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**16/ENG03/051**

**CVE 505 : WATER RESOURCES ENGINEERING**

**WATER RESOURCES ENGINEERING ASSIGNMENT**

**Due Date: 18th of January 2021**

**Questions**

1. Briefly describe how a productive borehole can be sited and developed in fractured basement complex regions?
2. What are the disadvantages of large dam projects?
3. What are the effect of water pollution on the environment?
4. What is a suitable approach to decontaminate river water, such as the Ureje River in Ado-Ekiti, which gets polluted daily by domestic and agricultural effluent?

**Solutions**

1. **Briefly Describe How A Productive Borehole Can Be Sited And Developed in Fractured Basement Complex Regions**

Siting and development of a productive borehole involves the careful observation and consideration of the environment before the borehole is sited. In the process of siting the borehole both geological and hydro-geological desk studies must be carried out for all borehole locations/sites to acquire preliminary information (geological formation, topography, drainage systems, vegetation) of the area; considering the accessibility of the site to the required drilling equipment. Following the studies proper geophysical investigation is carried out to determine the resistivity of rock materials, indicating the presence of possible aquifers/reservoir as well as availability of portable water, in this phase an electroresistivity test in carried out about 5 times to determine the location of underground water. After determining the location of the underground water the drilling process is carried out to get to the depth of the aquifer, the drilling process is carried out for the locations where the aquifer is present from the result obtained after the geophysical investigation. A test pump is installed at each drilled hole to determine the well with the maximum yield. When the well with the maximum yield is determined the borehole components are then installed up to the pump and the water system is laid out. Though the type of pumping system and piping installed for the borehole depends entirely on the use of it.

1. **Disadvantages of Large Dam Projects**
* Building a dam is very expensive, the government needs to ensure that strict guidelines are followed and a very high standard is maintained.
* They must operate for many years in order to become profitable enough to compensate for the high building cost.
* People residing in villages and towns in the nearby area, where there are chances of flooding, have to be relocated. They lose their businesses and [farms](https://byjus.com/biology/agriculture-and-organic-farming/%22%20%5Ct%20%22https%3A//byjus.com/biology/disadvantages-of-dams/_blank).
* Sometimes people are removed forcibly to set up hydro-power plant and it poses a serious ethical concern.
* The building of large dams can cause serious changes to the earth’s surface and lead to geological damage. It can trigger frequent earthquakes, however, modern planning and design of dams have reduced the possibility of occurrence of certain disasters.
* Constructing a large dam is very expensive, the government needs to ensure that strict guidelines are followed and a very high standard is maintained
1. **Effect of Water Pollution on The Environment**
* Heavy metals from industrial processes can accumulate in nearby lakes and rivers. These are toxic to marine life such as fish and shellfish, and can affect the rest of the food chain. This means that entire animal communities can be badly affected by this type of pollutant.
* Industrial waste often contains many toxic compounds that damage the health of aquatic animals and those who eat them. Some toxins affect the reproductive success of marine life and can therefore disrupt the community structure of an aquatic environment.
* Microbial pollutants from sewage often result in infectious diseases that infect aquatic life and terrestrial life through drinking water. This often increases the number of mortalities seen within an environment.
* Organic matter and nutrients causes an increase in aerobic algae and depletes oxygen from the water column. This is called eutrophication and causes the suffocation of fish and other aquatic organisms.
* Sulfate particles from acid rain change the pH of water making it more acidic, this damages the health of marine life in the rivers and lakes it contaminates, and often increases the number of moralities within an environment.
* Suspended particles can often reduce the amount of sunlight penetrating the water, disrupting the growth of photosynthetic plants and micro-organisms. This has subsequent effects on the rest of the aquatic community that depend on these organisms to survive.
1. **Treatment of River Water (Ureje River) Polluted By Domestic and Agricultural Effluent**

The process of river water treatment can either be using a chemical process, physical process, biological process or the combination of two or more of this processes to achieve water fit for domestic and industrial use.

1. Chemical Processes
* Pre-chlorination for algae management and biological growth arrest.
* Aeration with pre-chlorination for the removal of dissolved iron when relatively small quantities of manganese are present.
* Disinfection, using chlorine, ozone and ultra-violet light, to kill bacteria, viruses and other pathogens (Reddy et al., 2014).
1. Physical Process
* Pre-chlorination to control algae and to arrest biological growth.
* Aeration with pre-chlorination for the removal of dissolved iron when comparatively small quantities of manganese are present.
* Disinfection by using ammonia, ozone and ultra-violet light to kill bacteria, viruses and other pathogens (Reddy et al., 2014).
1. Physio-chemical Process: Also referred to as "Conventional" Treatment
* Coagulation for flocculation. Coagulation
* To promote coagulation and for more stable floc formation, coagulant supports, also known as polyelectrolytes.
* Polyelectrolytes, also referred to in the field as polymers, typically consist of either a positive or a negative charge, which is solely dependent on the characteristics of the treatment plant's source water.
* These are commonly used in combination with a main coagulant such as ferric chloride, ferric sulfate, or aluminum (Reddy et al., 2014).
1. Biological Process
* Slow sand filtration to metabolize organic matter using a biofilm (Reddy et al., 2014)