

Academic Year 2022-23

6.4

Water Reuse

6.4.2 Water Reuse Measurement

MRIIRS Weblink to SDG 6:

<https://mriirs.edu.in/sdg06-clean-water-and-sanitation/>

Water Reuse Measurement

As per the reports of Academic Year 2022-23, MRIIRS generates monthly Av 298KL water through STP (3574 KL Annum) which is 7900 L/day. This reclaimed water is used for horticulture and toilet flushing. It not only saves precious groundwater but also reduce energy consumption in extracting groundwater from aquifer. So, as it helps in conserving groundwater resource. Thus, recycling of water is reducing carbon foot print of the campus. MRIIRS has also installed rain water harvesting system in the campus.

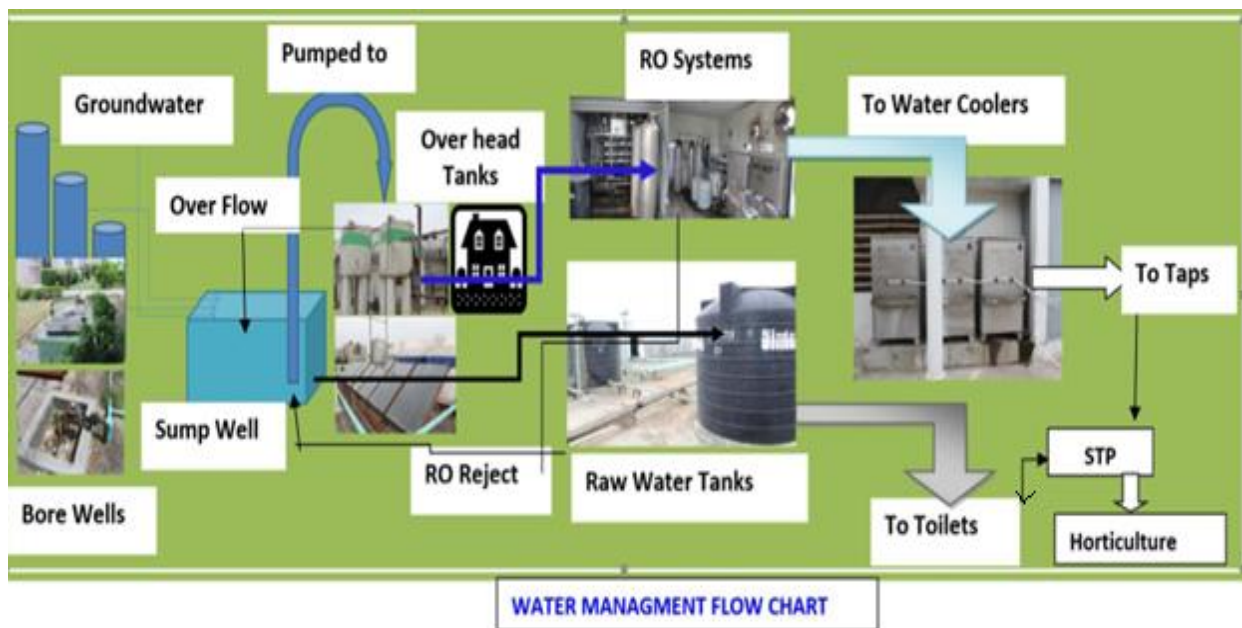
Following evidence in support to 6.4.2 are available

- ✓ **Flow of water management system at MRIIRS**
- ✓ **Video/geotagged pictures of STP**
- ✓ **Rain water harvesting system (RWH)** structure has been installed at MRIIRS and the detailed have been appended as a **consolidated report along with geotagged pictures**. The campus is situated in arid region, which stands in water scarcity zone. These practices help in recharging the ground water resource system.

All the data are also available in public domain through web site of MRIIRS.

Water Management System at MRIIRS:

MRIIRS has installed a 200KL/Day Sewage Treatment Plant (STP) to treat the sewage generated within the campus. Underground drains are constructed connecting all the buildings to the STP. The site of STP is kept in the down slope end of the campus, so as to facilitate the gravitational movement of sewage to STP.



The detailed flow of water management system at MRIIRS is as presented above. As shown in the flow, the treated water from STP is used for horticulture and toilet flushing. The reuse of water across the University is measured to keep the record and for further planning.

A register/log book is maintained by university **care taker** to record daily units of water reuse readings of the STP. Monthly data of water reuse is reported to the **Supervisor**. The supervisor reports the compiled monthly data to the **Manager-maintenance** for data storage/record keeping in the university MIS. Supervisor also keep track of maintenance of STP and testing of water samples in regular interval.

The sewage generated in the campus is collected and processed at installed STP of 200 m³/day capacity. It can be noted from the results that the performance of plant

is adequate to achieve discharge standards with respect to Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS).

Table 1: Characteristics of sample

Parameters	Raw Sewage	Treated Water
pH	7.27	7.53
Oil and Grease	12	< 2
Odour	Faint	Odourless
BOD (mg/L)	162	6
COD (mg/L)	311	69

The monthly records of MRIIRS STP discharge during the year are as presented below:

MRIIRS STP Discharge Data Log (1 unit = 1000L) (AY 2022-23)									
S. No.	Month	Input Start Reading	Input End Reading	Total Monthly input (Unit)	Output start Reading	Output end Reading	Total Monthly Discharge (Unit)	Unit Discharge Av/day	Per Day Unit Discharge Act days
1	Jul-22	4335	4800	465	7065	7236	171	5.51	6.57
2	Aug-22	4800	5220	420	7236	7458	222	7.16	7.16
3	Sep-22	5220	5600	380	7458	7674	216	7.20	7.2
4	Oct-22	5600	5943	343	7674	7840	166	5.35	5.53
5	Nov-22	5943	6283	340	7840	8002	162	5.23	5.4
6	Dec-22	6283	6680	397	8002	8200	198	6.39	6.39
7	Jan-23	6680	7050	370	8200	8350	150	4.84	4.84
8	Feb-23	0	2626	262	0	2447	244	7.87	8.82
9	Mar-23	2626	6490	387	2447	6045	359	11.58	11.58
10	Apr-23	6490	10000	351	6045	9363	331	10.68	11.03
11	May-23	10000	13396	339	9363	12475	311	10.03	10.03
12	Jun-23	13393	16195	280	12475	15061	258	8.32	8.6
13	Jul-23	16195	18704	250	15061	17414	235	7.58	7.58
14	Aug-23	18704	21838	313	17414	20410	296	9.55	9.55
15	Sep-23	21838	24506	266	20410	22961	255	8.23	8.5
				5163			3574	7.7	7.91

Annual discharge of STP is 3574 KL (Academic Year 2022-23). From the measurement it is calculated that Av 7.9 KL/Day discharge obtained from STP. It is used to generate sufficient treated waste water of around 7900 litres per day to irrigate 2.87ha planted landscape within the lush green campus and toilet flushing. The output water quality of STP is maintained keeping Biochemical Oxygen Demand

(BOD) within permissible level. Frequent analysis of output water is done to keep check on its quality.

Geotagged Pictures of Sewage Treatment Plant (STP) installed at MRIIRS

S. No	Relevant documents
1	Sewage Treatment Plant -Geotag Link to Google Maps
2	Sewage Treatment Plant Display Board
3	Sewage Treatment Plant Specifications
4	Sludge Tank Sewage Treatment Plant
5	Sludge Dry Bed Sewage Treatment Plant
6	Treated Water Distribution, Sewage Treatment Plant

Video link of STP installed at MRIIRS : [Click to view](#)



Sewage Treatment Plant: Screenshot of Geotag Link to Google Maps

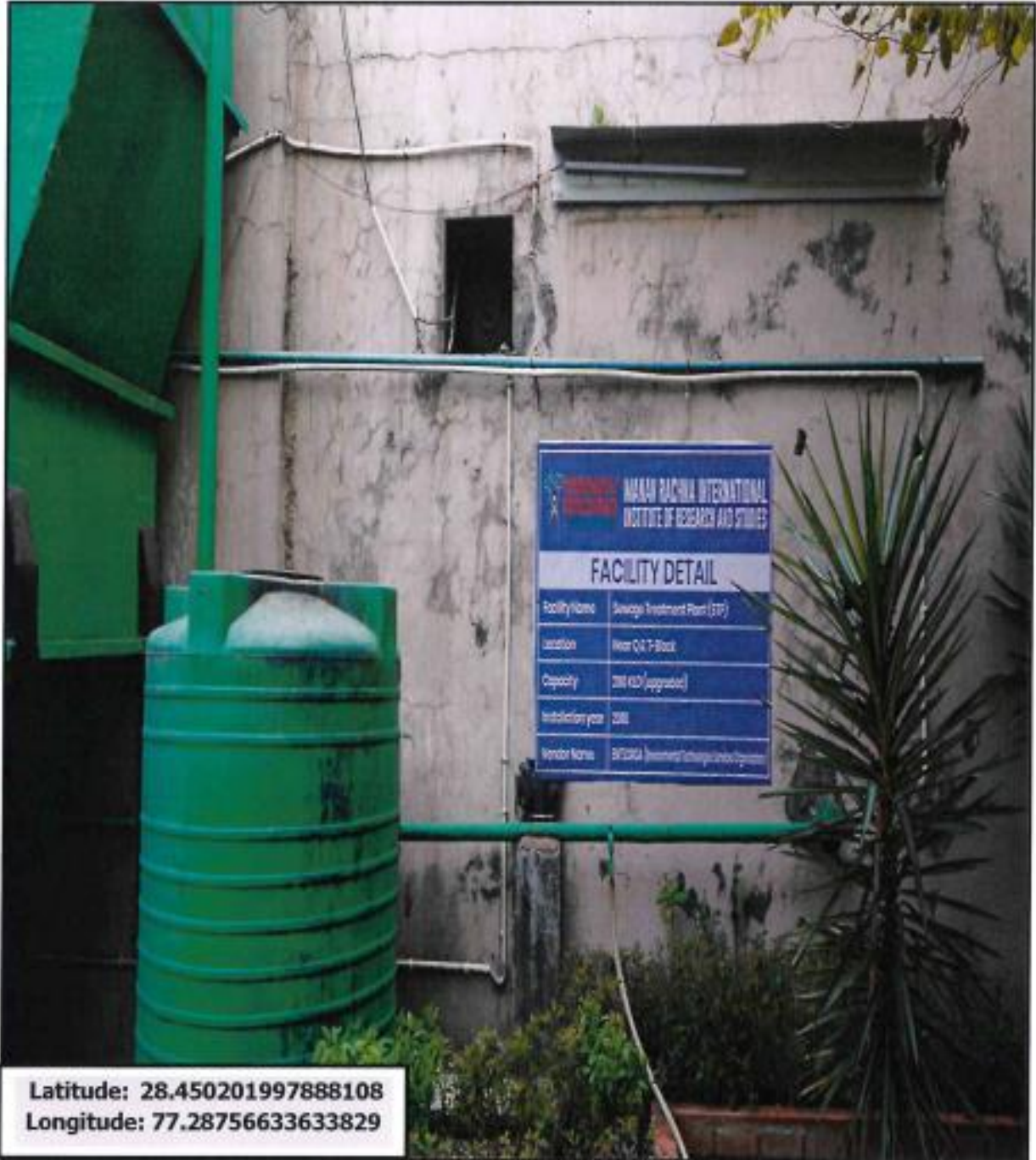
Geotag Link to Google Maps showing STP installed at MRIIRS:

<https://www.google.co.in/maps/place/STP/@28.4501691,77.2854833,18z/data=!4m12!1m6!3m5!1s0x390ce0ab6fec0aab:0x87c9e10e1ae0b0fc!2sManav+Rachna+International+Institute+Of+Research+And+Studies!8m2!3d28.4503781!4d77.2837474!3m4!1s0x390ce76550791101:0x258f2807dc40ea99!8m2!3d28.4501966!4d77.2875689>



Sewage Treatment Plant Display Board

Latitude: 28.45022148558922, Longitude: 77.28755426838266
28°27'00.8"N 77°17'15.2"E



Sewage Treatment Plant Specifications

Latitude: 28.450201997888108, Longitude: 77.28756633633829
28°27'00.7"N 77°17'15.2"E



Latitude 28.450211432035662,
Longitude: 77.28756361756224

Sludge Tanks ,Sewage Treatment Plant

Latitude: 28.450211432035662, Longitude: 77.28756361756224
28°27'00.8"N 77°17'15.2"E



Latitude: 28.450216115470344,
Longitude: 77.28756896417298

Sludge Dry Bed Sewage Treatment Plant

Latitude: 28.450216115470344, Longitude: 77.28756896417298
28°27'00.8"N 77°17'15.3"E



Sludge Dry Bed Sewage Treatment Plant Alternate View

**Latitude: 28.450256232031645, Longitude: 77.28754755312833
28°27'00.9"N 77°17'15.2"E**



Treated Water Distribution, Sewage Treatment Plant

Latitude: 28.45024675657095, Longitude: 77.28755558871049
28°27'00.9"N 77°17'15.2"E

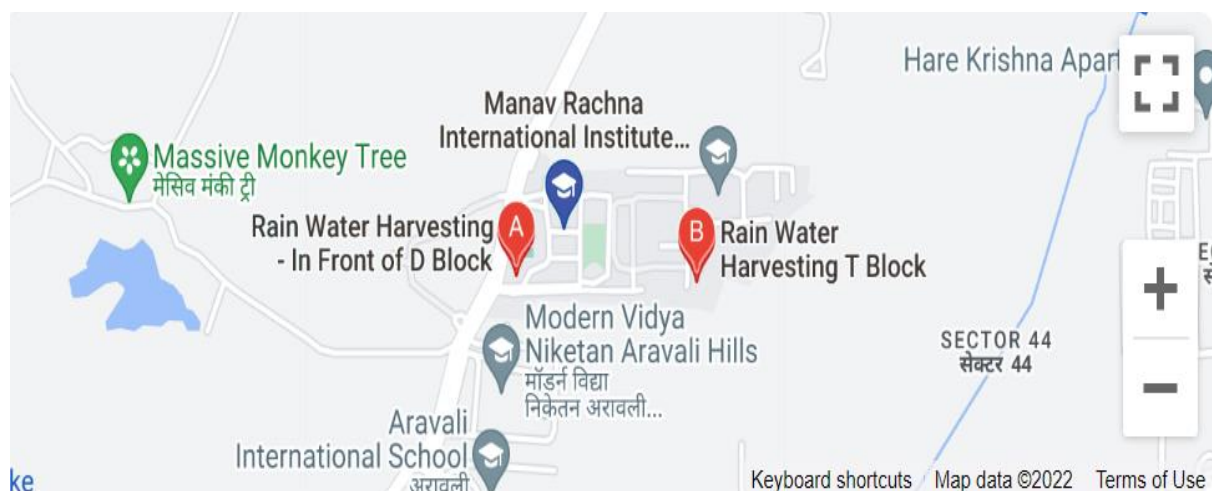
**Report
on
Rain Water Harvesting System
At MRIIRS**

Introduction:

India is suffering from a severe water crisis the likes of which the country has never seen and millions of lives and livelihoods are under threat. The need of the hour is sustainable, efficient and economic techniques which can tackle water scarcity. One such technology is rain water harvesting. Rainwater harvesting is the collection and storage of rainwater that runs off from the building tops, paved roads and other kinds of open spaces such as parks. The technology has proved itself on varied parameters and has emerged as one of the most important techniques a building can adopt in order to reduce its carbon footprint and enhance its eco friendliness. Manav Rachna being an institution which understands its responsibility of being eco-friendly has successfully installed and introduced the technology in its buildings. The report explains the rain water harvesting system of the institution in a detailed, elaborative, and lucid manner.

The rain water harvesting system was installed at MRIIRS with the following objectives:

- ❖ To increase recharge of groundwater by capturing and storing rainwater.
- ❖ To prevent water logging and thus the growth of disease producing bacteria.



Location of Rain Water Harvesting System installed at MRIIRS: C Block and T Block

Structural details of the rain water harvesting system:

Manav Rachna International Institute of Research and Studies have total area of 18.37 hectare. The potential annual runoff of the campus is estimated as 0.048 million cubic meters (MCM). Taking 50% efficiency, the potential runoff available for harvesting is 2.4 ham/yr. Thus, the harvesting of runoff water is planned in such a way that it is stored at the nearest possible site where it gets generated. The places of accumulation of runoff leading to the water logging in certain areas are indicated in the campus. So, four rainwater harvesting systems have installed in Block A Parking, Block C, near Gate No. 7 of Block T and Block Q of the campus.

A-block Parking: The harvested rain water from roof top and paved area of A-Block is entered into the storage tank from where water is entered into six wells of 3-meter diameter and 6-meter depth. The details of this structure are summarised below:

RWH Detail	
Location No.	1
Location Name	A-Block
Installation year	2002
Catchment Area	10,543 m ²
Dimension	3 m dia 6 m deep

D-Block Rainwater harvesting System: The harvested rain water from roof top and paved area is collected in a chamber of 37500 litre capacity. Then the silt free water is passed through filter and brought to the tube well for recharge of ground water. The filter is of 1.5 m³ volume, filled with boulder, gravel and coarse sand. The filtered water enters the well through slotted pipe. The recharge well is 60 meter deep and is telescopic in structure with 8 inches diameter of 18-meter length and 6 inches diameter of 27-meter length then 6 inches diameter of 12-meter length slotted pipe ended with 3-meter bail plug. The well has been constructed using rotary rig and gravel all through 6 inches diameter tube. Roof water and water from paved area is collected through storm water drain. The floor of the storm water

drain is designed to trap silt in it. The details of this structure are summarised in the next table.

RWH Detail	
Location No.	2
Location Name	C-Block
Installation year	2017
Catchment Area	58,710 m ²
Dimension	0.203 m dia, 60 m deep

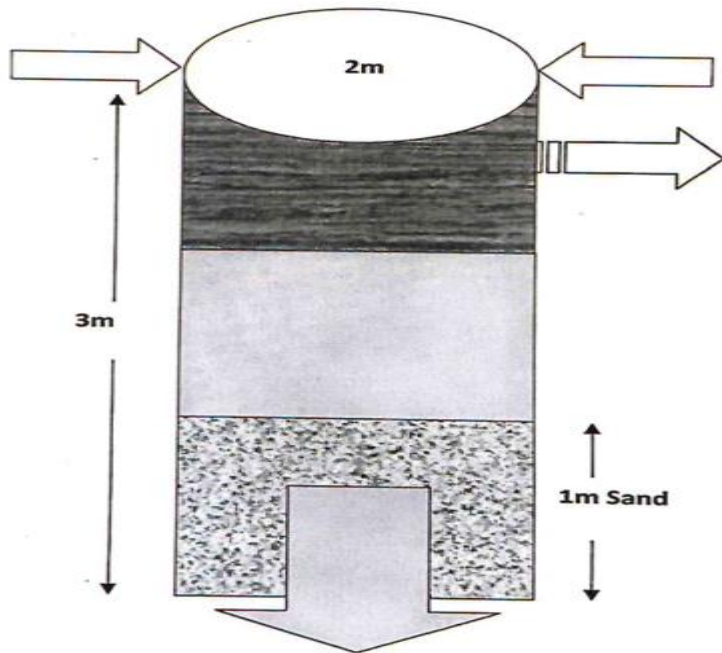
Gate No. 7 of T-Block Ground Water Recharge: The harvested rain water from roof top and paved area is made to enter into the recharge shaft of 2-meter diameter and 3-meter depth. The lower 1-meter part is filled with coarse sand to trap silt. The bottom of the shaft has been kept open against the aquifer for facilitating recharge. The over flow of the shaft has been connected with storm water drain. The details of this structure are summarised below:

RWH Detail	
Location No.	3
Location Name	T-Block
Installation year	2006
Catchment Area	57791 m ²
Dimension	2 m dia, 3 m deep

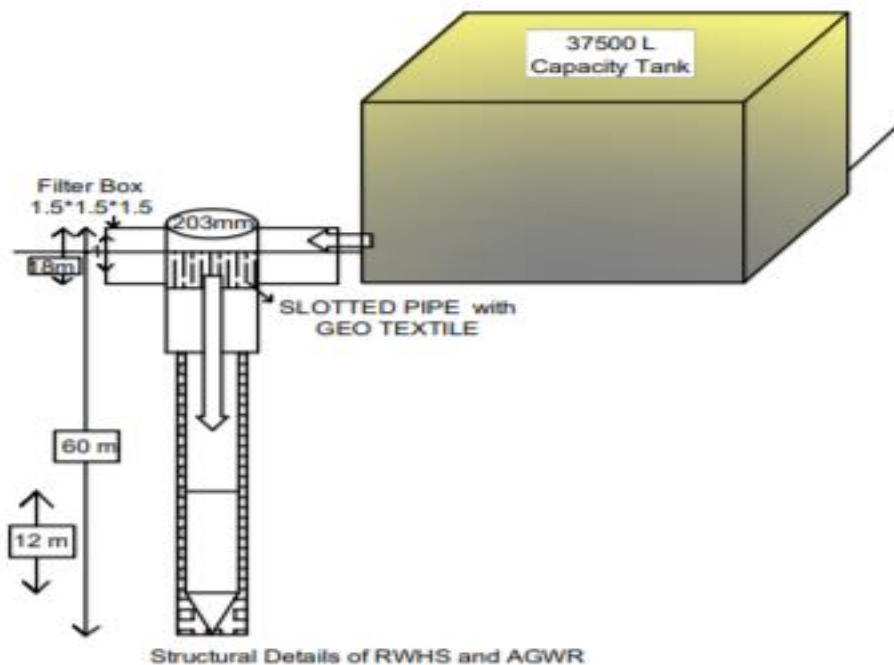
Q-Block Parking: The harvested rain water from roof top and paved area of Q-Block is entered into the storage tank from where water is made to enter into one well of 3-meter diameter and 6-meter depth. The details of this structure are summarised below:

RWH Detail	
Location No.	4
Location Name	Q-Block
Installation year	2006
Catchment Area	56656 m ²
Dimension	3 m dia 6 m deep

Schematic Diagram of Rainwater Harvesting System at MRIIRS



Gate No. 7 of T-Block Ground Water Recharge



C-Block Rainwater harvesting and artificial ground water recharge

Water harvesting Capacity of MRIIRS Campus

As per the reports of AY 2022-23, total quantity of runoff generated from the campus is **4.877 ham/ year**. It is assumed that 50% of generated runoff (i.e. **2.4 ham/ year**) will percolate down into ground water for recharging.

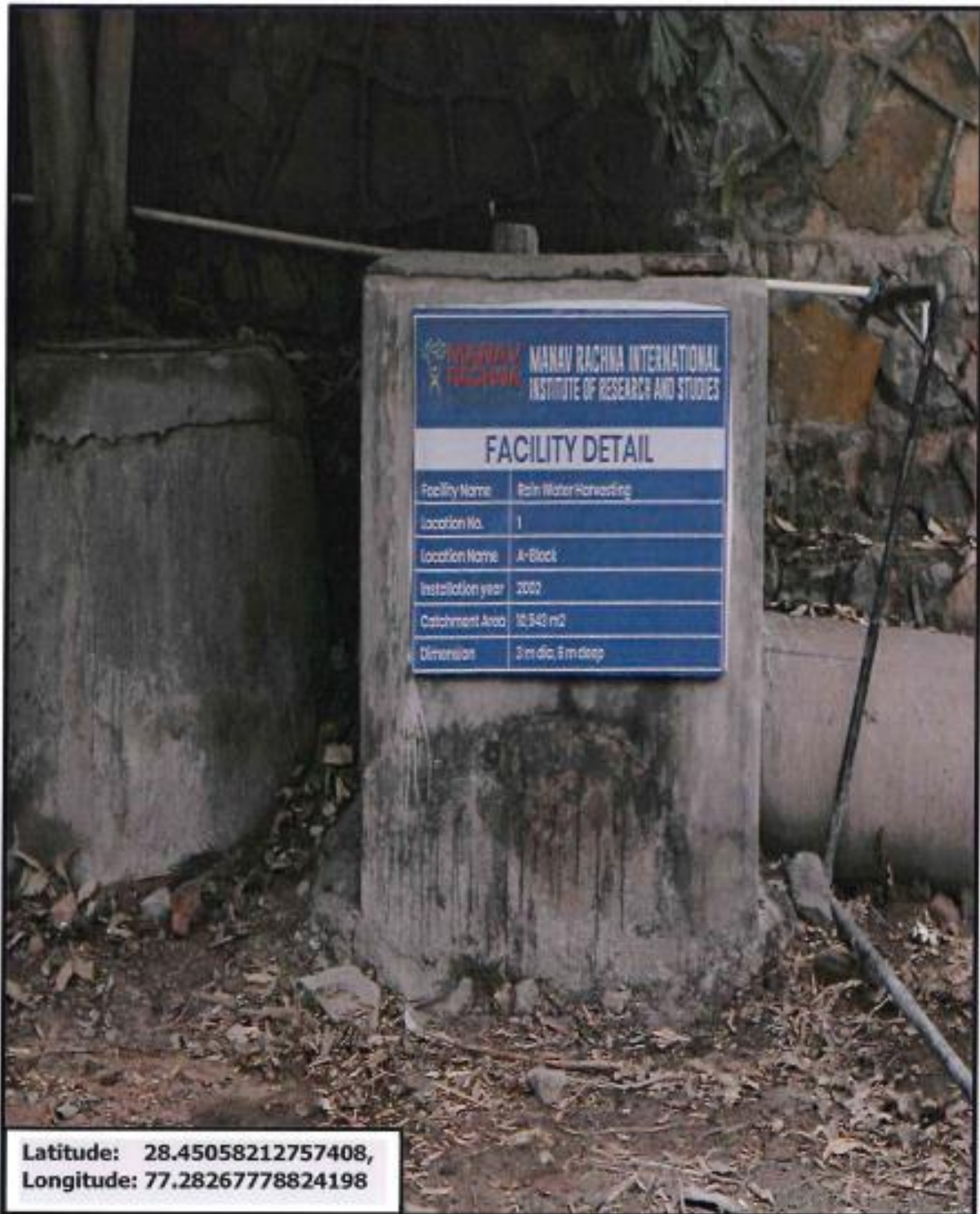
Details of land use and Runoff generation at MRIIRS Campus (AY 2022-23)

Detail of land use and generation of runoff at MREI campus											
Land Use	Zone 1	Zone 2	Zone 3	Total Area	Av Annual Rain Fall	Runn off Coefficient	Zone1	Zone2	Zone 3	Total Runoff (Z1+Z2+Z3)	
	Area						Area wise annual runoff				
Unit	m ²	m ²	m ²	m ²	m		m3	m3	m3	m3/yr	ham/yr
Roof Top	13413	11822	8355	33590	0.697	0.85	7947	7004	4950	19900	1.99004
Paved	20430	18200	7810	46440	0.697	0.7	9968	8880	3810	22658	2.26581
Green Belt	10446	18769	17525	46740	0.697	0.15	1092	1962	1832	4887	0.48867
Open	2000	3500	7175	12675	0.697	0.15	209	366	750	1325	0.13252
Campus	69253	57791	56656	139445	0.697	-	19216	18212	11343	48770	4.8770

The geotagged pictures of rain water harvesting structures at various locations have also been appended.

Geotagged Pictures of Rain Water Harvesting System At MRIIRS

S. No	Relevant documents
1	Rain Water Harvesting Specifications - A Block
2	Rain Water Harvesting A Block
3	Rain Water Harvesting Specifications - C Block
4	Rain Water Harvesting Ground Water Recharge Well - C Block
5	Rain Water Harvesting Specifications - T Block near Gate No 7
6	Rain Water Harvesting Ground Water Recharge Shaft - T Block near Gate No 7
7	Rain Water Harvesting Q Block with specifications



Rain Water Harvesting Specifications A Block

Latitude: 28.45058212757408, Longitude: 77.28267778824198
28°27'02.1"N 77°16'57.6"E



Rain Water Harvesting A, Block

Latitude: 28.45043372846215, Longitude: 77.28271728071604
28°27'01.6"N 77°16'57.8"E



Rain Water Harvesting Specifications C Block

Latitude: 28.449646652682453, Longitude: 77.28266095157997
28°26'58.7"N 77°16'57.6"E



Rain Water Harvesting Ground Water Recharge Well C Block

Latitude: 28.449680103517967, Longitude: 77.2826622628365
28°26'58.9"N 77°16'57.6"E



Rain Water Harvesting Specifications-T Block near Gate No 7

Latitude: 28.449571332093207, Longitude: 77.28677887093396
28°26'58.5"N 77°17'12.4"E



Rain Water Harvesting Ground Water Recharge Shaft T Block

Latitude: 28.449561886511788, Longitude: 77.28678960011572
28°26'58.4"N 77°17'12.4"E



Latitude: 28.450383620880505,
Longitude: 77.28761107057075

Rain Water Harvesting Q Block

Latitude: 28.450383620880505, Longitude: 77.28761107057075
28°27'01.4"N 77°17'15.4"E