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Design and Permitting Challenges of Highway Constructed Treatment Wetlands

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DESIGN AND PERMITTING CHALLENGES OF HIGHWAY CONSTRUCTED TREATMENT WETLANDS

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ABSTRACT

Over the past several years, the California Department of Transportation (Department) has initiated a number of pilot projects to assess the performance and applicability of various storm water Best Management Practices (BMPs). Included in the list are constructed treatment wetlands and wet detention basins. In the fall of 2001, the Department initiated a multi-year pilot study to design, construct, and investigate the water quality performance of one constructed treatment wetland and one wet detention basin in southern California as part of a storm water BMP retrofit project. The two study sites have the potential to provide habitat for two species of concern: the southwestern willow flycatcher and the least Bell's vireo. In addition, the sites are located adjacent to a Native American burial ground. Each BMP will be installed with automated samplers at influent and effluent points. Water quantity and quality data from flow-composite samples of storm water runoff will be collected and evaluated during representative storms over a three-year period.

In general, a constructed treatment wetland and a wet detention basin are designed with a permanent pool of water with varying depths and vegetation coverage. Additionally, both of these BMPs rely on physical, biological, and chemical processes to remove pollutants from storm water runoff. Sedimentation processes remove particulates, organic matter, and metals. Biological uptake removes dissolved metals and nutrients. Chemical processes include chelation, precipitation, and adsorption. The collection and storage of storm water runoff is important to help reduce the erosive potential and to allow soil particles to settle.

This paper presents a lessons learned discussion on: (a) the design methodologies used for the constructed treatment wetland and the wet detention basin; (b) the federal, state, and local permitting challenges for deploying both BMPs; and (c) construction challenges. A literature search was conducted to identify design guidelines for both BMPs currently used by practitioners. The pilot sites incorporate design recommendations from available literature on sizing, configuration, terrain-fitting, and vegetation selection. Consultation was made with a number of agencies to discuss potential issues which may develop during construction and future maintenance of the BMPs. Consultations with the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Game, California Department of Health Services, the Juaneño Band of Mission Indians, and the Gabrielino/Tongva Tribal Council were required before the BMP designs could be completed.

Key Words: constructed wetland; water quality; BMPs; storm water; treatment wetlands