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J. Kevin Ward, E.A.

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State Revolving Fund Workshops
Request for Statements of Qualifications for Water Research Study Priority Topic on Drought Management
Deadline December 14, 2007
Request for Applications for Regional Water and Wastewater Facility Planning
Deadline December 20, 2007
Request for Applications for Flood Protection Planning
Deadline January 4, 2008
Flood Mitigation & The NFIP
Texas Rain Catcher Award
2005 Regional Water Use Estimates
Water Conservation Advisory Council
2007 State Water Plan (adopted 11/14/06)
Environmental Flows Advisory Committee
Request for Proposals Groundwater Quality Analysis
Urban Growth and Barnett Shale Development in the Northern Trinity Aquifer
Reservoir Site Protection Study
Innovative Water Technologies website
Texas Instream Flow Program
Historical Water Use Information
Drought information
Customer Survey
2006 Adopted Regional Water Plans

### Hot off the Press

80th Legislative Session Wrap Up Report
Groundwater Resource Evaluation and GAM of the Gulf Coast Aquifer
Assessment of Water Conservation in Texas
Rainwater Harvesting
Evaluation Committee Final Report
Seawater Desalination Biennial Report
TGIC 2006 Biennial Report
Water Conservation Brochures
Legislative Appropriations Request FY08-09
TWDB Strategic Plan FY07-11
News Wire - TWDB Press Releases
Texas Manual on Rainwater Harvesting
*Water for Texas* Newsletter, Fall 2007

### Updates

## Calendar of ... 27, 2007

**» Events for today:**
**2007 STORET/WQX User Conference**
Presentation: No Event Description
Place: Austin, TX
**State Revolving Fund IUP Technical Asst. Workshop**
**10:00AM**
Workshop: No Event Description
Place: San Antonio Water System, 2800 US Hwy. 281 N., Customer Service Bldg. - San Antonio, TX
Sponsor: TWDB
Contact: Lana Dixon 512-463-0991, lana.dixon@twdb.state.tx.us

**» Next upcoming event:**
**2007 Texas Water Summit**
Event Date: 12/2/2007
Presentation: Sponsored by the TWDB. More information soon available.
Place: H. B. Gonzalez Convention Center - San Antonio, TX
Sponsor: TWDB
Contact: Lisa Glenn 463-8482

<< November* >>

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| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
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Stephen F. Austin Bldg.
P.O. Box 13231
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J. Kevin Ward, E.A.



# TWDB DATA

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# SURFACE WATER

Lake Volumetric Surveys - Index to completed Lake Volumetric Surveys.

Lake Evaporation Monitoring - Search tool for Lake Evaporation and **Precipitation** Data for one-degree quadrangles that cover the entire state.

Texas Water Conditions Report - Monthly TWDB publications on 77 selected reservoirs, streamflow gaging data for 24 stations, and groundwater levels in selected water wells.

Biweekly Drought Summary Report

Comprehensive Surface Water Information - Statewide surface water database, links and map tool.

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Page maintained by:
Dale Crockett, Program Specialist-Surface Water Section
Telephone (512) 936-0844, FAX (512) 936-0816
email: dcrocket@twdb.state.tx.us

# RESERVOIR VOLUMETRIC SURVEYS



## History and Overview

In 1991, the Texas Legislature authorized the Texas Water Development Board to develop a non-profit, self-supporting, reservoir (lake) volumetric survey program to provide a quick, accurate, and affordable surveying method to determine current reservoir storage capacities. Storage volumes for many Texas reservoirs were originally obtained by analyzing available topographic maps, and many reservoirs have not been resurveyed in the decades since their construction, some since before the 1950's. Because sediment deposition constantly reduces reservoir volumes over time, and because the original reservoir volumes were limited by the accuracy of existing topographic maps, estimates of the current capacities for un-surveyed reservoirs are subject to error. With population and statewide water use increasing, water shortages are a real possibility in places where storage capacities are significantly less than what is assumed.

Since 1993, the Surface Water Section of the TWDB has completed surveys of approximately 100 reservoirs. Fifty-two of the 77 major water-supply reservoirs in the state have been surveyed by TWDB. A list of priority reservoirs has been compiled based on the reservoir's use and on the date the reservoir was last surveyed.

A standard volumetric survey report is generated typically within three months of the completion of the field survey. Included in the report are updated elevation-area-capacity tables, bathymetric contour maps, and survey cross-sections. Sample products obtained from the Board's 1997 survey for Lake Tawakoni are available on-line for viewing.

The program utilizes the latest satellite surveying technology (GPS), differential global positioning system (DGPS) and acoustic depth sounder for data-collection, and geographic information system (GIS) software for data-processing.

Many interested parties in the past were unable to afford reservoir surveys due to the high cost of traditional methods. With the use of newer and more efficient methods, survey costs are now significantly lower than in the past. In addition, assistance is available through the U. S. Army Corps of Engineers [Planning Assistance to States (Section 22)] to qualifying reservoir owners. Survey charges vary according to the surface area of the lake and other considerations.

Updated elevation-area-capacity tables and other products generated by the Board's survey program are used by engineering firms and planners to determine reservoir yield, by TWDB and USGS in reporting statewide reservoir


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# RESERVOIR VOLUMETRIC SURVEYS

History and Overview | Completed Surveys/Data | Sample Products
Surveying Technology | Survey Charges | Priority Reservoirs
Contact / Get Your Reservoir Surveyed

## Completed Surveys and Data

The reservoirs (lakes) listed in the table below have been surveyed by the Texas Water Development Board since 1993. Information regarding conservation storage capacities before and after the surveys is provided. Descriptions of the raw data, ESRI Arc/Info TIN files, and some AutoCad DXF files are now available.

Data may be downloaded by clicking on the reservoir name which will lead to the folder of the particular reservoir selected. Linking to http://www.twdb.state.tx.us/hydro_survey will provide a directory of all the reservoirs.

Data Information Contact

| Reservoir Name | TWDB Survey Date | Conservation Storage Capacity (Acre-Feet) | Last Prior Survey Date | Percent Change in Storage Capacity Since Last Survey |
|---|---|---|---|---|
| White River Lake (1st Survey) | March 1993 | 29,880 | 1971 | -29.1% |
| Miller's Creek Reservoir | March 1993 | 27,888 | 1983 | -5.0% |
| White Rock Lake | March 1993 | 9,004 | 1970 | -16.2% |
| Choke Canyon Reservoir | March 1993 | 695,271 | 1982 | -0.6% |
| Lake Limestone | May 1993 | 215,748 | 1979 | -4.3% |
| Lake Nasworthy | September 1993 | 9,615 | 1948 | -18.4% |
| Lake Granbury | October 1993 July 2003 | 136,823 | 1966 | -10.2% |
| Lake Fort Phantom Hill | November 1993 | 70,036 | 1937 | -5.7% |
| Proctor Lake | December 1993 | 55,588 | 1960 | -6.4% |
| Lake Houston | February 1994 | 128,863 | 1965 | -0.7% |
| Lake Nacgodoches | March 1994 | 39,523 | 1976 | -6.6% |
| Possum Kingdom Reservoir | June 1994 | 556,220 | 1974 | -2.5% |
| | August 1994 | 38,785 | 1980 | -2.9% |

| | | | | |
|---|---|---|---|---|
| Lake Arlington | | | | |
| Belton Lake | September 1994<br>May 2003 | 434,500 | 1966 | -1.7% |
| Richland-Chambers Reservoir | October 1994 | 1,136,600 | 1985 | -3.8% |
| Waco Lake | January 1995 | 144,830 | 1970 | -2.9% |
| Cedar Creek Reservoir | February 1995 | 637,180 | 1966 | -6.2% |
| Stillhouse Hollow Lake | April 1995 | 226,063 | 1968 | -4.1% |
| Lake Georgetown | May 1995 | 37,010 | 1980 | -0.2% |
| Lake Meredith | June 1995 | 779,560 | 1980 | -2.5% |
| Medina Lake | July 1995 | 254,843 | 1912 | +0.3% |
| Granger Lake | October 1995 | 54,280 | 1980 | -17.1% |
| Aquilla Lake | October 1995 | 45,962 | 1983 | -12.3% |
| Somerville Lake | November 1995<br>July 2003 | 155,062 | 1967 | -3.2% |
| Lake Conroe | March 1996 | 416,228 | 1970 | -3.3% |
| Lake Mexia | May 1996 | 4,806 | 1960 | -51.9% |
| White River Lake (2nd Survey) | July 1996 | 31,537 | 1993 | -1.0% |
| Spring Lake | August 1996 | 84 | 1849 | -44.0% |
| Cherokee Lake | October 1996<br>November 2003 | 39,023 | 1986 | 4.3% |
| Lake Striker | December 1996 | 22,865 | 1957 | -15.2% |
| Lake Kurth | December 1996 | 14,769 | 1961 | -8.8% |
| Wright Patman Reservoir | January 1997 | 110,900 | 1956 | -23.7% |
| Hubbard Creek Reservoir | February 1997 | 318,070 | 1963 | +2.3% |
| Lake Tawakoni | April 1997 | 888,140 | 1960 | -5.1% |
| Lake Brownwood | April 1997 | 131,428 | 1933 | -12.3% |
| Squaw Creek Reservoir | May 1997 | 151,030 | 1977 | -0.0% |
| New Terrell City Lake | May 1997 | 8,594 | 1955 | -1.4% |
| Lake Tyler | June 1997 | 73,260 | 1968 | -0.9% |
| Benbrook Lake | January 1998 | 85,648 | 1945 | -3.0% |
| Lake Pat Cleburne | January 1998 | 25,730 | 1958 | -0.7% |
| Lake Athens | January 1998 | 29440 | 1962 | -10% |
| Lake Bob Sandlin | February 1998 | 200,579 | 1978 | -5% |
| Lake Monticello | February 1998 | 34,740 | 1972 | -13% |
| Lake Graham | April 1998 | 45,260 | 1952 | -16% |
| Lake Weatherford | April 1998 | 18,650 | 1973 | -12% |
| Lake Cypress Springs | April 1998 | 67,690 | 1952 | -7% |
| Lake O' The Pines | October 1998 | 238,933 | 1959 | -6% |
| Lake Murvaul | November 1998 | 38,284 | 1958 | -16% |
| Houston County Lake | January 1999 | 17,113 | 1966 | -12% |
| Lake Halbert | February 1999 | 6,033 | 1950 | -19% |
| Bardwell Lake | February 1999 | 46,122 | 1962 | -14% |

| | | | | |
|---|---|---|---|---|
| Town Lake | March 1999 | 6,248 | 1992 | -8% |
| Lake Austin | May 1999 | 21,725 | 1939 | 3% |
| Martin Lake | May 1999 | 75,116 | 1971 | 8% |
| Fairfield Lake | May 1999 | 44,169 | 1968 | -6% |
| Hubert H. Moss Lake | May 1999 | 24,058 | 1961 | 4% |
| E. V. Spence Reservoir | June 1999 | 517,272 | 1962 | 6% |
| Lake Stamford | July 1999 | 51,570 | 1950 | 18% |
| Lake J. B. Thomas | November 1999 | 199,931 | 1950 | -1% |
| Lake Gladewater | February 2000 | 4,637 | 1951 | -28% |
| Lake Bridgeport | April 2000 | 366,236 | 1988 | -2.3% |
| Eagle Mountian Lake | April 2000 | 182,500 | 1988 | 2.3% |
| Lake Waxahachie | July 2000 | 10,779 | 1945 | -10% |
| Lake Texana | August 2000 | 153,246 | 1991 | -1% |
| Canyon Lake | October 2000 | 378,781 | 1972 | -1% |
| Lake Fork | January 2001 | 604,927 | 1986 | -5% |
| Lake Kickapoo | April 2001 | 85,825 | 1945 | -19% |
| Lake Worth | May 2001 | 24,500 | 1969 | -34% |
| Lake Arrowhead | June 2001 | 235,997 | 1969 | -10% |
| Lake Nocona | July 2001 | 21,445 | 1960 | -14% |
| Welsh Reservoir | November 2001 | 18,431 | 1975 | -14% |
| Lake Corpus Christi Reservoir | January 2002 | 256,961 | 1988 | -4% |
| Grapevine Lake | May 2002 | 147,042 | 1966 | -9% |
| Lake Texoma | June 2002 | 1,467,283 | 1985 | -7% |
| Lake Copan (OK) | September 2002 | 33,887 | 1983 | -21% |
| Hulah Reservoir (OK) | September 2002 | 22,553 | 1973 | -28% |
| B.A. Steinhagen Lake | May 2003 | 66,962 | 1960 | -35% |
| Lake Crook | June 2003 | 9,195 | 1956 | -7.6% |
| Lake Palestine | June 2003 | 370,907 | 1989 | 3% |
| Hugo Lake(OK) | August 2003 | 118,850 | 1985 | -11.2% |
| Lake Bonham | March 2004 | 11,026 | 1969 | -7% |

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# VOLUMETRIC SURVEY
# OF
# SQUAW CREEK RESERVOIR

Prepared for:

**BRAZOS RIVER AUTHORITY AND TEXAS UTILITIES**

Prepared by:

**The Texas Water Development Board**

March 10, 2003

# Texas Water Development Board

**Craig D. Pedersen, Executive Administrator**



This report was prepared by the Hydrographic Survey group:

Scot Sullivan, P.E.
Duane Thomas
Erika Boghici
Wayne Elliott
Priscilla Hays
For more information, please call (512) 936-0848

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## APPENDICES



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# SQUAW CREEK RESERVOIR
# HYDROGRAPHIC SURVEY REPORT

## INTRODUCTION

Staff of the Hydrographic Survey Unit of the Texas Water Development Board (TWDB) conducted a hydrographic survey of Squaw Creek Reservoir during the period May 6 - 15, 1997. The purpose of the survey was to determine the capacity of the lake at the conservation pool elevation. In addition, the survey was to determine the amount of water stored behind the mini-dam for emergency purposes in the Squaw Creek Safe Shutdown Impoundment (SSI) facility. From this information, future surveys will be able to determine the location and rates of sediment deposition in the conservation pool over time. Survey results are presented in the following pages in both graphical and tabular form. All elevations presented in this report will be reported in feet above mean sea level based on the National Geodetic Vertical Datum of 1929 (NGVD '29) unless noted otherwise. The conservation pool elevation for Squaw Creek Reservoir is 775.0 feet. The original design information estimates the lake=s original surface area at this elevation to be 3,228 acres and the storage volume to be 151,047 acre-feet of water. The storage volume in the SSI facility was originally estimated at 558 acre feet with an area of 39.8 acres at elevation 775.0.

## HISTORY AND GENERAL INFORMATION OF THE RESERVOIR

Squaw Creek Dam and Reservoir are owned by Texas Utilities Electric Company and operated by Texas Utilities Generating Company. The reservoir is located on Squaw Creek in Somervell and Hood Counties, approximately four miles north of Glen Rose (see Figure 1). Records indicate the drainage area is approximately 64 square miles. At the conservation pool elevation, the lake has approximately 36 miles of shoreline and is five miles long. The widest point of the reservoir is approximately two miles (located about 0.40 miles upstream of the dam).

The Texas Water Commission issued Permit No. 2871 on September 11, 1973 to Dallas Power and Light Company, Texas Electric Service Company, Texas Power and Light Company and

Texas Utilities Services, Incorporated, Agent. This original permit authorized the permitees to construct a dam and reservoir on Squaw Creek having an impoundment capacity of 151,500 acre-feet of water. Permitees were also granted the right to construct a dam and reservoir (mini-reservoir ) on Panther Branch. The impoundment of this mini-reservoir was not to exceed 367 acre-feet of water and was to be included in the total capacity of 151,500 acre-feet of water in the main reservoir. Permitees were authorized to maintain the reservoirs with available waters from Squaw Creek and to divert supplemental water from Lake Granbury. The permitees were authorized to divert, circulate and recirculate water and to use consumptively, not to exceed, 20,780 acre-feet of water annually for industrial (condenser cooling) purposes. Authorization was granted to divert and use 2,400 acre-feet of water annually for ancillary purposes in the operation of the permitees= nuclear-fueled electric power generating plant. The permit was amended several times since it was granted. In November of 1982, the permitees, Dallas Power and Light Co., Texas Electric Service Co., and Texas Power and Light Co., merged into Texas Utilities Electric Co. In February of 1986, Certificate of Adjudication No. 12-4097 was issued by the Texas Water Commission. The certificate re-affirms the rights of Texas Utilities Electric Co. regarding the impoundment capacities and water uses stated in Permit 2871 for Squaw Creek Reservoir.

Records indicate the construction for Squaw Creek Dam began on November 17, 1974 and was completed on June 16, 1977. Freese and Nichols Consulting Engineers of Fort Worth designed the facility and Brown and Root, Inc., managed the construction project. Squaw Creek Dam and appurtenant structures consist of an earthfill embankment 4,360 feet in length with a maximum height of 159 feet and a crest elevation of 796.0 feet. The service spillway is an uncontrolled concrete ogee type located between the right (southwest) end of the embankment and abutment. The crest of the spillway is 100 feet in width at elevation 775.0 feet. The emergency spillway is an earthcut channel through bedrock located at the left abutment, northeast of the embankment. The width of the channel is 2,200 feet with a crest elevation of 783.0 feet. The service outlet structure consists of a concrete tower housing three gate-controlled outlets with invert elevations of 764.0 feet, 715.0 feet and 666.5 feet. The 30 inch diameter low-flow outlet has an invert elevation of 653.0 feet. All discharges from the outlet tower pass through a six foot diameter concrete encased conduit and are released downstream of the embankment.

Contained within Squaw Creek Reservoir, is a smaller reservoir. The smaller reservoir is designed to provide cooling water during an emergency situation to safely shutdown the Comanche Peak Steam Electric Station. This facility will be referred to as the mini-dam and the Squaw Creek Safe Shutdown Impoundment (SSI) facility. The mini-dam is located on Panther Branch, a tributary of Squaw Creek. The dam is composed of an earthfill embankment, approximately 1,520 feet in length. The maximum height of the embankment is 70 feet above the natural streambed. The 40 feet wide crest is at elevation 796.0 feet. The service/emergency spillway is a 40 feet wide by 400 feet long earthcut channel connecting the SSI facility to the main reservoir. This ingress/egress channel, located to the right (south) of the mini-dam, is also referred to as the equalization channel for the two reservoirs. The flow of water between the two reservoirs is controlled by a three feet tall by three feet wide concrete weir that extends the width of the channel with a flowline elevation of 769.5 feet.

## HYDROGRAPHIC SURVEYING TECHNOLOGY

The following sections will describe the theory behind Global Positioning System (GPS) technology and its accuracy. Equipment and methodology used to conduct the subject survey and previous hydrographic surveys are also addressed.

### GPS Information

The following is a brief and simple description of Global Positioning System (GPS) technology. GPS is a relatively new technology that uses a network of satellites, maintained in precise orbits around the earth, to determine locations on the surface of the earth. GPS receivers continuously monitor the broadcasts from the satellites to determine the position of the receiver. With only one satellite being monitored, the point in question could be located anywhere on a sphere surrounding the satellite with a radius of the distance measured. The observation of two satellites decreases the possible location to a finite number of points on a circle where the two spheres intersect. With a third satellite observation, the unknown location is reduced to two points where all three spheres intersect. One of these points is obviously in error because its location is in space, and it is ignored. Although three satellite measurements can fairly accurately locate a point on the earth, the minimum number of satellites required to determine a three dimensional position within the required accuracy is four. The fourth measurement compensates for any time discrepancies between the clock on board the satellites and the clock within the GPS receiver.

GPS technology was developed in the 1960's by the United States Air Force and the defense establishment. After program funding in the early 1970's, the initial satellite was launched on February 22, 1978. A four year delay in the launching program occurred after the Challenger space shuttle disaster. In 1989, the launch schedule was resumed. Full operational capability was reached on April 27, 1995 when the NAVSTAR (NAVigation System with Time And Ranging) satellite constellation was composed of 24 Block II satellites. Initial operational capability, a full constellation of 24 satellites, in a combination of Block I (prototype) and Block II satellites, was achieved December 8, 1993. The NAVSTAR satellites provide data based on the World Geodetic System (WGS '84) spherical datum. WGS '84 is essentially identical to the 1983 North American Datum (NAD '83).

The United States Department of Defense (DOD) is currently responsible for implementing and maintaining the satellite constellation. In an attempt to discourage the use of these survey units as a guidance tool by hostile forces, the DOD has implemented means of false signal projection called Selective Availability (S/A). Positions determined by a single receiver when S/A is active result in errors to the actual position of up to 100 meters. These errors can be reduced to centimeters by performing a static survey with two GPS receivers, one of which is set over a point with known coordinates. The errors induced by S/A are time-constant. By monitoring the movements of the satellites over time (one to three hours), the errors can be minimized during post processing of the collected data and the unknown position computed accurately.

Differential GPS (DGPS) can determine positions of moving objects in real-time or "on-the-fly." In the early stages of this program, one GPS receiver was set up over a benchmark with known coordinates established by the hydrographic survey crew. This receiver remained stationary during the survey and monitored the movements of the satellites overhead. Position corrections were determined and transmitted via a radio link once per second to another GPS receiver located on the moving boat. The boat receiver used these corrections, or differences, in combination with the satellite information it received to determine its differential location. The large positional errors experienced by a single receiver when S/A is active are greatly reduced by utilizing DGPS. The reference receiver calculates satellite corrections based on its known fixed position, which results in positional accuracies within three meters for the moving receiver. DGPS was used to determine horizontal position only. Vertical information was supplied by the depth sounder.

The need for setting up a stationary shore receiver for current surveys has been eliminated with the development of fee-based reference position networks. These networks use a small network of GPS receivers to create differential corrections for a large network of transmitting stations, Wide Area Differential GPS (WADGPS). The TWDB receives this service from ACCQPOINT, a WADGPS correction network over a FM radio broadcast. A small radio receiver purchased from ACCQPOINT, collects positional correction information from the closest broadcast station and provides the data to the GPS receiver on board the hydrographic surveying boat to allow the position to be differentially corrected.

**Equipment and Methodology**

The equipment used in the performance of the hydrographic survey consisted of a 23-foot aluminum tri-hull SeaArk craft with cabin, equipped with twin 90-Horsepower Johnson outboard motors. Installed within the enclosed cabin are an Innerspace Helmsman Display (for navigation), an Innerspace Technology Model 449 Depth Sounder and Model 443 Velocity Profiler, a Trimble Navigation, Inc. 4000SE GPS receiver, an ACCQPOINT FM receiver, and an on-board 486 computer. Power was provided by a water-cooled generator through an in-line uninterruptible power supply. Reference to brand names does not imply endorsement by the TWDB.

The GPS equipment, survey vessel, and depth sounder combine together to provide an efficient hydrographic survey system. As the boat travels across the lake surface, the depth sounder gathers approximately ten readings of the lake bottom each second. The depth readings are stored on the survey vessel's on-board computer along with the corrected positional data generated by the boat's GPS receiver. The daily data files collected are downloaded from the computer and brought to the office for editing after the survey is completed. During editing, bad data is removed or corrected, multiple data points are averaged to get one data point per second, and average depths are converted to elevation readings based on the daily recorded lake elevation on the day the survey was performed. Accurate estimates of the lake volume can be quickly determined by building a 3-D model of the reservoir from the collected data. The level of accuracy is equivalent to or better than previous methods used to determine lake volumes, some of which are discussed below.

**Previous Survey Procedures**

Originally, reservoir surveys were conducted with a rope stretched across the reservoir along pre-determined range lines. A small boat would manually pole the depth at selected intervals along the rope. Over time, aircraft cable replaced the rope and electronic depth sounders replaced the pole. The boat was hooked to the cable, and depths were again recorded at selected intervals. This method, used mainly by the Soil Conservation Service, worked well for small reservoirs.

Larger bodies of water required more involved means to accomplish the survey, mainly due to increased size. Cables could not be stretched across the body of water, so surveying instruments were utilized to determine the path of the boat. Monumentation was set for the end points of each line so the same lines could be used on subsequent surveys. Prior to a survey, each end point had to be located (and sometimes reestablished) in the field and vegetation cleared so that line of sight could be maintained. One surveyor monitored the path of the boat and issued commands via radio to insure that it remained on line while a second surveyor determined depth measurement locations by turning angles. Since it took a major effort to determine each of the points along the line, the depth readings were spaced quite a distance apart. Another major cost was the land surveying required prior to the reservoir survey to locate the range line monuments and clear vegetation.

Electronic positioning systems were the next improvement. If triangulation could determine the boat location by electronic means, then the boat could take continuous depth soundings. A set of microwave transmitters positioned around the lake at known coordinates would allow the boat to receive data and calculate its position. Line of site was required, and the configuration of the transmitters had to be such that the boat remained within the angles of 30 and 150 degrees with respect to the shore stations. The maximum range of most of these systems was about 20 miles. Each shore station had to be accurately located by survey, and the location monumented for future use. Any errors in the land surveying resulted in significant errors that were difficult to detect. Large reservoirs required multiple shore stations and a crew to move the shore stations to the next location as the survey progressed. Land surveying remained a major cost with this method.

More recently, aerial photography has been used prior to construction, to generate elevation contours from which to calculate the volume of the reservoir. Fairly accurate results could be obtained, although the vertical accuracy of the aerial topography was generally one-half of the contour interval or ± five feet for a ten-foot contour interval. This method could be quite costly and was only applicable in areas that were not inundated.

## PRE-SURVEY PROCEDURES

The reservoir's surface area was determined prior to the survey by digitizing with AutoCad software the lake's pool boundary (elevation 775.0) from a Jones and Boyd, Inc., 1" = 1,000 feet, work map of the newly formed reservoir and 1987 sedimentation range lines. The work map was created from 7.5 minute USGS quadrangle maps, ANemo,≅ and AHill City.≅ The graphic boundary file created was then transformed into the proper datum, from NAD '27 datum to NAD '83, using Environmental Systems Research Institutes's (ESRI) Arc/Info project command with the NADCOM (standard conversion method within the United States) parameters. The area of the lake boundary was checked to verify that the area was the same in both datums.

The survey layout was designed by placing survey track lines at 500 foot intervals across the lake. The survey design for this lake required approximately 150 survey lines to be placed along the length of the lake. Survey setup files were created using Coastal Oceangraphics, Inc. Hypack software for each group of track lines that represented a specific section of the lake. The setup files were copied onto diskettes for use during the field survey.

## SURVEY PROCEDURES

The following procedures were followed during the hydrographic survey of Squaw Creek Reservoir performed by the TWDB. Information regarding equipment calibration and operation, the field survey, and data processing is presented.

### Equipment Calibration and Operation

At the beginning of each surveying day, the depth sounder was calibrated with the Innerspace Velocity Profiler. The Velocity Profiler calculates an average speed of sound through the water column of interest for a designated draft value of the boat (draft is the vertical distance that the boat penetrates the water surface). The draft of the boat was previously determined to average 1.2 ft. The velocity profiler probe is placed in the water to moisten and acclimate the probe. The probe is then raised to the water surface where the depth is zeroed. The probe is lowered on a cable to just below the maximum depth set for the water column, and then raised to the surface. The unit displays an average speed of sound for a given water depth and draft, which is entered into the depth sounder. The depth value on the depth sounder was then checked manually with a measuring tape to ensure that the depth sounder was properly calibrated and operating correctly. During the survey of Squaw Creek Reservoir, the speed of sound in the water column varied daily between 4806 and 4966 feet per second. Based on the measured speed of sound for various depths, and the average speed of sound calculated for the entire water column, the depth sounder is accurate to within $\pm$0.2 feet, plus an estimated error of $\pm$0.3 feet due to the plane of the boat for a total accuracy of $\pm$0.5 feet for any instantaneous reading. These errors tend to be minimized over the entire survey, since some are positive readings and some are negative readings. Further information on these calculations is presented in Appendix A.

During the survey, the onboard GPS receiver was set to a horizontal mask of 10° and a PDOP (Position Dilution of Precision) limit of 7 to maximize the accuracy of horizontal positions. An internal alarm sounds if the PDOP rises above seven to advise the field crew that the horizontal position has degraded to an unacceptable level. The lake=s initialization file used by the Hypack data collection program was setup to convert the collected DGPS positions on-the-fly to state plane coordinates. Both sets of coordinates were then stored in the survey data file.

**Field Survey**

Data were collected at Squaw Creek Reservoir during the period of May 6 through May 15, 1997. Weather conditions were excellent with moderate temperatures and mild winds. Approximately 63,375 data points were collected over the 102 miles traveled along the pre-planned survey lines and the random data-collection lines. (Note: On October 9, 1997, 6,429 additional points were collected to clarify a questionable area within the lake.) These points were stored digitally on the boat's computer in 188 data files. Data were not collected in areas of shallow water (depths less than 3.0 feet) or with significant obstructions unless these areas represented a large amount of water. Random data lines were also collected parallel to the original stream bed in the main body of the lake. Extra data were collected in the SSI facility and on both sides of the mini-dam. Figure 2 shows the actual location of all data collection points.

TWDB staff observed many different distinct features above and below the water during the field survey. The land surface around the lake was generally rolling hills with some limestone cliffs along various portions of the south bank. Below the water, a rapid drop off of the lake bottom occurred to a depth of around 105 feet, as the boat traveled from south to north across the lake near the dam. The bottom was then fairly level as the boat traveled across the old river flood plain. Within this flood plain, the original river and creek channels were easily distinguishable on the depth sounder chart when they were crossed. Also noted within this flood plain, from the dam upstream about 1.5 miles to the power plant, were various borrow pits with water depths of over 125 feet. A steady upward slope occurred as the boat approached the north side of the lake, but the slope was not as severe as on the south side.

Navigational hazards such as standing trees, brush, submerged trees and stumps were encountered mostly upstream of Squaw Creek Park. Sediment deposits and aquatic vegetation were observed mainly in the upper reaches of the lake. The crew was able to collect data in these areas, but at a much slower pace. Data collection in the headwaters were discontinued when the boat could no longer cross the lake due to shallow water and extensive vegetation. The collected data were stored in individual data files for each pre-plotted range line or random data collection event. These files were downloaded to diskettes at the end of each day for future processing.

**Data Processing**

The collected data were down-loaded from diskettes onto the TWDB's computer network. Tape backups were made for future reference as needed. To process the data, the EDIT routine in the Hypack Program was run on each raw data file. Data points such as depth spikes or data with missing depth or positional information were deleted from the file. The depth information collected every 0.1 seconds was averaged to get one reading for each second of data collection. A correction for the lake elevation at the time of data collection was also applied to each file during the EDIT routine. During the survey, the water surface varied between 775.02 and 775.62 feet. After all changes had been made to the raw data file, the edited file was saved with a different extension. The edited files were combined into a single X,Y,Z data file, representative of the lake, to be used with the GIS software to develop a model of the lake's bottom surface.

The resulting data file was imported into the UNIX operating system used to run Environmental System Research Institutes's (ESRI) Arc/Info GIS software and converted to a MASS points file. The MASS points and the boundary file were then used to create a Digital Terrain Model (DTM) of the reservoir's bottom surface using Arc/Info's TIN software module. The module builds an irregular triangulated network from the data points and the boundary file. This software uses a method known as Delauney's criteria for triangulation. A triangle is formed between three non-uniformly spaced points, including all points along the boundary. If there is another point within the triangle, additional triangles are created until all points lie on the vertex of a triangle. All of the data points are preserved for use in determining the solution of the model by using this method. The generated network of three-dimensional triangular planes represents the actual bottom surface. Once the triangulated irregular network (TIN) is formed, the software then calculates elevations along the triangle surface plane by solving the equations for elevation along each leg of the triangle. Information for the entire reservoir area can be determined from the triangulated irregular network created using this method of interpolation.

If data points were collected outside the boundary file, the boundary was modified to include the data points. The boundary file in areas of significant sedimentation was also down-sized as deemed necessary based on the data points and the observations of the field crew. The resulting boundary shape was used to develop each of the map presentations of the lake in this report.

There were some areas where volume and area values could not be calculated by interpolation because of a lack of information within the reservoir. "Flat triangles" were drawn at these locations. Arc/Info does not use flat triangle areas in the volume or contouring features of the model. A review of these areas determined them to be insignificant on Squaw Creek Reservoir. Therefore no additional points were required to be added to the data file for interpolation and contouring of the entire lake surface. Volumes and areas were calculated from the TIN for the entire reservoir at one-tenth of a foot intervals. The area of lake computed from the TIN, was calculated to be 3,297 surface acres. The computed area was 69 surface acres more than originally calculated in 1977. The computed reservoir volume table is presented in Appendix B and the area table in Appendix C. An elevation-area-volume graph is presented in Appendix D.

Other presentations developed from the model include a shaded relief map and a shaded depth range map. To develop these maps, the TIN was converted to a lattice using the TINLATTICE command and then to a polygon coverage using the LATTICEPOLY command. Using the POLYSHADE command, colors were assigned to the range of elevations represented by the polygons that varied from navy to yellow. The lower elevation was assigned the color of navy, and the 775.0 lake elevation was assigned the color of yellow. Different color shades were assigned to the intermediate depths. Figure 3 presents the resulting depth shaded representation of the lake. Figure 4 presents a similar version of the same map, using bands of color for selected depth intervals. The color increases in intensity from the shallow contour bands to the deep water bands.

Linear filtration algorithms were then applied to the DTM smooth cartographic contours versus using the sharp engineered contours. The resulting contour map of the bottom surface at two-foot intervals is presented in Figure 5.

## RESULTS

Results from the 1997 TWDB survey indicate Squaw Creek Reservoir encompasses 3,297 surface acres and contains a volume of 151,418 acre-feet at the conservation pool elevation of 775.0 feet. The shoreline at this elevation was calculated to be 36.14 miles. The deepest point of the lake, elevation 644.69 or 130.31 feet of depth, was located approximately 3,350 feet upstream from the center of the dam. The dead storage volume, or the amount of water below the lowest outlet in the dam, was calculated to be 51 acre-feet based on the low flow outlet invert elevation of 653.0 feet. The conservation storage capacity, or the amount of water between the spillway and the lowest outlet, is therefore calculated to be, 151,370 acre-feet.

Results of the survey of the mini-dam and SSI facility indicate that at elevation 775.0, the surface area is 53 acres and the storage capacity is 701 acre-feet.

## SUMMARY

Squaw Creek Reservoir was formed in 1977. Initial storage calculations estimated the volume at the conservation pool elevation of 775.0 feet to be 151,047 acre-feet with a surface area of 3,228 acres.

A sedimentation survey was performed in 1987 by Jones and Boyd, Inc., Consulting Engineers. Results from the survey indicated that the surface area of the lake was 3,189 acres, and the storage volume had decreased to 150,569 acre-feet.

During the period of May 6 - 15, 1997, a hydrographic survey of Squaw Creek Reservoir was performed by the Texas Water Development Board's Hydrographic Survey Program. The 1997 survey used technological advances such as differential global positioning system and geographical information system technology to build a model of the reservoir's bathemetry. These advances allowed a survey to be performed quickly and to collect significantly more data of the bathemetry of Squaw Creek Reservoir than previous survey methods. Results indicate that the lake's capacity at the conservation pool elevation of 775.0 feet was 151,418 acre-feet and the area was 3,297 acres. Within the lake, the survey determined that the Squaw Creek Safe Shutdown Impoundment held 701 acre-feet, spread over a surface area of 53 acres. The total capacity of Squaw Creek Reservoir was slightly higher (849 acre-feet) than was determined by the 1987 sedimentation survey. This slight difference can be attributed to the amount of data collected by each survey. The 1987 survey collected data on 25 survey lines across the lake, while the 1997 survey collected data across 150 survey lines. The increased coverage of the 1997 survey made a significant change to the overall bottom profile of the lake versus the profile determined by the 1987 survey. While no estimates of sedimentation or sedimentation rates can be made from the two surveys due to the differences of each survey, the TWDB considers the 1997 survey to be a significant improvement over previous survey procedures and recommends that the same methodology be used in five to ten years or after major flood events to monitor changes to the lake's storage capacity.

# CALCULATION OF DEPTH SOUNDER ACCURACY

This methodology was extracted from the Innerspace Technology, Inc. Operation Manual for the Model 443 Velocity Profiler.

For the following examples, $t = (D - d)/V$

where: $t_D$ = travel time of the sound pulse, in seconds (at depth = D)
D = depth, in feet
d = draft = 1.2 feet
V = speed of sound, in feet per second

To calculate the error of a measurement based on differences in the actual versus average speed of sound, the same equation is used, in this format:

$$D = [t(V)]+d$$

For the water column from 2 to 30 feet: V = 4832 fps

$t_{30} = (30-1.2)/4832$
$= 0.00596$ sec.

For the water column from 2 to 45 feet: V = 4808 fps

$t_{45} =(45-1.2)/4808$
$=0.00911$ sec.

For a measurement at 20 feet (within the 2 to 30 foot column with V = 4832 fps):

$D_{20} = [((20-1.2)/4832)(4808)]+1.2$
= 19.9' (-0.1')

For a measurement at 30 feet (within the 2 to 30 foot column with V = 4832 fps):

$D_{30} = [((30-1.2)/4832)(4808)]+1.2$
= 29.9' (-0.1')

For a measurement at 50 feet (within the 2 to 60 foot column with V = 4799 fps):

$D_{50} = [((50-1.2)/4799)(4808)]+1.2$
= 50.1' (+0.1')

For the water column from 2 to 60 feet: $V = 4799$ fps Assumed $V_{80} = 4785$ fps

$$t_{60} = (60-1.2)/4799$$
$$= 0.01225 \text{ sec.}$$

For a measurement at 10 feet (within the 2 to 30 foot column with V = 4832 fps):

$$D_{10} = [((10-1.2)/4832)(4799)]+1.2$$
$$= 9.9' \quad (-0.1')$$

For a measurement at 30 feet (within the 2 to 30 foot column with V = 4832 fps):

$$D_{30} = [((30-1.2)/4832)(4799)]+1.2$$
$$= 29.8' \quad (-0.2')$$

For a measurement at 45 feet (within the 2 to 45 foot column with V = 4808 fps):

$$D_{45} = [((45-1.2)/4808)(4799)]+1.2$$
$$= 44.9' \quad (-0.1')$$

For a measurement at 80 feet (outside the 2 to 60 foot column, assumed V = 4785 fps):

$$D_{80} = [((80-1.2)/4785)(4799)]+1.2$$
$$= 80.2' \quad (+0.2')$$

TEXAS WATER DEVELOPMENT BOARD
RESERVOIR VOLUME TABLE

Oct 14 1997

SQUAW CREEK RESERVOIR MAY 1997 SURVEY

VOLUME IN ACRE-FEET ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 644 | | | | | | | | | | |
| 645 | | | | | | | | | | |
| 646 | | | | | | | | | | |
| 647 | | | | | | | | | | |
| 648 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| 649 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 7 | 8 |
| 650 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 17 | 18 | 19 |
| 651 | 20 | 21 | 23 | 24 | 25 | 27 | 28 | 30 | 31 | 32 |
| 652 | 34 | 35 | 37 | 39 | 40 | 42 | 44 | 46 | 48 | 50 |
| 653 | 51 | 53 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 |
| 654 | 73 | 75 | 77 | 79 | 82 | 84 | 86 | 89 | 91 | 93 |
| 655 | 96 | 98 | 101 | 103 | 106 | 108 | 111 | 113 | 116 | 118 |
| 656 | 121 | 124 | 126 | 129 | 131 | 134 | 137 | 140 | 142 | 145 |
| 657 | 148 | 151 | 154 | 157 | 160 | 163 | 166 | 169 | 173 | 176 |
| 658 | 179 | 183 | 186 | 190 | 194 | 197 | 201 | 205 | 209 | 213 |
| 659 | 217 | 221 | 225 | 229 | 234 | 238 | 243 | 247 | 252 | 257 |
| 660 | 262 | 267 | 272 | 277 | 282 | 288 | 293 | 299 | 305 | 310 |
| 661 | 316 | 322 | 329 | 335 | 341 | 348 | 354 | 361 | 368 | 375 |
| 662 | 382 | 390 | 397 | 405 | 413 | 420 | 429 | 437 | 445 | 453 |
| 663 | 462 | 471 | 480 | 489 | 498 | 507 | 517 | 527 | 536 | 546 |
| 664 | 557 | 567 | 577 | 588 | 599 | 610 | 621 | 632 | 644 | 655 |
| 665 | 667 | 679 | 691 | 704 | 716 | 729 | 742 | 755 | 768 | 781 |
| 666 | 795 | 809 | 823 | 837 | 851 | 866 | 881 | 896 | 911 | 926 |
| 667 | 942 | 958 | 974 | 990 | 1006 | 1023 | 1040 | 1057 | 1074 | 1092 |
| 668 | 1110 | 1127 | 1146 | 1164 | 1183 | 1201 | 1221 | 1240 | 1259 | 1279 |
| 669 | 1299 | 1319 | 1340 | 1360 | 1381 | 1402 | 1424 | 1445 | 1467 | 1489 |
| 670 | 1511 | 1533 | 1556 | 1579 | 1602 | 1625 | 1648 | 1672 | 1696 | 1720 |
| 671 | 1744 | 1769 | 1793 | 1818 | 1843 | 1868 | 1893 | 1919 | 1945 | 1971 |
| 672 | 1997 | 2023 | 2049 | 2076 | 2102 | 2129 | 2156 | 2184 | 2211 | 2239 |
| 673 | 2266 | 2294 | 2322 | 2350 | 2379 | 2407 | 2436 | 2465 | 2494 | 2523 |
| 674 | 2553 | 2582 | 2612 | 2642 | 2672 | 2702 | 2733 | 2763 | 2794 | 2825 |
| 675 | 2856 | 2887 | 2919 | 2950 | 2982 | 3014 | 3046 | 3079 | 3111 | 3144 |
| 676 | 3176 | 3209 | 3242 | 3275 | 3309 | 3342 | 3376 | 3409 | 3443 | 3477 |
| 677 | 3511 | 3546 | 3580 | 3615 | 3649 | 3684 | 3719 | 3754 | 3789 | 3825 |
| 678 | 3860 | 3896 | 3932 | 3968 | 4004 | 4040 | 4076 | 4113 | 4149 | 4186 |
| 679 | 4223 | 4261 | 4298 | 4335 | 4373 | 4411 | 4449 | 4487 | 4525 | 4563 |
| 680 | 4602 | 4640 | 4679 | 4718 | 4757 | 4796 | 4835 | 4874 | 4914 | 4954 |
| 681 | 4993 | 5033 | 5073 | 5114 | 5154 | 5195 | 5235 | 5276 | 5317 | 5358 |
| 682 | 5399 | 5440 | 5482 | 5523 | 5565 | 5607 | 5649 | 5691 | 5733 | 5775 |
| 683 | 5818 | 5860 | 5903 | 5946 | 5989 | 6032 | 6075 | 6119 | 6162 | 6206 |
| 684 | 6250 | 6294 | 6338 | 6382 | 6426 | 6471 | 6516 | 6560 | 6605 | 6650 |
| 685 | 6696 | 6741 | 6787 | 6832 | 6878 | 6924 | 6971 | 7017 | 7064 | 7111 |
| 686 | 7158 | 7205 | 7252 | 7300 | 7348 | 7395 | 7443 | 7491 | 7540 | 7588 |
| 687 | 7637 | 7685 | 7734 | 7783 | 7832 | 7882 | 7931 | 7981 | 8031 | 8081 |
| 688 | 8131 | 8181 | 8231 | 8282 | 8333 | 8384 | 8435 | 8486 | 8537 | 8589 |
| 689 | 8640 | 8692 | 8744 | 8796 | 8849 | 8901 | 8954 | 9007 | 9060 | 9113 |
| 690 | 9167 | 9220 | 9274 | 9328 | 9383 | 9437 | 9492 | 9546 | 9601 | 9656 |
| 691 | 9712 | 9767 | 9823 | 9879 | 9935 | 9991 | 10047 | 10104 | 10161 | 10218 |
| 692 | 10275 | 10332 | 10390 | 10447 | 10505 | 10563 | 10621 | 10679 | 10737 | 10796 |

SQUAW CREEK RESERVOIR MAY 1997 SURVEY

VOLUME IN ACRE-FEET ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 693 | 10855 | 10913 | 10972 | 11032 | 11091 | 11150 | 11210 | 11270 | 11330 | 11390 |
| 694 | 11451 | 11511 | 11572 | 11633 | 11694 | 11755 | 11817 | 11879 | 11941 | 12003 |
| 695 | 12065 | 12127 | 12190 | 12253 | 12316 | 12379 | 12442 | 12506 | 12569 | 12633 |
| 696 | 12697 | 12761 | 12826 | 12890 | 12955 | 13020 | 13085 | 13150 | 13216 | 13281 |
| 697 | 13347 | 13413 | 13480 | 13546 | 13613 | 13680 | 13747 | 13814 | 13881 | 13949 |
| 698 | 14017 | 14085 | 14154 | 14222 | 14291 | 14360 | 14429 | 14498 | 14568 | 14638 |
| 699 | 14708 | 14778 | 14849 | 14919 | 14990 | 15062 | 15133 | 15205 | 15276 | 15348 |
| 700 | 15421 | 15493 | 15566 | 15639 | 15713 | 15786 | 15860 | 15934 | 16009 | 16083 |
| 701 | 16158 | 16234 | 16309 | 16385 | 16461 | 16538 | 16615 | 16692 | 16769 | 16846 |
| 702 | 16924 | 17002 | 17081 | 17159 | 17238 | 17317 | 17396 | 17475 | 17555 | 17635 |
| 703 | 17715 | 17795 | 17876 | 17956 | 18037 | 18119 | 18200 | 18282 | 18364 | 18446 |
| 704 | 18528 | 18611 | 18694 | 18777 | 18860 | 18943 | 19027 | 19111 | 19195 | 19280 |
| 705 | 19364 | 19449 | 19534 | 19619 | 19705 | 19791 | 19877 | 19963 | 20049 | 20136 |
| 706 | 20223 | 20310 | 20397 | 20485 | 20573 | 20661 | 20749 | 20838 | 20926 | 21015 |
| 707 | 21105 | 21194 | 21284 | 21374 | 21464 | 21555 | 21645 | 21736 | 21828 | 21919 |
| 708 | 22011 | 22103 | 22195 | 22287 | 22380 | 22473 | 22566 | 22660 | 22753 | 22847 |
| 709 | 22942 | 23036 | 23131 | 23226 | 23321 | 23417 | 23513 | 23609 | 23705 | 23802 |
| 710 | 23898 | 23995 | 24092 | 24190 | 24288 | 24385 | 24483 | 24582 | 24680 | 24779 |
| 711 | 24878 | 24977 | 25077 | 25176 | 25276 | 25376 | 25476 | 25576 | 25677 | 25778 |
| 712 | 25879 | 25980 | 26081 | 26183 | 26285 | 26387 | 26489 | 26592 | 26694 | 26797 |
| 713 | 26901 | 27004 | 27108 | 27211 | 27316 | 27420 | 27524 | 27629 | 27734 | 27839 |
| 714 | 27945 | 28050 | 28156 | 28262 | 28368 | 28475 | 28581 | 28688 | 28795 | 28903 |
| 715 | 29010 | 29118 | 29226 | 29334 | 29443 | 29551 | 29660 | 29769 | 29879 | 29988 |
| 716 | 30098 | 30208 | 30318 | 30429 | 30540 | 30651 | 30762 | 30873 | 30985 | 31097 |
| 717 | 31209 | 31321 | 31433 | 31546 | 31659 | 31772 | 31886 | 32000 | 32114 | 32228 |
| 718 | 32342 | 32457 | 32572 | 32687 | 32803 | 32918 | 33034 | 33151 | 33267 | 33384 |
| 719 | 33500 | 33618 | 33735 | 33853 | 33970 | 34088 | 34207 | 34325 | 34444 | 34563 |
| 720 | 34682 | 34802 | 34921 | 35041 | 35162 | 35282 | 35403 | 35524 | 35645 | 35767 |
| 721 | 35888 | 36011 | 36133 | 36256 | 36379 | 36502 | 36625 | 36749 | 36873 | 36997 |
| 722 | 37122 | 37247 | 37372 | 37497 | 37623 | 37749 | 37875 | 38002 | 38129 | 38256 |
| 723 | 38383 | 38511 | 38639 | 38767 | 38896 | 39024 | 39153 | 39283 | 39412 | 39542 |
| 724 | 39672 | 39802 | 39933 | 40064 | 40195 | 40327 | 40459 | 40591 | 40723 | 40856 |
| 725 | 40989 | 41122 | 41256 | 41390 | 41524 | 41658 | 41793 | 41928 | 42064 | 42200 |
| 726 | 42336 | 42472 | 42609 | 42746 | 42884 | 43021 | 43159 | 43298 | 43436 | 43575 |
| 727 | 43715 | 43854 | 43994 | 44135 | 44276 | 44417 | 44558 | 44700 | 44841 | 44984 |
| 728 | 45126 | 45269 | 45412 | 45556 | 45700 | 45844 | 45988 | 46133 | 46278 | 46423 |
| 729 | 46569 | 46715 | 46862 | 47008 | 47155 | 47303 | 47450 | 47598 | 47747 | 47895 |
| 730 | 48044 | 48194 | 48343 | 48494 | 48644 | 48795 | 48946 | 49098 | 49250 | 49402 |
| 731 | 49555 | 49708 | 49861 | 50015 | 50169 | 50324 | 50479 | 50634 | 50790 | 50946 |
| 732 | 51103 | 51260 | 51417 | 51574 | 51732 | 51891 | 52049 | 52208 | 52368 | 52527 |
| 733 | 52687 | 52848 | 53009 | 53170 | 53331 | 53493 | 53655 | 53818 | 53980 | 54144 |
| 734 | 54307 | 54471 | 54635 | 54800 | 54965 | 55130 | 55296 | 55462 | 55628 | 55795 |
| 735 | 55962 | 56129 | 56296 | 56464 | 56633 | 56801 | 56970 | 57139 | 57309 | 57479 |
| 736 | 57649 | 57819 | 57990 | 58161 | 58332 | 58504 | 58676 | 58849 | 59021 | 59194 |
| 737 | 59368 | 59541 | 59715 | 59889 | 60064 | 60239 | 60414 | 60589 | 60765 | 60941 |
| 738 | 61118 | 61294 | 61471 | 61648 | 61826 | 62004 | 62182 | 62361 | 62540 | 62719 |
| 739 | 62899 | 63078 | 63259 | 63439 | 63620 | 63801 | 63982 | 64164 | 64346 | 64529 |
| 740 | 64712 | 64895 | 65078 | 65262 | 65446 | 65630 | 65814 | 65999 | 66184 | 66370 |
| 741 | 66556 | 66742 | 66929 | 67116 | 67303 | 67490 | 67678 | 67866 | 68055 | 68244 |
| 742 | 68433 | 68622 | 68812 | 69002 | 69193 | 69384 | 69575 | 69766 | 69958 | 70150 |

SQUAW CREEK RESERVOIR MAY 1997 SURVEY

VOLUME IN ACRE-FEET ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 743 | 70343 | 70535 | 70729 | 70922 | 71116 | 71310 | 71505 | 71699 | 71895 | 72090 |
| 744 | 72286 | 72482 | 72679 | 72876 | 73073 | 73270 | 73468 | 73666 | 73865 | 74064 |
| 745 | 74263 | 74462 | 74662 | 74862 | 75063 | 75264 | 75465 | 75666 | 75868 | 76070 |
| 746 | 76272 | 76475 | 76678 | 76882 | 77085 | 77289 | 77494 | 77699 | 77904 | 78109 |
| 747 | 78315 | 78521 | 78727 | 78934 | 79141 | 79348 | 79556 | 79764 | 79972 | 80181 |
| 748 | 80390 | 80599 | 80809 | 81019 | 81229 | 81440 | 81651 | 81862 | 82074 | 82286 |
| 749 | 82498 | 82710 | 82923 | 83137 | 83350 | 83564 | 83778 | 83993 | 84207 | 84423 |
| 750 | 84638 | 84854 | 85070 | 85287 | 85504 | 85721 | 85938 | 86156 | 86375 | 86594 |
| 751 | 86813 | 87032 | 87252 | 87472 | 87693 | 87914 | 88135 | 88356 | 88578 | 88801 |
| 752 | 89024 | 89247 | 89471 | 89695 | 89919 | 90144 | 90369 | 90595 | 90821 | 91047 |
| 753 | 91274 | 91501 | 91728 | 91956 | 92185 | 92413 | 92642 | 92872 | 93102 | 93332 |
| 754 | 93562 | 93793 | 94024 | 94256 | 94488 | 94721 | 94953 | 95187 | 95420 | 95654 |
| 755 | 95888 | 96123 | 96358 | 96594 | 96830 | 97066 | 97302 | 97540 | 97777 | 98015 |
| 756 | 98253 | 98492 | 98731 | 98970 | 99210 | 99450 | 99691 | 99932 | 100173 | 100415 |
| 757 | 100657 | 100899 | 101142 | 101386 | 101629 | 101873 | 102118 | 102363 | 102608 | 102854 |
| 758 | 103100 | 103346 | 103593 | 103840 | 104088 | 104336 | 104584 | 104833 | 105082 | 105332 |
| 759 | 105582 | 105833 | 106084 | 106335 | 106586 | 106839 | 107091 | 107344 | 107597 | 107851 |
| 760 | 108106 | 108360 | 108615 | 108871 | 109127 | 109383 | 109640 | 109897 | 110155 | 110413 |
| 761 | 110672 | 110930 | 111190 | 111450 | 111710 | 111970 | 112231 | 112493 | 112755 | 113017 |
| 762 | 113280 | 113543 | 113807 | 114071 | 114336 | 114601 | 114866 | 115132 | 115398 | 115665 |
| 763 | 115932 | 116199 | 116467 | 116735 | 117004 | 117273 | 117543 | 117813 | 118083 | 118354 |
| 764 | 118626 | 118897 | 119170 | 119442 | 119715 | 119989 | 120263 | 120537 | 120812 | 121087 |
| 765 | 121363 | 121639 | 121915 | 122192 | 122470 | 122747 | 123026 | 123304 | 123584 | 123863 |
| 766 | 124143 | 124424 | 124705 | 124987 | 125269 | 125551 | 125834 | 126117 | 126401 | 126686 |
| 767 | 126971 | 127256 | 127542 | 127828 | 128115 | 128403 | 128690 | 128979 | 129268 | 129557 |
| 768 | 129847 | 130138 | 130429 | 130720 | 131012 | 131305 | 131598 | 131891 | 132185 | 132480 |
| 769 | 132775 | 133070 | 133366 | 133663 | 133960 | 134257 | 134555 | 134854 | 135152 | 135452 |
| 770 | 135752 | 136052 | 136353 | 136655 | 136957 | 137259 | 137562 | 137866 | 138170 | 138474 |
| 771 | 138779 | 139088 | 139394 | 139700 | 140008 | 140315 | 140624 | 140932 | 141242 | 141552 |
| 772 | 141862 | 142173 | 142484 | 142797 | 143109 | 143422 | 143736 | 144050 | 144365 | 144680 |
| 773 | 144996 | 145312 | 145629 | 145946 | 146264 | 146582 | 146901 | 147220 | 147540 | 147860 |
| 774 | 148181 | 148502 | 148824 | 149147 | 149469 | 149793 | 150117 | 150441 | 150766 | 151092 |
| 775 | 151418 | | | | | | | | | |

TEXAS WATER DEVELOPMENT BOARD

Oct 14 1997

RESERVOIR AREA TABLE

SQUAW CREEK RESERVOIR    MAY 1997 SURVEY

AREA IN ACRES    ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 644 | | | | | | | | | | |
| 645 | | | | | | | | | | |
| 646 | | | | | | | | | | |
| 647 | | | | | | | | | | |
| 648 | | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| 649 | 3 | 4 | 4 | 5 | 6 | 7 | 7 | 8 | 9 | 10 |
| 650 | 11 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 |
| 651 | 12 | 13 | 13 | 13 | 13 | 14 | 14 | 14 | 15 | 15 |
| 652 | 15 | 16 | 16 | 16 | 17 | 18 | 18 | 19 | 19 | 19 |
| 653 | 20 | 20 | 20 | 21 | 21 | 21 | 21 | 22 | 22 | 22 |
| 654 | 22 | 22 | 23 | 23 | 23 | 23 | 23 | 24 | 24 | 24 |
| 655 | 24 | 24 | 25 | 25 | 25 | 25 | 25 | 25 | 26 | 26 |
| 656 | 26 | 26 | 26 | 27 | 27 | 27 | 27 | 28 | 28 | 28 |
| 657 | 29 | 29 | 29 | 30 | 30 | 31 | 32 | 32 | 33 | 34 |
| 658 | 34 | 35 | 36 | 36 | 37 | 37 | 38 | 39 | 39 | 40 |
| 659 | 41 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
| 660 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 |
| 661 | 60 | 61 | 62 | 64 | 65 | 66 | 67 | 69 | 70 | 71 |
| 662 | 73 | 74 | 75 | 77 | 78 | 80 | 81 | 82 | 84 | 85 |
| 663 | 87 | 88 | 90 | 91 | 93 | 95 | 96 | 98 | 99 | 101 |
| 664 | 102 | 104 | 106 | 107 | 109 | 111 | 112 | 114 | 115 | 117 |
| 665 | 119 | 121 | 122 | 124 | 126 | 128 | 130 | 131 | 133 | 135 |
| 666 | 137 | 139 | 141 | 143 | 145 | 147 | 149 | 151 | 153 | 155 |
| 667 | 157 | 159 | 161 | 163 | 165 | 168 | 170 | 172 | 174 | 176 |
| 668 | 178 | 180 | 183 | 185 | 187 | 189 | 192 | 194 | 196 | 199 |
| 669 | 201 | 203 | 206 | 208 | 210 | 212 | 214 | 216 | 219 | 221 |
| 670 | 223 | 225 | 227 | 229 | 231 | 233 | 235 | 237 | 239 | 241 |
| 671 | 243 | 245 | 247 | 249 | 251 | 253 | 254 | 256 | 258 | 260 |
| 672 | 261 | 263 | 264 | 266 | 268 | 270 | 271 | 273 | 275 | 277 |
| 673 | 278 | 280 | 281 | 283 | 285 | 286 | 288 | 290 | 291 | 293 |
| 674 | 295 | 297 | 298 | 300 | 302 | 303 | 305 | 307 | 308 | 310 |
| 675 | 312 | 314 | 315 | 317 | 319 | 320 | 322 | 323 | 325 | 326 |
| 676 | 328 | 329 | 331 | 332 | 334 | 335 | 337 | 338 | 339 | 341 |
| 677 | 342 | 343 | 345 | 346 | 348 | 349 | 350 | 352 | 353 | 354 |
| 678 | 356 | 357 | 359 | 360 | 362 | 363 | 365 | 366 | 368 | 370 |
| 679 | 371 | 373 | 374 | 375 | 377 | 378 | 380 | 381 | 382 | 384 |
| 680 | 385 | 386 | 388 | 389 | 390 | 392 | 393 | 395 | 396 | 398 |
| 681 | 399 | 400 | 402 | 403 | 404 | 406 | 407 | 408 | 410 | 411 |
| 682 | 412 | 414 | 415 | 416 | 417 | 419 | 420 | 421 | 423 | 424 |
| 683 | 425 | 427 | 428 | 429 | 431 | 432 | 433 | 435 | 436 | 438 |
| 684 | 439 | 440 | 442 | 443 | 444 | 446 | 447 | 449 | 450 | 452 |
| 685 | 453 | 455 | 456 | 458 | 460 | 462 | 464 | 466 | 468 | 470 |
| 686 | 471 | 473 | 474 | 476 | 477 | 479 | 480 | 482 | 483 | 485 |
| 687 | 486 | 488 | 489 | 491 | 492 | 494 | 496 | 497 | 499 | 500 |
| 688 | 502 | 504 | 505 | 507 | 508 | 510 | 511 | 513 | 514 | 516 |
| 689 | 518 | 520 | 521 | 523 | 525 | 526 | 528 | 530 | 532 | 534 |
| 690 | 535 | 537 | 539 | 541 | 543 | 545 | 547 | 549 | 551 | 552 |
| 691 | 554 | 556 | 558 | 559 | 561 | 563 | 565 | 567 | 569 | 570 |
| 692 | 572 | 573 | 575 | 577 | 578 | 580 | 581 | 583 | 584 | 586 |

SQUAW CREEK RESERVOIR MAY 1997 SURVEY

AREA IN ACRES ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 693 | 588 | 589 | 591 | 592 | 594 | 596 | 598 | 599 | 601 | 603 |
| 694 | 605 | 607 | 609 | 611 | 612 | 614 | 616 | 618 | 620 | 622 |
| 695 | 623 | 625 | 627 | 629 | 630 | 632 | 634 | 636 | 637 | 639 |
| 696 | 641 | 643 | 644 | 646 | 648 | 650 | 652 | 654 | 656 | 658 |
| 697 | 660 | 662 | 664 | 666 | 668 | 670 | 672 | 674 | 676 | 678 |
| 698 | 680 | 682 | 684 | 687 | 689 | 691 | 693 | 695 | 697 | 699 |
| 699 | 702 | 704 | 706 | 708 | 710 | 713 | 715 | 717 | 720 | 722 |
| 700 | 724 | 727 | 729 | 732 | 735 | 737 | 740 | 743 | 746 | 749 |
| 701 | 752 | 755 | 758 | 761 | 763 | 766 | 769 | 771 | 774 | 777 |
| 702 | 779 | 782 | 784 | 786 | 788 | 791 | 793 | 795 | 797 | 799 |
| 703 | 802 | 804 | 806 | 809 | 811 | 814 | 816 | 818 | 820 | 823 |
| 704 | 825 | 827 | 829 | 832 | 834 | 836 | 838 | 841 | 843 | 845 |
| 705 | 847 | 849 | 852 | 854 | 856 | 858 | 860 | 863 | 865 | 868 |
| 706 | 870 | 872 | 875 | 877 | 880 | 882 | 884 | 887 | 889 | 892 |
| 707 | 894 | 897 | 899 | 901 | 904 | 906 | 909 | 911 | 913 | 916 |
| 708 | 918 | 921 | 923 | 926 | 928 | 931 | 933 | 936 | 939 | 941 |
| 709 | 944 | 947 | 949 | 952 | 954 | 957 | 959 | 962 | 964 | 966 |
| 710 | 969 | 971 | 973 | 975 | 978 | 980 | 982 | 984 | 987 | 989 |
| 711 | 991 | 993 | 995 | 997 | 999 | 1001 | 1003 | 1005 | 1007 | 1009 |
| 712 | 1011 | 1013 | 1015 | 1017 | 1019 | 1022 | 1024 | 1026 | 1028 | 1031 |
| 713 | 1033 | 1035 | 1038 | 1040 | 1042 | 1044 | 1046 | 1048 | 1050 | 1053 |
| 714 | 1055 | 1057 | 1059 | 1061 | 1063 | 1066 | 1068 | 1070 | 1072 | 1074 |
| 715 | 1077 | 1079 | 1081 | 1083 | 1086 | 1088 | 1090 | 1092 | 1095 | 1097 |
| 716 | 1099 | 1102 | 1104 | 1106 | 1108 | 1111 | 1113 | 1115 | 1117 | 1119 |
| 717 | 1122 | 1124 | 1126 | 1129 | 1131 | 1134 | 1136 | 1139 | 1141 | 1144 |
| 718 | 1146 | 1148 | 1151 | 1153 | 1156 | 1158 | 1161 | 1163 | 1165 | 1168 |
| 719 | 1170 | 1172 | 1175 | 1177 | 1179 | 1182 | 1184 | 1186 | 1189 | 1191 |
| 720 | 1193 | 1196 | 1198 | 1201 | 1204 | 1206 | 1209 | 1211 | 1214 | 1217 |
| 721 | 1220 | 1222 | 1225 | 1228 | 1230 | 1233 | 1236 | 1239 | 1242 | 1244 |
| 722 | 1247 | 1250 | 1253 | 1256 | 1259 | 1262 | 1264 | 1267 | 1270 | 1273 |
| 723 | 1275 | 1278 | 1280 | 1283 | 1286 | 1289 | 1291 | 1294 | 1297 | 1300 |
| 724 | 1302 | 1305 | 1308 | 1311 | 1314 | 1317 | 1320 | 1323 | 1326 | 1328 |
| 725 | 1331 | 1334 | 1338 | 1341 | 1344 | 1347 | 1350 | 1353 | 1356 | 1360 |
| 726 | 1363 | 1366 | 1369 | 1372 | 1376 | 1379 | 1382 | 1386 | 1389 | 1392 |
| 727 | 1395 | 1399 | 1402 | 1405 | 1408 | 1412 | 1415 | 1418 | 1421 | 1424 |
| 728 | 1427 | 1430 | 1433 | 1437 | 1440 | 1443 | 1446 | 1449 | 1452 | 1455 |
| 729 | 1459 | 1462 | 1465 | 1468 | 1472 | 1475 | 1478 | 1482 | 1485 | 1489 |
| 730 | 1492 | 1496 | 1499 | 1503 | 1507 | 1510 | 1514 | 1518 | 1522 | 1526 |
| 731 | 1529 | 1533 | 1537 | 1540 | 1544 | 1548 | 1552 | 1555 | 1559 | 1563 |
| 732 | 1567 | 1570 | 1574 | 1578 | 1581 | 1585 | 1588 | 1592 | 1595 | 1599 |
| 733 | 1602 | 1606 | 1609 | 1613 | 1616 | 1620 | 1624 | 1627 | 1630 | 1634 |
| 734 | 1637 | 1641 | 1644 | 1648 | 1651 | 1654 | 1658 | 1661 | 1664 | 1668 |
| 735 | 1671 | 1674 | 1677 | 1681 | 1684 | 1687 | 1690 | 1694 | 1697 | 1700 |
| 736 | 1703 | 1706 | 1710 | 1713 | 1716 | 1719 | 1722 | 1725 | 1729 | 1732 |
| 737 | 1735 | 1738 | 1741 | 1744 | 1747 | 1750 | 1753 | 1756 | 1759 | 1762 |
| 738 | 1765 | 1768 | 1771 | 1775 | 1778 | 1781 | 1784 | 1787 | 1791 | 1794 |
| 739 | 1797 | 1800 | 1803 | 1807 | 1810 | 1813 | 1816 | 1819 | 1823 | 1826 |
| 740 | 1829 | 1832 | 1835 | 1838 | 1841 | 1844 | 1847 | 1850 | 1854 | 1857 |
| 741 | 1860 | 1864 | 1867 | 1870 | 1874 | 1877 | 1880 | 1884 | 1887 | 1890 |
| 742 | 1893 | 1897 | 1900 | 1903 | 1907 | 1910 | 1913 | 1917 | 1920 | 1923 |

SQUAW CREEK RESERVOIR MAY 1997 SURVEY

AREA IN ACRES ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 743 | 1926 | 1930 | 1933 | 1936 | 1940 | 1943 | 1947 | 1950 | 1954 | 1957 |
| 744 | 1960 | 1964 | 1967 | 1970 | 1974 | 1977 | 1980 | 1984 | 1987 | 1990 |
| 745 | 1993 | 1996 | 2000 | 2003 | 2006 | 2009 | 2013 | 2016 | 2019 | 2023 |
| 746 | 2026 | 2029 | 2032 | 2036 | 2039 | 2042 | 2046 | 2049 | 2052 | 2056 |
| 747 | 2059 | 2062 | 2065 | 2069 | 2072 | 2075 | 2079 | 2082 | 2085 | 2088 |
| 748 | 2092 | 2095 | 2098 | 2101 | 2105 | 2108 | 2111 | 2114 | 2117 | 2121 |
| 749 | 2124 | 2127 | 2130 | 2134 | 2137 | 2140 | 2143 | 2147 | 2150 | 2153 |
| 750 | 2157 | 2160 | 2164 | 2167 | 2171 | 2174 | 2178 | 2182 | 2185 | 2189 |
| 751 | 2193 | 2196 | 2200 | 2204 | 2207 | 2211 | 2215 | 2219 | 2222 | 2226 |
| 752 | 2230 | 2234 | 2238 | 2242 | 2246 | 2250 | 2254 | 2258 | 2262 | 2266 |
| 753 | 2270 | 2273 | 2277 | 2281 | 2285 | 2289 | 2292 | 2296 | 2300 | 2303 |
| 754 | 2307 | 2311 | 2315 | 2318 | 2322 | 2326 | 2330 | 2334 | 2338 | 2342 |
| 755 | 2345 | 2349 | 2353 | 2357 | 2361 | 2365 | 2368 | 2372 | 2376 | 2380 |
| 756 | 2384 | 2388 | 2392 | 2396 | 2400 | 2404 | 2408 | 2412 | 2416 | 2419 |
| 757 | 2423 | 2427 | 2431 | 2435 | 2439 | 2443 | 2447 | 2451 | 2455 | 2459 |
| 758 | 2463 | 2467 | 2471 | 2475 | 2479 | 2483 | 2487 | 2491 | 2495 | 2499 |
| 759 | 2503 | 2507 | 2511 | 2515 | 2519 | 2523 | 2527 | 2532 | 2536 | 2541 |
| 760 | 2545 | 2549 | 2553 | 2558 | 2562 | 2566 | 2570 | 2575 | 2579 | 2583 |
| 761 | 2587 | 2591 | 2596 | 2600 | 2604 | 2608 | 2613 | 2617 | 2621 | 2626 |
| 762 | 2630 | 2634 | 2639 | 2643 | 2647 | 2652 | 2656 | 2660 | 2664 | 2668 |
| 763 | 2673 | 2677 | 2681 | 2685 | 2690 | 2694 | 2698 | 2703 | 2707 | 2711 |
| 764 | 2716 | 2720 | 2724 | 2729 | 2733 | 2737 | 2741 | 2746 | 2750 | 2754 |
| 765 | 2758 | 2763 | 2767 | 2772 | 2776 | 2781 | 2785 | 2790 | 2794 | 2799 |
| 766 | 2804 | 2808 | 2813 | 2818 | 2822 | 2827 | 2832 | 2837 | 2842 | 2846 |
| 767 | 2851 | 2856 | 2861 | 2866 | 2871 | 2876 | 2882 | 2887 | 2892 | 2897 |
| 768 | 2902 | 2907 | 2912 | 2917 | 2922 | 2927 | 2932 | 2937 | 2942 | 2948 |
| 769 | 2953 | 2958 | 2963 | 2967 | 2972 | 2977 | 2982 | 2987 | 2992 | 2997 |
| 770 | 3002 | 3007 | 3012 | 3017 | 3022 | 3027 | 3032 | 3037 | 3042 | 3048 |
| 771 | 3053 | 3059 | 3065 | 3071 | 3077 | 3084 | 3090 | 3096 | 3102 | 3108 |
| 772 | 3114 | 3120 | 3126 | 3132 | 3138 | 3145 | 3151 | 3157 | 3163 | 3169 |
| 773 | 3175 | 3181 | 3187 | 3193 | 3199 | 3206 | 3212 | 3218 | 3224 | 3230 |
| 774 | 3236 | 3242 | 3248 | 3254 | 3260 | 3267 | 3273 | 3279 | 3285 | 3291 |
| 775 | 3297 | | | | | | | | | |

TEXAS WATER DEVELOPMENT BOARD                                        Aug 6 1997

RESERVOIR VOLUME TABLE

MINI-DAM(SQUAW CREEK)   MAY 1997 SURVEY

VOLUME IN ACRE-FEET                ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 739 | | | | | | | | | | |
| 740 | | | | | | | | | | |
| 741 | | | | | | | | | | |
| 742 | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 743 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 744 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 |
| 745 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 8 |
| 746 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 |
| 747 | 12 | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 |
| 748 | 17 | 18 | 19 | 19 | 20 | 20 | 21 | 22 | 22 | 23 |
| 749 | 23 | 24 | 25 | 25 | 26 | 27 | 27 | 28 | 29 | 29 |
| 750 | 30 | 31 | 32 | 32 | 33 | 34 | 35 | 35 | 36 | 37 |
| 751 | 38 | 38 | 39 | 40 | 41 | 42 | 43 | 43 | 44 | 45 |
| 752 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 56 |
| 753 | 57 | 58 | 59 | 60 | 62 | 63 | 64 | 66 | 67 | 68 |
| 754 | 70 | 71 | 73 | 74 | 75 | 77 | 78 | 80 | 82 | 83 |
| 755 | 85 | 86 | 88 | 89 | 91 | 93 | 94 | 96 | 98 | 100 |
| 756 | 101 | 103 | 105 | 107 | 108 | 110 | 112 | 114 | 116 | 118 |
| 757 | 120 | 122 | 123 | 125 | 127 | 129 | 131 | 133 | 135 | 137 |
| 758 | 139 | 141 | 143 | 145 | 147 | 149 | 151 | 153 | 156 | 158 |
| 759 | 160 | 162 | 164 | 166 | 168 | 170 | 173 | 175 | 177 | 179 |
| 760 | 181 | 184 | 186 | 188 | 190 | 193 | 195 | 197 | 200 | 202 |
| 761 | 204 | 207 | 209 | 211 | 214 | 216 | 219 | 221 | 223 | 226 |
| 762 | 228 | 231 | 233 | 236 | 239 | 241 | 244 | 246 | 249 | 252 |
| 763 | 254 | 257 | 259 | 262 | 265 | 267 | 270 | 273 | 276 | 278 |
| 764 | 281 | 284 | 287 | 289 | 292 | 295 | 298 | 301 | 304 | 306 |
| 765 | 309 | 312 | 315 | 318 | 321 | 324 | 327 | 330 | 333 | 336 |
| 766 | 339 | 342 | 345 | 349 | 352 | 355 | 358 | 361 | 364 | 368 |
| 767 | 371 | 374 | 377 | 381 | 384 | 387 | 391 | 394 | 397 | 401 |
| 768 | 404 | 408 | 411 | 415 | 418 | 422 | 425 | 429 | 432 | 436 |
| 769 | 440 | 443 | 447 | 451 | 454 | 458 | 462 | 466 | 469 | 473 |
| 770 | 477 | 481 | 485 | 489 | 493 | 497 | 501 | 505 | 509 | 513 |
| 771 | 517 | 521 | 525 | 529 | 534 | 538 | 542 | 546 | 551 | 555 |
| 772 | 559 | 564 | 568 | 572 | 577 | 581 | 586 | 590 | 595 | 599 |
| 773 | 604 | 609 | 613 | 618 | 622 | 627 | 632 | 637 | 641 | 646 |
| 774 | 651 | 656 | 661 | 666 | 671 | 676 | 681 | 686 | 691 | 696 |
| 775 | 701 | | | | | | | | | |

TEXAS WATER DEVELOPMENT BOARD
RESERVOIR AREA TABLE

Aug 6 1997

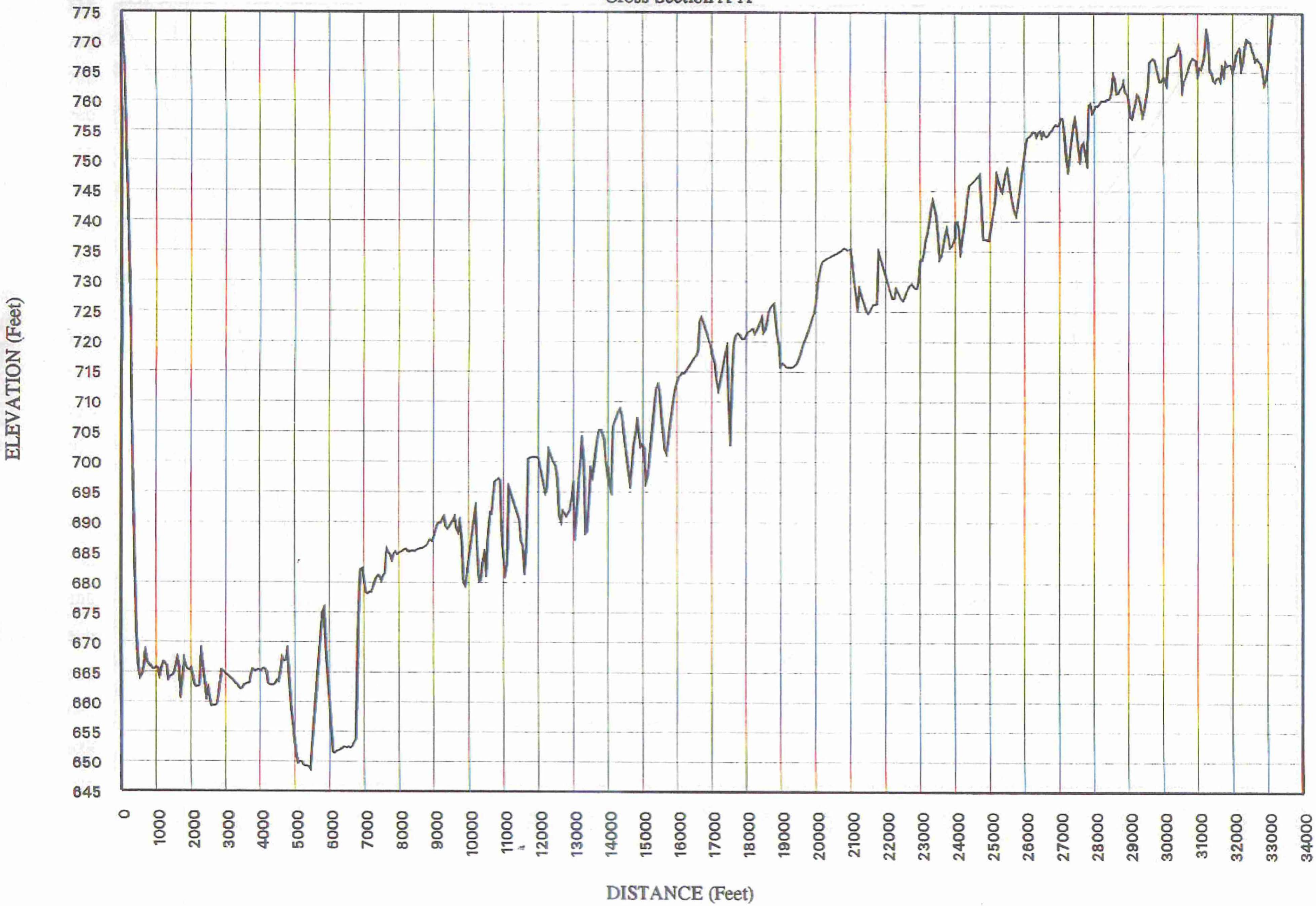
MINI-DAM(SQUAW CREEK) MAY 1997 SURVEY

AREA IN ACRES — ELEVATION INCREMENT IS ONE TENTH FOOT

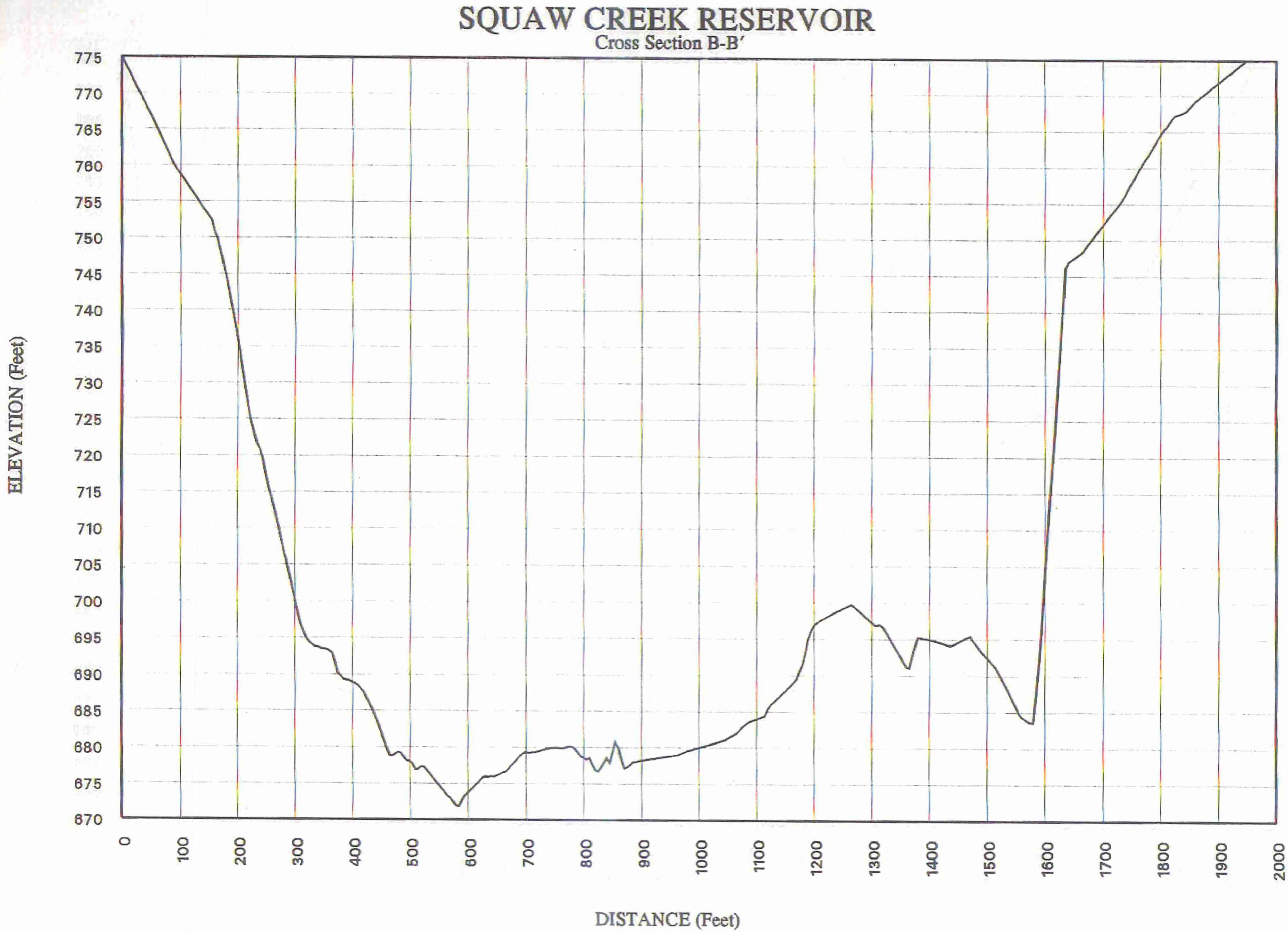
| ELEV. FEET | .0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 739 | | | | | | | | | | |
| 740 | | | | | | | | | | |
| 741 | | | | | | | | | | |
| 742 | | | | | 1 | 1 | 1 | 1 | 1 | 1 |
| 743 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| 744 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| 745 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 746 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 |
| 747 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 |
| 748 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 749 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 750 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 |
| 751 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 |
| 752 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 11 | 12 | 12 |
| 753 | 12 | 12 | 12 | 13 | 13 | 13 | 13 | 13 | 14 | 14 |
| 754 | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 16 |
| 755 | 16 | 16 | 16 | 16 | 16 | 17 | 17 | 17 | 17 | 17 |
| 756 | 17 | 18 | 18 | 18 | 18 | 18 | 19 | 19 | 19 | 19 |
| 757 | 19 | 19 | 19 | 19 | 19 | 20 | 20 | 20 | 20 | 20 |
| 758 | 20 | 20 | 20 | 20 | 20 | 21 | 21 | 21 | 21 | 21 |
| 759 | 21 | 21 | 21 | 21 | 22 | 22 | 22 | 22 | 22 | 22 |
| 760 | 22 | 22 | 22 | 23 | 23 | 23 | 23 | 23 | 23 | 23 |
| 761 | 23 | 24 | 24 | 24 | 24 | 24 | 24 | 25 | 25 | 25 |
| 762 | 25 | 25 | 25 | 25 | 26 | 26 | 26 | 26 | 26 | 26 |
| 763 | 26 | 26 | 27 | 27 | 27 | 27 | 27 | 27 | 27 | 27 |
| 764 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 29 | 29 | 29 |
| 765 | 29 | 29 | 29 | 29 | 30 | 30 | 30 | 30 | 30 | 31 |
| 766 | 31 | 31 | 31 | 31 | 31 | 32 | 32 | 32 | 32 | 32 |
| 767 | 32 | 33 | 33 | 33 | 33 | 33 | 34 | 34 | 34 | 34 |
| 768 | 34 | 35 | 35 | 35 | 35 | 35 | 36 | 36 | 36 | 36 |
| 769 | 36 | 37 | 37 | 37 | 37 | 37 | 38 | 38 | 38 | 38 |
| 770 | 39 | 39 | 39 | 39 | 40 | 40 | 40 | 40 | 41 | 41 |
| 771 | 41 | 41 | 42 | 42 | 42 | 42 | 43 | 43 | 43 | 43 |
| 772 | 44 | 44 | 44 | 44 | 44 | 45 | 45 | 45 | 45 | 46 |
| 773 | 46 | 46 | 46 | 47 | 47 | 47 | 47 | 48 | 48 | 48 |
| 774 | 48 | 49 | 49 | 49 | 49 | 50 | 50 | 50 | 50 | 51 |
| 775 | 53 | | | | | | | | | |

# SQUAW CREEK RESERVOIR

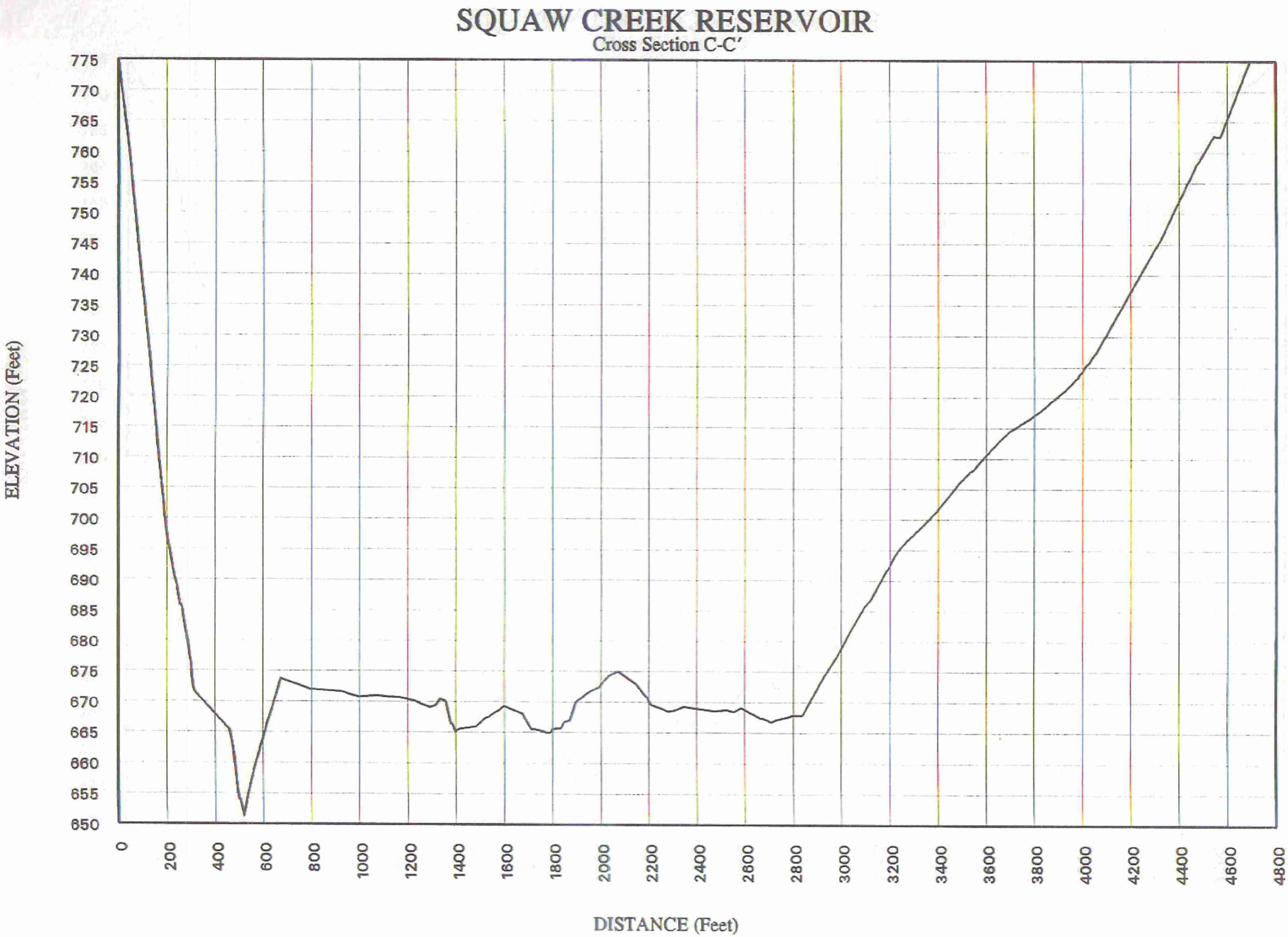
Cross Section A-A′




PREPARED BY: TWDB OCTOBER 1997



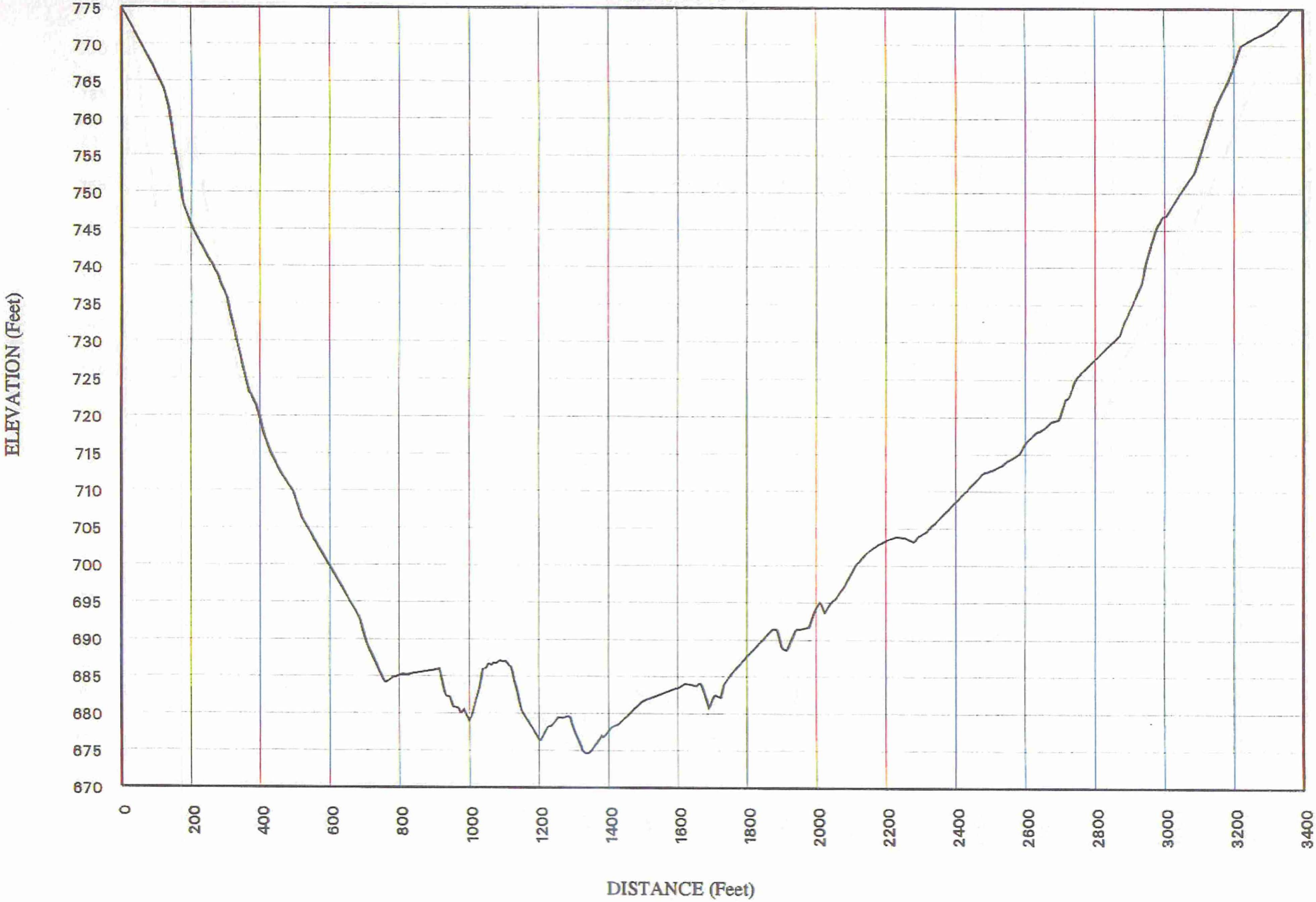

PREPARED BY: TWDB OCTOBER 1997




PREPARED BY: TWDB OCTOBER 1997

# SQUAW CREEK RESERVOIR

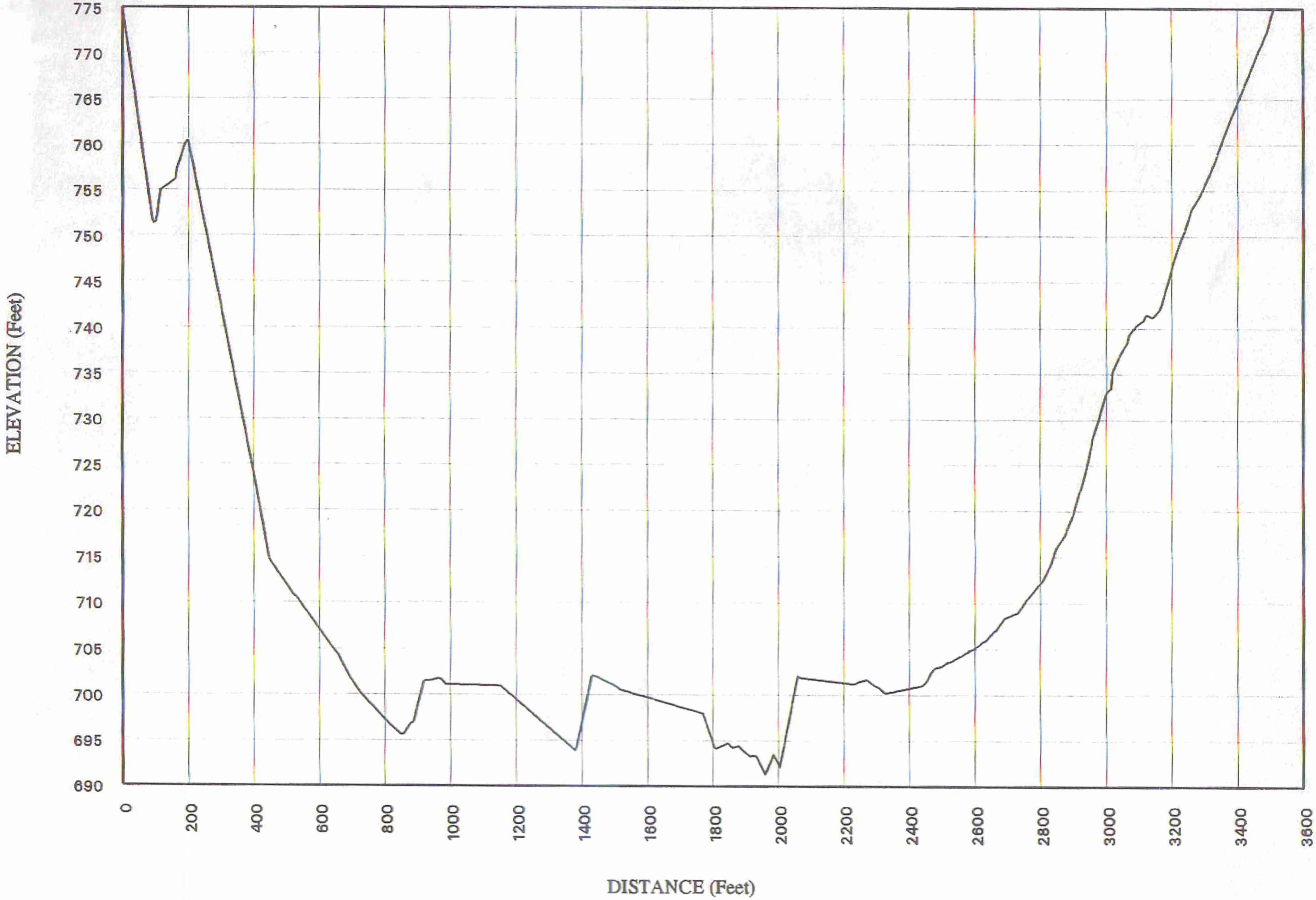
Cross Section D-D′




PREPARED BY: TWDB OCTOBER 1997

# SQUAW CREEK RESERVOIR

Cross Section E-E′

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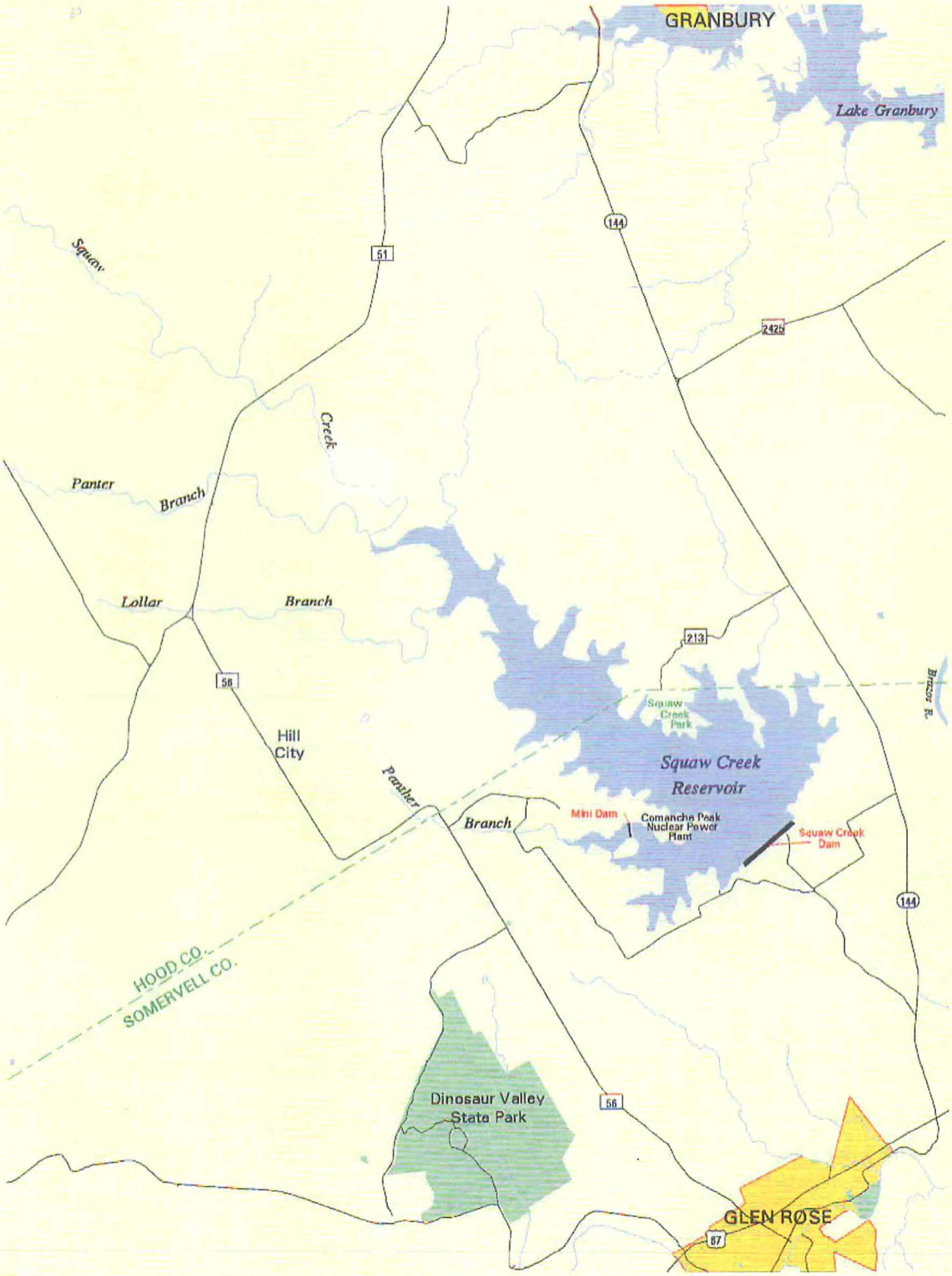
# FIGURE 1
# SQUAW CREEK RESERVOIR
Location Map

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1"=9000'

## FIGURE 2

# SQUAW CREEK RESERVOIR

Location of Survey Data

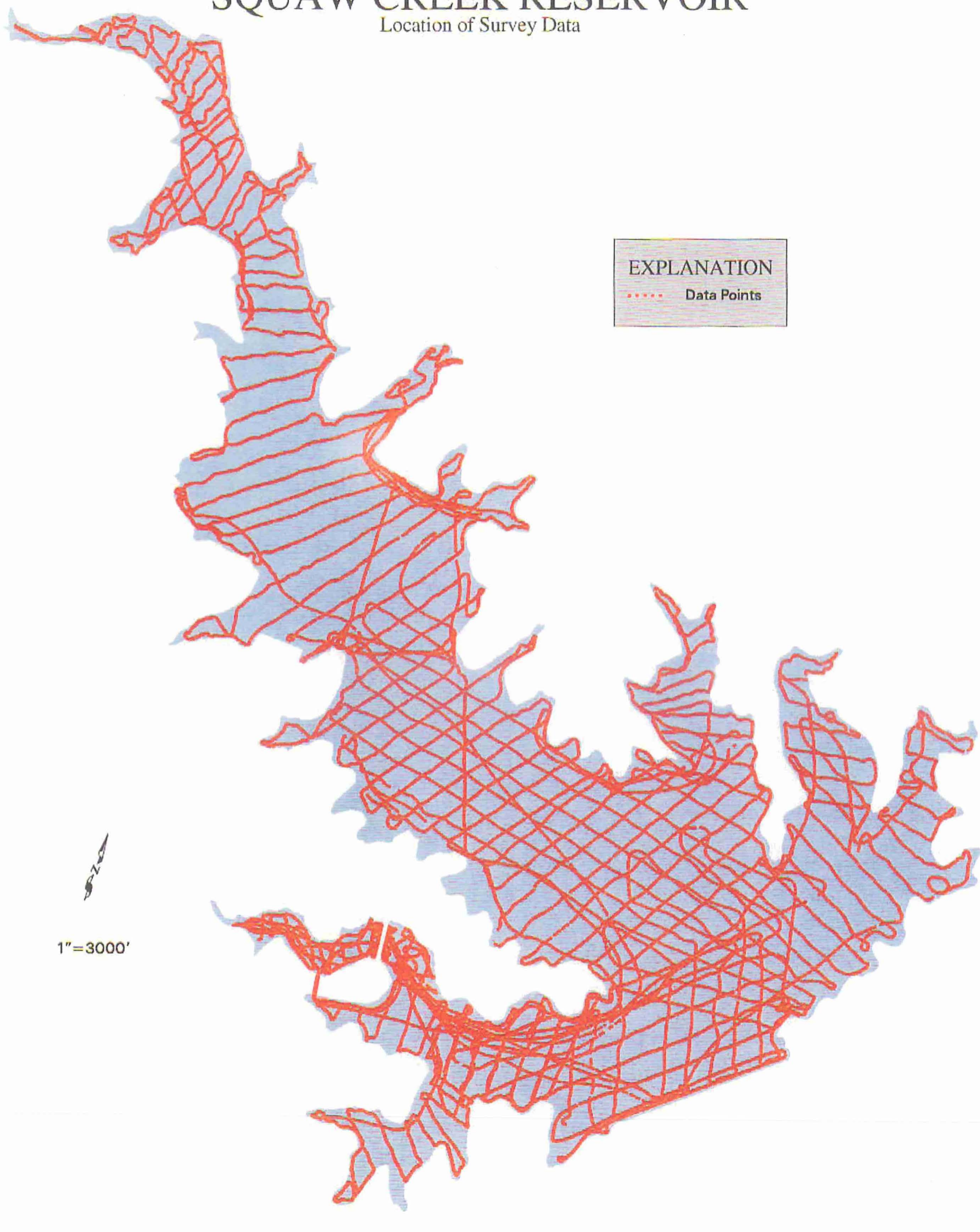


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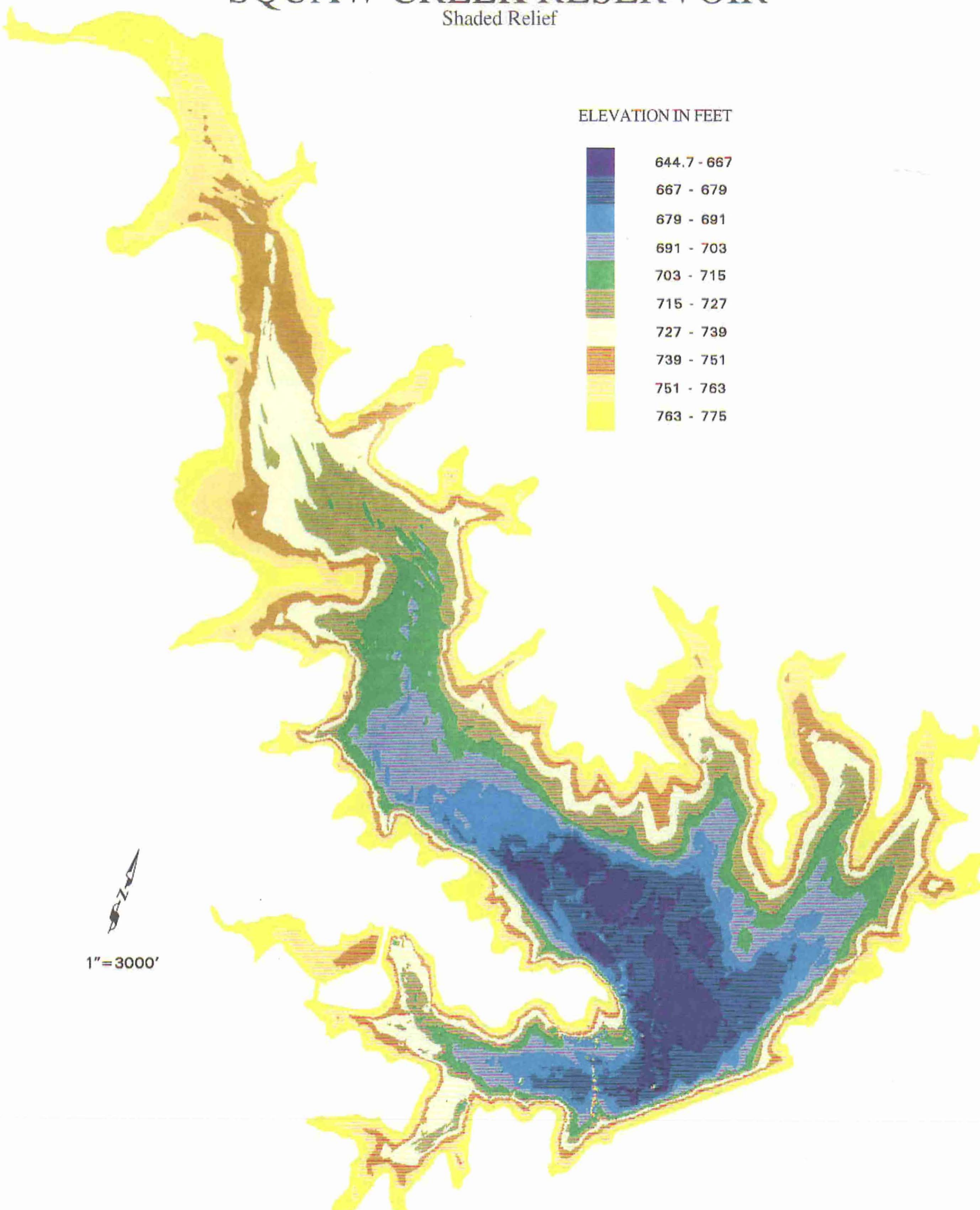
FIGURE 3

# SQUAW CREEK RESERVOIR

Shaded Relief

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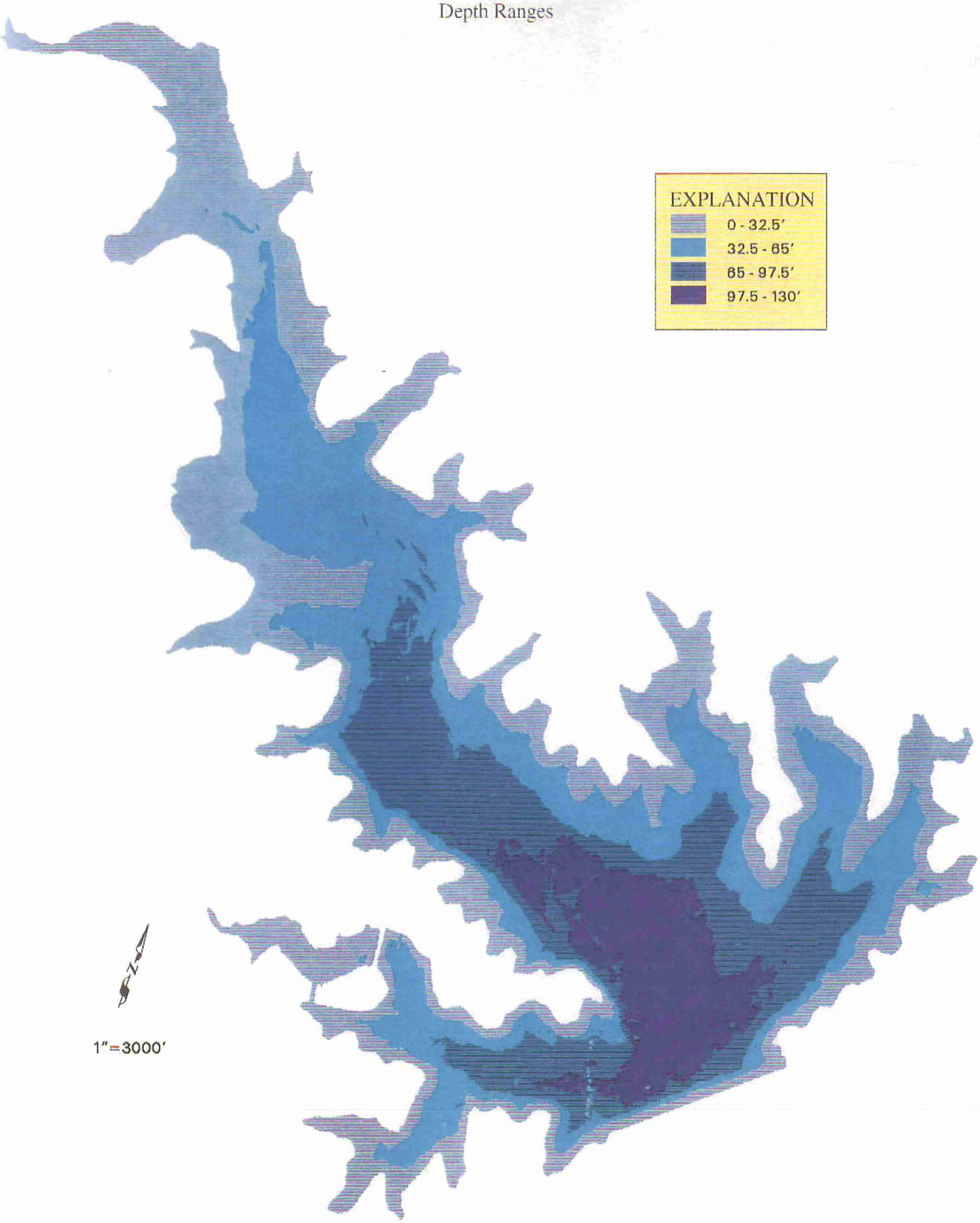
## FIGURE 4

# SQUAW CREEK RESERVOIR

Depth Ranges

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