HYDROLOGIC FEASIBILITY ANALYSIS FOR THE TOLAY LAKE RANCH PROPERTY
Sonoma County, California

Prepared For:

Sonoma County Agricultural Preservation & Open Space District

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December 2003

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EXECUTIVE SUMMARY

A hydrologic feasibility analysis was completed to evaluate a suite of potential restoration alternatives under existing watershed land-use practices and existing/future water demands (in the form of existing water rights/applications). This analysis consisted of developing a detailed water budget model to simulate alternative restored lake inundation areas and depths under median and dry year conditions as well as a 50-year historic period (1947-1997) displaying highly variable rainfall and runoff supplies.

Three lake restoration alternatives were evaluated based on existing topography and likely historic lake configurations. The restoration alternatives include lakes with storage volumes equivalent to 136-, 1100-, and 2550-acre feet. The outline of the maximum lake size for each alternative is presented on Figure 10. The 136-acre feet alternative is assumed to represent the area of sustained ponding under existing site conditions without active pumping to evacuate standing water. The 2550-acre feet lake configuration is controlled by the upper elevation of the existing downstream drainage divide while the 1100-acre feet scenario provides a meaningful evaluation of an intermediate alternative equal to the existing Cardoza water right application volume.

Results of the hydrologic feasibility analysis indicate an excellent opportunity for restoration of Tolay Lake under the conservative existing land- and water-use conditions. Median year-type water budget results indicate a maximum sustainable lake size approaching 1100-acre feet. Regardless of alternative, the restored lake will display a highly variable size and depth throughout the year, behaving more similar to a vernal pool-type system than perennial lake/reservoir. Water budget results for the 50-year simulated period indicate that the restored lake will be dry 62-percent of the time under the 136- ac ft alternative, 22-percent of the time under the 1100-ac ft alternative, and 11-percent of the time under the 2550 ac ft alternative.

A major control over the maximum sustainable lake size is upstream water rights, which potentially lay claim to approximately 35-percent of median year runoff to the lake and 93-percent of dry year runoff to the lake. Even under the smallest (136-ac ft) Tolay Lake restoration alternative, water budget results indicate that downstream water rights will be satisfied only around 50-percent of the time.

A number of potential constraints on Tolay Lake restoration were identified during implementation of the feasibility analysis, including:

- Flooding of adjacent (upstream) properties;
- Need for enlarged lake outlet works/spillway;
- Disturbance of archeological/cultural resources;
- Impacts to existing/future water rights;
- Changes in downstream ecological habitat water supply; and
- Potential increase in downstream flood hazards.

1.0 INTRODUCTION

1.1 Objectives of Study

The purpose of this report is to present the results of hydrologic analyses completed by Kamman Hydrology and Engineering, Inc. (KHE) for the Sonoma County Agricultural Preservation & Open Space District to evaluate the feasibility for restoration of Tolay Lake on the Cardoza family property in Sonoma County, California. The primary objectives of this analysis included:

- Characterize and describe the physical and hydrologic conditions of the Tolay Lake basin and the dominant processes controlling the movement and storage of water in the basin;
- Identify current/future water availability for Tolay Lake restoration in the form of a detailed water budget that accounts for major supplies and demands within the watershed;
- Delineate the historic lake configuration/size and lake outfall location; and
- Identify and evaluate hydrologic and geomorphic opportunities and constraints associated with lake/wetland restoration with special emphasis on surrounding land/water-use practices and existing natural/ecological resources.

1.2 Approach and Method of Analysis

A suite of tasks were completed to address the objectives listed above, including: review of background materials such as, but not limited to, available reports, maps, and aerial photographs; completing a field reconnaissance and limited data collection efforts; and developing a detailed water budget for a range of potential restoration alternatives.

A monthly spreadsheet water budget model was developed in order to estimate seasonal water level changes and associated inundation/habitat areas for a suite of restoration alternatives. Three restoration alternatives (i.e. varying lake configurations and sizes) were evaluated. For example, one alternative was defined as the likely maximum size of pre-drained Tolay Lake. Monthly lake water level changes were calculated based on balancing inflow to- and losses from the lake.

The water budget model accounts for all existing and known potential water rights within the Tolay Lake watershed. The water budget calculates the monthly area, depth, and volume of the restored lake utilizing a 50-year record of known meteorologic and hydrologic conditions. The water budget model includes simplified operational rules to account for known and potential water diversions within the basin, both upstream and downstream of the project site. The results of modeling indicate when and to what degree, water rights are satisfied within the watershed.

It is important to note that the water budget model assumes instantaneous release/spill of water in excess of maximum lake capacity. In reality, this does not occur as the Tolay Creek outlet has a limited capacity, which is commonly exceeded by storm flow to the existing basin. As a result, the Tolay Lake Ranch property experiences temporary induced flooding until storm runoff (inflow), lake levels and Tolay Creek outflow

equilibrate. Even then, the Cardoza's drain the remainder of the ponded water using high capacity pumps at the south end of their active fields.

2.0 EXISTING/HISTORIC SITE CONDITIONS

The following summary of site conditions was developed from the review of background information and data/observations gathered during site visits. This information sets the stage for later sections that describe key components, properties, processes, and assumptions that constitute the water budget model.

2.1 Site Setting and Geology

The Tolay Lake basin is located on a northwest-trending ridge separating the Petaluma River and Sonoma Creek valleys in Sonoma County, immediately north of San Pablo Bay (see Figure 1). The Tolay Lake basin is an elevated depression located within the Tolay Creek syncline and is bordered on the west by the northwest-trending Tolay fault and on the east by steep hills associated with the Adobe Creek anticline (Cardwell, 1958). Hitchcock and Kelson (1998) report that the Tolay Fault is a potentially active fault. A bedrock geology map of the project vicinity is presented as Figure 2.

The majority of the faulted and folded bedrock bounding and underlying the historic Tolay Lake bed consists of a series of Pliocene aged lava flows, ash beds, tuffs (cemented ash), and reworked sediments of volcanic debris, collectively called the Sonoma Volcanics (Cardwell, 1958; Huffman and Armstrong, 1980; Blake et al., 2000). Permeable intervals are known to yield water to wells, springs, and seeps in moderate amounts. The headwaters of the Tolay Lake basin, located to the northwest, are underlain by the relatively older Petaluma Formation which are described as compact deposits of clay, shale, sand, and sandstone and display relatively low permeability and slow yield to wells and springs (Cardwell, 1958).

2.2 Basin Soil Types

Although not depicted on Figure 2, Huffman and Armstrong (1980) indicate Quaternary-aged alluvial deposits cover the low-lying, flat valley floor of the Tolay Lake basin. The 1972 Sonoma County Soil Survey (USDA, 1972) indicates that the vast majority of the Tolay Lake basin and watershed area draining to the project site consists of clay and clay loam soil. In general, most of the clay soil is characterized as having low permeability and moderate to high runoff potential, with steep slopes displaying the most rapid runoff rates. The specific soil types within the study area are indicated on Figure 3. Descriptions and significant properties of these units are provided below.

Clear Lake Clay Loam (CcA):

This soil consists of clay formed under poorly drained conditions and typically occupies flat basin areas. The soil is characterized as having a very shallow depth (3-5 feet) to seasonal high water table, low permeability (0.06 to 0.2 inches per hour), and high shrink-swell potential[1]. Because of the slow infiltration rate and high groundwater table, these soils have a very high runoff potential.

[1] The shrink-swell potential is the quality of soil volume to change with moisture content. Expandable clay minerals (i.e., minerals that swell when wet) are most commonly associated with volcanic deposits. Thus, it is not surprising to encounter these types of clays at the site. Generally, soil that have high shrink-swell potential present hazards to the maintenance of structures constructed on or in them.

As part of the field investigation for this study, a pair of hand-auger soil borings (Boring #1 and Boring #2) were completed in the low, flat portion of the Cardoza fields. Soil boring locations are indicated on Figure 4. Borehole cuttings were described and logged consistent with the Unified Soil Classification System and boring logs are presented in Appendix A. The lithologies encountered are consistent with those described in detail in the County Soil Survey report and, with the exception of a 2-foot thick ash layer in Boring #2, consist predominantly of clay and clay with sand in the upper 8 feet below ground surface. A silt layer was also encountered at depth in Boring #2. The "pop-corn" texture and wide/deep desiccation cracks observed in surface soil at each location are signature characteristics of clay with high shrink-swell potential. It is also important to note that the groundwater table was encountered at relatively shallow depths (6.5 to 8.5 feet below ground surface) at each boring location.

Diablo Series (DbC, DbD, DbE, and DbF):
The Diablo series consists of well-drained clay soil occupying slopes of varying steepness (2-9 percent, 9-15 percent, 15-30 percent, and 30 to 50 percent slopes, respectively). These soils also display low permeability, high shrink-swell potential, and very high runoff potential. The hazard of erosion is high for these soils and increases with increasing percent slope.

Goulding-Toomes Complex (GoF):
Soil of this category consists of clay loam occupying slopes from 9 to 50 percent slope. Although the permeability of this soil is relatively higher than the Clear Lake and Diablo soils (0.63 to 2.0 inches per hour), it is still at the low end of the typical range for area soil. This soil displays moderate to low shink-swell potential, medium to rapid runoff and the hazard to erosion is medium to high.

Haire Clay Loam (HcC, HcD, and HcE):
The Haire complex of soils consists of moderately well drained clay loams that have a clay subsoil and occupy slopes of varying steepness (0-9 percent, 9-15 percent, and 15-30 percent slopes, respectively). These soils also display a slow permeability of 0.63 to 2.0 inches per hour, moderate shrink-swell potential, and high runoff potential.

2.3 Climate and Precipitation

The climate of the San Francisco-San Pablo Bay area is commonly referred to as a Mediterranean climate with wet winters and dry summers. The climate along the North Bay coast is moderated by the Pacific Ocean and usually experiences even temperatures, frequent heavy fog, and prevailing winds from the west to northwest. There are also local southerly winds that develop due to differential heating between adjacent land and water bodies on a seasonal basis in the Tolay Lake/Petaluma River/Sonoma Creek valleys due to their proximity to San Pablo Bay. Temperatures display a wider range further inland, away from the moderating effects of the Ocean and San Francisco-San Pablo Bay. Temperatures and rainfall are also influenced by elevation and local topography.

The long-term median annual[2] precipitation total for the project site is approximately 22.5 inches. This long-term average is based on an 83-year (1914 through 1997) record of precipitation at the Petaluma Fire Station rain gage. Precipitation in the San Francisco-San Pablo Bay area is seasonal with over 80-percent of the total annual rainfall occurring between the months of November and March. Very little, if any, precipitation occurs from June through September. This seasonal rainfall distribution is illustrated in Figure 5, which presents the long-term median monthly precipitation totals for the Petaluma Fire Station gage.

A plot of annual precipitation totals provides a picture of the long-term climatic conditions for the study area for the period 1914 through 1997 (see Figure 6). This time-series plot indicates that annual precipitation amounts range widely, from 221- to 43-percent of the median annual precipitation total. (Long term minimum and maximum derived totals are 49.8 and 9.7 inches respectively). In order to identify and characterize long-term wet and dry periods, the cumulative departure from the mean annual precipitation was tabulated[3] for the long-term rainfall record. Figure 7 presents the results of this analysis and clearly identifies long-term wet and dry periods. The recent intense droughts of 1976/77 and 1984-1994 and wet period from 1995-2000 provide some context for identifying and appreciating the historical cycles. For example, droughts similar in intensity to these recent events can be observed for the 1928-1934 period.

2.4 Surface Water Runoff

A combination of precipitation, geology, and impervious cover are the dominant controls over seasonal urban runoff patterns in California coastal basins. Approximately 80 percent of the total annual runoff volume occurs during the months of December through March. Typically, early season rains that fall on permeable surfaces in October and November quickly infiltrate into dry ground and contribute little to runoff. Based on a regional study of long-term runoff volumes in the San Francisco Bay region, Rantz (1974) identified strong correlations between mean annual precipitation and runoff for areas at similar latitude, distance from the ocean, altitude and orientation of slopes. Low permeable soil and rock, and a low capacity for subsurface storage will impede infiltration and lead to higher runoff rates. These natural influences result in a short lag-time between the occurrence of rainfall and initiation of runoff.

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[2] Annual precipitation totals are typically calculated for the periods starting on July 1st and ending on June 30th of the named year. However, for the purposes of this study, annual precipitation totals were calculated to be consistent with annual flow and runoff records, which are calculated according to "water years", which start on October 1st and end on September 30th of the named year.

[3] Annual departures from the mean are calculated by subtracting the long-term average rainfall from each annual rainfall total. Positive results indicate that the year experienced above average rainfall while the negative results indicate that year was drier than average. Keeping track of the chronological sum of annual departures from the mean identify prolonged wet and dry periods. A positive slope to the cumulative departure curve indicates extended we periods while a negative slope indicates an extended dry period.

2.5 Site Topography and Historic Lake Configuration

In an effort to better evaluate the historic and potential restored location and size of Tolay Lake, numerous available topographic maps, soil maps, geologic maps and aerial photographs were reviewed. The primary objective of this evaluation was to identify existing drainage divides and site grades that controlled ponding in the Tolay Lake basin under pre-European settler disturbances. Examples of disturbances include activities that enhanced drainage of the historic lake and channelized (incised) Tolay Creek downstream of the lake. The main constraint on this analysis is the poor vertical resolution on available topographic maps (e.g., available USGS 7.5-minute quadrangle maps and electronic Digital Elevation Models (DEMs) have contour intervals of 40 feet and 10 meters, respectively). However, review of numerous aerial photograph stereo pairs[4] and a completion of a longitudinal profile of the valley bottom utilizing a hand-held altimeter provided us with sufficient information on the relative relief of the basin to postulate the likely site and southward extent of the historic Tolay Lake. Drainage channel patterns flowing off the divide observed in aerial photographs were also used to identify and delineate the drainage divide.

Based on our preliminary analysis, it appears that there is a relatively broad, east-west oriented, low-lying divide crossing the basin approximately 2820 feet downstream (south) of the Cardoza ranch. The location and width of this divide is illustrated on Figure 8. Figure 8 also presents a revised topographic map of the basin based on our analyses. A schematic of a north-south ground surface profile along the length of the lake basin and highlighting this drainage divide feature is presented as Figure 9. Based on our field observations and analysis of available maps, we estimate that the sill elevation of the divide is approximately 14 feet higher than the flat fields (former lake bed) lying to the north.

Field observations indicate that the subject drainage divide consists of less clay-rich soil with higher silt and sand content than adjoining areas. Its also important to note that although there is a thin finger of Clear Lake Clays adjacent to the Tolay Creek channel downstream (south) of the divide, the majority of these soils (assumed to form in a lake environment) are located upstream (north) of the divide and are distributed consistent with the flat lying topographic areas depicted on Figure 3. The origin of the divide is likely associated with 1) the surface expression of a shallow bedrock control bisecting the basin, and/or 2) alluvial fan/land-slide deposits, originating from the eastern hills, accumulating in a lobate fashion on the valley floor. The presence of a shallow bedrock control is a more likely scenario as there are surface exposures of bedrock at lower elevations of the valley walls in this vicinity and it is reported that blasting through rock was required to deepen the Tolay Creek channel running perpendicular and through the divide feature (Marvin Cardoza, personal communication, October 2003).

[4] Viewing aerial photographs pairs with a stereoscope allows one to visualize the photographic in 3-dimensions. The drainage channel patterns flowing off the divide observed in aerial photographs were also used to identify and delineate the drainage divide.

3.0 WATER AVAILABILITY FOR TOLAY LAKE RESTORATION

This section of the report summarizes the approach and methods used to develop a water budget for the Tolay Lake basin. The water budget was used to evaluate available water supply to the site and proposed lake restoration designs. Specifically, the water budget was used to simulate proposed design conditions in order to determine if there is sufficient water supply to support a variety of restoration alternatives without impacting surrounding land and water uses.

3.1 Water Budget Model Development

The water budget is a spreadsheet model based on the continuity equation (inputs - outputs = change-in-storage). It accounts for the major hydrologic variables and processes controlling water supply to the Tolay Lake basin. The water budget model also accounts for the monthly change in ponded water surface elevation at the site. The main inputs (water supply) are direct precipitation and surface runoff draining to the lake. The major outputs (losses) are upstream water-rights diversions, evaporation from the lake surface, and lake overflow. Estimates of possible infiltration losses of runoff to the low-permeability substrate were also considered during this analysis. Further discussion of water budget parameters and model assumptions are presented below.

3.1.1 Available Water Supply (Inputs)

Precipitation

Monthly rainfall totals for the period 1947 through 1997 used in the water budget model came from the Petaluma Fire Station rain gage. The median annual rainfall for the project site for this period is estimated to be 21.8 inches. The median year value agrees well with the United States Geological Survey (Rantz, 1971) estimates of mean annual precipitation for the site area. The dry year precipitation total at the site was estimated to be 16.7 inches. This value represents an 80 percent exceedance probability (i.e. there is an 80 percent probability that annual rainfall at the site will equal or exceed 16.7 inches in any given year). Estimated monthly median and dry year precipitation totals for the project site are presented in Tables 2 and 5, respectively.

Runoff

Runoff estimates for the site were calculated from unit runoff totals for the corresponding 1947 through 1997 period for the USGS's Novato Creek stream gage. An evaluation of basin and runoff characteristics for a number of regional gages was completed prior to settling on the Novato Creek gage record. This record is believed to be most representative of the Tolay Creek basin/runoff characteristics from available long-term flow records. The median annual runoff at the site is estimated at 6.1 inches while dry year runoff (80 percent exceedance) is estimated at 1.8 inches per year. The median year value agrees relatively well with the USGS estimate of mean annual runoff for the site area (Rantz, 1974). Monthly estimates of median and dry year runoff are also presented on Tables 2 and 5, respectively. The watershed area draining to Tolay Lake was measured at 3084 acres (4.82 square miles).

Supplemental Water Supply

Although not quantified as part of this investigation or included in the water budget analyses, there are abundant spring and seep sources emanating from the surrounding hills that may act as significant local and seasonal sources of water to a restored Tolay Lake system. However, for purposes of this water budget modeling exercise, it was determined that these sources would likely be required to sustain riparian corridors and associated freshwater marsh/seasonal wetlands in upland areas above and independent of a restored Tolay Lake.

3.1.2 Estimated Water Demands (Outputs)

Surface Water Diversions

There are a number of water rights permits and pending applications within the Tolay Lake basin watershed. A summary of these potential demands is presented in Table 1. The locations of water rights "points-of-diversion" are presented on Figure 4. Although many permit applications are pending, the water budget analysis attempts to satisfy all upstream water rights pursuant to the diversion rates and dates stipulated in water right permits, prior to supplying water to Tolay Lake. Stated another way, the water budget is set up to satisfy all upstream water rights, pursuant to stipulated diversion rates and diversion periods, before delivering any water to Tolay Lake. Under all restoration alternatives analyzed, it is assumed that the Cardoza pending water rights will be translated to beneficial uses associated with Tolay Lake restoration and sustaining associated ecological habitats. We assume that the Cardoza water right will be senior to and prioritized over the downstream Roche water right. However, the water budget model also evaluates if the downstream Roche water rights are satisfied from lake overflow and runoff from the intervening drainage area.

Evaporation/Evapotranspiration

Open water evaporation rates were derived for the site by multiplying the California Department of Water Resource's (DWR) California Irrigation Management Information System (CIMIS) normal year reference ET rates for Petaluma, Sonoma County by an open water evaporation coefficient[5]. These evaporation rates are also reasonably consistent with evapotranspiration rates from freshwater marsh vegetation an no further adjustment was deemed necessary as part of this preliminary water budget analysis. The evaporation rates used in the water budget model are consistent with multi-year measured evaporation rates from local weather stations at the former Hamilton Army Airfield and Dutton's Landing. Estimated monthly median and dry year evaporation and evapotranspiration rates for the proposed pond/wetland areas are presented above in Tables 2 and 5, respectively.

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[5] Site-specific reference evapotranspiration rates are commonly referred to as ETo, and are available from DWR's California Irrigation Management Information System (CIMIS) for sites throughout California. ETo approximates the ET for a large field of 4- to 7-inch tall, cool-season grass (or uncut pasture) that is not water stressed. Daily ETo values are multiplied by crop coefficient values to determine daily evapotranspiration for a particular crop. Similarly, DWR reports that site-specific ETo values can be multiplied by an open water coefficient (1.10) to estimate the evaporation rate of open water surfaces (UC Davis, 1986a and 1986b).

Lake Overflow
Overflow from the lake was calculated as part of the water budget accounting process. The spill elevations for the various restoration alternatives are discussed in more detail below.

Other Potential Losses and Model Assumptions
Given the clayey nature of basin soil and the presence of a seasonally shallow groundwater table, infiltration is not considered to be significant mechanisms leading to water loss from the site. In addition, the water budget model does not address groundwater inflow or outflow from the site. Given the low permeability of underlying soil and the very flat gradients across the site, groundwater inflow and outflow are not likely to be significant controls over site ponding and may balance each other out.

3.2 Restored Lake Configuration and Water Budget Simulations
Based on the review of background material and results of fieldwork, three lake restoration alternatives were developed and evaluated using the water budget model. The three alternatives evaluated consist of a lake storage volumes equivalent to 136-, 1100-, and 2550-acre feet. The maximum water surface elevations for these three alternatives correspond to the 214.5-, 219.7-, and 226.5-foot site grades. The outline of the maximum lake size for each alternative is presented on Figure 10.

The 136-acre feet alternative represents the area of sustained ponding under existing site conditions without active pumping to evacuate standing water. This configuration was determined from aerial photographs of ponding on the site shortly after the floods of March 1958 and February 1999 (see Figure 11). The 2550-acre feet lake configuration is controlled by the upper elevation of the existing downstream drainage divide indicated in Figure 8 while the 1100-acre feet scenario provides a meaningful evaluation of an intermediate alternative equal to the existing Cardoza water right application volume.

The depth-volume-surface area relationships used in water budget model calculations are based on depth-volume and depth-area curves developed for each of the alternatives and are based on the revised topography presented in Figure 8. The site drainage area and ponded surface areas receiving direct precipitation are unique under each alternative lake configuration. The model was then used to simulate hydrologic conditions and associated water storage for the October 2000 through May 2001 period.

3.3 Results of Water Budget Modeling
In general, the water budget calculates the total amount of water available to Tolay Lake on a monthly basis and then subtracts the total monthly losses due to diversions, spills (assumed instantaneous), and evaporation. The resulting end-of-month lake volume, lake water depth, and lake surface area are then calculated. Three monthly water budgets were developed to evaluate each of the lake restoration alternatives, including:

1) Median Year Conditions;
2) Dry Year Conditions (based on 80 percent exceedance values of rainfall and runoff); and

3) The 50-year period (1947 to 1997) using historic rainfall and runoff data.

Water budget results for each lake restoration alternative are summarized below. The final section discusses what would likely occur under a "No Action"-type alternative, in which the property were acquired and no efforts were made to enhance or impede drainage on site.

3.3.1 Median Year Water Budget

Water budget results representative of median year conditions for the 136-, 1100-, and 2550-acre foot lake alternatives are presented on Tables 2 through 4 respectively. The end-of-month lake volume, depth, and surface area values are presented on the right hand side of each table. End-of-month lake water depths for each alternative are plotted on Figure 12. These results indicate:

- Ponding under the 136-ac ft lake alternative only occurs from January through June with a maximum water depth of 2.2 feet in February (Table 2);

- Ponding is sustained year-round under the 1100- and 2550-ac ft alternatives with maximum winter (March) water depths in the vicinity of 7.5 feet and minimum dry season water depths (October) at 2.7 feet (see Figure 12, Table 3, and Table 4);

- Based on results for the 2550 ac-ft alternative, the maximum lake volume possible under median year conditions is 1104 ac-ft (end of March lake volume in Table 4) which, coincidently, is equal to the existing Cardoza water right application for the site property;

- All upstream (total of 526 acre feet) water rights are satisfied under each alternative; and

- The downstream Roche water right application (for 2004 acre-feet) is fully satisfied under the 136-acre foot lake alternative, but only partially (80- to 85-percent) satisfied under the other alternatives.

3.3.2 Dry Year Water Budget

Water budget results representative of dry year conditions for the 136-, 1100-, and 2550-acre foot lake alternatives are presented on Tables 5 through 7 respectively. End-of-month lake water depths for each alternative are plotted on Figure 13. For purposes of this analysis, it was assumed that the preceding year was median year-type, providing some carryover lake storage into the dry year. Again, the end-of-month lake volume, depth, and surface area values are presented on the right hand side of each table. These results indicate:

- The lake remains dry throughout the year under the 136-ac ft lake alternative (Table 5);

- Ponding is sustained only through June under the 1100- and 2550-ac ft alternatives with maximum winter (March) water depths in the vicinity of 3.5 feet for each alternative (see Figure 13, Table 6, and Table 7);

- Based on results for the 1100- and 2550 ac-ft alternatives, the maximum lake volume possible under dry year conditions is 220 ac-ft (end of March lake volume in Tables 6 and 7);

- Only about 79-percent of upstream water rights (416 of 526-ac ft) are satisfied under the 1100- and 2550-ac ft alternatives; and

- Only 24-percent of the downstream Roche water right application (483 of 2004 acre-feet) is satisfied under each of the restoration alternatives.

3.3.3 50-Year Historic Conditions Water Budget

Tabulated water budget results for the 50-year (1947-1997) period are presented for the 136-, 1100-, and 2550-ac ft lake volume alternatives in Appendices B through D, respectively. The long-term end-of-month lake water depths for each alternative are plotted on Figure 14. Water budget results are also summarized in terms of water depth-, lake volume-, and lake surface area-duration curves - curves that present the percentage of time a given depth/volume/area is equaled or exceeded under a given alternative over the 50-year simulation period. For example, Figure 15 presents a lake depth duration curves for all three alternatives. Figures 16 and 17 present lake volume and lake surface-area duration curves, respectively. The curves in these figures indicate the following:

- Based on the monthly water budget for 50-years of historic data, water is ponded in the 136-ac ft lake alternative only 38-percent of the time (the lake is dry the remaining 62-percent of time) with the maximum lake depth approaching 2.5 feet (see Figures 14 and 15);

- Curves presented on Figures 15 through 17 indicate that Tolay Lake will contain ponded water 78-percent of the time under the 1100-ac ft alternative and 89-percent of the time under the 2550-ac ft alternative;

- Lake water depths will range from approximately 0.0 to 7.5 feet and 0.0 to 14.2-feet under the 1100- and 2550-ac ft alternatives respectfully (Figures 14 and 15);

- Maximum lake volumes over the 50-year simulation period approach 150-, 1100-, and 2500-acre feet under the three respective restoration alternatives (see Figure 16);

- The Cardoza's pending water rights application of 1100-acre feet would only be satisfied approximately 55-percent of the time under the 2550-ac ft alternative (see Figure 16);

- Maximum lake surface areas during the 50-year simulation period approach 130-, 345-, and 475-acres under the three respective restoration alternatives (see Figure 17);

In order to better evaluate the seasonal variability in lake water depth under each of the restoration alternatives over the 50-year simulation period, lake depth-duration curves for the end-of-month water depths in March and October were prepared (see Figures 18 through 20). The end-of-March water depth is most representative of the wettest annual conditions, while the end-of-October water depths are representative of the driest period of the year. The flat portions of the March curves spanning the lesser exceedance intervals indicate the period of time in which the lake is full. For example, the lake would have been at maximum capacity during 68-percent of time at the end of March during the simulation period under the 136-ac ft lake volume alternative (see end-of-March curve on Figure 18). Similarly, the 136-ac ft alternative lake would have dried out 91-percent of the time at the end of October during most years (see end-of-October curve on Figure 18). Similarly, maximum seasonal variability in lake water depths under the 1100- and 2550-ac ft alternatives is presented on Figures 19 and 20.

The water budget model was also designed to calculate the percentages of time upstream and downstream water rights would have been satisfied under each restoration alternative during the 50-year simulation period. These results are summarized below. Annual calculations of the degree to which basin water rights are satisfied are provided in the detailed water budget tables in Appendices B through D.

Restoration Alternative	Percentage of Time Water Rights Satisfied	
	Upstream Water Rights	Downstream Water Rights
136-ac ft Lake Volume	71%	47%
1100-ac ft Lake Volume	73%	49%
2550-ac ft Lake Volume	73%	55%

3.3.4 "No Action"-Type Alternative

Based on information obtained during the hydrologic feasibility analysis, along with the results of the restoration alternative water budget modeling, a prediction of what would happen if the property were acquired and no efforts were made to enhance or impede drainage on site is described here. Under this scenario, it is assumed that there would be no low-lying culverts that convey the internal drainage to the downstream section of Tolay Creek. On a monthly basis, the lake water budget (size and depth) would likely be very close, if not identical to those conditions resulting from the 136-ac ft alternative water budget analysis. However, during storms (i.e. single to multi-day time-step), the flooded area would expand for a short period when the outlet capacity to Tolay Creek was exceeded by the storm inflow rate. As the storm wanes and the inflow rate decreases to a rate less than the outlet capacity, the flooded area and depth would recede to a level controlled by the elevation of the lake outfall. During the peak of winter (but not during a storm), the maximum lake size would be similar to that of the 136-ac ft alternative (see Figure 10) or the photographs of the flooded areas depicted on Figure 11. It is important to point out that flooding would extend well off-site along the valley bottom of the northern arm of Tolay Creek.

4.0 DISCUSSION OF RESULTS

The results of the hydrologic feasibility analysis are discussed below in the context of opportunities and constraints to lake and wetland habitat restoration.

4.1 Opportunities for Tolay Lake Restoration

Results of the hydrologic feasibility analysis indicate that there is sufficient water supply to allow for restoration of Tolay Lake under the existing conservative land- and water-right conditions in the watershed. The 2550-ac ft lake water budget results for the median year-type indicate a maximum sustainable lake size approaching 1100-acre feet. However, results from the 50-year period analysis indicate a larger/deeper lake is sustainable due to greater carryover storage from excess wet year supply (see Figures 12-14).

The results of the water budget modeling clearly indicate that regardless of which alternative were selected, there are dry years and periods of drought that will cause Tolay Lake to dry out completely. This conclusion is not evident by solely evaluating water budget results for representative median and dry year-types (i.e., Tables 2 through 6). A more accurate prediction of restoration conditions was determined by simulating the long-term historic period that contains multiple year droughts of varying degree and length. Review of the detailed water budget results (provided in Appendices B through D) indicates dry or low lake level conditions coincide with the multi-year drought periods highlighted on Figure 7. The duration of these droughts include: 1947-50, 1959-62, 1976-77, and 1987-94.

4.2 Constraints on Tolay Lake Restoration

Based on the findings of the hydrologic feasibility analysis, a number of potential constraints on the restoration of Tolay Lake were identified and are listed and discussed below. In addition, we also introduce other potential possible constraints based on our experience with the planning of large-scale ecological habitat restoration projects in the Bay Area.

- ***Stakeholder/Public Perceptions and Expectations of "Lake" Restoration***

The water budget results paint a picture of a lake whose water level and area of inundation will fluctuate dramatically seasonally and between wet and dry year-types. This will lead to unique challenges in the planning and design of revegetation efforts in and around the lake. These results are also important from the context of educating stakeholders and the public of the highly dynamic lake and wetland conditions that will exist under any restoration alternative. It will be important to emphasize that many recreation activities such as boating and swimming may not be possible (or seasonally limited) due to the limited size and depth of the restored lake.

- ***Flood Impacts on Surrounding Properties***

An impact associated with any lake restoration alternative will be expansion of the lake onto adjacent off-site properties. Up to six adjacent land-owners (total of nine parcels) may be affected, including: David S. Martinelli; Margaret Kullberg; Joseph H. Mendoza; Gloria M. Altenreuther; Lee W. Schaller; and Universal Portfolio, Ltd. (see Figure 10).

One particular challenge for lake restoration design will be protecting upstream properties from inundation. The current valley bottom and historic/future lakebed is exceptionally flat and currently extends off-site to the north for some distance. Recent aerial photographs (see Figure 11) indicate that flooding in this area occurs concomitantly with flooding on the Cardoza property. A notable challenge to lake restoration will be prohibiting Tolay Lake from encroaching into this, and other, flat-lying, upstream areas. A simple dam or berm segregating upstream areas from the Cardoza property will not allow for drainage of upstream tributary creek flows into a restored lake without the aid of pumping over the dam/berm in order to prohibit ponding on the upstream side of the dam/berms. This problem is amplified if restoration efforts stipulate passive (i.e., non-mechanized and self-sustaining) drainage measures to and through the restored lake. The simplest solution to this constraint is acquiring and incorporating the upstream property into the restoration planning efforts. Other solutions will rely on engineering expertise and likely include obtaining selected properties and/or easements.

- ***Lake Drainage and Required Outlet Works***

The results of our analysis suggest that the existing low drainage divide indicated on Figure 8 will limit the need for an elaborate or large-scale outfall structure for the lake. Unlike the drainage problems associated with the upstream properties, the drainage divide and likely lake outfall is located entirely in the Tolay Lake Ranch property. The final design of the lake outlet will depend on defining the needed maximum outflow/spill capacity[6].

- ***Impacts on Existing/Potential Water Rights***

An important assumption in the water budget modeling and alternative feasibility analysis was to minimize impacts to upstream landowners by prioritizing their water rights. It is important to note that even when operated under this priority, upstream water rights holders are only be able to satisfy water demands 71- to 73-percent of the time. This inability to satisfy upstream demands is simply the result of an insufficient long-term natural supply of runoff. Permitting all existing and pending water rights applications could over allocate available surface water resources in the upper basin. Based on results of the water budget modeling, it is estimated that the cumulative annual water rights (excluding the Cardoza application for 1100 acre feet) account for nearly 35-percent of the median year total runoff and 93-percent of the representative dry year total runoff to the Tolay Lake basin. Obviously, reprioritizing these supplies to Tolay Lake could lead to noticeable differences in the duration and extent of ponding.

- ***Impacts on Cultural Resources***

The main reason for the high variability in restored lake size and depth is due to the broad/shallow nature of the lake and the rapid draw down in response to elevated dry

[6] As discussed earlier, under current conditions, there is some expanded and temporary flooding of the lakebed that occurs during and shortly after flood flows. This flooding is due to the limited outflow capacity through the existing Tolay Creek channel that bisects the downstream drainage divide. Identifying tolerable limits of temporary flooding (expressed as short-lived, storm-induced expansion of the lake size and depth), if any, will be an important part of determining the necessary lake outlet capacity, and in turn, outlet design.

season/year evaporation rates. One way to increase the duration of open water ponding is to deepen the lake while maintaining the same lake surface area. However, this would require considerable excavation of material that will likely be prohibited due to the high density of sensitive and rare Indian artifacts that exist across the proposed site. Similarly, any or all earthwork associated with the construction of drainage berms or outlet works may be prohibited/undesirable for similar reasons.

- ***Lake Sedimentation***

Although no quantitative data regarding erosion and sediment transport rates were found as part of the hydrologic feasibility analysis, anecdotal accounts from property owners, available soil and geology information, and field observations suggest that there is typically no significant creek derived sediment deposited during floods on the Tolay Lake Ranch property. Analysis of lakebed core samples collected from the site property also suggests fine-grained mud and occasional silt are the principal deposits that have aggraded on the historic lakebed. Based on this historic record, it is not anticipated that sediment influx poses a significant constraint on lake restoration.

- ***Changes in Downstream Habitat Water Supply***

Results of water budget modeling indicate that there are notable differences in wet season water releases from the lake between each of the proposed lake restoration alternatives. The magnitude and/or importance of shallow groundwater and/or springs/seeps that drain to the lake basin and sustain dry season base flows in Tolay Creek below the proposed lake were also not quantified as part of this study. Therefore, it is likely that investigations into the changes in seasonal supplies to Tolay Creek and associated impacts of downstream habitat will need to be better addressed as part of any future restoration planning for the Tolay Lake restoration project.

- ***Increases in Downstream Flood Hazards***

The hydrologic feasibility analysis focused on evaluating long-term water supply and lake sustainability. No detailed flood studies were completed as part of this study. Such studies may be warranted as part of further restoration planning and environmental documentation in order to assess project flood impacts on downstream properties. These analyses may require a catastrophic "dam-break"-type analysis due to the presence of the "active" Tolay Creek fault that follows the eastern margin of the drainage basin. Fluvial geomorphic analyses may also be warranted to evaluate the potential chronic impacts on channel stability and morphology associated with potential changes in flow to downstream reaches of the creek.

- ***Presence of Sensitive/Endangered Species***

Although there were no biological assessments conducted or reviewed as part of the hydrologic feasibility analysis, it is our experience that issues related to the possible disturbance and/or creation of sensitive/endangered species habitat commonly dictate and constrain habitat restoration efforts, regardless of desired intent and the cumulative ecological gains associated with restoration efforts. One example is that an endangered plant or animal may exist on site and have a specific life-stage that is incompatible with a restored lake. As a result, resource agencies may be reluctant to approve restoration

efforts or require conditions that further constrain lake restoration efforts and necessitate additional or supplemental hydrologic analyses.

4.3 Data Gaps and Recommendations

Apart from comparison to anecdotal accounts of the frequency and extent of historic flooding in the Tolay Lake basin, there is little data available to verify and validate the water budget model. An important objective of the feasibility analysis was to develop defensible water budget assumptions and reasonable model parameter values. One area in which the water budget could be better evaluated is to measure runoff rates from the basin. The necessary information could be developed from installing and maintaining a rainfall and surface flow gage within the Tolay Lake watershed. Data collected over a complete water year period would be used to better calibrate and validate the water budget model. In addition, a more rigorous attempt at quantifying the numerous spring flows around the Tolay Lake valley would also improve the accuracy of the model. Left undisturbed, these flows may serve as supplies to the lake, especially in the summer months.

4.4 Limitations

The analyses presented in this report are intended solely for use at the project site and under the proposed lake restoration design scenarios and physical conditions described herein. This report should be considered a preliminary planning document and should not be used as the sole technical source for the design and construction of a lake restoration project. If project designs or land and water resource uses in the watershed undergo significant change, technical members of the project team should be consulted to make necessary changes in the water budget as necessary.

5 REFERENCES

Blake, M.C., Graymer, R.W., and Jones, R.L., 2000, Geologic map and map database of parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California. U.S. Geological Survey, digital database and pamphlet to accompany miscellaneous field studies MF-2337, version 1.0.

Cardwell, G.T., 1958, Geology and ground water in the Santa Rosa and Petaluma Valley areas, Sonoma County, California. Geological Survey Water Supply Paper 1427, prepared in cooperation with the California Department of Water Resources, 273p.

Hitchcock, C.S. and Kelson, K.I., 1998, Final technical report for assessment of seismogenic sources between the Rodgers Creek and San Andreas faults, northwestern San Francisco Bay region, Sonoma County, California. U.S. Geological Survey National Earthquake Hazards Reduction Program, award 1434-HQ-97-GR-03153, November.

Huffman, M.E. and Armstrong, C.F., 1980, Geology for planning in Sonoma County. California Department of Mines and Geology, Special Report 120, prepared in cooperation with the Sonoma County Planning Department, 31p.

Rantz, S.E., 1971, Mean annual precipitation depth-duration-frequency data for the San Francisco Bay Region, California. United States Geological Survey, Water Resources Division open-file report, prepared in cooperation with the U.S. Department of Housing and Urban Development, 23p.

Rantz, S.E., 1974, Mean annual runoff in the San Francisco Bay Region, California, 1931-70. United States Geological Survey, Water Resources Division Miscellaneous Field Studies Map (MF-613).

University of California, Davis, 1986a, Determining Daily Reference Evapotranspiration (ETo). Leaflet 21426, Cooperative Extension, Division of Agriculture and Natural Resources, 10p.

University of California, Davis, 1986 b, Using Reference Evapotranspiration (ETo) and Crop Coefficients to Estimate Crop Evapotranspiration (Etc) for Agronomic Crops, Grasses, and Vegetable Crops. Leaflet 21427, Cooperative Extension, Division of Agriculture and Natural Resources, 12p.

U.S. Department of Agriculture, 1972, Soil survey Sonoma County, California. Forest Service and Soil Conservation Service, in cooperation with University of California Agricultural Experiment Station, 188p.

TABLES

TABLE 1: WATER RIGHTS INFORMATION FOR THE TOLAY LAKE WATER BUDGET

WR Owner	WR Application	WR Permit	WR License	WR Amount (ac-ft.)
Kullberg	A030592	NA	NA	35.0
Kullberg	A029402	20393	NA	12.0
Martinelli	A016625	10471	5882	9.0
Martinelli	A031022	NA	NA	225.0
Oxfoot	A029166	20330	NA	245.0
Roche	A030579	NA	NA	2004.0

Notes:

NA Not Applicable (a permit or license has not yet been issued and/or such information has not been added to the SWRCB website for Water Rights Information, www.waterrights.ca.gov)

TABLE 2: MEDIAN YEAR-TYPE WATER BUDGET
136 ac-ft. Capacity

dam scenario A	
Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**136.0**
Roche drainage area (ac):	3153.92

month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**END OF MONTH** **VOL.** of lake (ac-ft)	**DEPTH** of lake (ft.)	**AREA** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
Oct	1.07	0.00	0.02	4.64	4.64	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
Nov	3.05	0.00	0.06	14.64	14.64	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
Dec	3.80	0.00	0.43	111.04	111.04	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
Jan	5.65	0.00	1.86	478.34	395.68	82.66	0.00	1.08	9.20	73.46	1.67	95.92	
Feb	3.46	27.68	1.99	495.50	0.00	523.18	460.64	1.82	21.00	115.00	2.22	124.77	
Mar	3.14	32.63	1.36	334.87	0.00	367.51	346.50	3.09	35.77	100.23	2.03	114.69	
Apr	1.28	12.28	0.23	55.94	0.00	68.22	32.45	4.68	54.10	81.90	1.78	101.90	
May	0.27	2.28	0.09	22.89	0.00	25.17	0.00	6.17	61.39	45.68	1.29	75.76	
Jun	0.01	0.07	0.05	11.29	0.00	11.36	0.00	6.89	48.25	8.79	0.37	22.63	
Jul	0.00	0.00	0.01	3.15	0.00	3.15	0.00	7.12	18.11	0.00	0.00	0.00	
Aug	0.00	0.00	0.01	1.54	0.00	1.54	0.00	6.45	2.18	0.00	0.00	0.00	
Sep	0.04	0.00	0.00	0.73	0.00	0.73	0.00	4.94	0.81	0.00	0.00	0.00	
annual	**21.78**	**74.93**	**6.10**	**1534.58**	**526.00**	**1083.51**	**839.59**	**48.35**	**250.82**				**2442.99**

TABLE 3: MEDIAN YEAR-TYPE WATER BUDGET
1100 ac-ft. Capacity

dam scenario A	
Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**1100.0**
Roche drainage area (ac):	3153.92

month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	END OF MONTH **VOL.** of lake (ac-ft)	END OF MONTH **DEPTH** of lake (ft.)	END OF MONTH **AREA** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
Oct	1.07	14.99	0.02	4.38	4.38	14.99	0.00	3.36	49.25	151.86	2.70	148.21	
Nov	3.05	37.66	0.06	13.94	13.94	37.66	0.00	1.69	23.96	165.56	2.86	156.14	
Dec	3.80	49.41	0.43	105.42	105.42	49.41	0.00	1.08	16.50	198.47	3.26	174.69	
Jan	5.65	82.27	1.86	451.25	402.25	131.26	0.00	1.08	19.74	309.99	4.21	216.13	
Feb	3.46	62.36	1.99	475.57	0.00	537.93	0.00	1.82	45.98	801.94	6.38	297.27	
Mar	3.14	77.75	1.36	315.35	0.00	393.10	95.04	3.09	87.22	1012.78	7.30	327.06	
Apr	1.28	35.01	0.23	51.94	0.00	86.95	0.00	4.68	131.90	967.82	7.11	320.93	
May	0.27	7.17	0.09	21.21	0.00	28.38	0.00	6.17	167.04	829.17	6.50	301.27	
Jun	0.01	0.28	0.05	10.44	0.00	10.72	0.00	6.89	173.78	666.11	5.78	276.58	
Jul	0.00	0.00	0.01	2.89	0.00	2.89	0.00	7.12	164.30	504.70	5.07	250.34	
Aug	0.00	0.00	0.01	1.41	0.00	1.41	0.00	6.45	134.60	371.51	4.48	227.25	
Sep	0.04	0.85	0.00	0.68	0.00	1.52	0.00	4.94	93.65	279.39	4.08	210.49	
annual	**21.78**	**367.75**	**6.10**	**1454.48**	**526.00**	**1296.24**	**95.04**	**48.35**	**1107.92**				**1698.44**

TABLE 4: MEDIAN YEAR-TYPE WATER BUDGET
2550 ac-ft. Capacity

dam scenario A	
Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**2550.0**
Roche drainage area (ac):	3153.92

month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	END OF MONTH **VOL.** of lake (ac-ft)	END OF MONTH **DEPTH** of lake (ft.)	END OF MONTH **AREA** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
Oct	1.07	14.99	0.02	4.38	4.38	14.99	0.00	3.36	49.25	151.86	2.70	148.21	
Nov	3.05	37.66	0.06	13.94	13.94	37.66	0.00	1.69	23.96	165.56	2.86	156.14	
Dec	3.80	49.41	0.43	105.42	105.42	49.41	0.00	1.08	16.50	198.47	3.26	174.69	
Jan	5.65	82.27	1.86	451.25	402.25	131.26	0.00	1.08	19.74	309.99	4.21	216.13	
Feb	3.46	62.36	1.99	475.57	0.00	537.93	0.00	1.82	45.98	801.94	6.38	297.27	
Mar	3.14	77.75	1.36	315.35	0.00	393.10	0.00	3.09	90.34	1104.71	7.71	339.22	
Apr	1.28	36.31	0.23	51.71	0.00	88.02	0.00	4.68	136.52	1056.20	7.50	332.86	
May	0.27	7.44	0.09	21.12	0.00	28.55	0.00	6.17	173.11	911.65	6.86	313.11	
Jun	0.01	0.29	0.05	10.40	0.00	10.69	0.00	6.89	180.54	741.80	6.11	288.26	
Jul	0.00	0.00	0.01	2.88	0.00	2.88	0.00	7.12	171.22	573.46	5.37	261.74	
Aug	0.00	0.00	0.01	1.41	0.00	1.41	0.00	6.45	140.72	434.14	4.76	238.28	
Sep	0.04	0.89	0.00	0.68	0.00	1.56	0.00	4.94	98.18	337.52	4.33	221.15	
annual	**21.78**	**369.38**	**6.10**	**1454.10**	**526.00**	**1297.47**	**0.00**	**48.35**	**1146.06**				**1603.40**

TABLE 5: DRY YEAR-TYPE WATER BUDGET
136 ac-ft. Capacity

dam scenario A	
Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**136.0**
Roche drainage area (ac):	3153.92

month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	END OF MONTH **VOL.** of lake (ac-ft)	END OF MONTH **DEPTH** of lake (ft.)	END OF MONTH **AREA** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
Oct	0.48	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
Nov	1.64	0.00	0.01	2.82	2.82	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
Dec	3.17	0.00	0.13	32.43	32.43	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
Jan	4.35	0.00	0.35	90.64	90.64	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
Feb	3.05	0.00	0.68	175.00	175.00	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
Mar	3.14	0.00	0.37	96.04	96.04	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
Apr	0.85	0.00	0.17	43.86	43.86	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
May	0.00	0.00	0.09	23.28	0.00	23.28	0.00	6.17	29.95	0.00	0.00	0.00	
Jun	0.00	0.00	0.03	8.05	0.00	8.05	0.00	6.89	11.91	0.00	0.00	0.00	
Jul	0.00	0.00	0.00	0.54	0.00	0.54	0.00	7.12	0.87	0.00	0.00	0.00	
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
annual	**16.69**	**0.00**	**1.84**	**472.66**	**440.79**	**31.87**	**0.00**	**48.35**	**42.73**				**483.38**

TABLE 6: DRY YEAR-TYPE WATER BUDGET
1100 ac-ft. Capacity

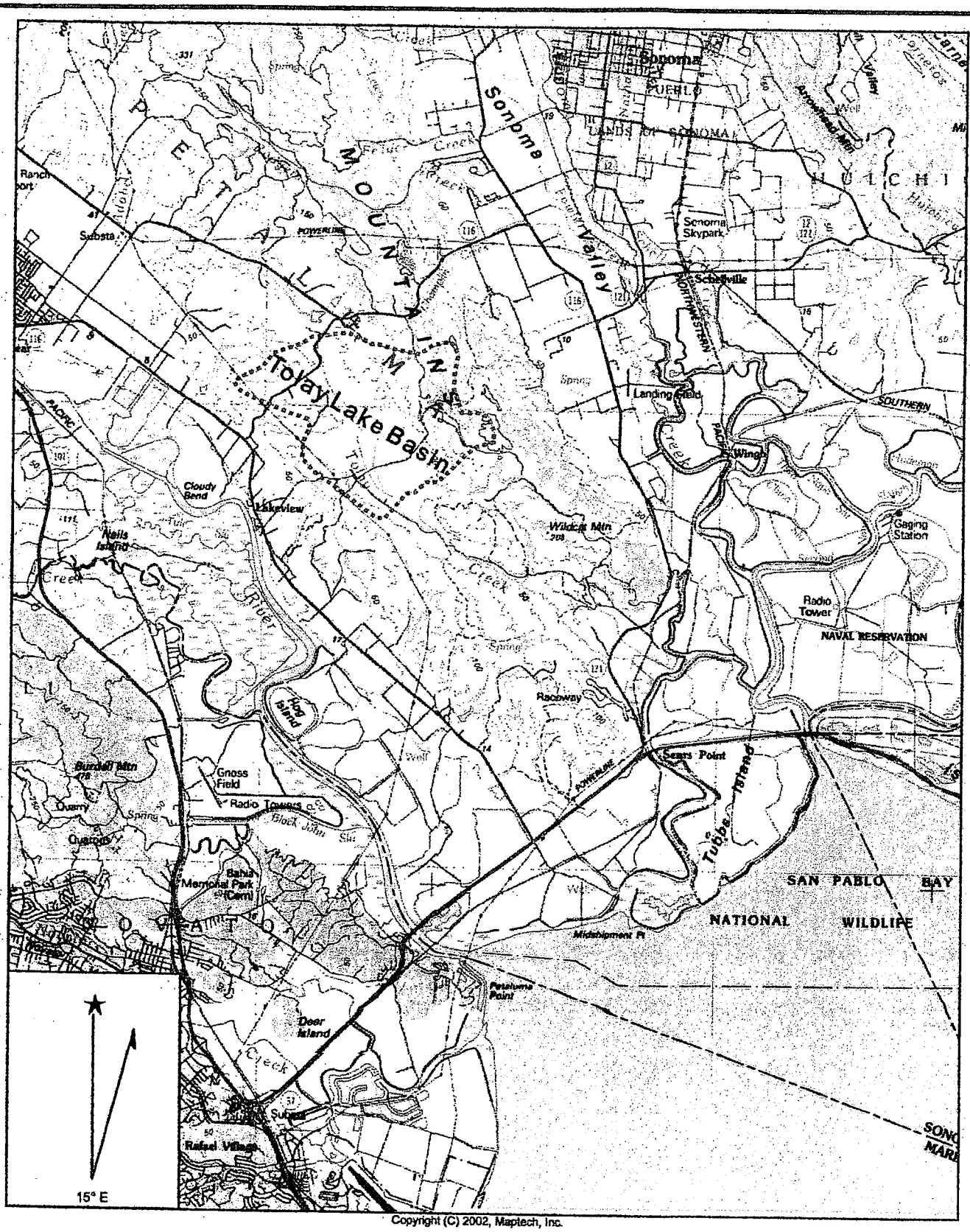
dam scenario A	
Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**1100.0**
Roche drainage area (ac):	3153.92

month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	END OF MONTH **VOL.** of lake (ac-ft)	END OF MONTH **DEPTH** of lake (ft.)	END OF MONTH **AREA** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
Oct	0.48	6.77	0.00	0.00	0.00	6.77	0.00	3.36	47.97	144.90	2.61	144.13	
Nov	1.64	19.76	0.01	2.68	2.68	19.76	0.00	1.69	21.97	142.69	2.59	142.83	
Dec	3.17	37.71	0.13	30.93	30.93	37.71	0.00	1.08	14.79	165.62	2.86	156.17	
Jan	4.35	56.66	0.35	86.05	86.05	56.66	0.00	1.08	16.86	205.42	3.35	178.52	
Feb	3.05	45.34	0.68	164.87	164.87	45.34	0.00	1.82	30.66	220.10	3.52	186.50	
Mar	3.14	48.87	0.37	90.24	90.24	48.87	0.00	3.09	53.72	215.25	3.47	183.88	
Apr	0.85	12.97	0.17	41.24	41.24	12.97	0.00	4.68	74.35	153.87	2.72	149.38	
May	0.00	0.00	0.09	22.16	0.00	22.16	0.00	6.17	83.37	92.66	1.92	109.44	
Jun	0.00	0.00	0.03	7.76	0.00	7.76	0.00	6.89	65.88	34.53	1.15	67.47	
Jul	0.00	0.00	0.00	0.53	0.00	0.53	0.00	7.12	40.25	0.00	0.00	0.00	
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
annual	**16.69**	**228.08**	**1.84**	**446.46**	**416.01**	**258.53**	**0.00**	**48.35**	**449.83**				**483.38**

TABLE 7: DRY YEAR-TYPE WATER BUDGET
2550 ac-ft. Capacity

dam scenario A	
Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**2550.0**
Roche drainage area (ac):	3153.92

month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	END OF MONTH **VOL.** of lake (ac-ft)	END OF MONTH **DEPTH** of lake (ft.)	END OF MONTH **AREA** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
Oct	0.48	6.77	0.00	0.00	0.00	6.77	0.00	3.36	47.97	144.90	2.61	144.13	
Nov	1.64	19.76	0.01	2.68	2.68	19.76	0.00	1.69	21.97	142.69	2.59	142.83	
Dec	3.17	37.71	0.13	30.93	30.93	37.71	0.00	1.08	14.79	165.62	2.86	156.17	
Jan	4.35	56.66	0.35	86.05	86.05	56.66	0.00	1.08	16.86	205.42	3.35	178.52	
Feb	3.05	45.34	0.68	164.87	164.87	45.34	0.00	1.82	30.66	220.10	3.52	186.50	
Mar	3.14	48.87	0.37	90.24	90.24	48.87	0.00	3.09	53.72	215.25	3.47	183.88	
Apr	0.85	12.97	0.17	41.24	41.24	12.97	0.00	4.68	74.35	153.87	2.72	149.38	
May	0.00	0.00	0.09	22.16	0.00	22.16	0.00	6.17	83.37	92.66	1.92	109.44	
Jun	0.00	0.00	0.03	7.76	0.00	7.76	0.00	6.89	65.88	34.53	1.15	67.47	
Jul	0.00	0.00	0.00	0.53	0.00	0.53	0.00	7.12	40.25	0.00	0.00	0.00	
Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
annual	**16.69**	**228.08**	**1.84**	**446.46**	**416.01**	**258.53**	**0.00**	**48.35**	**449.83**				**483.38**



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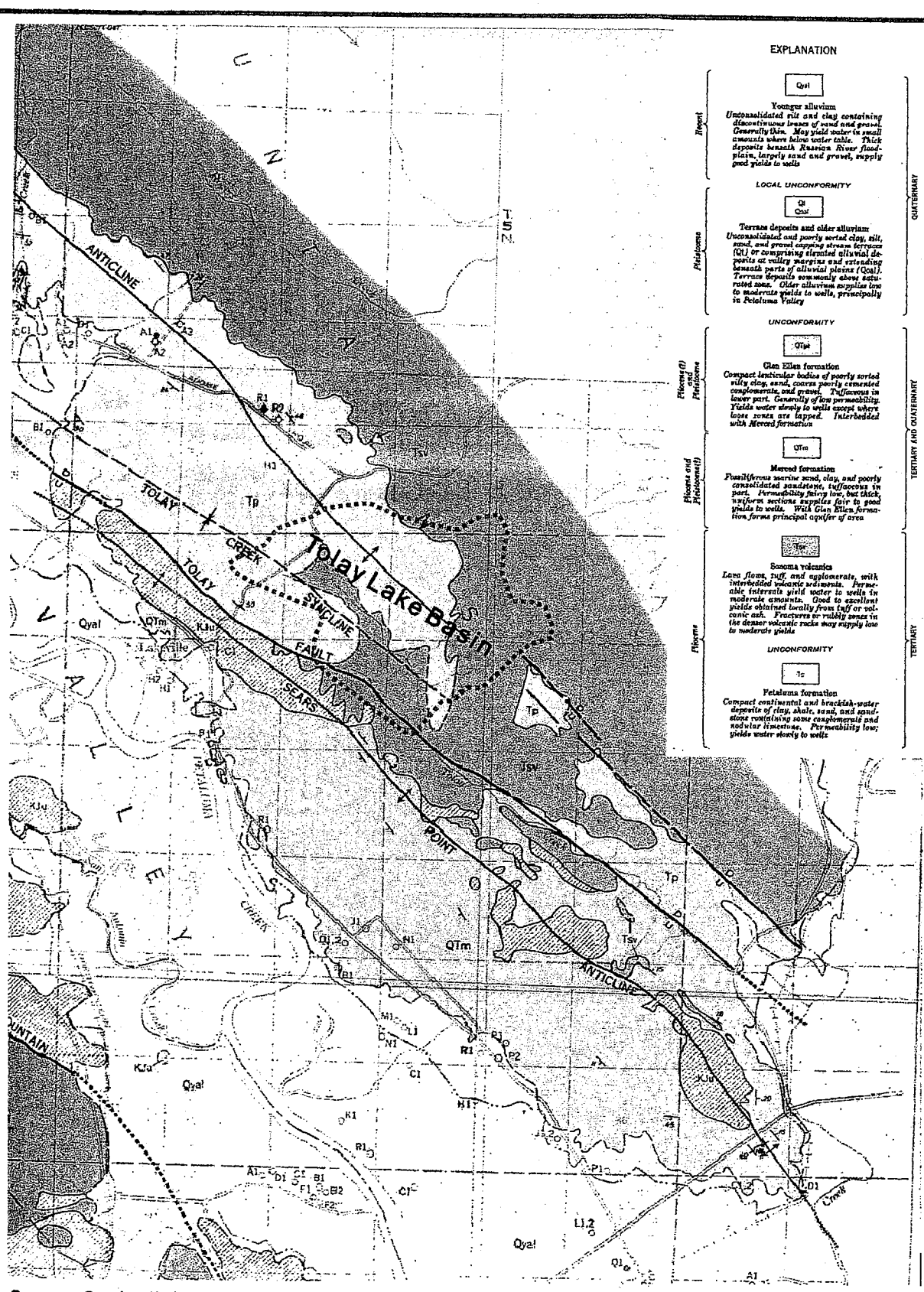
KAMMAN HYDROLOGY & ENGINEERING, INC.

SITE LOCATION MAP

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 1



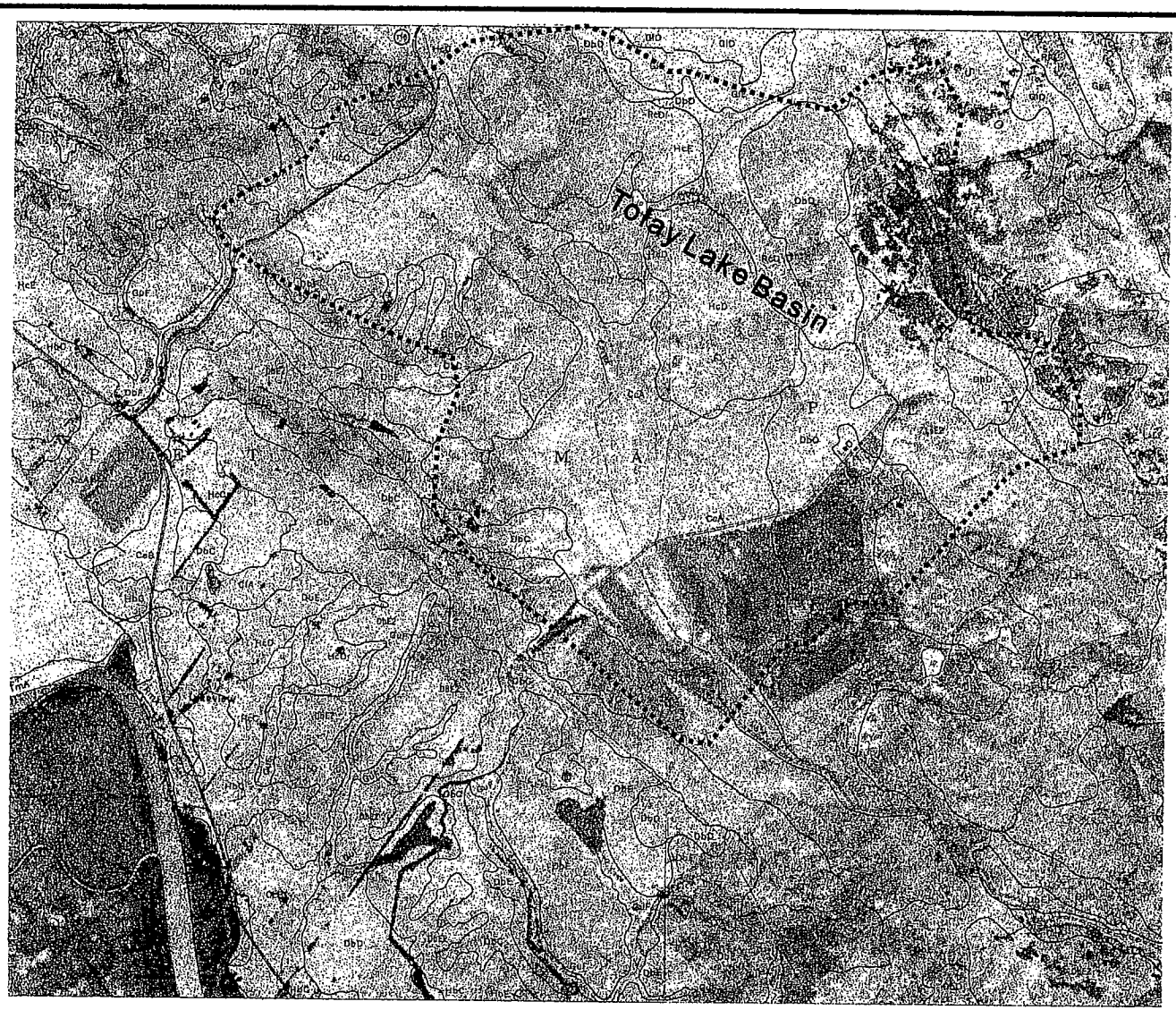
Source: Cardwell, 1958

KAMMAN HYDROLOGY & ENGINEERING, INC.

SITE GEOLOGY

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 2



N

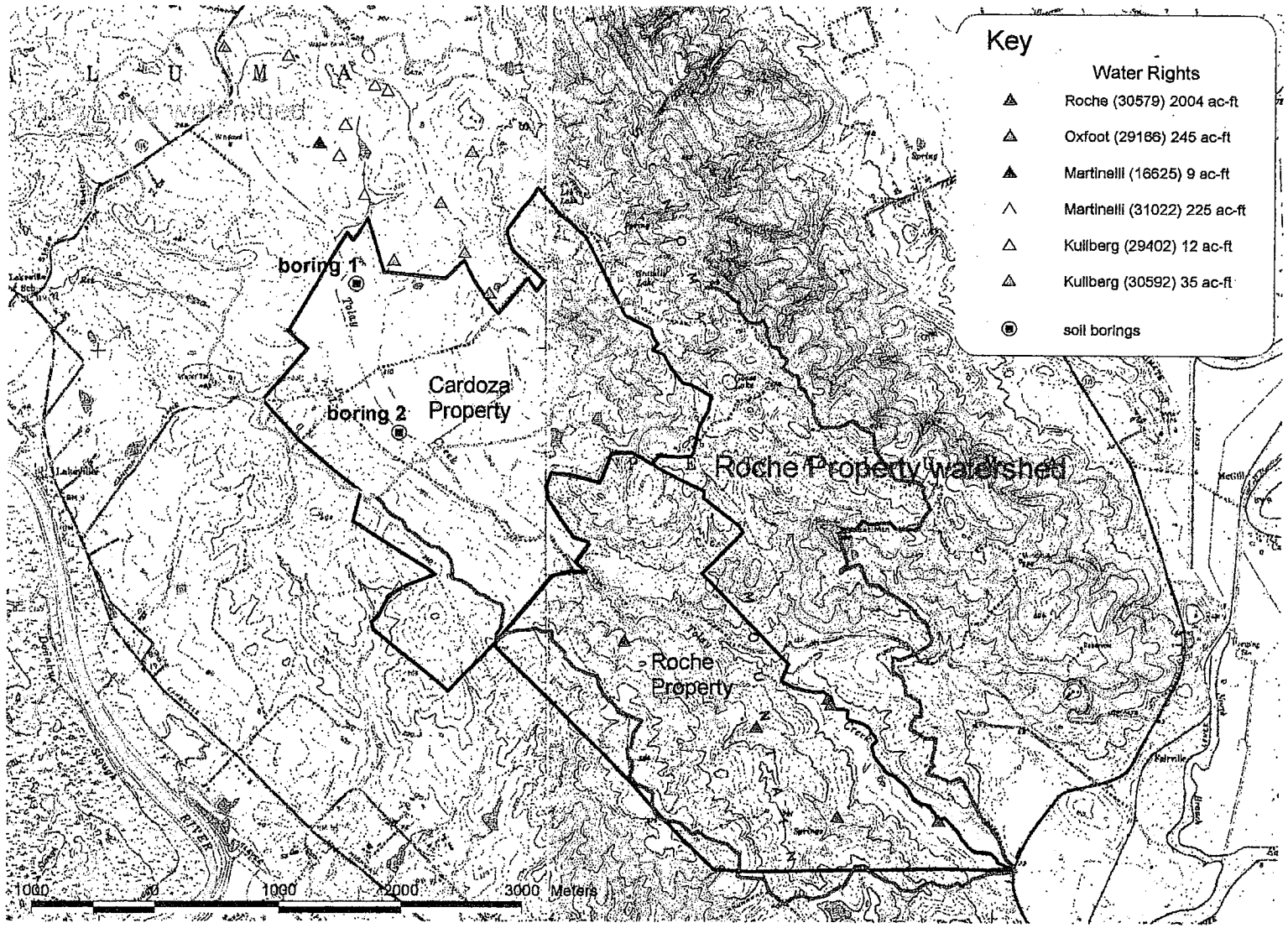
Source: Soil Conservation Service, Soil Survey of Sonoma County, CA (1972). Units described in text of report.

KAMMAN HYDROLOGY & ENGINEERING, INC.

SOIL UNITS

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 3

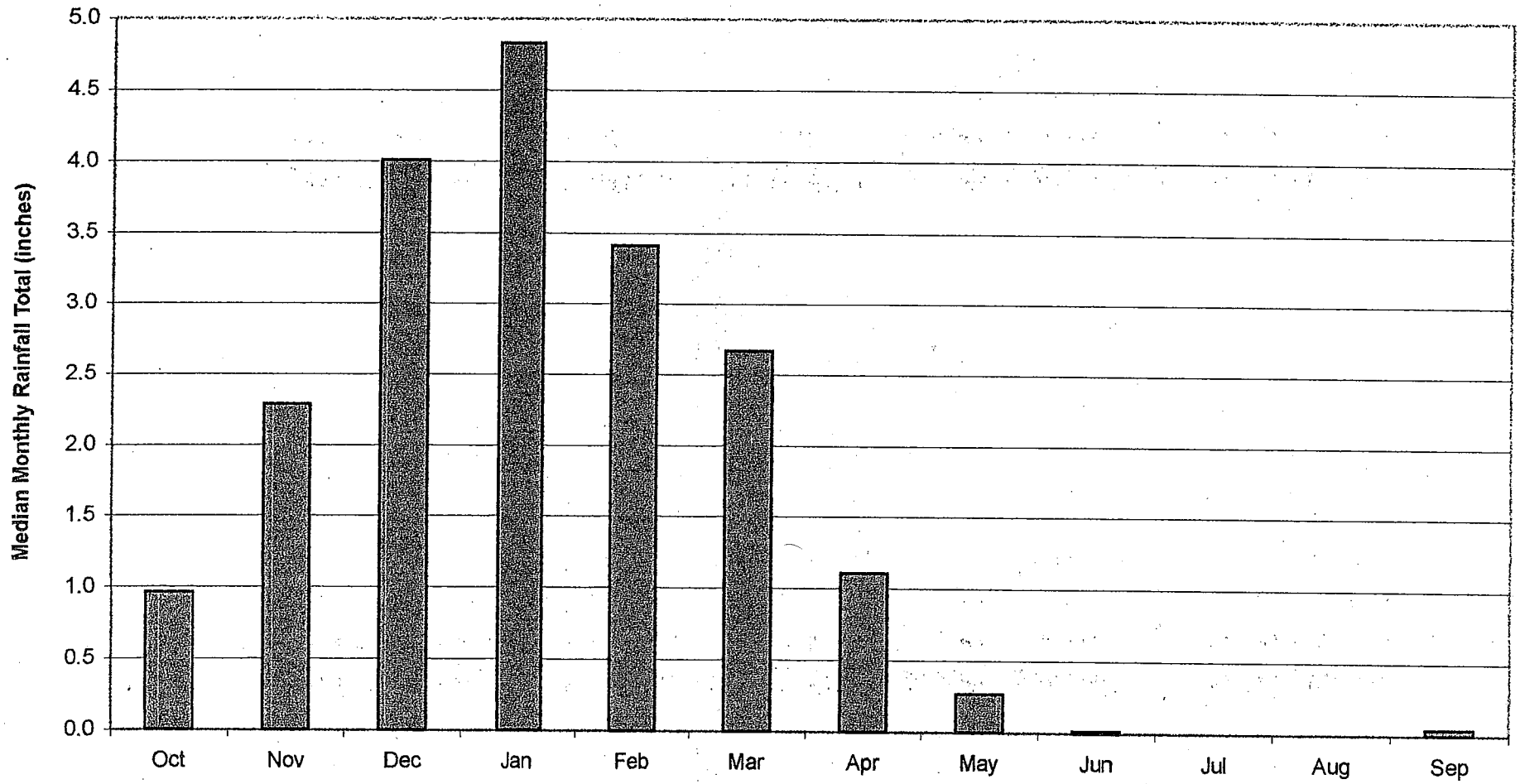


KAMMAN HYDROLOGY & ENGINEERING, INC.

SITE MAP

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 4



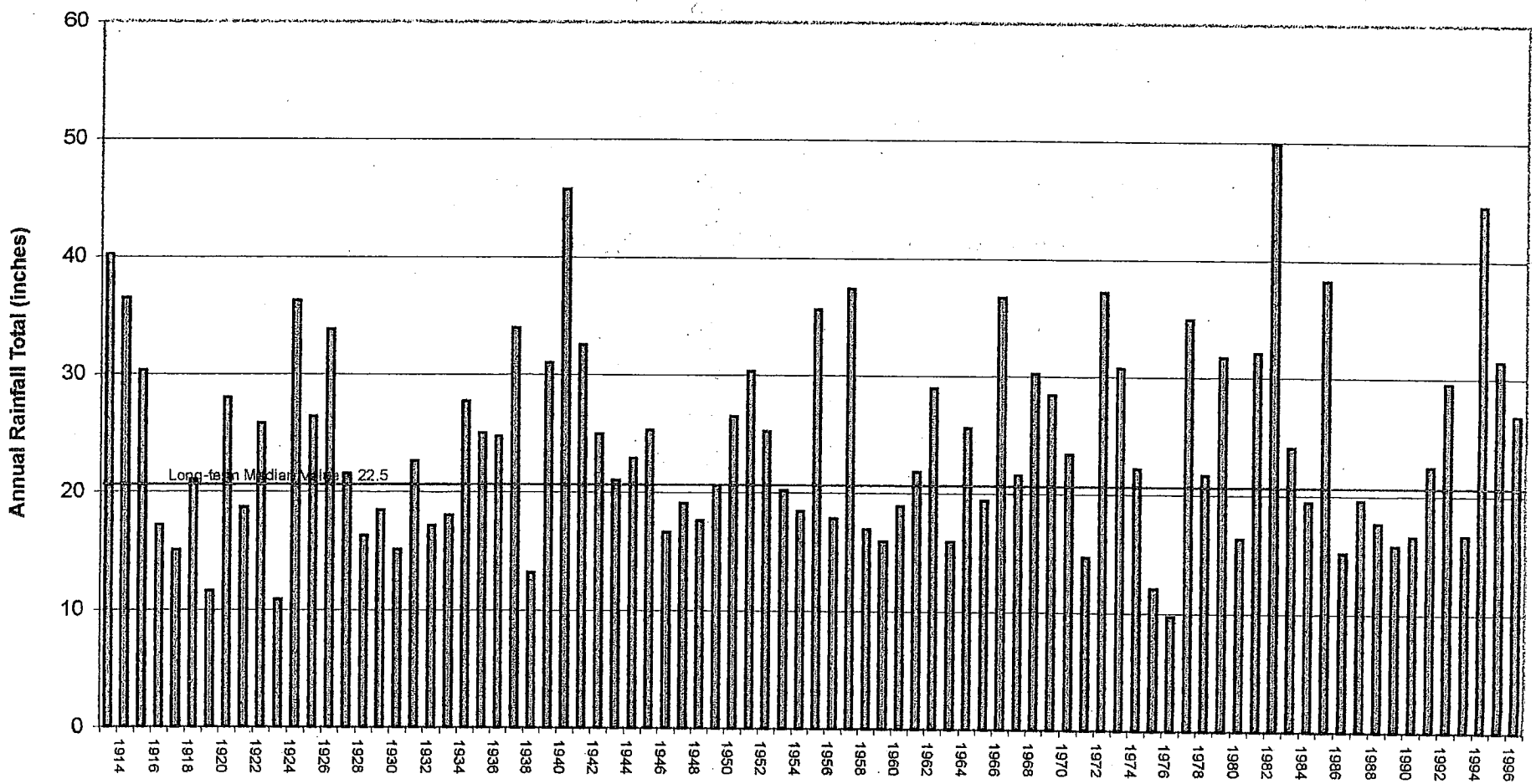
Source of Data: National Climate Data Center, Petaluma Fire Station rain gage, 1914-1997.

KAMMAN HYDROLOGY & ENGINEERING, INC.

LONG-TERM AVERAGE MONTHLY RAINFALL TOTALS (914-1997)

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 5



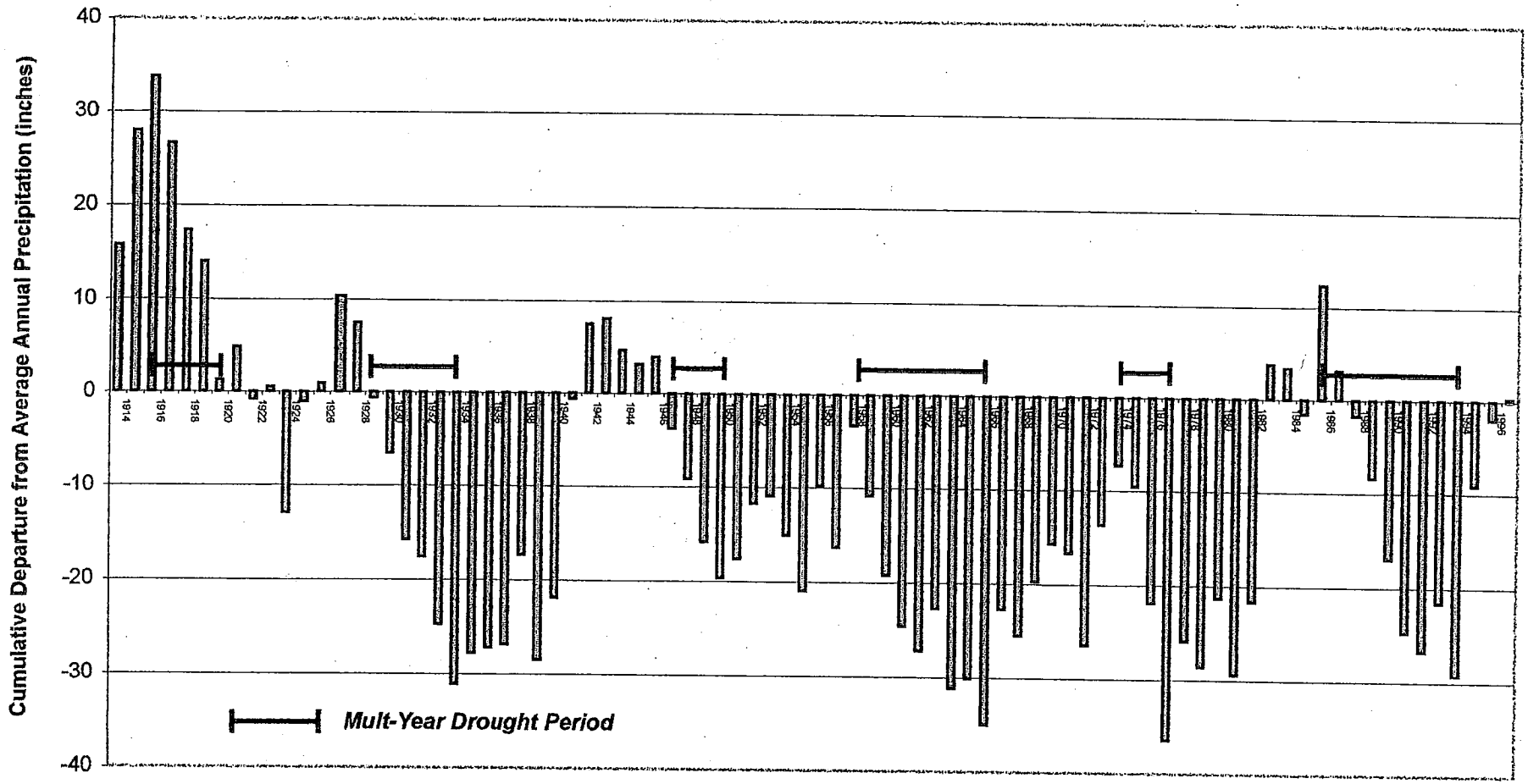
Source of Data: National Climate Data Center, Petaluma Fire Station rain gage, 1914-1997.

KAMMAN HYDROLOGY & ENGINEERING, INC.

LONG-TERM ANNUAL PRECIPITATION TOTALS (1914-1997)

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 6



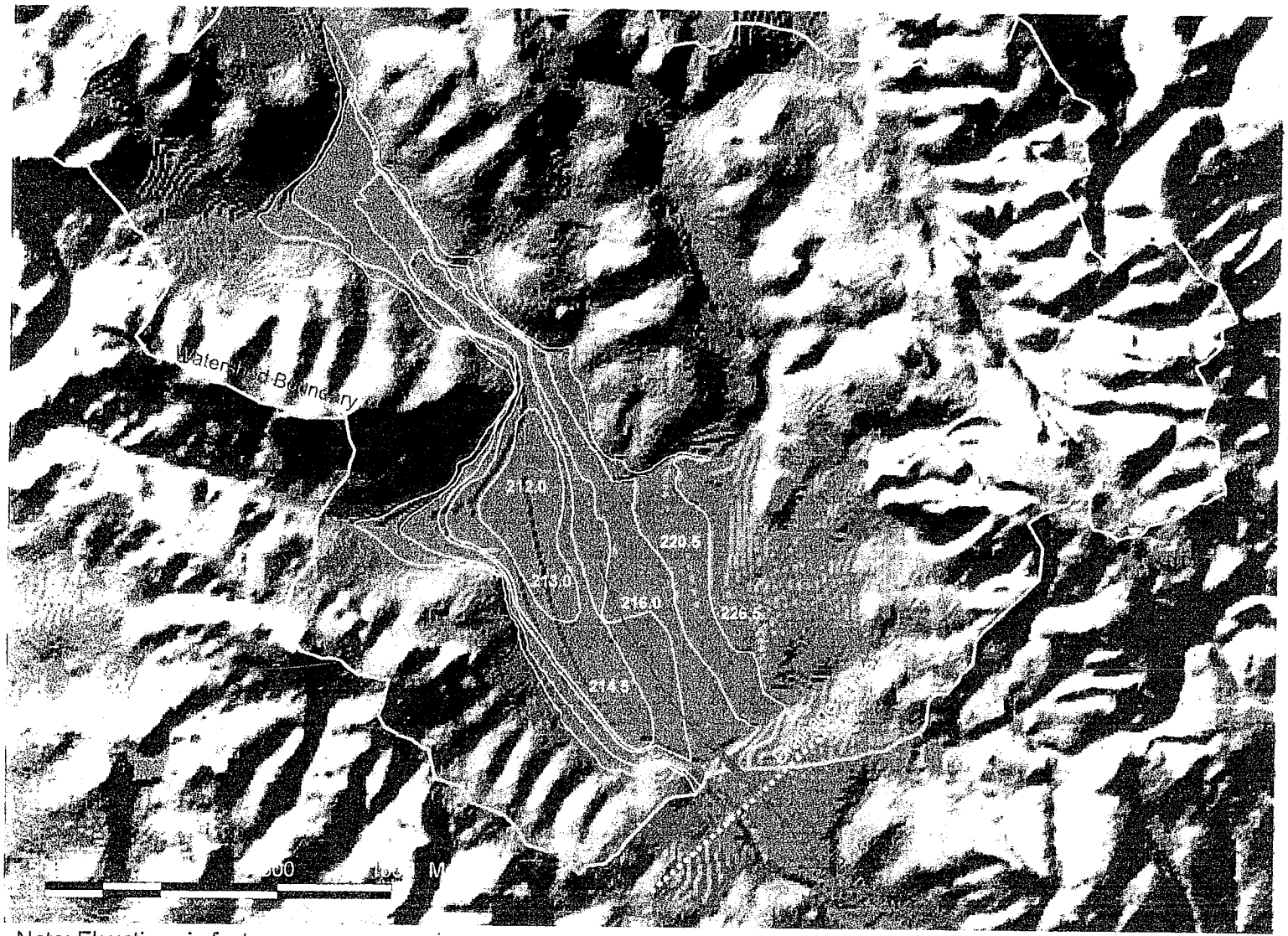
NOTE: Annual departures from the mean are calculated by subtracting the long-term average rainfall from each annual rainfall total. Positive results indicate that the year experienced above average rainfall while the negative results indicate that year was drier than average. Keeping track of the chronological sum of annual departures from the mean identify prolonged wet and dry periods. A positive slope to the cumulative departure curve indicates extended we periods while a negative slope indicates an extended dry period.

KAMMAN HYDROLOGY & ENGINEERING, INC.

CUMULATIVE DEPARTURE FROM AVERAGE ANNUAL RAINFALL

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 7



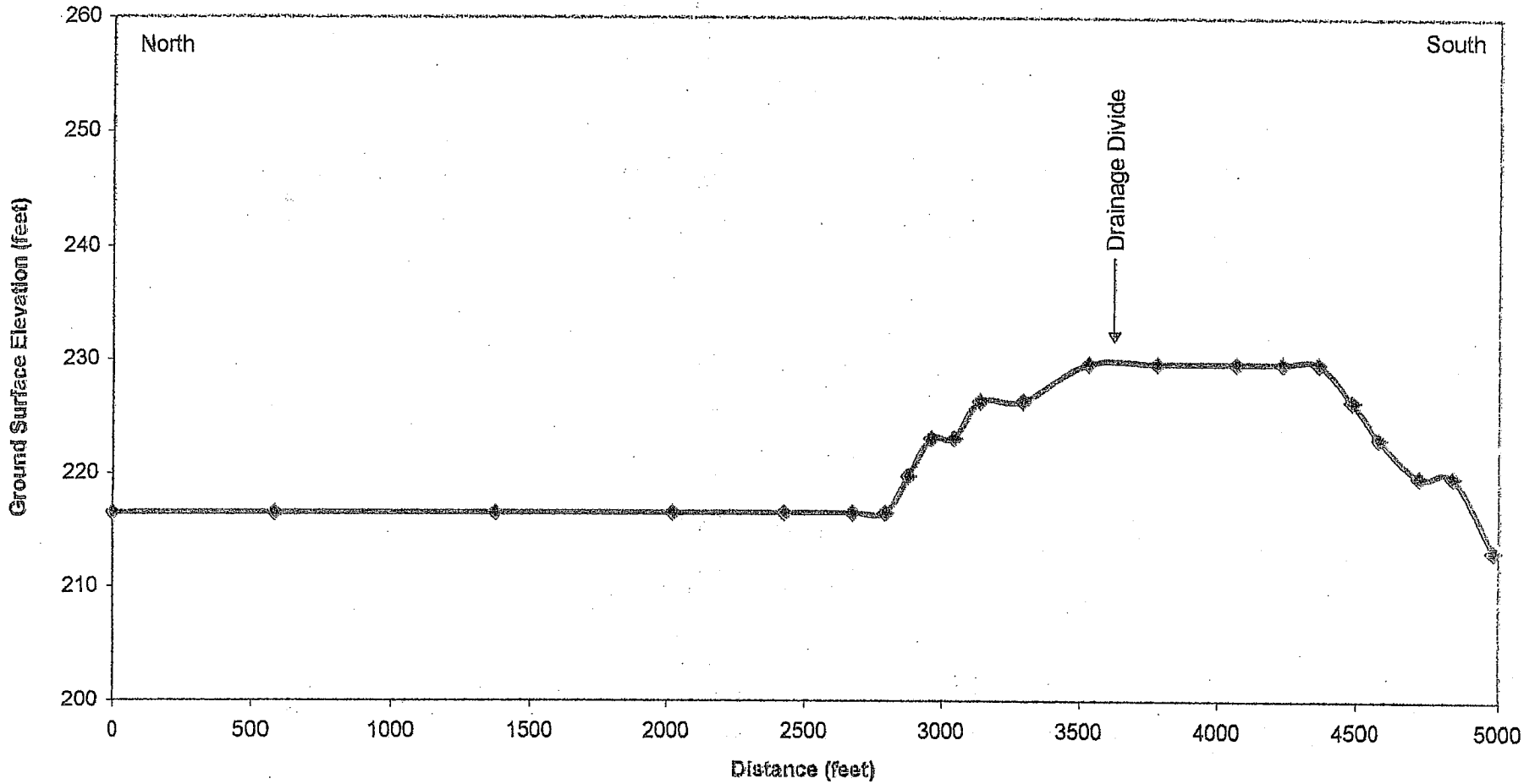
Note: Elevations in feet.

KAMMAN HYDROLOGY & ENGINEERING, INC.

ESTIMATED SITE TOPOGRAPHY

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 8



Note: Location of longitudinal profile indicated no Figure 8.

KAMMAN HYDROLOGY & ENGINEERING, INC.

PROFILE OF TOLAY LAKE BASIN: DOWNSTREAM DRAINAGE DIVIDE

Tolay Lake Ranch Property, Sonoma County, CA

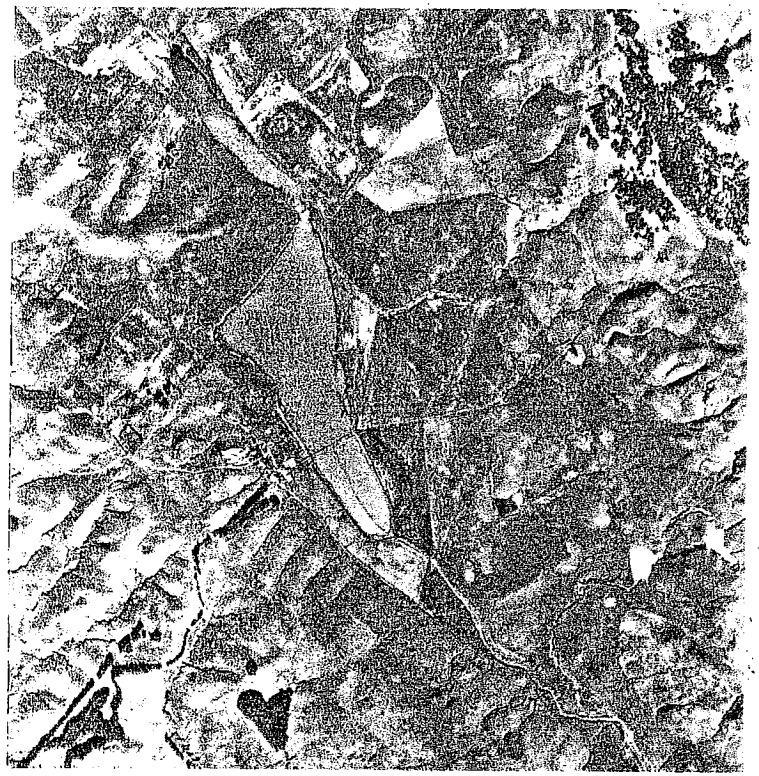
FIGURE 9

KAMMAN HYDROLOGY & ENGINEERING, INC.

CONFIGURATIONS OF LAKE RESTORATION ALTERNATIVES

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 10



MARCH 1, 1958

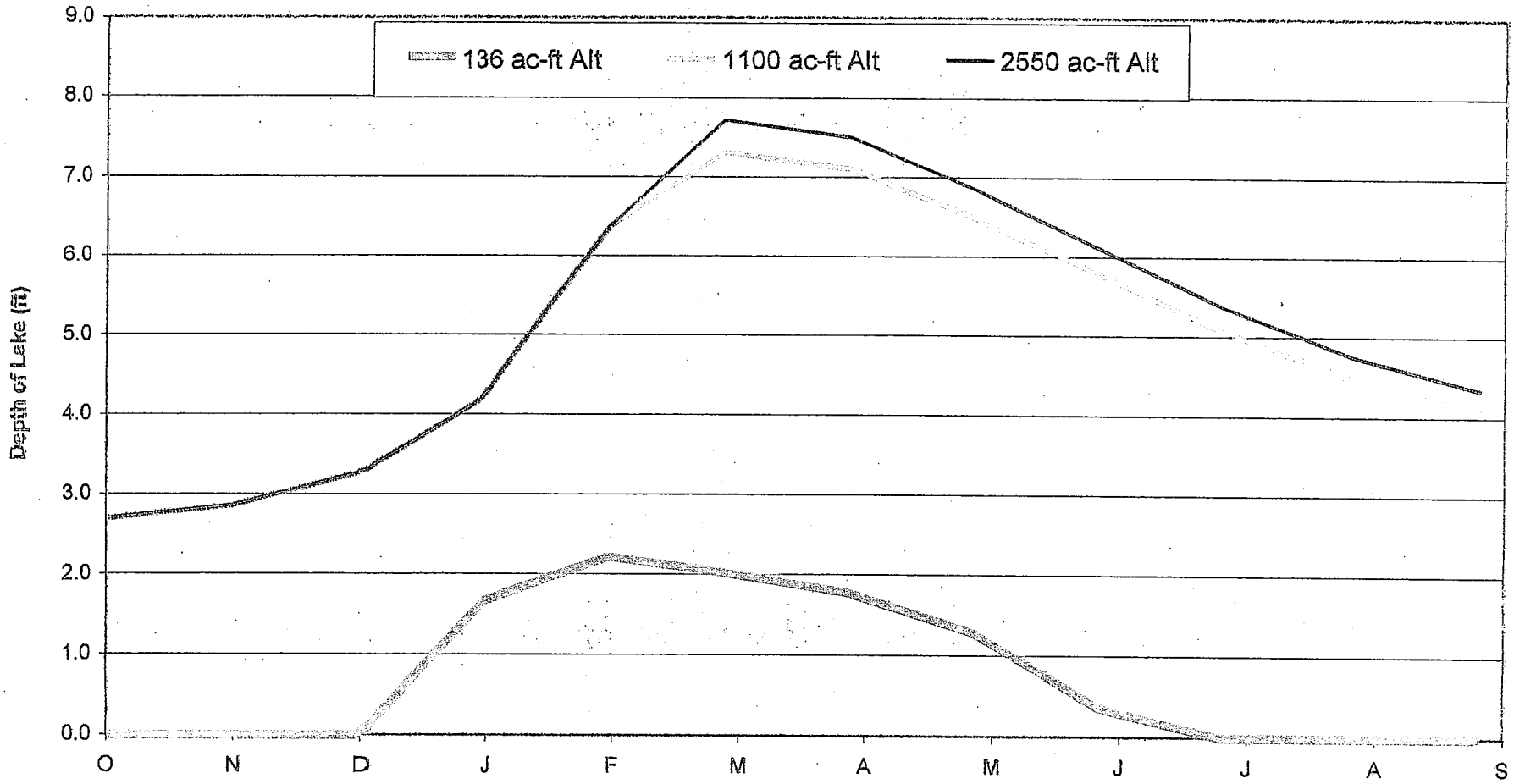
FEBRUARY 11, 1999

KAMMAN HYDROLOGY & ENGINEERING, INC.

INUNDATION AREAS: MARCH 1958 and FEBRUARY 1999

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 11

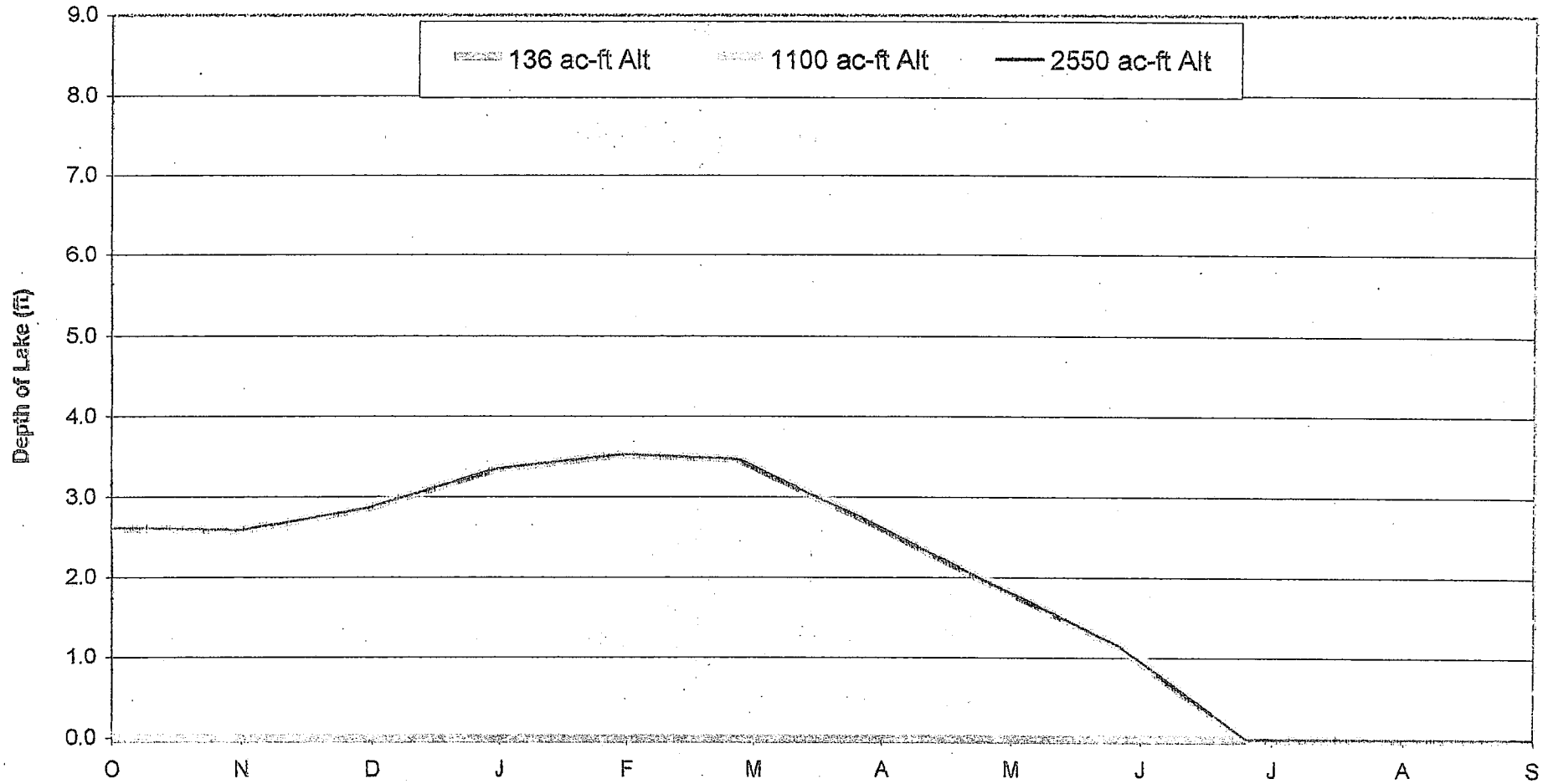


KAMMAN HYDROLOGY & ENGINEERING, INC.

END-OF-MONTH LAKE WATER DEPTHS: MEDIAN YEAR-TYPE

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 12

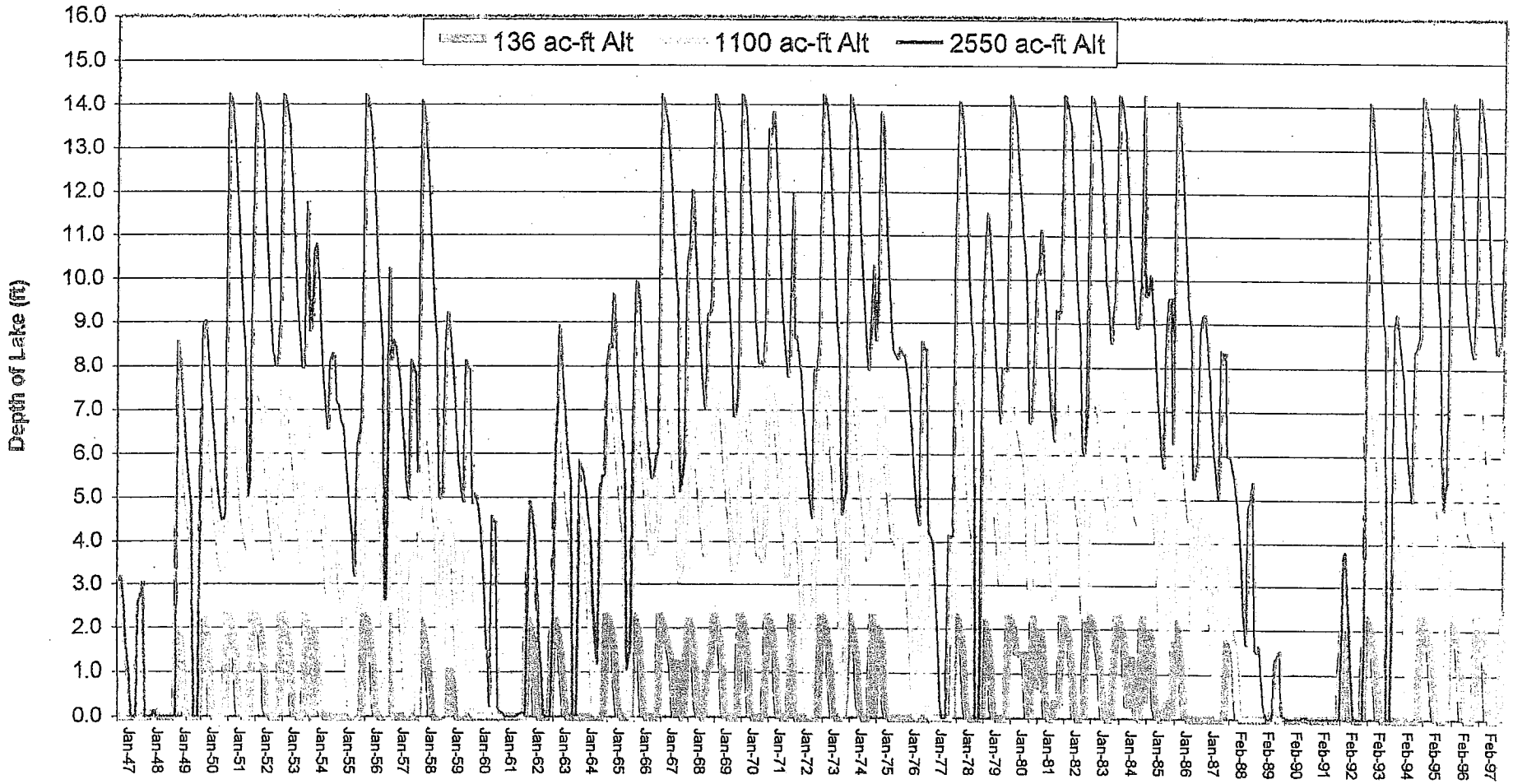


KAMMAN HYDROLOGY & ENGINEERING, INC.

END-OF-MONTH LAKE WATER DEPTHS: DRY YEAR-TYPE

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 13

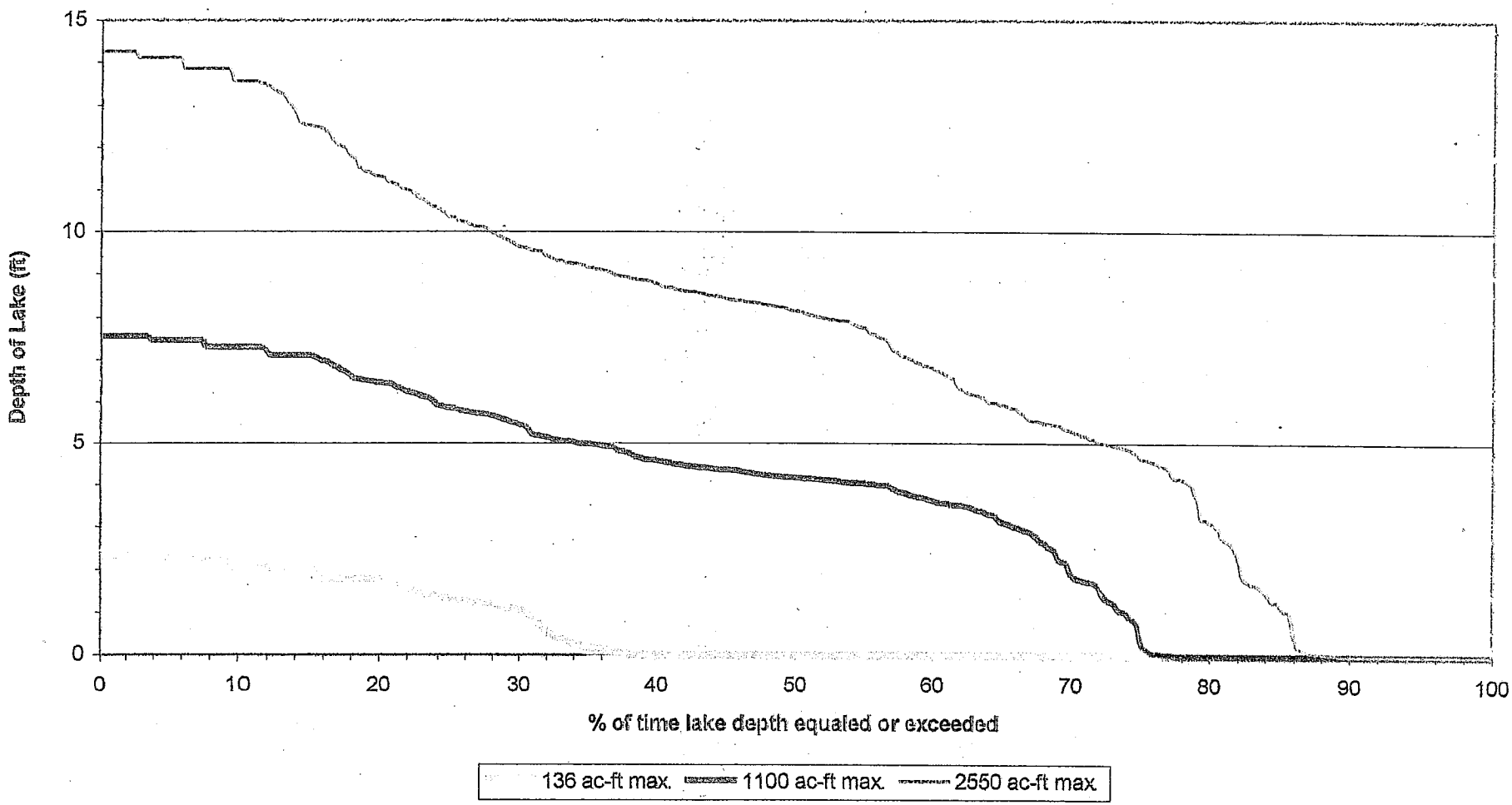


KAMMAN HYDROLOGY & ENGINEERING, INC.

END-OF-MONTH LAKE WATER DEPTHS: 1947-1997

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 14

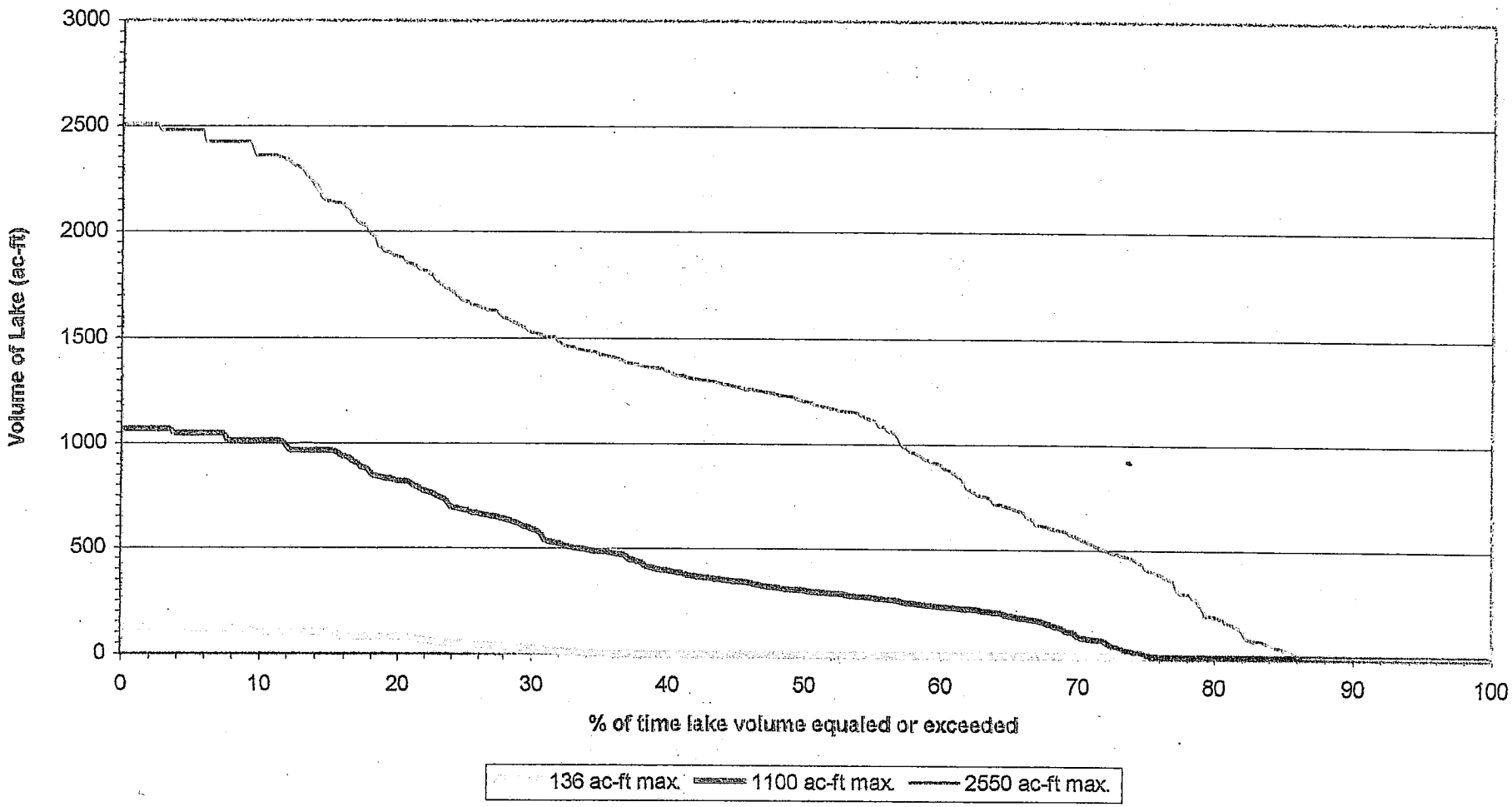


KAMMAN HYDROLOGY & ENGINEERING, INC.

LAKE DEPTH DURATION CURVES

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 15

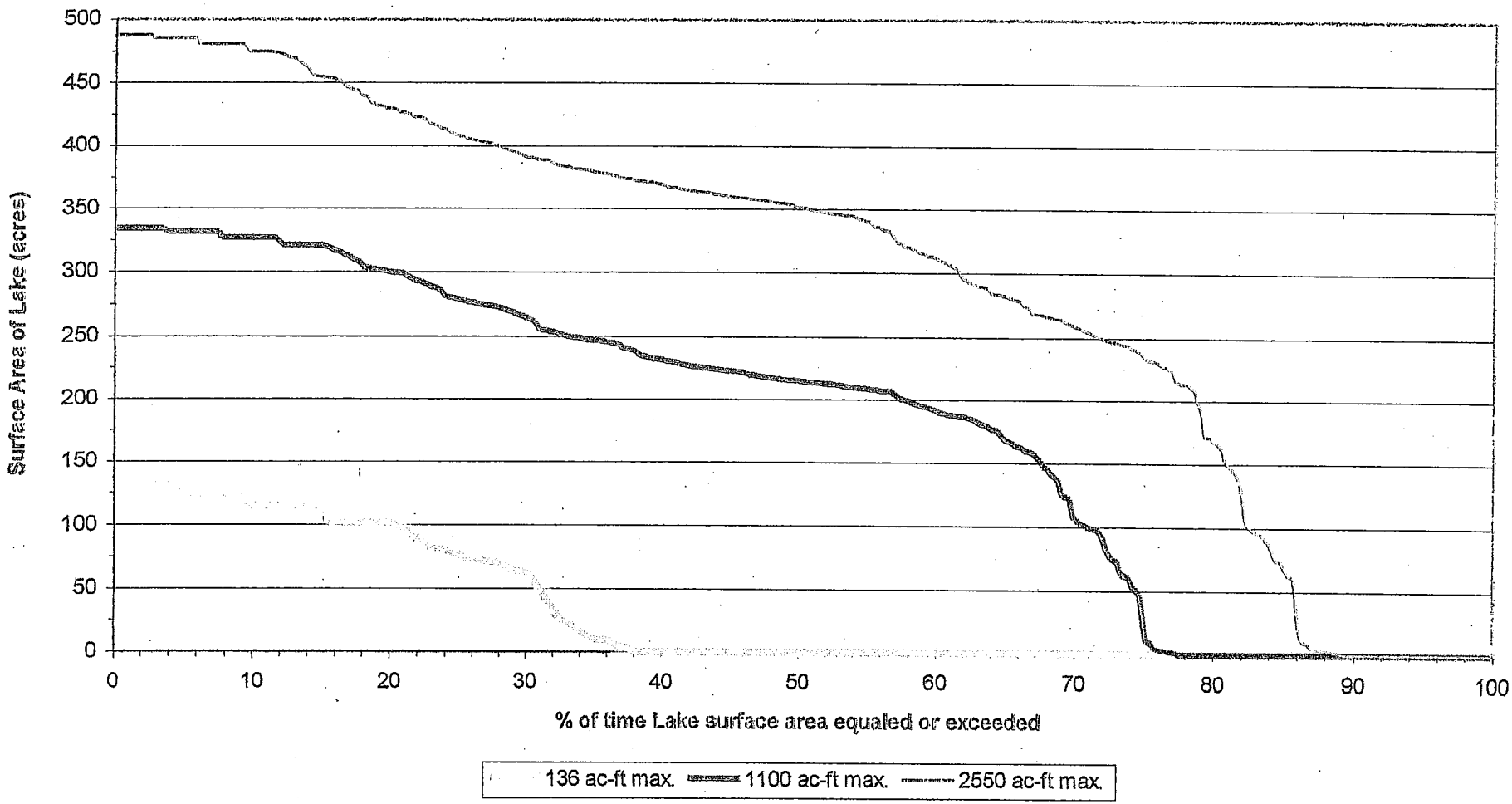


KAMMAN HYDROLOGY & ENGINEERING, INC.

LAKE VOLUME DURATION CURVES

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 16

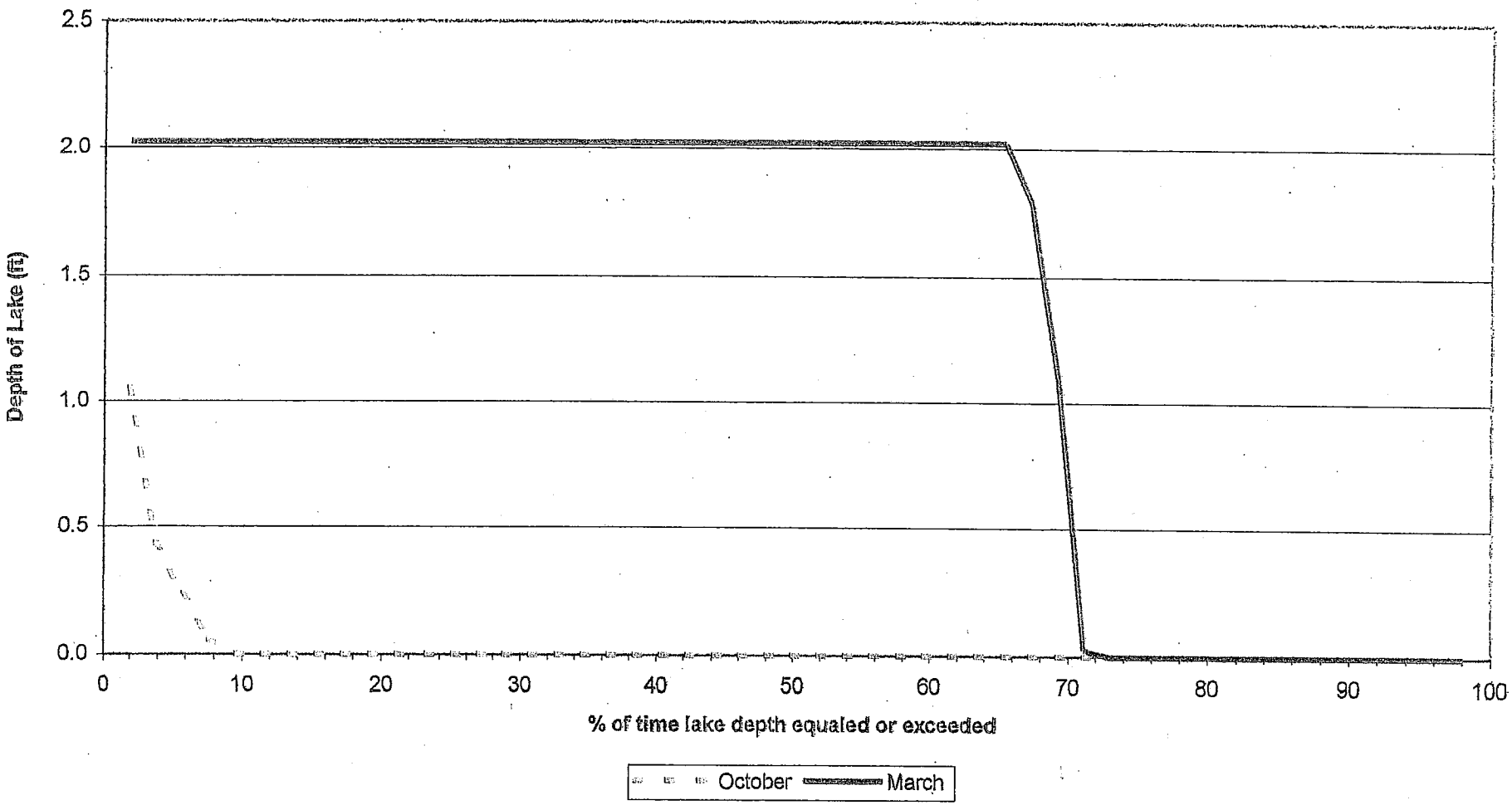


KAMMAN HYDROLOGY & ENGINEERING, INC.

LAKE SURFACE-AREA DURATION CURVES

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 17

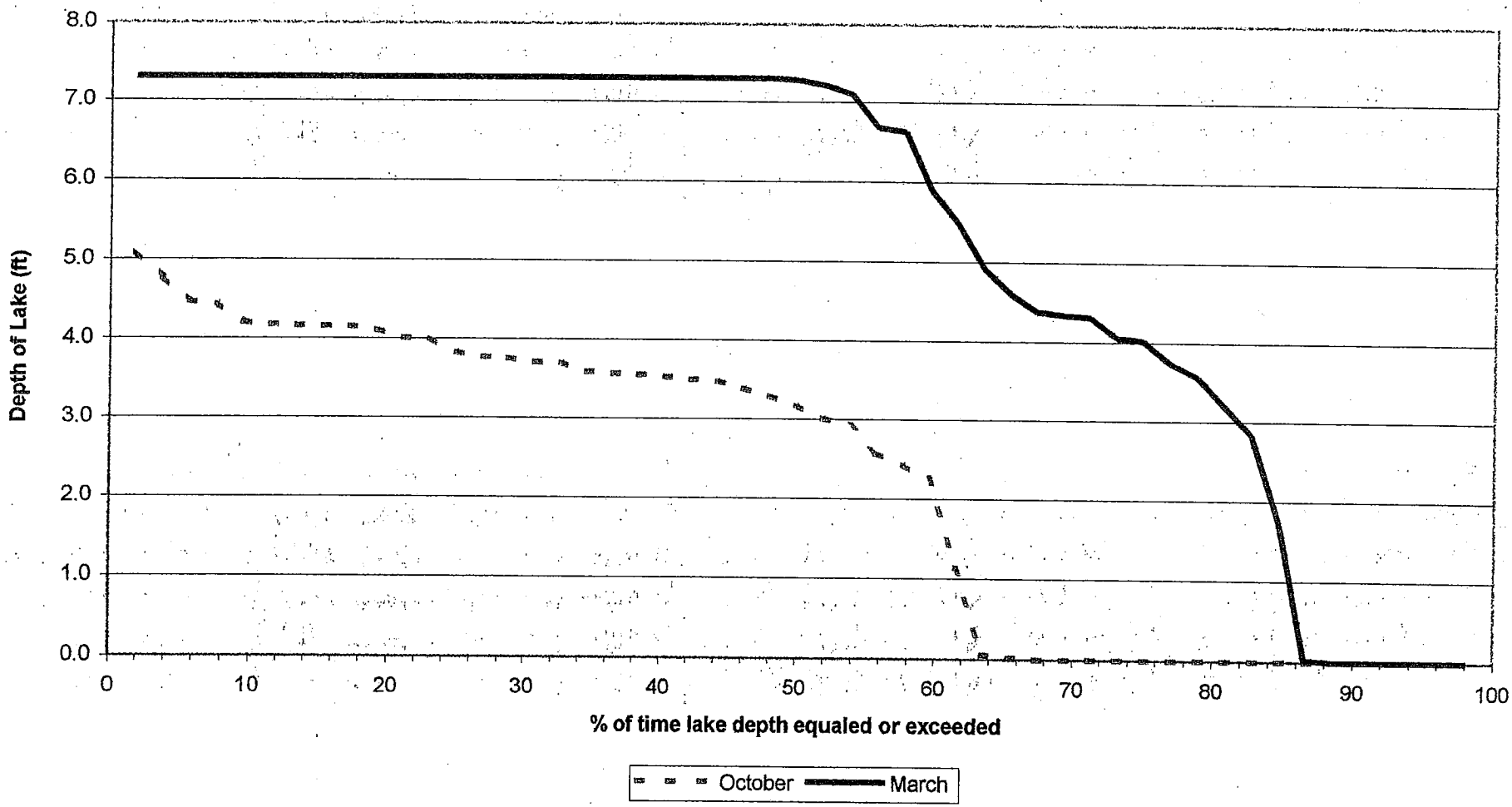


KAMMAN HYDROLOGY & ENGINEERING, INC.

END-OF-MONTH LAKE DEPTH DURATION CURVES: 136 ac-ft LAKE

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 18

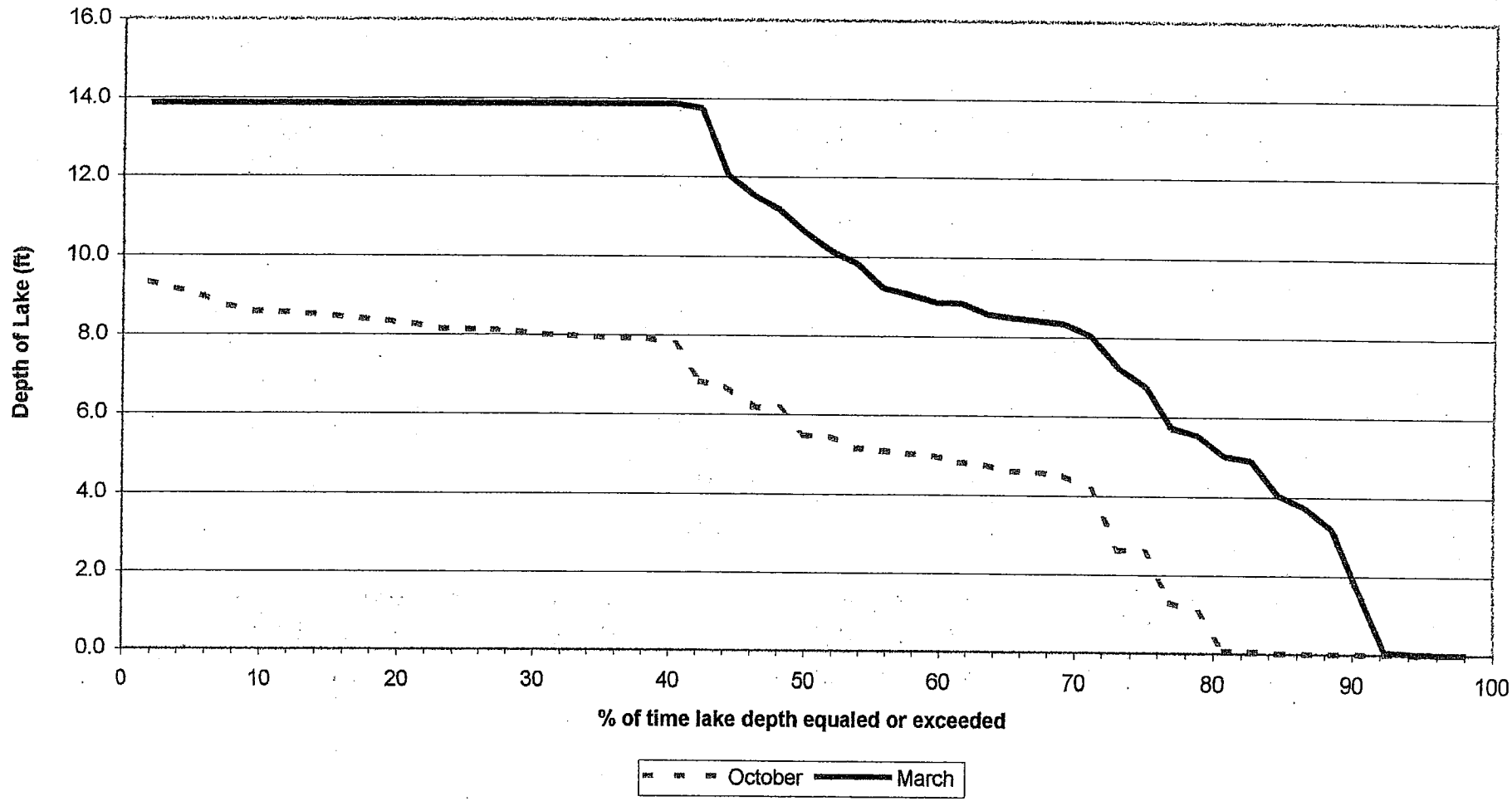


KAMMAN HYDROLOGY & ENGINEERING, INC.

END-OF-MONTH LAKE DEPTH DURATION CURVES: 1100 ac-ft LAKE

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 19



KAMMAN HYDROLOGY & ENGINEERING, INC.

END-OF-MONTH LAKE DEPTH DURATION CURVES: 2550 ac-ft LAKE

Tolay Lake Ranch Property, Sonoma County, CA

FIGURE 20

APPENDIX A
Boring Logs

KAMMAN HYDROLOGY & ENGINEERING, INC.

BORING LOG

Date: October 20, 2003

Boring Number: Boring # 1

Logged by: Greg Kamman

Project/Number: 3024 Tolay Lake

Driller:

Drilling Method: Hand Auger/Gouge Core

Ground Surface Elevation:

Sheet 1 of 1

DEPTH (feet)	GRAPHIC LOG	USCS	DESCRIPTION
1, 2, 3		CL	CLAY: black (5Y 2.5/1); dry; clay; very hard (adobe-like material); up to 4-cm, 50-cm deep mud cracks at surface; abundant white and salmon colored, 1-2mm diameter flakes (weathered minerals). Moist at 1-foot; firm, occasional roots Soft at 2.5 feet; color change to light olive brown (2.5Y 5/4)
4, 5, 6		CL	CLAY w/ SAND: olive (5Y 4/3); moist; 70% clay, 25% silt, 5% fine grained, angular sand; soft; low plasticity. Coarsening downward to 60% clay, 15% silt, 20% fine grained sand, and 5% fine-grained, angular gravel. Groundwater at 6.5-feet below ground surface
7, 8		CL	CLAY: olive (5Y 5/3); wet; 100% fines (clay >> silt), few fine sand grains; soft; moderate plasticity; , 5% fine grained, angular sand; soft; low plasticity.
9, 10			Bottom of Boring at 8.0-feet

KAMMAN HYDROLOGY & ENGINEERING, INC.

BORING LOG

Date: October 20, 2003

Boring Number: Boring # 2

Logged by: Greg Kamman

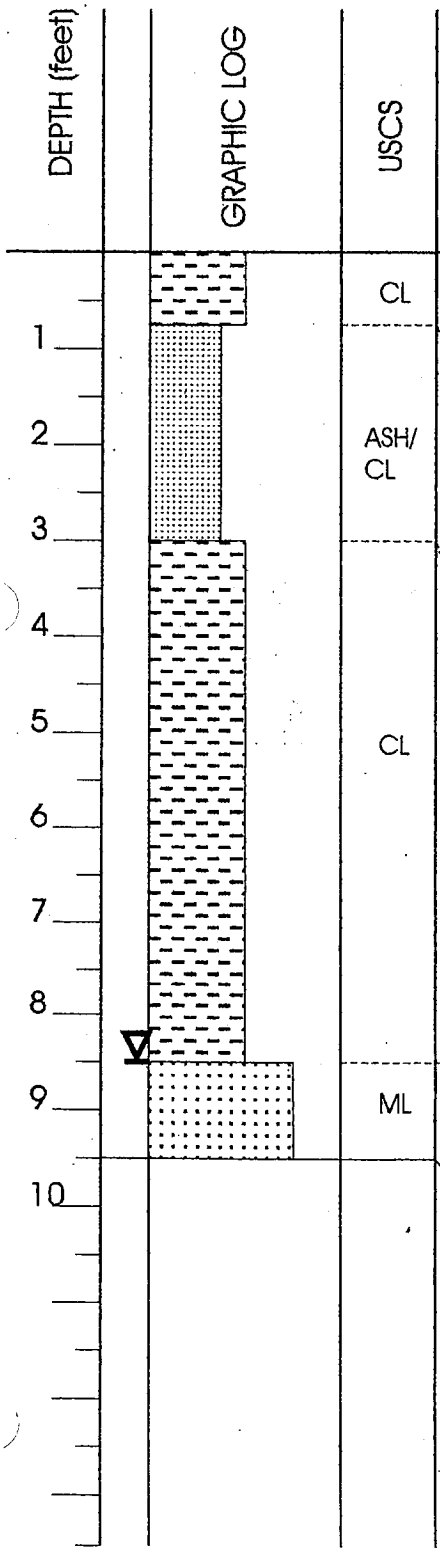
Project/Number: 3024 Tolay Lake

Driller:

Drilling Method: Hand Auger/Gouge Core

Ground Surface Elevation:

Sheet 1 of 1



USCS	DESCRIPTION
CL	CLAY: black (5Y 2.5/1); dry; clay with trace angular fine-grained sand; very hard (adobe-like material); up to 4-cm, 50-cm deep mud cracks at surface; abundant white, tan, and salmon-colored, 1-2mm diameter flakes (weathered minerals).
ASH/ CL	VOLCANIC ASH: yellowish brown (10YR 5/6); dry; soft, powder-like clay with abundant pink and salmon colored 1-2mm diameter flakes (weathered minerals).
	Interbedded (1-3cm-thick) layers of dry ash and black (10 YR 2/1), moist clay from 2-3 ft below ground surface (bgs).
CL	CLAY: black (10yr 2/1); moist; clay (no silt, sand, or gravel); firm; moderate plasticity.
	Trace, subrounded to subangular, fine-grained gravel 6.5-8.0 feet bgs.
	Color change to very dark grey (10YR 3/1) and increased silt/fine-grained sand content to 10% at 8.0 feet bgs.
ML	SILT: light grey (10YR 7/1); wet (groundwater table at 8.5 feet bgs); 60 percent silt, 40% clay; firm; low to moderate plasticity. Trace fine-grained sand at 9.0 feet bgs.
	Bottom of Boring at 9.5-feet

APPENDIX B

Water Budget for 50-Year Historic Conditions Simulation: 136 ac-ft Lake

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

known volumes (ac-ft.)		annual water rights (ac-ft.)		%time satisfied:
vol. 1 =	23.72	Kullberg (A030592):	35.0	
vol. 2 =	135.80	Kullberg (A029402):	12.0	
vol. 3 =	260.08	Martinelli (A016625):	9.0	
vol. 4 =	1276.06	Martinelli (A031022):	225.0	
vol. 5 =	2545.60	Oxfoot (A029166):	245.0	
			526.0	**72.55**
		Roche (A030579):	**2004.0**	**54.90**

dam scenario A
Tolay drainage area (ac): 3084.00
max. Tolay Lake capacity (ac-ft.): **136.0**
Roche drainage area (ac): 3153.92

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1947	Oct	0.23	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1947	Nov	3.52	0.00	0.00	0.54	0.54	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1947	Dec	2.97	0.00	0.08	20.71	20.71	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1947	Jan	0.76	0.00	0.04	9.76	9.76	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1947	Feb	2.63	0.00	0.54	137.60	137.60	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1947	Mar	4.26	0.00	0.92	237.36	237.36	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1947	Apr	0.69	0.00	0.37	95.95	95.95	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1947	May	0.29	0.00	0.05	12.63	0.00	12.63	0.00	6.17	16.58	0.00	0.00	0.00	
1947	Jun	1.26	0.00	0.01	3.42	0.00	3.42	0.00	6.89	5.13	0.00	0.00	0.00	
1947	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1947	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1947	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1947	**annual**	**16.61**	**0.00**	**2.02**	**517.96**	**501.92**	**16.05**	**0.00**	**48.35**	**21.71**				**529.71**
1948	Oct	3.37	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1948	Nov	1.20	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1948	Dec	1.15	0.00	0.00	1.14	1.14	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1948	Jan	1.82	0.00	0.02	4.38	4.38	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1948	Feb	2.03	0.00	0.02	5.32	5.32	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1948	Mar	3.75	0.00	0.25	64.14	64.14	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1948	Apr	5.11	0.00	0.62	159.16	159.16	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1948	May	0.50	0.00	0.16	40.91	0.00	40.91	0.00	6.17	37.14	3.76	0.16	9.82	
1948	Jun	0.07	0.06	0.03	8.77	0.00	8.83	0.00	6.89	18.46	0.00	0.00	0.00	
1948	Jul	0.00	0.00	0.00	0.98	0.00	0.98	0.00	7.12	1.55	0.00	0.00	0.00	
1948	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1948	Sep	0.03	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1948	**annual**	**19.03**	**0.06**	**1.11**	**284.79**	**234.14**	**50.71**	**0.00**	**48.35**	**57.14**				**291.28**
1949	Oct	0.51	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1949	Nov	0.87	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1949	Dec	4.67	0.00	0.15	38.04	38.04	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1949	Jan	1.50	0.00	0.27	69.52	69.52	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1949	Feb	2.54	0.00	1.20	307.13	307.13	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1949	Mar	7.16	0.00	5.86	1504.93	111.30	1393.63	1257.63	3.09	35.77	100.23	2.03	114.69	
1949	Apr	0.00	0.00	0.34	85.01	0.00	85.01	49.24	4.68	54.10	81.90	1.78	101.90	
1949	May	0.24	2.04	0.08	20.35	0.00	22.38	0.00	6.17	60.41	43.88	1.27	74.43	
1949	Jun	0.00	0.00	0.02	4.61	0.00	4.61	0.00	6.89	44.66	3.83	0.16	9.98	
1949	Jul	0.03	0.02	0.00	0.32	0.00	0.34	0.00	7.12	6.44	0.00	0.00	0.00	
1949	Aug	0.10	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1949	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1949	**annual**	**17.62**	**2.06**	**7.91**	**2029.92**	**526.00**	**1505.99**	**1306.88**	**48.35**	**201.38**				**3387.01**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1950	Oct	0.12	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1950	Nov	1.18	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1950	Dec	2.77	0.00	0.00	0.00	0.00	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1950	Jan	9.18	0.00	2.19	563.93	526.00	37.93	0.00	1.08	6.29	31.64	1.11	65.30	
1950	Feb	3.90	21.22	3.37	846.82	0.00	868.05	763.69	1.82	21.00	115.00	2.22	124.77	
1950	Mar	1.86	19.34	0.32	79.63	0.00	98.97	77.97	3.09	35.77	100.23	2.03	114.69	
1950	Apr	1.20	11.47	0.16	38.58	0.00	50.05	14.28	4.68	54.10	81.90	1.78	101.90	
1950	May	0.39	3.31	0.05	12.05	0.00	15.36	0.00	6.17	57.92	39.34	1.21	71.06	
1950	Jun	0.00	0.00	0.01	3.18	0.00	3.18	0.00	6.89	42.13	0.39	0.02	1.08	
1950	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.64	0.00	0.00	0.00	
1950	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1950	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1950	**annual**	**20.60**	**55.34**	**6.10**	**1544.20**	**526.00**	**1073.54**	**855.94**	**48.35**	**217.85**				**2459.34**
1951	Oct	2.78	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1951	Nov	5.93	0.00	0.86	219.92	219.92	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1951	Dec	7.41	0.00	5.63	1447.70	306.08	1141.62	1005.62	1.08	12.47	123.53	2.34	130.51	
1951	Jan	4.03	43.83	3.32	817.35	0.00	861.18	848.71	1.08	12.47	123.53	2.34	130.51	
1951	Feb	3.38	36.76	2.28	560.61	0.00	597.37	584.89	1.82	21.00	115.00	2.22	124.77	
1951	Mar	1.30	13.52	1.28	316.59	0.00	330.11	309.11	3.09	35.77	100.23	2.03	114.69	
1951	Apr	0.74	7.07	0.17	41.09	0.00	48.17	12.40	4.68	54.10	81.90	1.78	101.90	
1951	May	0.86	7.30	0.09	21.81	0.00	29.11	0.00	6.17	62.77	48.24	1.33	77.65	
1951	Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.89	44.56	3.69	0.16	9.62	
1951	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	5.70	0.00	0.00	0.00	
1951	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1951	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1951	**annual**	**26.43**	**108.48**	**13.63**	**3425.08**	**526.00**	**3007.56**	**2760.72**	**48.35**	**248.85**				**6341.76**
1952	Oct	1.36	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1952	Nov	3.17	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1952	Dec	6.99	0.00	0.77	198.64	198.64	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1952	Jan	10.46	0.00	7.79	2003.21	327.36	1675.85	1539.85	1.08	12.47	123.53	2.34	130.51	
1952	Feb	2.66	28.93	2.56	630.50	0.00	659.43	646.96	1.82	21.00	115.00	2.22	124.77	
1952	Mar	4.61	47.93	3.35	825.40	0.00	873.33	852.33	3.09	35.77	100.23	2.03	114.69	
1952	Apr	0.70	6.69	0.41	100.70	0.00	107.39	71.62	4.68	54.10	81.90	1.78	101.90	
1952	May	0.10	0.85	0.07	17.09	0.00	17.94	0.00	6.17	58.84	41.00	1.23	72.30	
1952	Jun	0.26	1.57	0.03	7.80	0.00	9.36	0.00	6.89	45.45	4.91	0.21	12.77	
1952	Jul	0.00	0.00	0.01	3.19	0.00	3.19	0.00	7.12	12.39	0.00	0.00	0.00	
1952	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1952	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1952	**annual**	**30.31**	**85.97**	**15.00**	**3786.52**	**526.00**	**3346.49**	**3110.75**	**48.35**	**240.02**				**7051.98**
1953	Oct	0.15	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1953	Nov	2.48	0.00	0.01	2.28	2.28	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1953	Dec	11.66	0.00	4.48	1151.43	523.72	627.71	491.71	1.08	12.47	123.53	2.34	130.51	
1953	Jan	4.68	50.90	5.65	1389.66	0.00	1440.56	1428.08	1.08	12.47	123.53	2.34	130.51	
1953	Feb	0.08	0.87	0.57	141.24	0.00	142.11	129.64	1.82	21.00	115.00	2.22	124.77	
1953	Mar	1.87	19.44	0.28	68.00	0.00	87.45	66.44	3.09	35.77	100.23	2.03	114.69	
1953	Apr	3.04	29.05	0.13	31.84	0.00	60.89	25.13	4.68	54.10	81.90	1.78	101.90	
1953	May	0.66	5.60	0.05	13.18	0.00	18.79	0.00	6.17	59.14	41.55	1.24	72.70	
1953	Jun	0.35	2.12	0.01	3.02	0.00	5.14	0.00	6.89	43.90	2.79	0.12	7.31	
1953	Jul	0.00	0.00	0.00	0.22	0.00	0.22	0.00	7.12	4.67	0.00	0.00	0.00	
1953	Aug	0.20	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1953	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1953	**annual**	**25.17**	**107.99**	**11.18**	**2800.88**	**526.00**	**2382.87**	**2141.00**	**48.35**	**243.53**				**5079.28**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1954	Oct	0.28	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1954	Nov	3.58	0.00	0.00	0.98	0.98	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1954	Dec	0.60	0.00	0.00	0.27	0.27	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1954	Jan	5.11	0.00	0.42	108.24	108.24	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1954	Feb	2.97	0.00	1.56	405.96	405.96	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1954	Mar	5.25	0.00	1.64	420.84	10.55	410.29	274.29	3.09	35.77	100.23	2.03	114.69	
1954	Apr	1.55	14.81	0.73	180.38	0.00	195.19	159.42	4.68	54.10	81.90	1.78	101.90	
1954	May	0.09	0.76	0.07	17.91	0.00	18.67	0.00	6.17	59.10	41.47	1.24	72.65	
1954	Jun	0.36	2.18	0.02	4.61	0.00	6.79	0.00	6.89	44.57	3.70	0.16	9.65	
1954	Jul	0.01	0.01	0.00	0.87	0.00	0.88	0.00	7.12	7.07	0.00	0.00	0.00	
1954	Aug	0.39	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1954	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1954	**annual**	**20.19**	**17.77**	**4.47**	**1140.08**	**526.00**	**631.83**	**433.71**	**48.35**	**200.60**				**1607.49**
1955	Oct	0.22	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1955	Nov	4.05	0.00	0.02	5.21	5.21	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1955	Dec	4.91	0.00	0.74	190.22	190.22	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1955	Jan	4.06	0.00	0.73	186.85	186.85	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1955	Feb	0.95	0.00	0.23	59.45	59.45	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1955	Mar	0.37	0.00	0.11	29.29	29.29	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1955	Apr	3.34	0.00	0.07	18.73	18.73	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1955	May	0.00	0.00	0.04	9.93	0.00	9.93	0.00	6.17	13.12	0.00	0.00	0.00	
1955	Jun	0.00	0.00	0.02	5.70	0.00	5.70	0.00	6.89	8.49	0.00	0.00	0.00	
1955	Jul	0.00	0.00	0.01	1.85	0.00	1.85	0.00	7.12	2.89	0.00	0.00	0.00	
1955	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1955	Sep	0.55	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1955	**annual**	**18.45**	**0.00**	**1.97**	**507.25**	**489.76**	**17.49**	**0.00**	**48.35**	**24.50**				**518.75**
1956	Oct	0.18	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1956	Nov	2.22	0.00	0.01	1.42	1.42	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1956	Dec	15.48	0.00	7.66	1969.54	524.58	1444.96	1308.96	1.08	12.47	123.53	2.34	130.51	
1956	Jan	9.85	107.12	8.58	2111.90	0.00	2219.02	2206.55	1.08	12.47	123.53	2.34	130.51	
1956	Feb	4.65	50.57	3.96	975.60	0.00	1026.17	1013.70	1.82	21.00	115.00	2.22	124.77	
1956	Mar	0.33	3.43	0.84	208.37	0.00	211.80	190.80	3.09	35.77	100.23	2.03	114.69	
1956	Apr	2.23	21.31	0.12	29.96	0.00	51.27	15.50	4.68	54.10	81.90	1.78	101.90	
1956	May	0.61	5.18	0.06	14.98	0.00	20.16	0.00	6.17	59.62	42.43	1.25	73.36	
1956	Jun	0.00	0.00	0.02	5.88	0.00	5.88	0.00	6.89	44.59	3.73	0.16	9.73	
1956	Jul	0.00	0.00	0.00	0.92	0.00	0.92	0.00	7.12	7.18	0.00	0.00	0.00	
1956	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1956	Sep	0.08	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1956	**annual**	**35.63**	**187.62**	**21.27**	**5318.57**	**526.00**	**4980.19**	**4735.50**	**48.35**	**247.21**				**10325.02**
1957	Oct	1.41	0.00	0.01	1.85	1.85	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1957	Nov	0.09	0.00	0.04	9.45	9.45	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1957	Dec	0.35	0.00	0.03	8.75	8.75	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1957	Jan	3.52	0.00	0.04	11.45	11.45	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1957	Feb	5.46	0.00	0.57	145.81	145.81	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1957	Mar	2.34	0.00	0.56	144.26	144.26	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1957	Apr	1.50	0.00	0.07	19.06	19.06	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1957	May	2.16	0.00	0.10	26.26	0.00	26.26	0.00	6.17	31.50	0.00	0.00	0.00	
1957	Jun	0.00	0.00	0.04	10.10	0.00	10.10	0.00	6.89	14.88	0.00	0.00	0.00	
1957	Jul	0.00	0.00	0.00	0.49	0.00	0.49	0.00	7.12	0.79	0.00	0.00	0.00	
1957	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1957	Sep	0.99	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1957	**annual**	**17.82**	**0.00**	**1.47**	**377.49**	**340.64**	**36.85**	**0.00**	**48.35**	**47.17**				**386.05**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1958	Oct	4.87	0.00	0.02	6.06	6.06	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1958	Nov	0.88	0.00	0.03	7.66	7.66	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1958	Dec	3.08	0.00	0.09	23.74	23.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1958	Jan	5.57	0.00	1.20	308.06	308.06	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1958	Feb	11.23	0.00	10.65	2736.83	180.49	2556.34	2420.34	1.82	21.00	115.00	2.22	124.77	
1958	Mar	5.21	54.17	2.56	631.57	0.00	685.74	664.74	3.09	35.77	100.23	2.03	114.69	
1958	Apr	5.72	54.67	5.15	1275.18	0.00	1329.85	1294.08	4.68	54.10	81.90	1.78	101.90	
1958	May	0.46	3.91	0.14	35.65	0.00	39.55	0.00	6.17	66.40	55.06	1.42	82.64	
1958	Jun	0.32	2.20	0.07	18.71	0.00	20.91	0.00	6.89	56.06	19.90	0.84	50.11	
1958	Jul	0.00	0.00	0.03	8.28	0.00	8.28	0.00	7.12	37.19	0.00	0.00	0.00	
1958	Aug	0.00	0.00	0.00	0.93	0.00	0.93	0.00	6.45	1.33	0.00	0.00	0.00	
1958	Sep	0.04	0.00	0.00	0.44	0.00	0.44	0.00	4.94	0.50	0.00	0.00	0.00	
1958	**annual**	**37.38**	**114.95**	**19.96**	**5053.09**	**526.00**	**4642.04**	**4379.16**	**48.35**	**272.35**				**9626.33**
1959	Oct	0.09	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1959	Nov	0.18	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1959	Dec	1.13	0.00	0.01	2.36	2.36	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1959	Jan	6.35	0.00	0.22	56.22	56.22	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1959	Feb	6.26	0.00	1.80	463.74	463.74	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1959	Mar	0.59	0.00	0.21	54.20	3.68	50.53	0.00	3.09	20.43	30.09	1.09	64.14	
1959	Apr	0.35	1.87	0.07	17.39	0.00	19.26	0.00	4.68	30.57	18.78	0.79	47.40	
1959	May	0.08	0.32	0.03	6.46	0.00	6.78	0.00	6.17	31.23	0.00	0.00	0.00	
1959	Jun	0.00	0.00	0.00	0.60	0.00	0.60	0.00	6.89	0.94	0.00	0.00	0.00	
1959	Jul	0.06	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1959	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1959	Sep	1.85	0.00	0.00	0.16	0.00	0.16	0.00	4.94	0.20	0.00	0.00	0.00	
1959	**annual**	**16.94**	**2.19**	**2.34**	**601.14**	**526.00**	**77.33**	**0.00**	**48.35**	**83.37**				**615.25**
1960	Oct	0.04	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1960	Nov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1960	Dec	1.31	0.00	0.00	1.25	1.25	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1960	Jan	5.88	0.00	0.07	17.68	17.68	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1960	Feb	4.76	0.00	1.27	326.90	326.90	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1960	Mar	2.24	0.00	0.23	58.92	58.92	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1960	Apr	1.01	0.00	0.05	14.01	14.01	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1960	May	0.66	0.00	0.04	9.09	0.00	9.09	0.00	6.17	12.03	0.00	0.00	0.00	
1960	Jun	0.00	0.00	0.00	0.81	0.00	0.81	0.00	6.89	1.25	0.00	0.00	0.00	
1960	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1960	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1960	Sep	0.02	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1960	**annual**	**15.92**	**0.00**	**1.67**	**428.65**	**418.75**	**9.90**	**0.00**	**48.35**	**13.28**				**438.37**
1961	Oct	0.40	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1961	Nov	3.91	0.00	0.00	1.14	1.14	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1961	Dec	2.75	0.00	0.05	13.97	13.97	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1961	Jan	4.37	0.00	0.19	50.00	50.00	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1961	Feb	1.99	0.00	0.22	56.11	56.11	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1961	Mar	3.25	0.00	0.13	32.83	32.83	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1961	Apr	1.15	0.00	0.02	4.24	4.24	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1961	May	0.37	0.00	0.00	0.27	0.00	0.27	0.00	6.17	0.39	0.00	0.00	0.00	
1961	Jun	0.07	0.00	0.00	0.00	0.00	0.00	0.00	6.89	0.00	0.00	0.00	0.00	
1961	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1961	Aug	0.02	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1961	Sep	0.63	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1961	**annual**	**18.91**	**0.00**	**0.62**	**158.54**	**158.27**	**0.27**	**0.00**	**48.35**	**0.39**				**162.14**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1962	Oct	0.07	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1962	Nov	3.29	0.00	0.00	0.54	0.54	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1962	Dec	4.11	0.00	0.18	46.12	46.12	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1962	Jan	1.30	0.00	0.05	12.46	12.46	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1962	Feb	9.15	0.00	2.64	679.65	466.88	212.77	76.77	1.82	21.00	115.00	2.22	124.77	
1962	Mar	3.32	34.52	1.26	310.13	0.00	344.65	323.65	3.09	35.77	100.23	2.03	114.69	
1962	Apr	0.43	4.11	0.10	25.72	0.00	29.83	0.00	4.68	52.54	77.52	1.72	98.81	
1962	May	0.00	0.00	0.04	9.45	0.00	9.45	0.00	6.17	54.24	32.74	1.12	86.13	
1962	Jun	0.00	0.00	0.01	3.03	0.00	3.03	0.00	6.89	39.25	0.00	0.00	0.00	
1962	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1962	Aug	0.03	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1962	Sep	0.08	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1962	**annual**	**21.78**	**38.63**	**4.29**	**1087.10**	**526.00**	**599.73**	**400.41**	**48.35**	**202.80**				**1526.94**
1963	Oct	7.29	0.00	0.59	152.68	152.68	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1963	Nov	0.61	0.00	0.04	10.26	10.26	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1963	Dec	3.32	0.00	0.24	60.60	60.60	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1963	Jan	4.97	0.00	1.28	329.94	238.43	91.51	0.00	1.08	9.76	81.75	1.78	101.80	
1963	Feb	3.04	25.79	3.00	745.43	64.03	707.19	652.95	1.82	21.00	115.00	2.22	124.77	
1963	Mar	4.58	47.62	0.96	235.83	0.00	283.45	262.45	3.09	35.77	100.23	2.03	114.69	
1963	Apr	4.58	43.77	1.79	442.31	0.00	486.09	450.32	4.68	54.10	81.90	1.78	101.90	
1963	May	0.46	3.91	0.14	35.16	0.00	39.07	0.00	6.17	66.23	54.74	1.42	82.41	
1963	Jun	0.00	0.00	0.06	14.11	0.00	14.11	0.00	6.89	53.15	15.70	0.66	39.86	
1963	Jul	0.00	0.00	0.04	9.31	0.00	9.31	0.00	7.12	35.76	0.00	0.00	0.00	
1963	Aug	0.00	0.00	0.00	0.71	0.00	0.71	0.00	6.45	1.02	0.00	0.00	0.00	
1963	Sep	0.05	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1963	**annual**	**28.90**	**121.09**	**8.13**	**2036.34**	**526.00**	**1631.43**	**1365.71**	**48.35**	**276.79**				**3503.63**
1964	Oct	1.52	0.00	0.01	3.03	3.03	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1964	Nov	5.60	0.00	0.11	28.35	28.35	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1964	Dec	0.92	0.00	0.05	13.13	13.13	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1964	Jan	4.63	0.00	1.07	276.07	276.07	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1964	Feb	0.26	0.00	0.22	57.63	57.63	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1964	Mar	1.81	0.00	0.07	17.84	17.84	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1964	Apr	0.08	0.00	0.03	6.84	6.84	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1964	May	0.21	0.00	0.01	3.03	0.00	3.03	0.00	6.17	4.08	0.00	0.00	0.00	
1964	Jun	0.84	0.00	0.04	9.77	0.00	9.77	0.00	6.89	14.41	0.00	0.00	0.00	
1964	Jul	0.05	0.00	0.00	0.54	0.00	0.54	0.00	7.12	0.87	0.00	0.00	0.00	
1964	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1964	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1964	**annual**	**15.92**	**0.00**	**1.62**	**416.23**	**402.89**	**13.34**	**0.00**	**48.35**	**19.36**				**425.67**
1965	Oct	2.42	0.00	0.04	9.93	9.93	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1965	Nov	5.42	0.00	0.13	33.88	33.88	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1965	Dec	5.81	0.00	1.54	395.59	395.59	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1965	Jan	5.19	0.00	4.81	1235.59	86.59	1149.00	1013.00	1.08	12.47	123.53	2.34	130.51	
1965	Feb	1.14	12.40	0.55	135.27	0.00	147.67	135.20	1.82	21.00	115.00	2.22	124.77	
1965	Mar	1.53	15.91	0.14	34.73	0.00	50.64	29.63	3.09	35.77	100.23	2.03	114.69	
1965	Apr	3.57	34.12	1.39	345.07	0.00	379.19	343.42	4.68	54.10	81.90	1.78	101.90	
1965	May	0.00	0.00	0.14	35.00	0.00	35.00	0.00	6.17	64.82	52.07	1.38	80.46	
1965	Jun	0.00	0.00	0.04	9.84	0.00	9.84	0.00	6.89	50.28	11.63	0.49	29.77	
1965	Jul	0.00	0.00	0.02	5.00	0.00	5.00	0.00	7.12	25.00	0.00	0.00	0.00	
1965	Aug	0.41	0.00	0.02	3.87	0.00	3.87	0.00	6.45	5.42	0.00	0.00	0.00	
1965	Sep	0.00	0.00	0.01	1.79	0.00	1.79	0.00	4.94	1.94	0.00	0.00	0.00	
1965	**annual**	**25.49**	**62.43**	**8.82**	**2245.57**	**526.00**	**1782.00**	**1521.25**	**48.35**	**270.81**				**3840.51**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1966	Oct	0.20	0.00	0.01	2.53	2.53	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1966	Nov	5.93	0.00	0.17	43.17	43.17	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1966	Dec	3.70	0.00	0.38	97.13	97.13	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1966	Jan	5.00	0.00	2.63	676.71	383.17	293.54	157.54	1.08	12.47	123.53	2.34	130.51	
1966	Feb	3.10	33.71	2.21	544.59	0.00	578.30	565.83	1.82	21.00	115.00	2.22	124.77	
1966	Mar	0.55	5.72	0.28	70.10	0.00	75.82	54.82	3.09	35.77	100.23	2.03	114.69	
1966	Apr	0.46	4.40	0.08	19.14	0.00	23.53	0.00	4.68	50.91	72.86	1.66	95.49	
1966	May	0.12	0.95	0.03	7.99	0.00	8.95	0.00	6.17	52.37	29.44	1.08	63.64	
1966	Jun	0.18	0.95	0.01	2.39	0.00	3.35	0.00	6.89	37.97	0.00	0.00	0.00	
1966	Jul	0.00	0.00	0.01	1.85	0.00	1.85	0.00	7.12	2.89	0.00	0.00	0.00	
1966	Aug	0.11	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1966	Sep	0.05	0.00	0.01	3.58	0.00	3.58	0.00	4.94	3.85	0.00	0.00	0.00	
1966	**annual**	**19.40**	**45.74**	**5.83**	**1469.19**	**526.00**	**988.93**	**778.19**	**48.35**	**217.23**				**2309.39**
1967	Oct	0.00	0.00	0.08	19.86	19.86	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1967	Nov	6.42	0.00	0.19	49.03	49.03	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1967	Dec	5.47	0.00	1.08	277.76	277.76	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1967	Jan	12.78	0.00	8.52	2188.38	179.35	2009.04	1873.04	1.08	12.47	123.53	2.34	130.51	
1967	Feb	0.49	5.33	1.73	425.19	0.00	430.52	418.04	1.82	21.00	115.00	2.22	124.77	
1967	Mar	4.47	46.48	0.94	230.98	0.00	277.46	256.46	3.09	35.77	100.23	2.03	114.69	
1967	Apr	4.96	47.40	3.52	870.51	0.00	917.91	882.15	4.68	54.10	81.90	1.78	101.90	
1967	May	0.07	0.59	0.38	94.90	0.00	95.49	41.39	6.17	71.41	64.59	1.55	89.56	
1967	Jun	2.02	15.08	0.18	44.29	0.00	59.36	0.00	6.89	75.05	48.90	1.34	78.13	
1967	Jul	0.00	0.00	0.16	40.85	0.00	40.85	0.00	7.12	63.71	26.05	1.03	61.09	
1967	Aug	0.00	0.00	0.04	10.89	0.00	10.89	0.00	6.45	37.21	0.00	0.00	0.00	
1967	Sep	0.03	0.00	0.34	87.97	0.00	87.97	0.00	4.94	43.70	44.27	1.28	74.72	
1967	**annual**	**36.71**	**114.88**	**17.15**	**4340.62**	**526.00**	**3929.50**	**3471.07**	**48.35**	**414.42**				**7979.64**
1968	Oct	0.82	5.11	0.04	10.51	10.51	5.11	0.00	3.36	21.94	27.44	1.05	62.14	
1968	Nov	2.35	12.17	0.03	6.86	6.86	12.17	0.00	1.69	10.06	29.55	1.08	63.73	
1968	Dec	3.15	16.73	0.05	13.19	13.19	16.73	0.00	1.08	6.85	39.43	1.21	71.13	
1968	Jan	6.58	39.00	0.86	217.08	217.08	39.00	0.00	1.08	8.93	69.50	1.61	93.08	
1968	Feb	3.70	28.70	1.37	342.10	278.35	92.45	25.94	1.82	21.00	115.00	2.22	124.77	
1968	Mar	3.43	35.66	1.31	323.05	0.00	358.72	337.71	3.09	35.77	100.23	2.03	114.69	
1968	Apr	0.32	3.06	0.14	35.13	0.00	38.19	2.42	4.68	54.10	81.90	1.78	101.90	
1968	May	0.58	4.93	0.06	15.79	0.00	20.71	0.00	6.17	59.82	42.79	1.26	73.63	
1968	Jun	0.00	0.00	0.02	6.04	0.00	6.04	0.00	6.89	44.81	4.03	0.17	10.50	
1968	Jul	0.00	0.00	0.01	3.52	0.00	3.52	0.00	7.12	11.57	0.00	0.00	0.00	
1968	Aug	0.62	0.00	0.00	1.06	0.00	1.06	0.00	6.45	1.52	0.00	0.00	0.00	
1968	Sep	0.03	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1968	**annual**	**21.58**	**145.35**	**3.92**	**974.35**	**526.00**	**593.70**	**366.08**	**48.35**	**276.36**				**1395.38**
1969	Oct	1.84	0.00	0.02	5.56	5.56	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1969	Nov	3.20	0.00	0.11	27.69	27.69	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1969	Dec	5.72	0.00	1.22	314.79	314.79	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1969	Jan	7.72	0.00	6.62	1700.20	177.96	1522.24	1386.24	1.08	12.47	123.53	2.34	130.51	
1969	Feb	7.57	82.33	7.45	1834.71	0.00	1917.04	1904.57	1.82	21.00	115.00	2.22	124.77	
1969	Mar	1.63	16.95	2.05	505.58	0.00	522.53	501.52	3.09	35.77	100.23	2.03	114.69	
1969	Apr	2.52	24.08	0.23	55.99	0.00	80.08	44.31	4.68	54.10	81.90	1.78	101.90	
1969	May	0.00	0.00	0.06	15.30	0.00	15.30	0.00	6.17	57.90	39.30	1.21	71.03	
1969	Jun	0.01	0.06	0.02	5.57	0.00	5.63	0.00	6.89	43.16	1.78	0.08	4.68	
1969	Jul	0.00	0.00	0.02	4.20	0.00	4.20	0.00	7.12	9.19	0.00	0.00	0.00	
1969	Aug	0.00	0.00	0.00	1.13	0.00	1.13	0.00	6.45	1.61	0.00	0.00	0.00	
1969	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1969	**annual**	**30.21**	**123.42**	**17.81**	**4470.73**	**526.00**	**4068.15**	**3836.64**	**48.35**	**235.20**				**8516.33**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1970	Oct	1.65	0.00	0.10	25.76	25.76	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1970	Nov	0.88	0.00	0.05	14.01	14.01	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1970	Dec	7.06	0.00	1.21	309.74	309.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1970	Jan	13.34	0.00	12.38	3181.57	176.49	3005.08	2869.08	1.08	12.47	123.53	2.34	130.51	
1970	Feb	2.34	25.45	1.81	445.57	0.00	471.02	458.55	1.82	21.00	115.00	2.22	124.77	
1970	Mar	2.48	25.79	1.50	369.90	0.00	395.68	374.68	3.09	35.77	100.23	2.03	114.69	
1970	Apr	0.17	1.62	0.09	23.37	0.00	25.00	0.00	4.68	51.29	73.94	1.67	96.26	
1970	May	0.00	0.00	0.04	9.13	0.00	9.13	0.00	6.17	52.83	30.24	1.09	64.25	
1970	Jun	0.48	2.57	0.02	4.63	0.00	7.20	0.00	6.89	39.96	0.00	0.00	0.00	
1970	Jul	0.00	0.00	0.01	2.02	0.00	2.02	0.00	7.12	3.15	0.00	0.00	0.00	
1970	Aug	0.00	0.00	0.01	3.20	0.00	3.20	0.00	6.45	4.49	0.00	0.00	0.00	
1970	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1970	**annual**	**28.40**	**55.43**	**17.22**	**4388.89**	**526.00**	**3918.32**	**3702.30**	**48.35**	**220.97**				**8228.11**
1971	Oct	0.96	0.00	0.01	2.69	2.69	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1971	Nov	9.11	0.00	0.88	226.44	226.44	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1971	Dec	6.40	0.00	3.82	981.40	296.87	684.54	548.54	1.08	12.47	123.53	2.34	130.51	
1971	Jan	1.87	20.34	1.31	322.43	0.00	342.76	330.29	1.08	12.47	123.53	2.34	130.51	
1971	Feb	0.31	3.37	0.16	39.61	0.00	42.98	30.50	1.82	21.00	115.00	2.22	124.77	
1971	Mar	3.38	35.14	0.54	134.23	0.00	169.37	148.37	3.09	35.77	100.23	2.03	114.69	
1971	Apr	0.85	8.12	0.28	69.17	0.00	77.29	41.53	4.68	54.10	81.90	1.78	101.90	
1971	May	0.33	2.80	0.06	13.84	0.00	16.64	0.00	6.17	58.38	40.16	1.22	71.67	
1971	Jun	0.00	0.00	0.03	7.48	0.00	7.48	0.00	6.89	44.30	3.34	0.14	8.72	
1971	Jul	0.00	0.00	0.02	3.86	0.00	3.86	0.00	7.12	11.04	0.00	0.00	0.00	
1971	Aug	0.00	0.00	0.01	2.69	0.00	2.69	0.00	6.45	3.79	0.00	0.00	0.00	
1971	Sep	0.15	0.00	0.00	0.80	0.00	0.80	0.00	4.94	0.88	0.00	0.00	0.00	
1971	**annual**	**23.36**	**69.78**	**7.12**	**1804.64**	**526.00**	**1348.42**	**1099.23**	**48.35**	**254.21**				**2970.34**
1972	Oct	0.21	0.00	0.00	0.19	0.19	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1972	Nov	2.37	0.00	0.06	14.99	14.99	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1972	Dec	5.48	0.00	0.49	125.92	125.92	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1972	Jan	1.67	0.00	0.15	39.73	39.73	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1972	Feb	2.40	0.00	0.54	138.06	138.06	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1972	Mar	0.38	0.00	0.06	16.67	16.67	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1972	Apr	1.08	0.00	0.04	10.26	10.26	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1972	May	0.00	0.00	0.02	4.55	0.00	4.55	0.00	6.17	6.08	0.00	0.00	0.00	
1972	Jun	0.15	0.00	0.01	1.79	0.00	1.79	0.00	6.89	2.71	0.00	0.00	0.00	
1972	Jul	0.01	0.00	0.00	1.06	0.00	1.06	0.00	7.12	1.68	0.00	0.00	0.00	
1972	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1972	Sep	0.92	0.00	0.00	0.55	0.00	0.55	0.00	4.94	0.62	0.00	0.00	0.00	
1972	**annual**	**14.67**	**0.00**	**1.38**	**353.75**	**345.80**	**7.95**	**0.00**	**48.35**	**11.09**				**361.77**
1973	Oct	4.46	0.00	0.26	67.50	67.50	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1973	Nov	5.26	0.00	0.95	244.36	244.36	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1973	Dec	4.50	0.00	0.69	176.75	160.50	16.26	0.00	1.08	3.70	12.55	0.53	32.07	
1973	Jan	11.27	30.12	10.81	2748.68	53.64	2725.16	2601.71	1.08	12.47	123.53	2.34	130.51	
1973	Feb	8.55	92.99	9.41	2315.23	0.00	2408.22	2395.74	1.82	21.00	115.00	2.22	124.77	
1973	Mar	2.81	29.22	3.52	867.40	0.00	896.61	875.61	3.09	35.77	100.23	2.03	114.69	
1973	Apr	0.08	0.76	0.20	50.03	0.00	50.80	15.03	4.68	54.10	81.90	1.78	101.90	
1973	May	0.02	0.17	0.11	26.37	0.00	26.54	0.00	6.17	61.87	46.57	1.31	76.41	
1973	Jun	0.00	0.00	0.04	9.21	0.00	9.21	0.00	6.89	47.73	8.06	0.34	20.78	
1973	Jul	0.00	0.00	0.03	6.69	0.00	6.69	0.00	7.12	22.24	0.00	0.00	0.00	
1973	Aug	0.00	0.00	0.01	3.03	0.00	3.03	0.00	6.45	4.26	0.00	0.00	0.00	
1973	Sep	0.27	0.00	0.01	1.63	0.00	1.63	0.00	4.94	1.77	0.00	0.00	0.00	
1973	**annual**	**37.22**	**153.26**	**26.02**	**6516.89**	**526.00**	**6144.15**	**5888.10**	**48.35**	**264.92**				**12727.49**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1974	Oct	1.25	0.00	0.03	6.73	6.73	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1974	Nov	9.70	0.00	1.09	280.20	280.20	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1974	Dec	4.65	0.00	2.03	521.84	239.07	282.78	146.78	1.08	12.47	123.53	2.34	130.51	
1974	Jan	5.30	57.64	5.36	1318.73	0.00	1376.37	1363.89	1.08	12.47	123.53	2.34	130.51	
1974	Feb	1.83	19.90	0.62	152.89	0.00	172.80	160.32	1.82	21.00	115.00	2.22	124.77	
1974	Mar	4.72	49.08	3.61	890.01	0.00	939.09	918.08	3.09	35.77	100.23	2.03	114.69	
1974	Apr	2.30	21.98	2.75	680.72	0.00	702.70	666.94	4.68	54.10	81.90	1.78	101.90	
1974	May	0.00	0.00	0.14	34.02	0.00	34.02	0.00	6.17	64.48	51.44	1.37	79.99	
1974	Jun	0.02	0.13	0.03	8.73	0.00	8.86	0.00	6.89	49.61	10.69	0.45	27.41	
1974	Jul	0.95	2.17	0.04	11.35	0.00	13.52	0.00	7.12	35.40	0.00	0.00	0.00	
1974	Aug	0.00	0.00	0.02	5.56	0.00	5.56	0.00	6.45	7.74	0.00	0.00	0.00	
1974	Sep	0.00	0.00	0.02	6.03	0.00	6.03	0.00	4.94	6.43	0.00	0.00	0.00	
1974	**annual**	**30.72**	**150.90**	**15.75**	**3916.81**	**526.00**	**3541.71**	**3256.01**	**48.35**	**299.49**				**7394.92**
1975	Oct	0.91	0.00	0.03	7.74	7.74	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1975	Nov	0.89	0.00	0.03	7.66	7.66	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1975	Dec	3.40	0.00	0.19	47.98	47.98	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1975	Jan	1.97	0.00	0.17	44.10	44.10	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1975	Feb	7.17	0.00	2.10	539.76	418.52	121.25	0.00	1.82	19.51	101.74	2.05	115.72	
1975	Mar	6.41	61.82	4.47	1106.60	0.00	1168.41	1134.15	3.09	35.77	100.23	2.03	114.69	
1975	Apr	1.13	10.80	0.40	99.44	0.00	110.24	74.47	4.68	54.10	81.90	1.78	101.90	
1975	May	0.00	0.00	0.09	21.16	0.00	21.16	0.00	6.17	59.98	43.08	1.26	73.84	
1975	Jun	0.11	0.68	0.03	8.75	0.00	9.42	0.00	6.89	46.35	6.15	0.26	15.94	
1975	Jul	0.12	0.16	0.02	5.36	0.00	5.52	0.00	7.12	17.72	0.00	0.00	0.00	
1975	Aug	0.03	0.00	0.01	2.02	0.00	2.02	0.00	6.45	2.86	0.00	0.00	0.00	
1975	Sep	0.00	0.00	0.00	1.17	0.00	1.17	0.00	4.94	1.28	0.00	0.00	0.00	
1975	**annual**	**22.14**	**73.45**	**7.55**	**1891.74**	**526.00**	**1439.20**	**1208.62**	**48.35**	**237.56**				**3192.29**
1976	Oct	4.64	0.00	0.08	20.87	20.87	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1976	Nov	0.68	0.00	0.01	3.58	3.58	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1976	Dec	0.79	0.00	0.02	6.40	6.40	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1976	Jan	0.32	0.00	0.03	7.24	7.24	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1976	Feb	1.95	0.00	0.04	9.58	9.58	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1976	Mar	0.97	0.00	0.06	14.14	14.14	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1976	Apr	1.51	0.00	0.05	13.03	13.03	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1976	May	0.00	0.00	0.00	1.14	0.00	1.14	0.00	6.17	1.57	0.00	0.00	0.00	
1976	Jun	0.01	0.00	0.00	0.03	0.00	0.03	0.00	6.89	0.08	0.00	0.00	0.00	
1976	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1976	Aug	0.62	0.00	0.00	0.45	0.00	0.45	0.00	6.45	0.67	0.00	0.00	0.00	
1976	Sep	0.57	0.00	0.01	3.58	0.00	3.58	0.00	4.94	3.85	0.00	0.00	0.00	
1976	**annual**	**12.06**	**0.00**	**0.31**	**80.06**	**74.84**	**5.22**	**0.00**	**48.35**	**6.17**				**81.88**
1977	Oct	0.60	0.00	0.01	3.20	3.20	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1977	Nov	1.54	0.00	0.04	10.10	10.10	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1977	Dec	0.89	0.00	0.04	9.76	9.76	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1977	Jan	1.80	0.00	0.10	26.93	26.93	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1977	Feb	1.26	0.00	0.04	9.58	9.58	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1977	Mar	2.00	0.00	0.09	22.39	22.39	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1977	Apr	0.06	0.00	0.01	2.77	2.77	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1977	May	0.82	0.00	0.01	2.02	0.00	2.02	0.00	6.17	2.73	0.00	0.00	0.00	
1977	Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.89	0.00	0.00	0.00	0.00	
1977	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1977	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1977	Sep	0.73	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1977	**annual**	**9.70**	**0.00**	**0.34**	**86.75**	**84.73**	**2.02**	**0.00**	**48.35**	**2.73**				**88.72**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1978	Oct	0.41	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1978	Nov	4.70	0.00	0.13	34.37	34.37	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1978	Dec	4.16	0.00	0.30	76.59	76.59	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1978	Jan	12.58	0.00	8.84	2272.55	415.03	1857.52	1721.52	1.08	12.47	123.53	2.34	130.51	
1978	Feb	4.62	50.25	4.44	1093.55	0.00	1143.79	1131.32	1.82	21.00	115.00	2.22	124.77	
1978	Mar	4.24	44.09	2.87	707.49	0.00	751.57	730.57	3.09	35.77	100.23	2.03	114.69	
1978	Apr	3.68	35.17	0.75	185.08	0.00	220.25	184.48	4.68	54.10	81.90	1.78	101.90	
1978	May	0.09	0.76	0.08	20.02	0.00	20.79	0.00	6.17	59.85	42.84	1.26	73.66	
1978	Jun	0.00	0.00	0.03	7.16	0.00	7.16	0.00	6.89	45.30	4.70	0.20	12.23	
1978	Jul	0.00	0.00	0.01	2.18	0.00	2.18	0.00	7.12	10.55	0.00	0.00	0.00	
1978	Aug	0.00	0.00	0.00	0.15	0.00	0.15	0.00	6.45	0.25	0.00	0.00	0.00	
1978	Sep	0.46	0.00	0.00	0.51	0.00	0.51	0.00	4.94	0.57	0.00	0.00	0.00	
1978	**annual**	**34.94**	**130.27**	**17.45**	**4399.65**	**526.00**	**4003.91**	**3767.89**	**48.35**	**239.85**				**8355.40**
1979	Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1979	Nov	1.51	0.00	0.03	7.98	7.98	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1979	Dec	0.73	0.00	0.03	8.92	8.92	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1979	Jan	10.45	0.00	1.33	341.72	341.72	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1979	Feb	5.61	0.00	1.94	498.71	167.37	331.34	195.34	1.82	21.00	115.00	2.22	124.77	
1979	Mar	1.73	17.99	1.00	245.52	0.00	263.51	242.51	3.09	35.77	100.23	2.03	114.69	
1979	Apr	1.17	11.18	0.18	44.55	0.00	55.73	19.96	4.68	54.10	81.90	1.78	101.90	
1979	May	0.38	3.23	0.07	16.93	0.00	20.16	0.00	6.17	59.62	42.43	1.25	73.36	
1979	Jun	0.00	0.00	0.03	7.95	0.00	7.95	0.00	6.89	45.46	4.92	0.21	12.80	
1979	Jul	0.00	0.00	0.01	2.18	0.00	2.18	0.00	7.12	10.89	0.00	0.00	0.00	
1979	Aug	0.00	0.00	0.00	0.57	0.00	0.57	0.00	6.45	0.84	0.00	0.00	0.00	
1979	Sep	0.09	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1979	**annual**	**21.67**	**32.40**	**4.62**	**1175.04**	**526.00**	**681.43**	**457.80**	**48.35**	**227.68**				**1672.63**
1980	Oct	3.40	0.00	0.13	33.33	33.33	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1980	Nov	3.17	0.00	0.98	252.51	252.51	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1980	Dec	5.60	0.00	1.59	407.38	240.16	167.21	31.21	1.08	12.47	123.53	2.34	130.51	
1980	Jan	5.89	64.06	6.75	1660.50	0.00	1724.56	1712.08	1.08	12.47	123.53	2.34	130.51	
1980	Feb	10.26	111.58	9.11	2242.43	0.00	2354.01	2341.54	1.82	21.00	115.00	2.22	124.77	
1980	Mar	1.82	18.94	1.92	473.27	0.00	492.21	471.21	3.09	35.77	100.23	2.03	114.69	
1980	Apr	1.08	10.32	0.27	67.76	0.00	78.08	42.31	4.68	54.10	81.90	1.78	101.90	
1980	May	0.24	2.04	0.15	37.28	0.00	39.31	0.00	6.17	66.32	54.90	1.42	82.53	
1980	Jun	0.05	0.34	0.49	122.56	0.00	122.90	41.60	6.89	79.68	56.32	1.44	83.56	
1980	Jul	0.19	1.32	0.56	141.01	0.00	142.33	62.65	7.12	82.36	53.64	1.40	81.61	
1980	Aug	0.00	0.00	0.56	139.79	0.00	139.79	57.43	6.45	74.59	61.41	1.51	87.26	
1980	Sep	0.00	0.00	0.00	0.70	0.00	0.70	0.00	4.94	36.12	25.98	1.03	61.04	
1980	**annual**	**31.70**	**208.61**	**22.51**	**5578.50**	**526.00**	**5261.11**	**4760.23**	**48.35**	**474.89**				**10677.33**
1981	Oct	0.34	1.73	0.01	2.15	2.15	1.73	0.00	3.36	17.43	10.28	0.43	26.39	
1981	Nov	0.32	0.70	0.00	0.48	0.48	0.70	0.00	1.69	3.97	7.01	0.30	18.13	
1981	Dec	3.26	4.93	0.34	86.69	86.69	4.93	0.00	1.08	2.74	9.20	0.39	23.66	
1981	Jan	5.93	11.69	1.55	395.90	395.90	11.69	0.00	1.08	4.72	16.17	0.68	41.02	
1981	Feb	1.57	5.36	0.28	69.91	40.79	34.48	0.00	1.82	12.01	38.65	1.20	70.54	
1981	Mar	4.24	24.93	1.03	258.24	0.00	283.17	185.82	3.09	35.77	100.23	2.03	114.69	
1981	Apr	0.07	0.67	0.14	34.82	0.00	35.49	0.00	4.68	54.00	81.72	1.78	101.78	
1981	May	0.38	3.22	0.04	9.28	0.00	12.50	0.00	6.17	56.84	37.38	1.18	69.60	
1981	Jun	0.00	0.00	0.02	4.94	0.00	4.94	0.00	6.89	42.05	0.27	0.01	0.78	
1981	Jul	0.20	0.01	0.01	1.85	0.00	1.86	0.00	7.12	3.33	0.00	0.00	0.00	
1981	Aug	0.00	0.00	0.00	1.14	0.00	1.14	0.00	6.45	1.64	0.00	0.00	0.00	
1981	Sep	0.00	0.00	0.00	0.23	0.00	0.23	0.00	4.94	0.27	0.00	0.00	0.00	
1981	**annual**	**16.31**	**53.25**	**3.42**	**865.63**	**526.00**	**392.87**	**185.82**	**48.35**	**234.77**				**1083.73**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1982	Oct	2.19	0.00	0.09	23.57	23.57	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1982	Nov	0.00	0.00	0.56	143.03	143.03	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1982	Dec	7.49	0.00	2.14	550.46	359.40	191.06	55.06	1.08	12.47	123.53	2.34	130.51	
1982	Jan	9.48	103.10	11.72	2885.72	0.00	2988.82	2976.35	1.08	12.47	123.53	2.34	130.51	
1982	Feb	3.44	37.41	3.19	784.85	0.00	822.26	809.79	1.82	21.00	115.00	2.22	124.77	
1982	Mar	5.58	58.02	3.48	857.71	0.00	915.72	894.72	3.09	35.77	100.23	2.03	114.69	
1982	Apr	3.28	31.35	4.63	1145.00	0.00	1176.34	1140.57	4.68	54.10	81.90	1.78	101.90	
1982	May	0.00	0.00	0.16	40.86	0.00	40.86	0.00	6.17	66.85	55.91	1.43	83.26	
1982	Jun	0.01	0.07	0.09	21.72	0.00	21.79	0.00	6.89	56.77	20.93	0.88	52.58	
1982	Jul	0.00	0.00	0.03	7.12	0.00	7.12	0.00	7.12	37.12	0.00	0.00	0.00	
1982	Aug	0.00	0.00	0.01	3.70	0.00	3.70	0.00	6.45	5.19	0.00	0.00	0.00	
1982	Sep	0.64	0.00	0.05	12.06	0.00	12.06	0.00	4.94	12.69	0.00	0.00	0.00	
1982	**annual**	**32.11**	**229.95**	**26.15**	**6475.78**	**526.00**	**6179.73**	**5876.49**	**48.35**	**314.44**				**12749.34**
1983	Oct	2.91	0.00	0.13	33.67	33.67	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1983	Nov	6.72	0.00	0.98	252.51	252.51	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1983	Dec	2.74	0.00	1.15	294.59	239.83	54.76	0.00	1.08	7.40	47.36	1.32	77.00	
1983	Jan	7.53	48.32	8.71	2182.99	0.00	2231.31	2142.66	1.08	12.47	123.53	2.34	130.51	
1983	Feb	9.11	99.08	9.64	2373.48	0.00	2472.55	2460.08	1.82	21.00	115.00	2.22	124.77	
1983	Mar	15.04	156.38	13.56	3343.60	0.00	3499.98	3478.98	3.09	35.77	100.23	2.03	114.69	
1983	Apr	4.59	43.87	1.61	398.40	0.00	442.26	406.49	4.68	54.10	81.90	1.78	101.90	
1983	May	0.28	2.38	0.84	209.98	0.00	212.36	158.26	6.17	71.41	64.59	1.55	89.56	
1983	Jun	0.00	0.00	0.15	36.54	0.00	36.54	0.00	6.89	66.17	34.96	1.15	67.79	
1983	Jul	0.00	0.00	0.09	23.21	0.00	23.21	0.00	7.12	50.36	7.82	0.33	20.17	
1983	Aug	0.48	0.81	0.07	16.89	0.00	17.70	0.00	6.45	32.60	0.00	0.00	0.00	
1983	Sep	0.42	0.00	0.05	11.73	0.00	11.73	0.00	4.94	12.35	0.00	0.00	0.00	
1983	**annual**	**49.82**	**350.83**	**36.98**	**9177.58**	**526.00**	**9002.40**	**8646.47**	**48.35**	**363.64**				**18365.55**
1984	Oct	0.61	0.00	0.07	18.69	18.69	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1984	Nov	8.16	0.00	0.67	172.68	172.68	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1984	Dec	9.43	0.00	7.01	1801.21	334.63	1466.57	1330.57	1.08	12.47	123.53	2.34	130.51	
1984	Jan	0.41	4.46	3.23	794.78	0.00	799.24	786.77	1.08	12.47	123.53	2.34	130.51	
1984	Feb	1.92	20.88	0.57	139.79	0.00	160.67	148.19	1.82	21.00	115.00	2.22	124.77	
1984	Mar	1.43	14.87	0.27	67.03	0.00	81.90	60.90	3.09	35.77	100.23	2.03	114.69	
1984	Apr	1.33	12.71	0.08	20.39	0.00	33.10	0.00	4.68	53.38	79.95	1.75	100.52	
1984	May	0.19	1.59	0.06	15.47	0.00	17.06	0.00	6.17	57.83	39.18	1.21	70.94	
1984	Jun	0.26	1.54	0.05	12.10	0.00	13.63	0.00	6.89	46.48	6.33	0.27	16.39	
1984	Jul	0.00	0.00	0.51	130.94	0.00	130.94	1.27	7.12	82.36	53.64	1.40	81.61	
1984	Aug	0.13	0.88	0.17	43.76	0.00	44.64	0.00	6.45	60.88	37.40	1.18	69.61	
1984	Sep	0.15	0.87	0.02	4.78	0.00	5.65	0.00	4.94	30.38	12.67	0.53	32.36	
1984	**annual**	**24.02**	**57.80**	**12.72**	**3221.61**	**526.00**	**2753.41**	**2327.70**	**48.35**	**413.04**				**5671.15**
1985	Oct	2.25	6.07	0.11	28.98	28.98	6.07	0.00	3.36	13.22	5.52	0.23	14.32	
1985	Nov	7.43	8.87	0.88	225.39	225.39	8.87	0.00	1.69	5.17	9.21	0.39	23.71	
1985	Dec	1.64	3.24	0.39	99.72	99.72	3.24	0.00	1.08	2.86	9.60	0.40	24.67	
1985	Jan	1.20	2.47	0.26	66.13	66.13	2.47	0.00	1.08	2.77	9.29	0.39	23.90	
1985	Feb	2.41	4.80	0.60	153.89	105.77	52.91	0.00	1.82	13.28	46.92	1.34	78.14	
1985	Mar	4.07	26.50	0.36	91.06	0.00	117.56	30.48	3.09	35.77	100.23	2.03	114.69	
1985	Apr	0.27	2.58	0.12	30.59	0.00	33.17	0.00	4.68	53.40	80.00	1.75	100.56	
1985	May	0.00	0.00	0.07	17.42	0.00	17.42	0.00	6.17	57.98	39.44	1.21	71.14	
1985	Jun	0.01	0.06	0.05	11.78	0.00	11.84	0.00	6.89	45.84	5.44	0.23	14.13	
1985	Jul	0.06	0.07	0.02	5.70	0.00	5.77	0.00	7.12	17.03	0.00	0.00	0.00	
1985	Aug	0.00	0.00	0.02	5.56	0.00	5.56	0.00	6.45	7.74	0.00	0.00	0.00	
1985	Sep	0.08	0.00	0.03	8.31	0.00	8.31	0.00	4.94	8.82	0.00	0.00	0.00	
1985	**annual**	**19.42**	**54.65**	**2.93**	**744.52**	**526.00**	**273.17**	**30.48**	**48.35**	**263.88**				**800.37**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1986	Oct	0.98	0.00	0.03	7.41	7.41	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1986	Nov	3.68	0.00	0.20	51.32	51.32	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1986	Dec	3.48	0.00	0.24	62.28	62.28	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1986	Jan	4.58	0.00	1.19	306.37	306.37	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1986	Feb	15.26	0.00	14.14	3633.91	98.62	3535.29	3399.29	1.82	21.00	115.00	2.22	124.77	
1986	Mar	7.07	73.51	6.07	1495.74	0.00	1569.25	1548.24	3.09	35.77	100.23	2.03	114.69	
1986	Apr	1.15	10.99	0.31	77.17	0.00	88.16	52.39	4.68	54.10	81.90	1.78	101.90	
1986	May	0.44	3.74	0.11	26.21	0.00	29.94	0.00	6.17	63.06	48.78	1.34	78.04	
1986	Jun	0.00	0.00	0.08	20.48	0.00	20.48	0.00	6.89	53.32	15.95	0.67	40.46	
1986	Jul	0.00	0.00	0.06	16.28	0.00	16.28	0.00	7.12	38.99	0.00	0.00	0.00	
1986	Aug	0.00	0.00	0.05	12.46	0.00	12.46	0.00	6.45	17.10	0.00	0.00	0.00	
1986	Sep	1.67	0.00	0.08	20.85	0.00	20.85	0.00	4.94	21.57	0.00	0.00	0.00	
1986	**annual**	**38.31**	**88.24**	**22.56**	**5730.47**	**526.00**	**5292.71**	**4999.92**	**48.35**	**304.91**				**10929.54**
1987	Oct	0.24	0.00	0.02	4.88	4.88	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1987	Nov	0.26	0.00	0.03	7.17	7.17	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1987	Dec	2.33	0.00	0.14	37.03	37.03	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1987	Jan	4.40	0.00	0.28	71.71	71.71	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1987	Feb	4.51	0.00	0.95	244.79	244.79	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1987	Mar	3.29	0.00	0.34	88.55	88.55	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1987	Apr	0.08	0.00	0.05	13.36	13.36	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1987	May	0.04	0.00	0.04	10.77	0.00	10.77	0.00	6.17	14.21	0.00	0.00	0.00	
1987	Jun	0.00	0.00	0.05	14.01	0.00	14.01	0.00	6.89	20.48	0.00	0.00	0.00	
1987	Jul	0.00	0.00	0.04	9.76	0.00	9.76	0.00	7.12	14.88	0.00	0.00	0.00	
1987	Aug	0.00	0.00	0.01	3.37	0.00	3.37	0.00	6.45	4.73	0.00	0.00	0.00	
1987	Sep	0.00	0.00	0.02	4.56	0.00	4.56	0.00	4.94	4.89	0.00	0.00	0.00	
1987	**annual**	**15.15**	**0.00**	**1.98**	**509.97**	**467.49**	**42.48**	**0.00**	**48.35**	**59.18**				**521.53**
1988	Oct	1.42	0.00	0.08	20.54	20.54	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1988	Nov	3.04	0.00	0.14	36.98	36.98	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1988	Dec	6.39	0.00	0.77	198.64	198.64	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1988	Jan	5.43	0.00	1.39	356.87	269.85	87.03	0.00	1.08	9.48	77.55	1.72	98.83	
1988	Feb	0.55	4.53	0.14	34.14	0.00	38.67	0.00	1.82	19.00	97.23	1.99	112.61	
1988	Mar	0.08	0.75	0.07	16.71	0.00	17.46	0.00	3.09	32.08	82.60	1.79	102.40	
1988	Apr	1.24	10.58	0.07	18.43	0.00	29.01	0.00	4.68	47.71	63.90	1.54	89.06	
1988	May	0.67	4.97	0.05	11.77	0.00	16.74	0.00	6.17	51.95	28.69	1.07	63.08	
1988	Jun	0.73	3.84	0.01	3.67	0.00	7.51	0.00	6.89	39.43	0.00	0.00	0.00	
1988	Jul	0.00	0.00	0.00	0.24	0.00	0.24	0.00	7.12	0.40	0.00	0.00	0.00	
1988	Aug	0.00	0.00	0.02	5.72	0.00	5.72	0.00	6.45	7.98	0.00	0.00	0.00	
1988	Sep	0.00	0.00	0.00	0.42	0.00	0.42	0.00	4.94	0.48	0.00	0.00	0.00	
1988	**annual**	**19.55**	**24.67**	**2.75**	**704.13**	**526.00**	**202.80**	**0.00**	**48.35**	**208.51**				**722.98**
1989	Oct	0.09	0.00	0.01	3.20	3.20	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1989	Nov	3.25	0.00	0.08	21.34	21.34	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1989	Dec	2.81	0.00	0.16	40.40	40.40	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1989	Jan	1.39	0.00	0.12	30.81	30.81	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1989	Feb	0.99	0.00	0.06	14.90	14.90	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1989	Mar	6.14	0.00	0.83	213.79	213.79	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1989	Apr	1.08	0.00	0.10	26.88	26.88	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1989	May	0.15	0.00	0.03	8.42	0.00	8.42	0.00	6.17	11.16	0.00	0.00	0.00	
1989	Jun	0.01	0.00	0.03	8.80	0.00	8.80	0.00	6.89	13.00	0.00	0.00	0.00	
1989	Jul	0.00	0.00	0.02	4.88	0.00	4.88	0.00	7.12	7.53	0.00	0.00	0.00	
1989	Aug	0.00	0.00	0.02	4.04	0.00	4.04	0.00	6.45	5.66	0.00	0.00	0.00	
1989	Sep	1.77	0.00	0.12	30.30	0.00	30.30	0.00	4.94	26.46	3.84	0.16	10.01	
1989	**annual**	**17.68**	**0.00**	**1.59**	**407.75**	**351.31**	**56.44**	**0.00**	**48.35**	**63.80**				**416.99**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1990	Oct	1.69	1.41	0.14	35.24	35.24	1.41	0.00	3.36	3.81	1.44	0.06	3.80	
1990	Nov	1.77	0.56	0.05	13.18	13.18	0.56	0.00	1.69	0.74	1.26	0.05	3.33	
1990	Dec	0.00	0.00	0.02	4.04	4.04	0.00	0.00	1.08	0.30	0.96	0.04	2.55	
1990	Jan	5.06	1.08	0.34	86.29	86.29	1.08	0.00	1.08	0.48	1.55	0.07	4.10	
1990	Feb	3.48	1.19	0.33	85.79	85.79	1.19	0.00	1.82	1.09	1.66	0.07	4.37	
1990	Mar	0.99	0.36	0.10	25.38	25.38	0.36	0.00	3.09	1.37	0.65	0.03	1.76	
1990	Apr	0.31	0.05	0.03	7.49	7.49	0.05	0.00	4.68	0.73	0.00	0.00	0.00	
1990	May	2.34	0.00	0.09	24.07	0.00	24.07	0.00	6.17	30.64	0.00	0.00	0.00	
1990	Jun	0.00	0.00	0.03	6.68	0.00	6.68	0.00	6.89	9.92	0.00	0.00	0.00	
1990	Jul	0.00	0.00	0.01	1.85	0.00	1.85	0.00	7.12	2.89	0.00	0.00	0.00	
1990	Aug	0.03	0.00	0.01	2.19	0.00	2.19	0.00	6.45	3.09	0.00	0.00	0.00	
1990	Sep	0.12	0.00	0.05	12.71	0.00	12.71	0.00	4.94	13.36	0.00	0.00	0.00	
1990	**annual**	**15.79**	**4.64**	**1.19**	**304.90**	**257.40**	**52.14**	**0.00**	**48.35**	**68.42**				**312.18**
1991	Oct	0.25	0.00	0.00	0.99	0.99	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1991	Nov	0.55	0.00	0.01	3.10	3.10	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1991	Dec	0.99	0.00	0.09	23.74	23.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1991	Jan	0.36	0.00	0.04	11.11	11.11	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1991	Feb	4.33	0.00	0.14	36.49	36.49	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1991	Mar	8.67	0.00	1.58	405.69	405.69	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1991	Apr	0.46	0.00	0.10	26.07	26.07	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1991	May	0.20	0.00	0.04	10.61	0.00	10.61	0.00	6.17	13.99	0.00	0.00	0.00	
1991	Jun	0.60	0.00	0.04	10.26	0.00	10.26	0.00	6.89	15.12	0.00	0.00	0.00	
1991	Jul	0.03	0.00	0.03	8.59	0.00	8.59	0.00	7.12	13.12	0.00	0.00	0.00	
1991	Aug	0.08	0.00	0.01	2.19	0.00	2.19	0.00	6.45	3.09	0.00	0.00	0.00	
1991	Sep	0.04	0.00	0.02	5.05	0.00	5.05	0.00	4.94	5.40	0.00	0.00	0.00	
1991	**annual**	**16.57**	**0.00**	**2.12**	**543.87**	**507.18**	**36.69**	**0.00**	**48.35**	**50.72**				**556.21**
1992	Oct	2.44	0.00	0.08	21.55	21.55	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1992	Nov	0.85	0.00	0.01	3.42	3.42	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1992	Dec	2.15	0.00	0.11	29.46	29.46	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1992	Jan	1.70	0.00	0.12	30.81	30.81	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1992	Feb	7.56	0.00	1.57	402.92	402.92	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1992	Mar	5.28	0.00	1.28	329.94	37.84	292.10	156.10	3.09	35.77	100.23	2.03	114.69	
1992	Apr	1.27	12.14	0.30	74.97	0.00	87.11	51.34	4.68	54.10	81.90	1.78	101.90	
1992	May	0.00	0.00	0.04	10.58	0.00	10.58	0.00	6.17	56.22	36.27	1.17	68.77	
1992	Jun	1.12	6.42	0.02	4.14	0.00	10.56	0.00	6.89	43.96	2.87	0.12	7.51	
1992	Jul	0.00	0.00	0.00	0.02	0.00	0.02	0.00	7.12	4.48	0.00	0.00	0.00	
1992	Aug	0.00	0.00	0.01	2.36	0.00	2.36	0.00	6.45	3.32	0.00	0.00	0.00	
1992	Sep	0.04	0.00	0.02	4.40	0.00	4.40	0.00	4.94	4.71	0.00	0.00	0.00	
1992	**annual**	**22.40**	**18.56**	**3.57**	**914.56**	**526.00**	**407.12**	**207.44**	**48.35**	**202.56**				**1146.17**
1993	Oct	2.71	0.00	0.07	19.02	19.02	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1993	Nov	0.40	0.00	0.01	2.77	2.77	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1993	Dec	6.26	0.00	0.65	167.50	167.50	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1993	Jan	10.25	0.00	7.14	1834.87	336.71	1498.16	1362.16	1.08	12.47	123.53	2.34	130.51	
1993	Feb	5.27	57.31	5.11	1258.09	0.00	1315.40	1302.93	1.82	21.00	115.00	2.22	124.77	
1993	Mar	2.06	21.37	1.13	279.44	0.00	300.81	279.81	3.09	35.77	100.23	2.03	114.69	
1993	Apr	0.63	6.05	0.26	63.21	0.00	69.26	33.49	4.68	54.10	81.90	1.78	101.90	
1993	May	1.15	9.77	0.10	25.72	0.00	35.48	0.00	6.17	64.99	52.39	1.38	80.69	
1993	Jun	0.80	5.38	0.07	17.77	0.00	23.15	0.00	6.89	55.89	19.65	0.83	49.50	
1993	Jul	0.00	0.00	0.05	11.93	0.00	11.93	0.00	7.12	38.70	0.00	0.00	0.00	
1993	Aug	0.00	0.00	0.03	6.73	0.00	6.73	0.00	6.45	9.36	0.00	0.00	0.00	
1993	Sep	0.00	0.00	0.01	2.77	0.00	2.77	0.00	4.94	2.99	0.00	0.00	0.00	
1993	**annual**	**29.53**	**99.88**	**14.63**	**3689.82**	**526.00**	**3263.69**	**2978.39**	**48.35**	**295.27**				**6824.84**

APPENDIX B: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
136 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1994	Oct	1.63	0.00	0.02	5.56	5.56	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1994	Nov	2.94	0.00	0.09	22.32	22.32	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1994	Dec	2.46	0.00	0.16	41.07	41.07	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1994	Jan	2.38	0.00	0.14	36.70	36.70	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1994	Feb	4.45	0.00	1.08	278.24	278.24	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1994	Mar	0.29	0.00	0.15	38.89	38.89	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1994	Apr	1.29	0.00	0.05	14.01	14.01	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1994	May	1.21	0.00	0.08	20.54	0.00	20.54	0.00	6.17	26.56	0.00	0.00	0.00	
1994	Jun	0.04	0.00	0.04	10.43	0.00	10.43	0.00	6.89	15.35	0.00	0.00	0.00	
1994	Jul	0.00	0.00	0.01	3.54	0.00	3.54	0.00	7.12	5.48	0.00	0.00	0.00	
1994	Aug	0.00	0.00	0.00	0.82	0.00	0.82	0.00	6.45	1.19	0.00	0.00	0.00	
1994	Sep	0.00	0.00	0.00	0.55	0.00	0.55	0.00	4.94	0.62	0.00	0.00	0.00	
1994	**annual**	**16.69**	**0.00**	**1.84**	**472.66**	**436.79**	**35.88**	**0.00**	**48.35**	**49.19**				**483.38**
1995	Oct	1.20	0.00	0.03	8.08	8.08	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1995	Nov	7.21	0.00	0.42	106.70	106.70	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1995	Dec	3.22	0.00	0.38	97.64	97.64	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1995	Jan	16.31	0.00	13.76	3535.08	313.58	3221.50	3085.50	1.08	12.47	123.53	2.34	130.51	
1995	Feb	1.00	10.88	2.18	537.31	0.00	548.18	535.71	1.82	21.00	115.00	2.22	124.77	
1995	Mar	11.98	124.56	10.41	2568.27	0.00	2692.83	2671.83	3.09	35.77	100.23	2.03	114.69	
1995	Apr	1.35	12.90	0.59	145.09	0.00	157.99	122.22	4.68	54.10	81.90	1.78	101.90	
1995	May	1.89	16.05	0.17	43.14	0.00	59.19	5.09	6.17	71.41	64.59	1.55	89.56	
1995	Jun	0.43	3.21	0.11	26.57	0.00	29.78	0.00	6.89	63.48	30.89	1.10	64.74	
1995	Jul	0.00	0.00	0.07	17.14	0.00	17.14	0.00	7.12	45.96	2.07	0.09	5.45	
1995	Aug	0.00	0.00	0.05	13.44	0.00	13.44	0.00	6.45	21.16	0.00	0.00	0.00	
1995	Sep	0.00	0.00	0.03	7.66	0.00	7.66	0.00	4.94	8.14	0.00	0.00	0.00	
1995	**annual**	**44.59**	**167.60**	**28.20**	**7106.11**	**526.00**	**6747.71**	**6420.34**	**48.35**	**333.50**				**13831.04**
1996	Oct	0.00	0.00	0.02	4.21	4.21	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1996	Nov	0.28	0.00	0.00	1.14	1.14	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1996	Dec	9.10	0.00	0.93	239.04	239.04	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1996	Jan	5.58	0.00	2.08	535.31	281.61	253.70	117.70	1.08	12.47	123.53	2.34	130.51	
1996	Feb	8.04	87.44	5.79	1424.09	0.00	1511.53	1499.05	1.82	21.00	115.00	2.22	124.77	
1996	Mar	2.54	26.41	2.31	570.19	0.00	596.60	575.60	3.09	35.77	100.23	2.03	114.69	
1996	Apr	3.40	32.49	0.49	121.56	0.00	154.05	118.28	4.68	54.10	81.90	1.78	101.90	
1996	May	2.37	20.13	0.16	39.88	0.00	60.01	5.91	6.17	71.41	64.59	1.55	89.56	
1996	Jun	0.00	0.00	0.07	16.61	0.00	16.61	0.00	6.89	58.19	23.01	0.97	57.58	
1996	Jul	0.00	0.00	0.04	11.23	0.00	11.23	0.00	7.12	39.89	0.00	0.00	0.00	
1996	Aug	0.00	0.00	0.02	5.56	0.00	5.56	0.00	6.45	7.74	0.00	0.00	0.00	
1996	Sep	0.10	0.00	0.01	3.10	0.00	3.10	0.00	4.94	3.33	0.00	0.00	0.00	
1996	**annual**	**31.41**	**166.47**	**11.93**	**2971.90**	**526.00**	**2612.37**	**2316.54**	**48.35**	**303.91**				**5451.68**
1997	Oct	1.01	0.00	0.01	2.86	2.86	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1997	Nov	2.73	0.00	0.12	30.63	30.63	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1997	Dec	10.82	0.00	3.14	806.33	492.51	313.82	177.82	1.08	12.47	123.53	2.34	130.51	
1997	Jan	8.65	94.07	9.17	2256.99	0.00	2351.06	2338.59	1.08	12.47	123.53	2.34	130.51	
1997	Feb	0.48	5.22	0.83	203.86	0.00	209.08	196.60	1.82	21.00	115.00	2.22	124.77	
1997	Mar	0.60	6.24	0.13	31.98	0.00	38.22	17.22	3.09	35.77	100.23	2.03	114.69	
1997	Apr	0.58	5.58	0.06	15.06	0.00	20.64	0.00	4.68	50.15	70.72	1.63	93.96	
1997	May	0.38	2.98	0.04	8.98	0.00	11.95	0.00	6.17	52.68	29.99	1.08	64.06	
1997	Jun	0.25	1.35	0.04	10.85	0.00	12.20	0.00	6.89	41.99	0.20	0.01	0.57	
1997	Jul	0.00	0.00	0.07	17.00	0.00	17.00	0.00	7.12	25.81	0.00	0.00	0.00	
1997	Aug	1.04	0.00	0.08	21.38	0.00	21.38	0.00	6.45	28.83	0.00	0.00	0.00	
1997	Sep	0.20	0.00	0.01	2.77	0.00	2.77	0.00	4.94	2.99	0.00	0.00	0.00	
1997	**annual**	**26.75**	**115.44**	**13.70**	**3408.68**	**526.00**	**2998.12**	**2730.23**	**48.35**	**284.17**				**6329.90**

APPENDIX C

Water Budget for 50-Year Historic Conditions Simulation: 1100 ac-ft Lake

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

known volumes (ac-ft.)		annual water rights (ac-ft.)		%time satisfied:
vol. 1 =	23.72	Kullberg (A030592):	35.0	
vol. 2 =	135.80	Kullberg (A029402):	12.0	
vol. 3 =	260.08	Martinelli (A016625):	9.0	
vol. 4 =	1276.06	Martinelli (A031022):	225.0	
vol. 5 =	2545.60	Oxfoot (A029166):	245.0	
			526.0	**72.55**
		Roche (A030579):	**2004.0**	**49.02**

dam scenario A
Tolay drainage area (ac): 3084.00
max. Tolay Lake capacity (ac-ft.): **1100.0**
Roche drainage area (ac): 3153.82

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1947	Oct	0.23	3.22	0.00	0.00	0.00	3.22	0.00	3.36	47.42	141.91	2.58	142.36	
1947	Nov	3.52	41.76	0.00	0.51	0.51	41.76	0.00	1.69	23.50	160.17	2.80	153.04	
1947	Dec	2.97	37.88	0.08	19.68	19.68	37.88	0.00	1.08	15.67	182.38	3.07	165.71	
1947	Jan	0.76	10.49	0.04	9.24	9.24	10.49	0.00	1.08	15.41	177.46	3.01	162.93	
1947	Feb	2.63	35.71	0.54	130.33	130.33	35.71	0.00	1.82	27.64	185.53	3.11	167.48	
1947	Mar	4.26	59.46	0.92	224.47	224.47	59.46	0.00	3.09	51.44	193.54	3.20	171.96	
1947	Apr	0.69	9.89	0.37	90.60	90.60	9.89	0.00	4.68	69.12	134.31	2.48	137.67	
1947	May	0.29	3.33	0.05	12.06	0.00	15.39	0.00	6.17	75.56	74.13	1.68	96.39	
1947	Jun	1.26	10.12	0.01	3.31	0.00	13.44	0.00	6.89	60.76	26.81	1.04	61.66	
1947	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	36.57	0.00	0.00	0.00	
1947	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1947	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1947	**annual**	**16.61**	**211.85**	**2.02**	**490.21**	**474.83**	**227.22**	**0.00**	**48.35**	**423.10**				**529.71**
1948	Oct	3.37	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1948	Nov	1.20	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1948	Dec	1.15	0.00	0.00	1.14	1.14	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1948	Jan	1.82	0.00	0.02	4.38	4.38	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1948	Feb	2.03	0.00	0.02	5.32	5.32	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1948	Mar	3.75	0.00	0.25	64.14	64.14	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1948	Apr	5.11	0.00	0.62	159.16	159.16	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1948	May	0.50	0.00	0.16	40.91	0.00	40.91	0.00	6.17	37.14	3.76	0.16	9.82	
1948	Jun	0.07	0.06	0.03	8.77	0.00	8.83	0.00	6.89	18.46	0.00	0.00	0.00	
1948	Jul	0.00	0.00	0.00	0.98	0.00	0.98	0.00	7.12	1.55	0.00	0.00	0.00	
1948	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1948	Sep	0.03	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1948	**annual**	**19.03**	**0.06**	**1.11**	**284.79**	**234.14**	**50.71**	**0.00**	**48.35**	**57.14**				**291.28**
1949	Oct	0.51	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1949	Nov	0.87	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1949	Dec	4.67	0.00	0.15	38.04	38.04	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1949	Jan	1.50	0.00	0.27	69.52	69.52	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1949	Feb	2.54	0.00	1.20	307.13	307.13	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1949	Mar	7.16	0.00	5.86	1504.93	111.30	1393.63	293.63	3.09	87.22	1012.78	7.30	327.06	
1949	Apr	0.00	0.00	0.34	78.93	0.00	78.93	0.00	4.68	131.50	960.22	7.07	319.88	
1949	May	0.24	6.40	0.08	18.86	0.00	25.26	0.00	6.17	166.28	819.19	6.45	299.81	
1949	Jun	0.00	0.00	0.02	4.27	0.00	4.27	0.00	6.89	172.40	651.05	5.71	274.21	
1949	Jul	0.03	0.69	0.00	0.29	0.00	0.98	0.00	7.12	162.72	489.31	5.00	247.74	
1949	Aug	0.10	2.06	0.00	0.00	0.00	2.06	0.00	6.45	133.27	358.11	4.42	224.86	
1949	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	92.55	265.56	4.02	207.91	
1949	**annual**	**17.62**	**9.15**	**7.91**	**2021.98**	**526.00**	**1505.13**	**293.63**	**48.35**	**945.93**				**2373.77**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1950	Oct	0.12	2.08	0.00	0.00	0.00	2.08	0.00	3.36	58.24	209.40	3.39	180.70	
1950	Nov	1.18	17.77	0.00	0.00	0.00	17.77	0.00	1.69	26.86	200.31	3.28	175.71	
1950	Dec	2.77	40.56	0.00	0.00	0.00	40.56	0.00	1.08	17.75	223.12	3.56	186.12	
1950	Jan	9.18	143.91	2.19	529.53	526.00	147.44	0.00	1.08	20.40	350.16	4.39	223.43	
1950	Feb	3.90	72.61	3.37	802.47	0.00	875.08	125.24	1.82	51.21	1048.79	7.46	331.88	
1950	Mar	1.86	51.44	0.32	74.06	0.00	125.50	74.29	3.09	87.22	1012.78	7.30	327.06	
1950	Apr	1.20	32.71	0.16	35.83	0.00	68.53	0.00	4.68	130.97	950.34	7.03	318.52	
1950	May	0.39	10.35	0.05	11.17	0.00	21.52	0.00	6.17	165.33	806.54	6.40	297.95	
1950	Jun	0.00	0.00	0.01	2.94	0.00	2.94	0.00	6.89	171.22	638.26	5.66	272.18	
1950	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	161.43	476.84	4.95	245.62	
1950	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	131.94	344.90	4.37	222.48	
1950	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	91.57	253.33	3.93	204.06	
1950	**annual**	**20.60**	**371.43**	**6.10**	**1455.99**	**526.00**	**1301.43**	**199.53**	**48.35**	**1114.13**				**1802.93**
1951	Oct	2.78	47.27	0.00	0.00	0.00	47.27	0.00	3.36	59.95	240.66	3.77	197.44	
1951	Nov	5.93	97.57	0.86	205.84	205.84	97.57	0.00	1.69	31.24	306.99	4.20	215.58	
1951	Dec	7.41	133.12	5.63	1346.50	320.16	1159.47	366.45	1.08	30.42	1069.58	7.55	334.63	
1951	Jan	4.03	112.38	3.32	760.86	0.00	873.24	842.82	1.08	30.42	1069.58	7.55	334.63	
1951	Feb	3.38	94.25	2.28	521.86	0.00	616.12	585.70	1.82	51.21	1048.79	7.46	331.88	
1951	Mar	1.30	35.95	1.28	294.43	0.00	330.39	279.17	3.09	87.22	1012.78	7.30	327.06	
1951	Apr	0.74	20.17	0.17	38.16	0.00	58.32	0.00	4.68	130.44	940.66	6.99	317.17	
1951	May	0.86	22.73	0.09	20.24	0.00	42.97	0.00	6.17	166.15	817.47	6.44	299.56	
1951	Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.89	171.90	645.58	5.69	273.34	
1951	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	162.11	483.46	4.98	246.75	
1951	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	132.55	350.92	4.39	223.56	
1951	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	92.02	258.90	3.99	206.94	
1951	**annual**	**26.43**	**563.45**	**13.63**	**3187.90**	**526.00**	**3225.35**	**2074.15**	**48.35**	**1145.62**				**5655.19**
1952	Oct	1.36	23.45	0.00	0.00	0.00	23.45	0.00	3.36	59.00	223.35	3.56	188.25	
1952	Nov	3.17	49.73	0.00	0.00	0.00	49.73	0.00	1.69	29.55	243.53	3.81	198.95	
1952	Dec	6.99	115.89	0.77	185.82	185.82	115.89	0.00	1.08	20.22	339.20	4.34	221.45	
1952	Jan	10.46	193.03	7.79	1859.37	340.18	1712.22	951.42	1.08	30.42	1069.58	7.55	334.63	
1952	Feb	2.66	74.18	2.56	586.93	0.00	661.10	630.68	1.82	51.21	1048.79	7.46	331.88	
1952	Mar	4.61	127.50	3.35	767.63	0.00	895.13	843.92	3.09	87.22	1012.78	7.30	327.06	
1952	Apr	0.70	19.08	0.41	93.49	0.00	112.57	25.35	4.68	131.92	968.08	7.11	320.97	
1952	May	0.10	2.67	0.07	15.84	0.00	18.51	0.00	6.17	166.36	820.23	6.46	299.96	
1952	Jun	0.26	6.50	0.03	7.21	0.00	13.71	0.00	6.89	173.28	660.66	5.75	275.72	
1952	Jul	0.00	0.00	0.01	2.91	0.00	2.91	0.00	7.12	163.80	499.77	5.05	249.51	
1952	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	134.03	365.74	4.46	226.23	
1952	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	93.11	272.63	4.05	209.23	
1952	**annual**	**30.31**	**612.03**	**15.00**	**3519.20**	**526.00**	**3605.23**	**2451.37**	**48.35**	**1140.12**				**6392.60**
1953	Oct	0.15	2.62	0.00	0.00	0.00	2.62	0.00	3.36	58.63	216.61	3.48	184.62	
1953	Nov	2.48	38.15	0.01	2.14	2.14	38.15	0.00	1.69	28.91	225.86	3.59	189.59	
1953	Dec	11.66	184.22	4.48	1080.64	523.86	741.00	0.00	1.08	28.82	938.04	6.98	316.81	
1953	Jan	4.68	123.56	5.65	1302.00	0.00	1425.56	1263.60	1.08	30.42	1069.58	7.55	334.63	
1953	Feb	0.08	2.23	0.57	131.48	0.00	133.71	103.29	1.82	51.21	1048.79	7.46	331.88	
1953	Mar	1.87	51.72	0.28	63.24	0.00	114.96	63.75	3.09	87.22	1012.78	7.30	327.06	
1953	Apr	3.04	82.85	0.13	29.56	0.00	112.42	25.20	4.68	131.92	968.08	7.11	320.97	
1953	May	0.66	17.65	0.05	12.22	0.00	29.87	0.00	6.17	167.16	830.80	6.50	301.51	
1953	Jun	0.35	8.79	0.01	2.79	0.00	11.59	0.00	6.89	173.98	668.40	5.79	276.94	
1953	Jul	0.00	0.00	0.00	0.20	0.00	0.20	0.00	7.12	164.27	504.33	5.07	250.28	
1953	Aug	0.20	4.17	0.00	0.00	0.00	4.17	0.00	6.45	134.82	373.68	4.49	227.64	
1953	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	93.69	279.99	4.08	210.60	
1953	**annual**	**25.17**	**515.96**	**11.18**	**2624.28**	**526.00**	**2614.25**	**1455.84**	**48.35**	**1151.05**				**4394.12**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1954	Oct	0.28	4.91	0.00	0.00	0.00	4.91	0.00	3.36	59.14	225.77	3.59	189.54	
1954	Nov	3.58	56.55	0.00	0.92	0.92	56.55	0.00	1.69	29.79	252.53	3.92	203.64	
1954	Dec	0.60	10.18	0.00	0.25	0.25	10.18	0.00	1.08	18.63	244.08	3.81	199.24	
1954	Jan	5.11	84.84	0.42	101.25	101.25	84.84	0.00	1.08	19.73	309.19	4.21	215.99	
1954	Feb	2.97	53.46	1.58	377.53	377.53	53.46	0.00	1.82	34.13	328.52	4.29	219.51	
1954	Mar	5.25	96.04	1.64	390.89	46.05	440.87	0.00	3.09	75.32	694.07	5.90	280.94	
1954	Apr	1.55	36.29	0.73	170.28	0.00	206.56	0.00	4.68	121.38	779.26	6.28	293.90	
1954	May	0.09	2.20	0.07	16.75	0.00	18.96	0.00	6.17	152.59	645.63	5.69	273.35	
1954	Jun	0.36	8.20	0.02	4.31	0.00	12.51	0.00	6.89	157.99	500.14	5.05	249.57	
1954	Jul	0.01	0.21	0.00	0.80	0.00	1.01	0.00	7.12	148.12	353.04	4.40	223.95	
1954	Aug	0.39	7.28	0.00	0.00	0.00	7.28	0.00	6.45	121.00	239.32	3.76	196.74	
1954	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	80.97	158.34	2.78	151.98	
1954	**annual**	**20.19**	**360.16**	**4.47**	**1062.98**	**526.00**	**897.13**	**0.00**	**48.35**	**1018.78**				**1173.78**
1955	Oct	0.22	2.79	0.00	0.00	0.00	2.79	0.00	3.36	42.94	118.19	2.27	126.92	
1955	Nov	4.05	42.84	0.02	5.00	5.00	42.84	0.00	1.69	21.67	139.35	2.55	140.85	
1955	Dec	4.91	57.63	0.74	181.53	181.53	57.63	0.00	1.08	15.62	181.36	3.06	165.14	
1955	Jan	4.06	55.87	0.73	176.85	176.85	55.87	0.00	1.08	17.58	219.66	3.52	186.26	
1955	Feb	0.95	14.75	0.23	55.86	55.86	14.75	0.00	1.82	29.36	205.04	3.34	178.31	
1955	Mar	0.37	5.50	0.11	27.60	27.60	5.50	0.00	3.09	46.70	163.84	2.84	155.15	
1955	Apr	3.34	43.18	0.07	17.79	17.79	43.18	0.00	4.68	69.89	137.13	2.52	139.53	
1955	May	0.00	0.00	0.04	9.48	0.00	9.48	0.00	6.17	74.64	71.98	1.65	94.86	
1955	Jun	0.00	0.00	0.02	5.53	0.00	5.53	0.00	6.89	56.69	20.81	0.88	52.31	
1955	Jul	0.00	0.00	0.01	1.82	0.00	1.82	0.00	7.12	33.62	0.00	0.00	0.00	
1955	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1955	Sep	0.55	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1955	**annual**	**18.45**	**222.55**	**1.97**	**481.46**	**464.63**	**239.38**	**0.00**	**48.35**	**408.71**				**518.75**
1956	Oct	0.18	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1956	Nov	2.22	0.00	0.01	1.42	1.42	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1956	Dec	15.48	0.00	7.66	1969.54	524.58	1444.96	344.96	1.08	30.42	1069.58	7.55	334.63	
1956	Jan	9.85	274.68	8.58	1965.94	0.00	2240.61	2210.20	1.08	30.42	1069.58	7.55	334.63	
1956	Feb	4.65	129.67	3.96	908.18	0.00	1037.84	1007.43	1.82	51.21	1048.79	7.46	331.88	
1956	Mar	0.33	9.13	0.84	193.79	0.00	202.91	151.70	3.09	87.22	1012.78	7.30	327.06	
1956	Apr	2.23	60.78	0.12	27.82	0.00	88.59	1.37	4.68	131.92	968.08	7.11	320.97	
1956	May	0.61	16.32	0.06	13.88	0.00	30.19	0.00	6.17	167.18	831.09	6.50	301.55	
1956	Jun	0.00	0.00	0.02	5.44	0.00	5.44	0.00	6.89	173.50	663.04	5.77	276.10	
1956	Jul	0.00	0.00	0.00	0.84	0.00	0.84	0.00	7.12	163.83	500.05	5.05	249.56	
1956	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	134.05	366.00	4.46	226.27	
1956	Sep	0.08	1.51	0.00	0.00	0.00	1.51	0.00	4.94	93.24	274.27	4.05	209.54	
1956	**annual**	**35.63**	**492.07**	**21.27**	**5086.83**	**526.00**	**5052.91**	**3715.65**	**48.35**	**1062.99**				**9305.17**
1957	Oct	1.41	24.62	0.01	1.73	1.73	24.62	0.00	3.36	59.86	239.03	3.75	196.59	
1957	Nov	0.09	1.47	0.04	8.85	8.85	1.47	0.00	1.69	27.86	212.64	3.43	182.46	
1957	Dec	0.35	5.32	0.03	8.24	8.24	5.32	0.00	1.08	16.65	201.32	3.30	176.26	
1957	Jan	3.52	51.70	0.04	10.79	10.79	51.70	0.00	1.08	18.32	234.70	3.70	194.30	
1957	Feb	5.46	88.41	0.57	136.63	136.63	88.41	0.00	1.82	33.05	290.06	4.12	212.46	
1957	Mar	2.34	41.43	0.56	134.33	134.33	41.43	0.00	3.09	56.68	274.80	4.06	209.64	
1957	Apr	1.50	26.20	0.07	17.76	17.76	26.20	0.00	4.68	83.56	217.45	3.49	185.07	
1957	May	2.16	33.31	0.10	24.68	0.00	58.00	0.00	6.17	107.87	167.58	2.89	157.30	
1957	Jun	0.00	0.00	0.04	9.59	0.00	9.59	0.00	6.89	93.40	83.77	1.81	103.22	
1957	Jul	0.00	0.00	0.00	0.47	0.00	0.47	0.00	7.12	61.41	22.82	0.96	57.14	
1957	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	30.69	0.00	0.00	0.00	
1957	Sep	0.99	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1957	**annual**	**17.82**	**272.47**	**1.47**	**353.06**	**318.32**	**307.22**	**0.00**	**48.35**	**589.35**				**386.05**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1958	Oct	4.87	0.00	0.02	6.06	6.06	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1958	Nov	0.88	0.00	0.03	7.66	7.66	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1958	Dec	3.08	0.00	0.09	23.74	23.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1958	Jan	5.57	0.00	1.20	308.06	308.06	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1958	Feb	11.23	0.00	10.65	2736.83	180.49	2556.34	1456.34	1.82	51.21	1048.79	7.46	331.88	
1958	Mar	5.21	144.09	2.56	587.37	0.00	731.46	680.24	3.09	87.22	1012.78	7.30	327.06	
1958	Apr	5.72	155.90	5.15	1183.98	0.00	1339.87	1252.65	4.68	131.92	968.08	7.11	320.97	
1958	May	0.46	12.30	0.14	33.03	0.00	45.33	0.00	6.17	168.23	845.18	6.57	303.60	
1958	Jun	0.32	8.10	0.07	17.33	0.00	25.43	0.00	6.89	176.32	694.29	5.90	280.97	
1958	Jul	0.00	0.00	0.03	7.65	0.00	7.65	0.00	7.12	167.34	534.59	5.20	255.34	
1958	Aug	0.00	0.00	0.00	0.85	0.00	0.85	0.00	6.45	137.24	398.21	4.60	231.99	
1958	Sep	0.04	0.77	0.00	0.41	0.00	1.18	0.00	4.94	95.57	303.82	4.18	215.00	
1958	**annual**	**37.38**	**321.16**	**19.96**	**4912.95**	**526.00**	**4708.11**	**3389.24**	**48.35**	**1015.06**				**8636.41**
1959	Oct	0.09	1.61	0.00	0.00	0.00	1.61	0.00	3.36	60.19	245.24	3.83	199.85	
1959	Nov	0.18	3.00	0.00	0.00	0.00	3.00	0.00	1.69	28.43	219.80	3.52	186.34	
1959	Dec	1.13	17.55	0.01	2.21	2.21	17.55	0.00	1.08	17.58	219.77	3.52	186.32	
1959	Jan	6.35	98.59	0.22	52.83	52.83	98.59	0.00	1.08	19.55	298.81	4.16	214.08	
1959	Feb	6.26	111.68	1.80	431.55	431.55	111.68	0.00	1.82	35.42	375.07	4.50	227.89	
1959	Mar	0.59	11.20	0.21	50.20	39.41	22.00	0.00	3.09	59.71	337.36	4.33	221.12	
1959	Apr	0.35	6.45	0.07	16.48	0.00	22.93	0.00	4.68	87.75	272.54	4.05	209.22	
1959	May	0.08	1.39	0.03	6.12	0.00	7.51	0.00	6.17	108.31	171.75	2.94	159.68	
1959	Jun	0.00	0.00	0.00	0.57	0.00	0.57	0.00	6.89	91.82	80.50	1.76	100.91	
1959	Jul	0.06	0.50	0.00	0.00	0.00	0.50	0.00	7.12	60.06	20.94	0.88	52.62	
1959	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	28.27	0.00	0.00	0.00	
1959	Sep	1.85	0.00	0.00	0.16	0.00	0.16	0.00	4.94	0.20	0.00	0.00	0.00	
1959	**annual**	**16.94**	**251.98**	**2.34**	**560.13**	**526.00**	**286.11**	**0.00**	**48.35**	**597.29**				**615.25**
1960	Oct	0.04	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1960	Nov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1960	Dec	1.31	0.00	0.00	1.25	1.25	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1960	Jan	5.88	0.00	0.07	17.68	17.68	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1960	Feb	4.76	0.00	1.27	326.90	326.90	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1960	Mar	2.24	0.00	0.23	58.92	58.92	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1960	Apr	1.01	0.00	0.05	14.01	14.01	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1960	May	0.66	0.00	0.04	9.09	0.00	9.09	0.00	6.17	12.03	0.00	0.00	0.00	
1960	Jun	0.00	0.00	0.00	0.81	0.00	0.81	0.00	6.89	1.25	0.00	0.00	0.00	
1960	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1960	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1960	Sep	0.02	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1960	**annual**	**15.92**	**0.00**	**1.67**	**428.65**	**418.75**	**9.90**	**0.00**	**48.35**	**13.28**				**438.37**
1961	Oct	0.40	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1961	Nov	3.91	0.00	0.00	1.14	1.14	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1961	Dec	2.75	0.00	0.05	13.97	13.97	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1961	Jan	4.37	0.00	0.19	50.00	50.00	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1961	Feb	1.99	0.00	0.22	56.11	56.11	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1961	Mar	3.25	0.00	0.13	32.83	32.83	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1961	Apr	1.15	0.00	0.02	4.24	4.24	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1961	May	0.37	0.00	0.00	0.27	0.00	0.27	0.00	6.17	0.39	0.00	0.00	0.00	
1961	Jun	0.07	0.00	0.00	0.00	0.00	0.00	0.00	6.89	0.00	0.00	0.00	0.00	
1961	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1961	Aug	0.02	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1961	Sep	0.63	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1961	**annual**	**18.91**	**0.00**	**0.62**	**158.54**	**158.27**	**0.27**	**0.00**	**48.35**	**0.39**				**162.14**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1962	Oct	0.07	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1962	Nov	3.29	0.00	0.00	0.54	0.54	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1962	Dec	4.11	0.00	0.18	46.12	46.12	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1962	Jan	1.30	0.00	0.05	12.46	12.46	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1962	Feb	9.15	0.00	2.64	679.65	466.88	212.77	0.00	1.82	27.61	185.16	3.10	167.27	
1962	Mar	3.32	46.28	1.26	305.68	0.00	351.96	0.00	3.09	65.88	471.24	4.92	244.67	
1962	Apr	0.43	8.77	0.10	24.60	0.00	33.36	0.00	4.68	97.52	407.08	4.64	233.55	
1962	May	0.00	0.00	0.04	9.02	0.00	9.02	0.00	6.17	120.92	295.18	4.15	213.41	
1962	Jun	0.00	0.00	0.01	2.88	0.00	2.88	0.00	6.89	122.77	175.30	2.98	161.70	
1962	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	95.90	79.39	1.75	100.13	
1962	Aug	0.03	0.25	0.00	0.00	0.00	0.25	0.00	6.45	53.88	25.76	1.03	60.87	
1962	Sep	0.08	0.41	0.00	0.00	0.00	0.41	0.00	4.94	25.18	0.99	0.04	2.64	
1962	**annual**	**21.78**	**55.70**	**4.29**	**1080.95**	**526.00**	**610.65**	**0.00**	**48.35**	**609.66**				**1126.52**
1963	Oct	7.29	1.60	0.59	152.55	152.55	1.60	0.00	3.36	1.90	0.69	0.03	1.86	
1963	Nov	0.81	0.09	0.04	10.26	10.26	0.09	0.00	1.69	0.30	0.49	0.02	1.33	
1963	Dec	3.32	0.37	0.24	60.58	60.58	0.37	0.00	1.08	0.21	0.65	0.03	1.76	
1963	Jan	4.97	0.73	1.28	329.75	238.48	92.00	0.00	1.08	9.83	82.82	1.79	102.55	
1963	Feb	3.04	25.98	3.00	745.24	64.14	707.08	0.00	1.82	44.69	745.21	6.13	288.78	
1963	Mar	4.58	110.22	0.96	222.76	0.00	332.98	0.00	3.09	86.49	991.70	7.21	324.20	
1963	Apr	4.58	123.74	1.79	411.10	0.00	534.84	426.54	4.68	131.92	968.08	7.11	320.97	
1963	May	0.46	12.30	0.14	32.58	0.00	44.88	0.00	6.17	168.20	844.76	6.57	303.54	
1963	Jun	0.00	0.00	0.06	13.07	0.00	13.07	0.00	6.89	175.27	682.56	5.85	279.15	
1963	Jul	0.00	0.00	0.04	8.57	0.00	8.57	0.00	7.12	166.35	524.79	5.16	253.71	
1963	Aug	0.00	0.00	0.00	0.65	0.00	0.65	0.00	6.45	136.34	389.10	4.56	230.38	
1963	Sep	0.05	0.96	0.00	0.00	0.00	0.96	0.00	4.94	94.89	295.16	4.15	213.41	
1963	**annual**	**28.90**	**275.99**	**8.13**	**1987.11**	**526.00**	**1737.10**	**426.54**	**48.35**	**1016.38**				**2564.46**
1964	Oct	1.52	27.03	0.01	2.82	2.82	27.03	0.00	3.36	61.05	261.15	4.00	207.09	
1964	Nov	5.60	96.64	0.11	26.44	26.44	96.64	0.00	1.69	31.73	326.05	4.28	219.07	
1964	Dec	0.92	16.79	0.05	12.20	12.20	16.79	0.00	1.08	19.95	322.89	4.27	218.49	
1964	Jan	4.63	84.30	1.07	256.51	256.51	84.30	0.00	1.08	20.98	386.21	4.55	229.87	
1964	Feb	0.26	4.98	0.22	53.33	53.33	4.98	0.00	1.82	34.90	356.29	4.42	224.53	
1964	Mar	1.81	33.87	0.07	16.54	16.54	33.87	0.00	3.09	59.39	330.77	4.30	219.92	
1964	Apr	0.08	1.47	0.03	6.35	6.35	1.47	0.00	4.68	85.78	246.45	3.84	200.48	
1964	May	0.21	3.51	0.01	2.83	0.00	6.34	0.00	6.17	104.80	148.00	2.65	145.95	
1964	Jun	0.84	10.22	0.04	9.31	0.00	19.53	0.00	6.89	90.25	77.28	1.72	98.63	
1964	Jul	0.05	0.41	0.00	0.52	0.00	0.93	0.00	7.12	58.89	19.32	0.81	48.70	
1964	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	26.16	0.00	0.00	0.00	
1964	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1964	**annual**	**15.92**	**279.22**	**1.62**	**386.87**	**374.20**	**291.88**	**0.00**	**48.35**	**593.89**				**425.67**
1965	Oct	2.42	0.00	0.04	9.93	9.93	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1965	Nov	5.42	0.00	0.13	33.88	33.88	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1965	Dec	5.81	0.00	1.54	395.59	395.59	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1965	Jan	5.19	0.00	4.81	1235.59	86.59	1149.00	49.00	1.08	30.42	1069.58	7.55	334.63	
1965	Feb	1.14	31.79	0.55	125.92	0.00	157.71	127.30	1.82	51.21	1048.79	7.46	331.88	
1965	Mar	1.53	42.31	0.14	32.30	0.00	74.61	23.40	3.09	87.22	1012.78	7.30	327.06	
1965	Apr	3.57	97.30	1.39	320.39	0.00	417.69	330.47	4.68	131.92	968.08	7.11	320.97	
1965	May	0.00	0.00	0.14	32.43	0.00	32.43	0.00	6.17	167.34	833.17	6.51	301.86	
1965	Jun	0.00	0.00	0.04	9.11	0.00	9.11	0.00	6.89	173.98	668.31	5.79	276.92	
1965	Jul	0.00	0.00	0.02	4.60	0.00	4.60	0.00	7.12	164.67	508.24	5.08	250.94	
1965	Aug	0.41	8.57	0.02	3.56	0.00	12.13	0.00	6.45	135.89	384.48	4.54	229.56	
1965	Sep	0.00	0.00	0.01	1.66	0.00	1.66	0.00	4.94	94.61	291.54	4.13	212.74	
1965	**annual**	**25.49**	**179.98**	**8.82**	**2204.86**	**526.00**	**1858.94**	**530.16**	**48.35**	**1037.24**				**2849.43**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1966	Oct	0.20	3.55	0.01	2.35	2.35	3.55	0.00	3.36	59.66	235.42	3.71	194.68	
1966	Nov	5.93	96.20	0.17	40.45	40.45	96.20	0.00	1.69	31.07	300.56	4.17	214.40	
1966	Dec	3.70	66.11	0.38	90.38	90.38	66.11	0.00	1.08	20.34	346.33	4.37	222.74	
1966	Jan	5.00	92.81	2.63	627.84	392.83	327.82	0.00	1.08	24.96	649.19	5.70	273.91	
1966	Feb	3.10	70.76	2.21	518.15	0.00	588.91	138.10	1.82	51.21	1048.79	7.46	331.88	
1966	Mar	0.55	15.21	0.28	65.20	0.00	80.41	29.19	3.09	87.22	1012.78	7.30	327.06	
1966	Apr	0.46	12.54	0.08	17.77	0.00	30.30	0.00	4.68	129.00	914.08	6.87	313.45	
1966	May	0.12	3.13	0.03	7.41	0.00	10.54	0.00	6.17	161.95	762.67	6.20	291.41	
1966	Jun	0.18	4.37	0.01	2.21	0.00	6.58	0.00	6.89	167.79	601.47	5.49	266.29	
1966	Jul	0.00	0.00	0.01	1.69	0.00	1.69	0.00	7.12	158.10	445.06	4.81	240.17	
1966	Aug	0.11	2.20	0.00	0.00	0.00	2.20	0.00	6.45	129.22	318.05	4.25	217.61	
1966	Sep	0.05	0.91	0.01	3.33	0.00	4.24	0.00	4.94	89.88	232.41	3.67	193.08	
1966	**annual**	**19.40**	**367.79**	**5.83**	**1376.77**	**526.00**	**1218.56**	**167.29**	**48.35**	**1110.40**				**1698.49**
1967	Oct	0.00	0.00	0.08	18.62	18.62	0.00	0.00	3.36	53.98	178.42	3.02	163.48	
1967	Nov	6.42	87.46	0.19	46.44	46.44	87.46	0.00	1.69	29.36	236.53	3.72	195.27	
1967	Dec	5.47	89.01	1.08	260.17	260.17	89.01	0.00	1.08	19.67	305.86	4.19	215.38	
1967	Jan	12.78	229.37	8.52	2035.55	200.77	2064.15	1270.02	1.08	30.42	1069.58	7.55	334.63	
1967	Feb	0.49	13.66	1.73	395.80	0.00	409.47	379.05	1.82	51.21	1048.79	7.46	331.88	
1967	Mar	4.47	123.63	0.94	214.82	0.00	338.44	287.23	3.09	87.22	1012.78	7.30	327.06	
1967	Apr	4.96	135.18	3.52	808.25	0.00	943.43	856.21	4.68	131.92	968.08	7.11	320.97	
1967	May	0.07	1.87	0.38	87.93	0.00	89.80	0.00	6.17	171.29	886.59	6.75	309.56	
1967	Jun	2.02	52.11	0.18	41.04	0.00	93.14	0.00	6.89	185.10	794.64	6.34	296.19	
1967	Jul	0.00	0.00	0.16	37.89	0.00	37.89	0.00	7.12	178.97	653.56	5.72	274.60	
1967	Aug	0.00	0.00	0.04	10.12	0.00	10.12	0.00	6.45	148.36	515.31	5.12	252.12	
1967	Sep	0.03	0.63	0.34	80.78	0.00	81.41	0.00	4.94	109.29	487.44	4.99	247.42	
1967	**annual**	**36.71**	**732.93**	**17.15**	**4037.40**	**526.00**	**4244.33**	**2792.50**	**48.35**	**1196.79**				**7301.07**
1968	Oct	0.82	16.91	0.04	9.91	9.91	16.91	0.00	3.36	69.97	434.37	4.76	238.32	
1968	Nov	2.35	46.67	0.03	6.46	6.46	46.67	0.00	1.69	34.77	446.27	4.81	240.38	
1968	Dec	3.15	63.10	0.05	12.42	12.42	63.10	0.00	1.08	22.56	486.81	4.99	247.32	
1968	Jan	6.58	135.61	0.86	204.39	204.39	135.61	0.00	1.08	24.22	598.19	5.48	265.76	
1968	Feb	3.70	81.94	1.37	322.35	292.82	111.47	0.00	1.82	42.86	666.81	5.78	276.69	
1968	Mar	3.43	79.09	1.31	306.47	0.00	385.56	0.00	3.09	85.61	966.75	7.10	320.79	
1968	Apr	0.32	8.55	0.14	32.70	0.00	41.25	0.00	4.68	127.16	880.84	6.72	308.74	
1968	May	0.58	14.92	0.06	14.69	0.00	29.62	0.00	6.17	160.93	749.52	6.15	289.43	
1968	Jun	0.00	0.00	0.02	5.61	0.00	5.61	0.00	6.89	166.57	588.56	5.44	264.20	
1968	Jul	0.00	0.00	0.01	3.23	0.00	3.23	0.00	7.12	157.01	434.79	4.76	238.39	
1968	Aug	0.62	12.32	0.00	0.98	0.00	13.30	0.00	6.45	129.29	318.79	4.25	217.74	
1968	Sep	0.03	0.54	0.00	0.00	0.00	0.54	0.00	4.94	89.66	229.68	3.64	191.63	
1968	**annual**	**21.58**	**459.66**	**3.92**	**919.20**	**526.00**	**852.86**	**0.00**	**48.35**	**1110.62**				**1029.30**
1969	Oct	1.84	29.38	0.02	5.21	5.21	29.38	0.00	3.36	57.88	201.18	3.30	176.19	
1969	Nov	3.20	46.98	0.11	26.11	26.11	46.98	0.00	1.69	28.43	219.74	3.52	186.30	
1969	Dec	5.72	88.80	1.22	295.77	295.77	88.80	0.00	1.08	19.39	289.15	4.12	212.30	
1969	Jan	7.72	136.58	6.62	1583.17	198.90	1520.84	709.99	1.08	30.42	1069.58	7.55	334.63	
1969	Feb	7.57	211.10	7.45	1707.91	0.00	1919.01	1888.59	1.82	51.21	1048.79	7.46	331.88	
1969	Mar	1.63	45.08	2.05	470.19	0.00	515.27	464.06	3.09	87.22	1012.78	7.30	327.06	
1969	Apr	2.52	68.68	0.23	51.99	0.00	120.67	33.45	4.68	131.92	968.08	7.11	320.97	
1969	May	0.00	0.00	0.06	14.18	0.00	14.18	0.00	6.17	166.06	816.20	6.44	299.37	
1969	Jun	0.01	0.25	0.02	5.15	0.00	5.40	0.00	6.89	172.24	649.36	5.71	273.94	
1969	Jul	0.00	0.00	0.02	3.83	0.00	3.83	0.00	7.12	162.83	490.36	5.01	247.92	
1969	Aug	0.00	0.00	0.00	1.04	0.00	1.04	0.00	6.45	133.27	358.13	4.42	224.86	
1969	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	92.55	265.58	4.02	207.92	
1969	**annual**	**30.21**	**626.86**	**17.81**	**4164.55**	**526.00**	**4265.41**	**3096.09**	**48.35**	**1133.42**				**7775.78**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1970	Oct	1.65	28.59	0.10	24.02	24.02	28.59	0.00	3.36	59.61	234.56	3.70	194.22	
1970	Nov	0.88	14.24	0.05	13.13	13.13	14.24	0.00	1.69	28.47	220.33	3.53	186.62	
1970	Dec	7.06	109.84	1.21	291.00	291.00	109.84	0.00	1.08	19.75	310.42	4.21	216.21	
1970	Jan	13.34	240.35	12.38	2958.52	197.86	3001.02	2211.44	1.08	30.42	1069.58	7.55	334.63	
1970	Feb	2.34	65.25	1.81	414.78	0.00	480.03	449.61	1.82	51.21	1048.79	7.46	331.88	
1970	Mar	2.48	68.59	1.50	344.01	0.00	412.60	361.38	3.09	87.22	1012.78	7.30	327.06	
1970	Apr	0.17	4.63	0.09	21.70	0.00	26.33	0.00	4.68	128.79	910.32	6.85	312.92	
1970	May	0.00	0.00	0.04	8.47	0.00	8.47	0.00	6.17	161.53	757.26	6.18	290.60	
1970	Jun	0.48	11.62	0.02	4.28	0.00	15.90	0.00	6.89	168.13	605.03	5.51	266.87	
1970	Jul	0.00	0.00	0.01	1.85	0.00	1.85	0.00	7.12	158.45	448.43	4.82	240.75	
1970	Aug	0.00	0.00	0.01	2.95	0.00	2.95	0.00	6.45	129.60	321.78	4.26	218.29	
1970	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	89.84	231.94	3.67	192.83	
1970	**annual**	**28.40**	**543.13**	**17.22**	**4084.69**	**526.00**	**4101.82**	**3022.43**	**48.35**	**1113.03**				**7548.24**
1971	Oct	0.96	15.43	0.01	2.52	2.52	15.43	0.00	3.36	58.18	191.18	3.17	170.64	
1971	Nov	9.11	129.55	0.88	213.91	213.91	129.55	0.00	1.69	30.79	289.94	4.12	212.44	
1971	Dec	6.40	113.30	3.82	913.80	309.56	717.54	0.00	1.08	29.32	978.16	7.15	322.35	
1971	Jan	1.87	50.23	1.31	301.48	0.00	351.72	229.88	1.08	30.42	1069.58	7.55	334.63	
1971	Feb	0.31	8.64	0.16	36.87	0.00	45.51	15.10	1.82	51.21	1048.79	7.46	331.88	
1971	Mar	3.36	93.48	0.54	124.83	0.00	218.31	167.10	3.09	87.22	1012.78	7.30	327.06	
1971	Apr	0.85	23.17	0.28	64.22	0.00	87.39	0.17	4.68	131.92	968.08	7.11	320.97	
1971	May	0.33	8.83	0.06	12.82	0.00	21.65	0.00	6.17	166.58	823.15	6.47	300.39	
1971	Jun	0.00	0.00	0.03	6.91	0.00	6.91	0.00	6.89	172.95	657.10	5.74	275.16	
1971	Jul	0.00	0.00	0.02	3.53	0.00	3.53	0.00	7.12	163.52	497.11	5.04	249.06	
1971	Aug	0.00	0.00	0.01	2.48	0.00	2.48	0.00	6.45	134.01	365.57	4.46	226.19	
1971	Sep	0.15	2.83	0.00	0.74	0.00	3.57	0.00	4.94	93.36	275.78	4.06	209.82	
1971	**annual**	**23.36**	**445.45**	**7.12**	**1684.12**	**526.00**	**1603.57**	**412.24**	**48.35**	**1147.49**				**2283.35**
1972	Oct	0.21	3.67	0.00	0.17	0.17	3.67	0.00	3.36	58.85	220.60	3.53	186.77	
1972	Nov	2.37	36.89	0.06	14.08	14.08	36.89	0.00	1.69	29.11	228.37	3.62	190.94	
1972	Dec	5.48	87.19	0.49	118.12	118.12	87.19	0.00	1.08	19.51	296.06	4.15	213.57	
1972	Jan	1.67	29.72	0.15	36.98	36.98	29.72	0.00	1.08	19.67	306.11	4.19	215.42	
1972	Feb	2.40	43.08	0.54	128.41	128.41	43.08	0.00	1.82	33.77	315.42	4.24	217.13	
1972	Mar	0.38	6.88	0.06	15.49	15.49	6.88	0.00	3.09	56.25	266.05	4.02	208.00	
1972	Apr	1.08	18.72	0.04	9.57	9.57	18.72	0.00	4.68	82.39	202.38	3.31	176.85	
1972	May	0.00	0.00	0.02	4.28	0.00	4.28	0.00	6.17	92.15	114.51	2.22	124.44	
1972	Jun	0.15	1.56	0.01	1.72	0.00	3.28	0.00	6.89	72.68	45.11	1.29	75.34	
1972	Jul	0.01	0.06	0.00	1.03	0.00	1.10	0.00	7.12	45.16	1.04	0.04	2.78	
1972	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	1.49	0.00	0.00	0.00	
1972	Sep	0.92	0.00	0.00	0.55	0.00	0.55	0.00	4.94	0.62	0.00	0.00	0.00	
1972	**annual**	**14.67**	**227.77**	**1.38**	**330.42**	**322.83**	**235.37**	**0.00**	**48.35**	**511.66**				**361.77**
1973	Oct	4.46	0.00	0.26	67.50	67.50	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1973	Nov	5.26	0.00	0.95	244.36	244.36	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1973	Dec	4.50	0.00	0.69	176.75	160.50	16.26	0.00	1.08	3.70	12.55	0.53	32.07	
1973	Jan	11.27	30.12	10.81	2748.68	53.64	2725.16	1637.71	1.08	30.42	1069.58	7.55	334.63	
1973	Feb	8.55	238.42	9.41	2155.22	0.00	2393.65	2363.23	1.82	51.21	1048.79	7.46	331.88	
1973	Mar	2.81	77.72	3.52	806.69	0.00	884.41	833.19	3.09	87.22	1012.78	7.30	327.06	
1973	Apr	0.08	2.18	0.20	46.46	0.00	48.64	0.00	4.68	129.95	931.47	6.95	315.89	
1973	May	0.02	0.53	0.11	24.48	0.00	25.00	0.00	6.17	164.23	792.24	6.33	295.83	
1973	Jun	0.00	0.00	0.04	8.54	0.00	8.54	0.00	6.89	170.48	630.30	5.62	270.92	
1973	Jul	0.00	0.00	0.03	6.14	0.00	6.14	0.00	7.12	161.26	475.18	4.94	245.34	
1973	Aug	0.00	0.00	0.01	2.79	0.00	2.79	0.00	6.45	132.04	345.93	4.37	222.67	
1973	Sep	0.27	5.01	0.01	1.51	0.00	6.52	0.00	4.94	92.13	260.32	3.99	206.93	
1973	**annual**	**37.22**	**353.98**	**26.02**	**6289.12**	**526.00**	**6117.10**	**4834.13**	**48.35**	**1022.65**				**11673.52**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1974	Oct	1.25	21.56	0.03	6.28	6.28	21.56	0.00	3.36	58.98	222.90	3.56	188.00	
1974	Nov	9.70	151.97	1.09	263.12	263.12	151.97	0.00	1.69	32.17	342.70	4.36	222.08	
1974	Dec	4.65	86.06	2.03	484.27	256.60	313.72	0.00	1.08	24.71	631.72	5.63	271.14	
1974	Jan	5.30	119.75	5.36	1255.93	0.00	1375.69	907.40	1.08	30.42	1069.58	7.55	334.63	
1974	Feb	1.83	51.03	0.62	142.33	0.00	193.36	162.94	1.82	51.21	1048.79	7.46	331.88	
1974	Mar	4.72	130.54	3.61	827.72	0.00	958.26	907.05	3.09	87.22	1012.78	7.30	327.06	
1974	Apr	2.30	62.69	2.75	632.04	0.00	694.72	607.50	4.68	131.92	968.08	7.11	320.97	
1974	May	0.00	0.00	0.14	31.52	0.00	31.52	0.00	6.17	167.27	832.33	6.51	301.73	
1974	Jun	0.02	0.50	0.03	8.08	0.00	8.59	0.00	6.89	173.86	667.06	5.78	276.73	
1974	Jul	0.95	21.91	0.04	10.42	0.00	32.33	0.00	7.12	167.11	532.27	5.19	254.95	
1974	Aug	0.00	0.00	0.02	5.10	0.00	5.10	0.00	6.45	137.41	399.96	4.61	232.30	
1974	Sep	0.00	0.00	0.02	5.57	0.00	5.57	0.00	4.94	96.01	309.52	4.21	216.05	
1974	**annual**	**30.72**	**646.00**	**15.75**	**3672.38**	**526.00**	**3792.38**	**2584.89**	**48.35**	**1158.29**				**6723.80**
1975	Oct	0.91	16.38	0.03	7.20	7.20	16.38	0.00	3.36	61.24	264.67	4.01	207.75	
1975	Nov	0.89	15.41	0.03	7.14	7.14	15.41	0.00	1.69	29.73	250.34	3.89	202.51	
1975	Dec	3.40	57.38	0.19	44.83	44.83	57.38	0.00	1.08	19.38	288.34	4.12	212.15	
1975	Jan	1.97	34.83	0.17	41.07	41.07	34.83	0.00	1.08	19.63	303.54	4.18	214.95	
1975	Feb	7.17	128.43	2.10	502.14	425.76	204.81	0.00	1.82	37.96	470.39	4.92	244.52	
1975	Mar	6.41	130.62	4.47	1058.58	0.00	1189.20	559.59	3.09	87.22	1012.78	7.30	327.06	
1975	Apr	1.13	30.80	0.40	92.33	0.00	123.13	35.91	4.68	131.92	968.08	7.11	320.97	
1975	May	0.00	0.00	0.09	19.61	0.00	19.61	0.00	6.17	166.44	821.25	6.46	300.11	
1975	Jun	0.11	2.75	0.03	8.09	0.00	10.84	0.00	6.89	173.12	658.96	5.75	275.46	
1975	Jul	0.12	2.75	0.02	4.91	0.00	7.66	0.00	7.12	164.08	502.54	5.06	249.98	
1975	Aug	0.03	0.62	0.01	1.86	0.00	2.48	0.00	6.45	134.50	370.52	4.48	227.08	
1975	Sep	0.00	0.00	0.00	1.09	0.00	1.09	0.00	4.94	93.54	278.07	4.07	210.24	
1975	**annual**	**22.14**	**419.97**	**7.55**	**1788.84**	**526.00**	**1682.81**	**595.50**	**48.35**	**1118.77**				**2579.17**
1976	Oct	4.64	81.29	0.08	19.45	19.45	81.29	0.00	3.36	62.93	296.43	4.15	213.64	
1976	Nov	0.68	12.11	0.01	3.34	3.34	12.11	0.00	1.69	30.47	278.06	4.07	210.24	
1976	Dec	0.79	13.84	0.02	5.96	5.96	13.84	0.00	1.08	19.12	272.79	4.05	209.26	
1976	Jan	0.32	5.58	0.03	6.75	6.75	5.58	0.00	1.08	18.89	259.48	4.00	207.23	
1976	Feb	1.95	33.68	0.04	8.94	8.94	33.68	0.00	1.82	32.22	260.93	4.00	207.05	
1976	Mar	0.97	16.74	0.06	13.19	13.19	16.74	0.00	3.09	54.14	223.53	3.57	188.34	
1976	Apr	1.51	23.70	0.05	12.24	12.24	23.70	0.00	4.68	78.26	168.97	2.91	158.09	
1976	May	0.00	0.00	0.00	1.09	0.00	1.09	0.00	6.17	81.62	88.43	1.87	106.49	
1976	Jun	0.01	0.09	0.00	0.03	0.00	0.12	0.00	6.89	61.16	27.40	1.05	62.11	
1976	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	36.83	0.00	0.00	0.00	
1976	Aug	0.62	0.00	0.00	0.45	0.00	0.45	0.00	6.45	0.67	0.00	0.00	0.00	
1976	Sep	0.57	0.00	0.01	3.58	0.00	3.58	0.00	4.94	3.85	0.00	0.00	0.00	
1976	**annual**	**12.06**	**187.02**	**0.31**	**75.01**	**69.86**	**192.18**	**0.00**	**48.35**	**480.16**				**81.88**
1977	Oct	0.60	0.00	0.01	3.20	3.20	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1977	Nov	1.54	0.00	0.04	10.10	10.10	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1977	Dec	0.89	0.00	0.04	9.76	9.76	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1977	Jan	1.80	0.00	0.10	26.93	26.93	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1977	Feb	1.26	0.00	0.04	9.58	9.58	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1977	Mar	2.00	0.00	0.09	22.39	22.39	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1977	Apr	0.06	0.00	0.01	2.77	2.77	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1977	May	0.82	0.00	0.01	2.02	0.00	2.02	0.00	6.17	2.73	0.00	0.00	0.00	
1977	Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.89	0.00	0.00	0.00	0.00	
1977	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1977	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1977	Sep	0.73	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1977	**annual**	**9.70**	**0.00**	**0.34**	**86.75**	**84.73**	**2.02**	**0.00**	**48.35**	**2.73**				**88.72**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1978	Oct	0.41	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1978	Nov	4.70	0.00	0.13	34.37	34.37	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1978	Dec	4.16	0.00	0.30	76.59	76.59	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1978	Jan	12.58	0.00	8.84	2272.55	415.03	1857.52	757.52	1.08	30.42	1069.58	7.55	334.63	
1978	Feb	4.62	128.83	4.44	1017.97	0.00	1146.80	1116.38	1.82	51.21	1048.79	7.46	331.88	
1978	Mar	4.24	117.26	2.87	657.97	0.00	775.24	724.02	3.09	87.22	1012.78	7.30	327.06	
1978	Apr	3.68	100.30	0.75	171.84	0.00	272.14	184.92	4.68	131.92	968.08	7.11	320.97	
1978	May	0.09	2.41	0.08	18.55	0.00	20.96	0.00	6.17	166.53	822.51	6.47	300.30	
1978	Jun	0.00	0.00	0.03	6.62	0.00	6.62	0.00	6.89	172.88	656.25	5.74	275.03	
1978	Jul	0.00	0.00	0.01	1.99	0.00	1.99	0.00	7.12	163.30	494.94	5.03	248.69	
1978	Aug	0.00	0.00	0.00	0.14	0.00	0.14	0.00	6.45	133.60	361.48	4.44	225.46	
1978	Sep	0.46	8.64	0.00	0.47	0.00	9.11	0.00	4.94	93.47	277.12	4.07	210.07	
1978	**annual**	**34.94**	**357.44**	**17.45**	**4259.07**	**526.00**	**4090.51**	**2782.84**	**48.35**	**1030.55**				**7370.36**
1979	Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.36	58.73	218.39	3.50	185.58	
1979	Nov	1.51	23.35	0.03	7.50	7.50	23.35	0.00	1.69	27.95	213.79	3.45	183.08	
1979	Dec	0.73	11.14	0.03	8.39	8.39	11.14	0.00	1.08	16.99	207.94	3.38	179.90	
1979	Jan	10.45	156.66	1.33	321.79	321.79	156.66	0.00	1.08	20.30	344.30	4.36	222.37	
1979	Feb	5.61	103.96	1.94	462.75	188.31	378.40	0.00	1.82	43.16	679.53	5.84	278.68	
1979	Mar	1.73	40.18	1.00	232.75	0.00	272.93	0.00	3.09	82.12	870.34	6.68	307.23	
1979	Apr	1.17	29.96	0.18	41.66	0.00	71.61	0.00	4.68	123.64	818.32	6.45	299.68	
1979	May	0.38	9.49	0.07	15.81	0.00	25.30	0.00	6.17	156.01	687.60	5.87	279.93	
1979	Jun	0.00	0.00	0.03	7.41	0.00	7.41	0.00	6.89	161.30	533.71	5.20	255.19	
1979	Jul	0.00	0.00	0.01	2.01	0.00	2.01	0.00	7.12	151.55	384.17	4.54	229.51	
1979	Aug	0.00	0.00	0.00	0.53	0.00	0.53	0.00	6.45	123.33	261.36	4.00	207.13	
1979	Sep	0.09	1.55	0.00	0.00	0.00	1.55	0.00	4.94	85.37	177.55	3.01	162.98	
1979	**annual**	**21.67**	**376.28**	**4.62**	**1100.59**	**526.00**	**950.88**	**0.00**	**48.35**	**1050.45**				**1214.82**
1980	Oct	3.40	46.18	0.13	31.57	31.57	46.18	0.00	3.36	52.69	171.04	2.93	159.28	
1980	Nov	3.17	42.02	0.98	239.46	239.46	42.02	0.00	1.69	25.79	187.27	3.13	168.46	
1980	Dec	5.60	78.61	1.59	385.12	254.97	208.77	0.00	1.08	20.81	375.24	4.50	227.92	
1980	Jan	5.89	111.87	6.75	1605.73	0.00	1717.60	992.84	1.08	30.42	1069.58	7.55	334.63	
1980	Feb	10.26	286.11	9.11	2087.45	0.00	2373.56	2343.14	1.82	51.21	1048.79	7.46	331.88	
1980	Mar	1.82	50.37	1.92	440.15	0.00	490.52	439.31	3.09	87.22	1012.78	7.30	327.06	
1980	Apr	1.08	29.44	0.27	62.91	0.00	92.35	5.13	4.68	131.92	968.08	7.11	320.97	
1980	May	0.24	6.42	0.15	34.54	0.00	40.96	0.00	6.17	167.93	841.11	6.55	303.01	
1980	Jun	0.05	1.26	0.49	113.55	0.00	114.82	0.00	6.89	163.22	772.71	6.25	292.92	
1980	Jul	0.19	4.64	0.56	131.17	0.00	135.81	0.00	7.12	185.44	723.08	6.03	285.41	
1980	Aug	0.00	0.00	0.56	130.30	0.00	130.30	0.00	6.45	163.72	689.66	5.88	280.25	
1980	Sep	0.00	0.00	0.00	0.65	0.00	0.65	0.00	4.94	115.39	574.92	5.38	261.98	
1980	**annual**	**31.70**	**656.92**	**22.51**	**5262.62**	**526.00**	**5393.53**	**3780.41**	**48.35**	**1215.75**				**9697.51**
1981	Oct	0.34	7.42	0.01	2.00	2.00	7.42	0.00	3.36	73.58	508.76	5.09	251.02	
1981	Nov	0.32	6.69	0.00	0.45	0.45	6.69	0.00	1.69	35.59	479.86	4.96	246.14	
1981	Dec	3.26	66.93	0.34	80.24	80.24	66.93	0.00	1.08	23.12	523.67	5.15	253.52	
1981	Jan	5.93	125.28	1.55	366.16	366.16	125.28	0.00	1.08	24.60	624.35	5.60	269.97	
1981	Feb	1.57	35.28	0.28	64.65	64.65	35.28	0.00	1.82	41.68	617.95	5.57	268.94	
1981	Mar	4.24	95.03	1.03	241.24	12.50	323.77	0.00	3.09	81.74	859.98	6.63	305.74	
1981	Apr	0.07	1.78	0.14	32.58	0.00	34.36	0.00	4.68	121.03	773.32	6.25	293.01	
1981	May	0.38	9.28	0.04	8.68	0.00	17.96	0.00	6.17	152.06	639.22	5.66	272.34	
1981	Jun	0.00	0.00	0.02	4.60	0.00	4.60	0.00	6.89	156.69	487.13	4.99	247.37	
1981	Jul	0.20	4.12	0.01	1.70	0.00	5.83	0.00	7.12	147.30	345.66	4.37	222.62	
1981	Aug	0.00	0.00	0.00	1.06	0.00	1.06	0.00	6.45	119.69	227.04	3.61	190.22	
1981	Sep	0.00	0.00	0.00	0.21	0.00	0.21	0.00	4.94	78.34	148.91	2.66	146.48	
1981	**annual**	**16.31**	**351.82**	**3.42**	**803.59**	**526.00**	**629.41**	**0.00**	**48.35**	**1055.42**				**897.92**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1982	Oct	2.19	26.73	0.09	22.45	22.45	26.73	0.00	3.36	45.26	130.38	2.43	135.07	
1982	Nov	0.00	0.00	0.56	136.77	136.77	0.00	0.00	1.69	19.07	111.31	2.17	122.27	
1982	Dec	7.49	76.34	2.14	528.64	366.78	238.19	0.00	1.08	20.06	329.44	4.30	219.68	
1982	Jan	9.48	173.55	11.72	2798.59	0.00	2972.14	2201.58	1.08	30.42	1069.58	7.55	334.63	
1982	Feb	3.44	95.93	3.19	730.61	0.00	826.53	796.12	1.82	51.21	1048.79	7.46	331.88	
1982	Mar	5.58	154.32	3.48	797.68	0.00	952.00	900.79	3.09	87.22	1012.78	7.30	327.06	
1982	Apr	3.28	89.40	4.63	1063.10	0.00	1152.50	1065.28	4.68	131.92	968.08	7.11	320.97	
1982	May	0.00	0.00	0.16	37.86	0.00	37.86	0.00	6.17	167.71	838.22	6.54	302.59	
1982	Jun	0.01	0.25	0.09	20.13	0.00	20.38	0.00	6.89	175.33	683.27	5.85	279.26	
1982	Jul	0.00	0.00	0.03	6.58	0.00	6.58	0.00	7.12	166.23	523.62	5.15	253.51	
1982	Aug	0.00	0.00	0.01	3.40	0.00	3.40	0.00	6.45	136.48	390.54	4.57	230.64	
1982	Sep	0.64	12.30	0.05	11.15	0.00	23.45	0.00	4.94	96.63	317.37	4.24	217.48	
1982	**annual**	**32.11**	**628.82**	**26.15**	**6156.95**	**526.00**	**6259.77**	**4963.76**	**48.35**	**1127.55**				**11836.61**
1983	Oct	2.91	52.74	0.13	31.29	31.29	52.74	0.00	3.36	63.47	306.64	4.20	215.52	
1983	Nov	6.72	120.69	0.98	234.86	234.86	120.69	0.00	1.69	33.47	393.86	4.58	231.22	
1983	Dec	2.74	52.80	1.15	272.50	250.32	74.98	0.00	1.08	21.94	446.90	4.81	240.49	
1983	Jan	7.53	150.92	8.71	2064.30	9.53	2205.69	1552.59	1.08	30.42	1069.58	7.55	334.63	
1983	Feb	9.11	254.04	9.64	2209.44	0.00	2463.48	2433.06	1.82	51.21	1048.79	7.46	331.88	
1983	Mar	15.04	415.96	13.56	3109.59	0.00	3525.55	3474.33	3.09	87.22	1012.78	7.30	327.06	
1983	Apr	4.59	125.10	1.61	369.90	0.00	495.00	407.78	4.68	131.92	968.08	7.11	320.97	
1983	May	0.28	7.49	0.84	194.55	0.00	202.04	70.13	6.17	174.13	925.87	6.92	315.11	
1983	Jun	0.00	0.00	0.15	33.79	0.00	33.79	0.00	6.89	183.52	776.14	6.26	293.43	
1983	Jul	0.00	0.00	0.09	21.48	0.00	21.48	0.00	7.12	175.93	621.69	5.58	269.54	
1983	Aug	0.48	10.78	0.07	15.52	0.00	26.30	0.00	6.45	147.04	500.95	5.05	249.71	
1983	Sep	0.42	8.74	0.05	10.78	0.00	19.52	0.00	4.94	104.13	416.35	4.68	235.18	
1983	**annual**	**49.82**	**1199.25**	**36.98**	**8568.00**	**526.00**	**9241.25**	**7937.89**	**48.35**	**1204.38**				**17656.97**
1984	Oct	0.61	11.95	0.07	17.26	17.26	11.95	0.00	3.36	66.33	361.97	4.44	225.55	
1984	Nov	8.16	153.37	0.67	160.05	160.05	153.37	0.00	1.69	35.59	479.75	4.96	246.12	
1984	Dec	9.43	193.41	7.01	1657.46	348.69	1502.18	881.93	1.08	30.42	1069.58	7.55	334.63	
1984	Jan	0.41	11.43	3.23	739.85	0.00	751.29	720.87	1.08	30.42	1069.58	7.55	334.63	
1984	Feb	1.92	53.54	0.57	130.13	0.00	183.67	153.25	1.82	51.21	1048.79	7.46	331.88	
1984	Mar	1.43	39.55	0.27	62.34	0.00	101.89	50.68	3.09	87.22	1012.78	7.30	327.06	
1984	Apr	1.33	36.25	0.08	18.93	0.00	55.18	0.00	4.68	130.28	937.68	6.97	316.76	
1984	May	0.19	5.02	0.06	14.35	0.00	19.36	0.00	6.17	164.28	792.77	6.34	295.91	
1984	Jun	0.26	6.41	0.05	11.19	0.00	17.60	0.00	6.89	171.30	639.07	5.66	272.31	
1984	Jul	0.00	0.00	0.51	120.02	0.00	120.02	0.00	7.12	172.51	586.58	5.43	263.88	
1984	Aug	0.13	2.86	0.17	41.10	0.00	43.96	0.00	6.45	145.55	484.99	4.98	247.01	
1984	Sep	0.15	3.09	0.02	4.50	0.00	7.58	0.00	4.94	102.19	390.38	4.57	230.61	
1984	**annual**	**24.02**	**516.88**	**12.72**	**2977.18**	**526.00**	**2968.06**	**1806.72**	**48.35**	**1187.31**				**5150.17**
1985	Oct	2.25	43.24	0.11	27.10	27.10	43.24	0.00	3.36	66.59	367.03	4.46	226.45	
1985	Nov	7.43	140.21	0.88	209.81	209.81	140.21	0.00	1.69	35.40	471.84	4.92	244.77	
1985	Dec	1.64	33.45	0.39	92.52	92.52	33.45	0.00	1.08	22.50	482.79	4.97	246.63	
1985	Jan	1.20	24.66	0.26	61.33	61.33	24.66	0.00	1.08	22.53	484.92	4.98	247.00	
1985	Feb	2.41	49.61	0.60	142.67	125.18	67.10	0.00	1.82	39.06	512.96	5.11	251.73	
1985	Mar	4.07	85.38	0.36	85.80	10.06	161.12	0.00	3.09	71.56	602.52	5.50	266.46	
1985	Apr	0.27	6.00	0.12	29.02	0.00	35.02	0.00	4.68	105.99	531.54	5.19	254.83	
1985	May	0.00	0.00	0.07	16.52	0.00	16.52	0.00	6.17	132.46	415.61	4.68	235.05	
1985	Jun	0.01	0.20	0.05	11.14	0.00	11.33	0.00	6.89	136.01	290.93	4.13	212.63	
1985	Jul	0.06	1.06	0.02	5.33	0.00	6.39	0.00	7.12	126.80	170.52	2.92	158.98	
1985	Aug	0.00	0.00	0.02	5.27	0.00	5.27	0.00	6.45	87.01	88.78	1.87	106.73	
1985	Sep	0.08	0.71	0.03	8.02	0.00	8.73	0.00	4.94	46.43	51.08	1.37	79.73	
1985	**annual**	**19.42**	**384.52**	**2.93**	**694.53**	**526.00**	**553.05**	**0.00**	**48.35**	**892.35**				**769.89**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1986	Oct	0.98	6.51	0.03	7.22	7.22	6.51	0.00	3.36	23.62	33.97	1.14	67.05	
1986	Nov	3.68	20.56	0.20	50.20	50.20	20.56	0.00	1.69	11.61	42.92	1.26	73.72	
1986	Dec	3.48	21.38	0.24	60.80	60.80	21.38	0.00	1.08	8.03	56.27	1.44	83.53	
1986	Jan	4.58	31.88	1.19	298.08	298.08	31.88	0.00	1.08	9.55	78.60	1.74	99.57	
1986	Feb	15.26	126.62	14.14	3516.58	109.71	3533.49	2512.09	1.82	51.21	1048.79	7.46	331.88	
1986	Mar	7.07	195.53	6.07	1391.05	0.00	1586.59	1535.37	3.09	87.22	1012.78	7.30	327.06	
1986	Apr	1.15	31.34	0.31	71.65	0.00	102.99	15.77	4.68	131.92	968.08	7.11	320.97	
1986	May	0.44	11.77	0.11	24.28	0.00	36.05	0.00	6.17	167.59	836.55	6.53	302.35	
1986	Jun	0.00	0.00	0.08	18.95	0.00	18.95	0.00	6.89	175.07	680.43	5.84	278.82	
1986	Jul	0.00	0.00	0.06	15.01	0.00	15.01	0.00	7.12	166.75	528.69	5.17	254.36	
1986	Aug	0.00	0.00	0.05	11.43	0.00	11.43	0.00	6.45	137.65	402.46	4.62	232.74	
1986	Sep	1.67	32.39	0.08	19.28	0.00	51.67	0.00	4.94	99.49	354.64	4.41	224.23	
1986	**annual**	**38.31**	**477.98**	**22.56**	**5484.52**	**526.00**	**5436.51**	**4063.24**	**48.35**	**1069.71**				**9992.85**
1987	Oct	0.24	4.48	0.02	4.53	4.53	4.48	0.00	3.36	62.92	296.20	4.15	213.60	
1987	Nov	0.26	4.63	0.03	6.67	6.67	4.63	0.00	1.69	30.27	270.56	4.04	208.85	
1987	Dec	2.33	40.55	0.14	34.53	34.53	40.55	0.00	1.08	19.43	291.68	4.13	212.76	
1987	Jan	4.40	78.01	0.28	66.76	66.76	78.01	0.00	1.08	20.39	349.30	4.39	223.27	
1987	Feb	4.51	83.91	0.95	227.07	227.07	83.91	0.00	1.82	36.02	397.20	4.60	231.81	
1987	Mar	3.29	63.56	0.34	81.89	81.89	63.56	0.00	3.09	62.56	398.20	4.60	231.99	
1987	Apr	0.08	1.55	0.05	12.35	12.35	1.55	0.00	4.68	90.49	309.26	4.21	216.00	
1987	May	0.04	0.72	0.04	10.02	0.00	10.74	0.00	6.17	112.09	207.91	3.38	179.88	
1987	Jun	0.00	0.00	0.05	13.19	0.00	13.19	0.00	6.89	107.33	113.78	2.21	123.94	
1987	Jul	0.00	0.00	0.04	9.37	0.00	9.37	0.00	7.12	77.25	45.90	1.30	75.92	
1987	Aug	0.00	0.00	0.01	3.28	0.00	3.28	0.00	6.45	42.08	7.10	0.30	18.35	
1987	Sep	0.00	0.00	0.02	4.53	0.00	4.53	0.00	4.94	12.26	0.00	0.00	0.00	
1987	**annual**	**15.15**	**277.41**	**1.98**	**474.21**	**433.80**	**317.81**	**0.00**	**48.35**	**673.07**				**521.53**
1988	Oct	1.42	0.00	0.08	20.54	20.54	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1988	Nov	3.04	0.00	0.14	36.98	36.98	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1988	Dec	6.39	0.00	0.77	198.64	198.64	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1988	Jan	5.43	0.00	1.39	356.87	269.85	87.03	0.00	1.08	9.48	77.55	1.72	98.83	
1988	Feb	0.55	4.53	0.14	34.14	0.00	38.67	0.00	1.82	19.00	97.23	1.99	112.61	
1988	Mar	0.08	0.75	0.07	16.71	0.00	17.46	0.00	3.09	32.08	82.60	1.79	102.40	
1988	Apr	1.24	10.58	0.07	18.43	0.00	29.01	0.00	4.68	47.71	63.90	1.54	89.06	
1988	May	0.67	4.97	0.05	11.77	0.00	16.74	0.00	6.17	51.95	28.69	1.07	63.08	
1988	Jun	0.73	3.84	0.01	3.67	0.00	7.51	0.00	6.89	39.43	0.00	0.00	0.00	
1988	Jul	0.00	0.00	0.00	0.24	0.00	0.24	0.00	7.12	0.40	0.00	0.00	0.00	
1988	Aug	0.00	0.00	0.02	5.72	0.00	5.72	0.00	6.45	7.98	0.00	0.00	0.00	
1988	Sep	0.00	0.00	0.00	0.42	0.00	0.42	0.00	4.94	0.48	0.00	0.00	0.00	
1988	**annual**	**19.55**	**24.67**	**2.75**	**704.13**	**526.00**	**202.80**	**0.00**	**48.35**	**208.51**				**722.98**
1989	Oct	0.09	0.00	0.01	3.20	3.20	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1989	Nov	3.25	0.00	0.08	21.34	21.34	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1989	Dec	2.81	0.00	0.16	40.40	40.40	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1989	Jan	1.39	0.00	0.12	30.81	30.81	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1989	Feb	0.99	0.00	0.06	14.90	14.90	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1989	Mar	6.14	0.00	0.83	213.79	213.79	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1989	Apr	1.08	0.00	0.10	26.88	26.88	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1989	May	0.15	0.00	0.03	8.42	0.00	8.42	0.00	6.17	11.16	0.00	0.00	0.00	
1989	Jun	0.01	0.00	0.03	8.80	0.00	8.80	0.00	6.89	13.00	0.00	0.00	0.00	
1989	Jul	0.00	0.00	0.02	4.88	0.00	4.88	0.00	7.12	7.53	0.00	0.00	0.00	
1989	Aug	0.00	0.00	0.02	4.04	0.00	4.04	0.00	6.45	5.66	0.00	0.00	0.00	
1989	Sep	1.77	0.00	0.12	30.30	0.00	30.30	0.00	4.94	26.46	3.84	0.16	10.01	
1989	**annual**	**17.68**	**0.00**	**1.59**	**407.75**	**351.31**	**56.44**	**0.00**	**48.35**	**63.80**				**416.99**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1990	Oct	1.69	1.41	0.14	35.24	35.24	1.41	0.00	3.36	3.81	1.44	0.06	3.80	
1990	Nov	1.77	0.56	0.05	13.18	13.18	0.56	0.00	1.69	0.74	1.26	0.05	3.33	
1990	Dec	0.00	0.00	0.02	4.04	4.04	0.00	0.00	1.08	0.30	0.96	0.04	2.55	
1990	Jan	5.06	1.08	0.34	86.29	86.29	1.08	0.00	1.08	0.48	1.55	0.07	4.10	
1990	Feb	3.48	1.19	0.33	85.79	85.79	1.19	0.00	1.82	1.09	1.66	0.07	4.37	
1990	Mar	0.99	0.36	0.10	25.38	25.38	0.36	0.00	3.09	1.37	0.65	0.03	1.76	
1990	Apr	0.31	0.05	0.03	7.49	7.49	0.05	0.00	4.68	0.73	0.00	0.00	0.00	
1990	May	2.34	0.00	0.09	24.07	0.00	24.07	0.00	6.17	30.64	0.00	0.00	0.00	
1990	Jun	0.00	0.00	0.03	6.68	0.00	6.68	0.00	6.89	9.92	0.00	0.00	0.00	
1990	Jul	0.00	0.00	0.01	1.85	0.00	1.85	0.00	7.12	2.89	0.00	0.00	0.00	
1990	Aug	0.03	0.00	0.01	2.19	0.00	2.19	0.00	6.45	3.09	0.00	0.00	0.00	
1990	Sep	0.12	0.00	0.05	12.71	0.00	12.71	0.00	4.94	13.36	0.00	0.00	0.00	
1990	**annual**	**15.79**	**4.64**	**1.19**	**304.90**	**257.40**	**52.14**	**0.00**	**48.35**	**68.42**				**312.18**
1991	Oct	0.25	0.00	0.00	0.99	0.99	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1991	Nov	0.55	0.00	0.01	3.10	3.10	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1991	Dec	0.99	0.00	0.09	23.74	23.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1991	Jan	0.36	0.00	0.04	11.11	11.11	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1991	Feb	4.33	0.00	0.14	36.49	36.49	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1991	Mar	8.67	0.00	1.58	405.69	405.69	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1991	Apr	0.46	0.00	0.10	26.07	26.07	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1991	May	0.20	0.00	0.04	10.61	0.00	10.61	0.00	6.17	13.99	0.00	0.00	0.00	
1991	Jun	0.60	0.00	0.04	10.26	0.00	10.26	0.00	6.89	15.12	0.00	0.00	0.00	
1991	Jul	0.03	0.00	0.03	8.59	0.00	8.59	0.00	7.12	13.12	0.00	0.00	0.00	
1991	Aug	0.08	0.00	0.01	2.19	0.00	2.19	0.00	6.45	3.09	0.00	0.00	0.00	
1991	Sep	0.04	0.00	0.02	5.05	0.00	5.05	0.00	4.94	5.40	0.00	0.00	0.00	
1991	**annual**	**16.57**	**0.00**	**2.12**	**543.87**	**507.18**	**36.69**	**0.00**	**48.35**	**50.72**				**556.21**
1992	Oct	2.44	0.00	0.08	21.55	21.55	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1992	Nov	0.85	0.00	0.01	3.42	3.42	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1992	Dec	2.15	0.00	0.11	29.46	29.46	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1992	Jan	1.70	0.00	0.12	30.81	30.81	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1992	Feb	7.56	0.00	1.57	402.92	402.92	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1992	Mar	5.28	0.00	1.28	329.94	37.84	292.10	0.00	3.09	54.82	237.27	3.73	195.66	
1992	Apr	1.27	20.71	0.30	72.93	0.00	93.64	0.00	4.68	85.69	245.22	3.83	199.84	
1992	May	0.00	0.00	0.04	10.23	0.00	10.23	0.00	6.17	105.50	149.95	2.68	147.09	
1992	Jun	1.12	13.73	0.02	4.03	0.00	17.76	0.00	6.89	90.31	77.40	1.72	98.72	
1992	Jul	0.00	0.00	0.00	0.02	0.00	0.02	0.00	7.12	58.56	18.86	0.80	47.59	
1992	Aug	0.00	0.00	0.01	2.32	0.00	2.32	0.00	6.45	28.58	0.00	0.00	0.00	
1992	Sep	0.04	0.00	0.02	4.40	0.00	4.40	0.00	4.94	4.71	0.00	0.00	0.00	
1992	**annual**	**22.40**	**34.44**	**3.57**	**912.03**	**526.00**	**420.46**	**0.00**	**48.35**	**428.17**				**938.73**
1993	Oct	2.71	0.00	0.07	19.02	19.02	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1993	Nov	0.40	0.00	0.01	2.77	2.77	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1993	Dec	6.26	0.00	0.65	167.50	167.50	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1993	Jan	10.25	0.00	7.14	1834.87	336.71	1498.16	398.16	1.08	30.42	1069.58	7.55	334.63	
1993	Feb	5.27	146.96	5.11	1171.14	0.00	1318.10	1287.68	1.82	51.21	1048.79	7.46	331.88	
1993	Mar	2.06	56.84	1.13	259.88	0.00	316.72	265.51	3.09	87.22	1012.78	7.30	327.06	
1993	Apr	0.63	17.25	0.26	58.69	0.00	75.94	0.00	4.68	131.34	957.38	7.06	319.49	
1993	May	1.15	30.62	0.10	23.84	0.00	54.46	0.00	6.17	168.12	843.71	6.56	303.39	
1993	Jun	0.80	20.23	0.07	16.45	0.00	36.68	0.00	6.89	177.13	703.26	5.94	282.36	
1993	Jul	0.00	0.00	0.05	11.01	0.00	11.01	0.00	7.12	168.47	545.80	5.25	257.20	
1993	Aug	0.00	0.00	0.03	6.17	0.00	6.17	0.00	6.45	138.71	413.27	4.67	234.64	
1993	Sep	0.00	0.00	0.01	2.56	0.00	2.56	0.00	4.94	96.76	319.07	4.25	217.79	
1993	**annual**	**29.53**	**271.89**	**14.63**	**3573.91**	**526.00**	**3319.80**	**1951.35**	**48.35**	**1049.38**				**5797.80**

APPENDIX C: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
1100 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1994	Oct	1.63	29.58	0.02	5.16	5.16	29.58	0.00	3.36	62.39	286.26	4.11	211.76	
1994	Nov	2.94	51.88	0.09	20.79	20.79	51.88	0.00	1.69	31.23	306.91	4.20	215.57	
1994	Dec	2.46	44.19	0.16	38.20	38.20	44.19	0.00	1.08	20.09	331.02	4.30	219.97	
1994	Jan	2.38	43.63	0.14	34.08	34.08	43.63	0.00	1.08	20.47	354.18	4.41	224.15	
1994	Feb	4.45	83.12	1.08	258.02	258.02	83.12	0.00	1.82	36.12	401.18	4.61	232.51	
1994	Mar	0.29	5.62	0.15	35.95	35.95	5.62	0.00	3.09	60.15	346.65	4.37	222.80	
1994	Apr	1.29	23.95	0.05	13.00	13.00	23.95	0.00	4.68	88.47	282.13	4.09	211.00	
1994	May	1.21	21.28	0.08	19.13	0.00	40.41	0.00	6.17	112.33	210.21	3.40	181.14	
1994	Jun	0.04	0.60	0.04	9.81	0.00	10.42	0.00	6.89	107.18	113.45	2.20	123.72	
1994	Jul	0.00	0.00	0.01	3.39	0.00	3.39	0.00	7.12	74.74	42.10	1.25	73.11	
1994	Aug	0.00	0.00	0.00	0.81	0.00	0.81	0.00	6.45	39.59	3.31	0.14	8.66	
1994	Sep	0.00	0.00	0.00	0.55	0.00	0.55	0.00	4.94	4.15	0.00	0.00	0.00	
1994	**annual**	**16.69**	**303.86**	**1.84**	**438.90**	**405.21**	**337.55**	**0.00**	**48.35**	**656.91**				**483.38**
1995	Oct	1.20	0.00	0.03	8.08	8.08	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1995	Nov	7.21	0.00	0.42	106.70	106.70	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1995	Dec	3.22	0.00	0.38	97.64	97.64	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1995	Jan	16.31	0.00	13.76	3535.08	313.58	3221.50	2121.50	1.08	30.42	1069.58	7.55	334.63	
1995	Feb	1.00	27.89	2.18	500.17	0.00	528.06	497.64	1.82	51.21	1048.79	7.46	331.88	
1995	Mar	11.98	331.33	10.41	2388.53	0.00	2719.85	2668.64	3.09	87.22	1012.78	7.30	327.06	
1995	Apr	1.35	36.79	0.59	134.71	0.00	171.50	84.26	4.68	131.92	968.08	7.11	320.97	
1995	May	1.89	50.55	0.17	39.97	0.00	90.52	0.00	6.17	171.34	887.26	6.75	309.65	
1995	Jun	0.43	11.10	0.11	24.62	0.00	35.72	0.00	6.89	180.59	742.39	6.11	288.35	
1995	Jul	0.00	0.00	0.07	15.87	0.00	15.87	0.00	7.12	172.44	585.82	5.43	263.76	
1995	Aug	0.00	0.00	0.05	12.32	0.00	12.32	0.00	6.45	142.75	455.39	4.85	241.95	
1995	Sep	0.00	0.00	0.03	7.06	0.00	7.06	0.00	4.94	100.08	362.36	4.44	225.62	
1995	**annual**	**44.59**	**457.65**	**28.20**	**6870.73**	**526.00**	**6802.39**	**5372.06**	**48.35**	**1067.97**				**12782.75**
1996	Oct	0.00	0.00	0.02	3.90	3.90	0.00	0.00	3.36	63.08	299.28	4.16	214.17	
1996	Nov	0.28	5.00	0.00	1.06	1.06	5.00	0.00	1.69	30.36	273.92	4.05	209.47	
1996	Dec	9.10	158.85	0.93	222.80	222.80	158.85	0.00	1.08	21.38	411.38	4.66	234.31	
1996	Jan	5.58	108.95	2.08	494.64	298.24	305.36	0.00	1.08	25.55	691.19	5.89	280.49	
1996	Feb	8.04	187.93	5.79	1351.77	0.00	1539.70	1130.89	1.82	51.21	1048.79	7.46	331.88	
1996	Mar	2.54	70.25	2.31	530.28	0.00	600.53	549.32	3.09	87.22	1012.78	7.30	327.06	
1996	Apr	3.40	92.67	0.49	112.86	0.00	205.53	118.31	4.68	131.92	968.08	7.11	320.97	
1996	May	2.37	63.39	0.16	36.95	0.00	100.34	0.00	6.17	172.01	896.42	6.79	310.96	
1996	Jun	0.00	0.00	0.07	15.38	0.00	15.38	0.00	6.89	179.68	732.12	6.07	286.79	
1996	Jul	0.00	0.00	0.04	10.38	0.00	10.38	0.00	7.12	171.02	571.47	5.36	261.42	
1996	Aug	0.00	0.00	0.02	5.08	0.00	5.08	0.00	6.45	140.87	435.69	4.77	238.55	
1996	Sep	0.10	1.99	0.01	2.86	0.00	4.84	0.00	4.94	98.53	342.00	4.35	221.96	
1996	**annual**	**31.41**	**689.02**	**11.93**	**2787.97**	**526.00**	**2951.00**	**1798.51**	**48.35**	**1172.84**				**4933.66**
1997	Oct	1.01	18.68	0.01	2.66	2.66	18.68	0.00	3.36	63.00	297.69	4.16	213.87	
1997	Nov	2.73	48.66	0.12	28.50	28.50	48.66	0.00	1.69	31.44	314.90	4.23	217.03	
1997	Dec	10.82	195.69	3.14	749.59	494.84	450.44	0.00	1.08	26.21	739.12	6.10	287.85	
1997	Jan	8.65	207.49	9.17	2136.75	0.00	2344.24	1983.37	1.08	30.42	1069.58	7.55	334.63	
1997	Feb	0.48	13.39	0.83	189.77	0.00	203.15	172.73	1.82	51.21	1048.79	7.46	331.88	
1997	Mar	0.60	16.59	0.13	29.74	0.00	46.34	0.00	3.09	87.06	1008.07	7.28	326.42	
1997	Apr	0.58	15.88	0.06	13.98	0.00	29.87	0.00	4.68	128.73	909.20	6.85	312.76	
1997	May	0.38	9.90	0.04	8.32	0.00	18.22	0.00	6.17	162.16	765.27	6.22	291.80	
1997	Jun	0.25	6.14	0.04	10.03	0.00	16.17	0.00	6.89	168.84	612.61	5.54	268.09	
1997	Jul	0.00	0.00	0.07	15.52	0.00	15.52	0.00	7.12	160.47	467.66	4.91	244.05	
1997	Aug	1.04	21.15	0.08	19.69	0.00	40.84	0.00	6.45	134.82	373.68	4.49	227.64	
1997	Sep	0.20	3.79	0.01	2.56	0.00	6.36	0.00	4.94	94.16	285.88	4.11	211.69	
1997	**annual**	**26.75**	**557.38**	**13.70**	**3207.12**	**526.00**	**3238.50**	**2156.10**	**48.35**	**1138.52**				**5755.77**

APPENDIX D

Water Budget for 50-Year Historic Conditions Simulation: 2550 ac-ft Lake

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

known volumes (ac-ft.)		annual water rights (ac-ft.)		%time satisfied:
vol. 1 =	23.72	Kullberg (A030592):	35.0	
vol. 2 =	135.80	Kullberg (A029402):	12.0	
vol. 3 =	260.08	Martinelli (A016625):	9.0	
vol. 4 =	1276.06	Martinelli (A031022):	225.0	
vol. 5 =	2545.60	Oxfoot (A029166):	245.0	
			526.0	**70.59**
		Roche (A030579):	**2004.0**	**47.06**

dam scenario A

Tolay drainage area (ac):	3084.00
max. Tolay Lake capacity (ac-ft.):	**2550.0**
Roche drainage area (ac):	3153.92

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1947	Oct	0.23	3.22	0.00	0.00	0.00	3.22	0.00	3.36	47.42	141.91	2.58	142.36	
1947	Nov	3.52	41.76	0.00	0.51	0.51	41.76	0.00	1.69	23.50	160.17	2.80	153.04	
1947	Dec	2.97	37.88	0.08	19.68	19.68	37.88	0.00	1.08	15.67	182.38	3.07	165.71	
1947	Jan	0.76	10.49	0.04	9.24	9.24	10.49	0.00	1.08	15.41	177.46	3.01	162.93	
1947	Feb	2.63	35.71	0.54	130.33	130.33	35.71	0.00	1.82	27.64	185.53	3.11	167.48	
1947	Mar	4.26	59.46	0.92	224.47	224.47	59.46	0.00	3.09	51.44	193.54	3.20	171.96	
1947	Apr	0.69	9.89	0.37	90.60	90.60	9.89	0.00	4.68	69.12	134.31	2.48	137.67	
1947	May	0.29	3.33	0.05	12.06	0.00	15.39	0.00	6.17	75.56	74.13	1.68	96.39	
1947	Jun	1.26	10.12	0.01	3.31	0.00	13.44	0.00	6.89	60.76	26.81	1.04	61.66	
1947	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	36.57	0.00	0.00	0.00	
1947	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1947	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1947	**annual**	**16.61**	**211.85**	**2.02**	**490.21**	**474.83**	**227.22**	**0.00**	**48.35**	**423.10**				**529.71**
1948	Oct	3.37	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1948	Nov	1.20	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1948	Dec	1.15	0.00	0.00	1.14	1.14	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1948	Jan	1.82	0.00	0.02	4.38	4.38	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1948	Feb	2.03	0.00	0.02	5.32	5.32	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1948	Mar	3.75	0.00	0.25	64.14	64.14	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1948	Apr	5.11	0.00	0.62	159.16	159.16	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1948	May	0.50	0.00	0.16	40.91	0.00	40.91	0.00	6.17	37.14	3.76	0.16	9.82	
1948	Jun	0.07	0.06	0.03	8.77	0.00	8.83	0.00	6.89	18.46	0.00	0.00	0.00	
1948	Jul	0.00	0.00	0.00	0.98	0.00	0.98	0.00	7.12	1.55	0.00	0.00	0.00	
1948	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1948	Sep	0.03	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1948	**annual**	**19.03**	**0.06**	**1.11**	**284.79**	**234.14**	**50.71**	**0.00**	**48.35**	**57.14**				**291.28**
1949	Oct	0.51	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1949	Nov	0.87	0.00	0.00	0.00	0.00	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1949	Dec	4.67	0.00	0.15	38.04	38.04	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1949	Jan	1.50	0.00	0.27	69.52	69.52	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1949	Feb	2.54	0.00	1.20	307.13	307.13	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1949	Mar	7.16	0.00	5.86	1504.93	111.30	1393.63	0.00	3.09	96.73	1296.90	8.56	363.44	
1949	Apr	0.00	0.00	0.34	77.89	0.00	77.89	0.00	4.68	145.40	1229.39	8.26	354.98	
1949	May	0.24	7.10	0.08	18.62	0.00	25.72	0.00	6.17	184.16	1070.95	7.56	334.81	
1949	Jun	0.00	0.00	0.02	4.21	0.00	4.21	0.00	6.89	192.44	882.72	6.73	309.01	
1949	Jul	0.03	0.77	0.00	0.29	0.00	1.06	0.00	7.12	183.36	700.42	5.93	281.92	
1949	Aug	0.10	2.35	0.00	0.00	0.00	2.35	0.00	6.45	151.63	551.14	5.27	258.08	
1949	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	106.22	444.91	4.81	240.14	
1949	**annual**	**17.62**	**10.22**	**7.91**	**2020.64**	**526.00**	**1504.86**	**0.00**	**48.35**	**1059.95**				**2080.13**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1950	Oct	0.12	2.40	0.00	0.00	0.00	2.40	0.00	3.36	67.26	380.06	4.52	228.78	
1950	Nov	1.18	22.50	0.00	0.00	0.00	22.50	0.00	1.69	32.86	369.70	4.47	228.93	
1950	Dec	2.77	52.38	0.00	0.00	0.00	52.38	0.00	1.08	21.22	400.87	4.61	232.46	
1950	Jan	9.18	177.83	2.19	521.42	521.42	177.83	0.00	1.08	23.59	555.11	5.29	258.73	
1950	Feb	3.90	84.09	3.37	792.56	4.58	872.07	0.00	1.82	57.42	1369.76	8.91	372.60	
1950	Mar	1.86	57.75	0.32	72.96	0.00	130.72	0.00	3.09	100.02	1400.45	9.05	376.37	
1950	Apr	1.20	37.64	0.16	35.18	0.00	72.82	0.00	4.68	150.04	1323.24	8.69	366.79	
1950	May	0.39	11.92	0.05	10.98	0.00	22.90	0.00	6.17	190.10	1156.04	7.93	345.81	
1950	Jun	0.00	0.00	0.01	2.89	0.00	2.89	0.00	6.89	198.65	960.28	7.07	319.89	
1950	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	189.72	770.56	6.24	292.60	
1950	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	157.17	613.39	5.55	268.21	
1950	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	110.39	503.00	5.06	250.05	
1950	**annual**	**20.60**	**446.51**	**6.10**	**1436.00**	**526.00**	**1356.51**	**0.00**	**48.35**	**1298.43**				**1603.40**
1951	Oct	2.78	57.93	0.00	0.00	0.00	57.93	0.00	3.36	72.61	488.32	5.00	247.57	
1951	Nov	5.93	122.34	0.86	202.27	202.27	122.34	0.00	1.69	37.80	572.86	5.37	261.65	
1951	Dec	7.41	161.57	5.63	1324.88	323.73	1162.71	0.00	1.08	37.24	1698.33	10.45	410.55	
1951	Jan	4.03	137.88	3.32	739.85	0.00	877.73	26.06	1.08	44.12	2505.88	14.25	487.39	
1951	Feb	3.38	137.28	2.28	492.87	0.00	630.15	586.02	1.82	74.29	2475.71	14.11	484.78	
1951	Mar	1.30	52.52	1.28	278.08	0.00	330.59	256.30	3.09	126.52	2423.48	13.86	480.23	
1951	Apr	0.74	29.61	0.17	36.04	0.00	65.65	0.00	4.68	189.31	2299.81	13.28	469.29	
1951	May	0.86	33.63	0.09	19.12	0.00	52.76	0.00	6.17	243.75	2108.82	12.38	451.79	
1951	Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.89	259.25	1849.57	11.16	426.42	
1951	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	252.91	1596.66	9.97	399.35	
1951	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	214.52	1382.15	8.97	374.13	
1951	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	153.98	1228.16	8.25	354.82	
1951	**annual**	**26.43**	**732.76**	**13.63**	**3093.10**	**526.00**	**3299.86**	**868.39**	**48.35**	**1706.30**				**4449.43**
1952	Oct	1.36	40.21	0.00	0.00	0.00	40.21	0.00	3.36	100.58	1167.80	7.99	347.30	
1952	Nov	3.17	91.74	0.00	0.00	0.00	91.74	0.00	1.69	50.63	1208.91	8.17	352.44	
1952	Dec	6.99	205.30	0.77	175.94	175.94	205.30	0.00	1.08	33.96	1380.25	8.96	373.89	
1952	Jan	10.46	325.91	7.79	1760.35	350.06	1736.20	566.45	1.08	44.12	2505.88	14.25	487.39	
1952	Feb	2.66	108.04	2.56	554.32	0.00	662.35	618.23	1.82	74.29	2475.71	14.11	484.78	
1952	Mar	4.61	186.24	3.35	724.99	0.00	911.22	836.93	3.09	126.52	2423.48	13.86	480.23	
1952	Apr	0.70	28.01	0.41	88.30	0.00	116.31	0.00	4.68	191.02	2348.78	13.51	473.66	
1952	May	0.10	3.95	0.07	14.96	0.00	18.91	0.00	6.17	244.44	2123.25	12.45	453.14	
1952	Jun	0.26	9.82	0.03	6.81	0.00	16.63	0.00	6.89	260.92	1878.96	11.30	429.41	
1952	Jul	0.00	0.00	0.01	2.75	0.00	2.75	0.00	7.12	254.84	1626.87	10.12	402.72	
1952	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	216.33	1410.54	9.10	377.60	
1952	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	155.41	1255.13	8.37	358.13	
1952	**annual**	**30.31**	**999.22**	**15.00**	**3328.41**	**526.00**	**3801.63**	**2021.61**	**48.35**	**1753.06**				**5962.83**
1953	Oct	0.15	4.48	0.00	0.00	0.00	4.48	0.00	3.36	100.28	1159.32	7.95	346.22	
1953	Nov	2.48	71.55	0.01	2.02	2.02	71.55	0.00	1.69	50.14	1180.74	8.04	348.93	
1953	Dec	11.66	339.04	4.48	1021.15	523.98	836.22	0.00	1.08	39.80	1977.16	11.76	439.17	
1953	Jan	4.68	171.28	5.65	1244.43	0.00	1415.71	842.87	1.08	44.12	2505.88	14.25	487.39	
1953	Feb	0.08	3.25	0.57	124.18	0.00	127.43	83.30	1.82	74.29	2475.71	14.11	484.78	
1953	Mar	1.87	75.54	0.28	59.73	0.00	135.27	60.98	3.09	126.52	2423.48	13.86	480.23	
1953	Apr	3.04	121.66	0.13	27.92	0.00	149.58	23.06	4.68	191.36	2358.64	13.55	474.53	
1953	May	0.66	26.10	0.05	11.54	0.00	37.64	0.00	6.17	245.73	2150.55	12.58	455.69	
1953	Jun	0.35	13.29	0.01	2.64	0.00	15.93	0.00	6.89	262.34	1904.14	11.42	431.94	
1953	Jul	0.00	0.00	0.00	0.19	0.00	0.19	0.00	7.12	256.19	1648.14	10.22	405.07	
1953	Aug	0.20	6.75	0.00	0.00	0.00	6.75	0.00	6.45	217.99	1436.90	9.22	380.78	
1953	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	156.72	1280.17	8.49	361.30	
1953	**annual**	**25.17**	**832.94**	**11.18**	**2493.80**	**526.00**	**2800.74**	**1010.21**	**48.35**	**1785.48**				**3948.49**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1954	Oct	0.28	8.43	0.00	0.00	0.00	8.43	0.00	3.36	101.32	1187.29	8.07	349.75	
1954	Nov	3.58	104.34	0.00	0.87	0.87	104.34	0.00	1.69	51.21	1240.42	8.31	356.33	
1954	Dec	0.60	17.82	0.00	0.24	0.24	17.82	0.00	1.08	32.21	1226.03	8.24	354.56	
1954	Jan	5.11	150.98	0.42	95.80	95.80	150.98	0.00	1.08	33.55	1343.46	8.78	369.33	
1954	Feb	2.97	91.41	1.58	357.35	357.35	91.41	0.00	1.82	57.56	1377.31	8.94	373.53	
1954	Mar	5.25	163.42	1.64	369.87	71.75	461.54	0.00	3.09	109.56	1729.29	10.60	413.87	
1954	Apr	1.55	53.46	0.73	162.20	0.00	215.66	0.00	4.68	169.86	1775.09	10.81	418.72	
1954	May	0.09	3.14	0.07	16.00	0.00	19.14	0.00	6.17	216.35	1577.88	9.89	397.23	
1954	Jun	0.36	11.92	0.02	4.12	0.00	16.03	0.00	6.89	228.98	1364.93	8.88	372.00	
1954	Jul	0.01	0.31	0.00	0.77	0.00	1.08	0.00	7.12	220.71	1145.31	7.89	344.44	
1954	Aug	0.39	11.19	0.00	0.00	0.00	11.19	0.00	6.45	185.79	970.71	7.12	321.33	
1954	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	132.25	838.46	6.54	302.63	
1954	**annual**	**20.19**	**616.42**	**4.47**	**1007.21**	**526.00**	**1097.63**	**0.00**	**48.35**	**1539.34**				**1173.78**
1955	Oct	0.22	5.55	0.00	0.00	0.00	5.55	0.00	3.36	84.83	759.17	6.19	290.89	
1955	Nov	4.05	98.17	0.02	4.72	4.72	98.17	0.00	1.69	43.11	814.24	6.43	299.08	
1955	Dec	4.91	122.37	0.74	171.77	171.77	122.37	0.00	1.08	28.44	908.17	6.84	312.62	
1955	Jan	4.06	105.77	0.73	167.91	167.91	105.77	0.00	1.08	29.39	984.55	7.18	323.23	
1955	Feb	0.95	25.59	0.23	53.22	53.22	25.59	0.00	1.82	49.41	960.72	7.08	319.95	
1955	Mar	0.37	9.87	0.11	26.25	26.25	9.87	0.00	3.09	82.76	887.82	6.75	309.73	
1955	Apr	3.34	86.21	0.07	16.85	16.85	86.21	0.00	4.68	125.36	848.67	6.58	304.11	
1955	May	0.00	0.00	0.04	8.95	0.00	8.95	0.00	6.17	157.05	700.57	5.93	281.94	
1955	Jun	0.00	0.00	0.02	5.18	0.00	5.18	0.00	6.89	162.25	543.50	5.24	256.82	
1955	Jul	0.00	0.00	0.01	1.70	0.00	1.70	0.00	7.12	152.48	392.72	4.58	231.02	
1955	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	124.10	268.62	4.03	208.48	
1955	Sep	0.55	9.56	0.00	0.00	0.00	9.56	0.00	4.94	86.54	191.64	3.18	170.90	
1955	**annual**	**18.45**	**463.09**	**1.97**	**456.56**	**440.73**	**478.92**	**0.00**	**48.35**	**1125.74**				**518.75**
1956	Oct	0.18	2.56	0.00	0.00	0.00	2.56	0.00	3.36	48.18	146.02	2.63	144.79	
1956	Nov	2.22	26.79	0.01	1.35	1.35	26.79	0.00	1.69	22.63	150.18	2.68	147.22	
1956	Dec	15.48	189.92	7.66	1875.52	524.65	1540.79	0.00	1.08	36.81	1654.16	10.24	405.74	
1956	Jan	9.85	333.04	8.58	1915.09	0.00	2248.14	1352.30	1.08	44.12	2505.88	14.25	487.39	
1956	Feb	4.65	188.86	3.96	857.72	0.00	1046.58	1002.45	1.82	74.29	2475.71	14.11	484.78	
1956	Mar	0.33	13.33	0.84	183.02	0.00	196.35	122.06	3.09	126.52	2423.48	13.86	480.23	
1956	Apr	2.23	89.24	0.12	26.27	0.00	115.51	0.00	4.68	190.99	2348.00	13.50	473.59	
1956	May	0.61	24.07	0.06	13.11	0.00	37.18	0.00	6.17	245.23	2139.95	12.53	454.70	
1956	Jun	0.00	0.00	0.02	5.14	0.00	5.14	0.00	6.89	261.20	1883.90	11.32	429.91	
1956	Jul	0.00	0.00	0.00	0.80	0.00	0.80	0.00	7.12	255.02	1629.67	10.13	403.03	
1956	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	216.50	1413.18	9.11	377.92	
1956	Sep	0.08	2.52	0.00	0.00	0.00	2.52	0.00	4.94	155.67	1260.03	8.39	358.72	
1956	**annual**	**35.63**	**870.34**	**21.27**	**4878.02**	**526.00**	**5222.36**	**2476.81**	**48.35**	**1677.16**				**8066.32**
1957	Oct	1.41	42.15	0.01	1.64	1.64	42.15	0.00	3.36	101.80	1200.38	8.13	351.38	
1957	Nov	0.09	2.64	0.04	8.37	8.37	2.64	0.00	1.69	49.65	1153.36	7.92	345.47	
1957	Dec	0.35	10.08	0.03	7.77	7.77	10.08	0.00	1.08	31.15	1132.29	7.83	342.78	
1957	Jan	3.52	100.55	0.04	10.17	10.17	100.55	0.00	1.08	31.93	1200.91	8.13	351.45	
1957	Feb	5.46	159.91	0.57	129.20	129.20	159.91	0.00	1.82	56.19	1304.63	8.60	364.43	
1957	Mar	2.34	71.06	0.56	127.22	127.22	71.06	0.00	3.09	96.16	1279.53	8.48	361.22	
1957	Apr	1.50	45.15	0.07	16.83	16.83	45.15	0.00	4.68	142.97	1181.72	8.05	349.05	
1957	May	2.16	62.83	0.10	23.29	0.00	86.12	0.00	6.17	184.96	1082.87	7.61	336.38	
1957	Jun	0.00	0.00	0.04	9.00	0.00	9.00	0.00	6.89	193.70	898.18	6.80	311.20	
1957	Jul	0.00	0.00	0.00	0.44	0.00	0.44	0.00	7.12	184.61	714.01	5.99	284.02	
1957	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	152.56	561.44	5.32	259.78	
1957	Sep	0.99	21.43	0.00	0.00	0.00	21.43	0.00	4.94	108.36	474.51	4.94	245.23	
1957	**annual**	**17.82**	**515.79**	**1.47**	**333.92**	**301.20**	**548.52**	**0.00**	**48.35**	**1334.03**				**386.05**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1958	Oct	4.87	99.52	0.02	5.58	5.58	99.52	0.00	3.36	73.21	500.83	5.05	249.69	
1958	Nov	0.88	18.31	0.03	7.04	7.04	18.31	0.00	1.69	35.68	483.46	4.98	246.75	
1958	Dec	3.08	63.33	0.09	21.84	21.84	63.33	0.00	1.08	23.12	523.67	5.15	253.52	
1958	Jan	5.57	117.68	1.20	282.73	282.73	117.68	0.00	1.08	24.50	616.85	5.56	268.77	
1958	Feb	11.23	251.52	10.65	2498.32	208.82	2541.03	607.88	1.82	74.29	2475.71	14.11	484.78	
1958	Mar	5.21	210.47	2.56	554.73	0.00	765.21	690.92	3.09	126.52	2423.48	13.86	480.23	
1958	Apr	5.72	228.91	5.15	1118.20	0.00	1347.11	1220.59	4.68	191.36	2358.64	13.55	474.53	
1958	May	0.46	18.19	0.14	31.19	0.00	49.38	0.00	6.17	246.26	2161.76	12.63	458.73	
1958	Jun	0.32	12.18	0.07	16.38	0.00	28.56	0.00	6.89	263.60	1926.72	11.52	434.20	
1958	Jul	0.00	0.00	0.03	7.23	0.00	7.23	0.00	7.12	257.94	1676.01	10.35	408.13	
1958	Aug	0.00	0.00	0.00	0.80	0.00	0.80	0.00	6.45	219.28	1457.54	9.32	383.25	
1958	Sep	0.04	1.28	0.00	0.39	0.00	1.66	0.00	4.94	157.82	1301.38	8.59	364.01	
1958	**annual**	**37.38**	**1021.39**	**19.96**	**4544.43**	**526.00**	**5039.82**	**2519.38**	**48.35**	**1693.57**				**7766.55**
1959	Oct	0.09	2.73	0.00	0.00	0.00	2.73	0.00	3.36	101.87	1202.24	8.14	351.61	
1959	Nov	0.18	5.27	0.00	0.00	0.00	5.27	0.00	1.69	49.73	1157.78	7.94	346.03	
1959	Dec	1.13	32.58	0.01	2.09	2.09	32.58	0.00	1.08	31.45	1158.91	7.95	346.17	
1959	Jan	6.35	183.18	0.22	49.91	49.91	183.18	0.00	1.08	33.16	1308.93	8.62	364.98	
1959	Feb	6.26	190.40	1.80	408.86	408.86	190.40	0.00	1.82	58.71	1440.62	9.24	381.23	
1959	Mar	0.59	18.74	0.21	47.50	47.50	18.74	0.00	3.09	98.78	1360.59	8.86	371.46	
1959	Apr	0.35	10.83	0.07	15.62	15.62	10.83	0.00	4.68	145.24	1226.18	8.24	354.58	
1959	May	0.08	2.36	0.03	5.81	0.00	8.17	0.00	6.17	182.86	1051.50	7.47	332.24	
1959	Jun	0.00	0.00	0.00	0.54	0.00	0.54	0.00	6.89	190.69	861.34	6.64	305.94	
1959	Jul	0.06	1.53	0.00	0.00	0.00	1.53	0.00	7.12	181.58	681.29	5.85	278.95	
1959	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	149.84	531.45	5.19	254.82	
1959	Sep	1.85	39.28	0.00	0.15	0.00	39.43	0.00	4.94	107.56	463.33	4.89	243.31	
1959	**annual**	**16.94**	**488.92**	**2.34**	**530.49**	**523.99**	**493.42**	**0.00**	**48.35**	**1331.47**				**615.25**
1960	Oct	0.04	0.81	0.00	0.00	0.00	0.81	0.00	3.36	68.06	396.07	4.59	231.61	
1960	Nov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.69	32.70	363.38	4.45	225.80	
1960	Dec	1.31	24.65	0.00	1.15	1.15	24.65	0.00	1.08	20.68	367.35	4.46	226.51	
1960	Jan	5.88	110.99	0.07	16.38	16.38	110.99	0.00	1.08	22.09	456.25	4.86	242.10	
1960	Feb	4.76	96.03	1.27	301.24	301.24	96.03	0.00	1.82	39.06	513.22	5.11	251.77	
1960	Mar	2.24	47.00	0.23	54.11	54.11	47.00	0.00	3.09	66.88	493.36	5.02	248.43	
1960	Apr	1.01	20.91	0.05	12.88	12.88	20.91	0.00	4.68	98.15	416.11	4.68	235.13	
1960	May	0.66	12.93	0.04	8.40	0.00	21.33	0.00	6.17	122.83	314.61	4.23	216.98	
1960	Jun	0.00	0.00	0.00	0.76	0.00	0.76	0.00	6.89	124.59	190.78	3.17	170.42	
1960	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	101.07	89.71	1.88	107.38	
1960	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	57.68	32.02	1.11	65.59	
1960	Sep	0.02	0.11	0.00	0.00	0.00	0.11	0.00	4.94	27.03	5.10	0.22	13.26	
1960	**annual**	**15.92**	**313.43**	**1.67**	**394.91**	**385.76**	**322.59**	**0.00**	**48.35**	**780.81**				**438.37**
1961	Oct	0.40	0.44	0.00	0.00	0.00	0.44	0.00	3.36	4.02	1.52	0.07	4.02	
1961	Nov	3.91	1.31	0.00	1.14	1.14	1.31	0.00	1.69	1.05	1.79	0.08	4.71	
1961	Dec	2.75	1.08	0.05	13.95	13.95	1.08	0.00	1.08	0.67	2.19	0.09	5.76	
1961	Jan	4.37	2.10	0.19	49.90	49.90	2.10	0.00	1.08	1.00	3.28	0.14	8.59	
1961	Feb	1.99	1.42	0.22	55.95	55.95	1.42	0.00	1.82	1.85	2.86	0.12	7.48	
1961	Mar	3.25	2.03	0.13	32.75	32.75	2.03	0.00	3.09	3.27	1.61	0.07	4.26	
1961	Apr	1.15	0.41	0.02	4.23	4.23	0.41	0.00	4.68	2.07	0.00	0.00	0.00	
1961	May	0.37	0.00	0.00	0.27	0.00	0.27	0.00	6.17	0.39	0.00	0.00	0.00	
1961	Jun	0.07	0.00	0.00	0.00	0.00	0.00	0.00	6.89	0.00	0.00	0.00	0.00	
1961	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	0.00	0.00	0.00	0.00	
1961	Aug	0.02	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1961	Sep	0.63	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1961	**annual**	**18.91**	**8.79**	**0.62**	**158.19**	**157.92**	**9.06**	**0.00**	**48.35**	**14.34**				**162.14**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1962	Oct	0.07	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1962	Nov	3.29	0.00	0.00	0.54	0.54	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1962	Dec	4.11	0.00	0.18	46.12	46.12	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1962	Jan	1.30	0.00	0.05	12.46	12.46	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1962	Feb	9.15	0.00	2.64	679.65	466.88	212.77	0.00	1.82	27.61	185.16	3.10	167.27	
1962	Mar	3.32	46.28	1.26	305.68	0.00	351.96	0.00	3.09	65.88	471.24	4.92	244.67	
1962	Apr	0.43	8.77	0.10	24.60	0.00	33.36	0.00	4.68	97.52	407.08	4.64	233.55	
1962	May	0.00	0.00	0.04	9.02	0.00	9.02	0.00	6.17	120.92	295.18	4.15	213.41	
1962	Jun	0.00	0.00	0.01	2.88	0.00	2.88	0.00	6.89	122.77	175.30	2.98	161.70	
1962	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	95.90	79.39	1.75	100.13	
1962	Aug	0.03	0.25	0.00	0.00	0.00	0.25	0.00	6.45	53.88	25.76	1.03	60.87	
1962	Sep	0.08	0.41	0.00	0.00	0.00	0.41	0.00	4.94	25.18	0.99	0.04	2.64	
1962	**annual**	**21.78**	**55.70**	**4.29**	**1080.95**	**526.00**	**610.65**	**0.00**	**48.35**	**609.66**				**1126.52**
1963	Oct	7.29	1.60	0.59	152.55	152.55	1.60	0.00	3.36	1.90	0.69	0.03	1.86	
1963	Nov	0.61	0.09	0.04	10.26	10.26	0.09	0.00	1.69	0.30	0.49	0.02	1.33	
1963	Dec	3.32	0.37	0.24	60.58	60.58	0.37	0.00	1.08	0.21	0.65	0.03	1.76	
1963	Jan	4.97	0.73	1.28	329.75	238.48	92.00	0.00	1.08	9.83	82.82	1.79	102.55	
1963	Feb	3.04	25.98	3.00	745.24	64.14	707.08	0.00	1.82	44.69	745.21	6.13	288.78	
1963	Mar	4.58	110.22	0.96	222.76	0.00	332.98	0.00	3.09	86.49	991.70	7.21	324.20	
1963	Apr	4.58	123.74	1.79	411.10	0.00	534.84	0.00	4.68	152.46	1374.08	8.93	373.13	
1963	May	0.46	14.30	0.14	31.96	0.00	46.26	0.00	6.17	194.79	1225.55	8.24	354.50	
1963	Jun	0.00	0.00	0.06	12.83	0.00	12.83	0.00	6.89	204.33	1034.05	7.40	329.92	
1963	Jul	0.00	0.00	0.04	8.42	0.00	8.42	0.00	7.12	196.33	846.14	6.57	303.74	
1963	Aug	0.00	0.00	0.00	0.64	0.00	0.64	0.00	6.45	163.21	683.57	5.86	279.31	
1963	Sep	0.05	1.16	0.00	0.00	0.00	1.16	0.00	4.94	115.03	569.70	5.35	261.13	
1963	**annual**	**28.90**	**278.20**	**8.13**	**1986.09**	**526.00**	**1738.28**	**0.00**	**48.35**	**1169.58**				**2137.92**
1964	Oct	1.52	33.08	0.01	2.77	2.77	33.08	0.00	3.36	74.51	528.26	5.17	254.29	
1964	Nov	5.60	118.67	0.11	26.01	26.01	118.67	0.00	1.69	38.62	608.31	5.52	267.40	
1964	Dec	0.92	20.50	0.05	11.99	11.99	20.50	0.00	1.08	24.32	604.50	5.51	266.78	
1964	Jan	4.63	102.93	1.07	252.19	252.19	102.93	0.00	1.08	25.42	682.01	5.85	279.06	
1964	Feb	0.26	6.05	0.22	52.41	52.41	6.05	0.00	1.82	42.35	645.70	5.69	273.36	
1964	Mar	1.81	41.23	0.07	16.26	16.26	41.23	0.00	3.09	72.08	614.86	5.55	268.45	
1964	Apr	0.08	1.79	0.03	6.25	6.25	1.79	0.00	4.68	104.69	511.95	5.10	251.56	
1964	May	0.21	4.40	0.01	2.78	0.00	7.19	0.00	6.17	129.98	389.15	4.56	230.39	
1964	Jun	0.84	16.13	0.04	9.04	0.00	25.17	0.00	6.89	134.75	279.58	4.08	210.52	
1964	Jul	0.05	0.88	0.00	0.50	0.00	1.38	0.00	7.12	125.01	155.95	2.75	150.59	
1964	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	80.89	75.06	1.69	97.05	
1964	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	39.95	35.11	1.15	67.90	
1964	**annual**	**15.92**	**345.65**	**1.62**	**380.21**	**367.88**	**357.98**	**0.00**	**48.35**	**892.57**				**425.67**
1965	Oct	2.42	13.69	0.04	9.71	9.71	13.69	0.00	3.36	21.82	26.98	1.04	61.79	
1965	Nov	5.42	27.91	0.13	33.21	33.21	27.91	0.00	1.69	11.65	43.24	1.26	73.95	
1965	Dec	5.81	35.81	1.54	386.11	386.11	35.81	0.00	1.08	8.97	70.07	1.62	93.50	
1965	Jan	5.19	40.44	4.81	1198.14	96.98	1141.60	0.00	1.08	31.69	1179.98	8.04	348.83	
1965	Feb	1.14	33.14	0.55	125.27	0.00	158.41	0.00	1.82	55.76	1282.63	8.50	361.62	
1965	Mar	1.53	46.11	0.14	31.95	0.00	78.05	0.00	3.09	95.69	1265.00	8.41	359.32	
1965	Apr	3.57	106.90	1.39	316.64	0.00	423.54	0.00	4.68	159.53	1529.00	9.66	391.64	
1965	May	0.00	0.00	0.14	31.60	0.00	31.60	0.00	6.17	203.26	1357.33	8.85	371.06	
1965	Jun	0.00	0.00	0.04	8.88	0.00	8.88	0.00	6.89	213.56	1152.66	7.92	345.38	
1965	Jul	0.00	0.00	0.02	4.48	0.00	4.48	0.00	7.12	205.18	951.97	7.04	318.74	
1965	Aug	0.41	10.89	0.02	3.47	0.00	14.36	0.00	6.45	172.28	794.05	6.34	296.10	
1965	Sep	0.00	0.00	0.01	1.62	0.00	1.62	0.00	4.94	121.97	673.70	5.81	277.77	
1965	**annual**	**25.49**	**314.88**	**8.82**	**2151.08**	**526.00**	**1939.96**	**0.00**	**48.35**	**1301.37**				**2319.26**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1966	Oct	0.20	4.63	0.01	2.30	2.30	4.63	0.00	3.36	77.86	600.47	5.49	266.13	
1966	Nov	5.93	131.51	0.17	39.44	39.44	131.51	0.00	1.69	40.48	691.50	5.89	280.54	
1966	Dec	3.70	86.50	0.38	88.29	88.29	86.50	0.00	1.08	26.39	751.61	6.16	289.75	
1966	Jan	5.00	120.73	2.63	613.14	395.96	337.90	0.00	1.08	30.30	1059.22	7.51	333.26	
1966	Feb	3.10	86.09	2.21	507.20	0.00	593.30	0.00	1.82	61.34	1591.17	9.95	398.73	
1966	Mar	0.55	18.28	0.28	63.61	0.00	81.89	0.00	3.09	105.04	1568.02	9.84	396.11	
1966	Apr	0.46	15.18	0.08	17.32	0.00	32.51	0.00	4.68	155.75	1444.78	9.26	381.73	
1966	May	0.12	3.82	0.03	7.23	0.00	11.04	0.00	6.17	196.98	1258.84	8.39	358.58	
1966	Jun	0.18	5.38	0.01	2.16	0.00	7.54	0.00	6.89	206.29	1060.09	7.51	333.38	
1966	Jul	0.00	0.00	0.01	1.65	0.00	1.65	0.00	7.12	197.85	863.89	6.65	306.31	
1966	Aug	0.11	2.81	0.00	0.00	0.00	2.81	0.00	6.45	164.75	701.94	5.94	282.16	
1966	Sep	0.05	1.18	0.01	3.26	0.00	4.43	0.00	4.94	116.41	589.96	5.44	264.43	
1966	**annual**	**19.40**	**476.10**	**5.83**	**1345.61**	**526.00**	**1295.71**	**0.00**	**48.35**	**1379.44**				**1531.20**
1967	Oct	0.00	0.00	0.08	18.16	18.16	0.00	0.00	3.36	73.93	516.03	5.12	252.24	
1967	Nov	6.42	134.95	0.19	45.02	45.02	134.95	0.00	1.69	38.71	612.28	5.54	268.03	
1967	Dec	5.47	122.18	1.08	253.62	253.62	122.18	0.00	1.08	25.79	708.66	5.97	283.19	
1967	Jan	12.78	301.60	8.52	1987.43	209.20	2079.83	238.49	1.08	44.12	2505.88	14.25	487.39	
1967	Feb	0.49	19.90	1.73	373.81	0.00	393.71	349.59	1.82	74.29	2475.71	14.11	484.78	
1967	Mar	4.47	180.58	0.94	202.88	0.00	383.46	309.17	3.09	126.52	2423.48	13.86	480.23	
1967	Apr	4.96	198.50	3.52	763.34	0.00	961.84	835.32	4.68	191.36	2358.64	13.55	474.53	
1967	May	0.07	2.77	0.38	83.04	0.00	85.81	0.00	6.17	247.90	2196.55	12.79	459.93	
1967	Jun	2.02	77.42	0.18	38.81	0.00	116.23	0.00	6.89	269.96	2042.82	12.07	445.53	
1967	Jul	0.00	0.00	0.16	35.86	0.00	35.86	0.00	7.12	266.26	1812.42	10.99	422.61	
1967	Aug	0.00	0.00	0.04	9.59	0.00	9.59	0.00	6.45	227.54	1594.47	9.96	399.10	
1967	Sep	0.03	1.00	0.34	76.59	0.00	77.58	0.00	4.94	167.80	1504.25	9.54	388.76	
1967	**annual**	**36.71**	**1038.89**	**17.15**	**3888.15**	**526.00**	**4401.05**	**1732.57**	**48.35**	**1754.19**				**6241.14**
1968	Oct	0.82	26.57	0.04	9.42	9.42	26.57	0.00	3.36	109.55	1421.26	9.15	378.90	
1968	Nov	2.35	74.20	0.03	6.14	6.14	74.20	0.00	1.69	54.73	1440.73	9.24	381.24	
1968	Dec	3.15	100.08	0.05	11.80	11.80	100.08	0.00	1.08	35.30	1505.50	9.55	388.91	
1968	Jan	6.58	213.25	0.86	194.18	194.18	213.25	0.00	1.08	37.08	1681.67	10.37	408.74	
1968	Feb	3.70	126.03	1.37	306.00	300.43	131.60	0.00	1.82	63.93	1749.34	10.69	416.00	
1968	Mar	3.43	118.91	1.31	291.26	4.03	406.14	0.00	3.09	117.50	2037.98	12.05	445.06	
1968	Apr	0.32	11.87	0.14	31.22	0.00	43.09	0.00	4.68	174.99	1906.09	11.43	432.14	
1968	May	0.58	20.89	0.06	14.04	0.00	34.93	0.00	6.17	224.02	1717.00	10.54	412.56	
1968	Jun	0.00	0.00	0.02	5.36	0.00	5.36	0.00	6.89	237.07	1485.29	9.45	386.54	
1968	Jul	0.00	0.00	0.01	3.09	0.00	3.09	0.00	7.12	229.46	1258.92	8.39	358.59	
1968	Aug	0.62	18.53	0.00	0.94	0.00	19.46	0.00	6.45	193.95	1084.43	7.62	336.58	
1968	Sep	0.03	0.84	0.00	0.00	0.00	0.84	0.00	4.94	138.58	946.70	7.01	318.01	
1968	**annual**	**21.58**	**711.15**	**3.92**	**873.46**	**526.00**	**1058.61**	**0.00**	**48.35**	**1616.17**				**1029.30**
1969	Oct	1.84	48.76	0.02	4.98	4.98	48.76	0.00	3.36	90.78	904.67	6.83	312.12	
1969	Nov	3.20	83.23	0.11	24.89	24.89	83.23	0.00	1.69	45.69	942.21	6.99	317.39	
1969	Dec	5.72	151.29	1.22	282.39	282.39	151.29	0.00	1.08	30.34	1063.16	7.53	333.78	
1969	Jan	7.72	214.73	6.62	1516.19	213.73	1517.19	30.35	1.08	44.12	2505.88	14.25	487.39	
1969	Feb	7.57	307.46	7.45	1613.02	0.00	1920.48	1876.35	1.82	74.29	2475.71	14.11	484.78	
1969	Mar	1.63	65.85	2.05	444.07	0.00	509.92	435.63	3.09	126.52	2423.48	13.86	480.23	
1969	Apr	2.52	100.85	0.23	49.10	0.00	149.95	23.43	4.68	191.36	2358.64	13.55	474.53	
1969	May	0.00	0.00	0.06	13.39	0.00	13.39	0.00	6.17	244.64	2127.40	12.47	453.53	
1969	Jun	0.01	0.38	0.02	4.86	0.00	5.24	0.00	6.89	260.53	1872.11	11.27	428.72	
1969	Jul	0.00	0.00	0.02	3.62	0.00	3.62	0.00	7.12	254.48	1621.25	10.09	402.10	
1969	Aug	0.00	0.00	0.00	0.98	0.00	0.98	0.00	6.45	216.05	1406.18	9.08	377.07	
1969	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	155.19	1250.98	8.35	357.62	
1969	**annual**	**30.21**	**972.55**	**17.81**	**3957.51**	**526.00**	**4404.06**	**2365.76**	**48.35**	**1734.01**				**7045.45**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	**SUPPLY** to lake (ac-ft.)	**SPILL VOL.** (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	**VOL. (2)** of lake (ac-ft)	**STAGE(2)** of lake (ft.)	**AREA (2)** of lake surface (acres)	**SUPPLY** to Roche prop. (ac-ft.)
1970	Oct	1.65	49.17	0.10	22.77	22.77	49.17	0.00	3.36	101.73	1198.43	8.12	351.14	
1970	Nov	0.88	25.75	0.05	12.41	12.41	25.75	0.00	1.69	50.02	1174.16	8.01	348.10	
1970	Dec	7.06	204.89	1.21	274.78	274.78	204.89	0.00	1.08	33.57	1345.47	8.79	369.58	
1970	Jan	13.34	410.85	12.38	2800.30	216.04	2995.11	1790.58	1.08	44.12	2505.88	14.25	487.39	
1970	Feb	2.34	95.04	1.81	391.73	0.00	486.77	442.65	1.82	74.29	2475.71	14.11	484.78	
1970	Mar	2.48	100.19	1.50	324.90	0.00	425.08	350.79	3.09	126.52	2423.48	13.86	480.23	
1970	Apr	0.17	6.80	0.09	20.49	0.00	27.30	0.00	4.68	188.02	2262.76	13.10	465.96	
1970	May	0.00	0.00	0.04	8.00	0.00	8.00	0.00	6.17	239.99	2030.77	12.01	444.37	
1970	Jun	0.48	17.77	0.02	4.04	0.00	21.82	0.00	6.89	256.19	1796.39	10.91	420.94	
1970	Jul	0.00	0.00	0.01	1.74	0.00	1.74	0.00	7.12	249.76	1548.38	9.75	393.87	
1970	Aug	0.00	0.00	0.01	2.79	0.00	2.79	0.00	6.45	211.74	1339.42	8.76	368.82	
1970	Sep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.94	151.80	1187.62	8.07	349.79	
1970	**annual**	**28.40**	**910.46**	**17.22**	**3863.96**	**526.00**	**4248.43**	**2584.02**	**48.35**	**1727.77**				**7109.82**
1971	Oct	0.96	27.98	0.01	2.39	2.39	27.98	0.00	3.36	98.77	1116.84	7.76	340.79	
1971	Nov	9.11	258.72	0.88	201.42	201.42	258.72	0.00	1.69	52.70	1322.85	8.69	366.74	
1971	Dec	6.40	195.59	3.82	864.70	322.19	738.10	0.00	1.08	40.18	2020.77	11.97	443.41	
1971	Jan	1.87	69.10	1.31	288.27	0.00	357.37	0.00	1.08	42.78	2335.36	13.45	472.46	
1971	Feb	0.31	12.21	0.16	35.02	0.00	47.23	0.00	1.82	72.09	2310.49	13.33	470.25	
1971	Mar	3.38	132.45	0.54	118.56	0.00	251.01	11.50	3.09	126.52	2423.48	13.86	480.23	
1971	Apr	0.85	34.02	0.26	60.65	0.00	94.67	0.00	4.68	190.29	2327.86	13.41	471.80	
1971	May	0.33	12.97	0.06	12.12	0.00	25.09	0.00	6.17	243.77	2109.19	12.38	451.82	
1971	Jun	0.00	0.00	0.03	6.53	0.00	6.53	0.00	6.89	259.62	1856.10	11.19	427.09	
1971	Jul	0.00	0.00	0.02	3.34	0.00	3.34	0.00	7.12	253.50	1605.93	10.02	400.39	
1971	Aug	0.00	0.00	0.01	2.34	0.00	2.34	0.00	6.45	215.22	1393.06	9.02	375.47	
1971	Sep	0.15	4.69	0.00	0.70	0.00	5.39	0.00	4.94	154.81	1243.65	8.32	356.72	
1971	**annual**	**23.36**	**747.73**	**7.12**	**1596.04**	**526.00**	**1817.78**	**11.50**	**48.35**	**1750.25**				**1882.61**
1972	Oct	0.21	6.24	0.00	0.16	0.16	6.24	0.00	3.36	99.95	1149.94	7.91	345.03	
1972	Nov	2.37	68.14	0.06	13.31	13.31	68.14	0.00	1.69	49.91	1168.17	7.99	347.34	
1972	Dec	5.48	158.62	0.49	111.73	111.73	158.62	0.00	1.08	32.99	1293.80	8.55	363.05	
1972	Jan	1.67	50.52	0.15	35.05	35.05	50.52	0.00	1.08	33.19	1311.14	8.63	365.26	
1972	Feb	2.40	73.05	0.54	121.71	121.71	73.05	0.00	1.82	56.62	1327.57	8.71	367.33	
1972	Mar	0.38	11.63	0.06	14.68	14.68	11.63	0.00	3.09	95.00	1244.20	8.32	356.79	
1972	Apr	1.08	32.11	0.04	9.08	9.08	32.11	0.00	4.68	140.56	1135.75	7.85	343.22	
1972	May	0.00	0.00	0.02	4.04	0.00	4.04	0.00	6.17	176.77	963.02	7.09	320.27	
1972	Jun	0.15	4.00	0.01	1.61	0.00	5.61	0.00	6.89	184.23	784.41	6.30	294.67	
1972	Jul	0.01	0.25	0.00	0.96	0.00	1.20	0.00	7.12	174.87	610.74	5.54	267.79	
1972	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	143.85	466.90	4.90	243.92	
1972	Sep	0.92	18.70	0.00	0.51	0.00	19.21	0.00	4.94	101.74	384.37	4.54	229.54	
1972	**annual**	**14.67**	**423.28**	**1.38**	**312.84**	**305.72**	**430.39**	**0.00**	**48.35**	**1289.67**				**361.77**
1973	Oct	4.46	85.31	0.26	62.48	62.48	85.31	0.00	3.36	68.33	401.35	4.61	232.54	
1973	Nov	5.26	101.93	0.95	225.93	225.93	101.93	0.00	1.69	35.31	467.97	4.91	244.11	
1973	Dec	4.50	91.54	0.69	162.76	162.76	91.54	0.00	1.08	23.31	536.21	5.21	255.61	
1973	Jan	11.27	240.06	10.81	2547.35	74.82	2712.59	698.79	1.08	44.12	2505.88	14.25	487.39	
1973	Feb	8.55	347.26	9.41	2035.48	0.00	2382.74	2338.61	1.82	74.29	2475.71	14.11	484.78	
1973	Mar	2.81	113.52	3.52	761.87	0.00	875.39	801.10	3.09	126.52	2423.48	13.86	480.23	
1973	Apr	0.08	3.20	0.20	43.88	0.00	47.08	0.00	4.68	188.69	2281.87	13.19	467.68	
1973	May	0.02	0.78	0.11	23.14	0.00	23.91	0.00	6.17	241.61	2064.17	12.17	447.57	
1973	Jun	0.00	0.00	0.04	8.08	0.00	8.08	0.00	6.89	257.27	1814.98	11.00	422.87	
1973	Jul	0.00	0.00	0.03	5.81	0.00	5.81	0.00	7.12	251.15	1569.64	9.85	396.29	
1973	Aug	0.00	0.00	0.01	2.64	0.00	2.64	0.00	6.45	213.04	1359.24	8.86	371.30	
1973	Sep	0.27	8.35	0.01	1.43	0.00	9.79	0.00	4.94	153.32	1215.71	8.20	353.29	
1973	**annual**	**37.22**	**991.96**	**26.02**	**5880.85**	**526.00**	**6346.81**	**3838.51**	**48.35**	**1676.96**				**10677.90**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1974	Oct	1.25	36.80	0.03	5.96	5.96	36.80	0.00	3.36	100.04	1152.48	7.92	345.36	
1974	Nov	9.70	279.16	1.09	248.82	248.82	279.16	0.00	1.69	53.68	1377.97	8.95	373.61	
1974	Dec	4.65	144.77	2.03	458.63	271.22	332.18	0.00	1.08	37.00	1673.16	10.33	407.82	
1974	Jan	5.30	180.12	5.36	1194.91	0.00	1375.03	498.19	1.08	44.12	2505.88	14.25	487.39	
1974	Feb	1.83	74.33	0.62	134.42	0.00	208.74	164.62	1.82	74.29	2475.71	14.11	484.78	
1974	Mar	4.72	190.68	3.61	781.74	0.00	972.42	898.12	3.09	126.52	2423.48	13.86	480.23	
1974	Apr	2.30	92.04	2.75	596.92	0.00	688.97	562.44	4.68	191.36	2358.64	13.55	474.53	
1974	May	0.00	0.00	0.14	29.77	0.00	29.77	0.00	6.17	245.38	2143.03	12.54	454.99	
1974	Jun	0.02	0.76	0.03	7.64	0.00	8.40	0.00	6.89	261.54	1889.90	11.35	430.51	
1974	Jul	0.95	34.08	0.04	9.85	0.00	43.93	0.00	7.12	257.93	1675.89	10.35	408.11	
1974	Aug	0.00	0.00	0.02	4.82	0.00	4.82	0.00	6.45	219.51	1461.21	9.34	383.69	
1974	Sep	0.00	0.00	0.02	5.28	0.00	5.28	0.00	4.94	158.18	1308.31	8.62	364.90	
1974	**annual**	**30.72**	**1032.75**	**15.75**	**3478.75**	**526.00**	**3985.50**	**2123.38**	**48.35**	**1769.52**				**6262.28**
1975	Oct	0.91	27.67	0.03	6.63	6.63	27.67	0.00	3.36	103.00	1232.98	8.27	355.42	
1975	Nov	0.89	26.36	0.03	6.77	6.77	26.36	0.00	1.69	50.63	1208.71	8.17	352.42	
1975	Dec	3.40	99.85	0.19	42.49	42.49	99.85	0.00	1.08	32.78	1275.78	8.46	360.63	
1975	Jan	1.97	59.20	0.17	38.95	38.95	59.20	0.00	1.08	33.08	1301.90	8.59	364.08	
1975	Feb	7.17	217.54	2.10	476.04	430.96	262.62	0.00	1.82	59.85	1504.68	9.54	388.81	
1975	Mar	6.41	207.69	4.47	1004.79	0.00	1212.48	167.16	3.09	126.52	2423.48	13.86	480.23	
1975	Apr	1.13	45.22	0.40	87.20	0.00	132.42	5.90	4.68	191.36	2358.64	13.55	474.53	
1975	May	0.00	0.00	0.09	18.52	0.00	18.52	0.00	6.17	244.87	2132.29	12.49	453.99	
1975	Jun	0.11	4.16	0.03	7.64	0.00	11.80	0.00	6.89	261.14	1882.95	11.32	429.81	
1975	Jul	0.12	4.30	0.02	4.64	0.00	8.93	0.00	7.12	255.45	1636.44	10.16	403.78	
1975	Aug	0.03	1.01	0.01	1.76	0.00	2.77	0.00	6.45	217.06	1422.14	9.15	379.00	
1975	Sep	0.00	0.00	0.00	1.03	0.00	1.03	0.00	4.94	156.04	1267.12	8.42	359.58	
1975	**annual**	**22.14**	**693.01**	**7.55**	**1696.65**	**526.00**	**1863.66**	**173.06**	**48.35**	**1731.78**				**2156.73**
1976	Oct	4.64	139.04	0.08	18.44	18.44	139.04	0.00	3.36	105.42	1300.74	8.58	363.93	
1976	Nov	0.68	20.62	0.01	3.16	3.16	20.62	0.00	1.69	51.74	1269.62	8.43	359.88	
1976	Dec	0.79	23.69	0.02	5.65	5.65	23.69	0.00	1.08	32.61	1260.70	8.40	358.80	
1976	Jan	0.32	9.57	0.03	6.40	6.40	9.57	0.00	1.08	32.34	1237.93	8.30	356.02	
1976	Feb	1.95	57.85	0.04	8.47	8.47	57.85	0.00	1.82	54.95	1240.84	8.31	356.38	
1976	Mar	0.97	28.81	0.06	12.51	12.51	28.81	0.00	3.09	92.70	1176.95	8.03	348.45	
1976	Apr	1.51	43.85	0.05	11.56	11.56	43.85	0.00	4.68	137.88	1082.91	7.61	336.38	
1976	May	0.00	0.00	0.00	1.02	0.00	1.02	0.00	6.17	173.05	910.88	6.86	313.00	
1976	Jun	0.01	0.26	0.00	0.03	0.00	0.29	0.00	6.89	179.63	731.54	6.07	286.70	
1976	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	170.04	561.50	5.32	259.79	
1976	Aug	0.62	13.42	0.00	0.42	0.00	13.84	0.00	6.45	140.77	434.57	4.76	238.35	
1976	Sep	0.57	11.32	0.01	3.31	0.00	14.63	0.00	4.94	99.14	350.06	4.39	223.41	
1976	**annual**	**12.06**	**348.43**	**0.31**	**70.96**	**66.19**	**353.21**	**0.00**	**48.35**	**1270.27**				**81.88**
1977	Oct	0.60	11.17	0.01	2.97	2.97	11.17	0.00	3.36	63.02	298.21	4.16	213.97	
1977	Nov	1.54	27.46	0.04	9.40	9.40	27.46	0.00	1.69	30.91	294.75	4.15	213.33	
1977	Dec	0.89	15.82	0.04	9.09	9.09	15.82	0.00	1.08	19.43	291.15	4.13	212.67	
1977	Jan	1.80	31.90	0.10	25.08	25.08	31.90	0.00	1.08	19.63	303.42	4.18	214.93	
1977	Feb	1.26	22.57	0.04	8.91	8.91	22.57	0.00	1.82	33.13	292.85	4.14	212.98	
1977	Mar	2.00	35.50	0.09	20.84	20.84	35.50	0.00	3.09	56.54	271.81	4.04	209.08	
1977	Apr	0.06	1.05	0.01	2.58	2.58	1.05	0.00	4.68	81.53	191.33	3.18	170.73	
1977	May	0.82	11.67	0.01	1.91	0.00	13.57	0.00	6.17	91.66	113.25	2.20	123.58	
1977	Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.89	70.92	42.33	1.25	73.28	
1977	Jul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.12	43.46	0.00	0.00	0.00	
1977	Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.45	0.00	0.00	0.00	0.00	
1977	Sep	0.73	0.00	0.00	0.00	0.00	0.00	0.00	4.94	0.00	0.00	0.00	0.00	
1977	**annual**	**9.70**	**157.13**	**0.34**	**80.77**	**78.87**	**159.04**	**0.00**	**48.35**	**510.23**				**88.72**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1978	Oct	0.41	0.00	0.00	0.00	0.00	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1978	Nov	4.70	0.00	0.13	34.37	34.37	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1978	Dec	4.16	0.00	0.30	76.59	76.59	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1978	Jan	12.58	0.00	8.84	2272.55	415.03	1857.52	0.00	1.08	38.38	1819.14	11.02	423.30	
1978	Feb	4.62	162.97	4.44	985.14	0.00	1148.11	417.25	1.82	74.29	2475.71	14.11	484.78	
1978	Mar	4.24	171.29	2.87	621.42	0.00	792.70	718.41	3.09	126.52	2423.48	13.86	480.23	
1978	Apr	3.68	147.27	0.75	162.30	0.00	309.57	183.05	4.68	191.36	2358.64	13.55	474.53	
1978	May	0.09	3.56	0.08	17.52	0.00	21.08	0.00	6.17	244.98	2134.74	12.50	454.21	
1978	Jun	0.00	0.00	0.03	6.25	0.00	6.25	0.00	6.89	260.98	1880.01	11.31	429.52	
1978	Jul	0.00	0.00	0.01	1.88	0.00	1.88	0.00	7.12	254.85	1627.04	10.12	402.74	
1978	Aug	0.00	0.00	0.00	0.13	0.00	0.13	0.00	6.45	216.35	1410.83	9.10	377.63	
1978	Sep	0.46	14.48	0.00	0.44	0.00	14.92	0.00	4.94	156.17	1269.57	8.43	359.88	
1978	**annual**	**34.94**	**499.56**	**17.45**	**4178.60**	**526.00**	**4152.16**	**1318.71**	**48.35**	**1563.88**				**5906.22**
1979	Oct	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.36	100.62	1168.96	7.99	347.44	
1979	Nov	1.51	43.72	0.03	7.08	7.08	43.72	0.00	1.69	49.82	1162.86	7.96	346.67	
1979	Dec	0.73	21.09	0.03	7.92	7.92	21.09	0.00	1.08	31.38	1152.57	7.92	345.37	
1979	Jan	10.45	300.76	1.33	303.46	303.46	300.76	0.00	1.08	34.38	1418.94	9.14	378.62	
1979	Feb	5.61	177.00	1.94	437.49	207.54	406.95	0.00	1.82	64.13	1761.76	10.75	417.32	
1979	Mar	1.73	60.16	1.00	221.25	0.00	281.41	0.00	3.09	114.77	1928.40	11.53	434.36	
1979	Apr	1.17	42.35	0.18	39.75	0.00	82.10	0.00	4.68	172.36	1838.14	11.11	425.26	
1979	May	0.38	13.47	0.07	15.09	0.00	28.56	0.00	6.17	220.19	1646.52	10.21	404.90	
1979	Jun	0.00	0.00	0.03	7.08	0.00	7.08	0.00	6.89	232.79	1420.80	9.15	378.84	
1979	Jul	0.00	0.00	0.01	1.92	0.00	1.92	0.00	7.12	224.82	1197.90	8.12	351.07	
1979	Aug	0.00	0.00	0.00	0.51	0.00	0.51	0.00	6.45	188.62	1009.79	7.29	326.65	
1979	Sep	0.09	2.45	0.00	0.00	0.00	2.45	0.00	4.94	134.58	877.66	6.71	308.28	
1979	**annual**	**21.67**	**661.00**	**4.62**	**1041.54**	**526.00**	**1176.54**	**0.00**	**48.35**	**1568.45**				**1214.82**
1980	Oct	3.40	87.35	0.13	30.00	30.00	87.35	0.00	3.36	89.62	875.38	6.70	307.96	
1980	Nov	3.17	81.25	0.98	227.29	227.29	81.25	0.00	1.69	45.09	911.54	6.86	313.09	
1980	Dec	5.60	146.11	1.59	366.02	268.71	243.42	0.00	1.08	31.05	1123.91	7.79	341.70	
1980	Jan	5.89	167.72	6.75	1541.76	0.00	1709.48	283.39	1.08	44.12	2505.88	14.25	487.39	
1980	Feb	10.26	416.72	9.11	1971.47	0.00	2388.18	2344.06	1.82	74.29	2475.71	14.11	484.78	
1980	Mar	1.82	73.58	1.92	416.70	0.00	489.27	414.98	3.09	126.52	2423.48	13.86	480.23	
1980	Apr	1.08	43.22	0.27	59.42	0.00	102.64	0.00	4.68	190.56	2335.56	13.45	472.48	
1980	May	0.24	9.45	0.15	32.64	0.00	42.09	0.00	6.17	244.89	2132.76	12.49	454.03	
1980	Jun	0.05	1.89	0.49	107.39	0.00	109.28	0.00	6.89	266.31	1975.73	11.76	439.03	
1980	Jul	0.19	6.95	0.56	124.31	0.00	131.26	0.00	7.12	267.85	1839.14	11.11	425.36	
1980	Aug	0.00	0.00	0.56	123.79	0.00	123.79	0.00	6.45	235.16	1727.77	10.59	413.71	
1980	Sep	0.00	0.00	0.00	0.62	0.00	0.62	0.00	4.94	170.30	1558.09	9.79	394.98	
1980	**annual**	**31.70**	**1034.23**	**22.51**	**5000.39**	**526.00**	**5508.62**	**3042.43**	**48.35**	**1785.76**				**8959.53**
1981	Oct	0.34	11.19	0.01	1.91	1.91	11.19	0.00	3.36	110.79	1458.50	9.32	383.37	
1981	Nov	0.32	10.22	0.00	0.43	0.43	10.22	0.00	1.69	54.29	1414.43	9.12	378.07	
1981	Dec	3.26	102.81	0.34	76.51	76.51	102.81	0.00	1.08	35.06	1482.18	9.44	386.17	
1981	Jan	5.93	190.83	1.55	349.00	349.00	190.83	0.00	1.08	36.63	1636.38	10.16	403.78	
1981	Feb	1.57	52.76	0.28	61.58	61.58	52.76	0.00	1.82	61.95	1627.19	10.12	402.76	
1981	Mar	4.24	142.31	1.03	229.77	36.58	335.51	0.00	3.09	112.76	1849.94	11.16	426.46	
1981	Apr	0.07	2.49	0.14	31.16	0.00	33.65	0.00	4.68	167.47	1716.12	10.53	412.46	
1981	May	0.38	13.06	0.04	8.31	0.00	21.37	0.00	6.17	213.28	1524.21	9.63	391.08	
1981	Jun	0.00	0.00	0.02	4.41	0.00	4.41	0.00	6.89	224.71	1303.91	8.60	364.34	
1981	Jul	0.20	6.07	0.01	1.63	0.00	7.71	0.00	7.12	216.66	1094.96	7.67	337.95	
1981	Aug	0.00	0.00	0.00	1.02	0.00	1.02	0.00	6.45	181.61	914.37	6.87	313.49	
1981	Sep	0.00	0.00	0.00	0.20	0.00	0.20	0.00	4.94	129.04	785.53	6.30	294.83	
1981	**annual**	**16.31**	**531.75**	**3.42**	**765.94**	**526.00**	**771.69**	**0.00**	**48.35**	**1544.25**				**897.92**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1982	Oct	2.19	53.81	0.09	21.31	21.31	53.81	0.00	3.36	84.65	754.69	6.17	290.21	
1982	Nov	0.00	0.00	0.56	129.57	129.57	0.00	0.00	1.69	40.97	713.73	5.99	283.97	
1982	Dec	7.49	177.29	2.14	499.78	375.11	301.95	0.00	1.08	29.42	986.26	7.19	323.46	
1982	Jan	9.48	255.53	11.72	2697.20	0.00	2952.73	1388.99	1.08	44.12	2505.88	14.25	487.39	
1982	Feb	3.44	139.72	3.19	690.01	0.00	829.73	785.61	1.82	74.29	2475.71	14.11	484.78	
1982	Mar	5.58	225.42	3.48	753.36	0.00	978.78	904.49	3.09	126.52	2423.48	13.86	480.23	
1982	Apr	3.28	131.26	4.63	1004.04	0.00	1135.30	1008.78	4.68	191.36	2358.64	13.55	474.53	
1982	May	0.00	0.00	0.16	35.75	0.00	35.75	0.00	6.17	245.65	2148.75	12.57	455.52	
1982	Jun	0.01	0.38	0.09	19.02	0.00	19.40	0.00	6.89	262.42	1905.72	11.43	432.10	
1982	Jul	0.00	0.00	0.03	6.22	0.00	6.22	0.00	7.12	256.64	1655.31	10.25	405.86	
1982	Aug	0.00	0.00	0.01	3.22	0.00	3.22	0.00	6.45	218.21	1440.32	9.24	381.19	
1982	Sep	0.64	20.33	0.05	10.57	0.00	30.90	0.00	4.94	158.41	1312.80	8.64	365.47	
1982	**annual**	**32.11**	**1003.74**	**26.15**	**5870.05**	**526.00**	**6347.79**	**4087.87**	**48.35**	**1732.65**				**10960.71**
1983	Oct	2.91	88.63	0.13	29.68	29.68	88.63	0.00	3.36	105.26	1296.17	8.56	363.35	
1983	Nov	6.72	203.48	0.98	222.76	222.76	203.48	0.00	1.69	54.80	1444.84	9.26	381.74	
1983	Dec	2.74	87.16	1.15	258.13	250.49	94.80	0.00	1.08	35.29	1504.34	9.54	388.77	
1983	Jan	7.53	243.98	8.71	1956.65	23.07	2177.55	1131.90	1.08	44.12	2505.88	14.25	487.39	
1983	Feb	9.11	370.01	9.64	2086.68	0.00	2456.69	2412.57	1.82	74.29	2475.71	14.11	484.78	
1983	Mar	15.04	607.59	13.56	2936.83	0.00	3544.42	3470.13	3.09	126.52	2423.48	13.86	480.23	
1983	Apr	4.59	183.69	1.61	349.35	0.00	533.04	406.52	4.68	191.36	2358.64	13.55	474.53	
1983	May	0.28	11.07	0.84	183.74	0.00	194.81	3.46	6.17	252.59	2297.41	13.27	469.08	
1983	Jun	0.00	0.00	0.15	31.91	0.00	31.91	0.00	6.89	270.81	2058.51	12.14	447.03	
1983	Jul	0.00	0.00	0.09	20.30	0.00	20.30	0.00	7.12	266.27	1812.54	10.99	422.62	
1983	Aug	0.48	16.90	0.07	14.67	0.00	31.58	0.00	6.45	228.76	1615.35	10.06	401.44	
1983	Sep	0.42	14.05	0.05	10.20	0.00	24.25	0.00	4.94	166.33	1473.27	9.39	385.12	
1983	**annual**	**49.82**	**1826.55**	**36.98**	**8100.89**	**526.00**	**9401.44**	**7424.56**	**48.35**	**1816.41**				**17143.64**
1984	Oct	0.61	19.58	0.07	16.35	16.35	19.58	0.00	3.36	108.32	1384.53	8.98	374.42	
1984	Nov	8.16	254.61	0.67	151.72	151.72	254.61	0.00	1.69	57.04	1582.09	9.91	397.70	
1984	Dec	9.43	312.53	7.01	1568.93	357.93	1523.53	555.62	1.08	44.12	2505.88	14.25	487.39	
1984	Jan	0.41	16.65	3.23	698.75	0.00	715.40	671.27	1.08	44.12	2505.88	14.25	487.39	
1984	Feb	1.92	77.98	0.57	122.90	0.00	200.88	156.75	1.82	74.29	2475.71	14.11	484.78	
1984	Mar	1.43	57.77	0.27	58.88	0.00	116.65	42.36	3.09	126.52	2423.48	13.86	480.23	
1984	Apr	1.33	53.23	0.08	17.88	0.00	71.11	0.00	4.68	189.50	2305.09	13.30	469.77	
1984	May	0.19	7.44	0.06	13.56	0.00	20.99	0.00	6.17	242.54	2083.54	12.26	449.40	
1984	Jun	0.26	9.74	0.05	10.58	0.00	20.31	0.00	6.89	258.98	1844.87	11.14	425.94	
1984	Jul	0.00	0.00	0.51	113.46	0.00	113.46	0.00	7.12	259.37	1698.96	10.45	410.62	
1984	Aug	0.13	4.45	0.17	38.96	0.00	43.41	0.00	6.45	223.07	1519.30	9.61	390.51	
1984	Sep	0.15	4.88	0.02	4.27	0.00	9.15	0.00	4.94	161.16	1367.29	8.90	372.29	
1984	**annual**	**24.02**	**818.85**	**12.72**	**2816.22**	**526.00**	**3109.06**	**1426.00**	**48.35**	**1789.04**				**4769.44**
1985	Oct	2.25	69.80	0.11	25.75	25.75	69.80	0.00	3.36	106.47	1330.63	8.72	367.72	
1985	Nov	7.43	227.68	0.88	199.44	199.44	227.68	0.00	1.69	55.76	1502.54	9.53	388.56	
1985	Dec	1.64	53.10	0.39	87.84	87.84	53.10	0.00	1.08	35.46	1520.19	9.61	390.62	
1985	Jan	1.20	39.06	0.26	58.22	58.22	39.06	0.00	1.08	35.49	1523.76	9.63	391.03	
1985	Feb	2.41	78.53	0.60	135.42	131.70	82.26	0.00	1.82	60.58	1545.46	9.73	393.53	
1985	Mar	4.07	133.47	0.36	81.51	23.06	191.92	0.00	3.09	106.83	1630.55	10.13	403.13	
1985	Apr	0.27	9.07	0.12	27.61	0.00	36.68	0.00	4.68	158.63	1508.61	9.56	389.27	
1985	May	0.00	0.00	0.07	15.74	0.00	15.74	0.00	6.17	201.12	1323.23	8.69	366.79	
1985	Jun	0.01	0.31	0.05	10.62	0.00	10.93	0.00	6.89	211.26	1122.89	7.79	341.57	
1985	Jul	0.06	1.71	0.02	5.09	0.00	6.80	0.00	7.12	203.10	926.59	6.93	315.21	
1985	Aug	0.00	0.00	0.02	4.99	0.00	4.99	0.00	6.45	169.69	761.88	6.20	291.29	
1985	Sep	0.08	1.94	0.03	7.52	0.00	9.47	0.00	4.94	120.48	650.87	5.71	274.18	
1985	**annual**	**19.42**	**614.68**	**2.93**	**659.75**	**526.00**	**748.43**	**0.00**	**48.35**	**1464.85**				**769.89**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1986	Oct	0.98	22.39	0.03	6.75	6.75	22.39	0.00	3.36	77.64	595.62	5.47	265.35	
1986	Nov	3.68	81.37	0.20	46.90	46.90	81.37	0.00	1.69	39.28	637.71	5.65	272.10	
1986	Dec	3.48	78.91	0.24	56.79	56.79	78.91	0.00	1.08	25.55	691.07	5.89	280.47	
1986	Jan	4.58	107.05	1.19	278.51	278.51	107.05	0.00	1.08	26.65	771.46	6.24	292.73	
1986	Feb	15.26	372.26	14.14	3288.98	137.05	3524.19	1745.65	1.82	74.29	2475.71	14.11	484.78	
1986	Mar	7.07	285.62	6.07	1313.77	0.00	1599.39	1525.09	3.09	126.52	2423.48	13.86	480.23	
1986	Apr	1.15	46.02	0.31	67.67	0.00	113.69	0.00	4.68	190.93	2346.24	13.50	473.43	
1986	May	0.44	17.36	0.11	22.94	0.00	40.30	0.00	6.17	245.29	2141.25	12.53	454.82	
1986	Jun	0.00	0.00	0.08	17.92	0.00	17.92	0.00	6.89	261.95	1897.22	11.39	431.25	
1986	Jul	0.00	0.00	0.06	14.19	0.00	14.19	0.00	7.12	256.61	1654.80	10.25	405.81	
1986	Aug	0.00	0.00	0.05	10.82	0.00	10.82	0.00	6.45	218.62	1446.99	9.27	381.99	
1986	Sep	1.67	53.16	0.08	18.27	0.00	71.43	0.00	4.94	160.69	1357.74	8.85	371.11	
1986	**annual**	**38.31**	**1064.14**	**22.56**	**5143.50**	**526.00**	**5681.64**	**3270.74**	**48.35**	**1704.03**				**9200.36**
1987	Oct	0.24	7.42	0.02	4.29	4.29	7.42	0.00	3.36	104.01	1261.15	8.40	358.86	
1987	Nov	0.26	7.78	0.03	6.33	6.33	7.78	0.00	1.69	50.79	1218.13	8.21	353.59	
1987	Dec	2.33	68.65	0.14	32.79	32.79	68.65	0.00	1.08	32.53	1254.25	8.37	358.02	
1987	Jan	4.40	131.27	0.28	63.39	63.39	131.27	0.00	1.08	33.65	1351.88	8.82	370.38	
1987	Feb	4.51	139.20	0.95	215.40	215.40	139.20	0.00	1.82	58.57	1432.51	9.20	380.26	
1987	Mar	3.29	104.25	0.34	77.63	77.63	104.25	0.00	3.09	101.11	1435.66	9.22	380.63	
1987	Apr	0.08	2.54	0.05	11.71	11.71	2.54	0.00	4.68	148.41	1289.79	8.53	362.53	
1987	May	0.04	1.21	0.04	9.51	0.00	10.72	0.00	6.17	187.14	1113.37	7.75	340.34	
1987	Jun	0.00	0.00	0.05	12.46	0.00	12.46	0.00	6.89	196.22	929.61	6.94	315.63	
1987	Jul	0.00	0.00	0.04	8.76	0.00	8.76	0.00	7.12	187.92	750.45	6.15	289.57	
1987	Aug	0.00	0.00	0.01	3.05	0.00	3.05	0.00	6.45	155.80	597.71	5.48	265.68	
1987	Sep	0.00	0.00	0.02	4.17	0.00	4.17	0.00	4.94	109.63	492.25	5.01	248.24	
1987	**annual**	**15.15**	**462.33**	**1.98**	**449.49**	**411.54**	**500.28**	**0.00**	**48.35**	**1365.77**				**521.53**
1988	Oct	1.42	29.37	0.08	18.88	18.88	29.37	0.00	3.36	70.78	450.84	4.83	241.17	
1988	Nov	3.04	61.10	0.14	34.09	34.09	61.10	0.00	1.69	35.51	476.42	4.94	245.55	
1988	Dec	6.39	130.76	0.77	182.82	182.82	130.76	0.00	1.08	24.00	583.17	5.41	263.33	
1988	Jan	5.43	119.16	1.39	326.40	290.21	155.35	0.00	1.08	25.85	712.67	5.98	283.81	
1988	Feb	0.55	13.01	0.14	32.03	0.00	45.04	0.00	1.82	43.96	713.75	5.99	283.98	
1988	Mar	0.08	1.89	0.07	15.74	0.00	17.64	0.00	3.09	73.84	657.54	5.74	275.23	
1988	Apr	1.24	28.44	0.07	17.36	0.00	45.80	0.00	4.68	110.01	593.33	5.46	264.98	
1988	May	0.67	14.79	0.05	11.08	0.00	25.87	0.00	6.17	138.41	480.80	4.96	246.30	
1988	Jun	0.73	14.98	0.01	3.45	0.00	18.43	0.00	6.89	143.12	356.10	4.41	224.50	
1988	Jul	0.00	0.00	0.00	0.22	0.00	0.22	0.00	7.12	133.17	223.15	3.56	188.14	
1988	Aug	0.00	0.00	0.02	5.37	0.00	5.37	0.00	6.45	102.61	125.92	2.37	132.11	
1988	Sep	0.00	0.00	0.00	0.41	0.00	0.41	0.00	4.94	54.48	71.84	1.65	94.76	
1988	**annual**	**19.55**	**413.50**	**2.75**	**647.85**	**526.00**	**535.35**	**0.00**	**48.35**	**955.76**				**722.98**
1989	Oct	0.09	0.71	0.01	3.10	3.10	0.71	0.00	3.36	26.64	45.92	1.30	75.93	
1989	Nov	3.25	20.57	0.08	20.82	20.82	20.57	0.00	1.69	12.83	53.65	1.40	81.61	
1989	Dec	2.81	19.11	0.16	39.33	39.33	19.11	0.00	1.08	8.57	64.19	1.54	89.26	
1989	Jan	1.39	10.34	0.12	29.91	29.91	10.34	0.00	1.08	8.68	65.84	1.56	90.46	
1989	Feb	0.99	7.46	0.06	14.46	14.46	7.46	0.00	1.82	14.49	58.81	1.47	85.38	
1989	Mar	6.14	43.68	0.83	207.87	207.87	43.68	0.00	3.09	29.94	72.55	1.65	95.27	
1989	Apr	1.08	8.57	0.10	26.05	26.05	8.57	0.00	4.68	39.49	41.64	1.24	72.77	
1989	May	0.15	0.91	0.03	8.22	0.00	9.13	0.00	6.17	40.89	9.88	0.42	25.39	
1989	Jun	0.01	0.02	0.03	8.72	0.00	8.75	0.00	6.89	26.98	0.00	0.00	0.00	
1989	Jul	0.00	0.00	0.02	4.88	0.00	4.88	0.00	7.12	7.53	0.00	0.00	0.00	
1989	Aug	0.00	0.00	0.02	4.04	0.00	4.04	0.00	6.45	5.66	0.00	0.00	0.00	
1989	Sep	1.77	0.00	0.12	30.30	0.00	30.30	0.00	4.94	26.46	3.84	0.16	10.01	
1989	**annual**	**17.68**	**111.38**	**1.59**	**397.71**	**341.54**	**167.54**	**0.00**	**48.35**	**248.16**				**416.99**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1990	Oct	1.69	1.41	0.14	35.24	35.24	1.41	0.00	3.36	3.81	1.44	0.06	3.80	
1990	Nov	1.77	0.56	0.05	13.18	13.18	0.56	0.00	1.69	0.74	1.26	0.05	3.33	
1990	Dec	0.00	0.00	0.02	4.04	4.04	0.00	0.00	1.08	0.30	0.96	0.04	2.55	
1990	Jan	5.06	1.08	0.34	86.29	86.29	1.08	0.00	1.08	0.48	1.55	0.07	4.10	
1990	Feb	3.48	1.19	0.33	85.79	85.79	1.19	0.00	1.82	1.09	1.66	0.07	4.37	
1990	Mar	0.99	0.36	0.10	25.38	25.38	0.36	0.00	3.09	1.37	0.65	0.03	1.76	
1990	Apr	0.31	0.05	0.03	7.49	7.49	0.05	0.00	4.68	0.73	0.00	0.00	0.00	
1990	May	2.34	0.00	0.09	24.07	0.00	24.07	0.00	6.17	30.64	0.00	0.00	0.00	
1990	Jun	0.00	0.00	0.03	6.68	0.00	6.68	0.00	6.89	9.92	0.00	0.00	0.00	
1990	Jul	0.00	0.00	0.01	1.85	0.00	1.85	0.00	7.12	2.89	0.00	0.00	0.00	
1990	Aug	0.03	0.00	0.01	2.19	0.00	2.19	0.00	6.45	3.09	0.00	0.00	0.00	
1990	Sep	0.12	0.00	0.05	12.71	0.00	12.71	0.00	4.94	13.36	0.00	0.00	0.00	
1990	**annual**	**15.79**	**4.64**	**1.19**	**304.90**	**257.40**	**52.14**	**0.00**	**48.35**	**68.42**				**312.18**
1991	Oct	0.25	0.00	0.00	0.99	0.99	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1991	Nov	0.55	0.00	0.01	3.10	3.10	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1991	Dec	0.99	0.00	0.09	23.74	23.74	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1991	Jan	0.36	0.00	0.04	11.11	11.11	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1991	Feb	4.33	0.00	0.14	36.49	36.49	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1991	Mar	8.67	0.00	1.58	405.69	405.69	0.00	0.00	3.09	0.00	0.00	0.00	0.00	
1991	Apr	0.46	0.00	0.10	26.07	26.07	0.00	0.00	4.68	0.00	0.00	0.00	0.00	
1991	May	0.20	0.00	0.04	10.61	0.00	10.61	0.00	6.17	13.99	0.00	0.00	0.00	
1991	Jun	0.60	0.00	0.04	10.26	0.00	10.26	0.00	6.89	15.12	0.00	0.00	0.00	
1991	Jul	0.03	0.00	0.03	8.59	0.00	8.59	0.00	7.12	13.12	0.00	0.00	0.00	
1991	Aug	0.08	0.00	0.01	2.19	0.00	2.19	0.00	6.45	3.09	0.00	0.00	0.00	
1991	Sep	0.04	0.00	0.02	5.05	0.00	5.05	0.00	4.94	5.40	0.00	0.00	0.00	
1991	**annual**	**16.57**	**0.00**	**2.12**	**543.87**	**507.18**	**36.69**	**0.00**	**48.35**	**50.72**				**556.21**
1992	Oct	2.44	0.00	0.08	21.55	21.55	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1992	Nov	0.85	0.00	0.01	3.42	3.42	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1992	Dec	2.15	0.00	0.11	29.46	29.46	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1992	Jan	1.70	0.00	0.12	30.81	30.81	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1992	Feb	7.56	0.00	1.57	402.92	402.92	0.00	0.00	1.82	0.00	0.00	0.00	0.00	
1992	Mar	5.28	0.00	1.28	329.94	37.84	292.10	0.00	3.09	54.82	237.27	3.73	195.66	
1992	Apr	1.27	20.71	0.30	72.93	0.00	93.64	0.00	4.68	85.69	245.22	3.83	199.84	
1992	May	0.00	0.00	0.04	10.23	0.00	10.23	0.00	6.17	105.50	149.95	2.68	147.09	
1992	Jun	1.12	13.73	0.02	4.03	0.00	17.76	0.00	6.89	90.31	77.40	1.72	98.72	
1992	Jul	0.00	0.00	0.00	0.02	0.00	0.02	0.00	7.12	58.56	18.86	0.80	47.59	
1992	Aug	0.00	0.00	0.01	2.32	0.00	2.32	0.00	6.45	28.58	0.00	0.00	0.00	
1992	Sep	0.04	0.00	0.02	4.40	0.00	4.40	0.00	4.94	4.71	0.00	0.00	0.00	
1992	**annual**	**22.40**	**34.44**	**3.57**	**912.03**	**526.00**	**420.46**	**0.00**	**48.35**	**428.17**				**938.73**
1993	Oct	2.71	0.00	0.07	19.02	19.02	0.00	0.00	3.36	0.00	0.00	0.00	0.00	
1993	Nov	0.40	0.00	0.01	2.77	2.77	0.00	0.00	1.69	0.00	0.00	0.00	0.00	
1993	Dec	6.26	0.00	0.65	167.50	167.50	0.00	0.00	1.08	0.00	0.00	0.00	0.00	
1993	Jan	10.25	0.00	7.14	1834.87	336.71	1498.16	0.00	1.08	34.86	1463.30	9.35	383.94	
1993	Feb	5.27	168.61	5.11	1150.14	0.00	1318.75	232.05	1.82	74.29	2475.71	14.11	484.78	
1993	Mar	2.06	83.02	1.13	245.45	0.00	328.47	254.18	3.09	126.52	2423.48	13.86	480.23	
1993	Apr	0.63	25.33	0.26	55.43	0.00	80.76	0.00	4.68	189.82	2314.42	13.35	470.60	
1993	May	1.15	45.10	0.10	22.54	0.00	67.64	0.00	6.17	245.09	2136.96	12.51	454.42	
1993	Jun	0.80	30.29	0.07	15.56	0.00	45.85	0.00	6.89	263.20	1919.62	11.49	433.49	
1993	Jul	0.00	0.00	0.05	10.42	0.00	10.42	0.00	7.12	257.71	1672.32	10.33	407.73	
1993	Aug	0.00	0.00	0.03	5.84	0.00	5.84	0.00	6.45	219.36	1458.81	9.33	383.40	
1993	Sep	0.00	0.00	0.01	2.43	0.00	2.43	0.00	4.94	157.92	1303.31	8.59	364.26	
1993	**annual**	**29.53**	**352.36**	**14.63**	**3531.95**	**526.00**	**3358.31**	**486.23**	**48.35**	**1568.78**				**4332.68**

APPENDIX D: LONG-TERM (50YR) WATER BUDGET, HISTORIC DATA
2550 ac-ft. Capacity

water year	month	precip. (P) (in.)	direct mo. precip. (ac-ft.)	runoff (in.)	runoff (ac-ft.)	diversion/ storage (ac-ft.)	SUPPLY to lake (ac-ft.)	SPILL VOL. (ac-ft.)	lake evap. (E) (in.)	lake evap. (E) (ac-ft.)	VOL. (2) of lake (ac-ft)	STAGE(2) of lake (ft.)	AREA (2) of lake surface (acres)	SUPPLY to Roche prop. (ac-ft.)
1994	Oct	1.63	49.48	0.02	4.90	4.90	49.48	0.00	3.36	103.58	1249.21	8.34	357.40	
1994	Nov	2.94	87.56	0.09	19.73	19.73	87.56	0.00	1.69	52.02	1284.75	8.51	361.89	
1994	Dec	2.46	74.19	0.16	36.25	36.25	74.19	0.00	1.08	33.35	1325.59	8.70	367.08	
1994	Jan	2.38	72.80	0.14	32.33	32.33	72.80	0.00	1.08	33.79	1364.60	8.88	371.96	
1994	Feb	4.45	137.94	1.08	244.69	244.69	137.94	0.00	1.82	58.77	1443.77	9.25	381.61	
1994	Mar	0.29	9.22	0.15	34.07	34.07	9.22	0.00	3.09	98.58	1354.41	8.83	370.69	
1994	Apr	1.29	39.85	0.05	12.33	12.33	39.85	0.00	4.68	146.33	1247.93	8.34	357.25	
1994	May	1.21	36.02	0.08	18.16	0.00	54.18	0.00	6.17	187.24	1114.87	7.75	340.54	
1994	Jun	0.04	1.14	0.04	9.27	0.00	10.41	0.00	6.89	196.18	929.10	6.94	315.56	
1994	Jul	0.00	0.00	0.01	3.17	0.00	3.17	0.00	7.12	187.42	744.85	6.13	288.72	
1994	Aug	0.00	0.00	0.00	0.75	0.00	0.75	0.00	6.45	155.15	590.45	5.45	264.51	
1994	Sep	0.00	0.00	0.00	0.51	0.00	0.51	0.00	4.94	108.90	482.05	4.97	246.51	
1994	**annual**	**16.69**	**508.20**	**1.84**	**416.16**	**384.30**	**540.06**	**0.00**	**48.35**	**1361.32**				**483.38**
1995	Oct	1.20	24.65	0.03	7.43	7.43	24.65	0.00	3.36	70.09	436.62	4.77	238.71	
1995	Nov	7.21	143.42	0.42	98.44	98.44	143.42	0.00	1.69	37.10	542.94	5.24	256.73	
1995	Dec	3.22	68.89	0.38	89.51	89.51	68.89	0.00	1.08	24.07	587.76	5.43	264.07	
1995	Jan	16.31	358.92	13.76	3232.38	330.61	3260.69	1298.44	1.08	44.12	2505.88	14.25	487.39	
1995	Feb	1.00	40.62	2.18	472.38	0.00	513.00	468.87	1.82	74.29	2475.71	14.11	484.78	
1995	Mar	11.98	483.97	10.41	2255.83	0.00	2739.80	2665.51	3.09	126.52	2423.48	13.86	480.23	
1995	Apr	1.35	54.03	0.59	127.22	0.00	181.25	54.73	4.68	191.36	2358.64	13.55	474.53	
1995	May	1.89	74.74	0.17	37.75	0.00	112.48	0.00	6.17	249.09	2222.03	12.91	462.27	
1995	Jun	0.43	16.56	0.11	23.27	0.00	39.83	0.00	6.89	267.34	1994.53	11.84	440.86	
1995	Jul	0.00	0.00	0.07	15.00	0.00	15.00	0.00	7.12	262.33	1747.20	10.68	415.78	
1995	Aug	0.00	0.00	0.05	11.65	0.00	11.65	0.00	6.45	224.00	1534.85	9.68	392.31	
1995	Sep	0.00	0.00	0.03	6.68	0.00	6.68	0.00	4.94	161.78	1379.74	8.95	373.83	
1995	**annual**	**44.59**	**1265.80**	**28.20**	**6377.55**	**526.00**	**7117.35**	**4487.55**	**48.35**	**1732.10**				**11898.25**
1996	Oct	0.00	0.00	0.02	3.70	3.70	0.00	0.00	3.36	104.52	1275.23	8.46	360.56	
1996	Nov	0.28	8.41	0.00	1.01	1.01	8.41	0.00	1.69	51.07	1232.57	8.27	355.37	
1996	Dec	9.10	269.49	0.93	211.49	211.49	269.49	0.00	1.08	34.90	1467.16	9.36	384.39	
1996	Jan	5.58	178.74	2.08	468.59	309.80	337.53	0.00	1.08	37.89	1766.80	10.77	417.85	
1996	Feb	8.04	279.96	5.79	1285.54	0.00	1565.50	782.30	1.82	74.29	2475.71	14.11	484.78	
1996	Mar	2.54	102.61	2.31	500.82	0.00	603.43	529.14	3.09	126.52	2423.48	13.86	480.23	
1996	Apr	3.40	136.07	0.49	106.59	0.00	242.66	116.14	4.68	191.36	2358.64	13.55	474.53	
1996	May	2.37	93.72	0.16	34.90	0.00	128.62	0.00	6.17	249.81	2237.45	12.99	463.67	
1996	Jun	0.00	0.00	0.07	14.53	0.00	14.53	0.00	6.89	266.82	1985.16	11.80	439.95	
1996	Jul	0.00	0.00	0.04	9.81	0.00	9.81	0.00	7.12	261.49	1733.48	10.62	414.32	
1996	Aug	0.00	0.00	0.02	4.81	0.00	4.81	0.00	6.45	222.83	1515.45	9.59	390.06	
1996	Sep	0.10	3.25	0.01	2.70	0.00	5.95	0.00	4.94	160.83	1360.58	8.86	371.46	
1996	**annual**	**31.41**	**1072.25**	**11.93**	**2644.50**	**526.00**	**3190.75**	**1427.58**	**48.35**	**1782.34**				**4562.72**
1997	Oct	1.01	31.26	0.01	2.52	2.52	31.26	0.00	3.36	104.93	1286.91	8.52	362.16	
1997	Nov	2.73	82.39	0.12	27.03	27.03	82.39	0.00	1.69	52.59	1316.71	8.66	365.96	
1997	Dec	10.82	329.98	3.14	710.65	496.45	544.17	0.00	1.08	38.41	1822.47	11.03	423.64	
1997	Jan	8.65	305.38	9.17	2032.98	0.00	2338.36	1610.83	1.08	44.12	2505.88	14.25	487.39	
1997	Feb	0.48	19.50	0.83	179.22	0.00	198.72	154.60	1.82	74.29	2475.71	14.11	484.78	
1997	Mar	0.60	24.24	0.13	28.09	0.00	52.33	0.00	3.09	126.03	2402.00	13.76	478.35	
1997	Apr	0.58	23.28	0.06	13.21	0.00	36.49	0.00	4.68	187.60	2250.89	13.05	464.89	
1997	May	0.38	14.72	0.04	7.86	0.00	22.58	0.00	6.17	240.12	2033.36	12.03	444.62	
1997	Jun	0.25	9.36	0.04	9.48	0.00	18.84	0.00	6.89	256.17	1796.03	10.91	420.91	
1997	Jul	0.00	0.00	0.07	14.68	0.00	14.68	0.00	7.12	250.54	1560.18	9.80	395.22	
1997	Aug	1.04	34.25	0.08	18.64	0.00	52.89	0.00	6.45	215.50	1397.56	9.04	376.02	
1997	Sep	0.20	6.27	0.01	2.43	0.00	8.70	0.00	4.94	155.20	1251.06	8.35	357.63	
1997	**annual**	**26.75**	**880.62**	**13.70**	**3046.80**	**526.00**	**3401.43**	**1765.43**	**48.35**	**1745.51**				**5365.09**