

**INTRODUCTION**

Increasing demand for freshwater in Hawaii has placed heavy stress on some of the State's basal aquifer systems. The most heavily stressed of these systems is the Pearl Harbor aquifer on Oahu. In 1975, 65 percent or 232 million gallons per day of all the ground water used on Oahu was withdrawn from this source (Nakahara, 1978).

In order to protect these basal aquifers from deterioration, the State enacted a Ground Water Use Act in 1959. Under this Act, the State Board of Land and Natural Resources is authorized to conduct investigations, to collect data on the ground-water resources, and to designate areas where the ground water must be regulated, protected, and controlled.

The U.S. Geological Survey has a continuing program in cooperation with the State of Hawaii, Department of Land and Natural Resources, to collect, analyze, and interpret ground-water data within the State. Under this program, the State has requested the U.S. Geological Survey to prepare status reports for areas that have potential problems. This report, on the Pearl Harbor area, is the first in this series.

This study, and those for the other problem areas, consists of the following tasks:

1. Review and compile the available ground-water data.
2. Select representative wells for head and chloride-concentration measurements, so that the present ground-water conditions can be depicted.
3. Make two mass measurements of water level, and collect water samples for chloride determination.
4. Prepare water-level contour maps and equal-chloride concentration maps using the data collected during the mass measurements and supplemental data, and compare these maps with others prepared previously.
5. Present the data summaries in a report.

This report is largely a graphic summary of ground-water data for the Pearl Harbor area through 1977. It consists of three sheets, each having a map of the area, a short explanatory text, and graphs presenting data on pumpage, chloride concentrations, and ground-water levels.

Sheet 1 shows the basal ground-water discharge trends. Sheet 2 shows trends in the chloride concentration of basal water.

Sheet 3 shows the basal-water head trends and head contours.

Records of spring discharge, pumpage, water levels, and chloride concentrations used in this report are available in the files of the Hawaii District, U.S. Geological Survey, Honolulu, Hawaii.

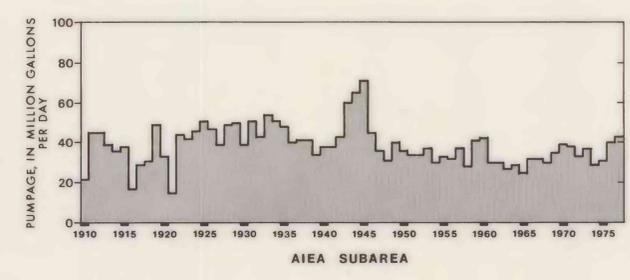
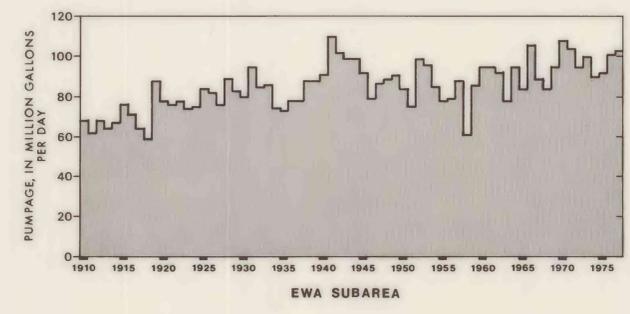
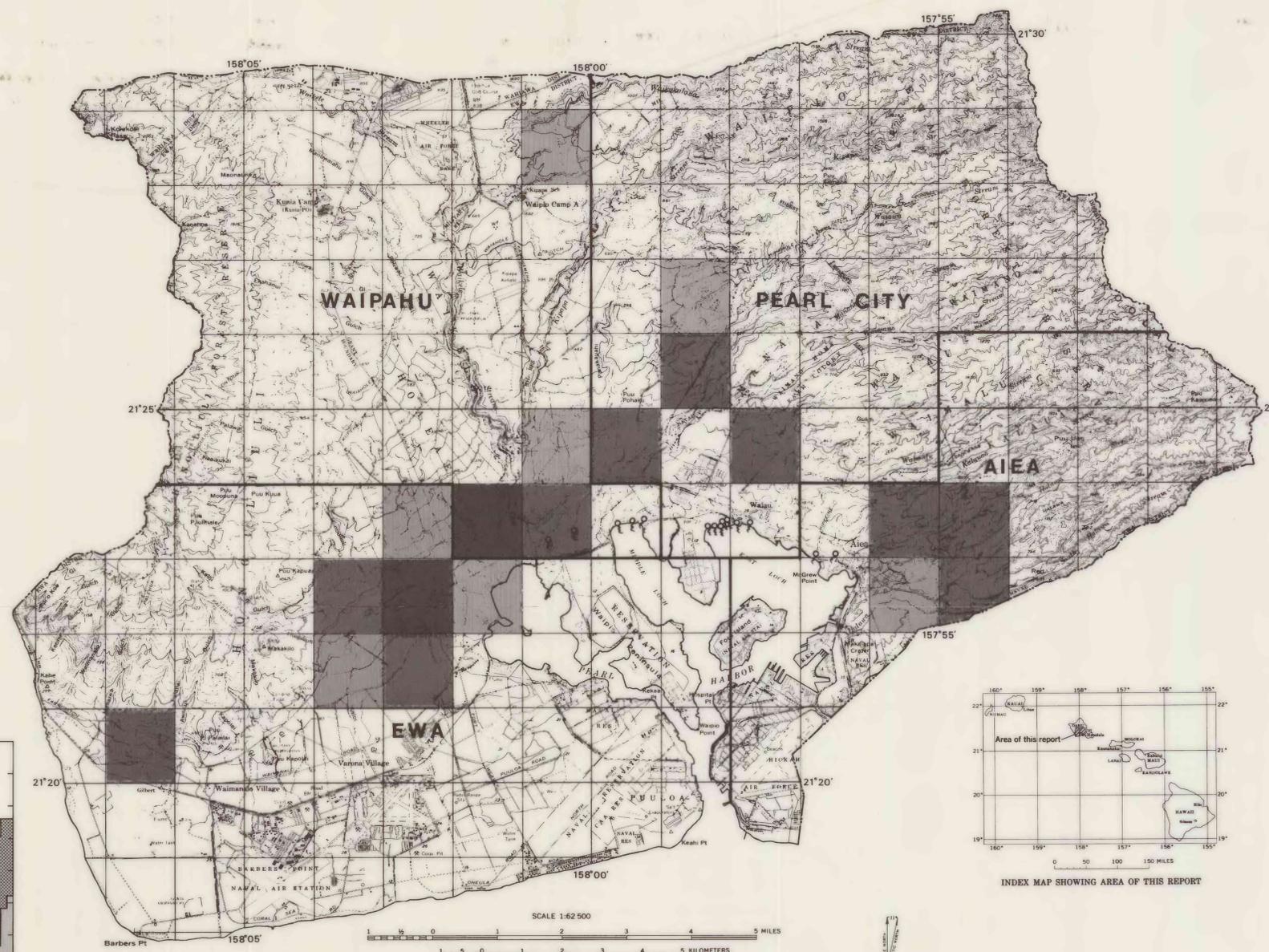
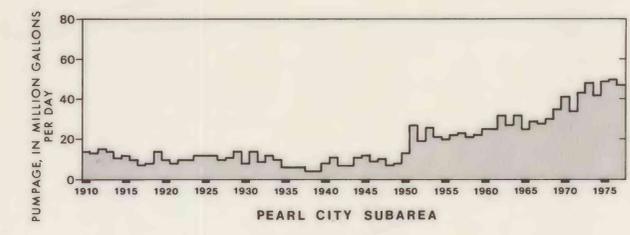
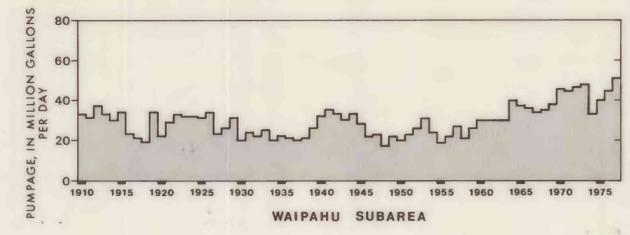
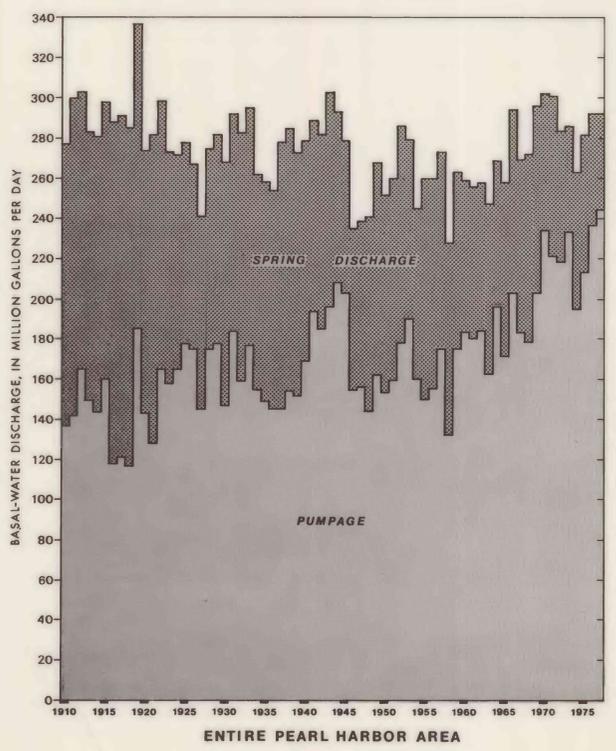
**PREVIOUS STUDIES**

The Pearl Harbor area has been the subject of several previous investigations. Stearns and Vaskvik mapped the geology of Oahu and made the first systematic interpretation of hydrologic data (Stearns and Vaskvik, 1935, 1938; Stearns, 1939). Wentworth (1951) made an intensive study of the ground-water resources of the Honolulu-Pearl Harbor area. Southern Oahu was studied by Visher and Mink (1964), who concentrated on the basal ground water. Dale (1967) documented land-use changes in the Pearl Harbor area and their relationship to the basal water. Dale and Ewart (1971) documented the changes that had taken place in the basal-water system between 1910 and 1970.

These references describe the occurrence and mechanics of the basal-water system in the Pearl Harbor area, and the reader is referred to these reports for background information.

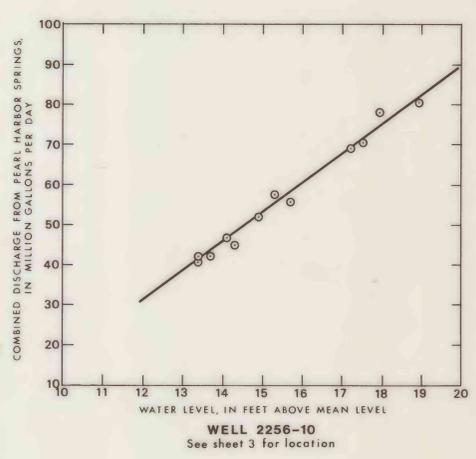
**ACKNOWLEDGMENTS**

The Honolulu Board of Water Supply provided invaluable assistance during the field work for this study by measuring heads and collecting water samples at their facilities in the Pearl Harbor area.



**BASAL GROUND-WATER DISCHARGE**

The two major components of basal ground-water discharge in the Pearl Harbor area are (1) pumpage from drilled wells and shafts, and (2) discharge at springs and flowing wells. As computed, and shown on this map, basal ground-water discharge includes all measured, recorded, and computed discharge from wells, shafts, and springs in the area. Some small household supplies and flowing wells are not monitored, but these are not deemed significant. Pumpage records from wells and shafts were supplied by the owners. The numerous springs in the Pearl Harbor area are located around the inner perimeter of the harbor from Aiea to Waipahu and are known collectively as the Pearl Harbor Springs. Because spring discharge is a direct function of the freshwater head, the annual discharges from the Pearl Harbor Springs can be estimated by correlating water levels in wells with spring-flow measurements. This was shown for individual springs by Visher and Mink, 1964. The line graph on this sheet shows the correlation used for estimating the annual discharge of the Pearl Harbor Springs on the basis of the altitude of the water level in well 2256-10.



The Pearl Harbor area has been divided into four subareas, corresponding to those used by Dale and Ewart (1971), to show trends in pumpage. Each subarea has at least one key well with a long-term record of basal-water head. A further division of the total area into 1-minute (latitude and longitude) square blocks was made to show the distribution of pumpage within the subarea.

Total annual basal-water discharge from wells and springs in the Pearl Harbor area has been remarkably steady since 1910. However, annual pumpage from wells has increased from about 140 Mgal/d in 1910 to about 240 Mgal/d in 1977. The sharpest increase in pumpage has occurred since about 1960. Correspondingly, spring discharge has declined from about 140 Mgal/d in 1910 to about 50 Mgal/d in 1977.

The pumpage in the Aiea and Waipahu subareas has not changed significantly since 1910. Ewa subarea pumpage has shown a slow and steady increase over the years and has always been pumped more heavily than the other subareas. Pumpage in the Pearl City subarea, on the other hand, has increased fivefold since about 1950.

- EXPLANATION**
- 1977 pumpage within each one-minute grid square
  - Less than 2 million gallons per day
  - 2 to 5 million gallons per day
  - 5 to 25 million gallons per day
  - More than 25 million gallons per day
  - Spring (measured)
  - Basin boundary

**GROUND-WATER STATUS REPORT, PEARL HARBOR AREA, HAWAII, 1978**

By  
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