

**EFFECTS OF HURRICANE HUGO ON
WATER AND WASTEWATER SYSTEMS
OF THE CHARLESTON COMMISSIONERS
OF PUBLIC WORKS**

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ABSTRACT

Hurricane Hugo had a major impact on the operations of the Charleston Commissioners of Public Works in their effort to provide safe water and wastewater service to their customers. Through careful preparation, a hurricane's impacts can be minimized even though not all such effects can be anticipated in a large-scale disaster.

The Charleston CPW is responsible for providing wastewater service to the City of Charleston and potable water service to nearly 400,000 residents of the Charleston Metropolitan Area. That potable water and sanitary wastewater systems are important lifelines for a metropolitan area is understood by some but is not fully appreciated by many until such services are interrupted, even for a short duration. Time does not permit a full description of the scope of operational problems encountered by the Charleston CPW during and after the hurricane, but four (4) major operational and infrastructural problems will be examined.

The first major problem that was experienced occurred at CPW's water treatment plant which is an 118 MGD "conventional" level water filtration facility located in the City of Hanahan. The high wind speeds made it impossible at the water treatment plant to properly flocculate and settle out water prior to filtration due to the effect of turbulence. (One of the engineers on CPW's staff stated that the sedimentation basins during the hurricane resembled the Atlantic Ocean.) This situation was further aggravated by the fact that the high-velocity winds re-suspended existing sludge which had been deposited earlier in the sedimentation basins. This in turn put a tremendous solids loading on the multi-media filters which meant an obvious decrease in

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the amount of water which could be processed through the water plant.

The second problem which was encountered which compounded the problem of reduced output of water at the treatment plant was ironically an increased water demand. There were a tremendous number of trees damaged by the high winds. Many of the damaged trees, especially the pines, simply snapped in two. But the stronger trees without the deep tap root system were often uprooted. The uprooting of trees produced nearly 1500 breaks in water mains and primarily water service lines of varying sizes. Damage to industrial and commercial buildings activated fire sprinkler systems. Therefore, with the decreased capacity at the water treatment plant due to the overloading of the filters and the increased demand on the water system, most of the water system pressure was lost early Friday morning. This reduced-pressure condition lasted for about two (2) days until such time as the water plant was able to "catch-up" in its ability to backwash filters and process sufficient water to meet water system demand. As water pressure returned, extensive sampling was conducted for possible bacteriological contamination as a "boil water" notice had been issued by the South Carolina Department of Health and Environmental Control in conjunction with the Charleston CPW as a precautionary measure. After not finding any contamination, the "boil water" notice was lifted late Monday afternoon.

The third problem which was encountered was actually a series of problems associated with the loss for a variety of reasons of electric power.

Both the water treatment plant and the Plum Island Wastewater Treatment Plant off James Island were without an external electric power source for nearly a week. This meant running both plants on diesel powered pumps and generators. In addition, approximately eighty (80) wastewater pump stations were without an electric power source which necessitated obtaining generators or pumping down the wetwells of those stations which received minimal flow, to minimize the discharge of untreated water to the environment.

The fourth major problem which was encountered occurred nine (9) days after the hurricane when a medicinal taste was detected in the finished water from the water treatment plant. Given the nature of the taste and preliminary analytical results, the contaminate was determined to be phenol which was at first suspected of being spilled from an industry in the drainage basin of

the raw water supply which was the Edisto River. However, sampling by CPW and the S.C. Department of Health and Environmental Control revealed the presence of phenols in the two major tributaries to the raw water source ruling out the likelihood of an industrial source. Instead, the sampling confirmed the speculation that the phenol levels were of a natural origin and were being leached from the literally hundreds of thousands of pine trees which had fallen over into the acidic black water swamps feeding the water supply.

To further confirm this theory, this process was modelled by CPW personnel who placed pine needles and bark in beakers of raw water. What was found was that phenolic compounds did in fact leach into the water at levels similar to what was found in the source water. Even though raw water phenolic levels were at or below 69 ppb which is well below health concerns, phenols become extremely aesthetically potent once chlorinated and can be detected by taste in concentrations as low as 2 or 3 ppb. After about ten (10) days, the problem gradually subsided. This last of the four major problems was unanticipated and emphasizes the need to expect unusual problems following disasters of such magnitude.