The Challenge of Aging and Submerged Pipes in Levees Due to Ohio River Pool Raises

Terry M. Sullivan, P.E., U.S. Army Corps of Engineers, Risk Management Center
William Puckett, P.E., U.S. Army Corps of Engineers, Louisville District
Jacob M. Nienaber, U.S. Army Corps of Engineers
Steven S. Spagna, P.E., U.S. Army Corps of Engineers, Huntington District

In many cities along the Ohio River, levee systems were constructed by the U.S. Army Corps of Engineers (USACE) in the 1940 to 1960 time frame following the devastating Flood of 1937. Typically, gravity storm water drainage pipes penetrate the levees, with accompanying closure devices. Many of the drainage structures used corrugated metal pipe (CMP). In the 1960 to 1980 time frame, USACE constructed a series of new so-called “High Lift” lock and dam facilities, with the result that the original 50 dams on the Ohio River were reduced in number to only 19. In many locations the construction of the higher dams resulted in a permanent and significant raising of the water level of the river adjacent to the levees. Where there was a significant pool level increase, it altered the hydraulic conditions of the storm water drainage structures that penetrated the levees. At some levee locations, USACE modified the drainage structures by raising the pipe elevations and properly removing or abandoning the original pipes to accommodate the change in pool level. However in many cities such forward thinking remedial action was not a responsibility accepted by the Government. As these submerged pipes have aged in the decades after the pool raises, they are generally minimally maintained, and proper inspection becomes challenging. The impacts of the failure of some of these submerged sewers may be significant, depending on the project location, the pipe sizes and the consequences for the communities involved. Thus levee owners and USACE are currently contending with some of these permanently submerged pipes. This paper will outline the extent of this phenomenon, discuss potential failure modes, the prediction of corrosion rates of submerged pipes, issues with underwater inspections, and will discuss possible remedial solutions to reduce the risk of potential failure. Several case histories will be presented which will demonstrate by example an important issue that may not be well understood by some levee owners.