

Devils Lake Private Water Well Sampling Project

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Above average annual precipitation throughout parts of the upper Midwest from 1993 to 1995 resulted in severe flooding in many areas. One area of continuing concern in North Dakota has been the Devils Lake region where the surface water elevation of Devils Lake has increased to near record levels.

Due to its size, coupled with its agricultural and recreation potential, the Devils Lake basin is considered one of the major drainage basins in North Dakota. The majority of the water in the Devils Lake basin drains to the terminal lakes of Devils Lake and Stump Lake located at the southern end and approximately the lowest point in the Devils Lake basin. The natural drainage of the basin frequently results in overland sheet flow across agricultural lands and some urban and rural residential areas located within the basin. The recent increase in the water level of Devils Lake has impacted or threatens to impact a significant number of commercial, industrial, and private interests.

In response to this concern, the North Dakota Department of Health (NDDH) with funding from the United States Centers for Disease Control and Prevention (CDC) and the United States Environmental Protection Agency (EPA) surveyed 158 private drinking water wells in the Devils Lake area. The wells were sampled for overall water quality impacts including nitrate plus nitrite, total coliforms, select trace metals, and general cation and anion chemistry. A total of 38 wells in the Devils Lake area (or one of every four wells) were tested for 50 distinct pesticides. All of the wells tested in this survey were used as a source of drinking water.

A total of 32 or 20.2% of the wells tested positive for coliform bacteria. A total of 12 or 7.6% of the wells had a nitrate concentration greater than or equal to EPA's Maximum Contaminant Level (MCL) of 10 milligrams per liter (mg/l) as nitrogen. Pesticides were not detected in any of the 38 private wells tested in the Devils Lake area. An average total dissolved solids concentration of 1,500 mg/l was found in the samples tested.

In comparison to the statewide 1994 and 1995 private water well studies performed by the NDDH, the private wells tested in the Devils Lake area had a lower bacterial contamination rate (20.2%) than either the 1994 survey results (31.6%) or 1995 survey results (36.2%). The private wells tested in the Devils Lake area had a lower nitrate contamination rate (7.6%) than either the statewide 1994 survey results (11.4%) or 1995 survey results (15.5%) based on the percentage of wells testing greater than or equal to the nitrate plus nitrite MCL of 10 mg/l as nitrogen.

To ascertain if rising surface water levels have negatively impacted water quality in private wells around Devils Lake and Stump Lake, data collected from wells adjacent to the high lake water levels were evaluated. Those wells which had a wellhead elevation less than 1457' and

1445' feet above mean sea level were evaluated. A total of 15 wells were located at an elevation of 1445' or below. This correlates to a well elevation within 10 feet of Devils Lake surface elevation at 1435'. These wells had a bacterial contamination rate of 26.7% while those wells above 1445' had a bacterial contamination rate of 20.1%. However, average nitrate levels in those wells at or below 1445' were lower (0.21 mg/l) when compared to those wells above 1445' (3.48 mg/l). A total of 58 wells were located at or below an elevation of 1457' above mean sea level or within 22 feet of Devils Lake surface elevation. These wells had a slightly lower rate of bacterial contamination (19.0%) compared to those wells above 1457' (20.8%). However, average nitrate levels in those wells at or below 1445' were slightly higher (5.06 mg/l) when compared to those wells above 1445' (4.43 mg/l).

Based on the wells sampled in this survey and the private water well survey results obtained in the statewide analysis in 1994 and 1995, water quality in the Devils Lake area in terms of bacterial and nitrate contamination is better than the statewide average. Although the recent flooding in the Devils Lake region has likely contaminated some drinking water wells in the area, the lab analysis results do not show a significant bacterial, nitrate, or pesticide contamination problem in private drinking water wells in the Devils Lake area covered by the survey.

If above average precipitation in the Devils Lake region continues and lake levels rise, a number of private wells sampled in this survey will be flooded. This will likely increase the amount of bacterial and chemical contamination in private drinking water wells in the region. If Devils Lake rises to 1445 feet, 15 wells sampled in this survey will be flooded. If Devils Lake rises to 1457 feet, 56 wells sampled in this survey will be flooded. These numbers only reflect those wells tested in this survey. Many more wells exist at or below these elevations which were not sampled in this survey which would also be flooded.

Based on the well characteristic inventories and laboratory analysis results, a majority of bacterial and nitrate detections are associated with well construction and maintenance, and point sources of contamination near the well. Following established water well construction regulations and guidelines will reduce the likelihood of drinking water well contamination. As indicated in this survey, since its inception in 1972, the Water Well Construction and Water Well Pump Installation Code (Chapter 33-18 in the ND Administrative Code) has helped to reduce bacterial and nitrate contamination in drinking water wells.

For further information regarding this and other water quality projects in North Dakota, contact the Division of Water Quality at (701)328-5210.