

An educational document from the American Concrete Pipe Association for users and specifiers

One of the most important natural resources is clean water. The sources for most of our drinking water are municipal plants that treat ground water and surface water, by removing toxic chemicals, metals and bacteria. Many toxins impact the ecology of streams and lakes and the health of native species.



One of the most dangerous toxins is zinc. Although it is a naturally occurring element, too much of the heavy metal can be extremely detrimental to the environment. This ePipe explains why it is critically important to remove zinc from our water systems, identifies the primary sources of zinc, and what we need to do to mitigate man-made products that leach zinc into our natural environment.

Zinc and the Natural Environment:

According to the publication Environmental Contaminants Encyclopedia (1997) provided by the National Park Service, Zinc is listed by the Environmental Protection Agency as one of 129 priority pollutants [58] (<http://www.nature.nps.gov/hazardssafety/toxic/zinc.pdf>). The publication notes that “Elevated concentrations of zinc in water are particularly toxic to many species of algae, crustaceans, and salmonids [180]. Elevated concentrations of zinc in water have especially strong impacts on macroinvertebrates such as mollusks, crustaceans, odonates, and ephemeropterans.” It points out that toxic levels of zinc are not attributed to the natural or food chain sources within the ecosystems but from direct toxicity from elevated concentrations attributed to man-made sources. It has been widely shown through research that high levels of zinc from stormwater runoff harms fish and other aquatic life as it can bind to fish gills and cause suffocation leading to fish kills.

Sources:

Many of the man-made products leaching zinc use a galvanized coating on their material surfaces to protect them from oxidation or rust. Typical sources of zinc that directly affect ground and stormwater come from roofs, downspouts and storm sewer pipes. A report from the Washington Department of Ecology titled “*Suggested Practices to Reduce Zinc Concentrations in Industrial Stormwater Discharges*” (2008) supports these claims and goes on to investigate the various sources of zinc in existing industrial facilities. While there are natural levels of zinc present throughout our environment and zinc is needed in the ecosystem, the areas of concern are when man-made items (**corrugated galvanized steel pipes and detention systems**) create unnatural heavy metal contamination.



There should be concern for potential cadmium and lead contamination if water has more than 1.0 mg/L of zinc. When zinc is detected in tap water above 1.0 mg/L, the most likely source of the zinc is corrosion of galvanized piping. Normal concentrations for zinc in ground water are usually below 0.1 mg/L.

Solutions:

According to the Washington Department of Ecology paper cited above, there are two primary ways to eliminate or effectively reduce harmful levels of zinc from entering the environment. The first deals with existing roof, downspout and drainage systems and recommends that all galvanized items to be coated with another material or removed and replaced with non-galvanized, more environmentally friendly materials such as concrete. The second addresses new construction and recommends that when building a new system, such as a road or retention/detention system, to not use galvanized metals at all (page 11). By requiring natural sustainable materials, such as concrete, the possibility of having an environmental zinc concern is eliminated. When selecting products for roofing, downspouts and drainage, specifiers should specify products with consideration of environmental impacts. The engineering community can help reduce their liability and protect our aquatic environment when specifying a stormwater pipeline system by considering the level of zinc in the aquatic environment and specifying precast concrete products for pipelines and culverts.

References:

Environmental Contaminants Encyclopedia – Zinc Entry, Roy J. Irwin, National Park Service, Water Resources Division, Fort Collins, CO, 1997 (<http://www.nature.nps.gov/hazardssafety/toxic/zinc.pdf>)

Suggested Practices to Reduce Zinc Concentrations in Industrial Stormwater Discharges, Department of Ecology, State of Washington, Publication Number 08-10-025, June 2008 (<https://fortress.wa.gov/ecy/publications/documents/0810025.pdf>)

Are There Any Potential Health Risks Associated With Corrosion Byproducts From Water Transported Through Galvanized Drinking Water Pipes? http://www.freedrinkingwater.com/water_health/health2/corrosion-byproducts2-galvanized-drinking-pipes-health-risks-page2.htm