

Kalihiwai Reservoir Bathymetry Study

Prepared for James Bray



AquaTechnex, LLC

PO Box 30824
Bellingham, WA 98228
360-527-1271

www.aquatechnex.com
www.pomilfoil.wordpress.com

Introduction

Aquatechnex, LLC (www.aquatechnex.com) was contacted by members of the Kalihiwai Ridger Community Association in the winter of 2009 regarding our bathymetry mapping services. That community had recently undergone an inspection of the Kalihiwai Reservoir, by a consultant for the State of Hawaii.

Kalihiwai Reservoir was originally constructed by agricultural interests in the 1920's to collect and supply irrigation water to downstream users and farmers. Over time, the shoreline of the lake was developed and there is now a lakeside residential community present on the shoreline. The primary beneficial uses of the reservoir at this point are recreation and fishing for the homeowners of the Association.

The failure of the Kaloko Reservoir in March of 2006 put the spotlight on these types of lake systems. During that event, the dam breached and the downstream rapid release of water caused extensive property damage and loss of life. The State of Hawaii mobilized to investigate similar constructed dams/reservoirs in a move to protect the public safety.

As part of that effort, Klienfedler (an engineering consultant) was contracted to visit and report on the condition of a number of reservoir systems in the Islands. Their report on Kalihiwai Reservoir was published in April of 2009. Members of the Community Association were concerned about some of the data presented in that report as they move to insure the stability of the dam at this location. Particularly, the water storage volume number presented in this document appeared to the Community to be high. This has a bearing on efforts that will be required to be undertaken to insure dam safety.

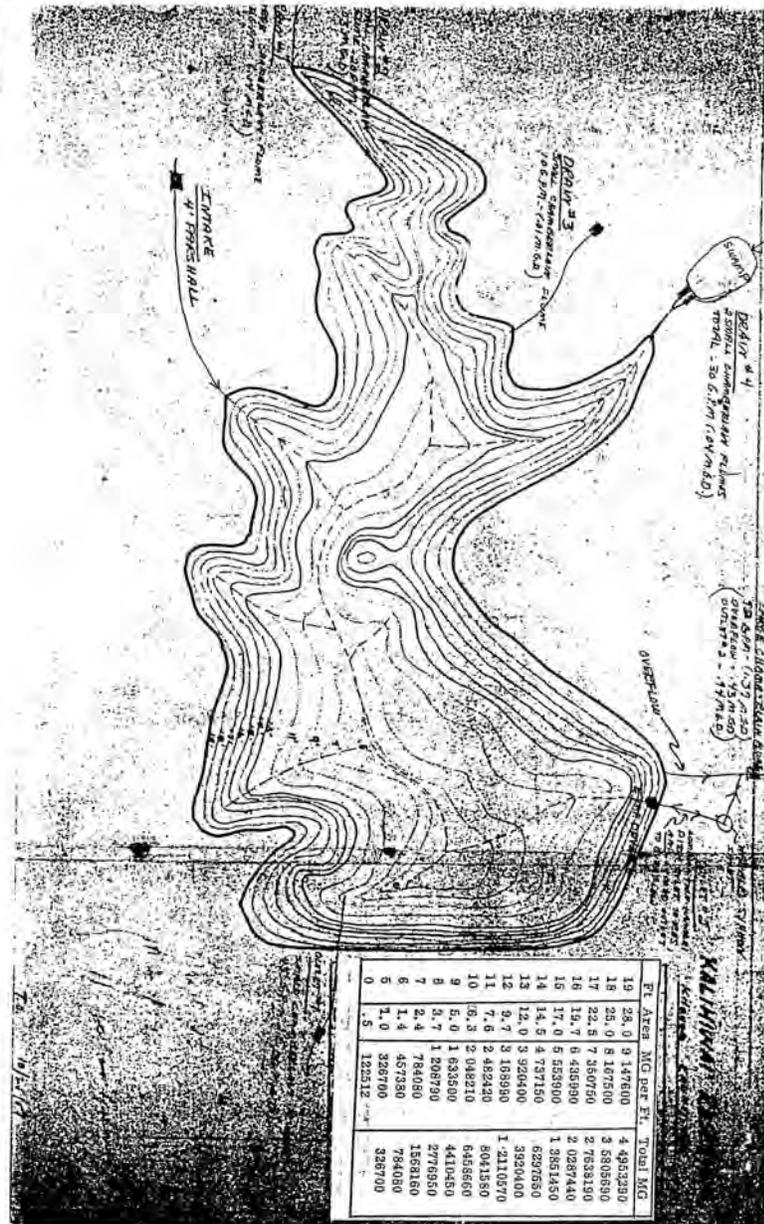
Aquatechnex was asked to perform a bathymetry mapping program and calculate the water volume stored in the lake. It had been many years since that type of operation has been performed and it was suspected that the lake did not have the storage capacity that was reported in the Klenfelder report. This document presented the Reservoir capacity at normal storage of 278 acre feet or 90.6 Million Gallons of water.

Our team mobilized in April of 2009 to perform that mapping effort.

Methods

On March 31st, our team mobilized to the Kalihiwai Reservoir and prepared to conduct a bathymetry mapping study of the lake.

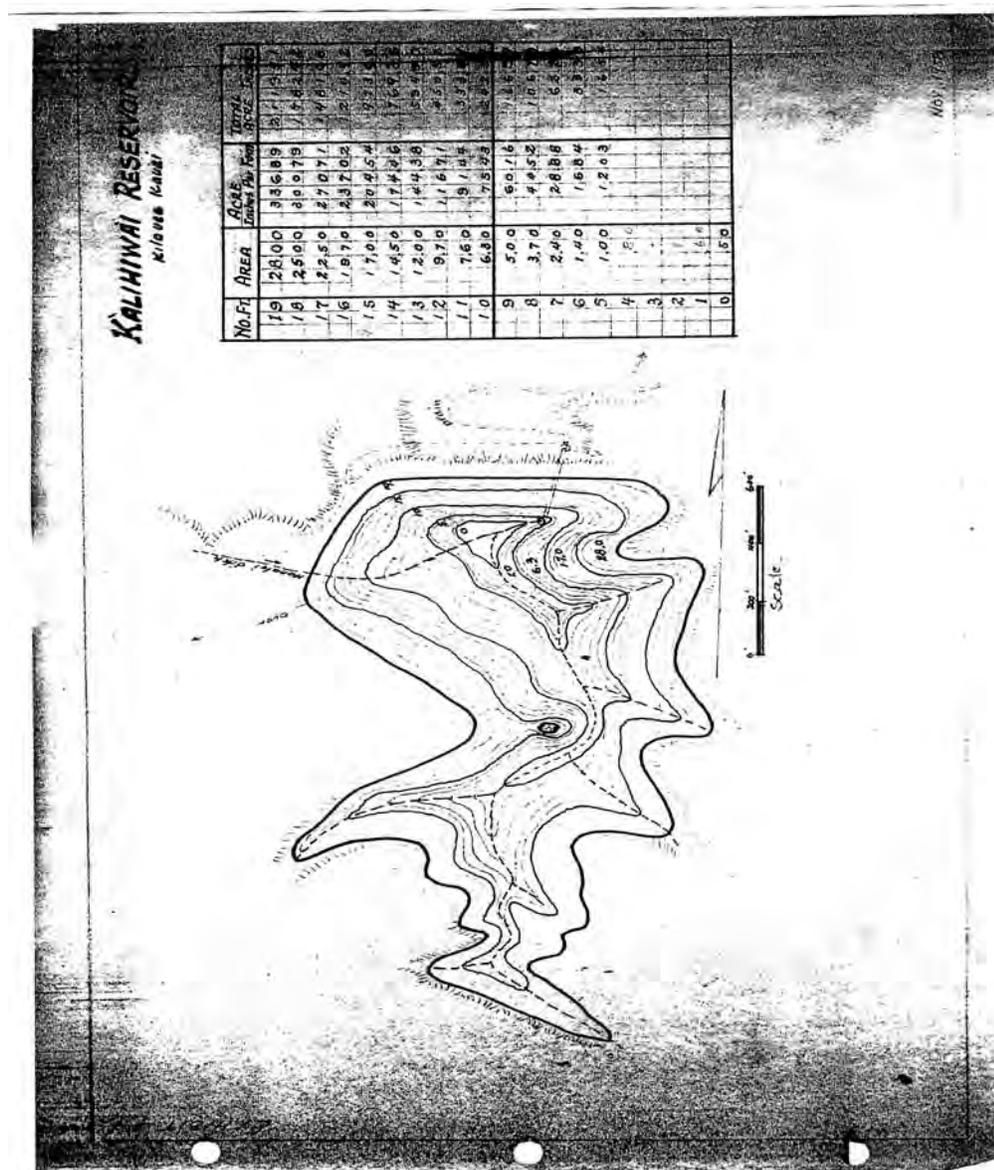
Our team's first step was to review currently available maps of the lake to understand the basic contours of the system.



Early Bathymetry map of Kalihikai Reservoir. The lake volume information presented here matches the information presented in the Kleinfelder report.

The first map we viewed showed water volume information calculated for each one foot layer presented on the map. This information matches the information presented in the report we reviewed regarding water volume. As this map is dated, additional sedimentation and infill of the reservoir that would have naturally occurred over time would not have known. A

second map was also available for review to understand the shape and structure of the lake bottom.



A second map was available for our review and use

Our team secured a mapping vessel from members of the Community Association. This vessel was configured with our bathymetry mapping equipment transported to the site.

Aquatechnex is a member of The Mapping Network (www.themappingnetwork.com). This organization has developed an extremely accurate methodology for mapping lake and reservoir systems.

This technique has been deployed successfully by our team on a number of occasions for similar studies. The key components of this system are the equipment and the protocols used to conduct bathymetry mapping operations.

The bathymetry mapping system we deployed to the lake combines GPS and hydroacoustic measuring equipment to collect depth points at exact locations. This information is then processed in 3D modeling software and maps are created.

The GPS receiver used is a Trimble GeoXH with an external Zephyr external antenna providing decimeter accuracy. The antenna is mounted directly over the hydroacoustic transducer and the receiver is programmed to record a GPS location and depth sample every two seconds as the mapping vessel moves across the lake surface. The hydroacoustic mapping system has accuracy of better than 1/10th of an inch vertically in the water column.

The mapping vessel protocols call for two complete laps of the reservoir shoreline to establish the slope of the inshore areas at approximately the 3 and 6 foot contours. After those passes are completed, the team transitions to mapping straight line transects across the reservoir surface.

This mapping mission performed on April 1st. The system collected 10,509 depth samples during the course of the mission along transects developed.

At the end of the mission, the mapping equipment is transported back to our facilities, the data downloaded and processed. Trimble Pathfinder software is used to provide any differential correction necessary. The data is then exported to 3D modeling software. Using the points and information collected on the lake, this software builds an extremely accurate representation of the lake bottom. This data is then used in ArcGIS mapping software to create display maps for the project and to calculate statistics and other information of interest.

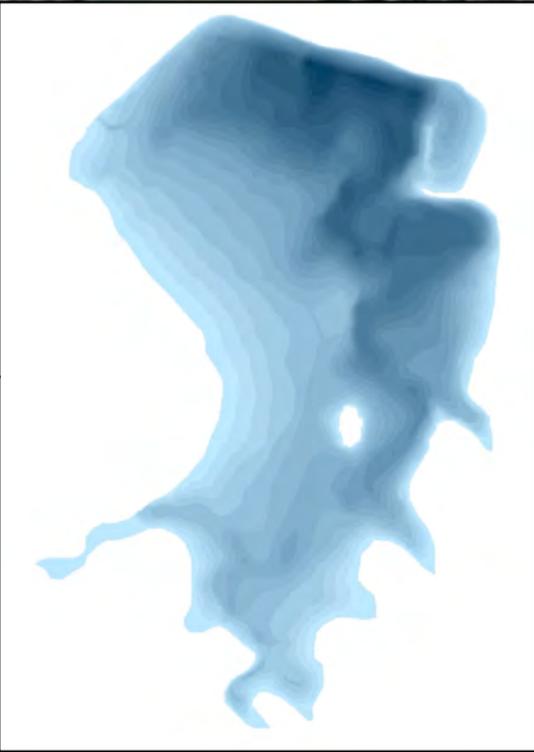
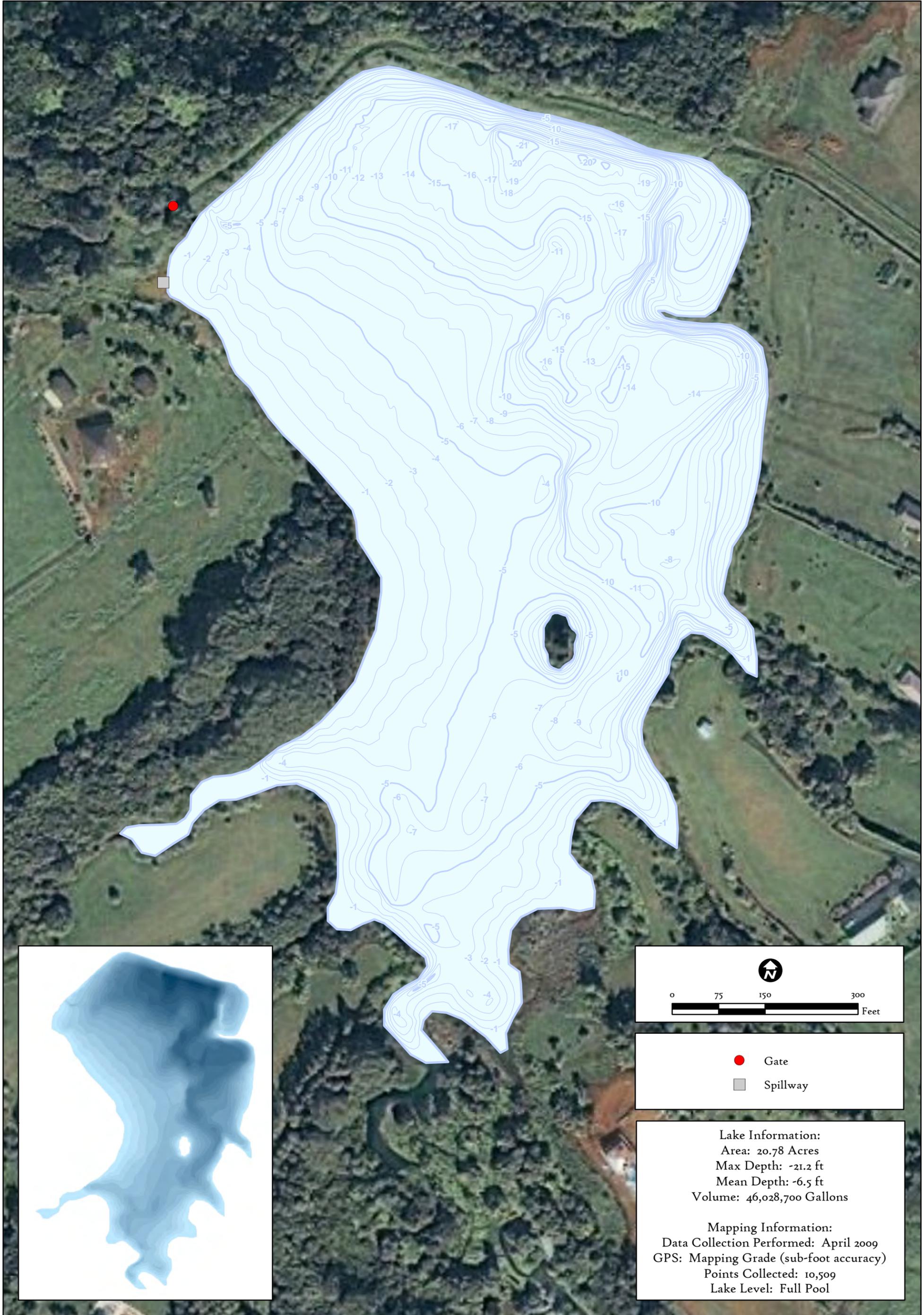
Results

The objective of this mission was to provide the Community Association members with current information on the storage capacity of this lake. We have presented two maps with this report that summarize the information collected and the current conditions of the lake.

The first map presents the current lake contours and conditions.

The lake surface area is calculated to be 20.78 acres. This mapping effort was undertaken at full pool. The lake water volume was calculated to be 46,028,700 gallons or 141.19 acre feet. The information presented in the Kleinfelder Study was (normal storage) 90,600,000 gallons or 287 acre feet. Notes in that document indicate that this data comes from "C122, Dams within the Jurisdiction of the State of Hawaii, September 1998.

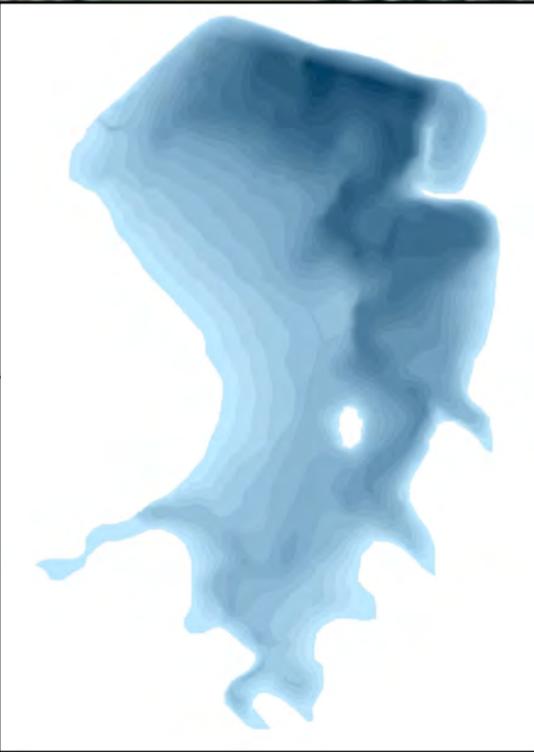
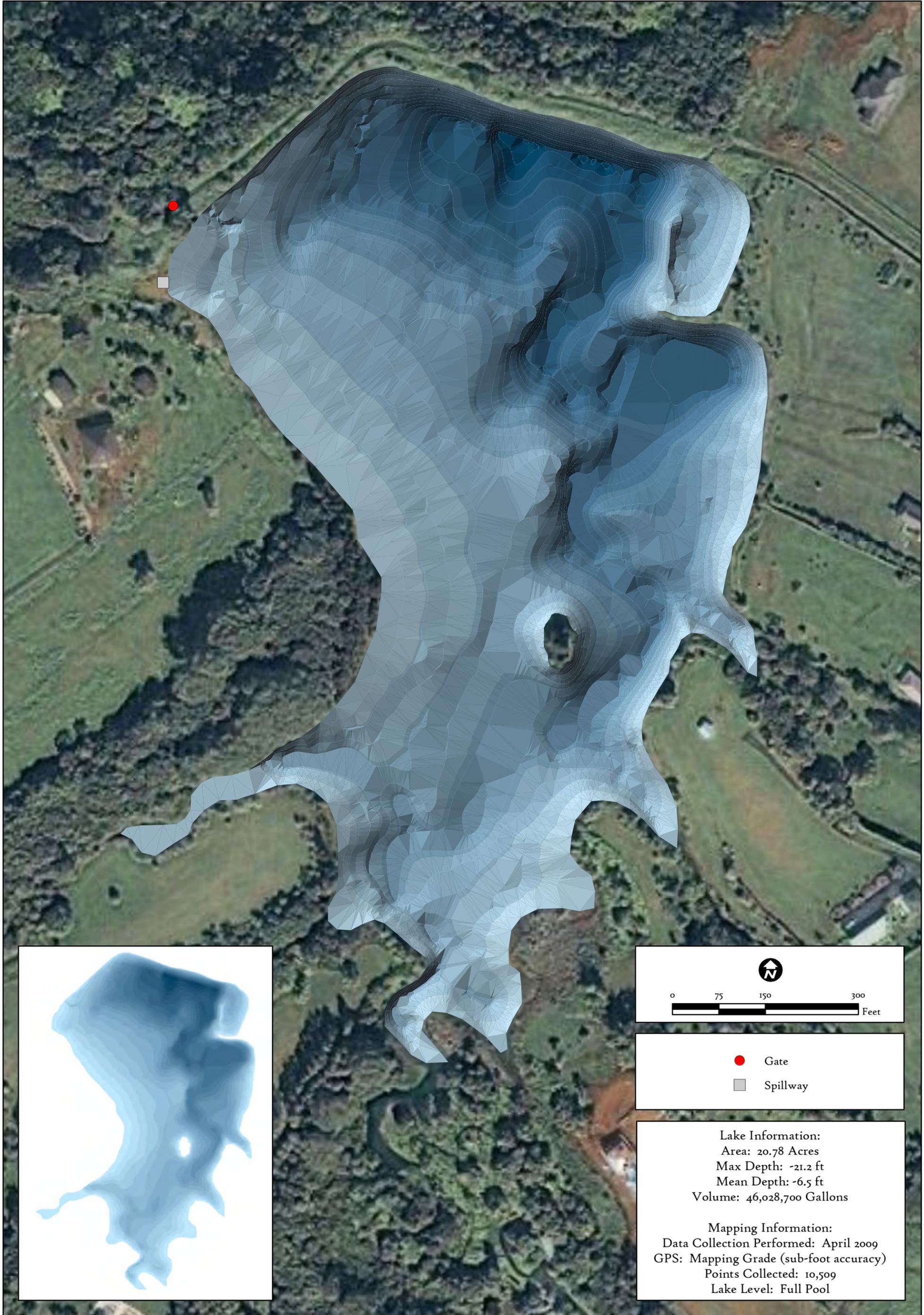
This is a significant difference, State records indicate this reservoir stores significantly more water than actual conditions as of April, 2009 would allow for.



- Gate
- Spillway

Lake Information:
 Area: 20.78 Acres
 Max Depth: -21.2 ft
 Mean Depth: -6.5 ft
 Volume: 46,028,700 Gallons

Mapping Information:
 Data Collection Performed: April 2009
 GPS: Mapping Grade (sub-foot accuracy)
 Points Collected: 10,509
 Lake Level: Full Pool



- Gate
- Spillway

Lake Information:
 Area: 20.78 Acres
 Max Depth: -21.2 ft
 Mean Depth: -6.5 ft
 Volume: 46,028,700 Gallons

Mapping Information:
 Data Collection Performed: April 2009
 GPS: Mapping Grade (sub-foot accuracy)
 Points Collected: 10,509
 Lake Level: Full Pool