



Verification Report for

Project : RWH for Well #N3406 Recharge at Goa, India.
UCR Project ID : 142

Name of Verifier	SQAC Certification Pvt. Ltd.
Date of Issue	May 09, 2022
Client	Ms. Sharin Wader
Project Proponent	Ms. Sharin Wader
Work carried by	Mr. Santosh Nair
Work reviewed by	Mr. Suuhas Tendulkar

Summary:

SQAC Certification Pvt. Ltd. has performed verification of the “RWH for Well #N3406 Recharge at Goa, India” for groundwater recharge via dilution to an open well, on the basis of UCR criteria. In doing so, the project activity improves the quality of existing ground water through dilution with rainwater runoff that would have been unutilized in the absence of the project activity and would not lead to conservation of the rainwater resources or groundwater recharge.

Verification for the period : **01/01/2017 to 31/12/2021**

In our opinion, the total RoU’s over the crediting / verification period stated in the Project Concept Note (PCN) submitted to SQAC are found to be correct and in line with the UCR guidelines.

The RoU’s were calculated on the basis of UCR Protocols which draws reference from, UCR Protocol Standard Baseline, UCR Rainwater verification standard Final ver2. Owing to the Covid pandemic, the verification was done remotely by way of video calls / verification, phone calls and submission of documents for verification through emails.

SQAC is able to certify that the RoU’s from the RWH for Well #N3406 Recharge at Goa (UCR ID – 142) for the period **01/01/2017 to 31/12/2021** amounts to **174 RoUs**



Detailed Verification Report:

Purpose:

The project activity RWH for Well #N3406 Recharge at Mapusa, Goa, India, is a rooftop rainwater harvesting system (RWHs) for groundwater recharge via dilution to an open well located at Survey #48/1-A-4, Alani Xeth (House #235), Panchayat: Paliem Punola / Lourdes Waddo, Village: Ucassaim, Taluka: Mapusa, District: Bardez, State: Goa, Country: India.

Project owner (PP) maintains the RWH system (RWHs) during the rains and ensures that the flow values are operated accordingly. PP is responsible for well cleaning, ensuring potable supply to surrounding users and ensuring smooth flow of rainwater during the monsoon period. PP maintains all the necessary permits and ownership documents for the recharge activity. The process of RWHs in this project activity is the most basic of systems that involves the installation of a harvesting system, which connects the main outlet of the building's terrace with a common pipe, which leads to an open well, to store water and recharge the groundwater aquifer

The RWHs is located on the north side of the single dwelling residential unit which collects rainwater runoff from the sloping roof and diverts it directly to the open well within the project boundary. In doing so, the project activity improves the quality of existing ground water through dilution with rainwater runoff that would have been unutilized in the absence of the project activity and would not lead to conservation of the rainwater resources or groundwater recharge.

The objectives of this verification are, by way of suitable evidences, to establish that:

1. The project has been commissioned as per the documented & video evidence
2. The details provided in the PCN are correct
3. The RoUs claimed from the project are correct and in accordance with the requirements of the UCR Standard.

Scope:

The scope covers verification of RoUs from the project - RWH for Well #N3406 Recharge at Goa (UCR ID – 142)

Criteria:

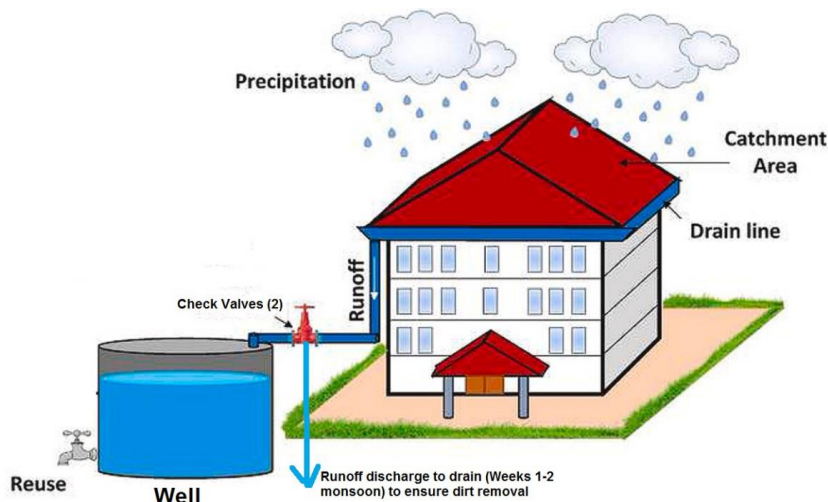
Verification criteria is as per the requirements of UCR Rainwater (RoU) Standard Version 2.0

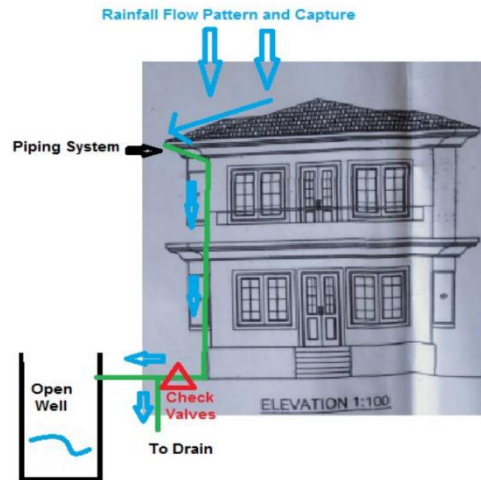
Description of project:

The project activity RWH for Well #N3406 Recharge at Mapusa, Goa, India, is a rooftop rainwater harvesting system (RWHs) for groundwater recharge via dilution to an open well located at Survey #48/1-A-4, Alani Xeth (House #235), Panchayat: Paliem Punola / Lourdes Waddo, Village: Ucassaim, Taluka: Mapusa, District: Bardez, State: Goa, Country: India. In urban residential areas, the roof top rainwater can be conserved and used for recharge of groundwater. This approach requires connecting the outlet pipe

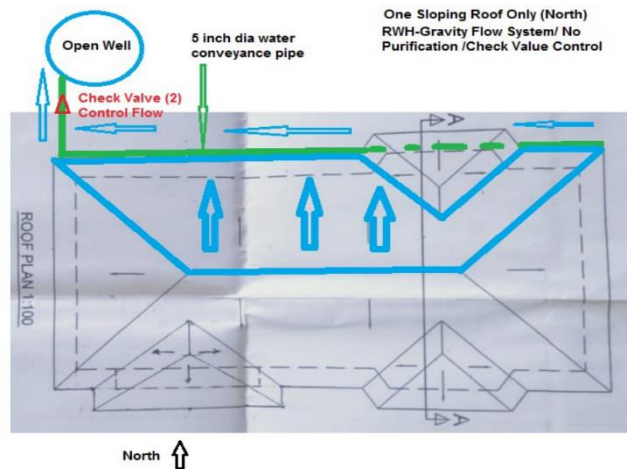
from rooftop to divert the water to existing wells, as is the case in this project activity. The RWHs is located on the north side of the single dwelling residential unit which collects rainwater runoff from the sloping roof and diverts it directly to the open well within the project boundary. In doing so, the project activity improves the quality of existing ground water through dilution with rainwater runoff that would have been unutilized in the absence of the project activity and would not lead to conservation of the rainwater resources or groundwater recharge.

PROJECT NAME : RWH for Well #N3406 Recharge at Mapusa, Goa, India
 UCR Scope : RoU Scope 3 Measures that improve the quality of existing ground water through dilution with rainwater runoff.
 PCNMR Prepared on : 14/04/2022
 Catchment Area (1 side sloping roof) : 15.58 m2 (Length = 5.73m x Height =2.72m)
 Type of Well & Number : Open Well (N 3406)
 Diameter/Size of Well (mts) : 1.5
 Depth of Well (mts) : 7 mts (bgl)
 Month and Year of Construction : January/2017
 Month and Year of Commissioning RWHs : January/2017
 Device Used for Lifting Groundwater : Centrifugal Pump
 Horse Power (Pump) HP : 1.5





First 3-4 days rain to drain to ensure cleaning of roof.
This is ensured via two check valves at the exit points



Rainfall

The rainy season begins typically in the months of June, July, August, September and October. The Village of Ucassaim comes under the Mapusa taluka (North District) which has dry periods in January, February, March, April and December. On an average, July is the wettest month with 900.0 mm (35.43 inch) of precipitation on average. On average, January is the driest month with no precipitation. The average amount of annual precipitation is: 2900.0 mm (114.17 inch)

Mean rainfall and the standard deviation of the 33 years and the average rainfall in the past decades and seasons for all the monitoring stations

Station	Mean Rainfall (mm)	Standard Deviation (σ)	Average rainfall in the past decades (mm)				Seasonal average rainfall (mm)		
			1980-1989	1990-1999	2000-2009	2010-2012	Pre-Monsoon	Monsoon	Post-Monsoon
IMD									
Mapusa	3088	579	3139	3143	2971	3465	77	2859	151

From the long term trend analysis carried out it is evident that since 1980 till 2012, there was a minor increase (~7- 8mm/year) in the rainfall, however, for more recent years (2009-2017) there is a decrease in the annual rainfall that is received by the state.

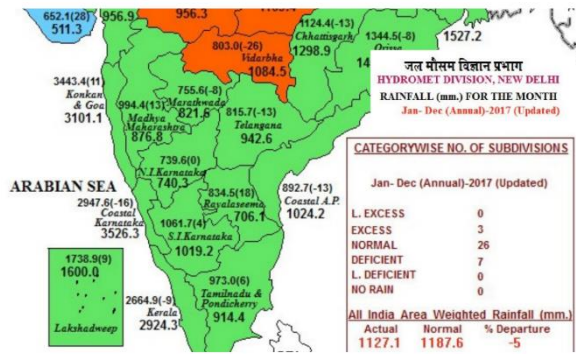
Contribution of July month to SW monsoon is highest (35.75%), followed by June (31.28 %), August (22.37 %) and September (10.58 %). Contribution of the SW monsoon to annual rainfall is 90 %. The variability of monsoon and annual rainfall is 15.9 % and 14.7 % respectively.

Average frequency of rainy days for SW monsoon season and annual is in the range of 80-85 and 94-100 days respectively for the coastal, southern and Eastern region of the North Goa district and northern and central region of the South Goa district respectively.

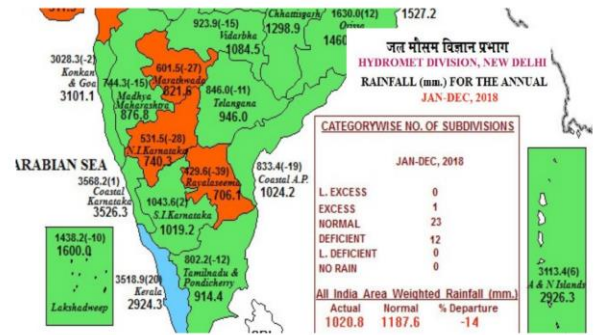
Average frequency of rainy days

The spatial pattern in average frequency of rainy days for the state of Goa indicate the analogous pattern for all time scales (See Figures below). For the coastal, southern and Eastern region of the North Goa district, the average frequency of rainy days is in the range of 20 to 21 days for June, 25 to 27 days for July, 23-25 days for August and 13 to 15 days for September, while similar range is observed for South Goa district mainly in the northern and central region.

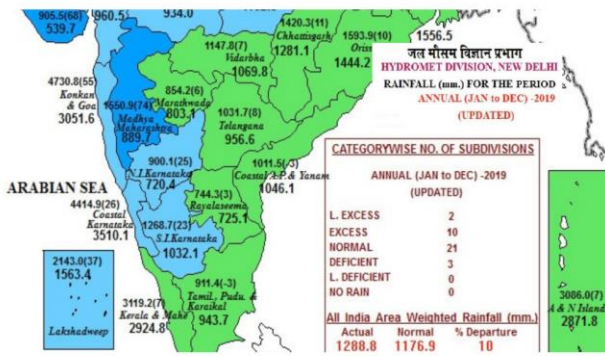
Rest of the region in both the districts show comparatively lesser number of rainy days for monsoon months. It is in the range of 14-16 for June, 19-21 for July, 17-19 for August and 11-12 for September respectively. When we consider SW monsoon season and annual for average frequency of rainy days, it is in the range of 80-85 and 94-100 days respectively for the coastal, southern and Eastern region of the North Goa district and northern and central region of the South Goa district respectively. Remaining parts of both the districts indicate the average frequency of rainy days for SW monsoon season and annual in the range of 61-66 and 75-80 days respectively.



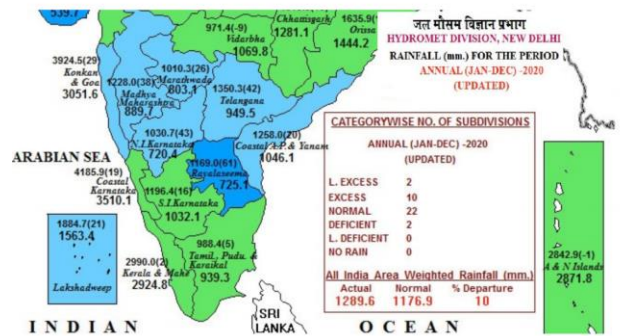
Year 2017 Actual Rainfall: 3443.1mm



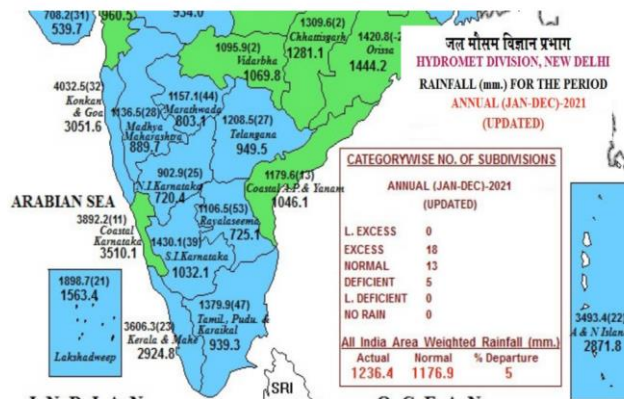
Year 2018 Actual Rainfall: 3028.3mm



Year 2019 Actual Rainfall: 4730.8mm



Year 2020 Actual Rainfall: 3924.5mm



Year 2021 Actual Rainfall: 4032.5mm



Choose the States/UTs: Select District:

District : NORTH GOA

Note : (1) The District Rainfall in millimeters (R/F) shown below are the arithmetic averages of Rainfall of Stations under the District.

(2) % Dep. are the Departures of rainfall from the long period averages of rainfall for the District.

(3) Blank Spaces show non-availability of Data

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2016	0.0	-100	0.0	-100	0.0	-100	0.0	-100	8.6	-91	1107.3	17	1012.8	-14	566.8	-22	333.9	14	119.7	-28	6.6	-81	0.7	-94
2017	0.0	-100	0.0	-100	0.0	-100	0.0	-100	57.0	-40	887.1	-7	874.6	-26	530.3	-27	451.7	55	170.2	3	0.0	-100	4.8	-57
2018	0.0	-100	0.0	100	6.4	820	5.3	-41	89.9	-5	1082.1	14	963.9	-18	536.6	-27	70.7	-76	117.8	-29	14.5	-59	0.0	-100
2019	0.0	-100	0.0	-100	0.0	-100	1.6	-73	1.3	-98	738.9	-20	1385.0	25	1239.7	71	764.3	142	533.0	235	22.5	-41	0.0	-100
2020	0.0	-100	0.0	-100	0.0	-100	9.3	56	7.7	-91	1064.5	16	1238.8	12	1261.5	74	707.1	124	257.0	61	0.8	-98	21.8	85

Source for district rainfall figures:

[https://hydro.imd.gov.in/hydrometweb/\(S\(4h0svtznbcwhue0qx353055\)\)/DistrictRaifall.aspx](https://hydro.imd.gov.in/hydrometweb/(S(4h0svtznbcwhue0qx353055))/DistrictRaifall.aspx)

Note: The most conservative data has been selected as per operation data map above vs district rainfall figures.

Baseline scenario

The baseline scenario is the situation where, in the absence of the project activity, unutilized water flows uncollected into drains and is not conserved and harvested into a well within the project boundary and hence remains unutilized. Baseline scenario, if not directly measurable, is calculated by using option 1 - Harvested water or Volume of water utilized (m3) = Area of Catchment/Roof/Collection Zone (m2) X Amount of rainfall (mm) X Runoff coefficient

Uncertainty Factor applied after taking into consideration Water Budget Components such as Surface Inflow, Precipitation, Surface Outflow, Evapotranspiration, Change in Storage, Deep Percolation is 0.64 (1-0.36)

Area of Roof: 15.58 m2

As per UCR RoU Standard: Runoff Coefficient (K) for Roof inclined (Sloping) = 0.95

The calculations of RoUs for rooftop rainwater harvesting systems year wise are rounded down as below:

Year	Amount of rainfall (mm)	Area	Coefficient	Uncertainty factor	RoU
2017	2975.7	15.58	0.95	0.64	28
2018	2,887.2	15.58	0.95	0.64	27
2019	4686.3	15.58	0.95	0.64	44
2020	3924.5	15.58	0.95	0.64	37
2021	4032.5	15.58	0.95	0.64	38
Total RoU					174

The total RoUs achieved in this monitoring period is as follows:

Summary of the Project Activity and RoUs Generated for the Monitoring Period	
Start date of this Monitoring Period	01/01/2017
Water credits claimed up to	31/12/2021
Total RoUs generated	174

Level of Assurance:

The verification report is based on the information collected through interviews conducted over video calls / phone calls, supporting documents provided during the verification, Project Concept Note (PCN) / Monitoring Report (MR), submitted to SQAC. The verification opinion is assured provided the credibility of all the above.

Verification Methodology:

Review of the following documentation was done by SQAC Verifier, Mr. Santosh Nair, who is experienced in such projects.

- Project Concept Note (PCN MR)
- Commissioning Report of the well
- Photographs and videos as evidence of the existence of the project
- Data provided upon request of all the documents of the related projects

Sampling:

Since there is only 1 well in question, the sampling can be considered as 100%.

Persons interviewed:

1. Ms. Sharin Wader : Project Proponent
2. Mr. Peter Menezes : Neighbour and also sharing the benefits of the same well (project)

During the interview with Mr. Peter Menezes resident of House No. 237, Lourdes Waddo, Village: Ucassaim, it was understood that their entire water requirements were getting fulfilled through the well comfortably and also the quality of the water was very good. They are using it for all their domestic uses which includes drinking, bathing, washing, cleaning, gardening, etc.

According to the UCR RoU Standard principles, the project activity accomplishes the following as detailed in the PCN submitted which is reproduced below:

- (a) Increases the sustainable water yield in areas where over development has depleted the aquifer

According to the data released by the Central Groundwater Board in 2021, the total amount of groundwater that can be utilised in a year is 398 billion cubic meters (BCM), of which, approximately 245 BCM is currently being utilised, which is about 62 per cent of the total. But the level of exploitation of groundwater is very high in States like Punjab, Rajasthan, Haryana, Delhi and Tamil Nadu. It should be noted that despite two households using the same recharge well in the project activity, there has never been an instance of using PWD water from the pipeline, or the well running dry during the summer season, thus showcasing that if other households adopted a similar practice, the groundwater and well levels in the surrounding areas will increase. The incentive from the sale of water credits under UCR is expected to lead to adoption at scale for such RWHs.

- (b) Collect unutilized water or rainwater from going into storm drains or sewers

The Goa Water Resources Department (WRD) has a subsidy scheme for the construction of rooftop rainwater harvesting systems but few people apply for it. (source:<https://www.downtoearth.org.in/news/water/water-stressed-in-india-ground-water-mostly-neglected-in-rain-surplus-south-go-69852>). In India, at the district level, in 24 states/UTs, as many as 267 districts had stages of groundwater extraction more than 63 per cent, ranging from 64 per cent to 385 per cent (source: https://www.business-standard.com/article/current-affairs/from-58-to-63-india-pumped-more-groundwater-between-2004-and-2017-121122101377_1.html). Hence this project activity will serve as an example to recharge unutilized water and prevent water flowing into the drains uncollected.

- (c) Conserve and store excess water for future use

The village of Pissurlem in the mining-belt of north-east Goa used to be brimming with water; it is now entirely dependent on government tankers. Opencast iron ore mining reduces the groundwater table and causes surface water pollution. People in mining affected villages are

dependent on an erratic supply of water from piped connections and tankers (source: <https://india.mongabay.com/2021/03/how-did-a-once-water-rich-village-in-go-a-become-entirely-dependent-on-tankers/>). Further, the discharge of rainwater in Goa is about 20% as against the recommended 5%, as a result of this rainwater discharge, the aquifers get fully discharged quickly post the monsoons in Goa. In 2019, ground water level for Goa was 4.14 mbgl. Though Goa ground water level fluctuated substantially in recent years, it tended to decrease through 2015 - 2019 period ending at 4.14 mbgl in 2019. Hence such RWH project activities can help in saving water for future generations.

(source:http://timesofindia.indiatimes.com/articleshow/87319400.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst).

RWH is responsible for lessening the load on primary water sources, adding fresh and potable water availability for the masses. In the urban areas, it is shown to be beneficial by increasing the efficiency of wastewater treatment plants since the need for clean water is compensated by the harvested rainwater, to a great extent. The system's installation is easy to handle and maintain by laymen, and the entire process decreases the dependence on groundwater, thereby preventing excessive depletion.

Documentation Verified:

- Project Concept Note (PCN MR)
- Commissioning Certificates
- District rainfall figures
- Operation data map

Corrective Action Requests (CARs)

Not applicable as no non-conformities has been evidenced.

Applied methodologies:

UCR Rainwater (RoU) Standard Version 2.0

Applicability of double counting emission reductions

Currently not applicable for water credits.

Issuance Period: 05 years – 01/01/2017 to 31/12/2021

RoU = Area of Catchment/Roof/Collection Zone (m²) x Amount of rainfall (mm) x Runoff coefficient x Uncertainty Factor / 1000

= (15.58 x 18506 x 0.95 x 0.64) / 1000

= **174** (round down figure)

Annual RoU calculation:

Year	RoU
2017	28
2018	27
2019	44
2020	37
2021	38
Total RoU	174

Conclusions:

Based on the audit conducted on the basis of UCR Protocol, which draws reference from UCR Rainwater (RoU) Standard Version 2.0, the documents submitted during the verification including the data, Project Concept Note (PCNMR), SQAC is able to certify that the Water Credits from the project - RWH for Well #N3406 Recharge at Goa (UCR ID – 142) for the period 01/01/2017 to 31/12/2021 amounts to **174 RoUs**