

Ground: in northern  
virginia, rain  
wastewater is



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ground: In Northern Virginia, rain wastewater is not treated due to the large landmass and population density of the region. Consequently, large amounts of harmful nitrogen and related fertilizers, dissolved and oxidized metals, and miscellaneous colloidal particles are released untreated into waterways and water bodies, thus disrupting wildlife and ecosystems. Due to current infrastructure and economical barriers, local authorities do not have a procedure to address the issue.

However, through mirroring the techniques of sewage treatment plants and treating subject water with same amounts of chemicals, harmful water can be prevented from draining into rivers from rainwater gutters. More specifically, the existence of Arsenic in municipal water poses a significant risk to wildlife and humans equally. To counter the spread of Arsenic and other unwanted toxins in sewage, sewage treatment facilities utilize a dynamic five-step process following primary physical water filtering. With the chemical treatment phases of chemical precipitation, chemical coagulation, chemical oxidation, ion exchanges, and chemical stabilization, water can be ensure on a molecular level safe for submittance into waterways. After solids have been filtered from the sewage water, scientists primarily use chemical precipitation as the first means of removing dissolved metals from sewage treatment.

A precipitation-causing reagent is added to water, metal ions simultaneously combine to form solid particles. Common examples of reagents are calcium and sodium hydroxide. After larger particles of metals form, they can be filtered out using fine filter paper. The next step, chemical coagulation, is the focal point of the experiment. The process of coagulation can be split into

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two main processes: coagulation and flocculation. Water treatment facilities utilize coagulants in order to neutralize the negative charges on suspended particles, thereby breaking the forces holding the particles together (Edzwald et. al.

). Aluminum salts and iron salts are the two most commonly used coagulants in water treatment plants. These salts work by hydrolyzing to form aluminum hydroxide and iron hydroxide particulates, respectfully. Due to the strong affinity to Arsenic by both Aluminum and Iron, both salts can be considered effective at removing dissolved Arsenic from sewage (Karvelas et. al.

). Although coagulants are effective at the process, coagulants require a set water pH to perform. For Iron (Ferric) salts, the pH must be between 5. 5 and 8. 5 in order to execute the process effectively. Flocculation is the process where the destabilized particles are gathered and then agglomerated (Edzwald et.

al.). Flocculant generally react with the positively charged portions of the mixture by performing two key tasks. Flocculants neutralize positive groups of particles or creates bridges between them to bind the particles into larger groups. After larger particle groups are formed, sedimentation can be used to remove the particles from the mixture (Lin et. al.).

The experiment details the accuracy of various quantities of coagulants and flocculants used. Chemical Oxidation and Ion Exchange are the next two major steps of the water treatment process. Chlorine and Chlorine ions are used to rearrange electrons from Chlorine to pollutants, thereby drastically changing the chemical makeup of the pollutants (Indarawis et. al.). Similar to <https://assignbuster.com/ground-in-northern-virginia-rain-wastewater-is/>

the cathode in a Galvanic cell, a gain of electrons causes a solid from of an otherwise aqueous solution.

After Chemical Oxidation and Ion Exchange, water is physically filtered again through a solid water filter. The last step, Chemical Stabilization is attributed to the final step where water is treated with high amounts of liquid Chlorine or Hydrogen peroxide to delay the expansion of biological agents in the water. After stabilization has been reached, the water is presumed safe to release into nature. The various methods for water treatments' efficiency can be determined by the quantity of water released, quality of water released, and amount of chemical waste created. A filtration system that contributes to a loss of 15 or more percent of water loss can be determined to be a faulty system.

Additionally, water that remains still and outdoors for more than five days can be attributed to be a health hazard as still water directly causes a rise in mosquito reproduction. Moreover, water that has a high amount of treatment chemicals can be deemed unsafe itself. Dissolved ions can be detected by its conductivity and its pH. Although the process for the treatment of sewage water can be considered a complex five-step procedure, the proposed treatment of storm drains and other wastewater is a much less complex one. By expanding on Chemical Flocculation and Chemical Coagulation, inquiry into the main wastewater treatment methodology is done. The use of common sewage treatment chemicals, like Calcium Hydroxide and Sodium Hydroxide, as well as various metal ions such as Magnesium and Calcium can be altered in from form or volume to address rainwater instead of sewage. In specific, the experiment's focus was to determine the ideal <https://assignbuster.com/ground-in-northern-virginia-rain-wastewater-is/>

amounts and types of flocculants and coagulants to set water at the environmentally safe amounts. The aim was to find a treatment solutions would allow for a more cost effective yet efficient way to limit water to safe amounts of conductivity and pH.