# Chapter 3: Hydraulic Analysis of Walnut Cove Wetland Cells

## Abstract

The Walnut Cove Treatment Wetlands were, like many constructed wetlands, built assuming the two wetland cells would act as plug flow reactors that utilize the entire wetland design volume. However, hydraulic inefficiencies resulting from stagnant pools, physical blockage, and preferential flow paths can result in only a portion of the wetland design volume being used. To understand the internal hydraulics of the site and evaluate the effect of the wetland clean out on wetland hydraulics, several tracer tests were conducted at the site using Rhodamine WT dye. 5 tracer tests were conducted in wetland cell 1 and 4 tracer tests were conducted in wetland cell 2, for a total of 9 tests. In cell 1, 2 of the tracer tests were conducted pre-cleanout and 3 were conducted post-cleanout. The tails of all tracer tests were extended past the last sample to approximately 2tn using an exponential decay curve fit to the recession limb. The tracer tests were analyzed using both the method of moments and by fitting a gamma probability distribution function. The hydraulic performance of the wetlands were compared using λe, τ10, and σ2 as recommended in Liu et al (2020). Cell 1 jumped from average λe, τ10, and the Morril index values of to values of , respectively, after detritus removal. Cell 2 remained constant at values of to values of , respectively, after detritus. It can be concluded that the detritus removal substantially improved the hydraulic performance of wetland cell 1.

## Introduction

Tracer tests

## Methods

Trapezoidal integration