REPORT

This report is prepared in response to the request of Water & drainage Section, Planning & Development Department, Govt. of Sindh, Karachi with required parameters as Magnesium and TDS of Indus River from Manchar Lake to Kotri Barrage.

The objective this report was to analyze the current position the water after current super floods which cause direct intrusion of polluted water of Manchar Lake into Indus River, from which the water for drinking and other purposes is used for main cities as Hyderabad and Karachi etc.

Executive Summary

The water samples were taken to analyze the water quality in the light of recent flooding and consequently discharge of Manchar Lake into Indus River then to Kotri Barrage. The Kotri Barrage is main source of drinking water with other proposes for the main cities of Sindh as Hyderabad and Karachi.

For this seek five (05) water samples were taken for Magnesium on 8th November 2010. TDS & EC and salinity parameters. There the highest level of Magnesium was observed at Jamshoro Thermal Power Plant then and at Manchar Lake. At Indus River near Petaro the above parameters showed reduction in their quantities. But again the TDS& EC were slightly increased reaching to Kotri Barrage; it seems to increased by the effluent of Jamshoro Thermal Power plant. The effluents of this Power Plant also have high in TDS&EC.

The high salinity was observed at Manchar Lake and Jamshoro Thermal Power Effluent. For salinity same phenomenon was seen as for TDS&EC reaching the Petaro Station from Manchar Lake but again it is increased. This may be due to Jamshoro Power Plant effluent. All above parameters comes under Pakistan NEQS and WHO. The salinity was also some how high then normal fresh waters criteria.

Table.1 Water Parameter Report of Indus River from Manchar Lake to Kotri Barrage

S.No.	Parameters	Manchar Lake	Indus River near Petaro	Jamshoro Thermal Power Station Effluent	Fuleli canal Outlet	Hyderabad Water Filter Plant	NEQs Pakistan& WHO for drinking waters
1	Magnesium (mg/l)	53	38	58	36	22	30-50mg/l
2	TDS (mg/l)	1303	699	1170	721	681	500-1000 mg/l
3	EC (µS/cm)	2036	1092	1827	1127	1065	_
4	Salinity (g/l)	1.0	0.5	0.9	0.6	0.5	_

General

In order to provide water quality report on the request of Assistant Chief (W&D) Section, Govt. of Sindh, Planning & Development Department (Water & Drainage Section), Karachi .with reference no. *WR (W)10 (P&D) Misc/04, Karachi, Dated; October 26, 2010,* with required parameters as Magnesium and TDS. The water samples collected on 8th November 2010. The deadliest weather related flood disaster of 2010 was unfold in Pakistan in July, 2010, where heavy monsoon rains have triggered flooding that has left more over 1,500 people dead.

Millions of homes in thousands of villages and towns have been destroyed. According to reports, over 20 Million people have been affected by this disaster - more than the 2004 Indonesia Tsunami, 2005 Pakistan Earthquake, and 2010 Haiti Earthquake combined and destruction is increasing each day. Infrastructure such as dams, power stations, roads, bridges, schools, agriculture wells, and drinking water hand pumps have been severely damaged or destroyed.

Unprecedented devastating super flood in the living memory in River Indus continued to unleash untold miseries and destruction in Sindh Monday, as around one million people had so far been forced out of their homes and take shelter of dry on moorland, rooftops and on highways.

In villages where people do remain, drinking water sources will have been contaminated. No one has yet begun to assess the health situation in these isolated areas.

There have been warnings of a looming malarial epidemic as mosquitoes are breeding

in huge numbers in the stinking, stagnant flood water as it evaporates. Other waterborne diseases pose serious health risks, while malnutrition, particularly among children, could lead to many deaths.

Due to breakup of Tori Bund mostly entire Right Bank of Indus River was washed out, all pollutants were dragged from Tori area to Manchar Lake. The Manchar Lake water already was highly polluted but with these floods it is now washed and cleaned the Manchar Lake. The Manchar lakes water is diluted now but still slightly high numbers of TDS and Salinity with other parameters is existing.

Quality Definitions

Five (05) water samples were analyzed for Magnesium, TDS, EC and Salinity. The Samples were collected on 8th November 2010. Five stations were fixed as 1. Manchar Lake, 2. Indus River near Petaro, 3. Effluent of Jamshoro Thermal Power Station, 4. Fuleli out let and Hyderabad Filter Plant (Filtered water). And on the same date these samples were given at the Sindh University Chemistry Institute under the supervision of Dr. Khuhawar. University of Sindh Jamshoro.

The magnesium ranges from 22 mg/l to 58mg/l, TDS ranges from 681 mg/l to 1303mg/l,1065 EC µS/cm to 2036 EC EC µS/cm and salinity ranges from 1 g/l to 0.5 g/l.

Water resources

The Kotri Barrage is supplied by after floods of 2010 from Manchar Lake. The Manchar Lake is supplied by the flood water of right bank of Indus River, still then it is drained out into Indus River. The water of Kotri Barrage is used as drinking water by Hyderabad city and its vicinity, Karachi and Thatta cities.

The soils of Indus Right Bank are combination of sandy loam and rocks of Kheerthar Ranges which contain enough magnesium and other minerals and salts etc.

Water Quality

Surface water is a large and essential part of the water resources available for human use and development. It forms an integral part of the hydrological cycle and is mane places are the only viable source of water supply. The chemistry (quality) of surface water reflects inputs from the atmosphere, from soil and water-rock reactions (weathering), as well as from pollutant sources such as mining, land clearance and human activities and cropping activities. As in the case of Surface water quality, it is difficult to simplify to a few parameters. However, in the context of geo indicators, a

selection has been made of a few important parameters that can be used in most circumstances to assess significant processes or trends at a time and scale. The chemical composition of surface water is a measure of its suitability as a source of water for human and animal consumption, irrigation, and for industrial and other purposes. It also influences ecosystem health and function, so that it is important to detect change and early warnings of change both in natural systems and resulting from pollution, it is also essential to protect surfaced water quality here. Surface water provides an important medium for of monitoring associated environmental change in this region. Hence following parameter were selected to categories the surface water quality:

Magnesium

Water described as "hard" is high in dissolved minerals, specifically calcium and magnesium. Hard water is not a health risk, but a nuisance because of mineral buildup on utensils and poor soap and/or detergent performance. 17.1 – 60 mg/l Slightly hard, 60 – 120 mg/l Moderately hard, 120 – 180 mg/l Hard and 180 & over Very Hard

Sources of Magnesium and Calcium Minerals in Drinking Water

Water is a good solvent and picks up impurities easily. Pure water -- tasteless, colorless, and odorless is often called the universal solvent. When water is combined with carbon dioxide to form very weak carbonic acid, an even better solvent results. As water moves through soil and rock, it dissolves very small amounts of minerals and holds them in solution. Calcium and magnesium dissolved in water are the two most common minerals that make water "hard." The degree of hardness becomes greater as the calcium and magnesium content increases and is related to the concentration of multivalent cations dissolved in the water.

Potential Health Effects

Hard water is not a health hazard. In fact, the National Research Council (National Academy of Sciences) states that hard drinking water generally contributes a small amount toward total calcium and magnesium human dietary needs. They further state that in some instances, where dissolved calcium and magnesium are very high, water could be a major contributor of calcium and magnesium to the diet. Researchers have

studied water hardness and cardiovascular disease mortality and kidney stone formation. Such studies have been "epidemiological studies," which are statistical relationship studies. While some studies suggest a correlation between hard water and lower cardiovascular disease mortality, other studies do not suggest a correlation. The National Research Council states that “results at this time are inconclusive and recommends that further studies should be conducted “

Total Dissolved Solids (TDS) & EC

TDS is a measure of the combined content of all inorganic and organic substances contained in a liquid in: molecular, ionized or micro-granular (colloidal sol) suspended form. Generally the operational definition is that the solids must be small enough to survive filtration through a sieve the size of two micrometer. Total dissolved solids are normally discussed only for freshwater systems, as salinity comprises some of the ions constituting the definition of TDS.

Primary sources for TDS in receiving waters are agricultural and residential runoff, leaching of soil contamination and point source water pollution discharge from industrial or sewage treatment plants. The most common chemical constituents are calcium, phosphates, nitrates, sodium, potassium and chloride, which are found in nutrient runoff, general storm water runoff and flooding. The Electrical Conductance is directly proportional to TDS

Potential Health Effects

Reliable data on possible health effects associated with the ingestion of TDS in drinking water are not available. The results of early epidemiological studies suggest that even low concentrations of TDS in drinking-water may have beneficial effects, although adverse effects have been reported in two limited investigations.

Water containing TDS concentrations below 1000 mg/liter is usually acceptable to consumers, although acceptability may vary according to circumstances. However, the Presence of high levels of TDS in water may be objectionable to consumers owing to the Resulting taste and to excessive scaling in water pipes, heaters, boilers, and household appliances (see also the section on Hardness). Water with extremely low concentrations of TDS may also be unacceptable to consumers because of its flat, insipid taste; it is also often corrosive to water-supply systems.

In areas where the TDS content of the water supply is very high, the individual constituents should be identified and the local public health authorities consulted. No health-based guideline value is proposed for TDS. However, drinking-water guidelines are available for some of its constituents, including boron, fluoride, and nitrate.

Salinity

The salinity refers to the total amount of soluble salts in the water and is measured in ppt, ppm and g/l or mg/l. The excessive soluble salt present in irrigation water reduces crop growth by reducing the ability of plant roots to absorb water and the phenomenon is known as osmotic pressure effects. Reduction of crop growth ultimately resulted in low crop production due to high concentration of salts in the irrigation water.

Potential Health Effects

In addition to agriculture use, the Indus river water is also used for drinking purposes. Small rural areas in Sindh do not receive adequately-treated water, for drinking purposes and of course, major cities, like Karachi, get contaminated water. Natural organic matter reacts with chlorine, used in water treatment plants for disinfection, to form trihalomethanes (THMs). Epidemiological studies have conclusively shown increased risks of cancers of the colon, rectum and bladder, associated with drinking-water, containing high levels for THMs (greater than 30 micrograms/litre). Nitrate-nitrogen level of greater than 10mg/1 in drinking-water cause, what is referred to as infant methemoglobinemia, or, "blue baby" syndrome. Relatively low acidity of an infant's stomach allows the bacteria to convert nitrate into potentiality dangerous nitrite. Nitrite is then absorbed from the infant's intestine and, enters into a chemical reaction with haemoglobin in the infant's blood, changing it to methemoglobin. Methemoglobin cannot carry oxygen, unlike hemoglobin which carries oxygen. As more blood hemoglobin is converted to methemoglobin, the oxygen-carrying capacity of the blood is reduced, causing symptoms of bluish discoloration of skin, lips and nailbeds. Hence the name "blue baby"

Results

Table.1 Showing the Parameters (Magnesium) of Water Samples

Station	Magnesium mg/l	WHO & NEQs Standards Limits 30-150mg/l
Manchar Lake	53	
Indus River Petaro	38	
Jamshoro Thermal Power Plant	58	
Fuleli Canal	36	
Hyderabad Water Filter Plant	22	

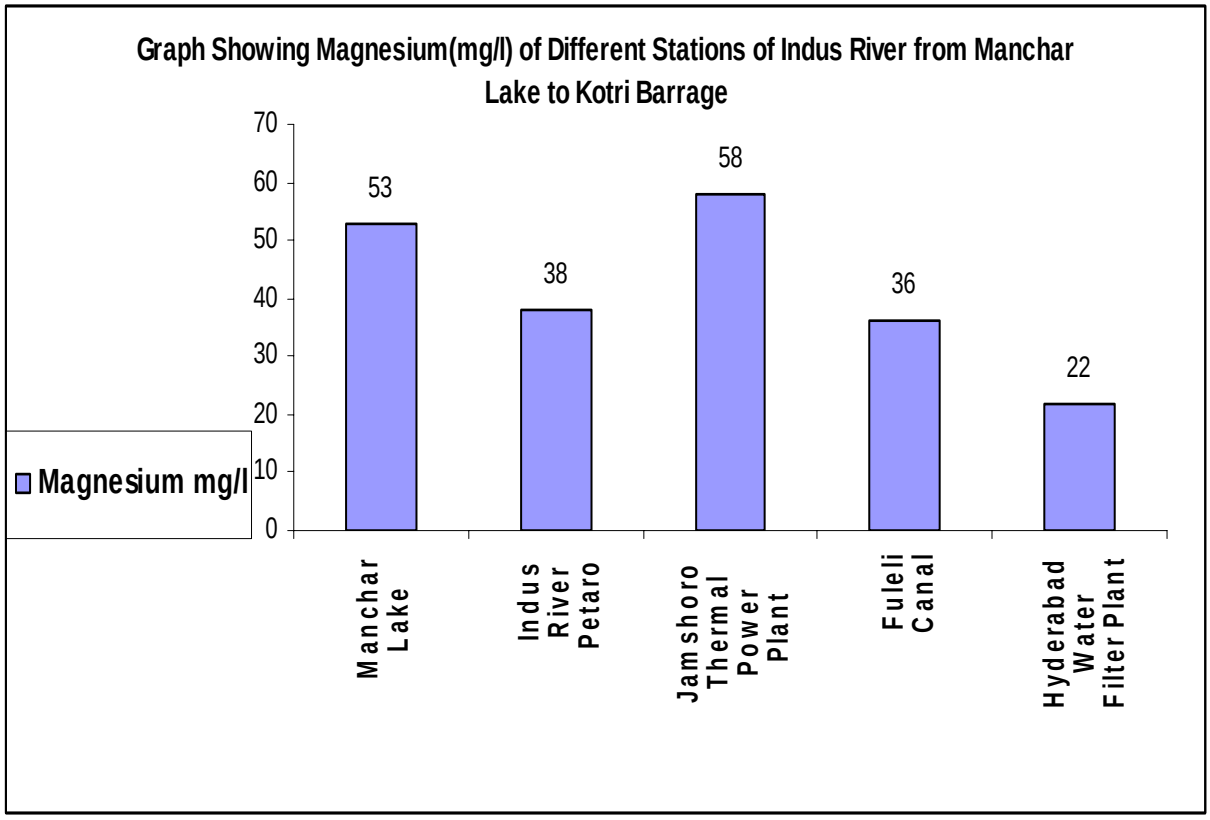

Figure.1 Showing the Magnesium quantities at different stations of Indus River from Manchar Lake to Kotri Barrage

Table.2 The values of TDS&EC of Water Samples

Station	TDS mg/l	EC µS/cm	WHO & NEQs Standards Limits 500-1500mg/l
Manchar Lake	1303	2036	
Indus River Petaro	699	1092	
Jamshoro Thermal Power Plant	1170	1827	
Fuleli Canal	721	1127	
Hyderabad Water Filter Plant	681	1065	

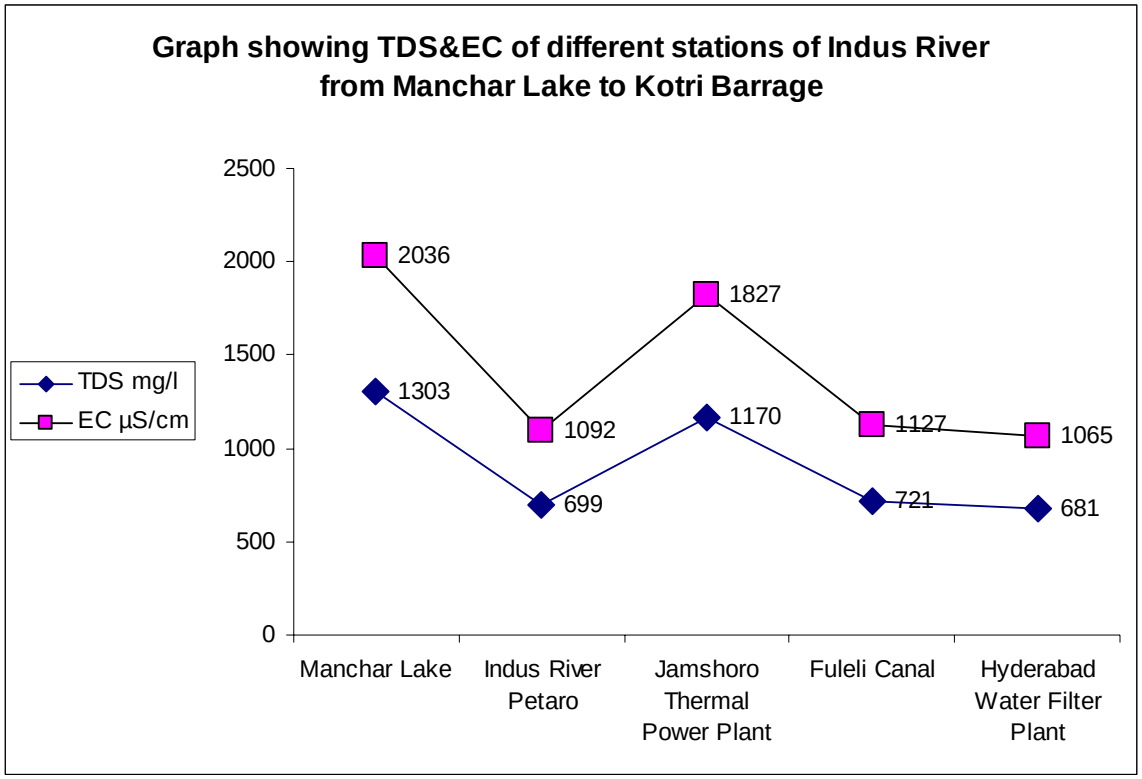

Figure.2 A pattern of TDS and Electrical Conductivity of different stations of Indus River from Manchar Lake to Kotri Barrage

Table.3 Showing the Parameters (Salinity) of Water Samples

Station	Salinity g/l
Manchar Lake	1
Indus River Petaro	0.5
Jamshoro Thermal Power Plant	0.9
Fuleli Canal	0.6
Hyderabad Water Filter Plant	0.5

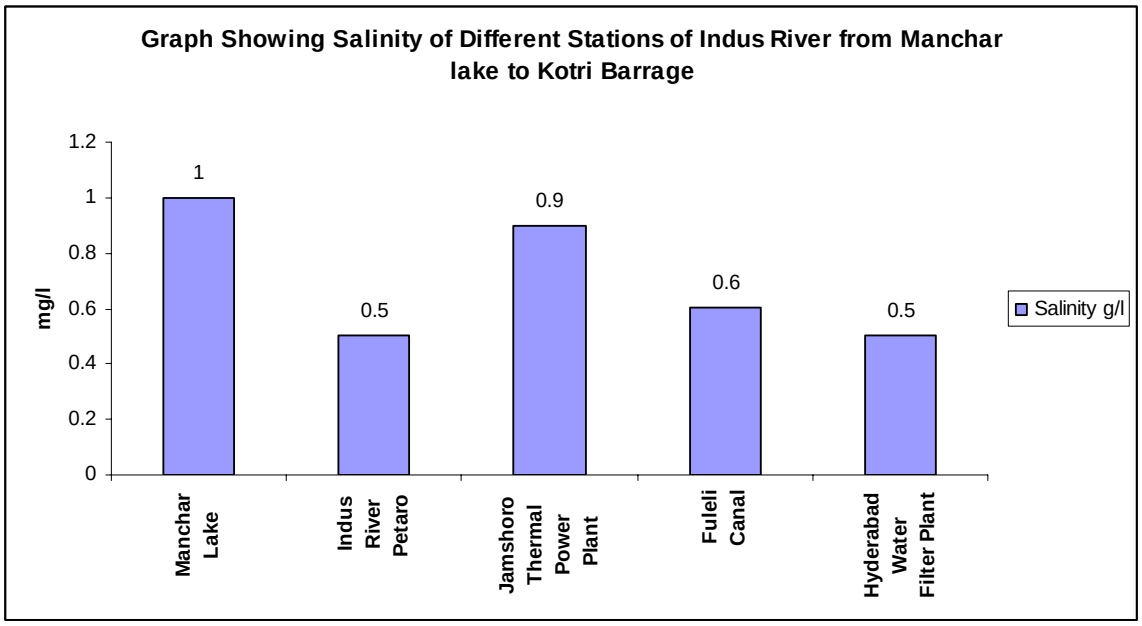

Figure.3 A pattern of salinity of different stations of Indus River from Manchar Lake to Kotri Barrage

CONCLUSION

Five (05) water samples were taken for Magnesium, TDS & EC and salinity parameters. There the highest level of Magnesium (58mg/l) is observed at Jamshoro Thermal Power Plant then secondly, the Manchar Lake (53 mg/l) and thirdly Indus River at the Petaro Point. The water of Hyderabad Filter Plant is supplied to Hyderabad city and its vicinity as drinking water after filtration.

The Machar lake in TDS have high quantities (1303 mg/l) with EC (2036 µS/cm) EC and secondly the Thermal Power Station Jamshoro (1170 mg/l) with EC (1827 µS/cm), comes with TDS and EC. The natural phenomenon of running waters is also observed that The TDS and EC is observed high at Manchar Lake but at Indus River near Petaro both of parameters are decreased after covering the distance of approximately 100 KM by running water but it again increased with 22 mg/l of TDS. There is possibility that this increment is due to effluent of Jamshoro Thermal Power Station, where TDS are high (1170 mg/l). The TDS and EC are directly correlated with linear relationship.

The highest salinity was observed at Manchar Lake (1 g/l) and on second Jamshoro Thermal Power Effluent (0.9 g/l). For salinity same phenomenon is seen as for the running and covering approximately 100 KM the salinity is decreased from 1g/l (Manchar Lake) to 5 g/l (Indus River near Petaro) but again it is increased from 0.5g/l to 0.6 g/l with 0.1 g/l increment. This may be due to Jamshoro Power Plant effluent which has 0.9 g/l salinity.

All above parameters comes under Pakistan NEQS and WHO. The salinity was also some how high then normal fresh waters criteria (Quality Drinking Water: Standards for Pakistan-Islamabad 2006)

REFERENCES:

Islamabad., 2006., Quality Drinking Water: Standards for Pakistan., Includes Legislating, Implementing and Monitoring Framework World Health Organization (WHO) And Government of Pakistan., Ministry of Health., Health Services Academy., P. 8.

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