UNIVERSAL WATER REGISTRY

Project Concept Note & Monitoring Report (PCNMR)	
Rainwater Offset Unit (RoU) Standard	Version 8.1
UWR RoU Scope (Annual RoU threshold limit)	**RoU Scope 5** (1,000,000 RoUs)
UNDP Human Development Indicator	0.644
National Water Security Index	2

Project Aggregator and Consultants	**SDG-CR CONSULTING LLP**
Project Proponent	**Gulmohar Greens – Golf & Country Club Ltd.**
RoU Scope Description	Conservation measures taken to recycle and reuse water, spent wash, wastewater etc. across or within specific industrial processes and systems.
Project Description	Recycle sewage wastewater and gainful use of treated water for irrigation purposes.
Project Location	Gulmohar Greens – Golf & Country Club Ltd.
Monitoring Period:	01/01/2014 - 31/12/2025
Crediting Period:	2014 -2025
Document Title	Project Concept Note and Monitoring Report (PCNMR)
Purpose	**FOR VERIFICATION**
SDGC Project Number	**6960 – P-02**
Revision	R0
PCNMR report submission date:	February 2026

REVISION HISTORY					
REV NO	**DATE**	**DESCRIPTION**	**PREPARED BY**	**REVIEWED BY**	**APPROVED BY**

PREFACE

SDG-CR Consulting LLP (SDGC) is a specialized consulting firm dedicated to advancing sustainable water management through market-based, data-driven, and community-centered approaches. The firm plays a pivotal role in implementing Water Credit Programs that leverage competitive market mechanisms to incentivize voluntary environmental actions across individual, community, and industrial stakeholders.

Beyond promoting behavioural change, SDGC enables private sector industries, companies, and institutions to meet their environmental compliance and sustainability obligations by aligning their actions with activities that generate or purchase water credits. Through this mechanism, SDGC bridges environmental responsibility with economic value creation.

At the core of SDGC's operations lies a robust digital data repository that integrates Geographical Information Systems (GIS) and Artificial Intelligence (AI). This integration provides actionable insights supporting ESG (Environmental, Social, and Governance) reporting, social impact assessments, and business value enhancement, enabling data-driven decision-making for sustainable growth.

As a project aggregator and consultant, SDGC collaborates with institutions, industries, and civil society organizations to promote integrated water management practices. Its initiatives align with the Universal Water Registry (UWR) framework, emphasizing the reversal of groundwater depletion and the recognition of water as both a social and economic asset.

SDGC's methodologies, developed in alignment with UWR RoU standards, quantify the ecosystem service value of water to foster behavioural change and sustainable water use. By integrating various water verticals—such as watershed studies, surface water analysis, and groundwater assessments—SDGC redefines water as a vital "source" rather than a mere resource.

This integrated approach establishes a clear relationship between water's price and its value, supporting applications in business risk analysis, climate risk assessment, green finance, engineering design, and resource valuation. SDGC's mission aligns with the triple bottom line of sustainability—People, Planet, and Profit—ensuring that its initiatives deliver social, environmental, and economic benefits in balance.

Through its innovative methodologies and comprehensive analytical framework, SDGC contributes to creating a hydraulic balance across the earth's water systems, promoting sustainable water use and safeguarding humanity's future before the economy.

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1 EXECUTIVE SUMMARY

The following recommendations have been provided by **SDGC**, by carrying out a hydrological and hydrogeological assessment for the brownfield facility of Gulmohar Greens – Golf & Country Club Ltd. (Gulmohar), Off Sarkhej, Kolat - Telav Rd, Next to Gokul-Vrindavan, Sanand, Gujarat, Bharat. By implementing these measures, Gulmohar can progress toward **water-positive operations** aligned with its eco-friendly operational goals, integrating climate-resilient and resource-efficient practices across its facilities. These interventions not only contribute to **water credit generation** but also strengthen Golmohar's alignment with broader **ESG and sustainability goals**, reinforcing its commitment to responsible and future-ready operations.

A. The site was physically visited, and the water-holding reservoirs were verified in May 2025.
B. The site was again visited to verify the operational STP units in November 2025.
C. The premises are assumed to be functional throughout the year irrespective of their occupancy.
D. Statutory compliance for the premises may be revisited for GDCR (Gujarat Development Control Regulations and CGWA (Central Ground Water Authority)
E. Water reservoirs were constructed in 2006 and operated from 2007 onwards.
F. The STP unit was installed and put into use from 2009 onwards.
G. The project has been commissioned with a conscious and sustainable design approach, however the same is now complying with the UN's Sustainability goals. H. SDG No. 6 - Drinking Water and Sanitation I. SDG No. 9 - Industry, Innovation and Infrastructure J. SDG No. 11 - Sustainable Cities and Communities K. SDG No. 12 - Responsible Consumption and Production L. SDG No. 13 - Climate Change. M. SDG No. 17 – Partnership for the Goals
N. Annual rainfall pattern is observed in reducing trend and the minimum annual rainfall is observed as 223 mm in 1987.
O. **Total water credits that have been calculated for Scope 5 are 2,74,948 RoU**

2 ABOUT THE PROJECT PROPONENT

The proponent of the project (PP) is Gulmohar Greens – Golf & Country Club Ltd., a visionary and futuristic project proponent, who has conceptualized not just to bring Golf and leisure at a new dimension to but also introduced the idea of responsible and efficient infrastructural initiatives to the industry. Every aspect of the project was well thought through while keeping the importance of sustainability and green living at its core. Such projects are an inspiration to everyone in the industry, and proof that a luxurious lifestyle can be brought to many, without completely giving up on their responsibilities towards other living species and the planet. Gulmohar evokes a unique joy that soothes the soul with a tagline of FLORA, FUANA, and FAMILIES and has incredibly expansive landscapes, lush green grass, and wildflowers revolving lotus ponds. Gulmohar is an idyllic base for migratory birds, making the space a natural hub for flora and fauna. The Site Plan of Gulmohar is represented below showing all salient features as developed. Gulmohar is admired for its peaceful location, free from noise and pollution, which contributes to a serene getaway. The infrastructure boasts a variety of praised amenities, including activities catering to all ages, scrumptious dining options and all enveloped in a pristine and well-kept setting. Guests enjoy the spaciousness of the its luxurious clubhouse. The staff's friendliness and professionalism receive commendations.

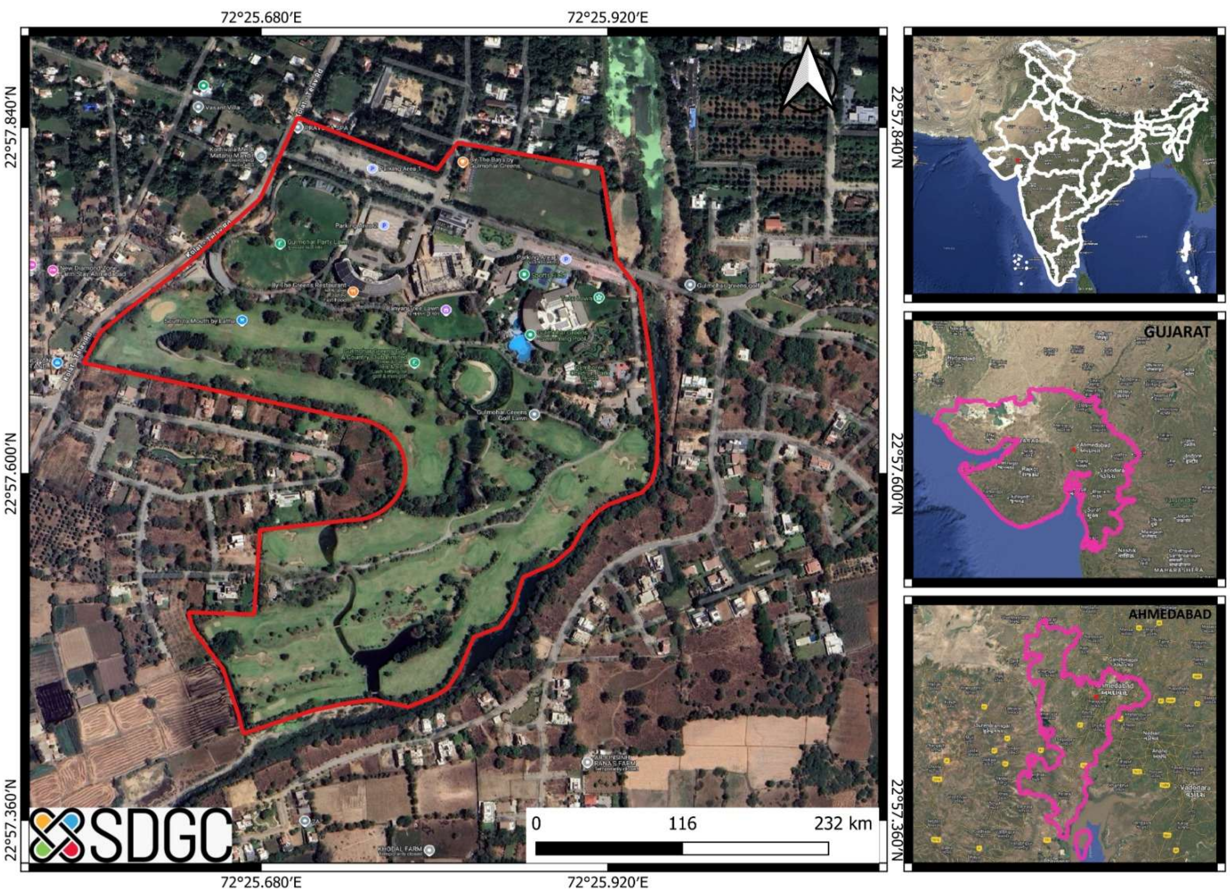

Figure 2-1 : Site Location

UWR requires projects that are real, verifiable, and must be currently operational. UWR Rules allow projects from domestic and developing nations as well. All UWR water conservation and recharge activities have prescriptive eligibility, evaluation, and verification requirements as outlined in their approved positive project list protocol requirements, as outlined in the UWR Rainwater Offset Standard Version 8.0.

2.1 UNDP HUMAN DEVELOPMENT INDICATOR

All projects using this methodology must be ideally located in a country or region with a recent UNDP Human Development Indicator below 0.900. However, countries and regions with higher HDI's will also be considered taking the goal of UN SDG 17 into account, especially water conservation and recharge projects that encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships.

India falls into 2022 HDI value 0.644 which is represented in the below image.

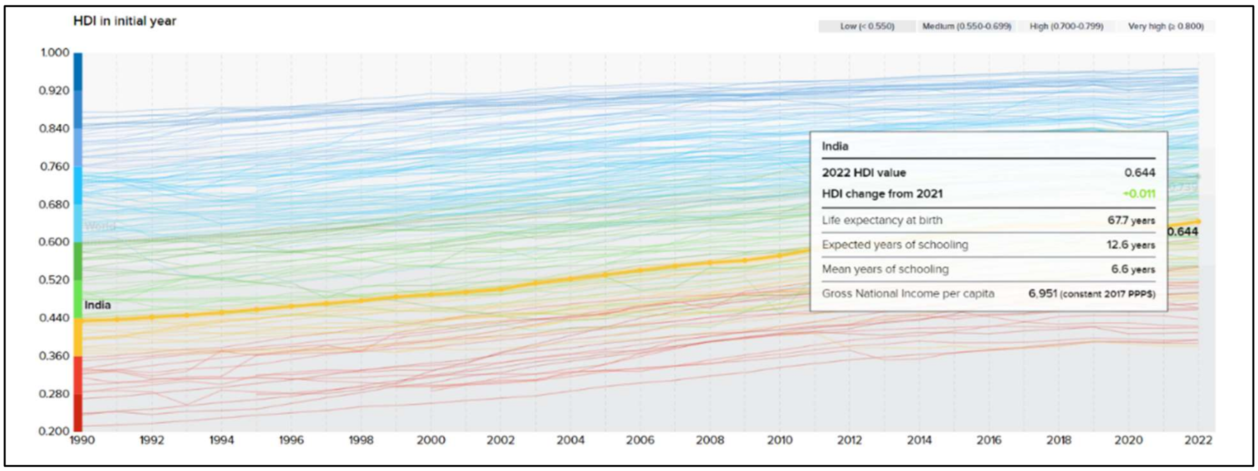

Figure 2.2: UNDP Human Development Indicator

2.2 NATIONAL WATER SECURITY INDEX

The five Key Dimensions form the National Water Security Index (NWSI). The maximum score for each KD is 20. The maximum NWS score—the sum of the KDs—is 100. At NWSI Stage 1, the water situation is encouraging, however there is a large gap between the current state and the acceptable level of water security. At NWSI Stage 5, the country may be considered a model for its management of water services and resources, and as water secure as possible under current circumstances.

All projects using this methodology are ideally below the NWS score of 60 and NWSI equal to or lower than 2 (NWSI ≤ 2). However, projects above the NWS score of 60 can also use the methodologies outlined in the UWR RoU Standard and be eligible for RoUs under the program.

NWSI	NWS Score	NWS Stage	Description
5	96 and above	Model	All people have access to safe, affordable, and reliable drinking water and sanitation facilities. Economic activities are not constrained by water availability. Environmental governance is good, and pressure on aquatic ecosystems is limited. Water-related risks are acceptable and relatively easy to deal with.
4	78–96	Effective	Nearly all people have access to affordable safe drinking water and sanitation facilities. Economic water security is high. Environmental governance is generally acceptable, and attention is given to ecological restoration. There are systematic commitments to reduce disaster risk.
3	60–78	Capable	Access to safe drinking water and sanitation facilities is improving. Economic water security is moderate. Environmental governance is moderate, with clear pressure on the ecosystem. There are some institutional commitments to reduce disaster risk.
2	42–60	Engaged	A significant majority of rural and urban households have access to basic water supply but less to sanitation. Economic water security is low. Environmental governance is moderate, with severe pressures on aquatic ecosystems. Progress in achieving disaster risk security is low.
1	0–42	Nascent	A low proportion of rural and urban households have access to basic water supply and sanitation. Economic water security is low. Environmental governance is poor, with significant pressures on the aquatic ecosystems. Hardly any attention is given to disaster risk reduction.

Figure 2.3: National Water Security Stages

India falls into the Engaged Stage (2) of the National Water Security Index in 2020 which is represented in the below image.

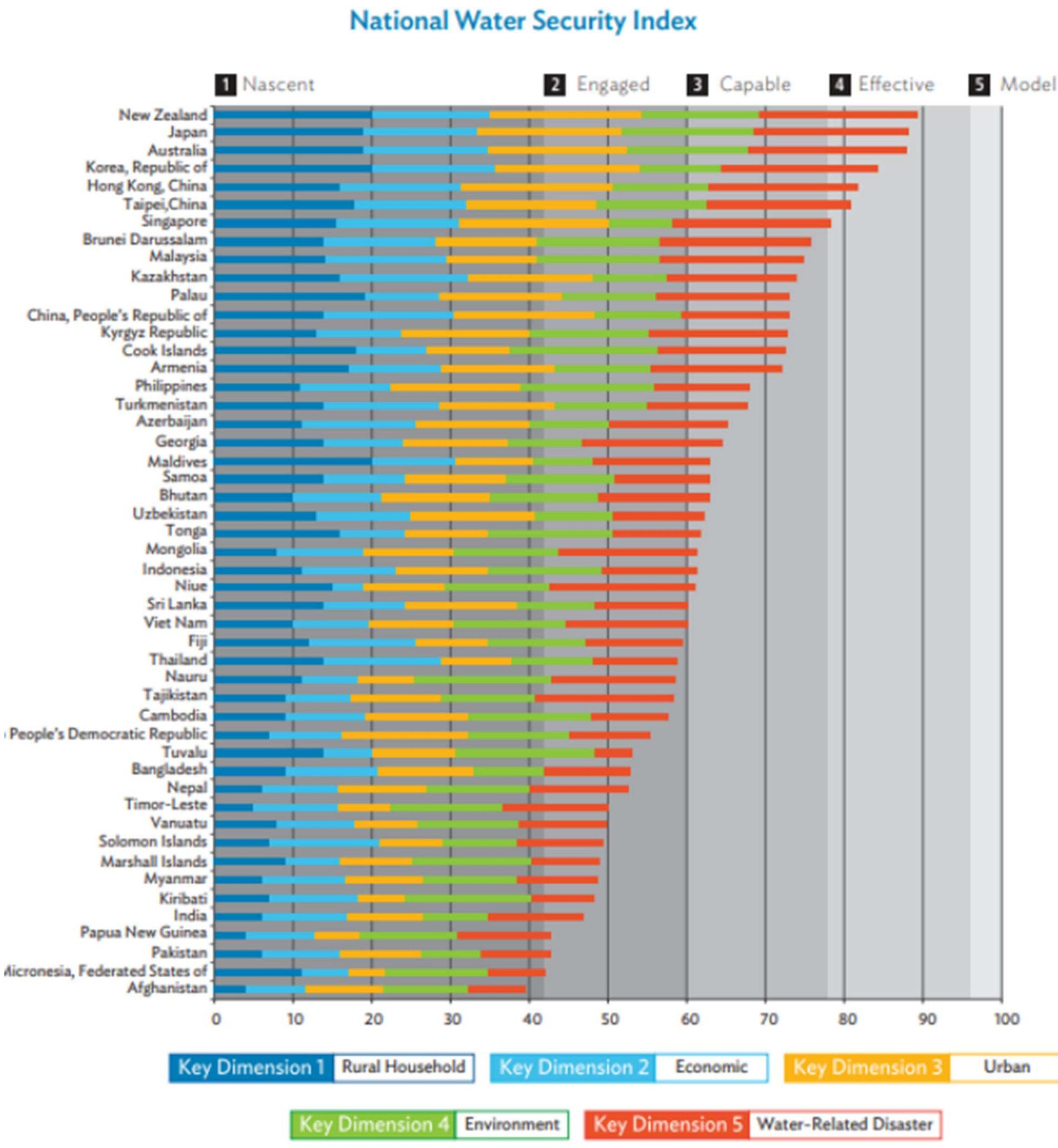

Figure 2-4: National Water Security Index

2.3 PROJECT BRIEF

The following site-specific information and details are to be referred to get acquainted with the water condition of the premises.

Table 2.1: Project Brief

SN	SPECIFICS	DESCRIPTION
1	Address of the project activity	Gulmohar Greens – Golf & Country Club Ltd., Off Sarkhej, Kolat - Telav Rd, Next to Gokul-Vrindavan, Sanand, Gujarat, Bharat.
2	District	Sanand
3	State	Gujarat
4	Country	Bharat
5	Latitude – Longitude	22.96137851840432, 72.4297370080433
6	Land use type	Commercial use
7	Project type	Infrastructure project
8	Industry type	Recreational infrastructure (Resort)
9	MSME Type	No
10	Plot area	72 acres approx.
11	Block basin	Sabarmati Basin
12	Sub-basin	Sabarmati Lower Basin
13	Assessment Unit Type	Safe
14	Primary water supply source	Production borewell (Groundwater storage)
15	Secondary water supply source	STP Treated water & Nalla
16	Annual irrigation water demand	2,87,168 cum (Reference Chapter 11)
17	Annual domestic water demand	9,902 CuMt
18	Installed STP Capacity	60 CuMt/ day
19	Topo sheet No	46B/5

2.4 KEY ROLES AND RESPONSIBILITIES

The Project Proponent and Owner (PP) possess all the necessary permits and ownership documents for the uncontested legal land title for the project area within the project boundary of the project.

The Gulmohar team was very conscious of how every action of theirs would have an exponential impact on multiple aspects. Considering that Golf courses require regular maintenance and water, they were very conscious of how important it was to secure a way to source water sustainably.

The most important aspect of the project conceptualization was the location, it was built on and how the project works to mitigate the challenges being faced at the location, especially the availability of water.

PP enabled and funded all the activities necessary for drawing water from Nalla and using it for gainful irrigation purpose for the entire crediting period.

PP enabled and funded the installation of the STP units also to recycle sewage wastewater and gainful use of treated water for irrigation purposes. The STP unit was installed and put into use from 2009 onwards. PP does the scheduled preventive maintenance of the STP units for the efficient use of the unit.

Project proponent and owner	Gulmohar Greens – Golf & Country Club Ltd.
Project proponent and owner's address	Gulmohar Greens – Golf & Country Club Ltd., Off Sarkhej, Kolat - Telav Rd, Next to Gokul-Vrindavan, Sanand, Gujarat, Bharat.
Project aggregator and consultant	SDGC
Project aggregator and consultant's address	4th Floor, Shreeji House, Behind M. J. Library, Ellisbridge, Amdavad 380006, Gujarat, Bharat.
Date PCNMR Prepared	February 2026

The **setting up an STP units for water reuse at Gulmohar, Gujarat, Bharat** is an initiative for water conservation, storage of unutilized water for future requirements, and reusing water. The initiatives were made operational since 2009 to recycling waste water.

PROJECT NAME	**Gulmohar**
UWR Scope:	Scope 5
Date PCNMR Submitted	February 2026
Catchment Area	8,886 acres (Refer to Chapter 9)
Month and Year of STP unit installation	2009

2.5 SITE VISIT

The following images were captured during a physical field visit in May 2025, November 2025 and January 2026 to identify various features of the study area, to understand the site physiography, operations.

Figure 2-5: Site Visit

The capacity of the STP was designed based on estimated occupancy and water consumption patterns for the facility, which will generate sewage water. The installed STP units at Gulmohar, which have been in operation since 2009 has a capacity of 60KLD catering to 52 guest rooms and events organized at lawns. Treated water will be stored and used for irrigation requirements.

3 STATUTORY COMPLIANCE

Groundwater usage laws and their enforcement are taking shape in Bharat. The policies also reach the end users, who are expected to be key stakeholders in a way they would understand its provisions and their role. Therefore, the UWR RoU program and methodologies are introduced to employ the broad monitoring and accounting framework to promote available technologies like GIS and remote sensing, where water security plans encompass a watershed for a large number of entities.

Yet the water security concept in its true sense has not become institutionalized enough, which is expected to capture the impacts of various water recharging, harvesting, recycling, and conservation practices, that are aimed at enhancing groundwater supply stocks. Therefore, it is mandatory to comply with statutory guidelines to obtain various "No Objection Certificates" to put the building in use, while claiming the water credits.

Groundwater abstraction guidelines have been prepared to regulate groundwater extraction and conserve the scarce groundwater resources in the country to have sustainable management of water resources. These guidelines come into force in 2020, 24th September through Gazette Notification number CG-DL-E-24092020-221952 and will supersede all earlier guidelines issued by the Central Ground Water Authority (CGWA).

The authority has been regulating groundwater development and management by issuing 'No Objection Certificates' for groundwater extraction to all new/ existing residential, industries or infrastructure projects unless specifically exempted. Framed guidelines apply to PAN India.

(Reference - THE GAZETTE OF INDIA: EXTRAORDINARY [PART II—SEC. 3(ii)] Clause no 4.3 – page no 38 – 39).

3.1 COMMERCIAL USE – INFRASTRUCTURE & INDUSTRIAL PROJECTS

Since infrastructure projects are location-specific, granting of No Objection Certificate to such projects located in over-exploited assessment units shall not be banned. New infrastructure projects/ residential buildings may require dewatering during construction activity and/ or use groundwater for construction. In both cases, applicants shall seek a No Objection Certificate from CGWA before the commencement of work. However, in over-exploited assessment units, groundwater use for construction activity shall be permitted only if no treated sewage water is available within a 10 km radius of the site.

All industries drawing ground water in safe, semi-critical and critical assessment units shall be required to pay ground water abstraction charges as per the CGWA Notification. All existing industries drawing ground water in over-exploited assessment units shall be liable to pay ground water restoration charges as applicable as per CGWA Notification.

All industries abstracting ground water in excess of 100 m3/d shall be required to undertake annual water audit through certified auditors and submit audit reports within three months of completion of the same to CGWA. All such industries shall be required to reduce their ground water use by at least 20% over the next three years through appropriate means.

3.1.1 DIGITAL WATER FLOW METER

In the case of infrastructure projects that require dewatering, the proponent shall be required to carry out regular monitoring of the dewatering discharge rate (using a digital water flow meter) and submit the data through the web portal to CGWA/SGWA as applicable. Monitoring records and results should be retained by the proponent for two years, for inspection or reporting as required by CGWA/ SGWA.

3.1.2 SEWAGE TREATMENT PLANT

For infrastructure projects, installation of Sewage Treatment Plants (STP) shall be mandatory for new projects, where the groundwater requirement is more than 20 m3 /day. The water from STP shall be utilized for toilet flushing, car washing, gardening, etc.

3.1.3 VALIDITY – NOC

For infrastructure dewatering/ construction activity, a No Objection Certificate shall be valid for a specific period as per the detailed proposal submitted by the project proponent.

3.1.4 PIEZOMETER

A piezometer is one of the borewell/tube wells being used only for measuring the water level/piezometric head and to take water samples periodically but not to be used for groundwater abstraction. It is also being used to take a water sample for water quality testing whenever needed. The groundwater quality must be monitored and tested once a year during the pre-monsoon (April/ May) and post-monsoon (Oct/ Dec) period by industries drawing groundwater.

Construction of a Piezometer(s) (An observation well(s)) is mandatory for the premises since the water extraction quantity is more than 10 m3 /day of groundwater. The Piezometer is suggested to be installed within the premises and monitored for water level monitoring as statutory compliance. Monthly water level data shall be submitted to the CGWA through the web portal. The piezometer (observation well) is proposed at a minimum distance of 15 m from the borewell/production well. The depth and aquifer zone tapped in the piezometer shall be the same as that of the pumping well/ wells. (Reference - THE GAZETTE OF INDIA: EXTRAORDINARY [PART II—SEC. 3(ii)] Clause no 14 – page no 45).

Table 3.1: No. of Piezometers to be constructed & Type of Water Level Monitoring Mechanism

Table 14.1 No. of Piezometers to be constructed & Type of Water Level Monitoring Mechanism					
S.No.	Quantum of Ground water withdrawal (cum/d)	No. of piezometer required	Monitoring mechanism		
			Manual	DWLR	DWLR with Telemetry
1	<10	0	0	0	0
2	11-50	1	1	0	0
3	51-500	1	0	1	0
4	>500	2	0	1	1

3.1.5 WETLAND

Since groundwater is very crucial for the survival of the wetland area, any excessive groundwater development within the zone of the wetland area would affect the volume of water in that wetland. Projects falling within 500 m. from the periphery of demarcated wetland areas shall mandatorily submit a detailed proposal indicating that any groundwater abstraction by the project proponent does not affect the protected wetland areas. Furthermore, before seeking permission from CGWA, the projects shall take consent/approval from the appropriate Wetland Authorities to establish their projects in the area

3.1.6 CAUTION

Aquifers are to be enhanced by artificial recharge and to be used as potable aquifers. Hence, it must be ensured that the water that is to be recharged is free from any type of contaminant. The water quality of the pumping tube wells should be monitored periodically. **Injection of treated/ untreated wastewater into the aquifer system is strictly prohibited.**

4 BASELINE SCENARIO

Scope 5 applicability with respect to the Baseline Scenario –

- Since the inception of the project, the Project Proponent has set up STPs for treating sewage water for its irrigation and domestic use with the production borewell being the primary source of water. To reduce its reliance on groundwater, the Project Proponent draws surface water from a nallah flowing next to its premises, treats it in the STP and uses it for irrigation of the golf course driving range. The STP also treats the sewage generated from domestic use of ground water in its resort and reuses the treated sewage for irrigation purposes of the plantations. Had the Project Proponent not implemented these interventions, the entire water demand for irrigation and domestic consumption would have to come from groundwater source.

- These developments thus establish its compliance with the baseline scenario parameters laid down in UWR RoU Standard 8.1 and further establish qualification of the project under Scope 5 for RoUs under the Standard.

5 CONCEPT

It is pertinent to look back at ancient Sanskrit literature for valuable insights from age-old wisdom, containing highly advanced scientific concepts regarding the hydrological cycle. The present report refers to **'Conceptual Aspect of Hydrological Cycle in Indian Mythology of Kishkindha Kanda, Ramayana'**, to arrive at the representational approach for aquifer mapping in the modern context. The concept of modern hydrology can be transformed based on a conceptual model of how water circulates between the earth and atmosphere in different states as water vapor, liquid or solid.

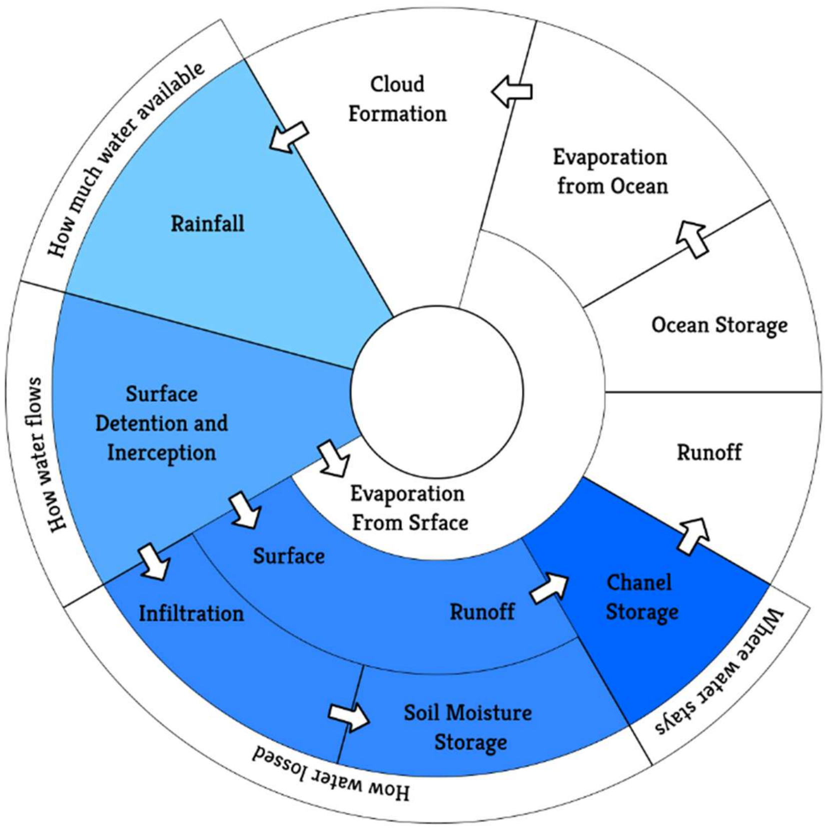

Figure 5-1: Ancient Hydrological Cycle from 800 to 500 B.C.

The present report uses these insights during the study as well as analysis of the data being generated at various stages. The Aquifer Management Plan will be based on the interdependencies of various stages to generate a contemporary understanding of the hydrological cycle with all important facets. It is required to base modern hydrological study approaches on ancient insights to obtain contextual reference and strengthen the modern approaches in terms of accuracy. Therefore, it is proposed to revisit ancient Indian water management practices to design the methodology statement to generate water credits.

6 OBJECTIVE

The objective of this voluntary water offset program is supported by the Universal Water Registry Rainwater Offset Unit Standard Version 8 Date: 07/07/2025 (UWR RoU Standard or Programme). This initiative is to drive unutilized water harvesting, recharge, and conservation efforts, defined as the catchment-based initiatives independent of water quality parameters undertaken for capturing/recycling/reusing unutilized water that is in consonance with the triple bottom line of sustainability i.e. People, Planet and Profit.

As this initiative will benefit the whole premises of Shree Ramkrishna Exports (SRK), rainwater conservation is done by creating a farm pond as an effective solution alongwith effective operations of STP installations. Sufficient water is made available for irrigation and domestic gainful use throughout the year, to reduce the consumption of groundwater. The overall goal of this project is to promote sustainable water development to maintain groundwater reserves and ensure water security in Bharat to attain the Sustainable Development Goals (SDGs) 6, 9, 11, 12, 13 and 17.

Figure 6-1: Sustainable Development Goals

7 METHODOLOGY

The UWR RoU program and methodology employs a broad monitoring and accounting framework that is expected to capture the impacts of various water recharging, harvesting, recycling, and conservation practices aimed at unutilized water savings and enhancing groundwater supply stocks. This methodology and protocol are aimed at the voluntary water conservation market and address the potential to quantify unutilized water units from water conservation, harvesting, restoration, and recharge projects. This methodology addresses Managed Aquifer Recharge (MAR) processes, defined as a holistic approach to preserving groundwater by surface water storage/ rainwater conservation. This project is applied for rainwater conservation as a practice including initiative of gainful use of Nalla water flowing outside the premises of Gulmohar Golf course for irrigation purposes.

The detailed methodology statement and work sequence have been developed to carry out integrated water resource planning and designing for pre-defined study objectives. Effective regional hydrology and site hydraulics are studied using an integrated approach of Geospatial technique and multiple criteria decision-making technique. Datasets based on Geographic Information Systems (GIS) are used as criteria and sub-criteria. A wide range of spatial datasets for the study area is generated, analyzed, and integrated by using various historical data like topographical, meteorological, geological, and geophysical within the context of the project.

A geographic Information System (GIS) is an essential tool to analyze and study such a large surface by remote sensing methods. Information about the physical characteristics and climatic parameters of the land has been acquired to understand its response to the business operation of the project premises for the design phase as well as for the operation/ maintenance phase. The information generated from the study may be analyzed, interpreted, and articulated as strategies to implement future water credit opportunities within the premises. The below flowchart represents the detailed methodology statement and work sequence developed for pre-defined study objectives, where we deliberately transform and convert the ancient Indian water management practices into modern hydrology based on how water moves around between the earth and atmosphere in different states as a gas, liquid, or solid in terms of accuracy to calculate water credit and water valuation.

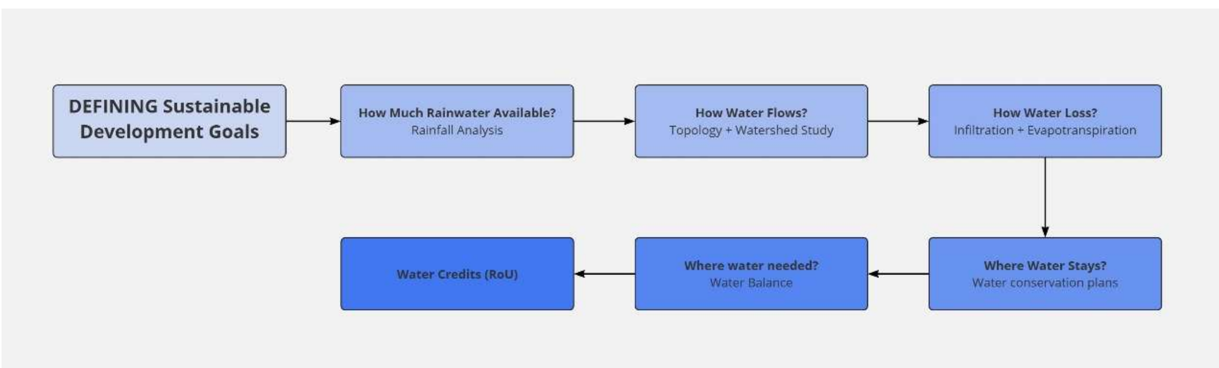

Figure 7-1: Flow Chart

8 RAINFALL ANALYSIS (How much rainwater is available?)

The southwest (June to September) is crucial for Bharat's economy, and this monsoon plays a pivotal role in water management and water security. Bharat receives around 76% of its total annual rainfall during four months – June, July, August, and September called the southwest monsoon. However, monsoonal variability triggers contrasting wet and dry conditions, leading to hydro-meteorological disasters. It's important to highlight that rainfall assessment primarily aims to provide fundamental insights into changing rainfall patterns in a simplified manner. We undertook this assessment at the study area to quantify and understand trends in changes in rainfall during the southwest monsoon (between June and September), while analyzing the trends over the past 34 years (1990–2024) approximately, with a particular focus on the quantification of changes over the past decade, between 2014 and 2024. Our primary aim with this assessment is to offer fundamental insights into calculating rainwater conservation to quantify the water credits. These insights are intended to serve to derive water valuation for stakeholders across various sectors, including water management, agriculture, energy, and urban planning, among others, to help them make climate-informed decisions. Rainfall frequency analyses have been generated by using historical precipitation data obtained from the nearest Sanand rain gauge station of the Indian Metrological Department (IMD), which is situated approximately 6 km from the site location as represented in the following map.

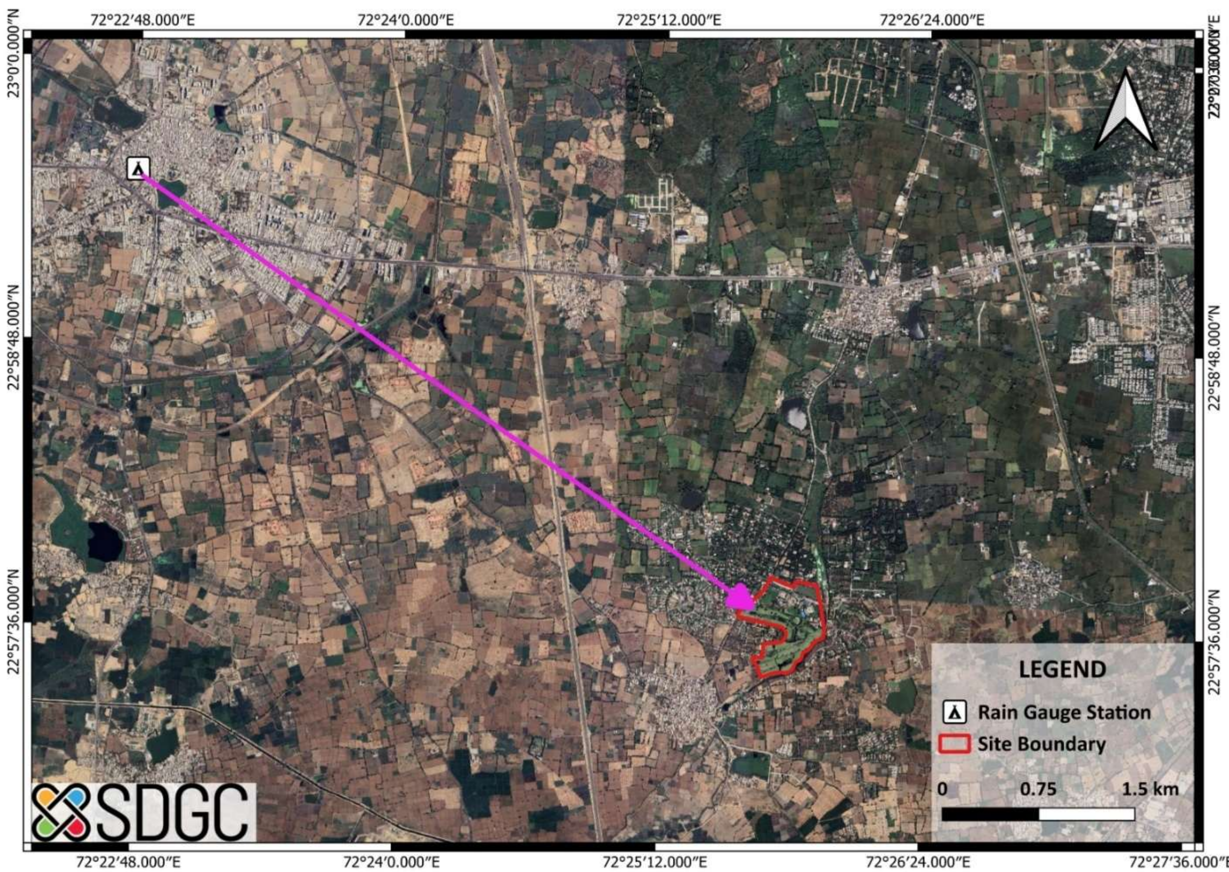

Figure 8-1: Raingauge Station- Sanand

8.1 Annual Rainfall

The annual rainfall recorded at the Sanand rain-gauge station over the past 44 years is illustrated in the bar chart below. Over the years, rainfall amounts have fluctuated, with some years experiencing moderate rainfall. The dotted trend line indicates a gradual increase in average rainfall over the period, although the year-to-year variation remains substantial.

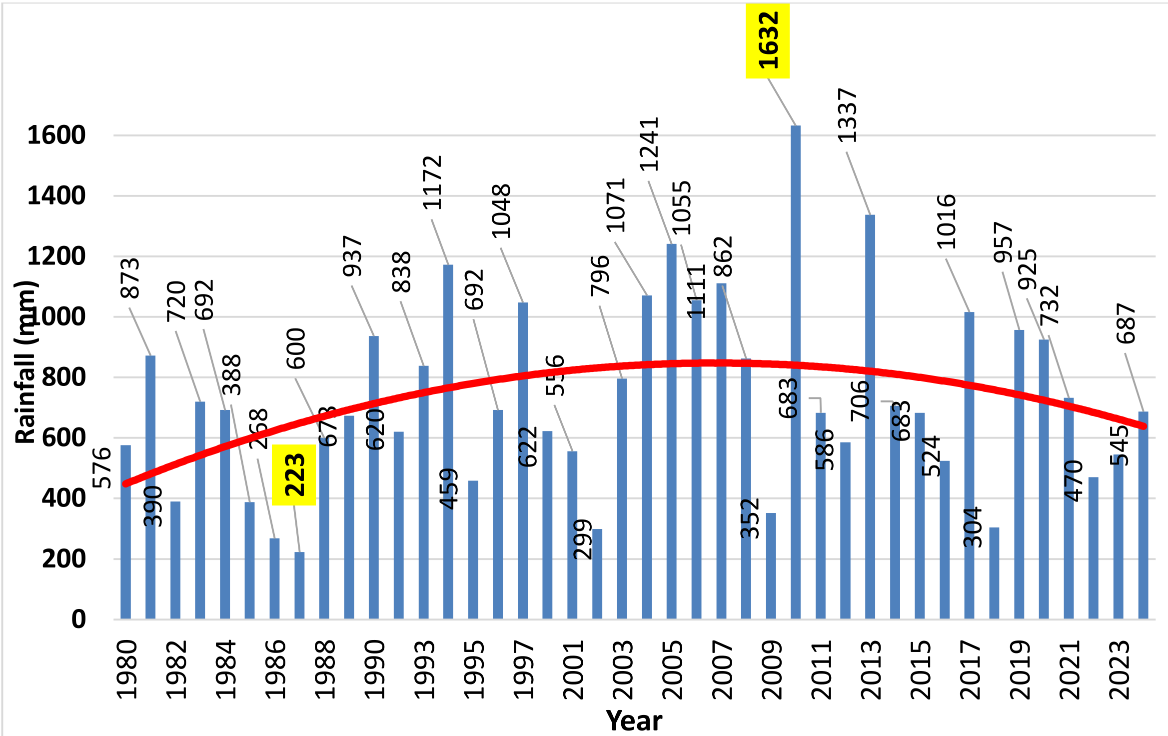

Figure 8-2: Annual Rainfall

The maximum observed annual rainfall for the Sanand rain gauge station is 1632 mm in the year 2010 and the minimum observed annual rainfall is 223 mm in the year 1987 as presented above. The trendline for rain gauge stations for annual rainfall is in decreasing trend, post-2010.

8.2 Rainy Days

The line chart below presents the daily rainfall days recorded at the Surat rain gauge station over a 44-year period, from 1980 to 2024.

The number of rainy days is required to assess to understand recurring rainfall events during the season to design rainwater harvesting structures and replenishment frequency of storage structures either with permanent structures or temporary arrangements. The number of rainy days for the last 44 years (1980 to 2024) recorded is represented below figure.

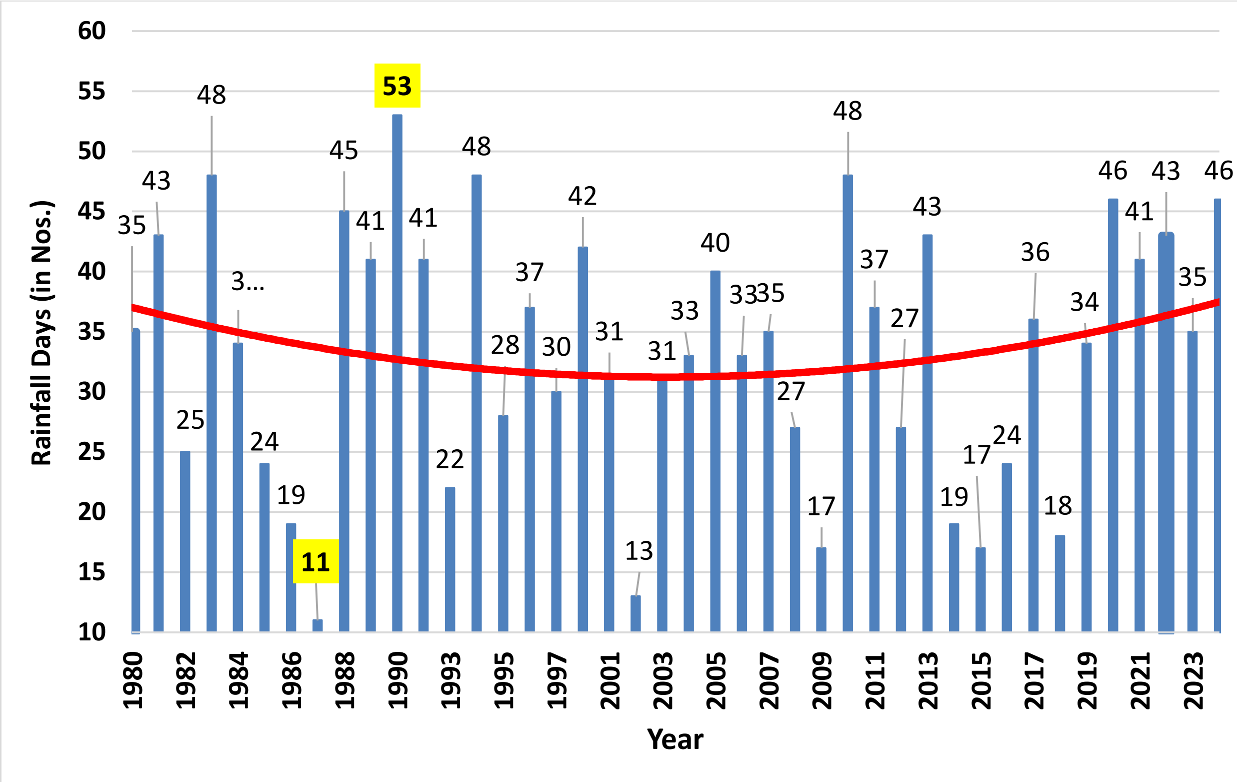

Figure 8.3 – No. of Rainy Days

A. Maximum 53 rainy days were observed in the year 1990.
B. Minimum 11 rainy days were observed in the year 1987.
C. Average 31 rainy days were observed over the period.
D. The trendline for the number of rainy days has increased gradually in the last two decades.
E. This information will be used to calculate the efficiency of rainwater harvesting structures.

9 EARTH SURFACE ASSESSMENT

9.1 WATERSHED STUDY (How water flows?)

The UWR RoU Standard challenges the notion of using hydrological basins as the basic organizational focus and looks at how water (and other vectors) move — a view that suggests that a "water harvesting/conservation/recharge system" could be a city, an ecosystem, a farmer's field, or a factory setting within closed boundaries. Water security plans need to consider a new approach that includes water sources on the surface water and groundwater.

The geographical zone in which water is captured flows through and eventually discharges at one or more points. The concept includes both surface water catchment and groundwater catchment. A surface water catchment is defined by the area of land from which all precipitation received flows through a sequence of streams and rivers towards a single river mouth, as a tributary to a larger river, or the sea.

9.1.1 Topographical data

Topographical maps are represented by Digital Elevation Maps to understand the natural water flow direction generated by natural terrain including effective water outfall locations downstream. The quality of the topographical data source is an important factor in the accuracy and reliability of the generated hydrology maps; thus, it is important to select the most suitable topographical data source.

Table 9.1: Data Source

What is a Digital Elevation Map?	Digital Elevation maps are detailed representations of natural water flow direction generated from the natural terrain of the earth's surface.
How is it generated?	Digital Elevation maps are generated by using a spatial resolution of 30 m grid capturing the extent of all possible (upstream) catchment areas.
What is the data source?	DEM (Digital Elevation Model) is taken from the Copernicus European Space Agency. This is based on the radar satellite data acquired during the TanDEM-X Mission, which is funded by a Public Private Partnership between the German State.
What does it provide?	The digital elevation map typically includes information such as relative elevation using different colors, to indicate the slope of the study area.

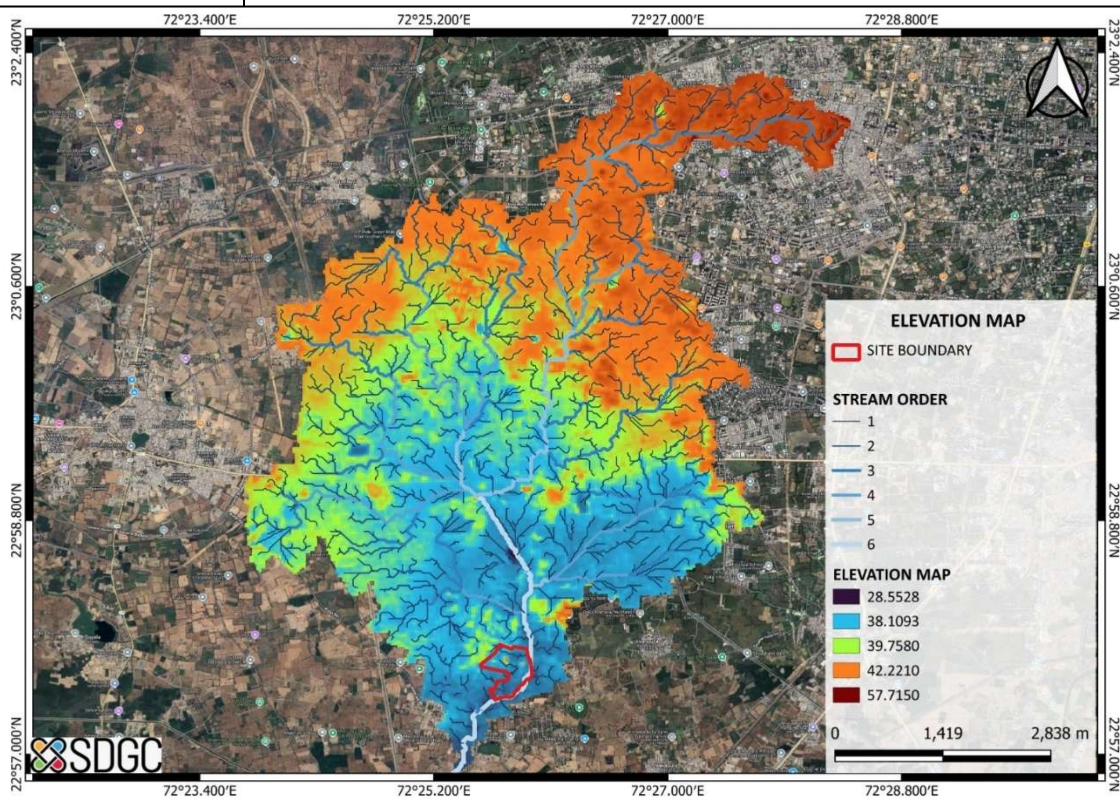

Figure 9-1: Digital Elevation Model Map

The following technical insights have been discovered from the Digital Elevation Map.

Table 9.2: Technical Insights

SN	TECHNICAL INSIGHTS
1	The dark brown shade indicates the upstream part of the study area.
2	The dark blue color indicates the downstream part of the study area.
3	All the levels mentioned in the map are to be referred from the mean sea level.
4	The highest terrain of the study area is at an elevation of 57.71m.
5	The lowest terrain of the study area is at an elevation of 28.55m
6	The north part of the study area indicates the highest elevation.
7	The southwest part of the study area has the lowest elevation that falls into a flood plain.

9.1.2 Drainage pattern

It is necessary to break the area of interest into manageable units to analyze the hydrological properties of an area. Catchments are defined as: "The region draining into a river, river system, or body of water." Catchments are always physically delineated by the area upstream from a given outlet point. This generally means that the contributing region is upstream to a separate ridgeline catchment from each other for a stream network.

Before landscapes can be managed as catchments, we need to delineate the boundaries of catchments to use common spatial terminology. Many GIS software applications contain routines to delineate catchment boundaries and perform other hydrologic analyses. This includes tools such as catchment delineation, flow accumulation, and flow length.

Table 9.3: Data Source

What is Catchment Delineation?	Catchment Delineation Maps are detailed representations of natural water flow direction generated from the natural terrain of the earth's surface.
How is it generated?	The drainage pattern is generated by using a Digital Elevation Model (DEM).
What is Catchment? (Alternative terms are watershed, basin, and river basin.)	A catchment is an area of land where all rainfall and surface water naturally flow into a common outlet, such as a river, lake, or the sea. It defines the boundary within which all water drains to a single point.
What does it provide?	The drainage pattern shows how water flows across the land and helps define the catchment area. In a catchment delineation map, the ridges represent higher elevations, while the drainages (streams) represent lower elevations, indicating the slope and direction of water flow in the study area.

The boundary for the study is georeferenced to know an effective catchment, that is not restricted to a limited distance from the site boundary. The hydrological catchment of the proposed premises has been identified with the probable drain path location.

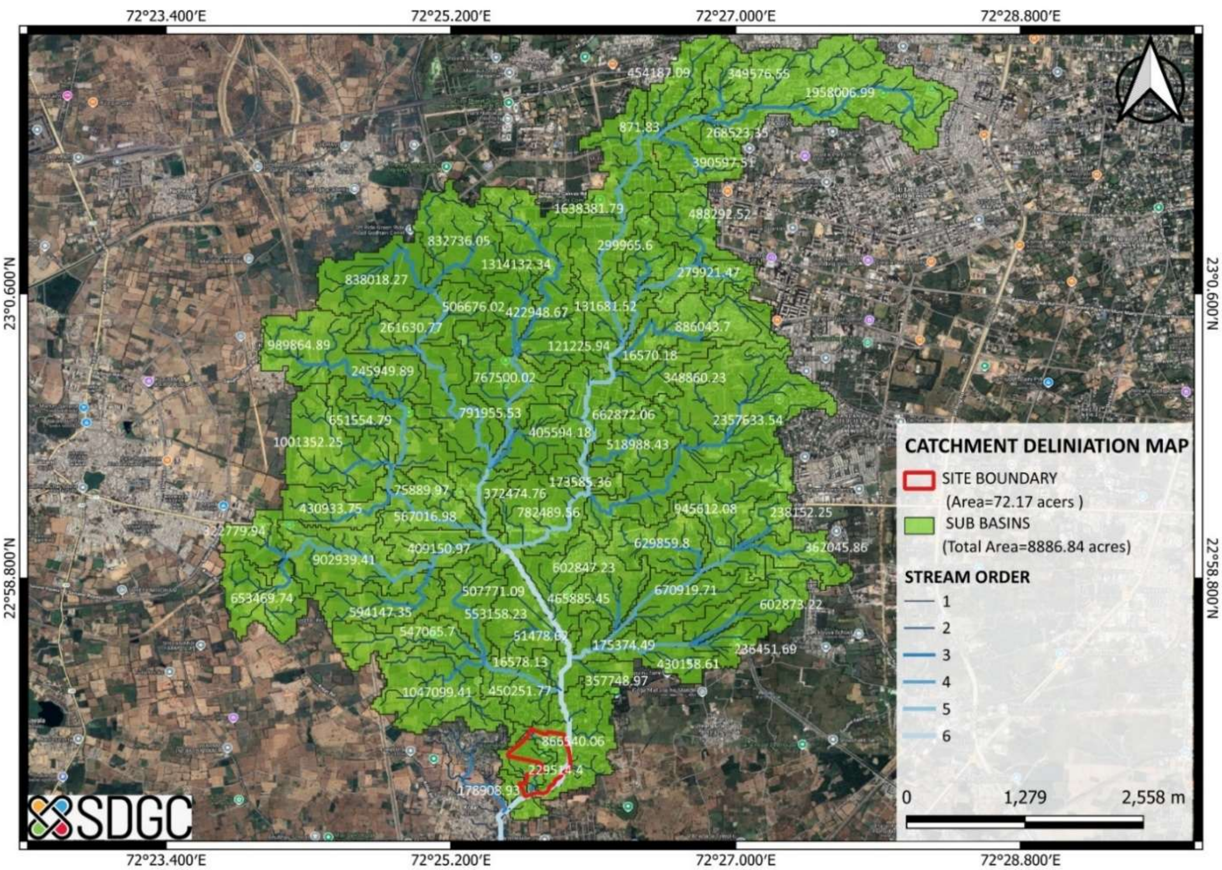

Figure 9-2 : Regional Catchment Delineation

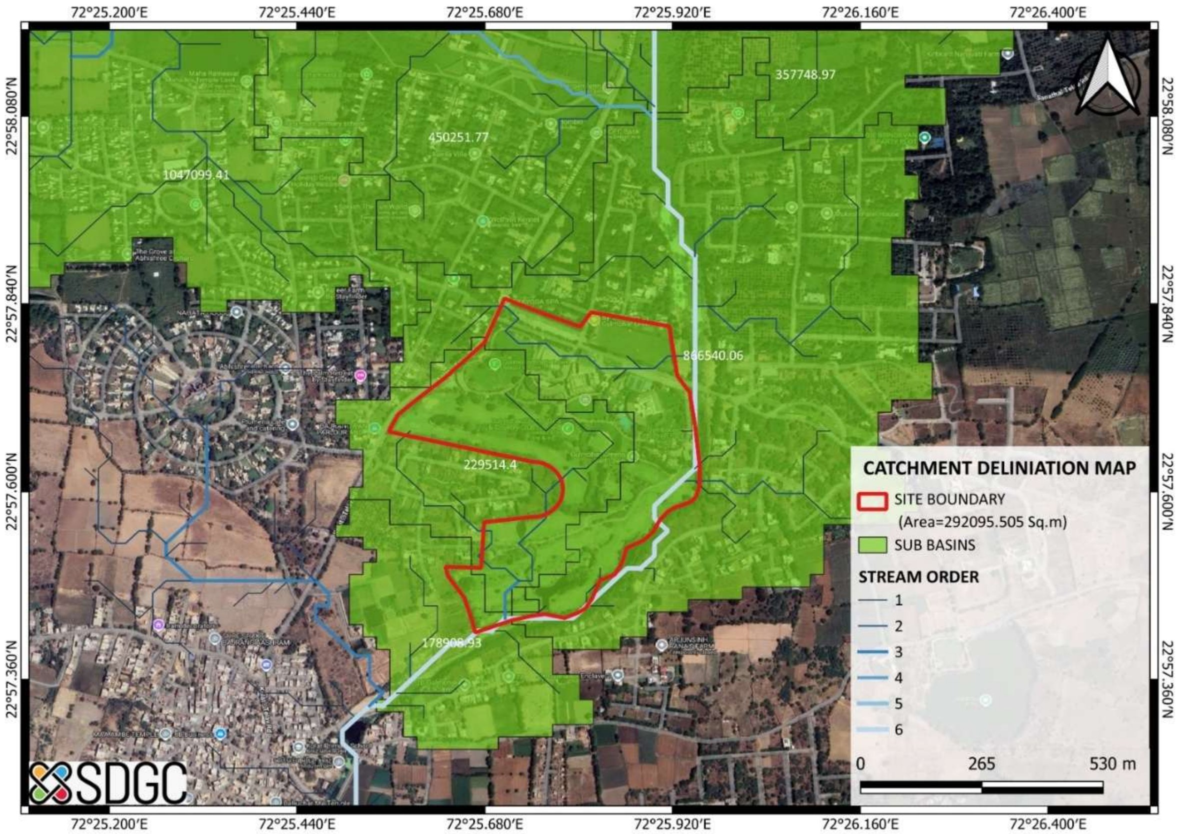

Figure 9-3: Study Area Catchment Delineation

The following technical insights have been generated and interpreted to analyze the hydrological impact of the study area from the above map. Tangible data and information will be further incorporated into water credit quantification.

Table 9.4: Technical Insights

SN	TECHNICAL INSIGHTS
1	The study area is demarcated with the red line, whereas sub-basins dedicated to the study area are represented in green color and black lines.
2	The whole study area is divided into two sub-basins by a ridge line.
3	The major streamline is passing through the east boundary of the study area from north to south direction.
4	The total upstream area of stream is 8,886 acres

9.2 HYDROLOGICAL LOSSES (How much water was lost?)

The amount of water losses depends on local climatic conditions like high air temperature, low humidity, strong winds, and sunshine. Hydrological losses include interception, infiltration, evaporation and transpiration from the plant surface. The hydrological losses have no local economic value and are not usable, therefore it is essential to calculate such losses and discount that into available freshwater quantification.

9.2.1 Land Use and Land Cover

Land use and Land cover is associated with surfaces and human activity of a specific land unit. In this study, land cover and land use will be used to calculate overall water demand of the site area specifically for green covers. Therefore, land cover for the study area is prepared based on a supervised classification technique utilizing Sentinel-2 Multi-spectral Imagery.

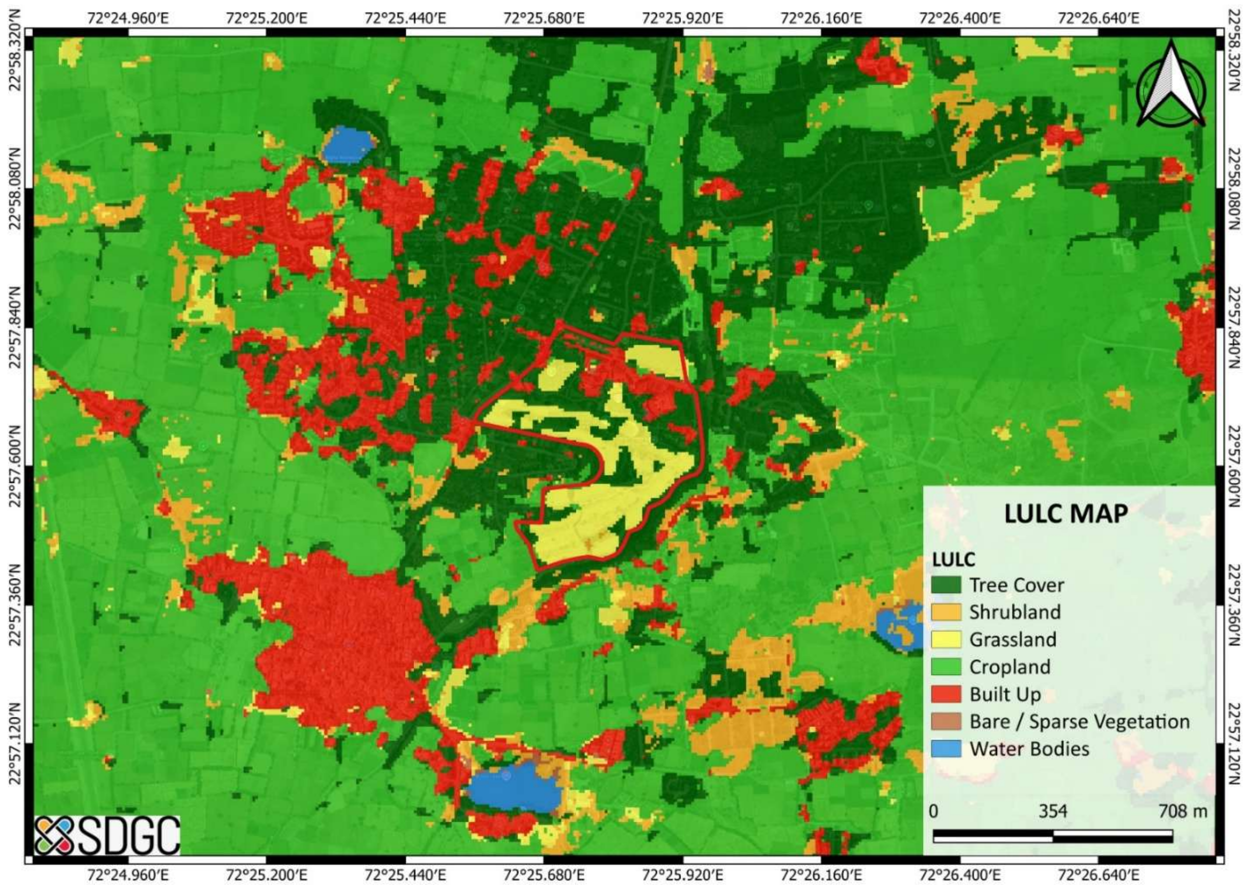

Figure 9-4: Land Cover Map

The following technical insights have been generated and interpreted to analyze the hydrological impact of the study area from the above map. Tangible data and information will be further incorporated into water credit quantification.

Table 9.5: Technical Insights

SN	TECHNICAL INSIGHTS
1	The study area is surrounded by the cropland and bare land which clearly indicates the peri urban or rural nature of the area.
2	The study area is mostly covered with green cover and built up and slightly with vegetation.
3	Multiple ponds / waterbodies are observed near and around the site, which indicates good water holding capacity of soil and less for infiltration
4	The study area is mostly covered with green cover and built up and slightly with vegetation.

10 WATER CONSERVATION (How water conserved?)

The hydrological basin may or may not be the "system" in many places, however, that focuses on what is happening within the project boundary (e.g. aquifers, often exist in recharge and discharge basins that have complex relationships with what is happening on the surface with reservoirs like rivers and lakes).

This methodology understands its own water use, catchment context, and shared concerns in terms of water governance; water balance; important water-related areas; water, sanitation, and hygiene (WASH), and then engages in meaningful actions that benefit people, the economy, and nature. In all project activities under this methodology, the end use of the water must either be consumption, utilization, recycling with gainful end use, groundwater recharge, or protection of freshwater-related ecosystems.

10.1 SURFACE WATER STORAGE - POND (Where water stays?)

Surface water storage (SWS) is the amount of freshwater stored in lakes, rivers, wetlands, and floodplains. It's a key component of the water cycle and land surface hydrology and is important for water resources management. The total volume of water held per unit area is called the surface storage capacity. Most reservoirs are built to increase water supplies, and sometimes for flood protection.

10.1.1 Geomorphology

Geomorphology is the scientific study of the origin and evolution of topographic and bathymetric created by physical, chemical and biological processes operating at or near the earth's surface. The morphological analysis concerns the annual water presence and transition processes due to hydrological impact.

Table 10.1: Data Source

What is a Geomorphology Map?	This map represents the surface landforms and terrain features of a particular area.
How are they created?	Through the interpretation of aerial photographs, satellite imagery, topographic maps, and ground truthing.

What do they provide?	Detailed information about the gradual changes in shape, composition, and arrangement of landforms such as mountains, valleys, plains, hills, rivers, and coastlines.
What is the application of this map?	Geography, geology, environmental science, urban planning, and engineering while understanding the morphological process and landform evolution of earth surfaces.
Water body (pond/ river)	Area containing water either freshwater, brackish or seawater which may include lakes, rivers, ponds, reservoirs, etc.
Fluvial origin older alluvial plain	Fluvial landforms are those landforms that are shaped and modified by running water is called as **fluvial origin landforms** and **alluvial plain** is a plain created by the deposition of sediment over a long period by one or more rivers coming from highland regions, from which alluvial soil forms.

The following technical insights have been generated and interpreted to analyze the hydrological impact of the study area from the below map. Tangible data and information will be further incorporated into water credit quantification.

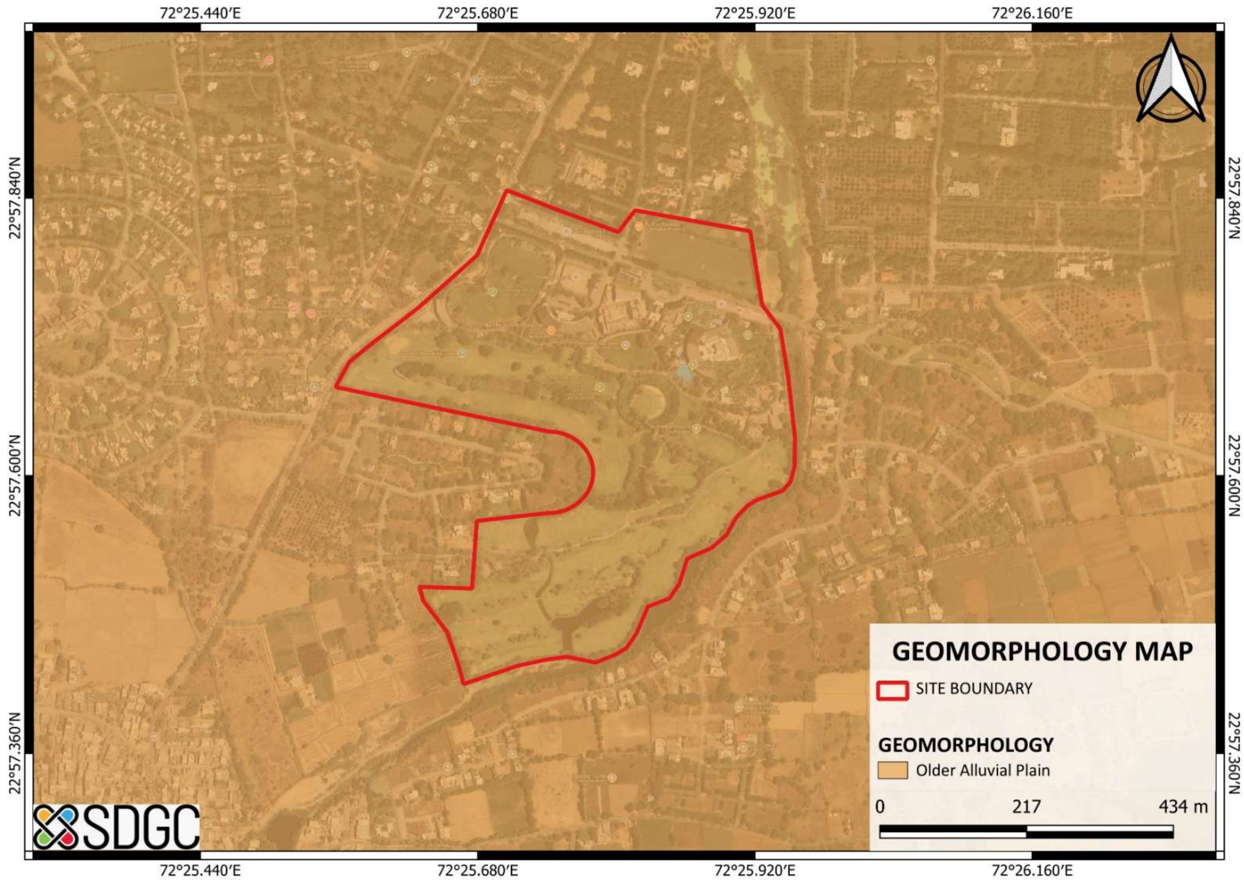

Figure 10-1: Geomorphology Map

Table 10.2: Technical Insights

SN	TECHNICAL INSIGHTS
1	The geomorphology map represents the presence of topsoil/ landscape activities above the geological strata.
2	The geomorphology of the site is of Older Alluvial Plains
3	Most of the land is an older alluvial plain around the site, suggesting that the region has predominantly been shaped by the deposition of alluvium carried by rivers over time. This process of erosion and deposition by fluvial activity is closely linked to the soil's infiltration characteristics.

10.1.2 Geology

Geology, in this context, refers to the study of lithology the physical makeup of rock and rock formations within the upper 10–30 meters of the subsurface. By characterizing each layer's composition, grain structure, texture, and hardness, it gains crucial insight into how water may infiltrate or percolate, and where potential weaknesses or preferential seepage paths may exist. This information also helps predict subsurface flow patterns, ensuring that both construction and long-term operations remain safe and resilient.

Table 10.3: Data Source

What is a Geological Map?	It represents the geological features and characteristics of a particular area.
What do they provide?	Display information such as rock units (lithology), geological formations, faults, folds, joints, fractures, dykes, mineral deposits, and other geological phenomena.
How are they created?	The geological data is obtained from Bhukosh (Geological Survey of India).
What is the application?	This geological information provides primary technical insight into the topsoil layer. That provides a broad idea of soil infiltration possibilities. That helps us to decide on the volume of water that may create flood situations and rainwater management plans.
Clay, Silt, and Sand	Clay, silt, and sand are soil particles distinguished by size—clay being the smallest, silt medium, and sand the largest. The Clay proportion is high, the silt proportion is moderate, and the Sand proportion is low. Clay feels sticky and holds water well, silt feels smooth and retains moderate moisture, while sand feels gritty and drains water quickly.
oolitic Calcareous Sand	It is composed mainly of small, rounded grains called ooids, which are formed by the concentric precipitation of calcium carbonate around a nucleus. This sand is typically found in warm, shallow marine environments where calcium carbonate is abundant.

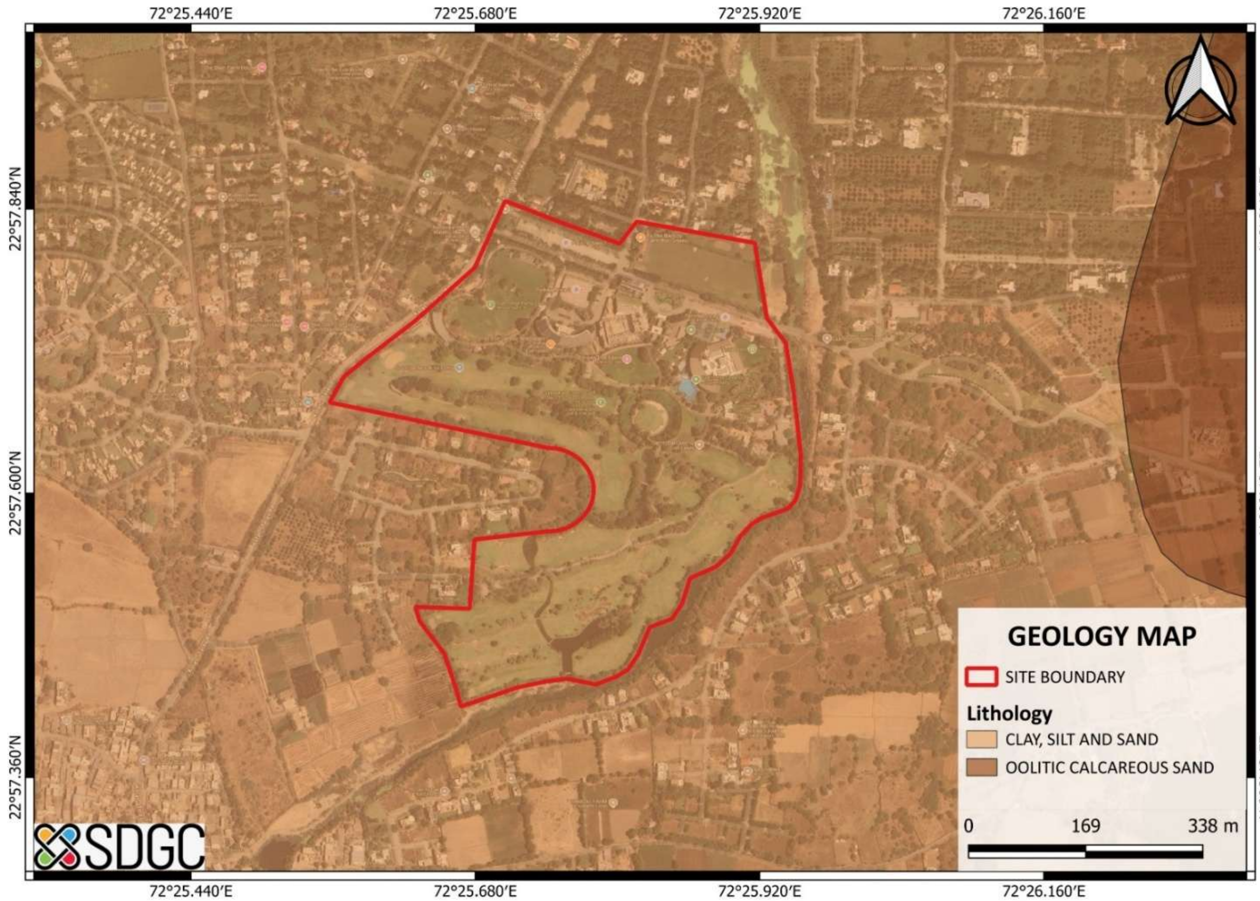

Figure 10-2: Geology Map

The following technical insights have been generated and interpreted to analyse the hydrological impact of the study area from the above map.

Table 10.4: Technical Insights

SN	TECHNICAL INSIGHTS
1	The study area and the surrounding region were observed to be Oolitic Calcareous and Clay, Silt, and Sand.
2	The site area is fully covered by Clay, Silt, and Sand.
3	The presence of clay, silt, and sand results in soils with low bearing capacity, high compressibility, and significant swelling potential, rendering them unsuitable for conventional shallow foundations without appropriate ground improvement or soil treatment.
4	Oolitic calcareous sand, characterized by its high porosity and permeability, facilitates efficient infiltration and groundwater recharge. Its calcium carbonate composition also helps improve soil structure, enhancing moisture retention and contributing to sustained water availability in the region.

10.1.3 Timelapse study

The timelapse study is carried out by extracting relevant satellite images of the study area to calculate the morphological changes for the vintage period. The satellite image for October represents the rainwater conservation done during the rainy season, whereas May represents the gainful use of conserved water for irrigation purposes.

Landsat-8 Satellite images are sourced to establish water presence in ponds, as water absorbs short-wave infrared bands. Composite 3 bands the red band is B07, the Green band is B06 and the Blue band is B04, where composite vegetation is seen in shades of green, soils and built-up areas are in various shades of brown, and water appears black.

December, 2013

April, 2013

December, 2014

April, 2015

September, 2015

May, 2016

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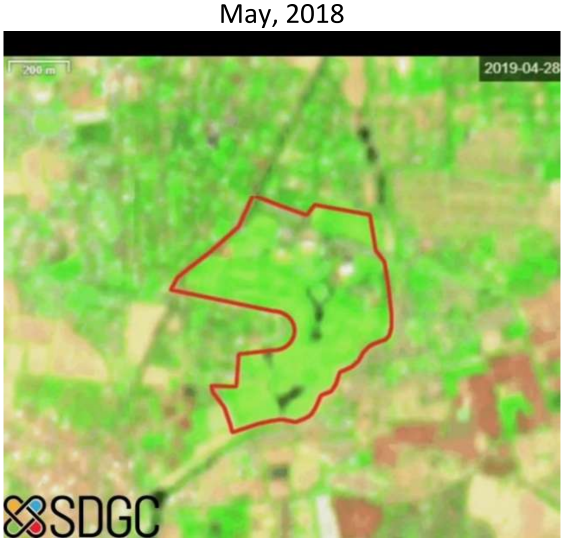
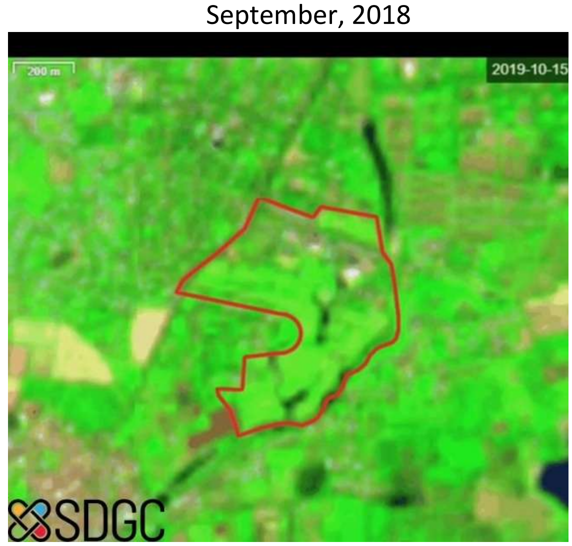
October, 2017

May, 2018

September, 2018



April, 2019



October, 2019

April, 2020

October, 2020

April, 2021

October, 2021

April, 2022

October, 2022

April, 2023

October, 2023

May, 2024

October, 2024

April, 2025

October, 2025

Figure 10.3: Timelapse Study

10.2 SURFACE WATER STORAGE (Where water stays?)

The Gulmohar premises has a large open water pond that is designed and excavated to store rainwater for beautification and sports purpose for the golf course. The recharge potential/aspects are not taken into account, since all water bodies are constructed over saturated sub-surface.

Surface water is consumed from Nalla (stream) which caters water from upstream surface runoff as well sewage water from the habitats located in upstream. De-silting of particular area of the Nalla is undertaken by the PP to maintain the availability of water for gainful usage.

Figure 10.4: Photographs of de-silting operations

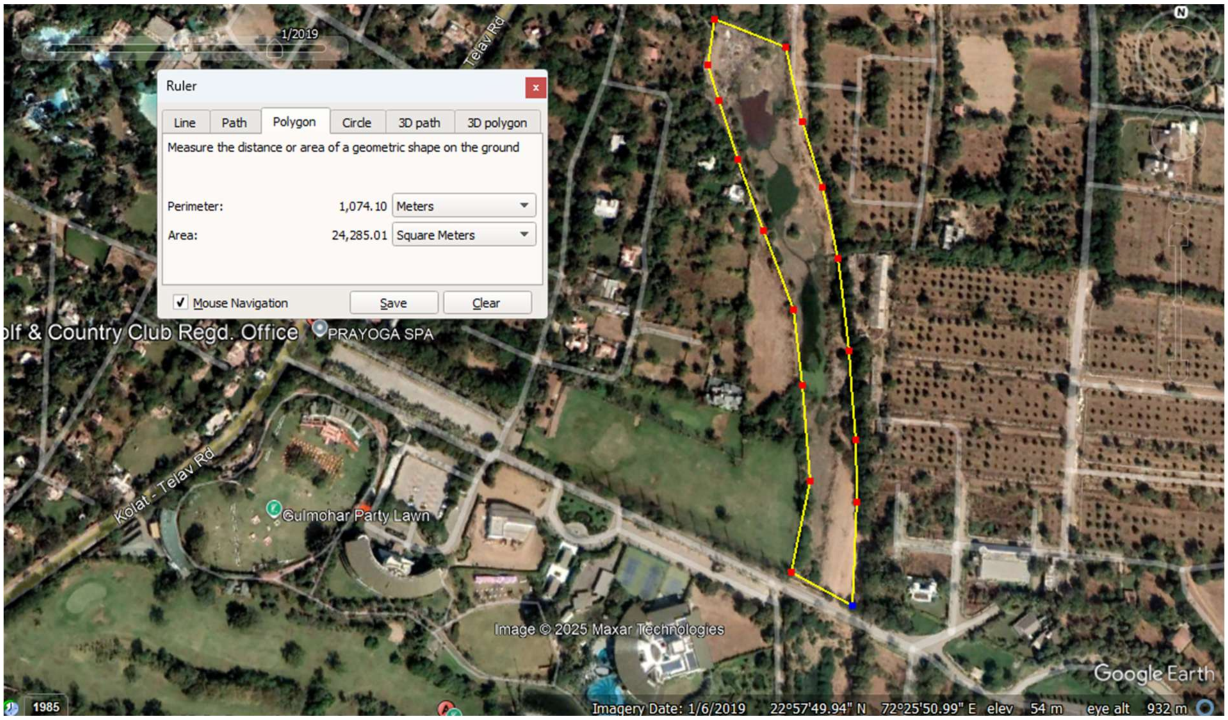


Figure 10-5: Area of stream

Table 10.5: Area Calculation

Sr. No.	Description	Qty	Unit
1	Area	24,285	Sqm
2	Depth	2	m
3	**Volume**	**48,570**	**cum**

10.3 GROUNDWATER STORAGE (Where water stays?)

The primary objective of the study is to investigate and understand subsoil formation by delineating sub-surface aquifer conditions and sub-surface layer information to know the depth of the potential water-bearing zone or potential groundwater recharge zone.

Water below the surface of the Earth is stored in pore spaces and fractures within rock or layers of sand and gravel (aquifers). In water sources management the term more specifically applies to water that can be extracted at a viable rate, quantity, and quality for human use (with or without treatment). Saline water or water contained in rocks of very low permeability is not conventionally considered groundwater.

The Resistivity survey and Geomagnetic survey are required carried out for delineating sub-surface aquifer conditions and subsurface layer information for groundwater beyond 10/30m. Generally, dry, and compact formations indicate high resistivity, water-bearing formations indicate medium resistivity, whereas saline (high TDS) formations indicate low resistivity. Permeable (bigger grain size) formations indicate comparatively higher resistivity than silt/clay/high TDS formations.

Specified investigation methodology will help in computing groundwater sources and strengthen the groundwater potential conditions of the study area.

The major confined and unconfined aquifer systems are formed by sand/ kankars, which causes a higher intake rate. The movement of groundwater is controlled primarily by the porosity and permeability of aquifer material. The aquifer recharge potential of any area depends upon three major factors rainfall, runoff, and aquifer acceptives. Hydrogeology of an area deals with the following parameters.

Table 10.6: Hydrogeology Parameters

SN	PARAMETERS
1	Average rainfall and probable run-off
2	Vegetative and land use cover for run-off estimation.
3	Subsoil absorption potential
4	Aquifer geometry
5	Aquifer material
6	Impact of Aquifer material on water quality
7	Seasonal fluctuation of water level
8	Study of surrounding water bodies

11 WATER BALANCE (Available Water for gainful use)

The existing annual water balance is prepared to understand water demand, water consumption, and expected water losses in the study area. This will be used to define the gross water footprint and recharge potential of the study area to implement water sustainability initiatives.

11.1 WATER DEMAND

Water Demand describes the total amount of water required from its source/ alternate source (Groundwater in aquifer + Surface water storage + Recycled water) to be used. Water demand could be assessed based on potential water requirements. The following assumptions have been made while calculating raw water demand for the premises.

Table 11.1: Data Assumptions

SN	ASSUMPTIONS
1	The premises are functional for 365 days continuously.
2	Irrigated area is 2,46,995 Sqmt as per LULC maps.
3	The number of rainy days can be referred to in chapter 8.
4	Domestic use of water consists of various direct and indirect activities like hand washing, face washing, housekeeping, sewer cleaning, road cleaning, car washing and other related activities.
5	Direct domestic use is marginal in proportion to overall water demand due to higher numbers of floating occupancy.
6	Landscaping/ horticulture water demand is calculated as 3 Lit/sqm/ day.
7	Irrigation water consumption is calculated for the dry season only. Landscaping/ horticulture water demand is not calculated for rainy days and subsequent days, assuming there is no water demand during rain.

11.1.1 IRRIGATION WATER DEMAND

Land Use and Land Cover map is used for the computation of irrigation area within the site. Following is the land use

Table 11.2: LULC Classification Results

LULC CLASSFICIATION RESULTS			
	AREA	**Percentage (%)**	**Area (sq. m)**
1	Tree cover	36.896	1,07,906
2	Water bodies	0.39588	1,158
3	Grassland	47.5587	1,39,089
4	Construction	1.29321	3,782
5	Buildings	13.855899	40,523

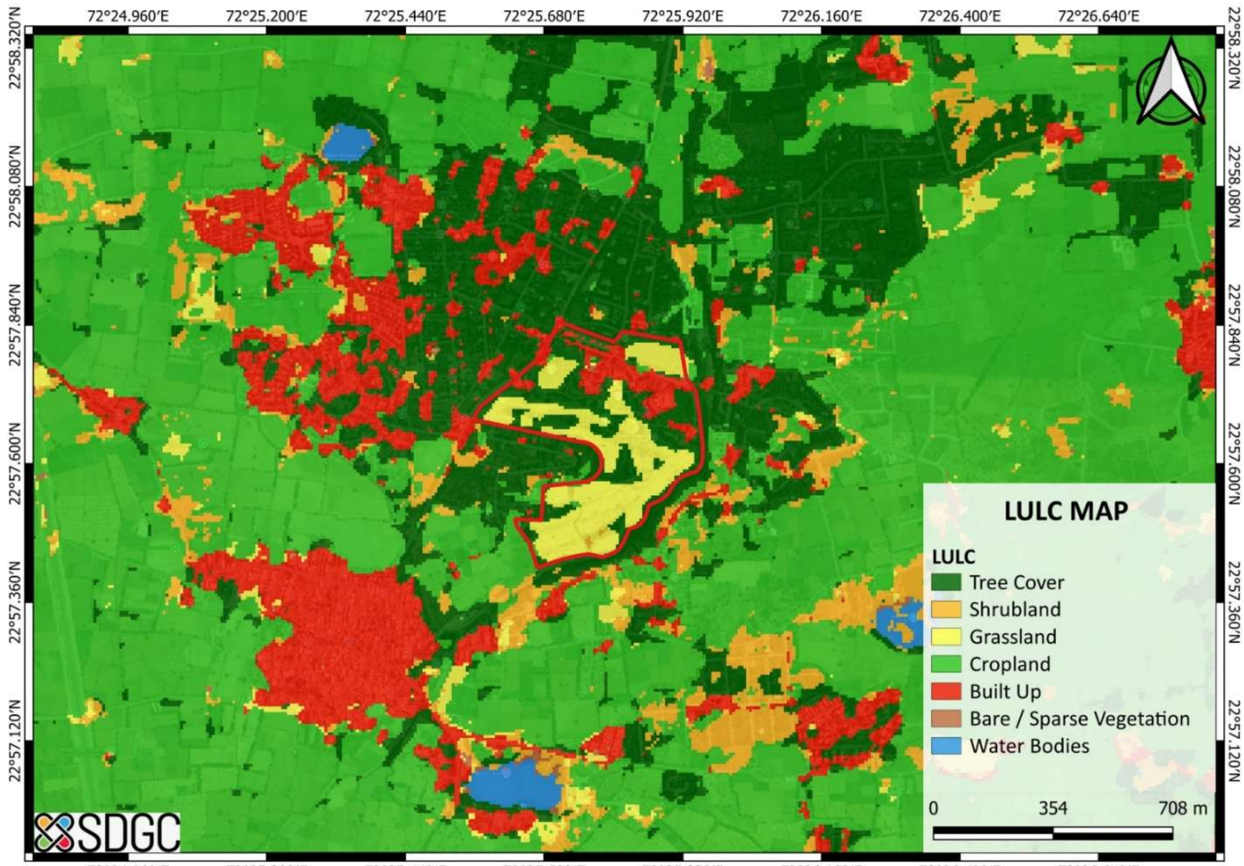


Figure 11.1: LULC Map

Table 11.3: Irrigation Water Demand

Sr. No.	Description	Area (Sqm)	Water Demand (lit / day / sqm)	Total Water Demand (lit / day)
1	Lawn	1,33,642	3	4,00,926
2	Tree Cover	1,07,906	4	4,31,624
3	Golf Lawn	5,447	5	27,235
	Total			**8,59,785**
			Irrigation Days (Non – Rainy Days)	**334**
			Total Yearly Irrigation (lit / year)	**28,71,68,190**
			Total Yearly Irrigation (cum / year)	**2,87,168.19**
			Daily Irrigation (cum / day)	**859**

11.1.2 DOMESTIC WATER DEMAND

Domestic Water demand has been calculated with following considerations

Sr. No.	Description
1	Domestic water demand is calculated for the domestic use of water for the staff, rooms at resort and events
2	Total 52 rooms are available and average occupancy rate is 26.25%, which is 4982 rooms occupied yearly. Double occupancy for each room is considered
3	Average 100 events are considered with occupancy of 700 pax
4	Average working staff per day is 250 pax, out of total staff 30 is resident and remaining is floating

Table 11.4: Domestic Water Demand

Sr. No.	Description		Unit
A	**Water Demand - Rooms**		
a1	Rooms	4,982	nos / yr
a2	Avg Occupancy	2	nos / room
a3	Raw water Consumption	135	LPCD
a4	Total Raw water Consumption	13,45,140	lit / yr
B	**Water Demand - Events**		
b1	Events	110	nos / yr
b2	Occupancy	700	pax / event
b3	Raw water consumption	45	litre / person
b4	Total Raw water Consumption	34,65,000	lit / yr
C	**Water Demand - Staff**		
c1	Resident Staff	30	pax
c2	Raw water Consumption	135	LPCD
c3	Total Raw water Consumption	4,050	lit / day
		14,78,250	lit / yr
c4	Floating Staff	220	pax
c5	Raw water Consumption	45	LPCD
c6	Total Raw water Consumption	9,900	lit / day
		36,13,500	lit / yr
c7	Total Raw Water consumption (staff) (c3 + c6)	50,91,750	lit / yr
D	**Total Domestic Demand (A+B+C)**	99,01,890	lit / yr
		9,902	cum / yr
		27	cum / day

11.2 CAPACITY CALCULATION -STP

The STP plays a vital role in water conservation and eco-friendly waste management. The STP is a critical infrastructure for managing sewage and promoting sustainable water usage. Treating and reusing wastewater minimizes environmental impact, supports resource conservation, and ensures a healthier ecosystem. Proper design, operation, and maintenance are essential for maximizing its efficiency and benefits.

The physical site survey was done on 30th November 2025, to know STP units' type at Gulmohar and its capacity to treat the wastewater. Total capacity of STP is 60KL. Water conservation by treatment of the sewage water is represented below as per the predefined assumption and water consumption pattern.

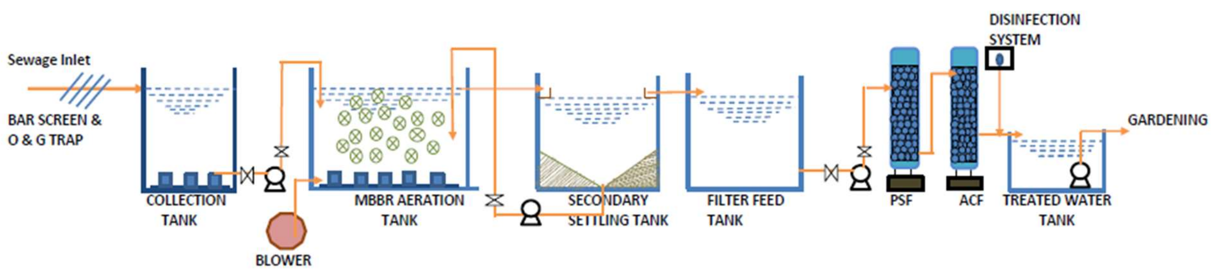


Figure 11.2: STP

11.3 Water Balance

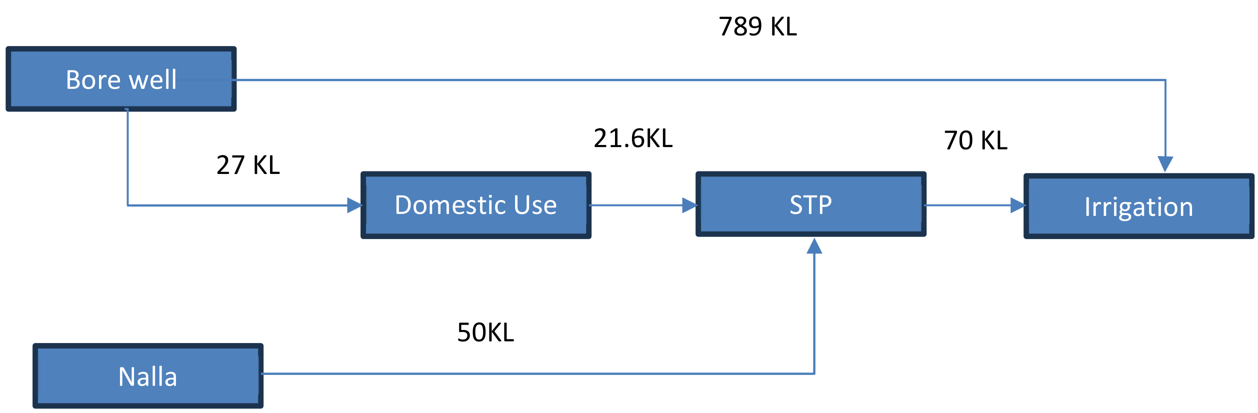


Figure 11.3: Water Balance

12 WATER CREDITS

The Universal Water Registry (UWR) Standard and Platform aim to introduce better waternomics with the next-generation voluntary rainwater offset projects that are far more efficient, faster, cheaper, de-centralized in transfer, and convenient for every small green project involved in rainwater or unutilized water capture and/or groundwater recharge. UWR Standard allows for early action projects and the ability to monetize rainwater credits from the vintage year 2014 onwards. Similar to the carbon vintage year concept, RoUs can be classified as the year in which the conservation, recharge, or recycling of water took place and quantified for the monitoring period from 01st January 14 to 31st December 2025. RoUs, serve as an important tool in rebalancing the water dynamics of the region by incentivizing and monetizing all efforts to harvest and conserve rainwater. The established RoUs represented below that is leading to a water-rich environment.

12.1 WATER CREDITS

Table 12.1: Total RoU Generation for Vintage Year (2014 – 2025)

Year (June 01, 2014 onwards)	RoUs (1 RoU = 1000 litres)/Year
01/01/2014 to 31/12/2014	23,380
01/01/2015 to 31/12/2015	23,380
01/01/2016 to 31/12/2016	23,380
01/01/2017 to 31/12/2017	23,380
01/01/2018 to 31/12/2018	23,380
01/01/2019 to 31/12/2019	23,380
01/01/2020 to 31/12/2020	23,380
01/01/2021 to 31/12/2021	23,380
01/01/2022 to 31/12/2022	23,380
01/01/2023 to 31/12/2023	23,380
01/01/2024 to 31/12/2024	23,380
01/01/2025 to 31/12/2025	23,380
	2,80,560
Less: Adjustment for standard uncertainty factor per UWR RoU Standard 8.1 @ 2%	5,612
Total RoU	**2,74,948**

13 IMPLEMENTATION BENEFITS

13.1 Pond

The ponds in the stream created at Gulmohar are observed as the primary water source for the premises which caters to substantial irrigation water needs. Hence the PP needs to carry out preventive maintenance of the pond to ensure water security since it's the only reliable and fully useable water source of the premises. This artificial storage addresses the following issues -

1. Harvesting of surplus monsoon runoff into the surface reservoir which otherwise was going un-utilized outside the watershed/ basin and to sea.
2. Fulfilling irrigation requirements by storing rainwater runoff which would have gone to the sea thereby preserving the groundwater security of the region and local geography.
3. Meeting substantial irrigation water requirements of the site with rainwater conservation for the vintage period.
4. Reduction of reliance on surface water from the major and minor irrigation canals that are primarily constructed to cater to surrounding farmlands.
5. Ensuring drawable groundwater availability and water security to the local agricultural farms and communities by harnessing and conserving rainwater.
6. Moreover, these ponds are freshwater ecosystems that support a variety of plants and animals and contribute to the environment in many ways.
7. Ponds provide habitats for many species, including amphibians, insects, fish, and birds to enhance biodiversity.
8. Ponds filter out sediments and can act as drinking water sources for wildlife.
9. Prevent water logging on roads and other parts of premises.
10. Serve as alternatives to enhance the sustainable yield in areas where overdevelopment has depleted the aquifer.
11. Reduces soil erosion.
12. Serves to conserve and store excess surface water for future requirements, since these requirements often change within a season or a period.
13. Ponds function as rainwater holding storage that can be connected with artificial rainwater harvesting to recharge surface water in groundwater by replenishing continuous water flow during the rainy season.

13.2 STP

The STP units at Gulmohar is a primary wastewater treatment plan for the resort, which treats the wastewater to make gainful use. When operating and maintaining a Sewage Treatment Plant (STP), certain preventive measures should be considered to ensure its efficiency, longevity, and environmental compliance. Here are the key preventive measures:

1. Contributing to water conservation and sustainable resource management aligns with global and local sustainability initiatives.

2. STP treats wastewater to remove harmful pollutants, ensuring that only clean, treated water can be reused for non-potable purposes such as irrigation, landscaping, etc.
3. Proper wastewater treatment prevents excessive groundwater use, which is crucial for regions relying on underground aquifers.

4. Reusing treated wastewater reduces the dependency on freshwater sources, lowering water procurement costs.

14 ALTERNATE WATER CONSERVATION METHODS

There is an urgent need for the management of water sources for sustainable development, where groundwater should be protected and reserved. Creating awareness amongst communities and industries regarding the conjunctive use of surface water and groundwater through the judicious use of water and the adoption of effective techniques has become important.

A planned water conservation strategy needs to be deployed to discharge and the withdrawal of water, that can be used during the lean period. Resorting to artificial recharge practices by diverting surplus runoff during the monsoon into ponds, percolation tanks, spreading basins abandoned dug wells, etc. could be an alternative rainwater conservation method, that could be taken up through appropriate techniques. That may be implemented depending upon the suitable hydrogeological conditions to explore other scopes as mentioned in the UWR guidelines.

Following suitable hydraulic structure's feasibility can be checked for the study area as an alternative to the project activity.

14.1 Recharge Wells with the concept of aquifer storage & recovery (ASR)

Table 14.1: Recharge Wells

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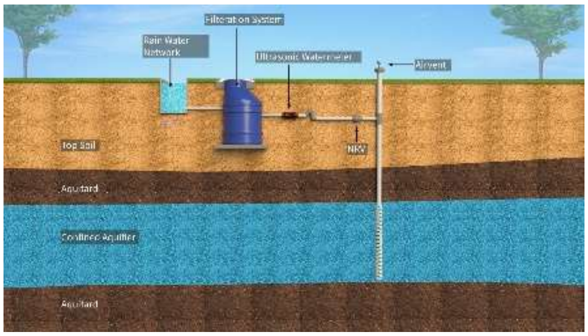

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Recharge wells are also known as infusion wells. This is being used to promote their products and concepts, however, the working fundamentals for both are the same.

Presently, surface rainwater runoff or rooftop rainwater gets diverted to a deeper aquifer (A1) through the reverse borehole through the conventional rainwater harvesting structure. Such structure could be planned in study area at various location.

Alternatively, the smart rainwater harvesting structure integrated with an ultrasonic water meter could be installed to recharge the deeper aquifer (A1) to bring groundwater balance. The number of such wells must neutralize groundwater extraction.
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14.2 Soil Biotechnology

Table 14.2: Soil Bio-Technology

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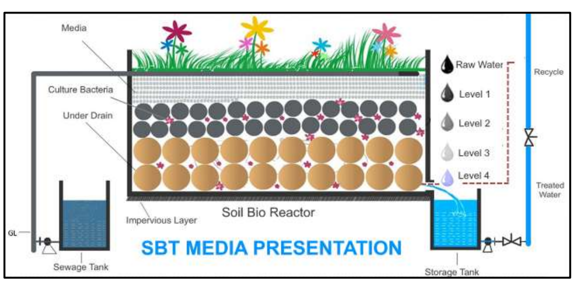

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SBT (alternative to Sewage Treatment Plant) systems are practically maintenance-free, do not produce biosolids or foul odors, and consume minimal energy. They achieve river-quality water and enhance the surrounding aesthetic with greenery. Their operation is straightforward, cost-effective, and energy-efficient.

SBT systems typically begin with an underdrain layer, followed by a media layer that supports culture and bioindicator plants. Water first flows through the additive layer and then through the media layer. The process can operate as either a single-stage or multi-stage system, depending on the desired water quality. Recirculation can be implemented for additional polishing if needed.
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15 FEASIBILITY EVALUATION

Alternative conservation methods have been evaluated to check the feasibility of investigating various hydrological and hydrogeological conditions based on historical rainfall patterns.

15.1 Recharge well

1. Recharge wells are feasible to implement at Gulmohar premises spread over strategic locations.
2. Necessary hydrogeological study is required to be carried out to ascertain and identify aquifer recharge potential.
3. Surrounding region is never explored for ground water extraction. However, that needs to be studied further for future use while installing recharge wells (ASR).

15.2 Soil Biotechnology

1. Soil Bio-Technology (SBT) is a green technology with green chemistry is feasible
2. In SBT, tertiary treatment is not required, and there is no maintenance needed during the breakdown period; it can practically operate under zero loading.
3. There is no generation of secondary biosolids, no chemical use, and zero liquid discharge compliance.
4. Low operating cost compared to operating technologies like conventional Sewage Treatment Plants.

15.3 Review of water consumption pattern

A thorough review of the site's water consumption pattern over various time periods should be conducted by having a water audit. This exercise will spell out possible avenues of further water conservation thereby reducing the gap between water demand and water conservation.

16 INTERVENTIONS BY PROJECT OWNER/ PROPONENT/ SELLER

The revenue from the sale of the water credits from this project activity for the 2014 and 2025 vintage years under the UWR RoU program will enable the PP to finance and set up further action for water security for the Company's locations and surrounding region.

1. An annual water audit is required to identify the gap between water demand and water conservation.
2. The water audit will help in creating future possibilities to generate more water credits under other scopes as may be applicable.
3. Further, water consumption data during construction and development phase should be recorded digitally and for claiming future water credits.
4. There is still an opportunity to reduce the gap between water conservation and water consumption quantity.

5. Rainwater harvesting can be further planned within the campuses for effective and early rejuvenation of the depleted aquifer system.
6. Qualitative water test results to be analyzed for their gainful utilization to plan farming using saline/ high TDS water.
7. The maintenance of the checkdam in the canal is to be ensured by scheduling a pre-monsoon activity list. Desilting into the pond/s is required to maintain the design capacity of the pond/s every year.
8. The future water credits should be ascertained based on digitized data while installation of a water meter in the inlet & outlet header of each user point to quantify gainful use.
9. Soil Biotechnology (SBT) can be further planned within the campus as a sustainable, eco-friendly, and efficient alternative for wastewater treatment.

17 UWR RAINWATER OFFSET DO NO NET HARM PRINCIPLES

The approach to mining water credits from projects addresses the **"Do No Harm or Negative Impact"** sustainability test. None of the information or elements of this project being mined on the UWR platform has any negative development impacts i.e. community or environment.

This PCNMR lays down the entire philosophy, methodology, implementation and future proposal of the functional model for the Company as envisaged and operated by the PP. During project operations since 2007, there has not been a single case of adverse impact on the local flora, fauna, water security, or local human geography. On the contrary, the project has ensured several tangible and intangible direct and indirect benefits to the local geographical area by addressing several of the UNSDGs.

We support projects that contribute to UNSDGs encompassing environmental, social, and governance standards (ESG) as a key basis for eligibility on the UWR platform while accepting quality green water credit projects from a predefined list of activities. All our water conservation and groundwater recharge projects, either by individual or collective actions, benefit people, the economy, and nature. While this program and standard is aimed at all unutilized water conservation and recharge efforts (with or without treatment) worldwide, its genesis lies in Bharat and hence, the protocol keeps projects established within Bharat in mind as the basis of development and standardization of water offset or credits.

18 ECOLOGICAL ASPECTS

Sustainable Development Goals are part of a transformative agenda adopted by Bharat and which came into effect after the Sustainable Development Summit in 2015. At the core of this national agenda for 2030 is the principle of universality: 'Leave No One Behind'. Development in all its dimensions must include all people, everywhere, and should be built through the participation of everyone. This comprehensive agenda recognizes that it is no longer sufficient just to focus on economic growth but on fairer and more equal societies, and a safer and more prosperous planet.

Ecological aspects protect the planet and the biodiversity of the utilized areas as habitats, maintaining ecosystem services provided by various participants of the given ecosystems. An ecosystem contains functional aspects for its maintenance, biogeochemical cycles, energy flow, nutrient cycle, ecological succession, ecological pyramid, food web, and food chain.

The Sustainable Development Goals (SDGs) are a set of 6 goals that are a call to action to end poverty and inequality, protect the planet, and ensure that all people enjoy health, justice, and prosperity through the projects. These are precise outcomes against the pre-defined objective for the project.

18.1 CLEAN WATER AND SANITATION

UNSDG that is directly addressed	UNSDG indicator	How does the PP intervention with the project address the UNSDG
	Ensure availability and sustainable management of water and sanitation for all.	Interventions of this project have fulfilled its irrigation requirements by storing surface rainwater runoff which would have gone to the sea thereby preserving the groundwater security of the region and local geography thus ensuring drawable groundwater availability and water security to the local agricultural farms and communities by harnessing and conserving rainwater.

18.2 INDUSTRY, INNOVATION AND INFRASTRUCTURE

UNSDG that is directly addressed	UNSDG indicator	How does the PP intervention with the project address the UNSDG
	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	The Project has met a substantial portion of its irrigation water demand of the campus with rainwater conservation since project inception. The intervention by the PP through this project is a hallmark of resilient and sustainable infrastructure which has stood the test of time since project inception in its industry segment.

18.3 SUSTAINABLE CITIES AND COMMUNITIES

UNSDG that is directly addressed	UNSDG indicator	How does the PP intervention with the project address the UNSDG
	Make cities and human settlements inclusive, safe, resilient and sustainable	The Project is catering to a community primarily for sports, recreation & leisure activities and creating a world class campus with complete state of the art infrastructure and facilities. The outcomes of this project activity are enumerated above and are testimony to the fact that the project has created an infrastructure that is sustainable in all dimensions of the term.

18.4 RESPONSIBLE CONSUMPTION AND PRODUCTION

UNSDG that is directly addressed	UNSDG indicator	How does the PP intervention with the project address the UNSDG
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	Ensure sustainable consumption and production patterns	The primary resource dependency of Gulmohar is water for upkeep and maintenance for efficient use. The project has met a substantial portion of its water demand being by rainwater conservation, the project ensures a highly judicious, safe, sustainable and prudent utilization/ consumption of this highly valuable and finite resource.

18.5 CLIMATE ACTION

UNSDG that is directly addressed	UNSDG indicator	How does the PP intervention with the project address the UNSDG
13 CLIMATE ACTION	Take urgent action to combat climate change and its impacts	The primary drivers to combat climate change as outlined by thousands of peer-reviewed research papers over the years are carbon footprint reduction, water footprint reduction, and responsible waste management. The project addresses one of these 3 drivers positively i.e. water footprint reduction with sustainable water management practices as enumerated in this PCNMR.

18.6 PARTNERSHIP FOR THE GOALS

UNSDG that is directly addressed	UNSDG indicator	How does the PP intervention with the project address the UNSDG
	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Gulmohar’s water stewardship initiatives strengthen UNSDG 17 (Partnerships for the Goals) by fostering collaboration between communities, local authorities, and development partners. Through joint action, resource mobilization, and capacity-building aimed at securing reliable water access, Gulmohar helps create strong, multi-stakeholder partnerships that advance sustainable development.

19 SCALING PROJECTS – LESSONS LEARNED – RESTARTING PROJECTS

Since a state-of-the-art infrastructure is created at Gulmohar, it is suggested that more locations should be taken up within the premises for aquifer creating new recharge wells with storage & recovery and reduce the reliance on ground water to meet the water demand.

It is important to list lessons learned from this project that can be applied in future projects, restarting the new project as well as enhancing the existing system.

1. Statutory compliance is the prerequisite for enhancing the existing water management system before scaling up the project.
2. The new project must be conceptualized with a sustainability design approach while complementing the design phase, development phase, construction phase and operational phase of the program.
3. The operational phase must be supported by the dashboard monitoring system by creating monitoring indicators to generate authentic data to support the verification process.
4. The construction phase must be supported by the Integrated Management Information System (IMIS), Real-time dashboard, and Geo-tagging assets will be updated periodically as the project progresses.
5. It is important to generate a large data bank to prepare water budgeting of the premises while planning the horizontal/ vertical growth.
6. By incorporating low-flow fixtures, can reduce the total water demand that will prevent the excessive use of groundwater.

7. Introducing water meters as a primary header and secondary header will be used as a powerful tool to quantify and initiate water conservation efforts for promoting environmental sustainability.

8. The option of raising the level of check dams at the outlet location may be explored to increase the water storage capacity of the pond while safeguarding facilities/ structures on the upstream part of the pond.

9. By incorporating low-flow fixtures, can reduce the total water demand that will prevent the excessive use of groundwater.

10. Introducing water meters as a primary header and secondary header will be used as a powerful tool to quantify and initiate water conservation efforts for promoting environmental sustainability.

20 ABBREVIATIONS

1. **Safe area:** Area categorized as SAFE from the groundwater resources point of view, based on the latest groundwater resources assessment carried out jointly by CGWB and State groundwater organizations. Details are available on the websites of NOCAP and CGWB.

2. **Semi-critical area**: Area categorized as SEMI-CRITICAL from the groundwater resources point of view, based on the latest groundwater resources assessment carried out jointly by CGWB and State groundwater organizations. Details are available on the websites of NOCAP and CGWB.

3. **Critical area**: Area categorized as CRITICAL from the groundwater resources point of view, based on the latest groundwater resources assessment carried out jointly by CGWB and State groundwater organizations. Details are available on the websites of NOCAP and CGWB.

4. **Over-exploited area:** Area categorized as OVER-EXPLOITED from the groundwater resources point of view, based on the latest groundwater resources assessment carried out jointly by CGWB and State groundwater organizations. Details are available on the websites of NOCAP and CGWB.

5. **Aquifer:** Geological formation capable of storing and transmitting groundwater.

6. **Deeper Aquifer:** In areas having multiple aquifer systems, the aquifer(s) occur below the uppermost aquifer.

7. **Well:** Any structure used for the extraction of groundwater, including open wells, dug wells, bore wells, dug-cum-bore wells, tube wells, filter points, collector wells, infiltration galleries, recharge wells, or any of their combinations or variations.

8. **Government Agency:** Maybe a Central or State Government body.

9. **Illegal Ground Water Abstraction Structure:** Any energized abstraction structure viz. dug well, tube, borewell used to withdraw groundwater without a valid No Objection Certificate from Central Ground Water Authority.

10. **Rainwater Harvesting:** The technique or system of collection and storage of rainwater, at the micro watershed scale, including rooftop harvesting, for future use or recharge of groundwater.

11. **Ground Water Draft:** Quantum of groundwater withdrawal.

12. **Saline Water:** Water having salinity above 2500 µsiemens/cm at 250C.

13. **Water Table Intersection**: Intersection of the water table on excavating the overlying material due to mining or other activities.

14. **Drinking and domestic use**: Besides drinking & domestic use of households, this category will cover drinking requirements of industries not requiring water for the industrial process; drinking, washing, cleaning use, etc. in the case of hospitals, hotels, malls & multiplexes, institutions, offices, banquet halls, fire stations, metro stations, railway stations, airports, seaports, stadia, etc.

15. **Sewage Treatment Plant (STP)**: is a process of purification of Sewage water and reusing for Gardening, Agricultural, and other general Purpose.

16. **Recycle/Reuse**: Using treated wastewater for various purposes/ putting water to multiple uses.

17. **Groundwater:** Water, which exists below the surface in the zone of saturation and can be extracted through wells or any other means or emerges as springs and base flow in streams and rivers.

18. **Bgl:** Below Ground Level.

19. **BCM:** Billion cubic meters.

20. **Groundwater Abstraction structure:** Structure used to withdraw groundwater like bore well/tube well / dug well/dug cum bore well/tunnel well.

21. **Observation well or Piezometer**: A bore well/tube well is used only for measuring the water level/piezometric head and to take water samples periodically but is not used for groundwater abstraction.

22. **Water Audit**: A method of quantifying water use in simple or complex systems to reduce water usage and often to save money on otherwise unnecessary water use.

23. **Groundwater pollution:** If the concentration of any parameter in groundwater exceeds the maximum permissible limit for drinking water prescribed by the Bureau of Indian Standards.

24. **Cooperative Group Housing Societies/ Builder flats**: A Housing Society is formed by house owners within a residential complex. The housing society formed must be formally registered with the registrar of co-operatives.

25. **KLD** – Kilo Liter per day

26. **ECGW –** Environmental compensation for drawing illegal groundwater.

27. **ECGWR –** Environmental compensation rates for drawing illegal groundwater.

28. **VES** – Vertical Electrical Sounding

29. **SWL** – Static Water Level

30. **PWL** – Pumping Water Level

31. **DD** – Draw Down

32. **LPM** – Liters Per Minute

33. **ppm** – Parts Per million

34. **TDS** – Total Dissolved Solids

35. **GPS** – Global Positioning System

36. **Aquifer Recharge** - defined as the process of water being added to a groundwater system comprised of a geological structure or formation, or part thereof, permanently, or intermittently permeated with water or capable of transmitting water. Water introduced or recharged into an aquifer becomes ‘groundwater.’

37. **Aquifer storage and recovery (ASR)** - injection of water into a well for storage and recovery from the same well.

38. **Aquifer storage transfer and recovery (ASTR)** - injection of water into a well for storage and recovery from a different well, generally to provide additional water treatment.

39. **Aquitard**- A geological layer that has low permeability and confines or separates aquifers.

40. **Artificial recharge (AR)** —intentional banking and treatment of water in aquifers.

41. **Artificial recharge and recovery (ARR)** —recharge to and recovery of water from an aquifer; that is, both artificial recharge of the aquifer and recovery of the water for subsequent use.

42. **Augmentation pond**—water body designed to supply water to river systems at defined rates during particular times.

43. **Bank filtration**—extraction of groundwater from a well or caisson near or under a river or lake to induce infiltration from the surface water body, thereby improving and making more consistent the quality of water recovered.

44. **Conjunctive use**—combining the use of both surface and groundwater to minimize the undesirable physical, environmental, and economic effects of each solution.

45. **Dry well**—synonymous with vadose zone well.

46. **Infiltration basin**—synonymous with recharge basin.

47. **Managed (or management of) aquifer recharge (MAR)**—intentional banking and treatment of water in aquifers (synonymous with AR). MUS may be considered a subset of MAR.

48. **Recharge basin (or pond)**—a surface facility, often a large pond, used to increase the infiltration of surface water into a groundwater basin; basins require the presence of permeable soils or sediments at or near the land surface and an unconfined aquifer beneath. Recharge well—a well-used to directly recharge water to either a confined or an unconfined aquifer.

49. **Surface spreading**—recharging water at the surface through recharge basins, ponds, pits, trenches, constructed wetlands, or other systems.

50. **Spreading basin**—synonymous with recharge basin.

51. **Underground storage and recovery (USR)** —similar to MUS; any type of project whose purpose is the artificial recharge, underground storage, and recovery of project water.

52. **Vadose zone well**—a well-constructed in the interval between the land surface and the top of the static water level and designed to optimize the infiltration of water.

53. **Borehole**: A vertical below-ground installation to abstract groundwater. It is drilled (or bored) and lined with metal or plastic tubes to keep it open, and to protect against surface/near surface pollution.

54. **Beneficial use:** A use of the environment or any element or segment of the environment which (a) is conducive to public benefit, welfare, safety, health, or aesthetic enjoyment and which requires protection from the effects of waste discharges, emissions or deposits or of the emission of noise or (b) is declared in India's environment protection policy to be a beneficial use.

55. **Catchment:** The geographical zone in which water is captured, flows through and eventually discharges at one or more points. The concept includes both surface water catchment and groundwater catchment.

56. **A surface water catchment** is defined by the area of land from which all precipitation received flows through a sequence of streams and rivers towards a single river mouth, as a tributary to a larger river, or the sea.

57. A **groundwater catchment** is defined by the geological structure of an aquifer and groundwater flow paths. It is replenished by water that infiltrates from the surface. It has vertical thickness (from a few meters to 100s meters) as well as area. Depending on local conditions, surface and groundwater catchments may be physically separate or interconnected.

58. **Catchment of origin** - refers to a catchment, distinct from the site's catchment(s), where a product or service is manufactured or sourced. It may be anywhere from an adjacent catchment to the other side of the world. Alternative terms are watershed, basin and river basin.

59. **Consumption** - references in the WF industry currently refer to it as the loss of water from the available ground–surface water body in a catchment area, which happens when water evaporates, is incorporated into a product or is transported to another catchment area or the sea.

60. **Contaminated water body**: A water body that receives (or has received) untreated sewage, effluent discharge and/or industrial waste, and/or is defined as ‘heavily polluted’ or “unfit for human consumption” by the authorities.

61. **Effluent**: Water or wastewater discharged from a site after being used. It is a more specific term than discharge (i.e., not including drainage or runoff). The quality of effluent may range from good to polluted, depending on its origin, its use, and the treatments applied.

62. **Embedded/virtual water**: Water that was used in the production or creation of an item, but not contained within it. For a crop, it is the water it needs to grow (irrigated or rain-fed), taken up by its roots and lost via transpiration, and is usually hundreds of times more than the water physically retained within the crop. It may also include water used to wash, process and transport it. Alternative terms are ‘virtual water’ and ‘water footprint’.

63. **Freshwater**: Freshwater plays a fundamental role in support of the environment, society and the economy. Ecosystems such as wetlands, rivers, aquifers and lakes are indispensable for life on Earth.

64. **Rain Water Offset Unit or Credit (RoU)** is a volumetric measure of water harvested or conserved through project activities on UWR and expressed as m3 or 1000 liters of water per year.

65. **Groundwater**: Water below the surface of the Earth stored in pore spaces and fractures within rock or layers of sand and gravel (aquifers). In water resources management the term more specifically applies to water that can be extracted at a viable rate, quantity and quality for human use (with or without treatment).

66. **Injection well** A well that admits water into an aquifer, either by pumping or under gravity.

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22 DISCLAIMER

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