stone 576



Fig. House get damaged at CP stone 507



Fig. House get damaged at CP stone 506



Fig. Road get blocked at CP stone 511



Fig. wood saw mill is get effected near Aratupuzha



Fig. casuarina trees fell down near CP 679 and CP 680 at Punnpra

Reach 1- Kollamkode to Panathura(CP No.0000 to 0070)



Fig 14 1: Damaged Sea wall at Kollamkode



Fig 14 2: Damaged Road at Kollamkode

Kollamkode at CP No. 0000 is the starting point. The area between CP NO.0000 to CP NO. 0008 was protected by the sea wall. The above area is thickly populated and is situated very near to the sea wall. Many numbers of Groyne are now under construction of Tamil Nadu Government from last week of November 2019 near the South of CP 0000 at Kollamkode. The construction of Groyne is seriously affected the north side of this Groyne, that is CP 0000 to CP 0008.



Fig 14 3,4: House before and after Damage at Kollamkode, North of CP 0006.

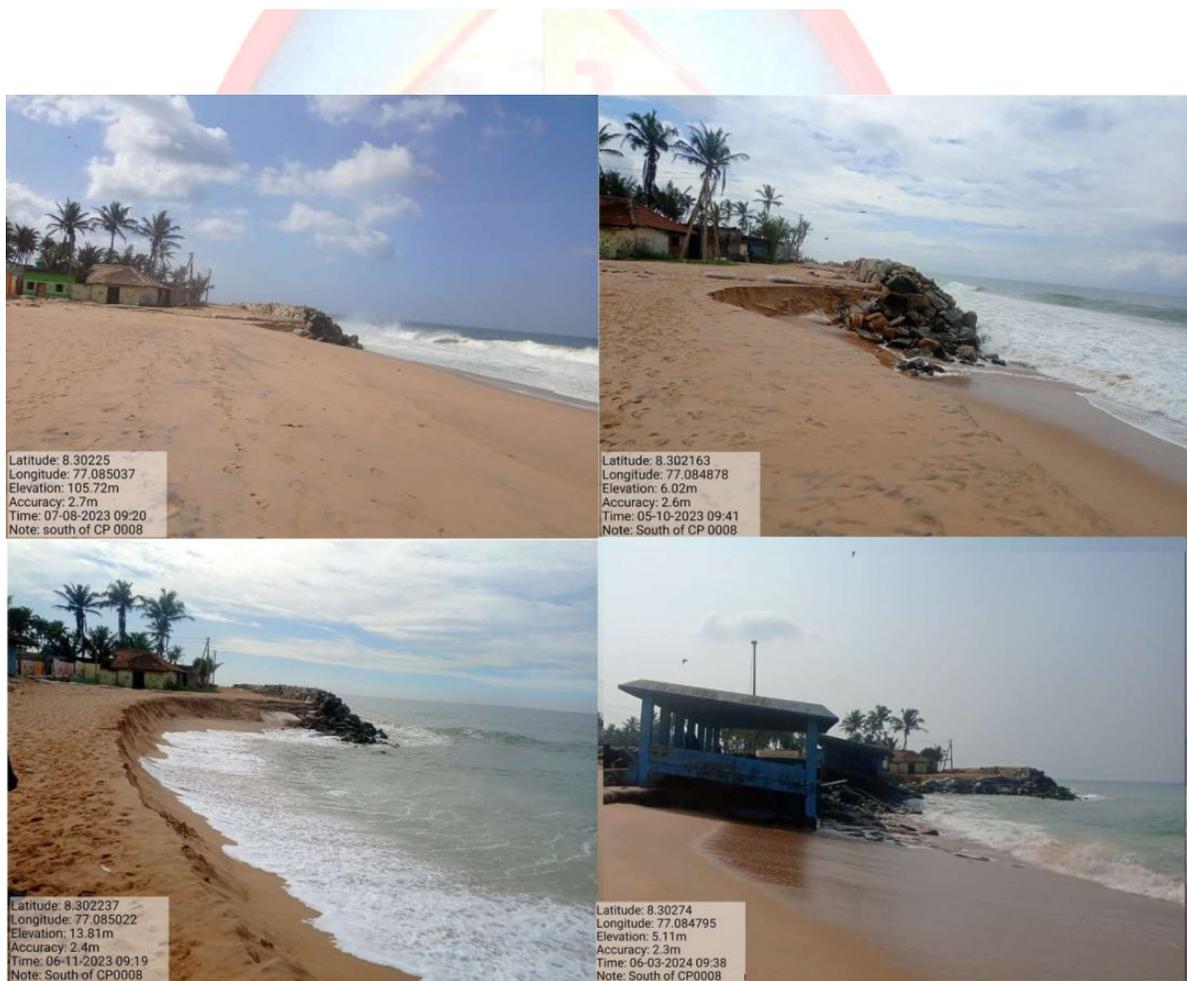


Fig 15: Shoreline Changes over Few months- South of CP 0008



Fig 16: Damaged net winding Centre, North of CP 0008

Continuous sea attacks occurred in this region due to the after effect of this Groynes construction. Much damage takes place such as about 1 nos of Houses are damaged and Two net winding Centre is damaged during the previous year. Moreover, the existing sea wall between CP 0000 to CP 0008 is fully damaged, sinked and collapsed condition. Due to the continuous sea attack without season, this coastal region is now changed as one of the vulnerable reaches.



Fig 18: Sea wall at Panathura



Fig 17: Damaged road and Side wall at Poovar between CP 0013 and CP 0015

The Poovar pozhi is situated in between CP No.0010 and 0011. The Adimalathura pozhi is situated near to CP No.0044. CP No.0011 to 0044 is having good beach maintained in all the seasons. New Vizhinjam harbor and Kovalam tourist place belong to this reach. CP No. 0057 to 0070 (Panathura) is protected by the sea wall.

The sea wall at CP 0057 to 0060 (Samudra beach) has been dilapidated and spreaded due to severe sea attack and overtopping and the remaining portion of sea wall maintained in good condition. Two numbers of groins situated between CP 0069 and CP 0070.



Fig 19 1,2: Damaged Sea wall at Kovalam

9.2. Reach 2- Panathura to Thumba (CP No.0070 to 0137)

This reach includes the vulnerable areas such as Poonthura, Beemapally, Valiathura and Sankhumugham. At Poonthura, (CP No.0080 to 0085), Beemapally (0085 to 0092),

Valiathura (0092 to 0101) and Sankhumugham (0101 to 0107), the entire sea wall is in dilapidated condition due to severe sea wave attack.



Fig 20 1,2: Damaged Sea wall at Ponthura

The above area is thickly populated and in monsoon seasons, the sea waves attack to nearby houses and cause damages especially in Valiyathura area. Valiyathura bridge is situated in between CP No.0094 and 0095 at Valiyathura.



Fig 21 1,2: Valiyathura bridge before and after damage



Fig 22 1,2: Realigning of sea wall progressing at Valiyathura, North of CP 0095.

15 nos of groynes have constructed at Beemapally area (Between CP 0085 and 0092). The famous Sangumugam beach was fully washed due to the sea attack during the previous years, including the approach road and the beach footpath. During this year the road has re-constructed and now the traffic maintained properly. The Diaphragm wall construction has been completed between CP 0103 and 0107 for the protection of road from the sea attack.



Fig 23 1,2: Sangumugam Beach



Fig 24 1,2: Damaged Sea wall at Sangumugam



Fig 25 1,3: Settled Gabion Sea wall between CP 0115 and CP 0116

CP No.0112 ,0114 and 0116 are simultaneous observation points of this office. The Veli pozhi is situated in between CP No.0127 and 0128. CP No.0128 to 0135 is protected by the Seawall.



Fig 26: Veli Beach

9.3. Reach 3- Thumba to Perumathura (CP No 0137 to 0211).



Fig 27: Perumathura Breakwater Between CP 0210-0211

Since the distance of CP between 137 to 150 (about 2.6 km) is under the control of ISRO and has been declared as Restricted area, the details of coast of this area is unknown. The area under this reach is very calm and maintains good beach in all the seasons. Between CP No 0210 and 0211, the harbor engineering department has constructed the breakwater at Perumathura. Hence, very large shore was created between CP No 0195 to 0211.



Fig 28: Sand mining at North of CP0210 for deeping Perumathura Breakwater

9.4. Reach 4- Perumathura to Paravoor pozhi (0211 to 0288)



Fig 29: Damaged sea wall at Kappil

The Harbour engineering department has constructed a breakwater for fishing harbor and also constructed a groyne between CP No.0211 and 0212. Another most vulnerable areas such as Poothura and Anjuthengu are comes under this reach. The coastal area between CP 0211 to CP 223 is protected by sea wall. But the sea wall between 0211 to 0215 is partially damaged and between 0215 to 0223 is heavily damaged and treated as most vulnerable reach. This portion occures heavy sea attack and also have thick populated area. Hence special attention has to be given to this area and also to be taken the advanced coastal protection methods. The CP stones have not been planted in between CP No 0259 to 0260 (approx 8.4 km) at Varkala. The Varkala cliff, a beautiful place, is slowly disappearing due to severe sea attacks. The above places are in cliffs and some protection work is needed since sometimes the soil erosion has been occurred in the cliff area during the heavy rainy season and due to the heavy sea attack Hence the portion of cliff is also treated as vulnerable. The portion between CP 0262 to 0267 at Edava, the sea wall is fully damaged and in collapsed condition and this location is also treated as vulnerable.



Fig 30: Paravur Cliff



Fig 31: Sea wall between CP 0220 and CP 0221 before and after realigned.

Coastal Damages from CP 288 to CP499



CP 408, Kovilthottam Light house

CP 330, Kollam Beach



Between CP 326 & CP 327



CP 327, Vedikunnu



St Gorge Chappel @ CP 327, Vedikkunnu fully collapsed due to wave attack



May 2023: Between CP 328 & CP 329



May 2024: Between CP 328 & CP 329



Between CP 495 & CP 496, Azheekkal



Mangroves planted @ CP 397 by the local bodies



Sea attack at Azheekkal Beach CP 499

VIII. DETAILS OF STONES

Sl. No.	Description	Thiruvananthapuram	Kollam	Thottapally	Cherthala	Ernakulam	Chavakkad	Parappanangadi	Kozhikode	Thalassery	Total
1.	C. P. Stones	288	212	212	166	212	362	189	372	712	2385
2.	Alignment Stones	288	212	212	166	212	362	189	372	712	2385
3.	Guard Stones	48	36	36	28	36	56	32	64	100	436
4.	K. M. Stones	79	42	42	33	43	72	38	76	158	583
5.	B. M. Stones	12	9	9	7	9	14	8	16	25	109

IX. LIST OF IMPORTANT STRUCTURES

A. Coastal Engineering Section, Thiruvananthapuram

CHURCH

<i>Sl. No.</i>	<i>CP Stone b/w</i>	<i>Name</i>
1	0000 & 0001	Kollamcode Kochupalli
2	0004 & 0005	St.Mathew's Church
3	0005 & 0006	St.Marry's Magdelence Church
4	0019 & 0020	St.Berthodony Church
c	0024 & 0025	St.Andrews Church
6	0025 & 0026	Church of God
7	0029 & 0030	St. Anthonys Church kochuthura
8	0036 & 0037	
9	0078 & 0079	St.Thomas Chuch Poonthura
10	0088 & 0089	St.Asseption Chuch Cheriyaathura
11	0094 & 0095	St.Antony's Forance Church
12	0110 & 0111	St.Peter's Church
13	0115 & 0116	Vettukadu Church
14	0122 & 0123	St.Joseph Church
15	0128 & 0129	St.Thomas Church Veli
16	0152 & 0153	Pallithura Church
17	0153 & 0154	St.Thomas Aquinas Church
18	0156 & 0157	
19	0160 & 0161	St.Dominic Church
20	0163 & 0164	St.Andrews Church
21	0171 & 0172	Puthenthope Church
22	0187 & 0188	St.Joseph's Church
23	0197 & 0198	St.Micheal's Church
24	0220 & 0221	St.Roche's Church
25	0226 & 0227	St.Joseph Church
26	0233 & 0234	St.Antony's Church
27	0234 & 0235	Holy Sprit Church Mampally

TEMPLE

<i>Sl. No.</i>	<i>CP Stone b/w</i>
1	0062 & 0063
2	0063 & 0064
3	0064 & 0065 (2 numbers)
4	0068 & 0069
5	0234 & 0235
6	0238 & 0239
7	0239 & 0240
8	0242 & 0243
9	0282 & 0283
10	0283 & 0284
11	0284 & 0285

MAZJID

Sl. No.	CP Stone b/w
1	0056 & 0057
2	0062 & 0063
3	0084 & 0085
4	0204 & 0205
5	0209 & 0210
6	0253 & 0254
7	0256 & 0257
8	0260 & 0261
9	0274 & 0275 (2 numbers)
10	0281 & 0282
11	0283 & 0284(2 numbers)

KURISADI

Sl. No.	CP Stone b/w
1	0009 & 0010
2	0018 & 0019
3	0027 & 0028
4	0036 & 0037
5	0038 & 0039
6	0042 & 0043
7	0093 & 0094
8	0123 & 0124
9	0157 & 0158
10	0163 & 0164
11	0210 & 0211
12	0213 & 0214
13	0218 & 0219
14	0228 & 0229

FISH LANDING SHED

Sl. No.	CP Stone b/w
1	0002 & 0003
2	0004 & 0005
3	0008 & 0009(2 no)
4	0018 & 0019
5	0019 & 0020
6	0020 & 0021
7	0024 & 0025
8	0025 & 0026
9	0026 & 0027
10	0027 & 0028 (2 no)
11	0028 & 0029
12	0030 & 0031 (2 no)
13	0031 & 0032 (2 no)
14	0032 & 0033 (2 no)
15	0033 & 0034 (2 no)

16	0034 & 0035 (3 no)
17	0035 & 0036 (2 no)
18	0037 & 0038
19	0039 & 0040
20	0040 & 0041 (2 no)
21	0041 & 0042 (3 no)
22	0042 & 0043
23	0043 & 0044 (4 no)
24	0183 & 0184
25	0189 & 0190 (2 no)
26	0193 & 0194
27	0194 & 0195 (2 no)
28	0223 & 0224
29	0253 & 0254
30	0256 & 0257
31	0257 & 0258

ANGANAVADI

<i>Sl. No.</i>	<i>CP Stone b/w</i>
1	0008 & 0009
2	0035 & 0036
3	0043 & 0044
4	0130 & 0131
5	0281 & 0282

Others

<i>Sl. No.</i>	<i>CP Stone b/w</i>	<i>Name</i>
1	0000 & 0001	Rajiv Gandhi centre for Aqua culture
2	0002 & 0003	V.R food enterprises Pvt. Ltd
3	0011 & 0012	Mini park
4	0012 & 0013	Coastal Police station
5	0020 & 0021	Foot ball ground
6	0029 & 0030	Foot ball ground
7	0031 & 0032	Foot ball ground
8	0036 & 0037	Matsya bhavan
9	0036 & 0037	St. Xavior's library & sports club
10	0037 & 0038	Kala Sagar Arts & sports club
11	0039 & 0040	Pulluvila fish market
12	0041 & 0042	Mini park
13	0044 & 0055	Somatheeram beach, Vizhinjam port, Vizhinjam light house, Kovalam beach, Leela resort.
14	0055 & 0056	Kovalam beach
15	0056 & 0057	KTDC Resrot
16	0057 & 0059	Bait Resort
17	0057	Samudra beach
18	0062 & 0063	Coir factory

19	0094 & 0095	Valiyathura bridge
20	0103 & 0107	Sangumugam beach
21	0103 & 0107	Airport
22	0105 & 0106	Art museum
23	0106 & 0107	Sangumugam palace
24	0107 & 0108	Holy cross hospital & Pratheeksha De addiction centre
25	0118 & 0120	Titanium factory
26	0125 & 0127	Veli Touist villa
27	0131 & 0132	Primary health centre
28	0137 & 0149	ISRO (VSSC compound)
29	0152 & 0153	Pallithura higher secondary school
30	0157 & 0158	L P School
31	0161 & 0162	St. Xavior's cicket stadium
32	0162 & 0163	St. Xavior's college
33	0171 & 0172	Stella Marry's convent
34	0178 & 0179	Sea boy fisheries Pvt.Ltd.
35	0210 & 0211	Perumathura break water & bridge
36	0211 & 0212	Fishing harbor,Coastal police station,Harbour Engineering sub division.
37	0223 & 0224	Anjuthengu fort, Anjuthengu light house, community health centre,Sacret heat convent.
38	0225 & 0226	School
39	0226 & 0227	Foot ball ground
40	0227 & 0228	Anjuthengu Panchayath office
41	0228 & 0229	St. Thomas library
42	0229 & 0230	Anjuthengu service co-operative Bank
43	0233 & 0234	St.Antony's L P School
44	0238 & 0239	Kayikkara Asan Smarakam & Asan memorial L P School
45	0240 & 0241	Community health centre
46	0250 & 0251	Arivalam Tourist Park
47	0259 & 0260	Varkkala beach & cliff
48	0268 & 0270	Kappil beach
49	0273 & 0274	Mini park
50	0281 & 0282	Library
51	0287 & 0288	Mini park

Coastal Engineering Section Kollam.

<i>Sl. No.</i>	<i>Location</i>	<i>Structures</i>
1	CP 0292	PWD Kadavu at Mukkam
2	CP 0302	Temple at Thanni
3	CP 0303	Church at Thanni
4	CP 0315	Church near Eravipuram
5	CP 0317	Pier of Port Department at Garfill Nagar
6	CP 0331	Gandhi Park at Kochupilamoodu
7	CP 0336	Church at Pallithottam
8	CP 0336	Kollam Port
9	CP0341	Church at Vadi (Moothakkara Palli)

10	CP 0343	Fishing Harbour at Thankasseri
11	CP0347	Thankasseri Break water park
12	CP0348	Light House at Thankasseri
13	CP 0357	Temple at Thirumullavaram
14	CP 0359	Church at Thirumullavaram
15	CP 0376	Church at Sakthikulangara
16	CP 380	Sakthikulangara Harbour and break water
17	CP 0381	GTS Benchmark at Neendakara
18	CP 0381	Fishing Harbour Port (Breakwater and Bridge) at Neendakara
19	CP 0393	P.B.M and M.C Health Centre at Neendakara
20	CP 0402	St. Francis Church at Karithura
21	CP 0408	Light House and IRE Company at Karithura
22	CP 0409	KMML Ltd at Kovilthottam
23	CP 0414	Church at Kovilthottam
24	CP 0415	St. Francis Church at Karithura
25	CP 0421	Temple at Kattilkadavu
26	CP 0437	Parayakadavu Church
27	CP 0439	Parayakadavu Bridge
28	CP 0446	Temple at Cheriyaazheekkal
29	CP 0452	Cheriyaazheekkal Football Association Club
30	CP 0463	Govt. Homeo Dispensary at Kuzhithura
31	CP0470	Sree Amruthanandamayee Matt and Ayurveda Treatment Centre
32	CP 0477	Pachimeswaram Temple
33	CP 0482	Weigh Bridge
34	CP 0490	Govt. LP School at Srayikadu
35	CP 0497	Valiyazheekkal Bridge Road
36	CP 0499	Fishing Harbour Port (Breakwater near Kayamkulam Pozhi)

Coastal Engineering Section Thottappally

<i>Sl. No.</i>	<i>Location</i>	<i>Structures</i>
1	CP 710	Port building at Alappuzha
2	CP 708	W&C Hospital
3	CP 706	Village office building
4	CP 703	ESI hospital
5	CP 697	SSV LP School Vadakkal
6	CP 687	Catholic church Paravoor
7	CP 680	Catholic church Punnapra
8	CP 676	Industrial unit Khadi and Village Industries-Punnapra

9	CP 656	Auction hall of Harbour Engineering -Valanjavazhi
10	CP 651	Railway line at Kakkazham
11	CP 646	Malsyafed building at Ambalappuzha
12	CP 619	LP School at Anandeswaram
13	CP 609	Thottappally Harbour
14	CP 609	Health Centre at Thottappally
15	CP 604	Coastal Engineering Section at Thottappally
16	CP 605	Spillway at Thottappally
17	CP 578	Mosque and Church at Chelakkad
18	CP 573	Thrikkunnappuzha Temple
19	CP 563	Mosque at Pathiyankara
20	CP 557	Mangalam Water Tank
21	CP 547	Union Bank, Arattupuzha
22	CP 535	Nallanickkal Church
23	CP 500	Break water at Valiyazheekkal
24	CP 500	Azheekkal - Valiyazheekkal Bridge Valiazheekkal

List Of Important Structures Along The Coast Near Shoreline – Ernakulam Sub Division

<i>Sl. No</i>	<i>Name of important structures</i>	<i>Place</i>	<i>Between CP</i>
1	Lighthouse	Alappuzha	CP810
2	Bishop house	Alappuzha	CP811-812
3	Recreation club	Alappuzha	CP810
4	Fish landing centre	Pollethai	CP857-858
5	Chethy harbour	Chethy	CP883-884
6	Arthunkal harbour	Arthunkal	CP908-911
7	Fish landing centre	Arthunkal	CP910-911
8	Arthunkal church	Arthunkal	CP904-905
9	Church	Ottamassery	CP926
10	Church	Thankey	CP929-930
11	Lighthouse	Andhakaranazhi	CP951-952
12	Church	South Chellanam	CP975

13	Chellanam Fishing Harbour	Chellanam	979-981
14	Kannamaly St' Joseph Church	Kannamaly	1021-1022
15	Fort Kochi Beach	Fort Kochi	1067-1072
16	Vypin Light House	Vypin	1081-1082
17	Kuzhuppilly Beach	Kuzhuppilly	1146-1147
18	Cherai Beach	Cherai	1164-1165
19	Munambam Beach	Munambam	1185-1186
20	Coastal Police Station	Azhikkode	CP.1188
21	Lighthouse	Azhikkode	CP.1201 – 1202
22	Beach Park At Snehatheeram	Thalikkulam	CP.1334 – 1336
23	Groyne	Chettuva (S)	CP.1380
24	Groyne	Chettuva (N)	CP.1381
25	LightHouse at Thottappu	Blangad	CP.1406 – 1407
26	A MultiStoried Lodge Building	Blangad	CP.1419 – 1420
27	Single Storied Building Of Fisheries Department (Damaged)		CP.1499 -1500
28	A MultiStoried Building Hatchery, Fisheries	Veliancode	CP. 1510 – 1512
29	BeeviJaram	Puduponnani	CP.1514
30	LightHouse	Ponnani	CP.1548 -1549

List Of Important Structures Along The Coast Near Shoreline – Kozhikode Sub Division

CE Section, Thalassery: -

- 1) Thalai-Gopalpetta Fishing Harbour (CP 2162 to 2168)
- 2) Thalassery Fort and tourism projects (North of CP 2178)
- 3) Tourism development projects at Dharmadam beach (CP 2208)
- 4) Tourism development project at Muzhappilangad beach (CP 2216 to 2232)
- 5) Ayikkara Fishing Harbour (CP 2278 to CP 2281)
- 6) Kannur Fort (CP 2281)
- 7) Payyambalam Beach Park (CP 2301 to CP 2306)
- 8) Azheekal Breakwater (CP 2354)
- 9) Naval Academy, Ezhimala (North of CP 2429)
- 10) Bekal Fort (CP 2656 to CP 2661)
- 11) Kasaragode harbour (CP 2709)
- 12) Light House, Kasaragode (CP 2730)

CES Section, Kozhikode: -

- 1) Fishing Harbour, Chombal at Azhiyur (CP 2100 to 2103).
- 2) Tourism Development Project, Sandbanks, Vatakara (CP 2046).
- 3) Turtle Hatchery, Kolavipalam
- 4) Light House, Thikodi (CP 1982)
- 5) Fishing Harbour Koyilandi (CP 1936 to CP 1939).
- 6) Tourism Development Project, Kappad (CP 1905)
- 7) Fishing Harbour, Puthiyappa (CP 1861 to 1864)
- 8) Fishing harbour-Vellayil (CP 1830 to 1832)
- 9) Light House, Tourism Development Project (CP 1827)
- 10) Brake water and Port, Beypore (CP 1772 to CP 1769).
- 11) Light House and 'NIRDESH', Chaliyam, Kozhikode (CP 1768)
- 12) Bird Sanctuary, Kadalundi and Vallikkunnu (CP 1745 to CP 1743)

CES Section, Parappanangadi: -

- 1) Tourism Development Project and Brake water, Padinjarakkara (CP 1555)
- 2) Tanur harbour (CP 1659 to CP 1662)
- 3) Parappanangadi harbour (CP 1706 to CP 1708)

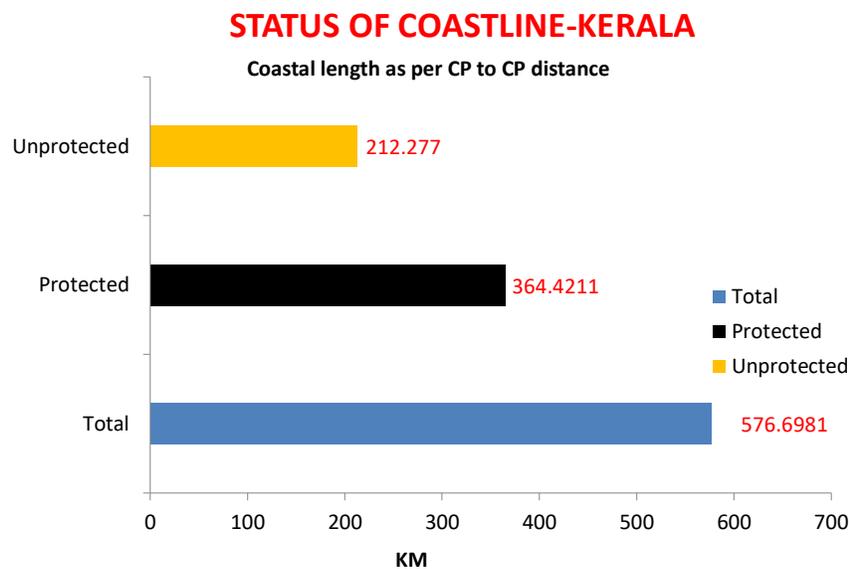
X. DETAILS OF WORKS

1.PLANTING OF NEW CONTROLPOINT STONES, ALIGNMENT STONES, KILOMETER STONES AND BENCH MARK STONES ALONG THE SEA COAST

Control Point Stones and Alignment Stones are the most important reference points for all the collection of data and for carrying out the protection works. In most area, levels are also established on those stones. The regions are referred by the Control Point stones. Shore line measurements, fixing of levels, topographic survey and similar important factors are based on these stones. Similarly, K.M. Stones are established to ear mark each region. BM stones are planted along the shore as permanent level marks. The levels on Control Point Stones are further checked on the basis of the B.M. stones. Many of the Control point stones and alignment stones are seen missing and damaged due to various reasons.

2. INVESTIGATION WORKS

Field studies and collection of data on coastal erosion have been conducted on all Sections under this Division.



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Field visit with NCCR for mapping of coastal structure along Kerala Coast

Staffs under this Office accompanied NCCR team during the field visit in Kerala on the basis of MoU between NCCR & Water Resource Department on “Shoreline management Plan & coastal protection measures for Kerala coast”. We conducted Topographic surveys on hotspot places and provide these datas for NCCR for design purpose. The purpose of field visit was to map all coastal structures to assess their existing status along Kerala coast. Based on the field data, a report on coastal protection structure for Kerala coast was prepared by NCCR which is

essential for the preparation of shoreline management plan & design of new coastal protection strategies for Kerala coast.

Field visit with Central Water Commission (CWC) for preparation of DPR for Salinity Ingress Management Projects in Coastal Areas.

Staffs under this office accompanied with Central Water Commission team during the field visits at Chellanam, Neerkunnam & Kappad for preparation of DPR for Salinity Ingress Management Projects in Coastal Areas.

New instruments purchased

Hand held GPS and Laptop were purchased in this financial year. (kollam)

Details of works under Kollam Sub Division

Civil Works:

Name of Work-GENERAL Replanting Maintenance of missing stone CES-Replanting the new Control point stone Alignment stone and Benchmark stone in place of missing stone and establishing connecting reduced level along the seacoast between CP 0000 and CP 0287, 61 numbers under the jurisdiction of Coastal Engineering Section Thiruvananthapuram-General Civil Work

Details of works under Kozhikode Sub Division

Civil Works:

Sanction for taking up two maintenance work for Re-planting CP Stones and Alignment stones in place of missing stones and one urgent work for Planting Control Point stones, Alignment stones, Kilometre stones for an amount of Rs. 2170500/- under the jurisdiction of CES Section Kozhikode& Thalassery was obtained during 2023-24. Details of works are given below.

- Urgent WorkCES- Planting Control Point stones, Alignment stones, Kilometer stones and Bench mark stones along the coast under Coastal Erosion Studies Section Thalassery at Valiyaparamba in Thrikkariapur LAC
- Replanting missing Control Point stones, Alignment stones, Kilometer stones and Bench mark stones and painting the existing stones between CP 2140 to CP 2750 (Mahe river mouth to Kasaragod) under the jurisdiction of Coastal Erosion Studies Section Thalassery - Phase 1

- Replanting and maintenance of Control Point stones, Alignment stones, Kilometer stones and Bench mark stones Guard stones under the coast under Coastal Erosion Studies Section Kozhikode Phase 1

Details of works under Ernakulam Sub Division

Civil Works:

1. Maintenance works to survey stones including laying new stones in missing places and establishing connecting reduced levels and allied works from CP 1187 to CP 1549 under the jurisdiction of Coastal Engineering Section, Chavakkad for the year 2023-24
2. Maintenance works to Survey Stones including laying new stones in missing places and establishing connecting reduced levels and allied works from CP.810 to CP.975 under the jurisdiction of Coastal Engineering Section Cherthala for the year 2023-24.

DETAILS OF CP & ALIGNMENT STONES UNDER KOLLAM SUB DIVISION

<i>REGION</i>	CONTROL POINTS			ALIGNMENT STONES			<i>REMARKS</i>
	EXISTING	LOST	TOTAL	EXISTING	LOST	TOTAL	
Thiruvananthapuram	193	95	288	217	71	288	
Kollam	167	45	212	171	41	212	
Thottapally	183	29	212	198	14	212	

DETAILS OF CP & ALIGNMENT STONES UNDER ERNAKULAM SUB DIVISION

<i>REGION</i>	CONTROL POINTS			ALIGNMENT STONES			<i>REMARKS</i>
	EXISTING	LOST	TOTAL	EXISTING	LOST	TOTAL	
Cherthala	143	23	166	153	13	166	
Ernakulam	147	65	212	144	68	212	
Chavakkad	312	50	362	315	47	362	

DETAILS OF CP & ALIGNMENT STONES UNDER KOZHIKODE SUB DIVISION

<i>REGION</i>	CONTROL POINTS			ALIGNMENT STONES			<i>REMARKS</i>
	EXISTING	LOST	TOTAL	EXISTING	LOST	TOTAL	

Parappanangadi	179	10	189	169	20	189	New work proposed for replanting
Kozhikode	324	48	372	330	42	372	Work for replanting stones in phase 1 in ongoing & another planting work in phase 2 is tender stage
Thalassery	416	296	712	417	295	712	Works for planting stones at Valiyaparamba & Thalassery phase 2 is ongoing

XI.BOTTLENECK FACING

Coastal Engineering Field Studies is the one and only institution entrusted with the collection of coastal field data and field studies connected with the erosion of the entire sea coast of Kerala, the functions assigned to which are vital & essential. The Chairman, Coastal Protection and Development Advisory Committee (CPDAC) had advised the Chief Secretaries of all Coastal States to create a separate department for dealing with the Coastal Engineering works of the respective states vide Lr.No:4(5)/2000 CED dated 9.6.2000 to organize a coordinated program of collection, compilation, evaluation and publication of coastal data. Hence this wing is to be made permanent.

The staff strength of the wing is insufficient even for the routine performance. Vaccancies of technical field staffs are not filled yet. This affects the efficiency of this wing very much. The CEFS Division is not having the posts of PA/TA., DA.

Coastal Engineering Section, Thalassery coming under the control of Deputy Director, Kozhikode Sub division extends from Mahe to Manjesweram with a length of 148 km. At

present only 90 km is under study reach. No study is being conducted in the remaining 58 km (excluding Naval Academy and Bakel fort). Assistant Director of each section is collecting field data and doing survey works for an average length of about 60Km with the assistance of 2 Draftsman/Overseer.

As far as Kerala Coast is concerned, the sea is turbulent, especially during monsoon and coastal erosion is a common phenomena along the sea coast for which continuous field study in all aspects is essential. At present the wing is collecting data on shoreline measurements, simultaneous observation, preparation of coastal damage reports with photographs and collecting soil samples only. Training programs on Coastal Engineering and allied subjects to update and train the technical personnel of the department regarding the latest development in this field is essential. No training has been conducted under this wing. The study wing now follows old conventional method of observations like visual observations, tape measurements etc. High derivative modern instruments are now available in this field.

25 Kms of stones are not planted on the Northern Side of Kerala ie, in North of Kasargode District. So no details of sea have been taken in that area. That is to be rectified immediately.

Also some stones are missing in the rest of the area, and it should be replanted immediately. Maintenance of the stones are not done till date. It is also to be done urgently.

As per the direction of Chief Engineer, I&A, TVM, the Jeep under CEFS Division has been transferred to MI Division Thrissur, the non-availability of vehicle affects the inspection of the sites.

XII. SUGGESTIONS / RECOMMENDATIONS

Sufficient staff has to be made available for conducting the entire study of coastal erosion. The coastal length coming under the jurisdiction of Thalassery section is 148km, and for studying the entire reach an additional section is to be formed.

The location of new International Port at Vizhinjam is between CP45 to 55 and the construction work is in progress. The construction authority has formed artificial shore and road by using materials drilled from the sea and breakwater construction is in progress. This area needs some specific studies for shoreline characteristics before and after the construction of Vizhinjam Port..Here due to terrain of land CP Stones have not been planted.

Some of the CP stones have been swallowed by the sea waves and some got destroyed by the weathering actions. As the new CP stones have not been planted for the continuous stretch, that profile could not be adopted for aligning sea walls etc. Hence CP stone planting and its timely maintenance is essential.

For getting the sufficient staff strength and for their maximum efficiency this wing is to be made permanent, considering the importance of this Division. Sufficient fund should be allocated for the training of technical staff and for procuring the modern scientific equipments for the collection of coastal data.

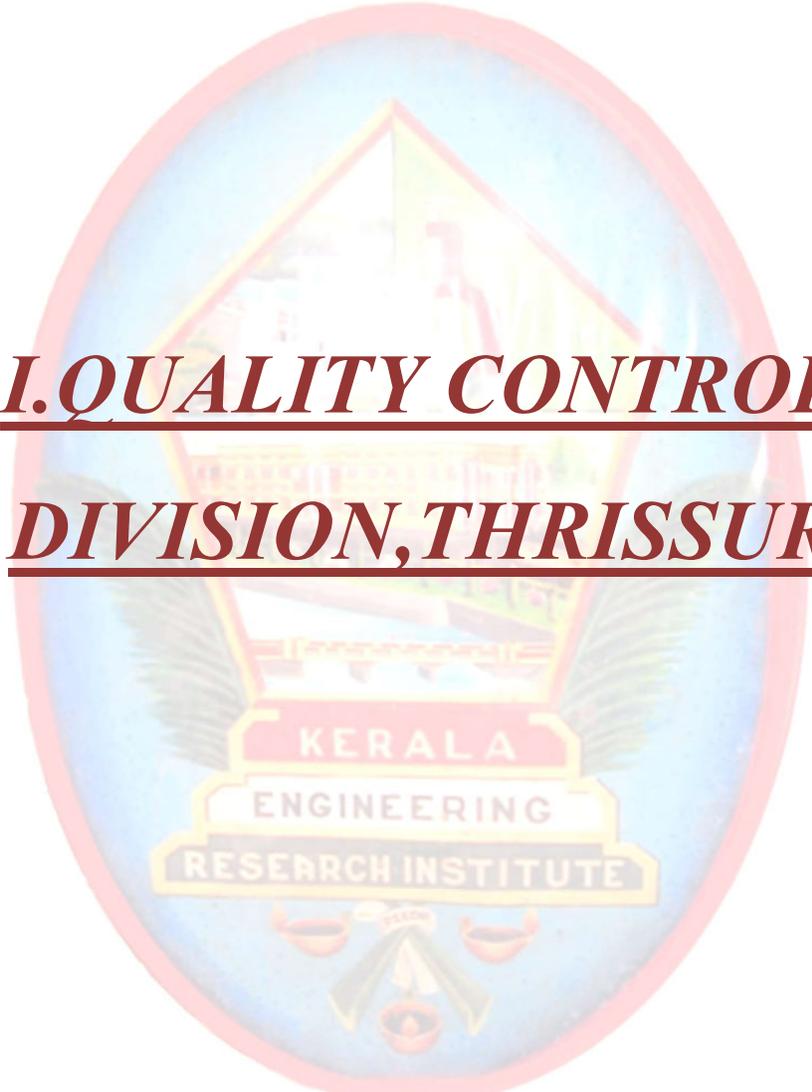
XIII. CONCLUSION

The ongoing studies on coastal erosion in 2023-2024 focus on understanding various erosion causes such as wave action, tidal action, storm surges, and human-made factors. GPS-based shore measurements are being taken from control points to create accurate coastal maps using ARC GIS software. This data will aid future coastal studies and analyses.

Detailed observations are made regarding sea conditions, including wave height, period, direction, tide, littoral drift, wind direction, and beach characteristics (e.g., width, erosion/accretion, material). Information on coastal protection works, dunes, water tables, coastal inlets, and mud banks is also gathered to inform the design of shoreline protection structures like seawalls and groynes.

Special studies are necessary to assess the effectiveness of shore protection works, such as groynes and breakwaters, including pre- and post-construction analyses. However, the study faces challenges due to a lack of modern equipment and limited funding. The feasibility of artificial nourishment and other protection methods, like geotube construction, is also being explored.

Data collection and coastal engineering studies are essential for the development of coastal regions, as they provide the foundation for constructing anti-erosion structures and other infrastructure. Stopping these studies would render the collected data useless, so the work is ongoing to support Kerala's coastal development efforts.



I.QUALITY CONTROL
DIVISION,THRISSUR

Quality Control Division, Thrissur.

The quality control wing under Irrigation Department was formed in 1995 as per G.O.(MS)No. 87/1995/Irrgn dated 13.06.1995 to ensure quality of the works executed by Irrigation Department. There are two Division offices under the wing one at Thrissur with jurisdiction extending from Ernakulam to Kasargod (8 districts) and the other at Kottarakkara with jurisdiction extending from Thiruvananthapuram to Kottayam (6 districts).

Quality Control Division, Thrissur was formed with effect from 15-11-2000 for Checking and monitoring of the quality of works under taken by the Irrigation Department, after abolishing KIP (MCS Division) 2 at Charumoodu as per Govt. order (RE) No.891/2000/IRD Dated: 12-07-2000. Up to 04-03-2010, this division was functioning under the control of Superintending Engineer, I&P Circle, Thrissur. From 05-03-2010 onwards this division is functioning under the direct control of the Director, F& AR,KERI Peechi as per the Govt. Order No. 10 /2010 Dated: 1-2-2010.

The Quality Control Division, Thrissur comprises of a division office at Thrissur and 5 Sub Division Offices at Muvattupuzha, Thrissur, Palakkad, Kozhikode, Kannur & 11 section offices. Monitoring of works executed by the Irrigation Department in Ernakulam, Thrissur, Palakkad, Malappuram, Kozhikode, Wayanad, Kannur and Kasargod are carried out by Quality Control Division, Thrissur.

The main objects of the formation of 5 Subdivisions under the Quality control Division, Thrissur and its functions.

- Muvattupuzha Sub Division was formed on deploying the Chimoni Dam Project in Thrissur District on 1-1-1992 as per GO(Rt) 717/91 Dt. 07-10-1991. The main object of this sub division is to check the quality of works in two divisions of MuvattupuzhaValley Irrigation Project and two divisions of Idamalayar Irrigation Project. There are three sections at Muvattupuzha, Koothattukulam, and Angamaly for this purpose. The quality of works of Muvattupuzha division of Muvattupuzha Valley Irrigation project and Pattissery Dam in Kanthalloor is checked by the Muvattupuzha Quality Control Section. The quality works under taken by the Piravam Division of Muvattupuzha Valley Project is done by the Koothattukulam Quality Control. Quality Control Section Angamaly is checking the quality of works undertaken by the Angamaly Division and Chalakudy Division of Idamalayar Irrigation Project.
- Thrissur Sub Division and its two sections at Thrissur and Ernakulam are envisaged to check the quality of works under taken by the various Execution divisions and

subdivisions of the Irrigation department in Thrissur and Ernakulam Districts. 2nd tier quality control activities of all major and minor Irrigation works under Ernakulam and Thrissur Districts except works under Muvattupuzha, Idamalayar and Chalakkudy Irrigation projects, are coming under this office. The works executed by 9 nos of major and minor Irrigation Divisions are coming under the jurisdiction of this office.

- Palakkad The quality control sub division, Palakkad was formed in the year 1995, with two sections having jurisdiction in the revenue districts of Palakkad and Malappuram. The Quality Control section Palakkad is located at Palakkad and Quality Control Section Malappuram is located at Eswaramangalam, Malappuram.
- Kozhikode Sub Division and its sections namely Kozhikode and Kalpetta are intended to check the quality of works under taken by the various Divisions and sub divisions of the Irrigation Department in Kozhikode and Wyanad Districts.
- Kannur sub division and its two sections at Kannur and Kasargod are intended to check the quality of works undertaken by the various Divisions and subdivisions of Irrigation department in Kannur and Kasargod districts.

Division office at Thrissur

Apart from compiling monthly and quarterly inspection reports received from the five subdivisions, scrutinizing of test results, comparing test results with IS and other approved standards, recommending necessary suggestion if any, are the duties of Division office. Random inspections of major and important works are to be done by the Division office.

Duties of the Division office also include effective coordination and supervision of these sub divisions which have such a vast area of operation in the field of quality monitoring of works under Irrigation Department and also execution of works under head 'Modernization of Quality Control Wing'.

Present functional activities of the Division and Sub divisions

Apart from inspections conducted by the Quality Control sections and Quality Control Sub Division offices, random inspection in major and important works are also being conducted by the Division Office. Shortfalls noticed are brought into the notice of the execution wing with clear direction to rectify the same. The major activities carried out under this office are implementing second tier quality control test, monitor the quality control process relating to the works under the jurisdiction of this office and bring to the notice of the field officers in case any shortfall in the quality of works carried out, approving the result of tests conducted in the QC laboratory and forwarding it with investigation report to the concerned Execution

officers and submit the same to the higher office, preparation and submission of monthly progress reports etc

One of the major projects coming under this Department is Dam Rehabilitation and Improvement Project (DRIP) of major dams of Kerala. Since 2013, the wing is engaged in the Quality Control testing of DRIP works also. DRIP is implementing with financial assistance of World Bank. The second tier quality control testing of the DRIP work is also being done by the quality control wing.

The list of dams that are coming under the Dam Rehabilitation and Improvement Project (DRIP) are as follows.

<i>Sl. No.</i>	<i>DAM</i>	<i>Name of District</i>
1	Pothundy	Palakkad
2	Malankara	Muvattupuzha
3	Vazhani	Thrissur
4	Peechi	Thrissur
5	PeriyarVally Berrage	Ernakulam
6	Chulliar	Palakkad
7	Meenkara	Palakkad
8	Walayar	Palakkad
9	Pazhassi	Kannur
10	Kanhirapuzha	Palakkad
11	Chimoni	Thrissur
12	Kuttiadi	Kozhikode
13	Malampuzha	Palakkad
14	Moolathara Regulator	Palakkad (Chitturpuzha)
15	Karapuzha	Wayanad

As part of modernization of quality control wing, setting up of full-fledged laboratories with modern equipments and machineries etc. under H/A 2701-80-005-93-00-00-V (Modernization of Design wing) is in progress.

Presently we have quality control labs at Koothattukulam, Angamaly, Aluva, Thrissur, Palakkad and Kozhikode. Quality control labs to be set up at Muvattupuzha, Kalpetta, Malappuram, Kannur and Kasargod.

The details of Agreement schedule received, quality control inspection conducted, sample collected and test details during the period 2023-2024 is given below.

Name of Office	Total no of Agreement schedules received	Total Nos of actual intimation received	Total no of site inspections carried out	No of samples collected							Total no of tests conducted	Total No of tests not found satisfactory	Total no of outside tests conducted	Remarks
				Concrete	Steel	Cement	Coarse aggregate	Fine aggregate	other materials if any	Total samples collected				
Quality control Section 1 , Muvattupuzha	23	27	27	27	0	0	0	0	0	27	27	1	0	
Quality control Section 2 , Koothattukulam	16	16	20	16	0	2	11	12	0	41	41	12	9	4 nos surprise visit conducted
Quality control Section 3 , Angamaly	86	81	81	92	0	0	0	0	0	92	92	7	0	
Quality Control Sub Division Muvattupuzha Total	125	124	128	135	0	2	11	12	0	160	160	20	9	
Quality control Section , Thrissur	91	93	93	101	0	9	2	2	0	114	98	6	27	Out of 93, site inspections, 7 nos of are general inspection
Quality control Section , Ernakulam	67	167	167	152	0	3	4	9	0	168	139	10	0	Out of 167, site inspection 44 nos are general inspection

Quality Control Sub Division Thrissur Total	158	260	260	253	0	12	6	11	0	282	237	16	27	
Quality control Section , Palakkad	90	90	68	39	0	0	1	6	0	46	46	15	1	
Quality control Section , Malappuram	28	28	40	21	3	0	0	0	0	24	24	1	3	
Quality Control Sub Division Palakkad Total	118	118	108	60	3	0	1	6	0	70	70	16	4	
Quality control Section , Kozhikode	102	99	130	93	0	0	1	1	0	95	101	0	0	
Quality control Section , Kalpetta	66	169	171	151	0	0	1	2	0	154	154	0	0	
Quality Control Sub Division Kozhikode Total	168	268	301	244	0	0	2	3	0	249	265	0	0	
Quality control Section , Kannur	120	104	148	91	0	0	0	0	0	91	91	0	91	

Quality control Section , Kasargode	30	119	173	111	0	0	0	0	0	111	111	0	111	
Quality Control Sub Division Kannur Total	150	223	321	202	0	0	0	0	0	202	202	0	202	

Budget Allotments and expenditure

The needs of this division is met with the provisions allotted under the head of account 2701-80-005-97 Investigation & Design & 2701-80-005-93 (Modernisation of Design Wing) under Plan and from 2701-80-004-96 for Non Plan wing.

Expenditure (For Thrissur Division)

<i>Plan / Non Plan</i>	<i>Heads of A/c</i>	<i>2023-24</i>
Plan	2701-80-005-93	Rs. 13.1 lakhs
Non Plan	2701-80-004-96	Rs. 725.83 lakhs

Various Test facilities available in the QC Lab under Muvattupuzha Sub Division

<i>SI No.</i>	<i>Name of Test</i>	<i>Remarks</i>
1	Consistency Test of Cement	
2	Initial & Final Setting time of Cement	
3	Compressive strength test of 150mm cubes and cylinder	
4	Compressive strength of Bricks, PCC block and paving tile	
5	Non Destructive Test--Rebound hammer test	
6	Slump test for fresh concrete	

Various test facilities available in QC Lab Thrissur

<i>SI No.</i>	<i>Name of Test</i>	<i>Remarks</i>
	CEMENT	
1	Fineness by sieving	
2	Test for consistency	
3	Setting time (Initial & Final)	

4	Determination of compressive strength	
	Testing of Aggregates	
5	Sieve Analysis of fine/ Coarse aggregates	
6	Unit weight, Bulk Density and Voids	
7	Water Absorption	
8	Specific gravity	
9	Aggregate Impact value	
10	Aggregate Crushing value	
11	Bulking of sand	
	Testing of Concrete and Mortar Cubes (Where material is supplied)	
12	Testing of 70.6mm cubes for compressive strength test	
13	Testing of 100mm cubes for compressive strength test	
14	Testing of 150mm cubes for compressive strength test -	
	Tests on Bricks and Tiles	
15	Water Absorption for bricks/tiles	
16	Compressive strength of bricks of all kind	
17	Effective length and width of tiles	
18	Efflorescence test	
	Tests on Steel	
19	Finding the diameter and weight per meter length	
	Tests on Building Stones	
20	Compressive strength test of building stones of 5 cm or nearest size cubes	
21	True Specific gravity	
22	Water Absorption test (stone blocks)	
23	Compressive strength of building stones, cutting and sizing the specimen in rock cutting machine	
24	Compressive strength of building stones, 50mm cutting and sizing the specimen in rock cutting machine and grinding uneven surfaces to line and level	
25	Concrete mix design	
26	NDT Test --Rebound hammer test	
27	Concrete core Drilling ,Cutting and its compressive test	
	SOIL TEST	
28	Specific gravity test	
29	Moisture content determination	
30	Bulk density, void ratio & porosity	
31	Atterberg limits	
32	Light Compaction test	

33	Heavy compaction	
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Quality Control Lab Ernakulam

<i>SI No.</i>	<i>Name of Test</i>	<i>Remarks</i>
CEMENT		
1	Fineness by sieving	
2	Test for consistency	
3	Setting time (Initial & Final)	
4	compressive strength test of cement	
5	Slump test	
6	Soundness	
Testing of Aggregates		
1	Sieve Analysis of fine/ Coarse aggregates	
2	Aggregate Impact value	
3	Aggregate Crushing value	
Testing of Concrete and Mortar Cubes (Where material is supplied)		
1	Compression strength test of cement and mortar cubes	

Details of test/ Services available in QC Lab Palakkad

Test on Cement		Remarks
1	Normal consistency- Vicat apparatus	
2	Initial setting time - Vicat apparatus	
3	Final setting time- Vicat apparatus	
4	Fineness- 90 micronsieve	
6	Tensile strength of cement(standard briquette test with standard sand)	
Test on fine aggregate		
1	Sieve analysis	
2	Bulking of sand -lab method using measuring jar	
Test on coarse aggregate		
1	Sieve analysis	
2	Aggregate impact test	
3	Aggregate crushing test	
Test on Fresh concrete		
1	Slump test	
Test on hardened concrete		
1	Compression test of concrete.	

Details of test/ Services available in QC Lab Kozhikode

<i>Sl No</i>	<i>Name of Test/Services</i>	<i>Remarks</i>
1	Compression Test / Cube test on concrete blocks	
2	Sieve Analysis of sand (using Electrical , Manual sieve shaker)	
3	Slump Test	
4	Vicat Apparatus -Initial Setting Time, Final Setting Time of cement	
5	Le-Chatlier Apparatus- for soundness of cement	
6	Liquid Limit ,Plastic Limit & Shrinkage Limit for soil	
7	Compaction Factor Test (Light & Heavy)	
8	Specific Gravity Test (Pycnometer & Specific Gravity Bottle) for soil	
9	Cone Penetro Meter (Digital) Test for soil	
10	Aggregate Impact Test	
11	Crushing value - coarse aggregate	
12	Grain size analysis with Hydrometer	
13	Tensile Test cement	
14	Core cutting	
15	Compaction factor	

Staff strength**1.Muvattupuzha Sub Division**

<i>Sl. No.</i>	<i>Category</i>	<i>Sanctioned strength</i>	<i>Present strength</i>
1	Asst. Exe. Engineer	1	1
2	1st Grade D'man	1	1
3	2nd Grade D,man	1	1
4	Head Clerk	1	1
5	Senior Clerk/Junior Clerk	3	1
6	Typist	2	0
7	Office Attendant	3	2

Quality Control Section No.1 Muvattupuzha

<i>Sl No</i>	<i>Staff Details</i>	<i>Sanctioned strength</i>	<i>Present strength</i>
1	Assistant Engineer	1	1
2	First Grade Overseer	1	1
3	Third Grade Overseer	1	1

Quality control section III,Angamaly			
<i>Sl. No.</i>	<i>Category</i>	<i>Sanctioned strength</i>	<i>Present strength</i>
1	Asst. Engineer	1	1
2	3rd Grade Overseer	1	1
3	2nd Grade Overseer	1	1
4	Part Time Sweeper	1	1

Quality Control Section No.2 Koothattukulam			
<i>Sl No</i>	<i>Staff Details</i>	<i>Sanctioned strength</i>	<i>Present strength</i>
1	Assistant Engineer	1	1
2	Second Grade Overseer	1	1
3	Third Grade Overseer	1	0

Quality Control Sub Division, Thrissur

<i>Sl. No.</i>	<i>Category</i>	<i>Sanctioned Strength</i>	<i>Present strength</i>
1	Assistant Executive Engineer	1	0
2	Head Clerk	1	1
3	Clerks	2	2
4	Typist	1	1
5	Office Attendant	2	1
6	First Grade D'Man	1	1
7	Second Grade D'Man	1	1
8	Driver	1	1
9	Part time Sweeper	1	1

Quality Control Section, Thrissur

1	Assistant Engineer	1	1
2	Second Grade D'Man	1	1
3	Third Grade Overseers	2	2
4	Lascar	1	1

Quality Control Section, Eranakulam-Aluva

1	Assistant Engineer	1	1
2	Second Grade D'Man	1	1
3	Third Grade Overseers	1	1
4	Lascar	1	1

Quality Control Sub Division, Palakkad

<i>Sl.No.</i>	<i>Post</i>	<i>Sanctioned Strength</i>	<i>Present Strength</i>
1.	Assistant Executive Engineer	1	1
2	Head clerk	1	1
3	Clerks	3	2 (1-vacant)
4	Typist	1	1
5	Overseer Grade I	1	1
6	Overseer Grade II	1	1
7	Office Attendant	1	1
8	Driver	1	1
9	Part Time Sweeper	1	1
Quality Control Section, Palakkad			
1.	Assistant Engineer	1	1
2.	Overseer Grade II	1	1
3.	Overseer Grade III	1	1
4.	Lascar	1	1
Quality Control Section, Malappuram			
1.	Assistant Engineer	1	1
2.	Overseer Grade II	1	Vacant
3.	Overseer Grade III	1	1
4.	Lascar	1	Vacant

Quality Control Sub division Kozhikode

<i>Sl.No.</i>	<i>Category</i>	<i>Sanctioned strength</i>	<i>Present strength</i>
1	Assistant Executive Engineer	1	1
2	I st Grade Draftsman	2	2
3	Head Clerk	1	1
4	LD/UD Clerk	3	3
5	Typist	1	1
6	Office Attendant	2	2
7	Part Time Sweeper	1	1
Quality Control Section Kozhikode			
1	Assistant Engineer	1	0 (1 vacant)
2	II st Grade Draftsman	1	1
3	III rd Grade Draftsman	1	1
Quality Control Section Kalpetta			
1	Assistant Engineer	1	1

2	II st Grade Draftsman	1	1
3	III rd Grade Draftsman	1	1

Quality Control Sub Division, Kannur

<i>Sl. No.</i>	<i>Category</i>	<i>Sanctioned Strength</i>	<i>Present strength</i>
1.	Assistant Executive Engineer	1	0 (1 vacant)
2.	I st Grade Draftsman	1	1
3.	Head Clerk	1	1
4.	LD/UD Clerk	3	2 (1 vacnt)
5.	Typist	1	1
6.	Office Attendant	2	2
7.	Driver	1	1
Quality Control Section, Kannur			
1.	Assistant Engineer	1	1
2.	III Grade Overseer	1	1
Quality Control Section, Kasargod			
1.	Assistant Engineer	1	1
2.	I st Grade Overseer	1	1
3.	III Grade Overseer	1	1

Irrigation Quality Control Division, Thrissur

<i>Sl. No.</i>	<i>Category</i>	<i>Sanctioned strength</i>	<i>Present strength</i>
1	Exe. Engineer	1	1
2	Asst. Exe.Engineer/Tech. Asst.	1	1
3	1st Grade D'man	1	1
4	2nd Grade D,man	2	2
5	Blue Printer	1	1 (Vanishing post)
6	Divisional Accountant	1	1
7	Junior Supdt	2	1 (1 Vacant)
8	Senior Clerk/Junior Clerk	8	7(1 Vacant)
9	Typist	1	1
10	Office Attendant	3	3
11	Watchman	1	1
12	Part Time Sweeper	1	1
	Total	23	21

Additional staff requirement in the newly set up QC Labs

1. Quality control lab at Thrissur

Sl.No.	Category	Required strength
1	First Grade D'man	1
2	Third Grade Overseer	1
3	Worker Grade I/Lascar	1
4	Part Time Sweeper	1

2. Mini quality control lab at Aluva, Ernakulam

Sl.No.	Category	Required strength
1	Third Grade Overseer	1
2	Worker Grade I/Lascar	1

3. Quality control lab at Palakkad

Sl.No.	Category	Required strength
1	First Grade Dman/Lab in charge	1
2	Worker Grade I/Lascar	2

4. Quality control lab at Kozhikode

Sl.No.	Category	Required strength
1	First Grade Dman/Lab in charge	1
2	Worker Grade I/Lascar	2

Moreover the offices has a shortage of staffs. These vacancies should be filled at the earliest for the smooth functioning of the said offices.

Conclusion

The testing of materials and concrete etc. as the part of routine first tier quality control process by the execution wing are now done in the outside laboratories. Such test results can be more credible, authoritative and trust worthy if these are done in Quality Control Labs under our control. After posting necessary Lab staff, additional revenue can be generated, by doing tests of private agencies, other Departments and for contractors conducting tests as per agreement.



J.QUALITY CONTROL
DIVISION, KOTTARAKKARA

QUALITY CONTROL DIVISION, KOTTARAKKARA

Introduction

At Present Quality Control Division Kottarakkara have Four Sub Divisions at Thiruvananthapuram, Kottarakkara, Alappuzha and Kottayam and Seven sections which are Thiruvananthapuram, Kollam, Kottarakkara, Alappuzha, Pathanamthitta, Kottayam and Idukki under its control. This Division has jurisdiction over six districts namely, Thiruvananthapuram, Kolam, Alappuzha, Pathanamthitta, Kottayam and Idukki.

Duties of the Division office include effective coordination and supervision of these sub divisions which have such a vast are of operation in the field of quality maintenance of work under Irrigation Department. Apart from inspections conducted by the Quality Control section and Quality Control Sub Division Offices, random inspections in major and important work are also being conducted by the Division Office. Irregularities noticed are brought into the notice of the execution wing with clear direction to rectify the same.

1.Irrigation Quality Control Sub Division, Thiruvananthapuram

Irrigation Quality Control Sub division, Thiruvananthapuram Office is under the control of IDR Chief Engineer, and Headed by the Director, Kerala Engineering Research Institute, Peechi. Our Division office is at Kottarakkara. Entire Thiruvananthapuram District comes under the jurisdiction of this office. All Minor Irrigation, Major Irrigation, Inland Navigation works in Thiruvananthapuram and Kollam Districts are to be monitored by this office. As per the Department Quality Manual Second Tier Quality Tests are conducted by this section office on random basis. It includes site inspection, monitoring the method of construction as per norms, sample collections, testing and analysis the test result with Indian Standard Codes, and records it on test result register. Then inform the concerned execution wings to take necessary corrective measures if needed.

1.1. Main Objects of Formation of Sub Division:

The main objective of forming this sub division is to monitor and ensure the quality of works are executed under its jurisdiction as per the specification and standards. If any deviation from test result values as per manual were obtained can be informed and advised the remedial measures to the execution wing hence there by rectification and modification of the structure can be done at an earlier stage.

1.2 Present Functioning Activities and Achievements

As per the department quality manual our office done the second tier quality tests on random basis. It includes site inspection, monitoring the work as per specifications and standards, Sample collection, Testing, Analysis the test result with relevant Indian standards and submit quality inspection report to higher offices.

Mainly Samples of M10 and above strength concrete works were taken for testing compressive strength of 28 days. During inspection brand and grade of cement used for the work and the physical appearance of other construction materials used for the work were noted and reported. After the site inspection the quality report in prescribed format will submit to higher office along with test results.

During the site inspection brand and grade of cement, physical appearance of all the materials used for the mix were noticed and tabulated in the report. Also the cross sectional details of the structure also verify with the agreed schedule and detailed estimate (T.S. recorded). Also taking photographs of site visited and kept as a record.

Regarding the Achievement of this Sub Division, under the Head of Modernization of Design wing(2701-80-005-93-00-00-P-V) 8 nos of works were sanctioned under action plan for 2023-2024 for Rs. 7.05 Lakhs. Two works were completed and 5 works are progressing. The Total expenditure for Financial year 2023-24 is Rs.2,07,274/-

1.3 Number of Inspections and Tests Conducted During this Period

During the financial year 2023-2024, 201 site inspections were conducted and 220 cube samples were tested, out of which 198 passed and 22 failed. All the test result reports were submitted to Quality Control Division office and also reported to the execution offices in time. An amount of Rs. 60,827/ had been received as Revenue from first tier quality tests conducted in labs under this sub division

**1.4 Pictures of test conducted on major and important works at Thiruvananthapuram
.Quality Control Section, Thiruvananthapuram**



*Construction of boat jetty at Panayilkadavu.
(Inland navigation Section Chirayinkeezhu.)*



*Retaining wall along east side of Kottukonam chira in Akkulam Ward.
(Minor Irrigation Section Thiruvananthapuram.)*



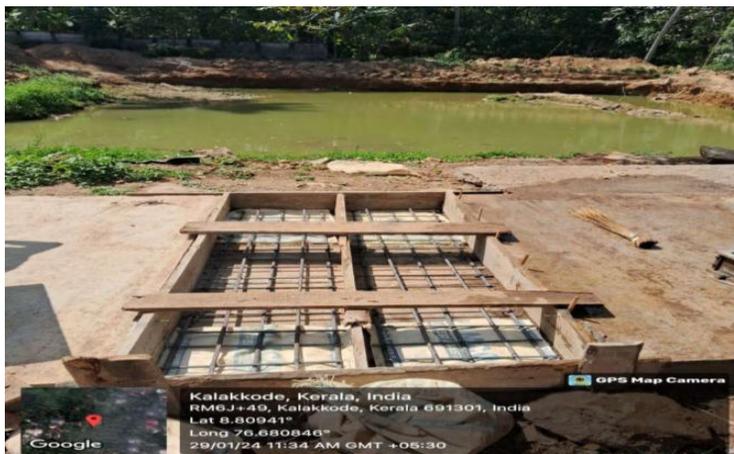
*Renovation of Kudavoor Mahadeva Temple pond-
Middle belt over D R Packing. (Minor Irrigation Section Kazhakootam)
Quality Control Section, Kollam*



Side Protection works for Thettiyođu Thodu



Renovation of Renovation of Njarod el



Pathmanabhan Boat Jetty

2. Irrigation Quality Control Sub Division, Kottarakara

Quality Control Wing was formed in the Irrigation department in the year 1995. The Control wing is under the control of Chief Engineer Investigation Design & Research Board (IDRB) with headquarters at Thiruvananthapuram. Quality Control Section Office Kottarakkara is under the Quality Control Sub Division Kottarakkara. There is a Quality Control Lab attached with this section office. The jurisdiction of the section office includes area under Kallada Irrigation Project (KIP) which is distributed in Kollam, Pathanamthitta and Alappuzha districts.

2.1 Functional Activities

Quality Control process is the required inspection, testing and corrective measures during the construction structures. The main function of the Quality Control Section office is to monitor the works of Kallada Irrigation Project and to conduct second tier test for these works. Quality of concrete, construction materials such as cement, coarse & fine aggregates, reinforcement steel etc, and workmanship are being inspected during the quality check. Currently limited testing facilities are available in our Laboratory. This includes testing of compressive strength of concrete and sieve analysis of coarse and fine aggregates. The main works under KIP are to inspect canal lining works, construction of culvert, canal inspection roads, concreting of flume beds etc. For all the sites visited a detailed inspection report is done monthly from the section office.

Apart from KIP works, the testing of the concrete cube samples collected from the quality section offices Pathanamthitta is also being carried out in this office. In addition to Irrigation Department works testing, testing from other Government departments and for public are also

conducted here. Through the above said testing, a revenue of Rs. 4,35,557 /- was generated in the financial year April 2023- March 2024.

2.2 Achievements for the year 2023-2024

During the financial year 2023-24, 60 Intimations received and 65 site inspections were conducted and 63 concrete cube samples were collected during site visits. 84 samples were received from the Quality Control Section offices at Pathanamthitta. The samples were tested and the results were intimated to the respective Assistant Engineers. 444 samples were obtained from Irrigation department, public and other govt. departments other than Irrigation Quality Control wing. The total revenue of Rs. 4,35,557 /- was generated by conducting tests for these samples collected.

Under the modernization of design wing maintenance work of Quality Control Division office and Quality Control Section office, Kottarakkara was also accomplished for Rs.6,56,116/-

2.3 Aims for the year 2024-25

To inspect all intimations that would be received from KIP offices during financial year 2024-2025. With CTM, Compression Strength of more concrete samples could be tested. Maximum revenue could also be generated by conducting compressive strength tests of samples collected from private agencies, other government departments and also from Irrigation department other than Quality Control wing. By the introduction of new equipments, more tests may be done in Quality Control Laboratory Kottarakkara and thus revenue can be generated. Through all these, a smooth running of the lab would be achieved.

2.4 Pictures of test conducted on major and important works at Kottarakkara



Concreting the long and short beam of the bridge with RCC 1:1.5:3 near Ch 5000m of RBMC



Canal bund road concreting with CC 1:2:4 using 20mm metal near Ch.5200m

3. Irrigation Quality Control Sub Division, Alappuzha

Irrigation Quality Control Sub Division, Alappuzha was formed in 1995 with two section offices one at Alappuzha and the other at Pathanamthitta Districts. Irrigation Quality control Section Alappuzha conducts inspection of Irrigation works under Alappuzha district which includes Major, Minor, PIP and some works under Kuttanad Package. Irrigation Quality Control Section Pathanamthitta conducts inspection of irrigation works under Pathanamthitta district which includes works under Major Minor and PIP

Irrigation Quality Control Section, Alappuzha office functioned at Mini Civil Station Alappuzha which has a Mini lab in which sieve analysis of aggregates carried out Concrete cube samples are tested in Quality Control Lab in Thanneermukkom under Inland Navigation and Kuttanad Package. Irrigation Quality Control Section, Pathanamthitta office situated on Pathanamthitta Civil Station compound. It has a lab in which sieve analysis of aggregate are carried out Concrete cube samples are tested in the lab of Quality Control Section, Kottarakara Water Samples are tested in Water Authority Lab in each districts.

Proposal for new lab under Irrigation Quality Control Sub Division, Alappuzha at Alappuzha is pending due to some issues related to the transfer of land from revenue department.

3.1 Activities

Works carried out in the above offices in Alappuzha and Pathanamthitta district are inspected by the sections and collected samples of coarse aggregate fine aggregate, concrete and water.

Concrete cube samples (15 cm x15 cm x15cm) collected by Irrigation Quality Control Section Pathanamthitta are tested at Quality control lab at Kottarakkara and Quality Control Section Alappuzha are tested at Quality Control Lab Thanneermukkom under Kuttanad Package

Results with criteria calculation sheet of the samples collected from the 43 section offices are tested and submitted to this office. They are verified in this office and submitted to Quality Control Division, Kottarakkara. Results not satisfied are intimated to the execution sub divisions and QC Division Kottarakkara for necessary action.

3.2 Main Objectives

Major irrigation works , Minor irrigation works and PIP works are inspected under this office LI Channel , main canal, Pump House protection work, Check Dam, Aqueduct, construction of boat jetty's ,construction of culvert and side protection of thodu are inspected included. Most of the works done by minor irrigation are side protection of thodu and construction of culvert.

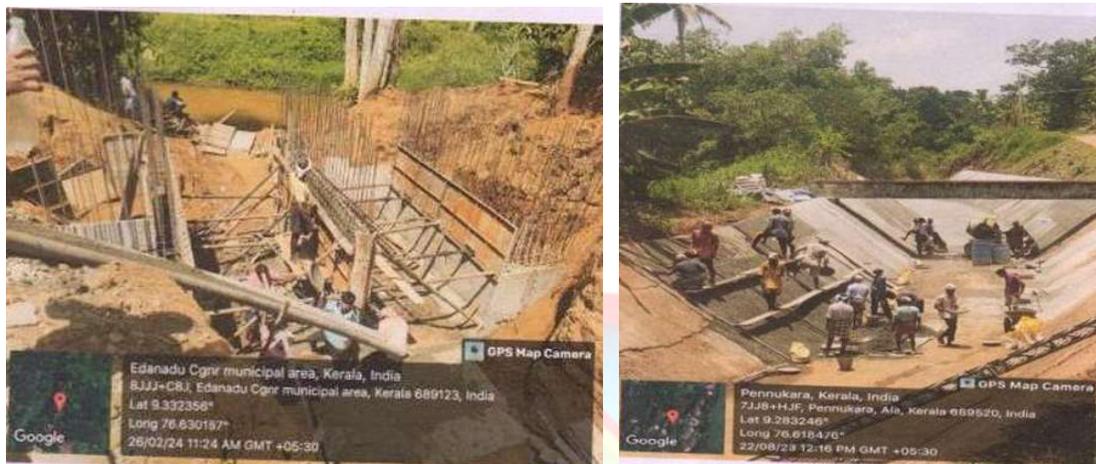
Construction materials like broken stone, sand water and concrete samples are collected from the site by the section offices. Site inspection report, test results of concrete samples, sieve analysis of coarse and fine aggregate and result of water tested at Water Authority Alappuzha and Thiruvalla labs are submitted to this office. The result are verified in this office and then submitted to Division Office. Sieve analysis is done using sieve of prescribed sizes for coarse aggregate and fine aggregate. Percentage passing of both fine aggregate and coarse aggregate are calculated and their classification is done as whether coarse sand or medium sand or fine sand and the zone is also identified.

Colour of sand is also noted. The type of materials used including cement are also checked and direction given to use the required type of materials for the particular work. The types of machineries used are also checked and direction given to use the required type of machinery for the particular work. We ensure that vibrators are used for compaction if necessary in all work

3.3 Target & Achievements

Total Target of inspection is 200 and achieved 184 Nos

3.4 Pictures of test conducted on major and important works at Alappuzha



4. Irrigation Quality Control Sub Division, Kottayam

There are two sections under Quality Control Sub division. Kottayam section and Idukki section. The jurisdiction of the Subdivision covers Kottayam and Idukki districts. Quality monitoring of the Irrigation projects under major and minor irrigation divisions comes under this office.

4.1 PRESENT SCENARIO

KOTTAYAM SUB DIVISION

Presently the staff pattern of the Sub division office consist of Assistant Executive Engineer, one number of Head clerk, two numbers of UD clerks, one number of first grade draftsman, one number of second grade draftsman, one number of office attendant, one number of driver, one number of typist,

KOTTAYAM SECTION

Presently the staff pattern of this office consist of Assistant Engineer, one number of first grade overseer, two number of third grade overseer. In addition to these staff two trainees were appointed for this year

IDUKKI SECTION

Presently the staff pattern of this office consist of Assistant Engineer, one number of first grade overseer, two number of third grade overseer, one number of lascar. In addition to these staff one number of trainee was appointed for this year.

4.2 Present Functioning Activities and Achievements

As per the department quality manual our office done the First and second tier quality tests on random basis. It includes site inspection, monitoring the work as per specifications and standards, Sample collection, Testing, Analysis the test result with relevant Indian standards and submit quality inspection report to higher offices. Sieve analysis is done using sieve of prescribed sizes for coarse aggregate and fine aggregate. Percentage passing of both fine aggregate and coarse aggregate are calculated and their classification is done as whether coarse sand or medium sand or fine sand and the zone is also identified.

Regarding the Achievement of this Sub Division, under the Head of Modernization of Design wing (2701-80-005-93-00-00-00-P-V) 7 nos of works were sanctioned under action plan for 2023-2024 for Rs. 9.56 Lakhs. Two works were completed and 4 works are progressing. Spill over works are completed. The total revenue of Rs.63,955/- was generated by conducting tests for samples collected.

4.3 DETAILS OF SITE VISIT

Kottayam section

The quality monitoring of six sections under two subdivisions of Minor Irrigation Division and six sections under two subdivisions of Major Irrigation Division comes under this office. In addition to that, monitoring of works under MRVS, Hydrology etc. in Kottayam District also comes under this office. Site inspections and quality tests of these works are done through this office. Testing and report preparation is done as per the new and updated Indian standards. The main tests conducted through this office are compressive strength of concrete, sieve analysis of fine and coarse aggregates etc. In this financial year 62 sites were visited and samples were collected. Compressive strength tests of 7 works were failed during this year. Field tests such as slump test, bulking of fine aggregate, pH of water etc are tested whenever needed.

Idukki section

A total of 74 site visits were conducted, out of which 1 were surprise visit. Fine aggregate and coarse aggregate samples were collected for sieve analysis. 61 number of concrete cubes and 13 number of concrete cylinders were collected for conducting compressive strength test. Out of the 74 compressive strength tests conducted, 4 number of tests failed.

4.4.FACILITIES MADE AVAILABLE AT QC LAB

QC LAB KOTTAYAM

- a) Concrete mix design –
Normal concrete and self compacting concrete
- b) Tests on soils
 - Grain size analysis of soils
 - Water content of soils
 - Water content-dry density relation using light compaction
 - Water content-dry density relation using heavy compaction
 - Liquid limit
 - Plastic limit
 - Specific gravity of soil
 - Field density using large sand pouring cylinder
 - Field density using large small pouring cylinder
- c) Tests on cement
 - Compressive strength of cement
 - Consistency, setting time of cement
 - Specific gravity and fineness of cement by dry sieving
 - Soundness of cement by le chatlier method
- d) Tests on aggregate
 - Sieve analysis (fine & coarse aggregate)
 - Specific gravity and water absorption
 - Bulk density and voids of aggregates
 - Bulking of fine aggregate (field method)
 - Flakiness index/Elongation index test
- e) Tests on concrete and bricks
 - Compressive strength of concrete, bricks
 - Slump test
 - Rebound hammer test
 - Water absorption of bricks
 - Efflorescence of bricks
- f) Tests on water
 - PH test

g) Non Destructive test

- Rebound Hammer test

QC LAB IDUKKI

a) Tests on soils

- Light compaction test
- Liquid limit
- Plastic limit
- Plastic size distribution
- Specific gravity of soil
- Field density test

b) Tests on cement

- Compressive strength of cement
- Consistency, setting time of cement

c) Tests on aggregate

- Elongation test
- Flakiness test
- Bulk density of coarse aggregate
- Sieve analysis

d) Tests on concrete

- Compressive strength of concrete
- Slump test

4.6.TRAININGS CONDUCTED

In this financial year online training on 'STORE PURCHASE MANUAL' was conducted under CTFM on 21/06/2023. All Technical staff in this office attended the training.

Also Assistant Engineer QC section, Kottayam attended two days training programme conducted by National Council for Cement and Building Materials on 'NON DESTRUCTIVE TESTING AND EVALUATION OF CONCRETE STRUCTURES'.

In addition to that 14 days Internship programme for Engineering students from Saintgits College of Engineering were conducted under Quality control Sub Division Kottayam. Lab sessions and Concrete mix design trials were also conducted



Internship Training Programme photos

4.8. FUTURE PLANS

1. Construction of new building for quality control laboratory at Kottayam and Idukki
2. Upliftment of testing facilities in the lab
3. Increasing revenue generation using available testing facilities.
4. Conducting internal training programmes.

4.9 PHOTOS OF SITE INSPECTIONS



Protecting the Kalathuvathodu (Kottathavalam) road near VarambanattuSreeDharmasastha Temple in ward no. 4 of PoonjarThekkekaraPanchayath



Renovation of AnthiMahakalanKavu temple pond in ward no.6 of Neendoorpanchayath



Protecting the right bank of Chakinithodu- near Samaritin Resource centre ,Cherpunkal in KidangoorPanchayath



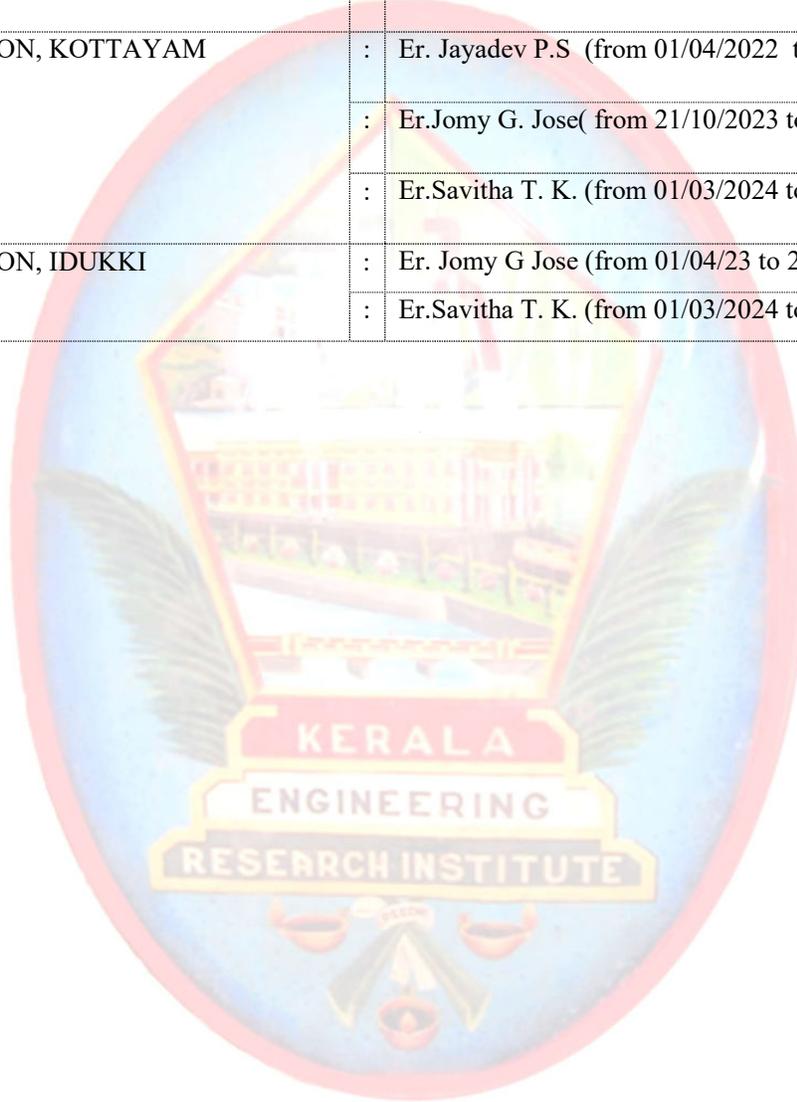
New canal construction of peroor L.I Scheme –Peroorpadasekharam (vazhatharabhagam) canal in Ettumanoor Municipality in Ettumanoor Consistency

2. PERSONNEL

The Executive officers who headed the various offices under Quality Control Division, Kottarakara during the financial year 2023-2024

QUALITY CONTROL DIVISION, KOTTARAKKARA	
EXECUTIVE ENGINEER	Er. Anjana.G.S (01/04/2023 to 31/03/2024)
ASSISTANT EXECUTIVE ENGINEERS	
QUALIYY CONTROL SUB DIVISION, THIRUVANANTHAPURAM	: Er. Leenakumari P. S. (from 01/04/2023 to 20/12/2023) : Er. Sheeja S Nair. (from 20/12/2023 to 31/03/2024)
QUALIYY CONTROL SUB DIVISION, KOTTATAKARA	Er. Ajaya Kumar (From 01/04/2023 to 31/03/2024) : Er. Deepa P (From 01/04/2024 to 31/03/2024)
QUALITY CONTROL SUB DIVISION, ALAPPUZHA	: Er. Jessy Thomas (from 01/04/2023 to 31/03/2024)
	: Er. Merin Thomas (from 01/04/2023 to 22/11/2023)
QUALITY CONTROL SUB DIVISION, KOTTAYM	: Er. Jomy G Jose (from 23/11/2023 to 30/11/2023) : Er. Anithakumari S (from 01/12/2023 to 31/03/2024)
ASSISTANT ENGINEERS	

Q.C SECTION, THIRUVANANTHAPURAM	:	Er.. Ambili.I (from 01/04/2023 to 31/03/2024)
Q.C SECTION, KOLLAM	:	Er.. Rajeena.M (From 01/04/2023 to 31/03/2024)
Q.C. SECTION , KOTTARKARA	:	Er. Neha Yohannan (From 01/04/2023 to 31/03/2024)
Q.C SECTION, ALAPPUZHA	:	Er. Anjana S (from 01/04/2022 to 31/03/2023 onwards)
Q.C SECTION, PATHANAMTHITTA	:	Er.Deepa B (from 01/04/2023 to 31/03/2024 onwards)
Q.C SECTION, KOTTAYAM	:	Er. Jayadev P.S (from 01/04/2022 to 20/10/2023)
	:	Er.Jomy G. Jose(from 21/10/2023 to 29/02/2024)
	:	Er.Savitha T. K. (from 01/03/2024 to 31/03/2024)
Q.C SECTION, IDUKKI	:	Er. Jomy G Jose (from 01/04/23 to 29/02/2024)
	:	Er.Savitha T. K. (from 01/03/2024 to 31/03/2024)



Annual Report 2023-24

Details of Intimation received, Quality Control Inspection conducted, sample collected and test details during the period 2023-2024

Name of Office	Total nos of Agreement schedules received	Total Nos of actual intimation received	Total no of site inspections carried out	No of samples collected							Total no of tests conducted	Total No of tests not found satisfactory	Total no of outside tests conducted	Total Revenue earned from testing charges	Remarks
				Concrete	Steel	Cement	Coarse aggregate	Fine aggregate	other materials if any	Total samples collected					
Irrigation Quality Control Section, Thiruvananthapuram	34	34	83	87	0	0	0	0	0	87	87	35	3	2889/-	
Irrigation Quality Control Section, Kollam	62	62	125	121	0	0	0	0	0	121	121	7	69	59717/-	
Irrigation Quality Control Section, Kottarakara	21	60	65	61	0	0	68	68	0	197	197	6	439	435557/-	
Irrigation Quality Control Section, Alappuzha	22	73	73	73	0	0	73	73	0	219	219	0	0	0	
Irrigation Quality Control Section, Pathanamthitta	13	78	78	78	0	0	78	78	0	234	234	12	0	0	
Irrigation Quality Control Section, Kottayam	62	62	62	62	0	0	62	62	62	248	248	8	34	43030/-	
Irrigation Quality Control Section, Idukki	75	75	75	74	0	0	65	65	0	204	74	4	25	20925/-	

Note:- For concrete one sample means average of 3 nos of concrete cube specimen.

K. IWR DIVISION PALAKKAD



IWR DIVISION PALAKKAD

The following are the activities carried out by IWR Division Palakkad during 2023 - 2024

1.PREPARATION OF PREFEASIBILITY REPORT ON SEETHAR KUNDU DIVERSION SCHEME

1.1 ABSTRACT

The Chulliar dam is constructed across Chulliyar river, 2.4 km upstream of its confluence with Meenkara river. The water spread area of Chulliar Reservoir is 165Ha and live Capacity is 13.70 Mm³ at FRL 154.08m.

The project receives water from:

- 1) Direct rainfall from South West and North East Monsoon
- 2) The surplus water from Meenkara Reservoir (which is connected to Chulliyar reservoir by a link canal of length 4.2Km) and
- 3) Water from Palakappandy Diversion Scheme which was commissioned in 2016

Out of 35 years data available (from 1977 to 2021), the reservoir was filled to its maximum capacity only in 9 years. It is shocking to note that only 10% and 33% capacity of the reservoir was filled in the consecutive years of 2016 and 2017, even after the commissioning of Palakappandy diversion scheme. Palakappandy diversion scheme was also not successful as expected and it failed to meet the water requirement of Chulliyar reservoir. Hence, Seetharkundu diversion scheme is envisaged to utilize the water availability in the catchment of Seetharkundu river especially during the south west monsoon to augment the Chulliyar project.

1.2 METHODOLOGY

The Seetharkundu diversion scheme is proposed to convey water from Athikundu stream to Palakappandy weir through pipe lines. The proposed project has three major components namely weir, ductile iron pipe line and sedimentation tanks. The weir of height 2m, length 30m and top width 2m is proposed at Athikundu to divert water from Seetharkundu catchment area. The pipe line of diameter 800mm is provided from Athikundu weir to Palakappandy canal for a distance of 3390m. The system is designed to convey a daily discharge of 0.04Mm³. The anticipated expenditure for the project is 8.9Cr.

1.3 DISCUSSION

1. From the time of commissioning of the Chulliyar dam, it was completely filled only in 9 years (from the available data).
2. The Palakappandy Diversion Scheme claimed to have an effective runoff of 22.08 Mm³ from its catchment, whereas the maximum storage capacity of the Chulliyar dam is 13.7 Mm³ only. But, even after the commissioning of this scheme in 2016, the dam is not completely filled till date (even in 2018).
3. Seetharkundu is an ungauged catchment, hence the rainfall data selected for Hydro meteorological studies is from rain gauge station in Manalaroo estate of nearby subcatchment in Bharathapuzha basin. This may not be a true representation of Seetharkundu catchment.
4. Though the 10 daily flow for the months June, July and August shows an yield of 12 Mm³, the 75% dependable flow for these months is only 1.4 Mm³.
5. Athikundu area has a very steep terrain, hence storage provided is very low. So the project is designed as Diversion Scheme. Hence the maximum utilization of the monsoon flow may not be feasible.
6. The daily designed discharge is 0.04 Mm³. The maximum water that could be conveyed during the months of June, July and August is only 3.68 Mm³ (provided 0.04 Mm³ is available daily)
7. Though the project is “need of the hour” for the farmers, BC ratio may not be justifiable (Rough estimated cost of the project is 8.9 crores)
8. The entire project falls in the forest area

The pre-feasibility report of Seetharkundu diversion scheme had been submitted on 02/02/2023 finally to Chief Engineer, IDR, TVM.

PRIORITY WORKS

1. SITE INVESTIGATION FOR PROPOSED VCB CUM BRIDGE ACROSS PUTHUSSERYKADAVU RIVER AT THEERTHUKUNNU IN PADINJARATHARA GRAMA PANCHAYATH

This estimate is prepared based on letter no DB 9-2321/IVW/2022-23 about Priority list of Investigation works for the year 2022 - 23 dated 23/11/2022 received from Superintending Engineer, Minor Irrigation Circle, Kozhikkode for carrying out Site Investigation for the construction of Proposed VCB cum bridge at Padinjarathara Grama Panchayath of Wayanad district. This proposal would help in ensuring sufficient head of water for the Puthusserykadavu Lift

Irrigation Scheme nearby (under construction) and also help in connecting two panchayaths Padinjarethara and Vellamunda.

The site investigation includes Topographical Survey and Soil Investigation. Topographic survey is conducted along the river and river bank, 6 km upstream and 1 km downstream of proposed site in Puthusserykadavu River by considering an average river width of 70 m. Cross sections are taken in every 15 m interval for initial 60 m of upstream and downstream, 50m interval for next 500m upstream and 100m interval for the balance upstream and downstream. The survey work is expected to complete in three weeks. Soil investigation is conducted by drilling ten boreholes in the site (two boreholes along the stream line, two bore holes at the left and right abutments, four numbers of borehole for left and right retaining walls at both upstream and downstream side and two boreholes for apron). The soil investigation may be completed in three weeks.

This estimate is divided into two parts namely Appendix A (Topographic investigation) and Appendix B (Soil Investigation). The appendix A includes following provisions – Setting a temporary base station, taking fly levels from the nearest G.T.S Bench Mark, conducting topographic survey in river and river bank, engaging boat with boatmen, diver and coolie, transportation charges, report printing charges and rent for rooms for safe custody of instruments.

The appendix B of this estimate includes following provisions -setting up boring plant, shifting of plant, boring in soil below and above 10 m, boring in soft rock , boring in hard rock, installation of casing pipe, loading and unloading charges of boring plant machineries and pontoons, engaging watchman at site, conducting SPT test, provisions for purchase of core boxes and consumables for boring, hiring charges for hydraulic excavator, additional labours for shifting of boring plant, engaging boat with boat man, transportation charges, revenue charge for testing soil samples in soil mechanics lab, unforeseen items, minor repair of boring plant and purchase of consumables, rent of room for safe custody of samples, report printing charges and revenue charge for boring plant.

2. INVESTIGATION WORKS TO AYANCHERI, KADAMERI AND THAROPOYIL PADASEKHARAM IN AYANCHERI GRAMA PANCHAYATH IN KUTTIADY LA IN KOZHICKODE DISTRICT

This estimate is prepared based on letter no DB 9-2321/IVW/2022-23 about Priority list of Investigation works for the year 2022 -23 dtd 23/11/2022 received from Superintending Engineer, Minor Irrigation Circle, Kozhikkode for carrying out Site Investigation to Ayancheri, Kadameri and Tharopoyil Padasekharam in Ayancheri Grama Panchayath in Kuttiady LA in Kozhikkode District.

A Thodu originating from Kuttiady river is used for irrigation purpose of Ayancheri, Kadameri and Tharopoyil Padasekharam in Ayancheri Grama Panchayath. Now cultivation in these padasekharams are reduced to the drainage problems in this thodu. Water is to be headed up in downstream and drained out in upstream by construction of VCB' s or check dams. This project is proposed for conducting survey works along thodu and its bank for the side protection of existing thodu, construction of kaithodu to drain excess water into Kuttiady river and to identify the suitable locations for the construction of VCBs.

This Estimate includes following provisions – Setting a temporary base station, taking fly levels from the nearest G.T.S Bench Mark, conducting topographic survey in thodu and bank, daily hire of boat with boatmen on Kuttiady river mouth, engaging diver, engaging coolie, hiring charge for transporting instruments and visit of officers, report printing charges, rent for rooms for safe custody of instruments and unforeseen items, purchase of consumables etc.

3. INVESTIGATION WORKS TO THE CONSTRUCTION OF REGULATOR CUM BRIDGE ACROSS KADALUNDIPUZHA AT MANNATTAMPARA, IN TIRURANGADI BLOCK PANCHAYATH

This work has been taken up as per the request of the Superintending Engineer, Minor Irrigation North Circle Kozhikode Office. The purpose of this estimate is Investigation works to the Construction of Regulator cum bridge across Kadalundipuzha at Mannattampara, in Tirurangadi Block Panchayath. Mannattampara Weir-cum-Lock across River Kadalundi which was constructed in the year 1958. It is a regulator of salt water exclusion type. It prevents salinity intrusion into Kadalundi River and thereby to a vast area of agricultural lands lying along its banks. Being in the alignment of inland waterways it is provided with navigation locks.

Mannattampara Weir-cum-Lock is located at the tail end of Kadalundippuzha at a few kilometers upstream of its confluence with Arabian Sea. The latitude – longitude coordinates of the structure are 11.082668 N and 75.884312 E respectively. The site can be accessed by diverting from Palakkal on NH 66 and travelling for 4 Km along Palakkal – Mannattampara Road. Mannattampara Weir-cum Lock prevents salinity intrusion into Kadalundi River and thereby to a vast area of agricultural lands lying along its banks. It is a critical infrastructure influencing a complex system of rivers and artificial canals. Rivers Kadalundi, Keeranallur, and Poorappuzha are these rivers, and Old and New Cuts the artificial canals. These artificial cuts link Keeranallur puzha with Poorapuzha. The Old Cut was inland water transport which has now been rerouted through the New Cut. The navigation lock at Pooraparamba is across Old Cut. The stretch of Kadalundi River, where Mannattampara Weir-

cum Lock is located, is inland water transport route, and hence the structure is provided with navigation locks.

The VCB at Parayil is upstream of the confluence of Old Cut and Poorapuzha. Keeranallur Regulator is at the confluence point of New Cut and Poorapuzha. Low-lying land such as Morya

Kapp is also linked to this system through natural streams. The structure has been controlling lives of lakhs of people for more than half a century. A regulator has been constructed at Bakkikkayam upstream of Mannattampara, and would become fully operational by next season. Controlled releasing of fresh water impounded from this regulator to downstream would become essential during summer season. Hence it needs to be ensured that the released quantum of water does not leak out into saline water. River Kadalundi, in its last stretch, traverses through Moonniyur Grama Panchayath, Thirurangadi and Parappanangadi Municipalities, Vallikkunnu and A.R. Nagar Grama Panchayaths. If salinity intrudes, it is likely that places as far as 20 Km away from sea mouth would get adversely affected. Water Supply Schemes of Kerala Water Authority and various LSGI are located upstream of the structure. Lift irrigation projects maintained by minor irrigation wing such as Mullankuzhi, Ullanam, Thekkepadam, Thrikkulam, Kolappuram, kooriyad, Irringallur, Valiyora, Benchali, Benchali Reclamation are also located on the upstream of Mannattampatra Lock. Apron and cut-off wall of the structure built years back have become weak and ineffective. Since apron is worn out due to ageing, saline water enters into the river, and precious fresh water leaks out into saline water. The piers and its embedded parts are in damaged condition due to continuous upward and downward tidal movement of saline water. Spalling has seen occurred in many points. Leak arresting at Mannattampara has been the topic of discussion for years in many important meetings such as Taluk Sabha, Dist Agrl Development Committee etc. Hundreds of families depend on Manattampara Lock for agricultural and drinking water purposes. Apron of the weir has been worn out, the foot bridge is in a very dangerous condition and the repairing this aged structure that had been constructed more than 60 years back might not effectively prevent salt water intrusion. Based on these observations, Mannattampara Weir-cum- Lock across River Kadalundi will replaced by Regulator cum bridge with lock. Technical Sanction accorded for Rs.4,31,000/- Fund requested in advance through EMILI.

4. INVESTIGATION FOR CONSTRUCTION OF A REGULATOR CUM BRIDGE ACROSS ARALAM RIVER AT KALIKKAYAM IN KANICHAR PANCHAYATH.

Aralam river is one of the main tributaries of Valapattanam river which originates from Western Ghat region in Wayanad District and flows through Kottiyur, Kelakam, Kanichar and Aralam Panchayaths and joins the other tributary - Koottupuzha river at Irritty. The Pazhassi Dam exists in the river on the downstream side of Irritty town. There is no other storage structure on the u/s of Pazhassi dam in this river. The construction work of a new water supply scheme for Kottiyur, Kelakam and Kanichar Panchayaths are under progress under Kerala Water Authority. The construction work of intake well and pump house are in progress at Kalikayam in Kanichar Panchayath. During the summer season the water level in the river lowers and the flow become very lean. This area is not coming under the storage area of Pazhassi Dam. Hence during the summer there will be a shortage of water. There for the Executive Engineer, Project Division, Kerala Water Authority, in his letter dated 13.01.2021 requested to irrigation department for taking necessary action for constructing a check dam on the downstream side of the pump house which is under construction at Kalikayam. The site is located near Kanichar – Kalikayam – Anangottu Kurishupalli road and which is about 2.00 km away from Kanichar town. The left bank of the river is a settlement area of ST people (Block-9) inside Aralam farm and right bank is Kanichar panchayath. There is a road on the right bank. If a bridge is constructed, it will become an easy way for ST people residing in Block No. 9 of Aralam Farm to reach the Kanichar town. The existing bridge on the u/s of the site is 1.40 km away and on the downstream side is 1.10 km away from the site. For the construction of the Regulator cum bridge at this location soil investigation and detailed topographic survey is essential. If a regulator is constructed at this location, it will increase the irrigation potential of this locality. At present the farmers are providing lift irrigation facilities themselves. But due to the lean flow during summer it became very difficult to draw water from the river. With implementation of the scheme, the farmers can easily use the stored water for irrigation purpose. The stored water can also be supplied to Aralam farm also by constructing lift irrigation or micro irrigation scheme. The average width of the river at this location is 91.00 m and the bank height is 4.00 m. The coordinates of the proposed site are 11.91505, 75.7748356. A total number 8 bore holes are proposed in the river along the alignment of regulator and cut off wall and 6 bore holes are proposed on the banks of the river for abutment, cut off wall and bank protection work. Estimate resubmitted for FS of Amount Rs.13,57,000/-

5. INVESTIGATION WORK FOR CONSTRUCTION OF REGULATOR ACROSS VALAPATTANAM RIVER NEAR MUNAMBU KADAVU IN MAYYIL PANCHAYATH, KANNUR DISTRICT

Valapattanam river is one of the major rivers in Kerala. It is having 110 Km length and flowing through Kannur District. Pazhassi dam is constructed across this river at Veliyambra. The main

source of drinking water scheme in Kannur is Pazhassi reservoir. Both sides of this river is agricultural land and residential area. Farmers are depending on this river and its tributaries for irrigating their land. Now a days due to entry of saline water through this river, the farmers are experiencing much difficulties. They are dropping their II and III crop cultivation due to salinity. Also acute drinking water scarcity is another problem in summer season. The two LI schemes of this department located in this river are adversely affected by saline water. The motors, pumps and pipes of LI schemes needed frequent repair due to the entry of saline water. As the water is saline, the farmers cannot use this pumped water from LI schemes. The distance of tidal effect is increasing year by year and which will effect salinity in more places. Hence to prevent the saline water intrusion it is essential to construct a Regulator across this river at a suitable place. Accordingly a suitable location is selected which is at Munambu kadavu in Mayyil panchayath. At this place adequate bank height are there for constructing Regulator. The proposed location is 150 m downstream of merging point of two major tributaries of Valapattanam river ie; Sreekandapuram river and Irikkur river. The Irikkur river has an average width of 150m and Sreekandapuram river has an average width of 80 m at the merging pont. The river course is straight and river has an average width of 182m at the proposed location. About 750m upstream of proposed location Malapattam bridge and 1.00 Km downstream Chekkikadavu bridge exists. Therefore construction of regulator alone is required at this place. At upstream side of proposed structure Pazhassi dam is situated 25 Km in Irikkur river and Madambam RCB is located at 15 Km in Sreekandapuram river. The coordinates of the proposed site are Lat. 12.001968, Long. 75.465294. By constructing an RCB at this place will prevent the salinity problem in 6 panchayath named Kurumathur, Chengalayi, Malapattam, Sreekandapuram, Mayyil and Kuttiyatoor. Two irrigation schemes under MI Division Kannur namely Pavannur L I scheme in Irikkur river and Adichery LI scheme in Sreekandapuram river are also get benefit of this project.

Estimate submitted for AS of Amount Rs.18,88,000/-

6. FINANCE

In the budget for the financial year 2023-24 an outlay of Rs. 110 Lakh (Rupees Hundred and Ten lakhs only) had been allotted under the Head of Account '4701-80-800-99-00-34-03-V Development of KERI Stage II'. The proposal for the amount was grouped under three heads viz., Routine activities, modernization and revamping.

Details of Expenditure statement for the year 2023 – 24 had been allotted under the Various **Head of Account** are given below.

SL NO	Head of Account/ Name of the Project	No.of works	Project Cost* (Rs Lakhs)	Expenditure* (Rs. Lakhs)	Expenditure %	Remark
	2023-2024					
1	4701-80-800-99 -34-03-V Development of Kerala Engineering Research Institute - Stage II (2023-2024)					
	JD CM &FE KERI ,Peechi	14	48.2895	24.86129	51.5%	
	JD Hydraulic Research, KERI ,Peechi	15	61.71	52.01748	84.3%	
		29	110	76.87877	69.9%	Bill with held at treasury 18.7792 % including bill pending 86.96%

Details of Expenditure statement for the year 2023 – 24 had been allotted under the Various **Head of Account** are given below.

SL NO	Head of Account/ Name of the Project	No.of works	Project Cost* (Rs Lakhs)	Expenditure including spill over (Rs. Lakhs)	Expenditure %	Remark
2	2701-80-005-93-00-00-00-P-V Modernisation of Design Wing					
	Quality Control Kottarakkara	43.00	32.45	29.87	92.0%	
	Quality Control Thrissur	50	35.25	12.86708	36.5%	
	JD Construction Materials & Foundation Engineering KERI ,Peechi	11	17.44	24.94728	143.0%	
	JD Hydraulic Research,KERI ,Peechi	8	30.7	28.61867	93.2%	

	TOTAL JD,Coastal Engineering Field Studies ,Thrissur	39	21.71	26.20324	120.7%	
	TOTAL ,Investigation for Water Resource Division ,Palakkad.	7	2.15	2.10693	98.0%	
	TOTAL Modernisation of Design Wing		139.70	124.61	89.20%	
3	4701-80-800-88-00-00-00-P-V Formation of River Basin Organization					
	JD,Coastal Engineering Field Studies,Thrissur	33	98	44.774	45.7%	
	JD Hydraulic Research, KERI ,Peechi	2	0	4.75696		No allocation in the current year,Expenditure of spillover work
	JD CM &FE KERI ,Peechi (2023-2024)	1	2.00	0.00	0.0%	
	TOTAL Formation of River Basin Organization		100.00	49.53	49.53%	
4	4700-80-005-99-02-00-00-P-V Investigation of Irrigation Schemes					
	JD CM &FE KERI ,Peechi	5	20.85	8.52336	40.9%	
	Hydraulic Research, KERI ,Peechi	4	6	1.2158	20.3%	
	Investigation for Water Resource Division, Palakkad.	5	39.5	0	0.0%	
	TOTAL Investigation of Irrigation Schemes	14.00	66.35	9.74	14.68%	Bill pending at treasury 4.662918 % including bill pending 39.67%

7. SUMMARY

In the annual report for the current financial year a general introduction about the institute, organization set up, major technical achievements, division wise functioning of the institute, implementation of modernization scheme and details regarding budget allotment and expenditure have been explained in detail.

The bottlenecks or hindrance in the development of the institute as a full fledged research organization are:

- Difficulties in adapting Price-3 in case of departmental execution work, purchase of the equipments, hiring of vehicles, tendering of works etc.
- KERI is executing works departmentally. Treasury Regulations in sanctioning work advance affecting the taking up of more investigations.
- The process of approving lowest tender system for purchasing equipments and machineries sometimes cause purchase of poor quality of equipments.
- National level suppliers are not willing to participate in Government tenders due to the procedures associated with Govt Tenders such as security Deposit from Treasury Savings Account/stamp paper from Kerala etc.
- Qualified and experienced personnel are required in every technical posts and also skilled workers like Lab assistants, Electrician etc.
- The continuous transfer and posting of staffs affecting the performance of the institution. Major Key posts remains vacant for several months.
- Lack of research activities due to lack of guidance from experts.
- Procedural challenges faced in collaborating with other leading academic institutions & industry experts for addressing solutions to various problems faced by the department.

All these require intervention from the part of the Government and it is hoped that the upgradation of the personnel of the institute will be taken up as a continuation of the modernization scheme.

APPENDIX – I**VACANCY DETAILS OF TECHNICAL STAFF FOR THE MONTH OF MARCH 2024****Fundamental and Applied Research ,KERI,Peechi**

Office	District	Designation	Sanctioned	Existing	Vacancy	Nature of Vacancy	Office Seat/Section	Date of Occurrence of Vacancy (DD-MM-YYYY)	If the Seat is Reserved for any Category, Give Details	Remarks
DIRECTOR, FUNDAMENTAL & APPLIED RESEARCH, KERI, PEECHI										
FUNDAMENTAL & APPLIED RESEARCH KERI PEECHI	Thrissur	Senior Clerk	2	0	2	Relieving on Promotion		.09.02.2023		Two Vacancies, 1.09.02.2023, 2.13-02-2024
FUNDAMENTAL & APPLIED RESEARCH KERI PEECHI	Thrissur	Office Attendant	2	1	1	Relieving from Dept.		28.10.2021		
JOINT DIRECTOR, HYDRAULIC RESEARCH, KERI, PEECHI										
HYDRAULIC RESEARCH KERI PEECHI	Thrissur	Clerk	7	6	1	Retirement	E6	01-06-2021	No	Retirement on 31/05/21
HYDRAULIC RESEARCH KERI PEECHI	Thrissur	Blue Printer	1	0	1	Relieving on Transfer	B P	13-10-2017	No	Relived on 12/10/17
HYDRAULIC DIVISION KERI PEECHI	Thrissur	Scientific Assistant	1	0	1	Retirement			No	
HYDRAULIC DIVISION KERI PEECHI	Thrissur	Lab Attendant	1	0	1	Retirement		01-11-2000	No	Retired on 31/10/2000

HYDRAULIC DIVISION KERI PEECHI	Thrissur	Part Time Sweeper	1	0	1			01-07-2009	No	
EXECUTIVE ENGINEER, QUALITY CONTROL DIVISION, KOTTARAKKARA										
QUALITY CONTROL DIVISION KOTTARAKKARA	Kollam	Draftsman Grade I / Overseer Grade I	3	2	1	Joining on Promotion				01/03/2024 FN
QUALITY CONTROL DIVISION KOTTARAKKARA	Kollam	Typist (Senior Grade)	1	0	1	Category Change				14/03/2024 AN
QUALITY CONTROL DIVISION KOTTARAKKARA	Kollam	Driver (Grade I)	1	0	1					
QUALITY CONTROL SUB DIVISION ALAPPUZHA	Alappuzha	Draftsman Grade I / Overseer Grade I	1	0	1	Joining on Promotion	D 1	28-02-2024	NA	
QUALITY CONTROL SECTION PATHANAMTHITTA	Pathanamthitta	Draftsman Grade I / Overseer Grade I	1	0	1	Joining on Promotion	D 1	06-03-2024	NA	Relieved on 01
QUALITY CONTROL SUB DIVISION KOTTARAKKARA	Kollam	Driver (Senior Grade)	1	0	1	Death		06-03-2024	NA	
QUALITY CONTROL SECTION IDUKKI	Idukki	Asst.Engineer/ Assistant Director	1	0	1	Relieving from Dept.	A E	01-03-2024	NA	Relieved on 29/02/2024 AN
QUALITY CONTROL SECTION IDUKKI	Idukki	Draftsman Grade I / Overseer Grade I	1	0	1	Relieving on Promotion	Overseer 1	25-02-2024	NA	Relieved on 24/02/2024 AN
QUALITY CONTROL SECTION KOTTAYAM	Kottayam	Asst.Engineer/ Assistant Director	1	0	1	Relieving from Dept.	A E	21-10-2023	NA	Relieved on 20/10/2023 AN
QUALITY CONTROL SUB DIVISION THIRUVANANTHAPURAM	Thiruvananthapuram	Clerk	3	2	1	Others	E3		-	Relieved on 05/05/2022. Vacancy occurred on 06/05/2022.

QUALITY CONTROL SECTION THIRUVANANTH APURAM	Thiruvananthapuram	Draftsman Grade I / Overseer Grade I	1	0	1	Relieving on Promotion	D 1	-	Relieved on 28.02.2024 AN. Vacancy occurred from 29.02.2024
JOINT DIRECTOR, CONSTRECTION METIREALS & FOUNDATION ENGINEER, KERI,PEECHI									
CM & FE KERI PEECHI	Thrissur	Draftsman Grade II / Overseer Grade II	2	1	1	Joining on Promotion	D B	22-Jan-24	
CM & FE KERI PEECHI	Thrissur	Senior Clerk	2	1	1	Retirement	E B4	1-Jun-23	
CM & FE KERI PEECHI	Thrissur	Clerk	5	4	1	Relieving from Dept.	E B1	17-Jan-23	
INSTRUMENTATION SECTION NO.1 KERI PEECHI	Thrissur	Clerk	1	0	1	Retirement	A B	1-Aug-17	
CM & FE KERI PEECHI	Thrissur	Office Attendant	2	1	1	Relieving on Transfer	O A	31-May-23	
PUBLICATION WING KERI PEECHI	Thrissur	Office Attendant	1	0	1	Relieving from Dept.	O A	29-Dec-23	
PUBLICATION WING KERI PEECHI	Thrissur	Part Time Sweeper	1	0	1	Retirement	PT S	1-Aug-23	
PUBLICATION WING KERI PEECHI	Thrissur	Information Assistant	1	0	1		IA		
SOIL MECHANICS & FOUNDATION DIVISION KERI PEECHI	Thrissur	Scientific Assistant	1	0	1	Relieving from Dept.	S A	11-Apr-13	
CONSTRUCTION MATERIALS DIVISION KERI PEECHI	Thrissur	Lab Attendant	1	0	1		L A		
JOINT DIRECTOR, COASTAL ENGINEERING FIELD STUDIES THRISSUR									

CEFS THRISSUR	Thrissur	Draftsman Grade I / Overseer Grade I	3	2	1	Relieving on Promotion	D 2	28-02-2024	No	
CEFS THRISSUR	Thrissur	Head Clerk	1	0	1	Relieving on Promotion	H C	01-03-2024	No	
COASTAL ENGINEERING SUB DIVISION KOLLAM	Kollam	Senior Clerk	2	1	1	Relieving on Promotion	E1	02-08-2023	No	
COASTAL ENGINEERING SECTION THIRUVANANTHAPURAM	Thiruvananthapuram	Office Attendant	1	0	1	Relieving on Promotion		03-08-2016	No	
COASTAL ENGINEERING SUB DIVISION THRIPIUNITHURA	Ernakulam	Senior Clerk	2	1	1	Relieving on Promotion	A 1	09-02-2024	No	
COASTAL ENGINEERING SECTION ERNAKULAM	Ernakulam	Draftsman Grade I / Overseer Grade I	1	0	1	Relieving on Promotion	D B1	24-02-2024	No	
COASTAL ENGINEERING SECTION CHAVAKKADU	Thrissur	Senior Clerk	1	0	1	Relieving on Promotion	A B1	03-02-2024	No	
COASTAL EROSION STUDIES SUB DIVISION KOZHICODE	Kozhikode	Asst.Exe.Engineer/ Deputy Director	1	0	1	Retirement	Head of Office	01-06-2023	No	
COASTAL EROSION STUDIES SECTION PARAPPANANGADI	Malappuram	Asst.Engineer/ Assistant Director	1	0	1	Relieving on Promotion	Head of Office	01-01-2023	No	
COASTAL EROSION STUDIES SECTION PARAPPANANGADI	Malappuram	Draftsman Grade II / Overseer Grade II	2	1	1	Relieving on Promotion	D B2	01-08-2023	No	
EXECUTIVE ENGINEER, QUALITY CONTROL DIVISION, THRISSUR										
QUALITY CONTROL DIVISION THRISSUR	Thrissur	Junior Superintendent	2	0	2	Retirement	JS	04-01-2024		Retired on 31.03.2024

QUALITY CONTROL DIVISION THRISSUR	Thrissur	Senior Clerk	8	7	1	Retirement	E1	06-01-2022		Retired on 31.05.2022
QUALITY CONTROL SUB DIVISION MUVATTUPUZHA	Ernakulam	Senior Clerk	3	1	2	Relieving on Promotion	E2	26-Jul-23		Promoted as HC vide Order No. CEIA/4811/2022-B2 Dtd 01.07.2023 of CE,I&A,Tvm.
						Relieving on Promotion	E3	8-Aug-23		Promoted as HC vide Order No. CEIA/4811/2022-B2 Dtd 01.07.2023 of CE,I&A,Tvm.
QUALITY CONTROL SUB DIVISION MUVATTUPUZHA	Ernakulam	Typist (Lower Division)	2	0	2	Relieving on Promotion	T1	17-May-23		Promoted as Fair Copy Superintendent vide Order No. B5-592/2023 Dtd. 10.04.2023 of CE,I&A,Tvm.
						Others	T2	1-Jun-13		Addl. post created as per GO(Rt) No.616/2013/WRD Dtd. 01.06.2013. Vacant from the date of creation of post
QUALITY CONTROL SUB DIVISION MUVATTUPUZHA	Ernakulam	Office Attendant	3	2	1	Others	O A 3	1-Jun-23		Addl. post created as per GO(Rt) No.616/2013/WRD Dtd. 01.06.2013. Vacant from the date of creation of post
QUALITY CONTROL SECTION KOOTHATTUKULAM	Ernakulam	Draftsman Grade II / Overseer Grade II	3	2	1	Relieving on Promotion	D 1	1-Mar-24		Promoted as First Grade Overseer vide A4/33533/2022 Dtd. 01.01.2024.

QUALITY CONTROL SUB DIVISION THRISSUR	Thrissur	Asst.Exe.Engineer/ Deputy Director	1	0	1	LPR	A E E	20-Feb-24		Sri. Babu. M. S., Assistant Executive Engineer relieved on 19/02/2024 on LPR. Smt. Litty Augustine, Assistant Executive Engineer, Quality Control Sub Division, Muvattupuzha on full additional charge.
QUALITY CONTROL SUB DIVISION THRISSUR	Thrissur	Draftsman Grade I / Overseer Grade I	1	0	1	Relieving on Promotion	D 1	25-Feb-24		Promoted as Assistant Engineer and Relieved on 24/02/2024 AN
QUALITY CONTROL SUB DIVISION THRISSUR	Thrissur	Part Time Sweeper	1	0	1	Death	PT S	29-Nov-21		Vaccancy arised due to death Smt. Sarojini. K
QUALITY CONTROL SECTION ERNAKULAM	Ernakulam	Draftsman Grade III / Overseer Grade III	1	0	1	LWA (Appendix XII)	B2	19-Jan-24		As per CE, I&A, Tvm order No. CEIA/71/2024 -A6 dated 17/01/2024 (Appendix XII C for joining spouse abroad)
QUALITY CONTROL SUB DIVISION PALAKKAD	Palakkad	Draftsman Grade I / Overseer Grade I	1	0	1	Relieving on Promotion	D 1	24-Feb-24		
QUALITY CONTROL SUB DIVISION PALAKKAD	Palakkad	Clerk	2	1	1	Relieving on Promotion	E3	3-Feb-24		
QUALITY CONTROL SECTION MALAPPURAM	Malappuram	Lascar	1	0	1	Relieving on Transfer		1-Dec-18		
QUALITY CONTROL SUB DIVISION KOZHICODE	Kozhikode	Office Attendant	2	1	1	Relieving from Dept.		26-Aug-23	NO	
QUALITY CONTROL SECTION KOZHICODE	Kozhikode	Asst.Engineer/ Assistant Director	1	0	1	Relieving from Dept.		7-Feb-24	NO	
QUALITY CONTROL SUB DIVISION KANNUR	Kannur	Asst.Exe.Engineer/ Deputy Director	1	0	1	Retirement	Head of the	31-Mar-24	NA	

							office			
EXECUTIVE ENGINEER, I W R, DIVISION PALAKKAD										
IWR DIVISION PALAKKAD	Palakkad	Senior Clerk	4	1	3	Others		18/02/ 2021		
IWR DIVISION PALAKKAD	Palakkad	Clerk	9	8	1	LWA (Appendix XII)		09-01- 2022		
IWR DIVISION PALAKKAD	Palakkad	Draftsman Grade II / Overseer Grade II	2	0	2	Relieving on Transfer		09/08/ 2023		
IWR DIVISION PALAKKAD	Palakkad	Office Attendant	3	1	2	Relieving on Transfer		30/11/ 2023		
IWR DIVISION PALAKKAD	Palakkad	Part Time Sweeper	1	0	1	Others		18/02/ 2021		
IWR SECTION 1/1 PALAKKAD	Palakkad	Asst.Engin eer/ Assistant Director	1	0	1	Relieving on Transfer		12-05- 2023		
IWR SECTION 1/1 PALAKKAD	Palakkad	Lascar	1	0	1	Relieving on Transfer		15/03/ 2023		
IWR SECTION 3/1 AGALY	Palakkad	Asst.Engin eer/ Assistant Director	1	0	1	Others		18/02/ 2021		
IWR SECTION 3/1 AGALY	Palakkad	Draftsman Grade III / Overseer Grade III	2	1	1	Relieving on Transfer		08-05- 2022		
IWR SECTION 3/1 AGALY	Palakkad	Lascar	1	0	1	Relieving on Transfer		01-02- 2022		

APPENDIX – II

An abstract of the Weather data collected from Automatic Weather Station for the period from April 2023 to March 2024 is given below

Abstract of the weather data from April, 2023 to March, 2024

STATION: K.E.R.I, PEECHI

Latitude- 10° 31' 30" N Longitude- 76° 21'59" E MSL- +96.03 M.

<i>Sl.No</i>	<i>Weather Elements</i>	<i>Range of the Weather Data</i>
1.	Temperature	The maximum temperature was 41.3°C in April,2023 and the minimum temperature was 21°C in October 2023 and January 2024
2.	Relative Humidity	Maximum relative humidity recorded was 100% in June and September 2023 and minimum relative humidity was 77.% on April,June, August and October 2023
3.	Precipitation	Annual rainfall was 2474.00 mm and the maximum monthly rainfall was 727.42 mm in July 2023 and minimum monthly rainfall 0.20 mm in March 2024
4.	Wind-Direction	The main wind directions observed were from South East and South West directions.
5.	Wind Speed	Maximum daily mean wind speed was 7.94 km/hr in December, 2023 and minimum daily mean wind speed was 0.09 km/hr in August 2023.
6.	Evaporation	Maximum Evaporation was 8.4 mm in April 2023 and minimum of 0.2 mm in July 2023.
7.	Sunshine Recorder	The maximum duration of bright sunshine was 9.80 Hours in November 2023

APPENDIX-III**List of Tests conducted during the financial year 2023-24**

1	CM 01/23-24	Assistant Engineer, Quality Control Section , Eswaramangalam,Malapuram	Sheet Pile Test
2	CM 02/23-24	Project Manager Nutech Construction,Edapally	Cube Test
3	CM 03/23-24	Assistant Engineer, Chamravattom Project Section 1/1, Eswaramangalam,Ponnani	Sheet Pile Test
4	CM 04/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
5	CM 05/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Block Test
6	CM 06/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
7	CM 07/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
8	CM 08/23-24	Assistant Executive Engineer,Chavakkad Municipality	Cube Test
9	CM 09/23-24	Project Engineer-47,RCB Barathapuzha,Kankakkadvu,KIIDC TVM	Steel Test
10	CM 10/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
11	CM 11/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Steel Test
12	CM 12/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
13	CM 13/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
14	CM 14/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
15	CM 15/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Rubble Stone
16	CM 16/23-24	Assistant Engineer,Pampar Project Section,Marayoor	Rock Core Test
17	CM 17/23-24	Assistant Engineer,Head Works, Peechi	Cement Test
18	CM 18/23-24	State farming corporation of kerala,Punalur,Kollam	Gauge Wire Test
19	CM 19/23-24	Rineesha,Malappuram.	Paving Tiles
20	CM 20/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
21	CM 21/23-24	Assistant Engineer ,Minor Irrigation,Kodakara	Aggregates Test
22	CM 22/23-24	Assistant Engineer ,Minor Irrigation,Kodakara	Cement Test

23	CM 23/23-24	Assistant Engineer ,Minor Irrigation,Kodakara	Steel Test
24	CM 24/23-24	MVIP Thodupuzha	Steel Wire Rope Test
25	CM 25/23-24	Irrigation, Koottayi-Mangalam	Rock Core Test
26	CM 26/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
27	CM 27/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
28	CM 28/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
29	CM 29/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
30	CM 30/23-24	Assistant Engineer, Chamravattom Project Section 1/1, Eswaramangalam,Ponnani	Sheet Pile test
31	CM 31/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
32	CM 32/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
33	CM 33/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
34	CM 34/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
35	CM 35/23-24	Assistant Engineer ,Minor Irrigation,Kodakara	Cube Test
36	CM 36/23-24	Seceretary,Alagappanagar GP,Alagappanaga	Steel Test
37	CM37/23-24	Range Officer,Kalady Range	Gauge Wire Test
38	CM 38/23-24	Range Officer,Thundathil Range	Gauge Wire Test
39	CM 39/23-24	Assistant Executive Engineer ,Inland Navigation,TVM	PET
40	CM 40/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Rubble Stone
41	CM 41/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Mix Design
42	CM 42/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
43	CM 43/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
44	CM 44/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
45	CM 45/23-24	Assistant Engineer ,Minor Irrigation,Kodakara.	Cube Test
46	CM 46/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
47	CM 47/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
48	CM 48/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test

49	CM 49/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
50	CM 50/23-24	Assistant Engineer, Quality Section, Eswaramangalam, Malapuram	Steel Test
51	CM 51/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Mix Design
52	CM 52/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Mix Design
53	CM 53/23-24	Olivia Projects, Punkunnam, Thrissur	Mud Block Test
54	CM 54/23-24	Assistant Engineer ,Minor Irrigation,Kodakara.	Cube Test
55	CM 55/23-24	Assistant Executive engineer ,Inland Navigation, TVM	Steel Test
56	CM 56/23-24	Assistant engineer PWD Bridge section,chalaky	Cube Test
57	CM 57/23-24	Assistant engineer PWD Bridge Section,chalaky	Cube Test
58	CM 58/23-24	Project Manager, Nirmithi Kendra,Ayyanthole	Paver Blocks
59	CM 58A/23-25	Tojo KM,Thrissur	Paver Blocks
60	CM 59/23-24	Assistant engineer PWD Bridge Section,Chalaky	Cube Test
61	CM 60/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
62	CM 61/23-24	Project Engineer-47,RCB Barathapuzha, Kankakkadvu, KIIDC	Steel Test
63	CM 62/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
64	CM 63/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
65	CM 64/23-24	Seceretary,Alagappanagar GP,Alagappanagar	Cube Test
66	CM 65/23-24	Assistant Engineer, Minor Irrigation, Kodakara.	Cube Test
67	CM 66/23-24	Assistant Engineer ,PWD,KRFB-PMU Division, Ernakulam	Steel Test
68	CM 67/23-24	Assistant Engineer ,LSGD Thanniyam GP	Paver blocks
69	CM 68/23-24	Assistant Engineer, Minor Irrigation, Kodakara.	Cube Test
70	CM 69/23-24	Assistant Executive Engineer ,LSGD Irinjalakuda	Cube Test
71	CM 70/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Mix Design
72	CM 71/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Mix Design
73	CM 72/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Mix Design
74	CM 73/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test

75	CM 74/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
76	CM 75/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
77	CM 76/23-24	Dhinil,KPN Pisharody Road, Kannatakara, Thrissur	Mud Block Test
78	CM 77/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
79	CM 78/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Cement Test
80	CM 79/23-24	Assistant Engineer ,Irrigation Section -2 ,Ponnani	Steel Test
81	CM 80/23-24	Assistant Engineer,MI Section ,Pudukkad, Thrissur	Steel Test
82	CM 81/23-24	Assistant Engineer,Head Works,Peechi	Concrete Core Samples
83	CM 82/23-24	Executive Engineer,Karapuzha Irrigation Project ,Kalpetta	PET
84	CM 83/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Paving Block
85	CM 84/23-24	Office of EE,KRFB-PMU Ernakulam,Thrissur/Ernakulam	Close Graded Premix Surfacing Materials
86	CM 85/23-24	Assistant Engineer, MI, Palakkad, Chunnambuthara	Core Test
87	CM 86/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
88	CM 87/23-24	Ramesan.A.K,Attuvaluppil House,Nellayi	Cube Test
89	CM 88/23-24	Project Engineer-47,RCB Barathapuzha, Kankakkadvu, KIIDC TVM	Steel Test
90	CM 89/23-24	Ramesan.A.K,Attuvaluppil House,Nellayi	Cube Test
91	CM 90/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
92	CM 91/23-24	Assistant Engineer PWD Bridge Section,Chalakydy	Cube Test
93	CM 92/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Paving Block
94	CM 93/23-24	Project Engineer-47,RCB Barathapuzha, Kankakkadvu, KIIDC TVM	Aggregates Test
95	CM 94/23-24	Project Engineer-47,RCB Barathapuzha, Kankakkadvu, KIIDC TVM	Cement Test
96	CM 95/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Paving Block
97	CM 96/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Paving Block
98	CM 97/23-24	Manager,HPCL,Kozhikode	Paving Block

99	CM 98/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
100	CM 99/23-24	Assistant Engineer ,Minor Irrigation,Thrissur	UPV
101	CM 100/23-24	Assistant Engineer ,Minor Irrigation,Pulincunnu	PET
102	CM 101/23-24	Assistant Engineer PWD Bridge Section,Chalaky	Cube Test
103	CM 102/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
104	CM 103/23-24	Project Engineer-37, KIIDC Thrissur	Steel Test
105	CM 103A/23-24	Project Engineer-37, KIIDC Thrissur	Plate Test
106	CM 104/23-24	Ramesan.A.K,Attuvaluppil house,Nellayi	Cube Test
107	CM 105/23-24	Assistant Engineer MI Section,Chalaky	Steel Test
108	CM 106/23-24	Executive Engineer,MI,Sulthan Bathery ,Wynad	NDT
109	CM 107/23-24	Joys,Thettayil building materials,Athayi, Thrissur	Sheet-Roofing
110	CM 108/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Steel Test
111	CM 109/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
112	CM 110/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
113	CM 111/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
114	CM 112/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
115	CM 113/23-24	Assistant Engineer,MI Section ,Pudukkad, Thrissur	Cube Test
116	CM 114/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
117	CM 115/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
118	CM 116/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Sheet-Roofing
119	CM 117/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
120	CM 118/23-24	Project Engineer-47,RCB Barathapuzha, Kankakkadvu, KIIDC TVM	Steel Test
121	CM 119/23-24	Range Forest Officer,Athirapilly Range, Vazhachal Division	Fencing Materials
122	CM 120/23-24	Range Forest Officer,Athirapilly Range, Vazhachal Division	Fencing Materials
123	CM 121/23-24	Range Forest Officer,Athirapilly Range, Vazhachal Division	Fencing Materials

124	CM 122/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
125	CM 123/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
126	CM 124/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
127	CM 125/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Aggregates Test
128	CM 126/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
129	CM 127/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
130	CM 128/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
131	CM 129/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Mix Design
132	CM 130/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Mix Design
133	CM 131/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Mix Design
134	CM 132/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Mix Design
135	CM 133/23-24	Prathmesh &KK ,Tilak Nagar ,Maharashtra	Mix Design
136	CM 134/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Paving Block
137	CM 135/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Paving Block
138	CM 136/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Solid Blocks
139	CM 137/23-24	KSEB,Mechanical Facility,Kolathara,Kozhikode	Cube Test
140	CM 138/23-24	Assistant Engineer, PWD Bldgs. Section, Ayyanthole.	Solid Blocks
141	CM 139/23-24	Assistant Engineer PWD Bldgs. Section, Ayyanthole	Solid Blocks
142	CM 140/23-24	Assistant Engineer PWD Bldgs. Section, Ayyanthole.	Steel Test
143	CM 141/23-24	Assistant Engineer PWD Bldgs. Section, Ayyanthole.	Steel Test
144	CM 142/23-24	Ramesan.A.K,Attuvaluppil House,Nellayi	Cube Test
145	CM 143/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
146	CM 144/23-24	TM Raj,DGM -Civil RITES	Cube Test
147	CM 145/23-24	TM Raj,DGM -Civil RITES	Steel Test
148	CM 146/23-24	TM Raj,DGM -Civil RITES	Steel Test
149	CM 147/23-24	Assistant Engineer,Pananchery GP	Cube Test
150	CM 148/23-24	Assistant Engineer,Pananchery GP	Cube Test
151	CM 149/23-24	Assistant Engineer PWD section,Thrissur	Steel Test

152	CM 150/23-24	Assistant engineer PWD Buildings,Thrissur .	Cube Test
153	CM 151/23-24	Assistant Engineer,Pananchery GP	Cube Test
154	CM 152/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
155	CM 153/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
156	CM 154/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
157	CM 155/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
158	CM 156/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
159	CM 157/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
160	CM 158/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
161	CM 159/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
162	CM 160/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
163	CM 161/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
164	CM 162/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
165	CM 163/23-24	HPCL,Westhill,Chungam-Design Edge	Paving Block
166	CM 164/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
167	CM 165/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
168	CM 166/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
169	CM 167/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
170	CM 168/23-24	AE,MI SECTION ,Kunnamkulam	Mix Design
171	CM 169/23-24	AE,MI SECTION ,Kunnamkulam	Mix Design
172	CM 170/23-24	AE,MI SECTION ,Kunnamkulam	Mix Design
173	CM 171/23-24	AE,MI SECTION ,Kunnamkulam	Mix Design
174	CM 172/23-24	Assistant Engineer,Head Works,Peechi	Paving Block
175	CM 173/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
176	CM 174/23-24	Executive Engineer, Karapuzha Project Division,Kalpetta,Wayanad	PET
177	CM 175/23-24	Assistant Engineer PWD Buildings,Thrissur .	Cube Test
178	CM 176/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test

179	CM 177/23-24	Raman.D,Site Engineer,Raj Construction	Cube Test
180	CM 178/23-24	PB Homes Pvt.Ltd,TPBL Arcade,Kottapuram Thrissur	Mix Design
181	CM 179/23-24	PB Homes Pvt.Ltd,TPBL Arcade,Kottapuram Thrissur	Mix Design
182	CM 180/23-24	Ar.Jennifer Wilfred ,Chembuthara	Mud Blocks
183	CM 181/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
184	CM 182/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
185	CM 183/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
186	CM 184/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
187	CM 185/23-24	Assistant Engineer, Irrigation section 2 ,Ponnani	Cube Test
188	CM 186/23-24	Assistant engineer KWA ,PH Section Peechi,Thrissur .	Cube Test
189	CM 187/23-24	Ramesan.A.K,Attuvaluppil House,Nellayi	Cube Test
190	CM 188/23-24	HPCL,Westhill,Chungam-Design Edge	Paver blocks
191	CM 189/23-24	Range Forest Officer,Palapilly Range	Fencing Materials
192	CM 190/23-24	Raman.D,Site Engineer,Raj Construction	Cube Test
193	CM 191/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Steel Test
194	CM 192/23-24	Assistant Engineer,MI Section ,Thrissur	Mix Design
195	CM 193/23-24	Assistant Engineer,Peechi Project Section, Mannamangalam,Thrissur	Cement Test
196	CM 194/23-24	Assistant Engineer,Peechi Project Section, Mannamangalam,Thrissur	Steel Test
197	CM 195/23-24	Deputy Director,Instrumentation Division,Keri, Peechi	Rock core Test
198	CM 196/23-24	Assistant Engineer,(lid&ew) ,Thrissur Corporation	Cube Test
199	CM 197/23-24	Sibi k jose, Kannampuzha, Parathodu, Kambilikandom, Idduki	Structural stability
200	CM 198/23-24	Olivia Projects, Punkunnam, Thrissur	Mix Design
201	CM 199/23-24	Assistant Engineer,MI section ,Mala,Thrissur	Cube Test
202	CM 200/23-24	Assistant Engineer,MI section ,Mala,Thrissur	Cube Test
203	CM 201/23-24	M/s Hostech PMC Pvt.ltd	Mix Design

204	CM 202/23-24	M/s Hostech PMC Pvt.ltd	Mix Design
205	CM 203/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
206	CM 204/23-24	Assistant engineer PWD Buildings, Thrissur	Cube Test
207	CM 205/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
208	CM 206/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
209	CM 207/23-24	TM Raj,DGM -Civil RITES	Steel Test
210	CM 208/23-24	HPCL,Westhill,Chungam-Design Edge	Paver Blocks
211	CM 209/23-24	HPCL,Westhill,Chungam-Design Edge	Paver Blocks
212	CM 210/23-24	HPCL,Westhill,Chungam-Design Edge	Paver Blocks
213	CM 211/23-24	Dhinil,KPN Pisharody Road, Kannatakara, Thrissur	Solid Blocks
214	CM 212/23-24	Assistant Engineer,MI section ,Thrissur,	Steel Test
215	CM 213/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
216	CM 214/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Aggregates Test
217	CM 215/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
218	CM 216/23-24	Raman.D,Site Engineer,Raj Construction	Cube Test
219	CM 217/23-24	Ayaz.K.M,Operation Manager,Paver Solutions	Paver Blocks
220	CM 218/23-24	AE,PWD Bridges,Vadakara	NDT
221	CM 219/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
222	CM 220/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
223	CM 221/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
224	CM 222/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
225	CM 223/23-24	Olivia Projects, Punkunnam, Thrissur	Solid Blocks
226	CM 224/23-24	Team Leader RITES	Cube Test
227	CM 225/23-24	Team Leader RITES	Steel Test
228	CM 226/23-24	Assistant Engineer ,Peechi Project Section Thanipadam,Thrissur .	Cement Test
229	CM 227/23-24	Assistant engineer,MI Section, Kodugalur, Thrissur	Mix Design
230	CM 228/23-24	Assistant engineer,MI Section, Kodugalur, Thrissur	Mix Design

231	CM 229/23-24	Assistant engineer,MI Section, Kodugalur, Thrissur	Mix Design
232	CM 230/23-24	Assistant engineer,MI Section, Kodugalur, Thrissur	Mix Design
233	CM 231/23-24	Ramesan.A.K,Attuvaluppil House,Nellayi	Cube Test
234	CM 232/23-24	Deputy Director,Instrumentation Division,Keri, Peechi	Rock Core Test
235	CM 233/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Cement Test
236	CM 234/23-24	Builtech Foundation,Chittur,Palakkad	Steel Test
237	CM 235/23-24	Assistant Engineer,Minor Irrigation Section,Thrithala	Rock core Test
238	CM 236/23-24	Assistant Engineer PWD Buildings,Thrissur	Cube Test
239	CM 237/23-24	HPCL,Westhill,Chungam-Design Edge	Paver Blocks
240	CM 238/23-24	HPCL,Westhill,Chungam-Design Edge	Paver Blocks
241	CM 239/23-24	Raman.D,Site Engineer,Raj Construction	Cube Test
242	CM 240/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
243	CM 241/23-24	Assistant Engineer,Minor Irrigation Section, Pattambi,Palakkad Dist.	Sheet Pile Test
244	CM 242/23-24	Assistant Engineer,Minor Irrigation Section, Pattambi,Palakkad Dist	Cube Test
245	CM 243/23-24	HPCL,Westhill,Chungam-Design Edge	Paver Blocks
246	CM 244/23-24	Assistant Engineer,Pambar Project Section no-2 Maratoor	Rock Core Test
247	CM 245/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Steel Test
248	CM 246/23-24	Olivia Projects, Punkunnam, Thrissur	Brick Test
249	CM 247/23-24	Olivia Projects, Punkunnam, Thrissur	Brick Test
250	CM 248/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
251	CM 249/23-24	Ramesan.A.K,Attuvaluppil House,Nellayi	Cube Test
252	CM 250/23-24	Minor Irrigation Sub Division, Kasargode	PET
253	CM 251/23-24	Nirmithi Kendra ,Ayyanthol,Site Engineer	Cube Test
254	CM 252/23-24	Assistant Engineer PWD Buildings,Thrissur	Cube Test
255	CM 253/23-24	Ecohomes Constructions, Muthuthalaroad, Thrithala	Mud Block Test

256	CM 254/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
257	CM 255/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
258	CM 256/23-24	Assistant Engineer,LSGD Sub Division, Ollukkara BP,Thrissur	Cube Test
259	CM 257/23-24	Assistant Engineer PWD Buildings,Thrissur	Cube Test
260	CM 258/23-24	Prathmesh &KK ,Tilak Nagar ,Maharastra	Steel Test-I Section
261	CM 259/23-24	DGM -Civil-RITES-,RCB Kankakkadvu,	Steel Test
262	CM 260/23-24	Office of Assistant Engineer,MI Section, Tripunithura	Fencing Materials
263	CM 261/23-24	Assistant Engineer,Irrigation Section, Malapuram.	PET
264	CM 262/23-24	Olivia Projects, Punkunnam, Thrissur	Red Brick
265	CM 263/23-24	Olivia Projects, Punkunnam, Thrissur	Cube Test
266	CM 264/23-24	Deputy Director,Instrumentation Division,Keri, Peechi	Rock Core Test
267	CM 265/23-24	Assistant Engineer PWD Buildings,Thrissur	Cube Test
268	CM 266/23-24	Deputy Director,Instrumentation Division,Keri, Peechi	Rock Core Test
269	CM 267/23-24	Athul M.S,Manalil House,Valapanchiragara	Alumimium Bars
270	CM 268/23-24	Assistant Engineer PWD Buildings,Thrissur	Cube Test
271	CM 269/23-25	Assistant Engineer,Quality Control ,Palakkad	Sheet Pile Test
272	CM 270/23-26	CMK Projects Private Limited, Bangalore	NDT

APPENDIX-IV

LABORATORY INVESTIGATION

Testing and analysis of soil samples, including both undisturbed and disturbed samples, were conducted for the following works:

C.5.01 Desiltation of Chitturpuzha at the upstream of Shanmugham

C.5.02 Investigation work for repair and rehabilitation of Koottayi RCB in Tirur-Ponnanipuzha in Mangalam GP

C.5.03 Testing of soil sample sample from Chembuthra, Pattikkad

C.5.04 Testing of Soil sample from ward 29 of Kodungallur Municipality

C.5.05 Testing of soil samples as a part of the Ph.D (Agrl.Engg) research work of Ms. Aiswarya L on landslide hazard vulnerability and risk assessment for Chaliyar River basin

C.5.06 Investigation & Boundary Demarcation for repair, rehabilitation & rejuvenation of flood affected Chellankavu Irrigation Tank – Testing of Soil Samples

C.5.07 WRD – Request for testing the 7 Nos of excavated soil samples kept in Komalapuram Spinning Mill, Alappuzha – Six laning of Paravoor to Kottukulangara Section of NH-66 EPC mode under Bharathmala Pariyojana

C.5.08 General-Investigation Work-Parapram-Preliminary Investigation for construction of side Protection wall on either bank of Anjarakkandy River near Parapram regulator in Kannur District

C.5.09 Disposal of dredged material for deepening of shoal near Tevara on National Waterway No.3

C.5.10 Preliminary Soil investigation for second phase Development of Chettuva Fishing Harbour

C.5.11 Desiltation Proposal of Sand accumulated at the site of Koottakadavu Regulator across Bharathapuzha in Anakkara Panchayath

C.5.12 Construction of Regulator cum Bridge at Attappilly across Kurumali River in Thrissur District

C.5.13 Desiltation of Bharathapuzha at upstream of Cheruthuruthi check dam

C.5.14 Construction of check dam across Bharathapuzha – Testing of gradation of sand samples from Pattambi

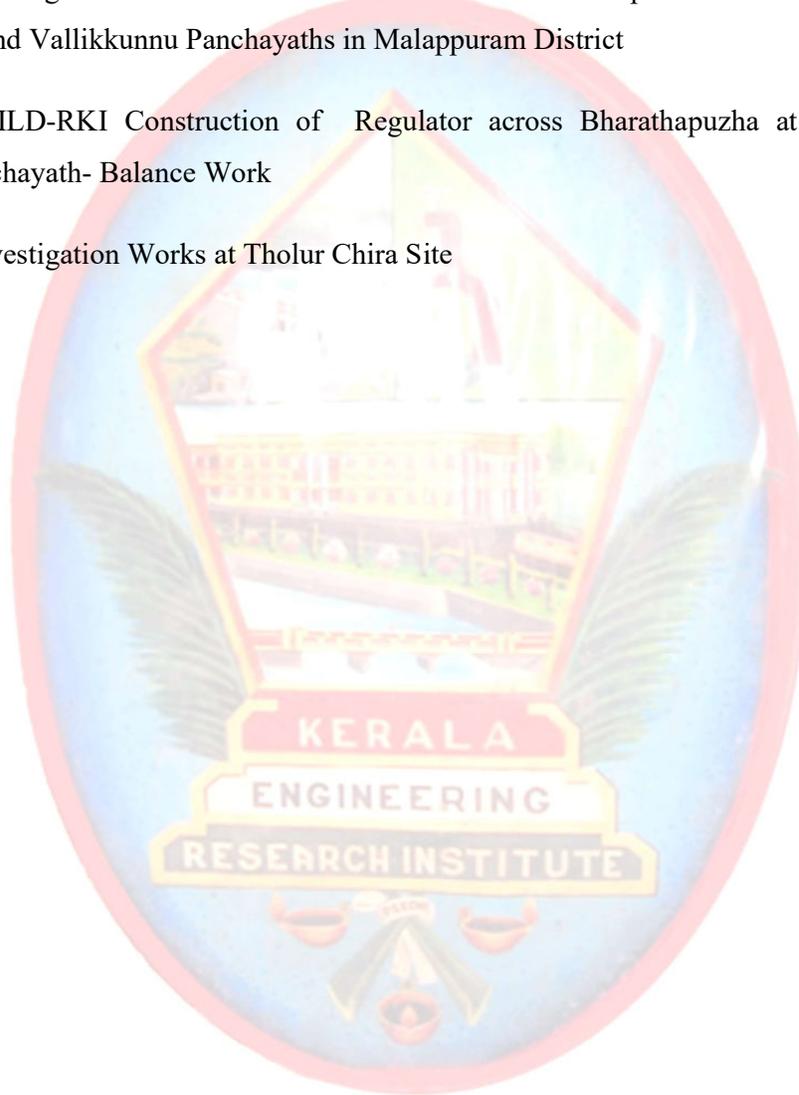
C.5.15 Bathymetric Study of Bhoothathankettu Reservoir using Integrated Bathymetric Study (IBS)

C.5.16 Soil Investigation for desiltation of Construction of RCB across Bharathapuzha at Kankakkadavu in Kuttipuram Panchayath, Malappuram District

C.5.17 Soil Investigation works to the reconstruction of Mannattampara weir across Kadalundi river in Mooniyur and Vallikkunnu Panchayaths in Malappuram District

C.5.18 REBUILD-RKI Construction of Regulator across Bharathapuzha at Koottakadavu in Anakkara Panchayath- Balance Work

C.5.19 Soil Investigation Works at Tholur Chira Site



APPENDIX-V**DATES AND PLACES OF OBSERVATIONS**

In order to have more detailed idea of the behavior of factors affecting the shore line changes, three consecutive points are taken for reference. At a particular study reach five readings are taken in all three points at definite timing. Nearly 20 to 25 Km apart straight reaches without much external disturbances are selected for taking these simultaneous observations. The places of observations with timing and CP Nos. are listed below. The dates in the year 2023-2024 are as follows:

Sl.No	Month	Date of observation
1.	April	20.04.2023
2.	May	19.05.2023
3.	June	17.06.2023
4.	July	17.07.2023
5.	August	16.08.2023
6.	September	14.09.2023
7.	October	14.10.2023
8.	November	13.11.2023
9.	December	12.12.2023
10.	January	11.01.2024
11.	February	09.02.2024
12.	March	10.03.2024

APPENDIX-VI**DETAILS OF SIMULTANEOUS OBSERVATIONS**

Sl No	Name of Station	Time and CP Nos				
		9.00 AM	10.00 AM	11.00 AM	11.45 AM	12.30 AM
1	Vettukkad	0112	0114	0116	0114	0112
2	Mariyanad	0194	0196	0198	0196	0194
3	Eravipuram	0324	0329	0332	0329	0324
4	Thottappally	0597	0600	0602	0600	0597
5	Alapuzha	0704	0707	0710	0707	0704
6	Thanki	0935	0930	0926	0930	0935
7	Kannamali changed to Puthuvype from july 2023	1087	1094	1098	1094	1087
8	Kuzhuppilly	1140	1147	1149	1147	1140
9	Perinjanam	1269	1274	1279	1274	1269
10	Nattika	1323	1330	1333	1330	1323
11	Blangad	1418	1421	1428	1421	1418
12	Vakkad	1595	1599	1605	1599	1595
13	Calicut	1830	1826	1821	1826	1830
14	Melody	2013	2009	2004	2009	2013
15	Thalassey	2188	2176	2171	2176	2188
16	Kanhangad	2608	2603	2598	2603	2608
17	Kasargod	2730	2725	2720	2725	2730
18	Kannuvatheertha (Old CP)	103	111	121	111	103

