UWR Rainwater Offset Unit Standard

(UWR RoU Standard)

Concept & Design: Universal Water Registry

www.uwaterregistry.io

Project Concept Note & Monitoring Report

(PCNMR)

Project Name: Wastewater Recycling and Reuse by Kunnankalpalayam Common Effluent Treatment Plant Pvt Ltd

UWR RoU Scope: 5

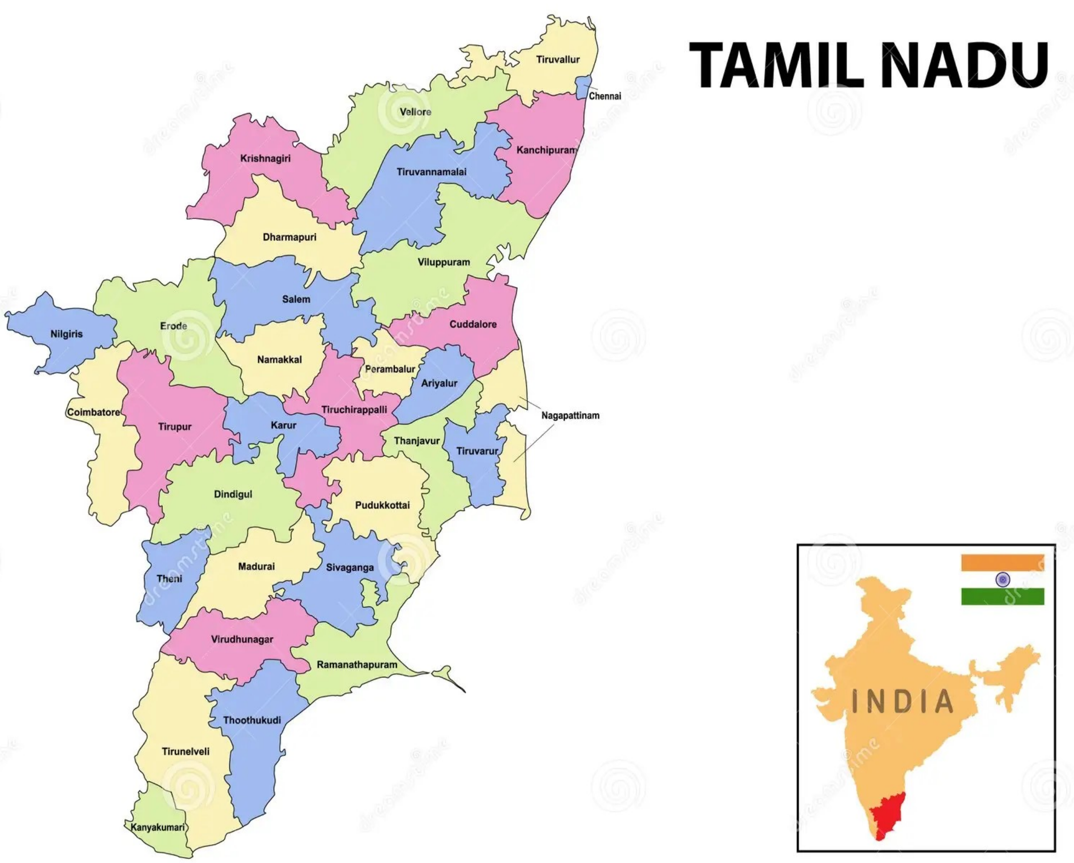
Monitoring Period: 01/01/2014-31/12/2023

Crediting Period:1/01/2014-31/12/2023

UNDP Human Development Indicator: 0.644 (India)

A.1 Location of Project Activity

State	Tamil Nadu
District	Tiruppur
Block Basin/Sub Basin/Watershed	Parambikulam-Aliyar basin [Tiruppur | TWAD]
Lat. & Longitude	11°03'27", 77°19'33"
Area Extent	385G+5HG Kunnankalpalayam Common Effluent Treatment Plant Pvt Ltd, Chinnakarai, Tiruppur, Murugampalayam, Tamil Nadu 641604
No. of Villages/Towns	1



Geographical Map of Project Location

Satellite View of Kunnankalpalayam Common Effluent Treatment Plant Pvt Ltd

AUTHORISATION No. 21HFC30799151 dated 01/03/2021
Proceeding No. T5/TNPCB/F.0174TPS/HWA/RL/TPS/2021 dated 01/03/2021

Sub: Tamil Nadu Pollution Control Board – Hazardous Waste Authorization-Fresh- M/s. KUNNANKALPALAYAM COMMON EFFLUENT TREATMENT PLANT PRIVATE LIMITED, S.F.No. 260/3, 262/1, KARAIPUDUR Village, PALLADAM Taluk, Tiruppur District - Authorization under Rule 6 (2) of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 enacted under Environment (Protection) Act, 1986 – Issued- Reg.

Ref: 1.Unit's HWA Application No. 30799151, dated : 02.09.2020

2.DEE/TPR(S), HWA-IR.No.0174TPS/HWA/RL/DEE/TPS/2021 dated 01.02.2021

FORM 2

[See rule 6 (2)]

FORM FOR GRANT OR RENEWAL OF AUTHORISATION TO THE OCCUPIERS, RECYCLERS, REPROCESSORS, REUSERS, USER AND OPERATORS OF DISPOSAL FACILITIES

1. Number of authorization: 21HFC30799151 and dated : 01/03/2021
2. The Managing Director of M/s. KUNNANKALPALAYAM COMMON EFFLUENT TREATMENT PLANT PRIVATE LIMITED is hereby granted an Authorisation based on the based on the enclosed signed Inspection report for Generation,Collection,Storage,Transportation, Disposal of hazardous or other wastes or both on the premises situated at S.F.No. 260/3, 262/1, KARAIPUDUR Village, PALLADAM Taluk, Tiruppur District.

Sl No	Schedule / Name of the Processes	Name of Hazardous Waste (with category No)	Quantity	Activities for which Authorization is issued
1	Schedule I /35. Purification and treatment of exhaust air/gases, water and waste water from the processes in this schedule and common industrial effluent treatment plants (CETP's)	35.3-Chemical sludge from waste water treatment	250 T/Annum	Generation,Collection,Storage,Transportation,Disposal to M/s.Ultra Tech Cement Limited, Ariyalur
2	Schedule I /35. Purification and treatment of exhaust air/gases, water and waste water from the processes in this schedule and common industrial effluent treatment plants (CETP's)	35.3-Chemical sludge from waste water treatment	2000 T/Annum	Generation, Collection, and Storage of bio sludge in an impervious closed shed within the CETP premises.
3	Schedule I /35. Purification and treatment of exhaust air/gases, water and waste water from the processes in this schedule and common industrial effluent treatment plants (CETP's)	35.3-Chemical sludge from waste water treatment	200 T/Annum	Generation, Collection, and Storage of mixed salt in an impervious closed shed within the CETP premises.

3. This authorization shall be valid for a period upto 31/03/2025.

The Authorization is issued subject to the following general and special conditions annexed.

For Member Secretary
Tamil Nadu Pollution Control Board
Chennai

NOC for Hazardous waste disposal

A.2. Project owner information, key roles and responsibilities

Project Proponent (PP):	Kunnankalpalayam Common Effluent Treatment Plant Pvt Ltd
UCR Project Aggregator	Viviid Emissions Reductions Universal Private Limited
Contact Information:	lokesh.jain@viviidgreen.com

The Project Proponent (PP) affirms that they meet all the requirements outlined in the management plan regarding ownership, legal rights, permits, and cost details for the successful implementation of the project. Specifically:

Water User Rights: The PP holds the necessary water user rights for the area within the project's boundary. These rights are legally secured and ensure that the PP has full entitlement to use the water resources required for the project's operations.

Legal Land Title: The PP holds an uncontested legal land title for the entire project area within the project's boundary. The title is fully documented and free of any disputes, confirming the PP's legal right to utilize the land for project purposes.

Necessary Permits: The PP has obtained all the required permits for the implementation of the project. In cases where certain permits are pending, the PP has already applied for the necessary approvals and is working in full compliance with the relevant regulatory requirements to ensure the timely commencement of the project.

Cost Details: The PP has thoroughly assessed and documented the cost details for project implementation. A detailed cost breakdown is available, covering all aspects of project development, including infrastructure, permits, equipment, and operational costs.

By meeting these criteria, the PP ensures that all legal and regulatory requirements for the project are satisfied, enabling the project to proceed without hindrance.

A.2.1 Project RoU Scope

PROJECT NAME	Wastewater Recycling and Reuse by Kunnankalpalayam Common Effluent Treatment Plant Pvt Ltd
UWR Scope:	Scope 5: Conservation measures taken to recycle and/or reuse water, spent wash, wastewater etc. across or within specific industrial processes and systems, including wastewater recycled/ reused in a different process, but within the same site or location of the project activity. Recycled wastewater used in off-site landscaping, gardening or tree plantations/forests activity are also eligible under this Scope.
Date PCN MR Prepared date	19/11/2024

A.3. Land use and Drainage Pattern

Not Applicable.

This project activity involves treating and reusing wastewater. It doesn't include any land-use practices. Also, this is an industrial process designed with technical requirements and following the specified norms of the local pollution control board. Hence, the project activity does not harm any land and Drainage system**.**

A.4. Climate

The project activity does not rely on the climatic conditions of the area as it treats and reuses only the wastewater from the tanneries without letting the water be exposed to any climatic condition.

A.5. Rainfall

The project activity is not dependent on the rainfall pattern of the area as it treats and reuses the wastewater from the tanneries.

A.6. Ground Water

The project activity does not draw water from the ground water reservoirs as it treats and reuses wastewater.

A.7. Alternate methods

TDS in effluent is treated in developed countries and in some other developing countries by adopting either of the two options:

(1) to combine it with domestic sewerage where it gets diluted for further treatment, or

(2) to discharge the high TDS treated effluent into the sea (marine discharge)

Unfortunately, neither of these options is readily available for the Ahmednagar sugar factories. In the first instance, the domestic sewerage from the areas where factories are concentrated (Ahmednagar) is not at all treated.

Secondly, marine discharge (of the treated effluent) option is impractical as the nearest seacoast is at least 600 km from the Tirupur district. Accordingly, the treated effluent is discharged as such into the irrigation and factory premises. Though Upper River is situated within the limits of Tirupur, somehow, the PP has not been offered the choice of either diluting its effluent with city sewerage or marine discharge; so, here surface discharge of treated effluent is resorted to.

The RoU program promotes wastewater treatment and reuse initiatives, thereby offering an alternative to the release of wastewater through surface Discharge which could have an adverse impact on soil Health.

A.8. Design Specifications

The Treatment Process Overview:

The Kunnankalpalayam CETP is designed to handle effluent from textile dyeing industries, specifically processing 5.5 million Liters per Day (MLD) of highly colored wastewater containing various dyes and chemicals. The treatment process begins when colored effluent from multiple dyeing units is collected in a centralized Receiving Sump. This initial collection point serves as the heart of the primary treatment phase, ensuring consistent feed to the subsequent treatment processes.

Primary Treatment and Equalization:

From the Receiving Sump, the effluent passes through a Bar Screen system, which effectively removes larger solid materials like fabric pieces and debris that could potentially damage downstream equipment. The screened wastewater then flows into a Storage & Homogeneous Tank, where it's thoroughly mixed to ensure uniform composition. This equalization step is crucial as it helps manage varying flow rates and concentrations from different industrial units. Following this, the wastewater enters a Neutralization Tank where its pH is carefully adjusted to create optimal conditions for biological treatment.

Biological Treatment and Clarification:

The neutralized effluent undergoes biological treatment in an aeration tank, where microorganisms break down organic compounds in the presence of oxygen. This biological process is fundamental in reducing the organic load of wastewater. The treated mixture then flows into a Secondary Clarifier, where gravity separation allows the treated water to be separated from the biological sludge. The settled sludge is collected in a Sludge Return Sump for further processing, while the clarified water moves to a Chlorine Contact Tank for disinfection.

Advanced Filtration System:

After chlorination, the water undergoes a series of sophisticated filtration steps. It first passes through a Quartz Filter for removal of suspended particles, followed by Micro Filtration for finer particulate removal, and finally through a Softener Filter to reduce water hardness. This multi-stage filtration ensures the water quality meets the stringent requirements for further advanced treatment. The filtered water then enters a Reactor Clarifier for additional purification and preparation for the reverse osmosis process.

Reverse Osmosis and Concentrate Management:

The treatment system incorporates a multi-stage Reverse Osmosis (RO) process, including primary RO followed by Additional Stage RO (4th & 5th Stage HPRO). This advanced separation technology produces high-quality permeate (treated water) while concentrating the dissolved solids in the reject stream. The RO reject, rich in dissolved salts, is further processed through a Multiple Effect Evaporator (MEE) system, where it's concentrated through careful evaporation under vacuum conditions. The condensate from the MEE is recycled back into the system, while the concentrate moves to an Agitated Thin Film Dryer (ATFD) for final processing. The R.O. permeate generating from the R.O. system is sent to the member dyeing industries for reuse in the dyeing process. The reject from the R.O system is further concentrated in the Addl. Stage R.O. & High pressure R.O. systems to get the reject TDS of 90 g/L. to 100 g/L.

Resource Recovery and Product Generation:

The ATFD process is crucial in recovering valuable products from the concentrated stream. It produces several commercially valuable products including Glauber's Salt, Anhydrous Sodium Sulphate, and

Sodium Chloride Salt. Meanwhile, the treated water stream is collected in a Product Water Storage Tank. A separate stream of treated brine is also produced through a dedicated brine preparation system. The facility demonstrates excellent resource recovery principles, with all products being reused by member industrial units.

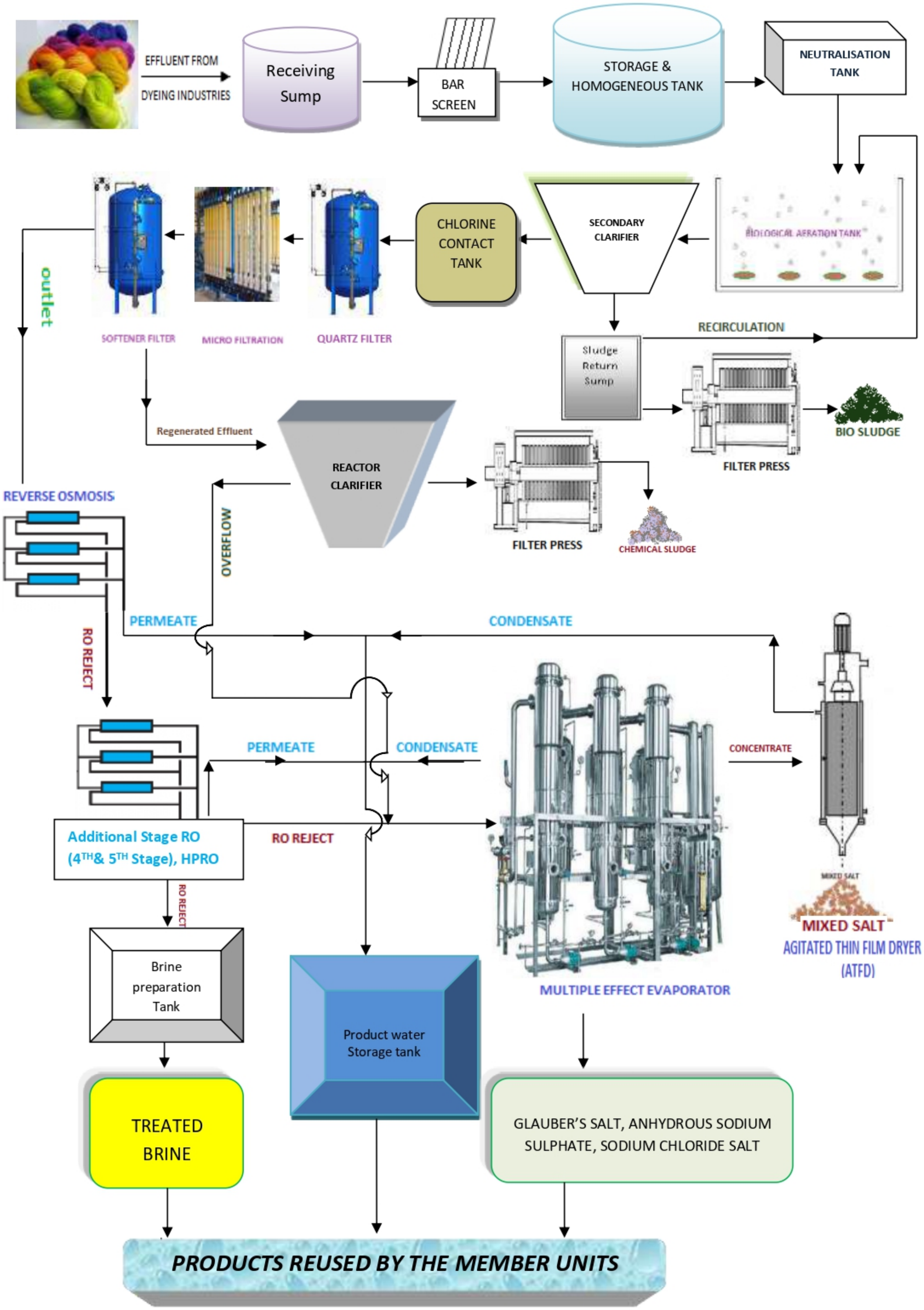
Sludge Management and Environmental Compliance:

The treatment process generates two types of sludge - biological and chemical. These are efficiently managed through Filter Press operations, which dewater the sludge to produce manageable solid cake. The biological sludge can be used as bio-fertilizer, while chemical sludge is properly disposed of following environmental regulations. The filtrate from the press operations is recycled back into the treatment system, ensuring maximum water recovery.

This comprehensive treatment system represents a modern Zero Liquid Discharge (ZLD) facility that not only treats industrial effluent to meet environmental standards but also recovers valuable resources. The process demonstrates how industrial wastewater can be effectively treated while recovering useful products and minimizing environmental impact. The success of this facility lies in its systematic approach to treatment, efficient resource recovery, and commitment to environmental sustainability.

Through this integrated approach, the Kunnankalpalayam CETP effectively manages industrial effluent while recovering valuable resources, making it a model for sustainable industrial wastewater treatment. The facility's design ensures that water quality standards are met while maximizing the recovery and reuse of valuable materials, contributing to both environmental protection and resource conservation.

SCHEMATIC DIAGRAM OF 5.5 MLD KUNNANKALPALAYAM CETP



A.9. Implementation Benefits to Water Security

To meet the quantitative targets for water recovery and reuse in the region, several artificial recharge structures, including modifications to the existing Reverse Osmosis (RO) system, High-Pressure RO, Multi-Effect Evaporator (MEE) systems, and related infrastructure, have been implemented at the Kunnankalpalayam Common Effluent Treatment Plant (CETP). These modifications were designed to optimize water recovery, improve effluent treatment efficiency, and ensure sustainable water reuse across the member units.

The key infrastructure implemented includes:

1. Reverse Osmosis (RO) System: The existing RO system has been modified to accommodate the current feed water parameters. A High-Pressure RO system was also introduced to enhance recovery rates. As a result, the average permeate recovery rate was improved to 90–91%, surpassing the design recovery rate of 85%.

2. Additional Multi-Effect Evaporator (MEE) and Chiller: A new MEE system with a chiller has been installed to further enhance the evaporation process and improve the management of recovered water and brine. This modification supports the increased recovery capacity of the plant.

3. Effluent Flow and Water Recovery: The average inflow to the CETP during October–December 2021 was approximately 2497 m^3/day, which is about 50% of the plant's design flow, with the maximum inflow reaching 2774 m^3/day. The feed flow to the Reverse Osmosis section peaked at 3173 m^3/day, resulting in the recovery of water that ranged from 86% to 95% of the effluent flow from the member units.

The efficient handling of effluent, along with the significant improvements to the RO and MEE systems, enables the plant to recover a substantial volume of water, which is then reused by the member units. The wide variation in water recovery and brine discharge across the units highlights the customized approach needed for each unit's specific water treatment needs. These measures contribute to the overall goal of achieving sustainable water management and meeting the water recovery and reuse targets set for the region.

The modifications to the CETP's infrastructure, including the installation of advanced RO systems and the MEE, represent a substantial step toward meeting the quantitative targets for water recovery, reuse, and efficient effluent management in the region.

A9.1 Objectives vs Outcomes

The impact assessment or objectives of this project activity can generally be enumerated as follows:

- The project activity highlights the catalytic role that corporate India must play vital role in reducing industrial water consumption as well as water pollution per unit of industrial output.
- The PP has showcased technology that creates safe industrial grade water from an effluent source and has overcome the challenges faced by the alternate methods implemented and/or being proposed for the same.
- The PP has showcased the successful wastewater treatment of industrial effluent, thus saving millions of liters of wastewater.
- The project activity showcases best-in-class wastewater treatment technology that can replace the equivalent freshwater and industrial demand in different sectors for nonportable purposes while reducing the proportion of untreated wastewater and substantially increasing recycling and safe reuse in the project activity area.
- All the Dying industries under Kunnankalpalayam CETP has been benefiting from this plant.

A9.2 Interventions by Project Owner / Proponent / Seller

.

The project at Kunnankalpalayam CETP involved key interventions to optimize effluent treatment, water recovery, and brine management:

Modification of Existing RO System: The existing Reverse Osmosis (RO) system was upgraded based on current feed water parameters, replacing the planned Ultrafiltration (UF) system. This modification included the implementation of a High-Pressure RO system, which improved permeate recovery to 90-91%, exceeding the design target of 85%.

High-Pressure RO System: A High-Pressure RO system was installed to improve water recovery, handling flows up to 3173 m^3/day, with an average recovery rate of 90-91%. This enhanced the efficiency of water treatment.

Installation of Additional MEE with Chiller: An additional Multi-Effect Evaporator (MEE) and chiller were installed to manage brine more effectively and reduce environmental impact by concentrating the brine for safe disposal.

Modification of Existing MEE: The existing MEE system was upgraded to handle increased brine volumes from the High-Pressure RO system, improving brine concentration and disposal efficiency.

Coal-Based Boiler Capacity Upgrade: A high-capacity coal-based boiler was installed to meet the increased energy demands of the enhanced treatment process, ensuring stable operation.

Effluent and Water Recovery Management: The CETP handled an average inflow of 2497 m^3/day, 50% of the design capacity. Recovered water for member units varied between 86% and 95% of the effluent flow, improving water reuse efficiency.

These interventions collectively enhanced the CETP's capacity, optimized water recovery, and ensured efficient brine management, leading to improved operational performance and environmental sustainability.

The project activity hence achieves the sustainable management and efficient use of India's natural resources since the PP had the option to install bore wells that would have depleted the local groundwater resources and/or continued to use existing drinking water resources in the surrounding area. The PP has instead intervened and chosen to treat and reuse ETP effluent voluntarily at significant costs, thus saving millions of liters of safe drinking water for the city.

Increase in population density and improvement in quality of life has resulted in an increase in demand for natural resources like water. Groundwater being the major source of water supply catering to about 85% of rural water supply, the stress on groundwater is ever increasing. It has resulted in over-exploitation of the resources at places. The situation demands a reorientation of the strategy for its development and management.

The intervention of the PP has had a direct impact on the water security of the area. Over-development of the ground water resources results in declining ground water levels, shortage in water supply, intrusion of saline water in coastal areas and increased pumping lifts necessitating deepening of ground water structures and increase in power costs.

A.10. Feasibility Evaluation

The installed CETP by the PP are robust and smoothly adapts to variations in wastewater effluent. Before establishing the project, PP has done the feasibility test as per TNPCB Standard.

A.11. Ecological Aspects & Sustainable Development Goals (SDGs):

The sustainable development attributes attached to the project activity are demonstrated below:

Sustainable Development Goals Targeted	Most relevant SDG Target/Impact	Indicator (SDG Indicator)
3 GOOD HEALTH AND WELL-BEING	3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	The PP showcases how recycling and reusing wastewater can prevent depletion of natural water reserves and prevent water scarcity during droughts. The hazardous impact of industrial wastewater is now avoided due to this project. The PP ensures water availability in the nearest to the project location.
6 CLEAN WATER AND SANITATION	6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	The PP has showcased recycling and safe reuse of 5500 million liters within the industry during this monitored period, which directly correlates to this indicator 6.3.
8 DECENT WORK AND ECONOMIC GROWTH	8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Number of jobs created, and the Number of people trained as part of this project activity.
13 CLIMATE ACTION	13.2: Integrate climate change measures into national policies, strategies and planning	Recycling and reusing wastewater is an effective solution for climate change adaptation because it helps mitigate the impacts of droughts, floods, and other extreme weather events that are becoming increasingly common due to climate change due to water scarcity. The quantity of wastewater recycled and reused by the PP is the SDG indicator.

This project serves as a strong example of sustainable resource management and efficient utilization of water resources within India’s industrial sector. The project proponent (PP) was faced with two key options to meet the water demands for the operations of the bleaching and dyeing industries in the region.

One option was to install borewells, a solution that could have led to the over-extraction of local groundwater reserves. With groundwater levels already under significant stress in many parts of India, this would have posed a serious risk of depleting the local aquifers, impacting both agricultural and domestic water needs. The alternative was to continue drawing from existing, potentially potable water resources registered with the Universal Water Registry, which could have led to increased pressure on local freshwater sources that are often already under strain due to urbanization and population growth.

Recognizing the environmental and social impact of these options, the PP made the commendable decision to implement a more sustainable solution: the installation of a Common Effluent Treatment Plant (CETP). This facility is specifically designed to treat the effluent generated by the bleaching and dyeing industries—a sector that typically produces large volumes of highly contaminated wastewater. By treating and reusing this effluent, the CETP significantly reduces the dependency on both local groundwater and potable water supplies, achieving notable water savings in the process.

Key Achievements and Impacts

1. Water Reuse and Conservation:

> The CETP has been highly effective in treating the effluent from the dyeing and bleaching processes, making the treated water suitable for reuse by the member industries. The plant treats wastewater from various textile processes, which often contain high levels of dyes, chemicals, and organic contaminants. Post-treatment, the recovered water is returned to the member units, reducing their need for fresh water. The reuse of treated water for industrial purposes such as cooling, processing, and cleaning contributes to millions of liters of water saved annually, alleviating the demand on local water resources.

Impact:

> The average inflow to the CETP during October–December 2021 was 2497 m^3/day, about 50% of the design flow.
>
> The average permeate recovery rate achieved by the Reverse Osmosis (RO) system was 90-91%, higher than the design recovery rate of 85%, ensuring a high percentage of effluent is effectively treated and reused.

2.Environmental Benefits:

> By opting for a CETP, the PP has significantly mitigated the environmental risks associated with untreated effluent discharges from the textile industries. The treated water is used in non-potable applications such as irrigation and gardening within the industrial area, thereby preventing potential leakage of pollutants into the surrounding soil and water bodies. This not

only reduces the contamination of groundwater but also helps in maintaining a safer and more environmentally friendly industrial environment.

Impact:

The treated effluent is reused by member units, and effluent reuse rates have been recorded between 86% and 95% of the effluent flow from the member industries.

The introduction of high-efficiency RO and High-Pressure RO systems has enhanced water recovery rates, ensuring more wastewater is treated and reused rather than being discharged.

3.Groundwater Management:

The project demonstrates a responsible approach to groundwater management. By avoiding over-reliance on borewells and instead treating and reusing effluent, the PP has contributed to the conservation of local groundwater resources. This proactive approach also serves as a model for other industries, particularly large-scale textile and dyeing units, that face similar challenges with water usage and disposal.

Impact:

The project has avoided the need for additional groundwater extraction, which could have led to unsustainable depletion of local aquifers.

Through the use of advanced water treatment technologies, the PP ensures that water resources are replenished, rather than depleted.

4.Solid Waste and Manure Disposal:

As part of the project's environmental responsibility, the PP has conducted a comprehensive Environmental Impact Assessment (EIA). This assessment has ensured that the treatment process, including the disposal of sludge, manure, and solid waste, is carried out safely and in compliance with environmental regulations. Proper disposal methods have been implemented to minimize any adverse impacts on the surrounding environment.

Impact:

The CETP is designed to handle solid waste generated during the treatment process in a way that minimizes harm to the local ecosystem. This includes the safe disposal of sludge and other by-products, which are processed and handled according to environmental standards.

This project sets an important precedent for the industrial sector, particularly within the textile and dyeing industries, which are among the largest consumers of water and generators of wastewater in India. The success of the CETP project encourages other industries to adopt similar sustainable water management practices to address the growing challenges of water scarcity and environmental pollution.

By investing in treatment technologies such as Reverse Osmosis (RO), High-Pressure RO, and Multi-Effect Evaporators (MEE), the project demonstrates that it is possible to significantly reduce the consumption of freshwater, enhance water recycling, and limit the environmental impact of industrial operations. The success of this project underscores the potential for sustainable, resource-efficient solutions that can help industries meet both their operational needs and environmental obligations.

The CETP project represents a major step forward in the sustainable management of water resources in India's industrial sector. By treating and reusing effluent, this initiative not only conserves millions of liters of water but also reduces the environmental impact of textile and dyeing operations. The project serves as a powerful example for other industries to follow, encouraging the widespread adoption of responsible water management and waste treatment practices to safeguard India's water resources for future generations.

Ecological Issues addressed by the project activity in terms of	
Inundation of inhabited land	The project does not lead to inundation of residential land.
Creation of water logging and vector disease prevention mitigation	The project activity has taken necessary precautions in the CETP area to avoid any type of leakage that can be percolated into the surrounding soil.
Deterioration of quality of groundwater	By avoiding the use of borewells the project activity does not deplete aquifers and hence prevents the depletion of groundwater resources.

A.12. Recharge Aspects:

NA

Water Budget Component	Typical Estimated Uncertainty (%)	Description
Surface Inflow	1%	In accordance with the RoU Standard version 7, and considering that the flow meters are calibrated, PP has accounted for a 1% uncertainty factor in both inflow and outflow volumes to maintain a conservative approach. Consequently, an uncertainty factor of 0.98 is applied to

		all ROUs.
Precipitation	NA	Not available
Surface Outflow	1%	In accordance with the RoU Standard version 7, and considering that the flow meters are calibrated, PP has accounted for a 1% uncertainty factor in both inflow and outflow volumes to maintain a conservative approach. Consequently, an uncertainty factor of 0.98 is applied to all ROUs.
Evapotranspiration	NA	Not available
Deep Percolation	NA	Not available

A.13. Quantification Tools

Baseline Scenario

The baseline scenario is the situation where, in the absence of the project activity, the PP would have **one or all** the below options:

a) installed multiple bore wells within the project boundary which would have depleted the local groundwater resources (aquifers); **and/or**
b) diverted existing safe drinking water resources from the surrounding residential area; **and/or**
c) discharged the ETP effluent without further treatment, recycling, and reuse.

Hence the following baseline scenario is applicable for this project activity:

"The net quantity of treated ETP effluent / wastewater that would be discharged directly into the local drain/sewer without further being recycled and/or reused daily post treatment per year"

The net quantity of treated water used is measured via flow meters installed at the site. The primary set of data records are kept at plant level, managed by a technical team. Also, for conservative purposes, the working days or operational days have been assumed at 360 days in a year during the 1st monitoring period. However, the number of days is not an influential parameter on RoUs calculation as RoUs are calculated based on total quantity of treated water being recycled & reused.

Sr.No.	Month	INLET (in m^3) (Collection well to SHT)	Total Water Treated (m^3) (Actual Inflow)	Total Water Recycled		RoUs with Uncertainity Factor
				Recovered Water (in m^3)	Brine solution (in m^3)	
1	Jan-14	16187	15487	14726	560	14980
2	Feb-14	19029	18255	17338	868	17842
3	Mar-14	19449	19924	19143	786	19530
4	Apr-14	18410	20705	19656	818	20065
5	May-14	20946	21426	20206	1007	20789
6	Jun-14	24851	23653	22620	742	22895
7	Jul-14	25604	21854	20470	935	20977
8	Aug-14	27660	28310	26908	1022	27371
9	Sep-14	26987	28939	27738	925	28090
10	Oct-14	19522	19324	18458	548	18626
11	Nov-14	21934	18284	17162	778	17581
12	Dec-14	27010	25655	24505	1118	25111
13	Jan-15	19413	20666	19578	906	20074
14	Feb-15	19594	20070	18993	939	19533
15	Mar-15	23188	25147	23988	1094	24580
16	Apr-15	23890	21736	21573	1084	22204
17	May-15	20717	20717	18196	1205	19013
18	Jun-15	22681	24193	22396	971	22900
19	Jul-15	24413	28356	27201	1047	27683
20	Aug-15	23264	25250	24482	987	24960
21	Sep-15	24365	19515	18650	776	19037
22	Oct-15	28158	29018	27497	1255	28177
23	Nov-15	16422	15212	14476	593	14768
24	Dec-15	28988	30483	29380	1042	29814
25	Jan-16	19601	20051	19152	817	19570
26	Feb-16	23566	25396	24362	936	24792
27	Mar-16	25878	26268	24980	1064	25523
28	Apr-16	26354	25019	24529	965	24984
29	May-16	23148	21903	20830	952	21346
30	Jun-16	30908	32105	30764	1223	31347
31	Jul-16	27383	24829	23786	856	24149
32	Aug-16	25850	28094	27338	752	27528
33	Sep-16	27929	28627	27639	741	27812
34	Oct-16	28077	26824	25678	911	26057
35	Nov-16	20977	21102	20483	387	20453
36	Dec-16	30946	29250	28223	727	28371
37	Jan-17	17774	16582	16043	381	16096
38	Feb-17	25903	27421	26255	873	26585

39	Mar-17	28992	29560	28346	909	28670
40	Apr-17	24590	25470	24203	986	24685
41	May-17	29282	29680	28195	1153	28761
42	Jun-17	28312	24549	23284	1165	23960
43	Jul-17	29559	29960	28345	1476	29225
44	Aug-17	31507	32260	31014	1055	31428
45	Sep-17	29747	31997	30724	1051	31140
46	Oct-17	25386	27574	26418	1054	26923
47	Nov-17	33498	32224	30650	1336	31346
48	Dec-17	32913	31685	30040	1453	30863
49	Jan-18	25181	26801	25673	924	26065
50	Feb-18	30438	29988	28377	1368	29150
51	Mar-18	31629	31985	30376	1447	31187
52	Apr-18	29574	31684	30367	1202	30938
53	May-18	32721	32402	30696	1579	31630
54	Jun-18	28949	28859	27414	1337	28176
55	Jul-18	25482	25710	24530	1109	25126
56	Aug-18	22700	22509	21603	822	21977
57	Sep-18	29174	30824	29625	1101	30111
58	Oct-18	34666	34714	33518	1088	33914
59	Nov-18	18618	17908	17290	516	17450
60	Dec-18	32839	32829	31366	1328	32040
61	Jan-19	28187	28652	27462	1023	27915
62	Feb-19	33253	33648	32278	1242	32850
63	Mar-19	37079	37236	35771	1321	36350
64	Apr-19	37040	36490	35112	1251	35636
65	May-19	43000	41048	39258	1624	40064
66	Jun-19	33673	32459	30943	1368	31665
67	Jul-19	36763	37606	35694	1701	36647
68	Aug-19	34489	33739	33358	1303	33968
69	Sep-19	34004	33654	33311	991	33616
70	Oct-19	33819	34360	33549	1151	34006
71	Nov-19	32128	33104	32306	861	32504
72	Dec-19	41495	42240	39254	1385	39826
73	Jan-20	32399	32406	29868	1003	30254
74	Feb-20	37464	36056	34671	1428	35377
75	Mar-20	30140	30114	28523	958	28891
76	Apr-20	468	849	-	-	0
77	May-20	9850	9958	9486	324	9614
78	Jun-20	34532	31485	30328	1248	30944
79	Jul-20	41632	37366	33984	1464	34739
80	Aug-20	44898	42747	39642	1699	40514

81	Sep-20	44882	42492	39239	1839	40256
82	Oct-20	46529	43699	41190	2022	42348
83	Nov-20	30790	29980	28352	1406	29163
84	Dec-20	52711	51739	49264	2332	50564
85	Jan-21	45088	44466	42380	1794	43291
86	Feb-21	53859	52071	50047	2123	51127
87	Mar-21	57474	54469	52364	2206	53479
88	Apr-21	47774	46295	44926	1682	45676
89	May-21	20388	20079	19189	650	19442
90	Jun-21	24790	23427	22653	963	23144
91	Jul-21	54321	52904	51464	2126	52518
92	Aug-21	59708	60560	57279	2318	58405
93	Sep-21	58841	59163	56672	2250	57744
94	Oct-21	64942	64370	61700	2153	62576
95	Nov-21	27603	28871	27908	875	28207
96	Dec-21	58485	55495	53902	1988	54772
97	Jan-22	38564	39830	39159	1198	39550
98	Feb-22	54280	52551	50866	1900	51711
99	Mar-22	57251	54354	52213	2406	53527
100	Apr-22	53755	52129	50466	2048	51464
101	May-22	52375	54894	52946	1955	53803
102	Jun-22	49207	48605	46638	1807	47476
103	Jul-22	45897	47195	45438	1490	45989
104	Aug-22	32419	33888	32926	1019	33266
105	Sep-22	38580	39307	37896	1324	38436
106	Oct-22	29138	30669	29906	1123	30408
107	Nov-22	42552	43291	42018	1177	42331
108	Dec-22	42551	43392	42447	932	42511
109	Jan-23	29516	32442	31630	882	31862
110	Feb-23	40360	43948	42351	1518	42992
111	Mar-23	48418	51034	48988	2047	50014
112	Apr-23	49466	49442	47626	1821	48458
113	May-23	42270	42628	41234	1677	42053
114	Jun-23	52292	54999	52919	2161	53978
115	Jul-23	47253	47997	46267	1950	47253
116	Aug-23	48238	48908	47601	1820	48433
117	Sep-23	52498	52693	50663	1878	51490
118	Oct-23	51442	52877	51026	1630	51603
119	Nov-23	29523	31023	30013	992	30385
120	Dec-23	47819	51940	50209	1809	148741
						4011801

Quantification

Year	Total ROUs (1000 liters)/yr UCR Cap(1 million RoUs/yr
2014	253856
2015	272743
2016	301933
2017	329681
2018	337763
2019	415047
2020	372665
2021	550380
2022	530472
2023	647262
Total RoUs	**4,011,801**

A.14. UWR Rainwater Offset Do No Net Harm Principles

1. **Increase the Sustainable Water Yield in Areas Where Over-Development Has Depleted the Aquifer:** The project activity, through the operation of the Common Effluent Treatment Plant (CETP) in the dyeing industry, reduces the dependence on groundwater by recycling and reusing treated wastewater. By processing effluents generated from dyeing and textile manufacturing processes, the CETP reintroduces water back into the system, lessening the pressure on local aquifers. In regions where groundwater extraction rates are high, such as in parts of Tamil Nadu, this approach supports sustainable water management by providing an alternative water source and reducing groundwater depletion.

2. **Collect Unutilized Water or Rainwater from Going into Storm Drains or Sewers:** Although rainwater harvesting is not a part of this specific project activity, the CETP plays a critical role in preventing the untreated wastewater from dyeing and textile processes from entering storm drains or sewers. The CETP effectively collects and treats the effluents generated by industry, which would otherwise contribute to water pollution. This prevents unutilized or untreated water from being discarded into the environment and ensures that the wastewater is processed and safely reused, contributing to cleaner water management in the region.

3. **Conserve and Store Excess Water for Future Use:** The CETP setup contributes to water conservation by treating and reusing wastewater from the dyeing industry. The treated effluent is stored and repurposed for various processes within the industry, reducing the need for fresh water. This reuse

of excess treated water helps in conserving valuable water resources, particularly in areas where water scarcity is a growing concern. By minimizing the reliance on external water sources and efficiently utilizing treated wastewater, the project ensures that water is conserved and stored for future use, reducing the pressure on local freshwater resources.

4. **Enhance Local Women's Participation and Professional Development:** The CETP setup in the dyeing industry provides opportunities for local women to actively participate in water management activities. Women are trained in the operation and maintenance of water treatment facilities, wastewater recycling processes, and the management of effluent treatment systems. By involving women in these technical and operational roles, the project helps enhance their professional skills and empowers them to contribute to sustainable water management. This involvement not only boosts their economic and professional development but also promotes gender equality in the workforce, fostering a more inclusive community development approach.

A.15. Scaling Projects-Lessons Learned-Restarting Projects

The Common Effluent Treatment Plant (CETP) at Kunnankalpalayam, Tirupur, which has been designed to treat 5500 m^3/day of effluent from hosiery bleaching and dyeing units, demonstrates an advanced approach to wastewater management and Zero Liquid Discharge (ZLD). Scaling up this project to other regions and sectors requires leveraging existing integrated practices while addressing areas where duplication can be minimized. Below are strategies for scaling the project and enhancing water and urban management:

Scaling up the Common Effluent Treatment Plant (CETP) model, such as the one at Kunnankalpalayam in Tirupur, can significantly improve water and wastewater management in India's dyeing industry. This CETP, designed to achieve Zero Liquid Discharge (ZLD) by treating 5500 m^3/day of effluent, serves as an effective example of how centralized wastewater treatment can be scaled to other textile clusters like Ahmedabad, Jaipur, and Surat, where water-intensive dyeing and textile industries are prevalent. These areas could adopt similar CETPs, customized to meet their specific wastewater volumes and environmental conditions. A cluster-based approach, where small and medium-sized dyeing units share a common treatment facility, can lower operational costs, ensure uniform quality of effluent treatment, and reduce the environmental risks associated with untreated wastewater.

To optimize water recovery and treatment processes, scaling the CETP model could involve upgrading existing systems with advanced technologies such as membrane bioreactors (MBRs), ultrafiltration, or nanofiltration, which provide higher quality treated water. Additionally, improving Reverse Osmosis (RO) systems and enhancing brine management will be crucial. Brine concentrates, which typically contain high levels of salts, can be treated to recover valuable by-products like sodium chloride and sodium sulphate (Glauber's salt), which could be sold or repurposed in other industries, such as agriculture or construction. By maximizing resource recovery, CETPs can contribute to a zero-waste model, reducing the environmental footprint of dyeing industries and generating economic value.

Effluent reuse within the dyeing process is another area where scaling can have a significant impact. By implementing closed-loop systems where treated water is recycled back into the dyeing units, the industry can reduce its freshwater intake and minimize wastewater discharge. Dedicated pipelines connecting CETPs to individual dyeing units can streamline this process, ensuring treated water is efficiently delivered for reuse in dye baths or washing processes, further conserving valuable water resources.

Another key aspect of scaling up CETPs is integrating these systems into urban water management strategies. In regions where CETPs are established, treated effluent could be directed to municipal systems for non-potable uses, such as street cleaning, public park irrigation, or cooling in commercial complexes, thus reducing demand on potable water supplies. In larger cities, collaborations between industry stakeholders and municipal water management authorities could lead to the broader adoption of water reuse practices in urban planning.

Resource recovery from the effluent treatment process also offers a significant opportunity for waste minimization and economic growth. For example, sludge generated during treatment can be analyzed for recoverable materials, such as heavy metals or organic compounds, which can be reused in other industries. Additionally, energy recovery from organic matter in wastewater, through biogas production or other methods, can help power CETP operations, making the system more energy-efficient and reducing its reliance on external power sources.

Public awareness and community engagement play a crucial role in the successful scaling of CETPs. Educating local communities and industry workers about the safety standards, the benefits of wastewater treatment, and the potential for water recycling will help build trust in the system. Targeted communication campaigns can address misconceptions about treated water, emphasizing that it is safe, well-regulated, and beneficial for both industries and urban areas. Case studies of successful water reuse projects can be showcased to demonstrate the long-term benefits of these technologies.

To encourage the scaling of CETPs, government policies and incentives will be vital. Financial incentives or tax breaks for industries that adopt ZLD systems, wastewater recycling, and resource recovery technologies could accelerate their adoption. Additionally, stricter regulations mandating ZLD in water-intensive industries, coupled with streamlined approval processes for CETP projects, would help drive the adoption of best practices in water and wastewater management. Integrating CETP efforts into larger urban water management frameworks will further ensure that treated effluent is put to productive use, creating a circular water economy.

Scaling up CETPs for the dyeing industry in India offers a practical and sustainable solution to the country's water challenges. By replicating successful models, optimizing treatment processes, improving resource recovery, and integrating these systems into urban planning, India can move toward a more sustainable and water-efficient textile sector. These efforts not only reduce water pollution but also conserve freshwater resources, contribute to circular economies, and help mitigate water scarcity in industrial zones and urban areas.

Appendix

Annual Lab Test Report

RAW EFFLUENT (INLET) - MONTHLY AVERAGE LAB REPORT FROM APR - 2023 TO AUG - 2024

PARAMETERS

Month / Year	pH	Temperature °C	EC @ 25°C	TDS (ppm)	TSS (ppm)	Chloride (ppm)	Sulphate (ppm)	COD(T) (ppm)	BOD (ppm)	Total Hardness (ppm)	Calcium Hardness (ppm)	Magnesium Hardness (ppm)	Ca as Ca (ppm)	Mg as Mg(ppm)	Total Alkalinity	P-Alkalinity (ppm)
Apr-23	8.87	35.33	11777	8774	226	1435	2860	2067	612	160	57	103	23	25	1580	109
May-23	9.01	33.56	12090	9009	237	1647	3021	1809	660	173	71	102	28	25	1600	169
Jun-23	8.95	35.44	12622	9410	228	1773	3037	1837	624	191	80	111	32	27	1481	128
Jul-23	9.03	32.16	13004	9697	214	1638	3505	1662	576	234	97	137	39	33	1496	102
Aug-23	8.86	35.03	13195	9841	184	1684	3572	1502	624	217	97	123	37	30	1448	101
Sep-23	8.83	34.07	13526	10086	179	1820	3755	1598	522	201	90	110	36	27	1455	83
Oct-23	8.63	35.39	14761	10999	248	2058	4211	1640	562	261	115	146	46	36	1350	61
Nov-23	8.85	35.23	15929	11950	213	2383	3723	1557	588	321	134	187	54	45	1852	218
Dec-23	8.72	32.63	14697	10976	195	1768	4055	1654	564	334	142	192	57	47	1479	139
Jan-24	8.75	31.88	15231	11368	212	2288	3710	1570	532	251	117	134	47	33	1578	127
Feb-24	8.81	32.96	14648	10926	240	2293	3271	1945	632	192	86	106	34	26	1788	147
Mar-24	8.61	33.81	14653	10966	239	2275	3637	1978	552	202	88	113	35	28	1501	70
Apr-24	8.41	37.07	15038	11277	206	2470	3370	1871	612	194	84	110	34	27	1658	93
May-24	8.33	33.17	16356	12376	208	2653	4141	1990	568	187	83	104	33	25	1619	58
Jun-24	8.10	32.05	15723	11834	209	2584	3852	1932	612	200	83	109	31	27	1462	23
Jul-24	8.13	32.02	14803	11087	200	2369	3701	1985	580	194	82	112	33	27	1491	24
Aug-24	8.06	32.53	12884	9624	233	1949	3315	1800	526	161	66	95	27	23	1234	30
Average	8.64	33.78	14173	10600	216	2064	3572	1788	585	216	93	123	37	30	1534	99
Minimum	8.06	31.88	11777	8774	179	1435	2860	1502	522	160	57	95	23	23	1234	23
Maximum	9.03	37.07	16356	12376	248	2653	4211	2067	660	334	142	192	57	47	1852	218

Month / Year	M-Alkalinity (ppm)	Carbonate Alkalinity	Bicarbonate Alkalinity	CO_3^{2-} (ppm)	HCO_3^- (ppm)	Carbonate Hardness (ppm)	Non Carbonate Hardness (ppm)	FRC (ppm)	Color (pt.Co)	Turbidity (NTU)	Silica as SiO_2 (ppm)	Orthophospate (ppm)	Ammonical Nitrogen (ppm)	Nitrate as NO_3 (ppm)	Fluorides (ppm)	Total Iron (ppm)
Apr-23	1471	218	1362	131	1662	160	0	NIL	2586	134	23.3	43.8	10.95	1.7	1.98	0.1
May-23	1431	338	1262	203	1540	173	0	NIL	2767	148	13.9	56.5	20.6	2.5	1.3	0.05
Jun-23	1354	255	1226	153	1496	191	0	NIL	2721	134	27.8	39.6	13.1	2.2	0.56	0.04
Jul-23	1394	204	1292	122	1576	234	0	NIL	2610	118	26.4	60	2.05	2.7	1.28	0.06
Aug-23	1346	203	1245	122	1519	217	0	NIL	2357	97	23.9	38.3	13.35	3.1	1.84	0.06
Sep-23	1373	165	1290	99	1574	201	0	NIL	2162	91	33.5	57.3	12.35	3.3	1.47	0.08
Oct-23	1289	122	1228	73	1498	261	0	NIL	2431	139	25.8	57.7	9.6	1.9	2.73	0.12
Nov-23	1634	436	1416	262	1728	321	0	NIL	2181	119	29.6	48.6	11.35	3.4	1.63	0.15
Dec-23	1340	278	1201	167	1465	334	0	NIL	2196	103	30.4	43.1	11.8	3.1	1.93	0.09
Jan-24	1451	254	1324	152	1615	251	0	NIL	2256	115	24.6	51.6	11.6	3.4	1.87	0.16
Feb-24	1641	294	1494	177	1822	192	0	NIL	2449	133	27.9	59.3	10.45	3.2	1.98	0.11
Mar-24	1431	140	1361	84	1661	202	0	NIL	2504	135	23.1	46.2	8.9	2.8	0.76	0.09
Apr-24	1564	187	1471	112	1795	194	0	NIL	2327	112	31.2	45.7	11.7	4.5	1.43	0.17
May-24	1561	117	1503	70	1833	187	0	NIL	2396	110	26.3	31.3	9.3	2.3	1.98	0.06
Jun-24	1438	47	1415	28	1726	187	0	NIL	2482	110	25	28.3	14.6	4.3	1.63	0.12
Jul-24	1467	49	1442	29	1760	196	0	NIL	2470	114	22.1	66	8.3	1.9	1.06	0.07
Aug-24	1204	60	1174	36	1432	161	0	NIL	2505	143	24.9	67.2	11	3	1.58	0.23
Average	1435	198	1336	119	1629	215	0	NIL	2435	121	25.86	49.44	11.24	2.90	1.59	0.10
Minimum	1204	47	1174	28	1432	160	0	NIL	2162	91	13.90	28.30	2.05	1.70	0.56	0.04
Maximum	1641	436	1503	262	1833	334	0	NIL	2767	148	33.50	67.20	20.60	4.50	2.73	0.23

Calibration Details.

EMFM Calibration Details			
Sl. No.	EMFM	Calibration Date	Calibration Done By
1	Raw Effluent	16.08.2024	KhroneMarshall ServicePerson
2	Product Water	16.08.2024	KhroneMarshall ServicePerson