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# Comparison of River Bank Filtration with other filtration technique at Haridwar city

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**ABSTRACT:-** *Riverbank filtration is a natural water treatment technology that consists of extracting water from rivers by pumping wells located in areas at vicinity of river. During the process when water passage underground, a series of chemical, physical, and biological processes occur and improve the quality of river water. Study site is situated in Haridwar (India). There are 20 production well and 2 monitoring well along the vicinity the river Ganga and the upper Ganga canal. The objective of this paper is to compare the performance of RBF water with ground water by other technique at Haridwar by checking the water Quality at various parameter .the filtered water were tested for different water quality parameter and best result shown by RBF as compare to ground water and municipal treated water. Therefor RBF can provide an alternate source of drinking water.*

***Keywords*: River bank filtration, Ground water / Surface water relation, hydrochemistry, Production well, NSFWQI.**

## 1. Introduction

RBF a natural water purification technology, involves extracting of water from rivers by production wells. During the process, when a number of chemical, physical, and biological processes occur and enhance the quality of water. During these process, polluted elements present in river water are removed and hence it is an alternative of conventional drinking water treatment [1].RBF is efficient in removing turbidity, natural organic matter, pesticides, pharmaceuticals, microorganism etc. [2].

RBF consist of a process in which pumping wells located along river bank induces flow of the river water towards the wells. During which, the processes like filtration, microbial degradation, sorption to sediment and aquifer sand, and dilution with background groundwater occur with the removal of contaminants of water [4].

Other sources of drinking water at Haridwar city is ground water which is extracted by dug well, hand pump, bore well etc. and municipal supplied treated water. The objective of paper is compare the all water technique and find the efficient one.

## 2. STUDY SITE AND ITS METHODOLOGY

### 2.1 River bank filtration technique

Haridwar (29° 58' and78°10' E), located on the west side of Uttarakhand state of India, is one of the most religious places for Hindus. The city of Haridwar is situated between the Ganga River in the South and the Shiavlik Mountain in the North and Northeast. Dehradun and Pauri bounds Haridwar district in northeast, Bijnor district of Uttar Pradesh in the southeast (Fig 1) and the geographical area covered by Haridwar district is 2360 $km^2$.The population is about .27 million, According to 2011 census. Approx. 0.5-0.6 people visit Haridwar every year for religious rituals. Kumbha Mela and Ardhakumbha. Where 7 million people take bath in Holy River in these occasions


**Fig 1:** Haridwar bounded by other cities [24]

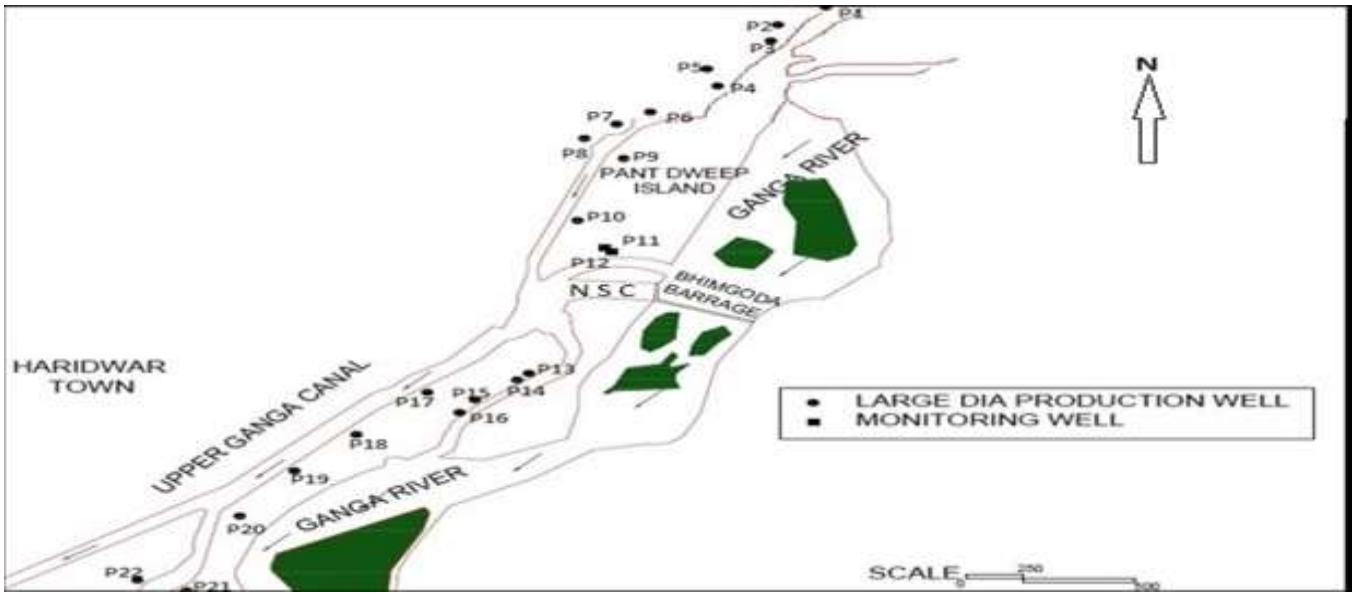


**Fig 2:** River bank filtration site with production well in the vicinity of the river Ganga and upper Ganga canal at Haridwar.

A part of River Ganga at Haridwar is diverted into the Upper Ganga Canal (UGC). For the irrigation purpose, the water is supplied through UGC. A barrage (Bhimgoda barrage) or headwork was constructed on the River Ganga near Pant Dweep Island where an additional supply of water is provided through New Supply Channel (NSC) to the UGC (Fig 2). There are 25 tube wells and 22 production wells located on the bank of River Ganga. Location is shown in Fig 2.

Some of the Water quality parameters were determinant in the field while for the others samples were preserved & brought to the laboratory for analysis as per standard method of analysis (APHA).a total of 21 samples were collected from 21 production wells, while 2 sample of surface water from Pantdweep Island and UGC in December 2015.

### 2.2 ground water

Gopal Krishnan et al studied, 40 sites of water at Haridwar city for assessing the groundwater quality and analyzed in Laboratory of Central Groundwater Board (CGWB), Dehradun using the standard procedure described by APHA (2012). In the present study, 7 parameters have been considered to compute WQI. These parameters include pH, Total Dissolved Solids, Total Hardness, Fluoride, Chloride, Sulfate and Nitrate. The quality rating scale and accordingly the weight values have been assigned to the selected parameters to estimate the overall water quality index. Governed by as per BIS: 10500-2012 and Central Pollution

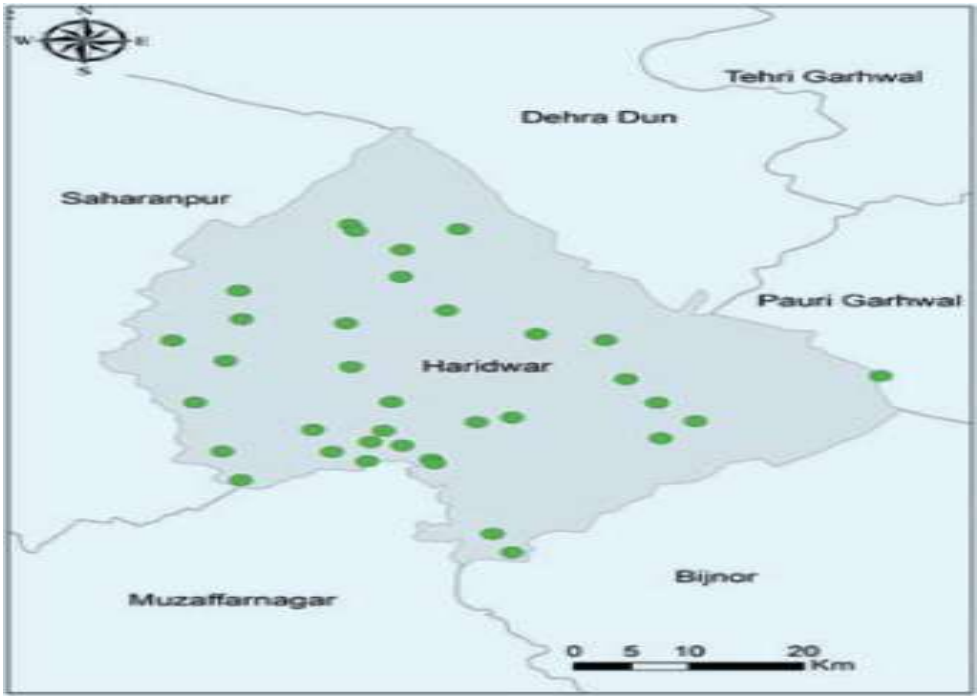


**Fig 3:** sample location of ground water

### 2.3 Municipal treated water

Nitin kamboj et al studied five municipal supplied sites including 20 sample from these site. The taps were continuously run prior to sampling. Sample were collected in plastic bottle and preserved by adding ultra-pure nitric acid, while samples for bacteriological analysis were collected in sterilized bottles covered with aluminum foils. The tests were performed in laboratory of gurukul kangri university, Haridwar. The physio chemical analysis was performed following standard method (apha 1998 and IS: 10500:2012). Total coliform collected by MacConkey broth.

## 3. Result and discussion

**The** sample were collected from different sites and make average result in year 2015 by RBF technique and compare the result with municipal water result of year 2015 [5] and ground water collected from hand pump ,dug well ,bore well of year 2014-1015 [6].

| parameter | Ground water | municipal water | RBF |
|---|---|---|---|
| **pH** | 8 | 7.2 | 6.8 |
| **fluorine** | 0.2 | Not performed | 0.2 |
| **Chloride** | 29.2 | 21.86 | 23.58 |
| **sulphate** | 36.4 | 20 | 22.5 |

| | | | |
|---|---|---|---|
| **nitrate** | 15.6 | 1.12 | 1.02 |
| **TDS** | 426.4 | 373 | 217.69 |
| **total hardness** | 271.1 | 314 | 162 |
| **turbidity** | not performed | 0.1 | 1.2 |
| **conductivity** | not performed | 483.6 | 457.21 |
| **Fecal coliform** | not performed | ABSENT | Absent |

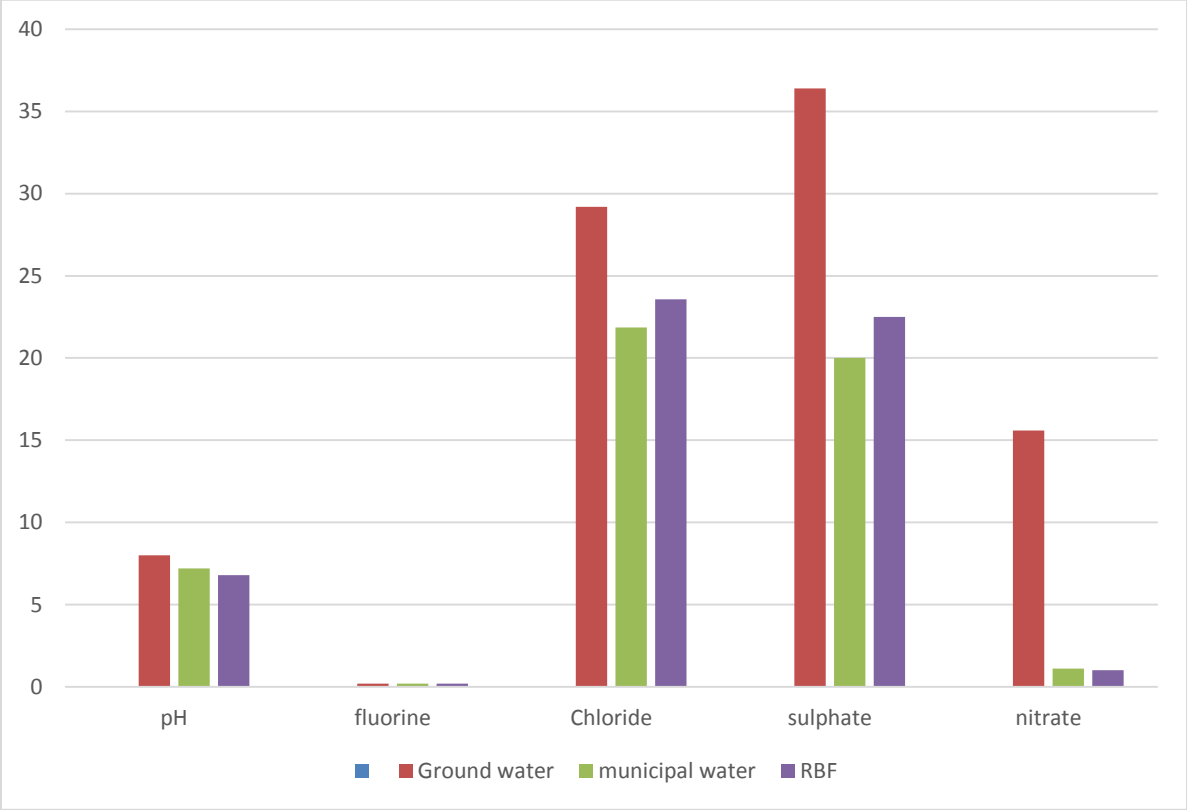


**Fig 4:** Comparative results of different filtration technique part 1 at Haridwar city

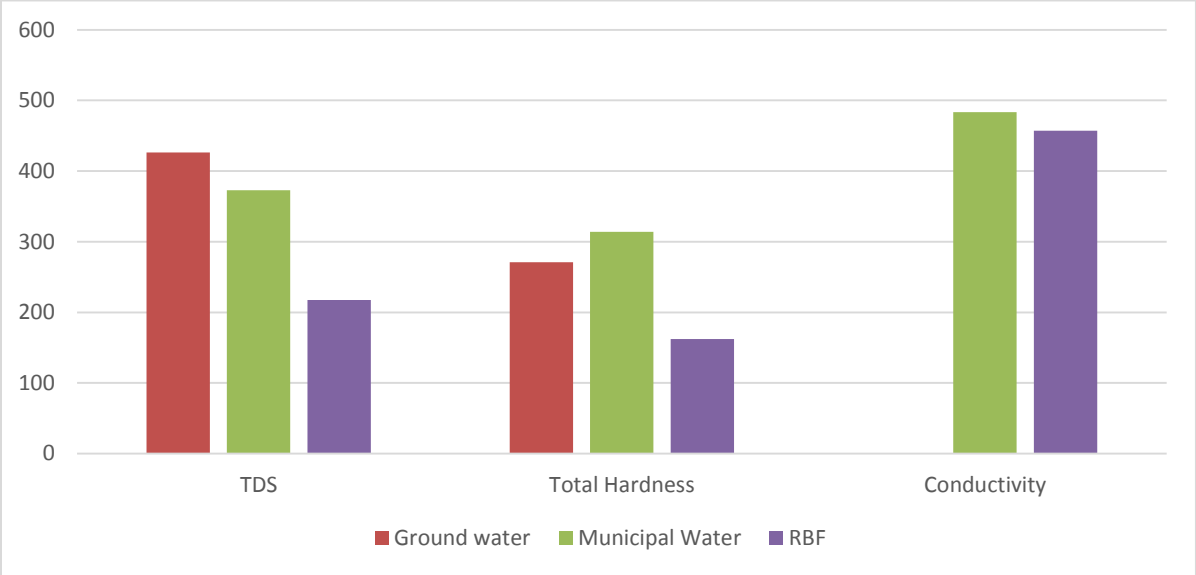


**Fig 5:** Comparative results of different filtration technique part 2 at Haridwar city

As graph clearly show that result got from RBF are better than other two, only chloride and sulphate content is more than municipal treated water. Which is also under permissible limit. RBF technique also good for removal of fecal coliform and Turbidity. Which is major problem in hilly state.

**Conclusions**

The drinking water supply from different source tested at Haridwar and now compare to each other results. The location were different sites at Haridwar, and result are compare according average data from different sites. Based on the study conclusion are mentioned below-

1. Removal of total and fecal coliform during RBF Technique and municipal water treatment are efficient.
2. Results showed that RBF Technique has lesser hardness, TDS, Fluoride, nitrate content and conductivity.
3. Chloride content and sulphate content is more in RBF as compare to municipal treated water but within permissible limit.

Result shows that RBF technique is most efficient technique of water treatment .The water quality parameters of filtered water are with in desirable limit as per IS 10500. So the water is suitable for drinking purpose. The 48% of water supply of Haridwar city is provided by these RBF wells and an alternate source of drinking water supply.

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