**Equestrian Stormwater Management in Orange County, California**

D.A. Apt1\*, C. Kuchinke1\*, B. Parks1

*1Olaunu, 940 Avenida Presidio, San Clemente, CA 92672, USA*

*\*Corresponding author emails:* *dapt@olaunu.com**; ckuchinke@olaunu.com*

# Highlights

* Development of stormwater management plans for equestrian facilities
* The challenges associated with equestrian stormwater management
* The use of source controls and green infrastructure at equestrian facilities

# Introduction

Equestrian facilities in Orange County, California or experiencing increasing regulation from regulatory agencies and increasing scrutiny from environmental groups regarding stormwater management. Olaunu is currently assisting several equestrian facilities in Orange County, California that are facing these challenges. This presentation outlines the process in the planning and identification of existing and proposed stormwater Best Management Practices (BMPs) at several equestrian facilities to ensure contaminated stormwater is not discharged from the equestrian sites into the surrounding natural environment through the development of stormwater management plans. The BMPs within the stormwater management plans consist of non-structural source controls and structural stormwater measures. These BMPs are specifically designed to control and treat pollutants associated with equestrian facilities, which include bacteria, sediment, phosphorus, nutrients, and toxic compounds. The presentation will include some discussion of the sources of these pollutants including manure, urine, soiled beddings, and chemicals used during horse grooming and in horse living areas. Wash water is also a concern from equestrian facilities that in addition to stormwater can mobilize these pollutants. The presentation will outline the challenges equestrian facilities face, the process in the development of the stormwater management plans, and the specific BMPs identified within these plans.

# Methodology

Olaunu has developed stormwater management plans for several equestrian facilities in Orange County, California. The development of these plans begins with a site visit and a conversation with the site owner about the operations of the equestrian facility, both of which will help to identify the potential pollutants of concern. The next step in the methodology is to gather any other relevant information from the equestrian facility such as as-builts, geotechnical information, or other relevant information and identify what information is needed. Next information needed is gathered which could include 1) geotechnical borings to identify percolation rates for the site area; 2) survey of the site to identify site elevations; 3) and aerial photography with the use of drones for exhibits.

The next steps are to identify the appropriate source control BMPs for the facility based on the facility operations and configuration and to perform a planning level analysis for the integration of structural stormwater measures. Source control BMPs specified are consistent with the Equestrian-Related

Water Quality Best Management Practices guidance document developed for Orange and San Diego Counties (Cooperative Effort, 2004). The planning level analysis includes the delineation of drainage areas on the site and the identification of containment or production areas (e.g. stables, wash down areas) which are the areas that have the highest concentration or pollutants. Once the delineation of drainage area is complete the planning level analysis includes the identification of the location, type of structural storm water measure, and initial sizing of the structural stormwater measures for each drainage are identified. Structural measure types could include bioretention, infiltration systems, biofiltration, stormwater capture and use, or other types of BMPs. The identification of which types of structural BMPs will be implemented are site specific and based on the conditions at the site.

The next step in the development of the equestrian stormwater management plans is the development of concept designs for the structural stormwater BMPs as well as an engineer’s cost estimate for each of the structural stormwater BMP locations. Concept designs include the identification of utilities, structural stormwater BMP footprint, drainage area to the BMP, and structural stormwater BMP sizing. BMP sizing is an element of ongoing coordination with the regulatory agencies as the regulations are not clear on the design storm for equestrian facilities. The regulatory challenges for equestrian facilities will be explored in the presentation. The next step in the methodology is compilation of the stormwater management plan with all of the aforementioned information and coordination with the regulatory agencies which includes the municipality, the Regional Water Quality Control Board, and potentially the US Army Corp of Engineers, and the California Department of Fish and Wildlife if discharging directly to a water of the state or water of the U.S.

Once the stormwater management plans are finalized base don coordination with the regulatory agencies, implementation of the non-structural BMPs commences and design of structural stormwater facilities can commence. Design plans are developed that serve as construction documents for the structural stormwater BMPS for the equestrian facility. Design plans are developed for 30%, 60%, 90%, and 100% design submittals for the project. Review and input will be provided on each submittal and modifications will be made for the subsequent submittal usually form the City. Construction oversight is provided to ensure that projects are constructed per the design plans.

# Results and discussion

The result of Olaunu’s development of equestrian stormwater management plans is a stepwise process to integrate the appropriate non-structural source control BMPs and structural stormwater BMPs with coordination and approval of the appropriate regulatory agencies. Equestrian facilities pose many challenges for stormwater management including sizing, sediment, horse operations, regulatory issues, and others that will be explored in the presentation. This process has resulted in effective stormwater management plans that help to protect and improve the water quality in downstream receiving waters in Orange County.

Conclusions and future work
Olaunu’s process for developing equestrian stormwater management plans provides the following:

* A stepwise process for the evaluation and development of stormwater management plans tailored for each specific facility and their operations
* A process for communication and collaboration with the equestrian facility regulatory agencies
* A pathway for future compliance with equestrian stormwater regulations

Olaunu’s future work will likely include assistance with implementation of the equestrian stormwater management plans including structural stormwater BMP design, construction, operation and maintenance, and potentially monitoring. Additionally, Olaunu’s work will be ongoing discussions with the regulatory agencies regarding appropriate regulation of equestrian facilities and related sizing of structural stormwater BMPs.

# References

Cooperative Effort. 2004. Equestrian-Related Water Quality Best Management Practices <https://www.americantrails.org/images/documents/Equestrianwatermgmt.pdf>