

Report on Groundwater Recharge Activity Plan based on Hydrogeological Investigation for Mohammad wadi Aquifer of the Pune city.



Advance Center for Water Resources Development and Management

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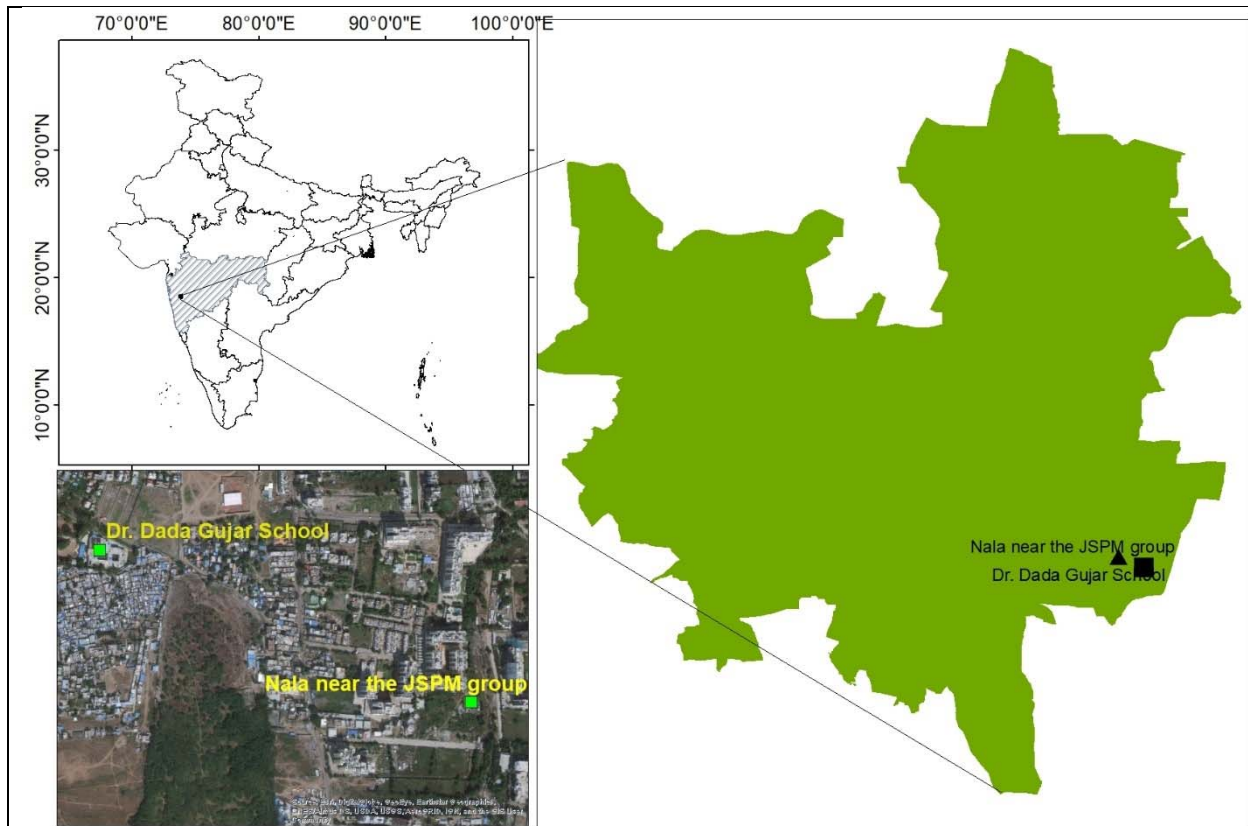
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DRAWING AND DESIGNS

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INTRODUCTION



Map 1:- Map showing 1) Location of project area in reference with its geographical location in India, Maharashtra. 2) Location of project area on Google earth image. 3) The broad Geological setting (Basalt – Green color in the map) of Pune city within its electoral boundary and location of project area within electoral boundary limit.

Nearly 1.5 billion urban dwellers rely on groundwater, globally. Population pressures, rapid urbanization, increased per-capita use of water, higher ambient temperatures, increasing pressures on river intakes and the relatively modest cost of wells is resulting in an increased urban dependency on groundwater in the developing cities of the world. Despite the increasing role that groundwater plays in urban water management, a clear picture about groundwater usage in nearly 8000 urban foci in India is still missing from the national groundwater discourse. Pune is no different! More so, because the groundwater usage in Pune is often masked by its relatively visible surface water supply systems. More and more people in Pune are using

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groundwater both formally and informally. Most discussion on water security for Pune city ignores the subject of urban groundwater management.

The role of groundwater in burgeoning urban centers cannot be ignored if one were to begin addressing both, the groundwater crisis in India as well as the shift in the nature and quantum of water demands in and around these centers. Unless basic understanding on the state of urban aquifers in India is developed, haphazard groundwater use will lead only to a deepened crisis surrounding groundwater. The strategic importance of Pune's aquifers needs greater attention both in practice and policy.

BACKGROUND

With the rapid urbanization the water resources in Pune city will need to be largely augmented in coming years so as to meet the growing demand stemming from burgeoning populations. Considering the limitations of the surface water availability, the dependency on groundwater is increasing in many folds in the city. Though the city is occupied by hard rocks called Deccan Trap or Basalt, the groundwater availability is significant. However, due to various reasons the groundwater resources in the city are not getting replenished and hence there is depletion in the groundwater levels. So, there is a dire need for the massive scale implementation of various measures for artificial groundwater recharge; like roof top rain water recharge through dug well/bore well, recharge trench, recharge shaft, percolation trench, pervious pavements, desilting of old structures etc.

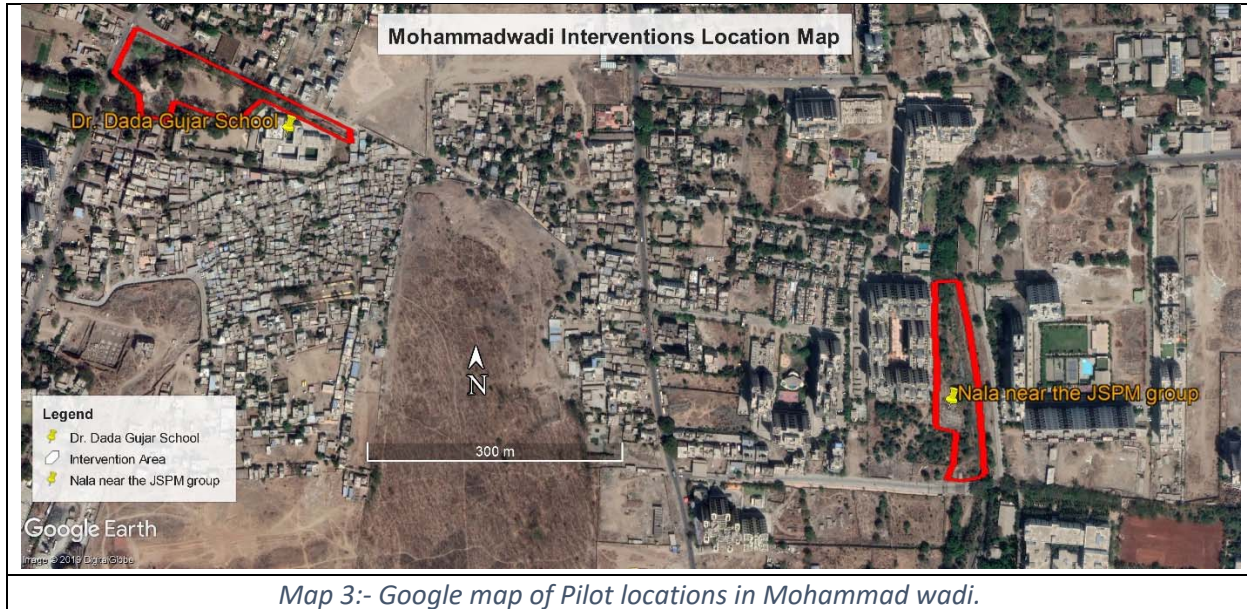
On the background of increasing pune's urban and peri urban population, monsoon irregularity, changes in water demand, climate change, rapid development. Pune-kars are and will be more dependent on groundwater for daily water needs. Therefore, it is important to have detailed knowledge about an entity which host the water in it and is "Aquifer"; The occurrence of groundwater is governed by local hydrogeological conditions. Rocks form the framework in which groundwater accumulates and moves. Hence, implementation for water conservation related works should be based on detailed hydrogeological assessment in order to understand the groundwater system(s) of an area based on which the precise cause-effect situations behind groundwater problems shall address.



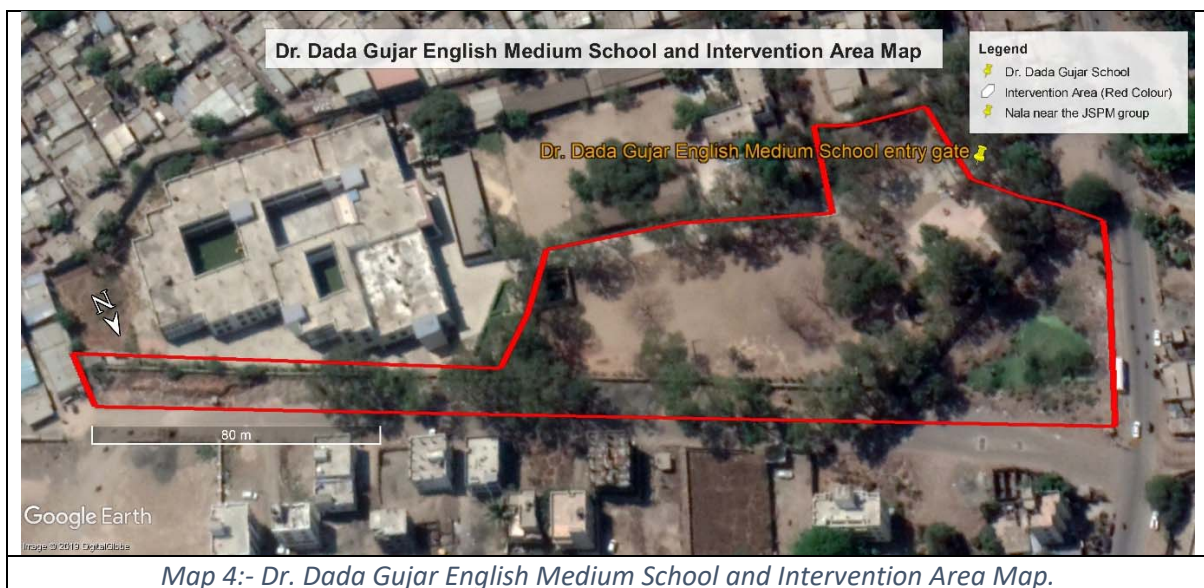
Page:3

LOCATION

Two locations were identified by PMC for piloting this Aquifer based artificial groundwater recharge intervention project in Mohammad wadi area. One location identified near Dr. Dada Gujar English Medium School and other location near the JSPM group of Institutes. These pilot project area sites have been visited on 27th May 2019 to explore the possibilities of various location specific measures for the artificial groundwater recharge of the aquifer.



LOCATION 1: - DR. Dada Gujar English Medium School.

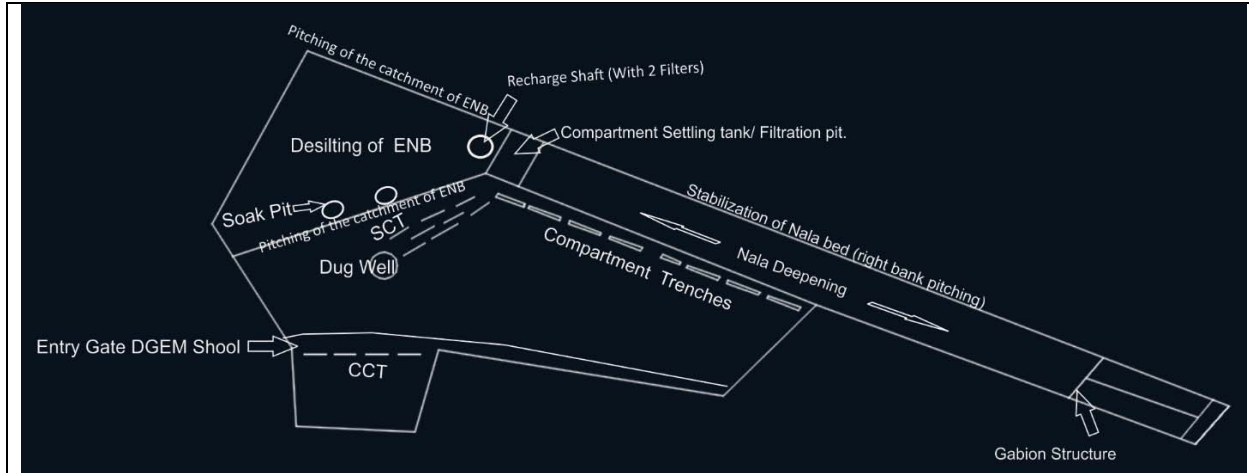


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Based on the field survey, Geological and Hydrogeological investigations, following measures have been suggested to augment the groundwater in shallow unconfined aquifer of the area.

- I. Desilting of ENB near Dr. Dada Gujar English Medium School. (Note: Depth will be subject field verification).
- II. Pitching of the catchment of ENB.
- III. Gabion Structure (Between compound wall DGEM school and Road). Note: based on the Nala dimensions the size and the number of the structures will vary.
- IV. Nala Deepening.
- V. Stabilization of Nala bed (right bank pitching)
- VI. Staggered Continuous Contour Trenches within school Premise.
- VII. Compartment trenches along school compound wall (within school). Note: the dimensions will vary as per the actual survey.
- VIII. Continuous contour trenches within school Premise right hand side to Entry gate.
- IX. Recharge Shaft (with 2 pit filters). Note: the design is from CGWB and will vary as per the site condition
- X. Compartment Settling tank/ Filtration pit.
- XI. Soak pit (Outside the compound wall of DGEM school behind Urinary of School).
- XII. Bamboo plantation along the soak pits and compound wall



Map 5:- Dr. Dada Gujar English Medium School intervention Locations on the Map.

Rejuvenation of the small pond, which was acting as a percolation structure for the area (as reported by the Dr. Dada Gujar School Authorities) to its downstream near Dr. Dada Gujar English medium school & setting up a unique Groundwater Museum. The locations for specific measures are as shown in map above (Map:4) for artificial groundwater recharge.

LOCATION 2: - Nala near JSPM group of Institutes.



Map 6:- Map of Nala location near JSPM Group OF Institutes.

For the Nala near JSPM group of institutes (flows from South to North), following measures have been suggested based on the local Aquifer to augment the groundwater in the vicinity of that area.

- I. Desilting of Stream (Approximately 250 m). (Note: - The Depth, Width for Desiltation may vary depending on field validation, recommendation).
- II. Installation of Metal gates on K.T Weir to store surface water.
- III. Recharge shaft (With RCC Hume pipe, Filtration media and Pit).
- IV. Pitching on 250 m Embankments.



Rejuvenation of the old K. T. Weir (may be constructed during British Regime??), existing in front of the Kumar Pebbles Society, which is in good condition, but almost fully silted. Even today the dug well located in the down-stream of the K. T. Weir is having ample water and the Kumar Pebbles Society is using that water for their day-today use.

EXPECTED OUTCOMES

- The aquifer in the area down stream of Dr. Dada Gujar School will get benefitted by the proposed interventions in and around Dr Dada Gujar School. Considering the normal rainfall of 740 mm around 50000 to 60000 m³ of groundwater will get annually recharged in the downstream unconfined aquifers. Besides, the soil moisture too will get replenished, which will ultimately benefit the green cover in the area.
- Similarly, due to desilting and impounding of water into the Nala near the JSPM group of Institutes, the aquifer in and around 1 to 2 sq.km. area will get benefitted. The estimated rise in water level will be by 3 mts. Considering the normal rainfall and catchment, around 1,00,000 m³ of groundwater will get annually replenished. Besides, the soil moisture will get replenished on large scale, which will ultimately benefit the green belt in the area.
- Near the Kumar Pebbles society there exists a dug well in the downstream of the K.T. Weir. This well is being used by the society. On the field visit day, the well had 1 mt of water column, indicating good groundwater availability. After desilting and impounding of water into the Nala this well will get direct benefit.



MISSION GROUNDWATER

भूजल अभियान

FIELD PHOTOGRAPHS



Photograph 1:- ENB location, Pitching of catchment of ENB & Soak pit location next to Dr. DGEM School compound.



Photograph 2:- Nala Deepening & Gabion structure site



Photograph 3:- Entrance of Nala near JSPM group of Institutes.



Photograph 4:- Location of Desilting of stream, Recharge shaft & Embankments pitching at JSPM.



Photograph 5:- K.T Weir site with no gates.



Photograph 6:- Dug well located in the down - stream of the K.T Weir.

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IMPLEMENTATION ESTIMATE

Rejuvenation of earthen pond in Survey No. 94 – Area Near Dr. Dada Gujar English Medium School										
Sr No	Activity Description	Unit	No	Length	Width	Height	Quantity	New Rate	New Amount	Remark
1 a)	Desilting of ENB near Dr. Dada Gujar English Medium School. Note: Depth will be subject field verification (PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55.)	Cum	1	2000	1	4	8000	414	3312000	
1 b)	Pitching of the catchment of ENB PMC ROAD DSR 2019-20 Page No. 36 Item No. Part B-90.	Sqm	1				100	422	42200	
2 a)	Gabion Structure (Between compound wall DGEM school and Road). Note: based on the nala dimensions the size and the number of the structures will vary. (PMC ROAD DSR 2019-20 Page No. 36 Item No. Part B-211.)	Cum	12	10	1.5	1	180	2864	515520	
2 b)	Nala Deepening (PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55.)	Cum	1	500	1	1.5	750	382	286500	
2 c)	Stabilization of nala bed (right bank pitching) (PMC ROAD DSR 2019-20 Page No. 36 Item No. Part B-90.)	Sqm	1	500	1		500	422	211000	



3	Staggered Continuous Contour Trenches within school Premise. (PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55.)	Nos	10	30	0.5	0.5	75	382	28650	
4 a)	Compartment trenches along school compound wall (within school) Note: the dimensions will vary as per the actual survey. (PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55.)	Nos	6	10	1	1	60	382	22920	
		Nos	1	6	1	1	6	382	2292	
		Nos	1	9	1	1	9	382	3438	
4 b)	Continuous contour trenches within school Premise right hand side to Entry gate. (PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55.)	Nos	5	6	1	1	30	382	11460	
5	Recharge Shaft (with 2 pit filters). Note: the design is from CGWB and will vary as per the site condition. (PMC BHAVAN DSR 2019-20 Page No.18 Item No. A 22.50).	Rmt	2	70			140	455	63700	
6	3 Compartment Settling tank/ Filtration pit.									
	Brickwork (BHAVAN DSR 2019-20 Page No.161 Item No. Z 53.36)	Cum	4	6	0.23	2	11.04	4966	54824.64	
	Plaster (BHAVAN DSR 2019-20 Page No.56 Item No. L 32.11)	Sqm	1	6	0.23		1.38	665	917.7	
	Plaster (BHAVAN DSR 2019-20 Page No.56 Item No. L 32.11)	Sqm	2	6		2	24	665	15960	
7	Soak pit (Outside the compound wall of DGEM school behind Urinary of School). PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55., PMC ROAD	Cum	2	1	1	1	2	2303	4606	

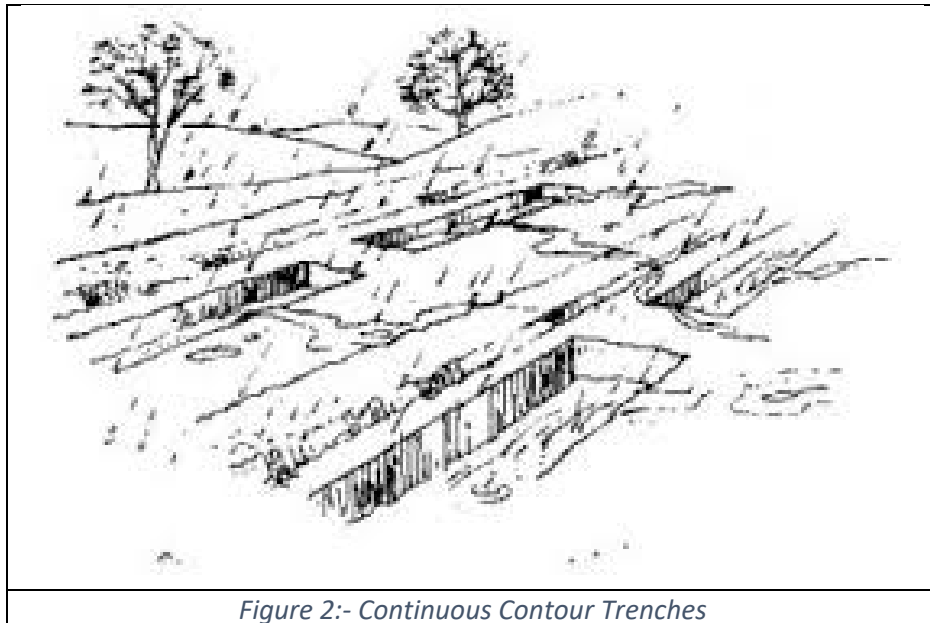
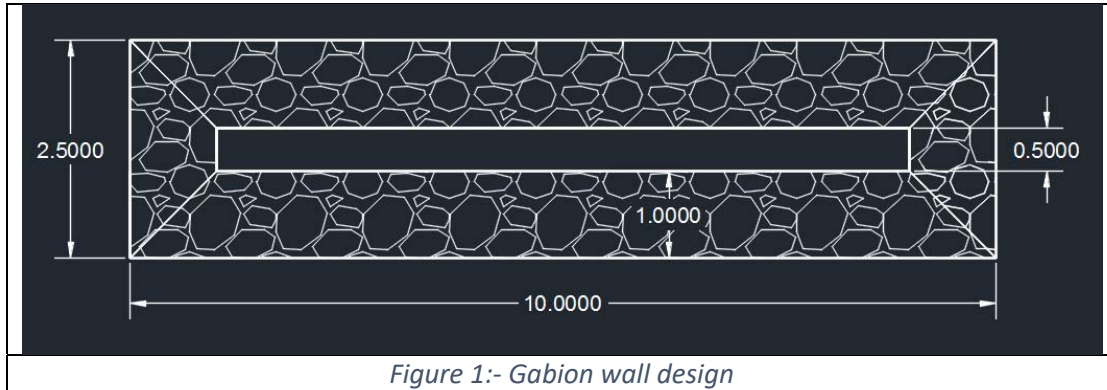


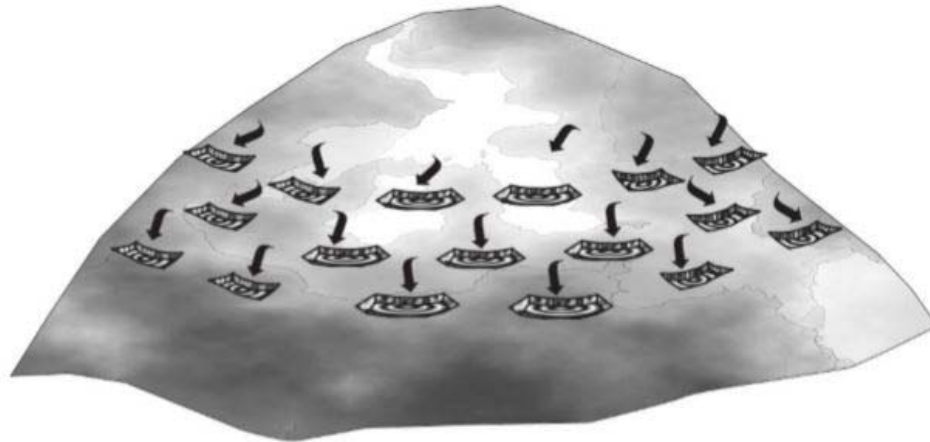
DSR 2019-20 Page No. 2 Item No. PART A-16.										
Amount (A)									4575988.34	

Rejuvenation of old K.T. Weir in the Nala stretch in front of the Kumar Pebbles Society or near JSPM Group of Institutions										
Sr No	Activity Description	Unit	No	Length	Width	Height	Quantity	Rate	Amount	Remark
1	Desilting of Stream (Approximately 250 m). Note: - The Depth, Width for Desiltation may vary depending on field validation, recommendation. The cost comprising of loading of silt, JCB, Fuel, Man power cost. (PMC BHAVAN DSR 2019-20 Page No.1 Item No. A 21., PMC ROAD DSR 2019-20 Page No. 12 Item No. PART A-55.)	Cum	1	250	41	0.5	5125	414	2121750	
2	Metal gates to K.T Weir.	Kg	3				750	60	45000	
3	Recharge shaft (With RCC Hume pipe, Filtration media and Pit). (PMC BHAVAN DSR 2019-20 Page No.18 Item No. A 22.50).	Rmt	2	70			140	455	63700	
4	Pitching on 250 m Embankments. PMC ROAD DSR 2019-20 Page No. 36 Item No. Part B-90.	Nos	2	200	10		4000	422	1688000	
Amount (B)									3918450	
Total Amount (C = A+B)									8494438	



DRAWING AND DESIGNS





Staggered trenches minimise the risk of going off the contour and are therefore safer

(Source: Watershed works manual: Samaj Pragati Sahayog)

Figure 3:- Staggered Contour Trenches

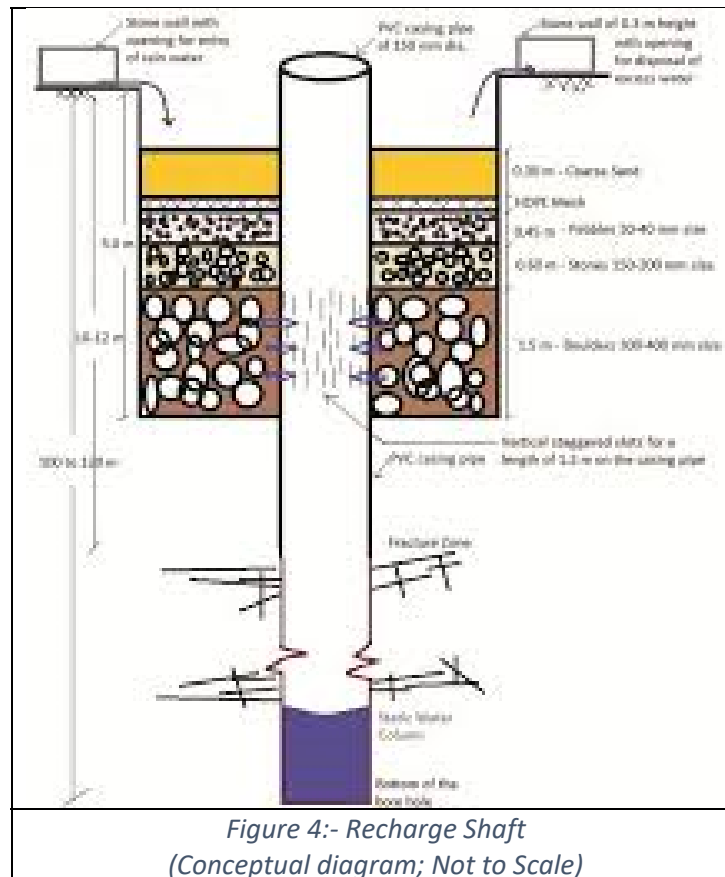


Figure 4:- Recharge Shaft
(Conceptual diagram; Not to Scale)