LAKE BROWNWOOD
HYDROGRAPHIC SURVEY REPORT

INTRODUCTION

Staff of the Hydrographic Survey Unit of the Texas Water Development Board (TWDB) conducted a hydrographic survey of Lake Brownwood during the period April 21 - April 24, 1997. The purpose of the survey was to determine the capacity of the lake at the conservation pool elevation. 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 Lake Brownwood is 1425.0 feet. From a survey conducted in 1940, the lakes original surface area was estimated at 7,298 acres and the storage volume was estimated at 149,925 acre-feet of water. The 1940 survey was based on a combination of field surveying and a 1927 U. S. Geological Survey topographic map with 20 foot contours.

HISTORY AND GENERAL INFORMATION OF THE RESERVOIR

Lake Brownwood and Lake Brownwood Dam are owned and operated by the Brown County Water Improvement District No. 1. The reservoir is located at the confluence of Pecan Bayou and Jim Ned Creek in Brown County, eight miles north of Brownwood, TX (See Figure 1.). Records indicate the drainage area is approximately 1,535 square miles. At the conservation pool elevation, the lake has approximately 68 miles of shoreline and is 13.5 miles long. The widest point of the reservoir, located two and one-quarter miles upstream of the dam on Jim Ned Creek, is approximately one and one-half miles.

The State Board of Water Engineers issued Permit No. 1036 to the Brown County Water Improvement District No. 1 on December 3, 1929. Certificate of Adjudication No. 14-2454 was

issued by the Texas Water Commission on June 1, 1983. The certificate authorized the Brown County Water Improvement District No. 1 to maintain an existing dam on Pecan Bayou and impound therein, not to exceed 114,000 acre-feet of water. The owner was authorized to divert, not to exceed 15,996 acre-feet of water per annum and use not to exceed 12,797 acre-feet of water annually for municipal purposes. Additionally, the owner was granted the right to divert, not to exceed, 5,004 acre-feet of water per annum and use not to exceed 4,003 acre-feet of water annually for industrial purposes. The certificate also authorizes the owner to divert, not to exceed, 8,712 acre-feet of water per annum and use not to exceed 6,970 acre-feet of water per annum to irrigate a maximum of 7,891 acres of land within the boundaries of the Brown County Water Improvement District No. 1.

Records indicate the construction for the project began in 1930. Flood waters filled the reservoir in 1932 but were released in order to complete the construction of the dam. The project was completed in 1933 and deliberate impoundment began in July of that same year. D. W. Ross was the design engineer for the original project.

The original dam consisted of an earthfill embankment, 1,580 feet in length, rising to a height of 120 feet with a crest elevation of 1,449.5 feet. In 1982 the embankment was modified and raised to an elevation of 1,470.0 feet. The service spillway is a earth cut channel located approximately 800 feet to the left (north) of the dam. A two feet wide concrete wall serves as a weir and extends 479 feet at elevation 1,425.0 feet. The outlet works consist of three gated outlets, staggered at elevations 1,360.0, 1,380.0 and 1,408.5 feet. All flows that pass through the embankment are discharged through a 42 inch diameter conduit.

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 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