

EVALUATION OF ANTHROPOGENIC IMPACTS ON THE FLOW OF TWO
COASTAL SPRINGS IN MAUNALUA BAY, SOUTH SHORE, O`AHU

A THESIS SUBMITTED TO
THE GLOBAL ENVIRONMENTAL SCIENCE
UNDERGRADUATE DIVISION IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE

IN

GLOBAL ENVIRONMENTAL SCIENCE

MAY 2011

By
Joseph J. Kennedy

Thesis Advisors

Craig R. Glenn
Henrieta Dulaiova

Abstract

Groundwater discharge has long been known to fringe O`ahu's south shores as springs and beach seeps, with many examples sporadically described since the early works of Stearns and Vaksvik (1935). Hawaiians have used these freshwater resources for centuries, primarily for creating brackish water environments that formed the setting for many of the fishponds that were found throughout the islands. Coastal development over the years has impacted these unique aquaculture practices and left most in ruin. The road widening project of Kalaniana'ole Highway in 1993 effectively severed all flow of water from the freshwater conduit that fed one of the last remaining fishponds on O`ahu, Lucas Spring, and allowed an estimated 1 million gallons of groundwater per day to infiltrate into an adjacent sewer line damaged during the construction. The proposed rehabilitation project of the sewer line in 2010 created a unique opportunity to study the possible restoration of groundwater flow to Lucas Spring. Continuous radon measurements combined with a salt mass-balance approach was used to determine groundwater flow rates into the impacted Lucas Spring, as well as in Kanewai Spring, which was selected as a comparison site. Over the course of this study, groundwater discharge to Lucas Spring increased from less than $1 \text{ m}^3 \text{ day}^{-1}$ to $\sim 140 \text{ m}^3 \text{ day}^{-1}$ and the volume of water increased from $\sim 8 \text{ m}^3$ to $\sim 190 \text{ m}^3$ with no effective change in the nearby comparison spring. Although a spring discharge of $140 \text{ m}^3 \text{ day}^{-1}$ only represents $\sim 20\%$ of the historic flow, it is still a significant improvement over the prior decades' average flow when the pond was almost completely dry.