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## MEMORANDUM

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TO: BCWD Board of Managers  
FROM: Karen Kill & Bob Fossum  
RE: Long Lake (DNR ID 82-21) Sediment Survey Results  
DATE: March 31, 2004

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### **Background**

The purpose of this project was to collect and document sediment depths and thickness in Long Lake for a possible future lake management plan. Since knowing the lake and sediment volume would be vital in the preparation of a lake management plan, the Brown's Creek Watershed District authorized the Washington Conservation District to proceed with the Long Lake Sediment Survey at their January 2004 meeting. The Long Lake Sediment Survey would be accomplished by measuring the depth of water and sediment thickness in approximately 100 sampling locations. Each sediment depth sample point was located using GPS technology. The resultant data would be compiled and plotted and displayed in isopleth maps. In addition the volumes and quantities of sediment were to be documented. The whole study was to be documented in a letter report.

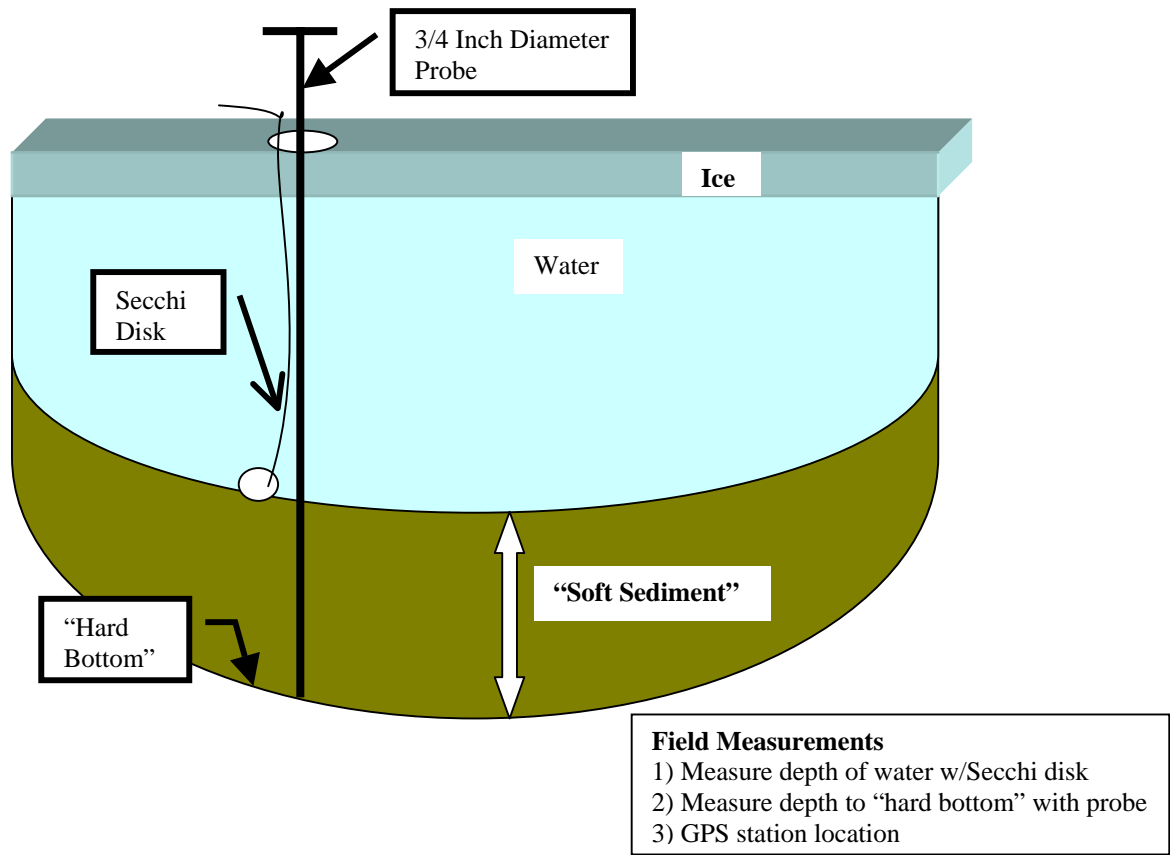
### **Methods**

The Long Lake sediment survey work was conducted February 25, 2004. Water and sediment depth stations were set up on the ice at approximately 150-foot intervals for a total of 109 stations across the lake. Holes were drilled through the ice at each station then surveyed for water depth and depth to hard bottom. Each station location was recorded using Global Positioning System (GPS) technology (Figure 1).

Water depth was measured using an 8-inch diameter disk that was lowered into each hole until it settled on the soft sediment. Depth was measured from the water surface in each hole. The depth to hard bottom was measured using ten-foot sections of ¾ inch galvanized steel pipe. The pipe was lowered into each hole and then pushed straight down into the sediment until refusal. This was assumed to be the hard bottom. Depth was again measured from the water surface in the hole. The difference between the water depth and the depth to hard bottom was determined as the sediment thickness.

The GPS locations and the measurement data collected at each station were downloaded into the Geographic Information System (GIS). ArcView 3-D Analyst was used to create contours for water depth, depth to hard bottom, and sediment thickness. The surface areas of the polygons created by the contour lines were calculated with ArcView and the depths were then used to calculate the water and sediment volumes.

Figure 1. Long Lake Sediment Survey Methods



## Results

Long Lake is calculated to have a water volume of 374 acre-feet (approximately 604,000 cubic yards). The greatest water depth of 20 ft was found in the northern-most lobe (Figure 2). Approximately 80% of Long Lake's surface area is less than five feet deep. Approximately 90% of the surface area is less than seven feet deep.

The depth to hard bottom survey showed that there are two distinct holes in the lake (Figure 3). The deepest depth to hard bottom, 41.0 ft, was found in the northern-most lobe of the lake, where the water is approximately twenty feet deep. The other hole was 38.0 ft and found in the central portion of the lake, where the water is approximately six feet deep.

The sediment thickness, calculated by subtracting the water depth from the depth to hard bottom, was also thickest in the northern-most lobe and the central portions of the lake. The sediment thickness was 24.0 ft and 32.0 ft, respectively (Figure 4). The majority of the lake had at least six feet of sediment.

If all "soft" sediments were removed and the lake water volume was equivalent to the depth to hard bottom, the lake would have a volume of 977 acre-feet (1,577,000 cubic yards).

The sediment found in the southern third of Long Lake was noted to be of a mineral origin; whereas, the sediment found in the northern two-thirds of Long Lake was noted to be mostly decomposed organic material.