

Assessment of Costs and Benefits of Detention for Water Quality Enhancement

Authors:

Scott M. Taylor, P.E.

Laura Hansen

Cathy Beitia

Disclaimer:

This work reflects the author's opinions and does not represent official policy or endorsement by the California Department of Transportation, the California State University, or the University of California.

Assessment of Costs and Benefits of Detention for Water Quality Enhancement

Scott M. Taylor, P.E.

Laura Hansen

Cathy Beitia

Abstract:

The California Department of Transportation (Caltrans) has initiated a four to five-year study in two Districts (Los Angeles and San Diego, California) to examine the benefits, technical feasibility, costs and operation and maintenance requirements of retrofitting extended detention facilities into existing highway and related infrastructure. Five locations are being retrofitted with extended detention that have varying watershed areas and basin design parameters. Automated monitoring stations have been installed at each site upstream and downstream of the BMP to assess constituent removal. Constituents monitored in the runoff include: suspended solids (e.g., sediment), metals, nutrients, and organics (e.g., gasoline). Detailed records are also being kept for maintenance and operations requirements. To date the projects have been sited, designed, constructed and monitored (for three years). A comprehensive operation and maintenance program is in place to ensure the detention basins operate at peak performance. Sampling results show average suspended solids removal was 73%, total metals removal varied between 61% and 75%, while dissolved metals removal varied between 16% and 44%. Removal was lowest for nutrients, especially nitrate, which was about 17%. The constituent removal efficiency for a concrete lined basin showed generally lower removal rates. A focus of the study is on determining the unique problems and solutions to those problems that occur with structural BMP retrofit relative to construction, operation and maintenance. Operation and maintenance requirements have been tracked. It appears that major maintenance of the basin (removal of sediment) will be required on average about every 10 years. Other program elements include vector monitoring and biological (endangered species) monitoring. This paper examines the feasibility of using detention for water quality enhancement for new construction, but with emphasis on retrofit construction, and design parameters that appear to enhance performance based on the field sampling results and the long-term operation and maintenance costs of this technology.