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Analysis of Ground Water Quality and Leachate of Surrounding Mavallipura Msw Site Bangalore

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ABSTRACT

The experiment was conducted in Mavallipura MSW dumping site, located at N 13º O6' 36" and East 77º 31' 38.8" longitude, Bangalore North covering an area of 300 Ha Bangalore North. Due to the industrialization and urbanization, various types of wastes produced from the city are dumped in low lying areas and outside the cities without proper treatment and engineering controls. As water percolates through MSW, it makes leachate that consists of decomposing organic matter combined with iron, mercury, lead, zinc, nickel, cadmium, copper, and Manganese, which is cause for the groundwater contamination in the nearby areas of the dumpsite. So there is a need for groundwater analysis around the dumpsite to know what extent groundwater has been contaminated. The wastes may solid, liquid, @ semisolids, from industries and domestic areas. Leachate and groundwater samples were collected from municipal solid waste dumpsite of Mamallapuram which comes under Bruhat Bangalore Mahanagara like Bangalore. The water samples are collected within the radius of 2 km around the solid waste dumping site for study. The results of physicochemical analysis of the subsurface water samples indicated that the normal water suitable for drinking needs magnesium 50mg/l and whereas the samples drawn from this site was 495.97mg/l. The electrical conductivity of sample water was reached up to 4720 µs/cm as against 2500 for normal water. The total hardness in sample water was 510.48mg/l against the 350mg/l in normal water. Similarly for other parameters assess were sodium, nitrate, and TDS which were found to be 1906.5mg/l, 141.67mg/l and 2734mg/l respectively against the normal water contents 200,50 and 500mg/l respectively. The leachate was also analyzed and it was found that magnesium was reached at 740mg/l, electrical conductivity is very high to the tune of 46400 µs/cm. The total hardness in the leachate was 1300mg/l and nitrate was reached to 257mg/l based on this study it is concluded that the underground water is fully contaminated which is not fit for drinking in future days.

KEYWORDS: *Contamination, Dumpsite, Ground Water, Solid waste, Leachate, Pollutants.*

1. INTRODUCTION:

India is the second fastest growing economy and the second most polluted country in the world. The pollution of India is accepted to increase from 1029 million to 1400 million during the period 2001 to 2026, an increase of 36% in 26 years at the rate of 3.35% annually. Ground water is the water found beneath the surface of the ground, consisting largely of surface water that has seeped

down , the source of water in springs and wells. As ground water provides drinking water to the people and it contains over 90% of the fresh water resources, the quality of ground water is of paramount importance.

Solid waste is termed as unwanted materials arising from human and animal activities, they include garbage, rubbish, ashes, construction and demolition waste, market and street refuse, dead organic waste, industrial and mining waste, sludge and agricultural wastes. Municipal solid waste accounts for a major portion of solid waste produced by Indian city, the average composition of refuse by weight consists of garbage 50%, rubbish 10%, ashes 15% and fine dust, silt and sand.
Solid waste is not inert; much of it breaks down over time into noxious gases and liquids, which contaminate the air, soil and ground water supplies around the disposal site.

2. STUDY AREA

The present area is mavallipura MSW dumping site is located at N 13º O6' 36" and East 77º 31' 38.8" longitude. The present study area covering an area of approximately 3sq.k, located at outskirts of the city in Hesargatta zone, Bangalore north.

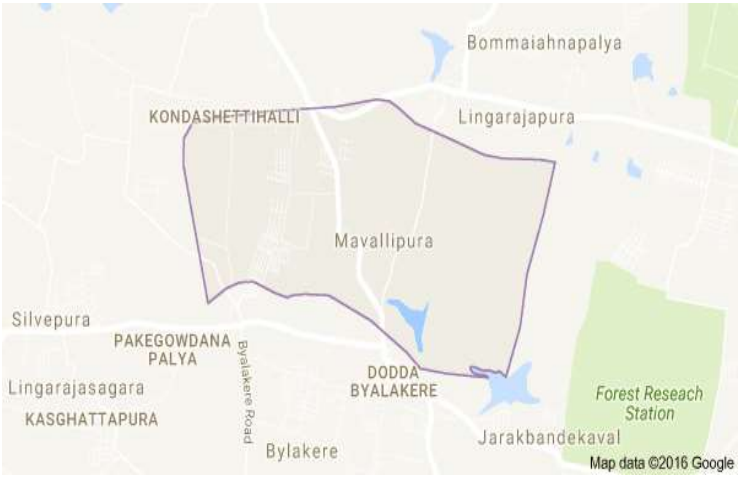

Figure 1. Survey No 108 Mavallipura village, Hesargatta zone, Bangalore

The proposed site is situated at survey No 108 Mavallipura village, Hesargatta zone, Bangalore North. The area of site is 100 acres, the dumpsite consists of 6 acres, the plant is located on the North West side of the Bangalore.

2.1 MATERIALS AND METHODS

Sampling of leachate and ground water

Based on the analysis and results, the water and soil in and around the dumpsite is getting polluted due to the leachate produced by the municipal solid waste hence it is require proper remedial measures are to be taken for prevent the migration of leachate by ground water of barriers and soil washing, polarisation and organic decomposing to prevent migration.

In an effort to study the extent of the ground water contamination

1. Sampling of ground water is collected nearby 7 bore wells of dumpsite using "grab sampling".
2. The samples of ground water of various bore wells points were collected in 2 litres of plastic cans
3. Leachate was collected at the dumpsite in a plastic container after adding concentric nitric acids till the samples P^H reduced less than 2, in order to preserve the inorganic materials as per IS STDS.
4. The samples which were collected were tested at KSPCB Lab Bangalore, as per IS STD of drinking water analysis and results are presented in the form of graph as shown below.

3. RESULTS AND DISCUSSION

The results of physico - chemical analysis of the subsurface water samples are shown in Table 1 and Table 2. The results indicated that the variations of P^H of all the bore well water samples range from 6.6 to 7.1. P^H of bore well water samples are in desirable limits. Further, the electrical conductivity (E.C) is a valuable indicator of the amount of iconic materials dissolved in the water. the variation of E.C of bore well water samples and it varies from 536 to 3190 µmhos/cm. E.C of samples 6 and 7 is far above the acceptable limits. The turbidity of all the bore well water samples ranges from 0.2 to 2.8. The total dissolved solids (TDS) 244 to 1012 mg/l. The TDS of bore wells water samples 6 is more than acceptable limits of potable water which may due to its location adjacent to the dump yard. The ground water pollution from the garbage in the vicinity of the dumping sites is detectable through

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the increased TDS concentration of water. The high concentration of TDS decreases the palatability and may cause the gastro intestinal irritation in human and may also have laxative effect particularly upon transits (W.H.O, 1997).

The concentration of total hardness of water samples ranges from 183.8 to 392.5mg/l. The hardness in the water is mainly due to the salts and most common are carbonates and sulphates and the concentration of chloride and calcium, chloride of water samples ranges from 42.7 to 389.7mg/l and calcium ranges from 94 to 328.0 mg/l there is an increase in the calcium hardness in water samples sample 2 and 6. The concentration of fluoride of water samples ranges from 0.2 to 0.4 mg/l which is under the acceptable limits. Fluoride at low concentration in drinking water has been considered beneficial but high concentration may cause the dental fluorosis and may seriously skeletal fluorosis, concentration of Total Alkalinity water samples ranges from 176 to 319.2 mg/l which are under the slightly higher than the acceptable limits of BIS and concentration of Magnesium hardness in the bore well water samples varies from 160 to 341.85 mg/l, is slightly higher than the acceptable limits. The concentration of sodium and potassium hardness water samples ranges from 102.6 to 665.1 mg/l. the variation of concentration of Nitrate it ranges from 24.28 to 66.78 mg/l which are under permissible limits. BOD and D.O and C.O.D of bore well water samples ranges from 1.6 to 2.25 mg/l (BOD), DO ranges from 3.34 to 5.12 mg/l, and COD ranges from 3.44 to 66.08 mg/l, such that bore well water samples of 6 and 7 have slightly higher than the acceptable limits. The E- COLI FORM (MPN/100 ml) is present in the bore well samples of 6 and 7.such that in the water sample there is rapid formation of E COLI FORMS.

Table 1 Physical and Chemical analysis of ground water

Parameters	UNIT	Sample 1	Sample 2	Sample 3	Sample 4
Turbidity	NTU	0.2	1.3	2.8	0.1
PH Value		6.6	6.5	6.6	6.7
Total hardness as caco3	mg/l	185.52	320.16	298.12	266
Chloride	mg/l	44.32	171.36	164.88	68.96
Calcium	mg/l	94	**328.08**	136.16	118.08
Fluoride	mg/l	0.3	0.3	0.2	0.3
Alkalinity	mg/l	198.32	319.2	225.6	301.68
E.C	µs/cm	536	1201	1139	1236
Magnesium as mg	mg/l	**165.15**	**240.43**	**265.03**	**237.3**
Sodium	mg/l	302.7	470.85	406.9	287.2
Potasssium	mg/l	15.9	19	12.25	9.1
D.O	mg/l	5.12	4.38	3.48	4.77
C.O.D	mg/l	5.36	7.6	5.08	3.44
Nitrate	mg/l	51.4	37.89	44.28	54.94
B.O.D	mg/l	2	2.25	1.82	1.6
ECOLIFORM	MPN/1000 ML	-	-	-	-
Total dissolved Solids	mg/l	432	790	624	574

Table 2 Physical and Chemical analysis of ground water

Parameters	UNIT	Sample 5	Sample 6	Sample 7	Sample 8
Turbidity	NTU	0	1.4	1	29.9
PH Value		7.1	6.3	6.4	8.8
Total hardness as caco3	mg/l	221.92	**392.52**	183.8	**510.48**
Chloride	mg/l	42.7	389.76	70.48	**1220.2**
Calcium	mg/l	120.96	**208.48**	97.52	59.68
Fluoride	mg/l	0.3	0.2	0.4	0.3
Alkalinity	mg/l	248	308	176	424.48
E.C	µs/cm	717	**2840**	**3190**	**4720**
Magnesium as mg	mg/l	**190.52**	**341.85**	**160.1**	**495.97**

Sodium	mg/l	102.66	**665.1**	298.4	**1906.5**
Potasssium	mg/l	8.28	13	7.25	**615.7**
D.O	mg/l	3.82	3.301	3.34	2.73
C.O.D	mg/l	5.12	**66.08**	**9.84**	**141.67**
Nitrate	mg/l	24.28	78.4	66.78	**141.67**
B.O.D	mg/l	2	6.6	1.9	60
ECOLIFORM	MPN/1000 ML	-	5	5	-
Total dissolved Solids	mg/l	244	**1012**	318	**2734**

Table 3: Chemical analysis of surface water (leachate pond)

PARAMETERS	SAMPLE - LEACHATE
TEMPERATURE(C)	27
P^H	8.1
TURBIDITY (NTU)	28
EC(µs/cm)	46400
TDS (mg/l)	29366
TOTAL HARDNESS (mg/l)	1300
CALCIUM (mg/l)	487
MAGNESIUM (mg/l)	740
CHLORIDE (mg/l)	130
SULPHATE (mg/l)	2.4
TOTAL ALKALINITY (mg/l)	980
FLUORIDE (mg/l)	1.0
NITRATE (mg/l)	257.0

4. CONCLUSION

From the present study of the assessment of ground water in and around Municipal solid waste dumping site of Mavallipura Bangalore, it is found that some of the parameters like Total Dissolved Solid (TDS), Total Hardness (TH), Calcium, Magnesium and Nitrates concentration are above the acceptable limits of Indian Standard for drinking water (BIS- 10500:1991). The higher concentration of TDS in the water samples of bore well shows the penetration of landfill leachate has occurred to the subsurface water. Hence we can conclude that unless proper measures to control the contamination of leachate from the dumpsite are not taken there will be a serious to the subsurface water. The emphasis should be given to improve the waste management practices and construct properly engineered landfill sites to curtail the ground water pollution. Further, the continuation of the experimental investigations are needed on heavy metal pollution of subsurface water and as well as effects on soil have to be carried out.

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