THE HISTORIC WATER BUDGET OF THE EWA PLAINS SECTOR OF OAHU, HAWAI'I

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ABSTRACT

The Ewa Plains sector of Oahu is a burgeoning social and economic region of Hawai'i, and is quickly becoming a secondary urban center, behind Honolulu. Land use changes are expected to create a significant increase in water demand in the future. A comprehensive water budget calculated over four sequential time periods is used to map how land use changes over time have affected water use. The water budget used in this study assumes precipitation + irrigation = runoff + evapotranspiration + recharge, and is calculated for pre-development, mid 1950s, modern (2000), and future 2015 time periods. A constant precipitation amount of 115.0 mgd is assumed over each period. In the pre-development time period, runoff equaled 7.2 million gallons a day, recharge 17.6 mgd, and evapotranspiration 90.3 mgd. Irrigation amounts of 171.6 mgd were required in the area as sugarcane cultivation was introduced in the mid 1950s time period. Runoff rose to 8.9 mgd, and the large irrigation requirements in the mid 1950s caused recharge to climb to 143.2 mgd. In relation to the large increase in irrigation, evapotranspiration also increased to 134.1 mgd in the mid 1950s. With the change from a plantation land use, to a more urban land use, the modern time period showed a much lower irrigation value of 11.3 mgd, a noticeable decrease from the mid 1950s. A recharge of 26.0 mgd and evapotranspiration of 86.7 mgd were found, as runoff largely due to urbanization, rose to 13.5 mgd in the modern time period. A projected increased irrigation requirement of 25.4 mgd was calculated for the 2015 time

period, consistent with the trend of continued urban growth along with the expansion of parks and golf courses. The increased irrigation in the 2105 time period leads to an increased runoff of 15.7 mgd, evapotranspiration of 93.3 mgd, and a recharge of 31.4 mgd. The Ewa area receives its domestic water supply primarily from water pumped from the Ko'olau basal aquifer. This aquifer supplies much of the water for southern Oahu (Mink, 1980). However, the Ewa area is consuming more than its fair share. Current water demands already exceed the recharge the area naturally receives by over 60%, and by the year 2015 water consumption in the area is expected to increase almost another 50%.