WILL ANNE ARUNDEL COUNTY RUN DRY OF WATER?

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(This report is taken from 2 papers by David Andreasen, MDE, MGS (2002, 2007)

Many of us have read or heard about the problems that California is having with its potable water supplies. Many sections of the state have gone to rationing or are having to pay excessive fees for their water. ***Will that happen here***?

Ground water is the only source of potable water in Anne Arundel County (AAC), Maryland. Ground water pumped from individual wells tapping the Aquia aquifer supplied approximately 1.6 million gallons per day (Mgal/d) to an estimated population of 26,400 in 2000. An additional 0.18 Mgal/d was withdrawn from the Aquia aquifer for mobile home parks and irrigation. Withdrawals from the Magothy aquifer totaled approximately 0.22 Mgal/d in 2000. Total water demand in Southern Anne Arundel County may increase from about 2 Mgal/d in 2000 to 2.8 Mgal/d by 2020 to support a population of 32,750.

The Aquia and Magothy aquifers are the most likely sources for future withdrawals, given their relatively shallow depths, although deeper aquifers in the Potomac Group are also available. The natural water quality of the Aquia is generally acceptable for self-supplied domestic use. However, the Magothy aquifer contains iron concentrations at levels requiring additional procedures that add to the cost of the water.

This raises the important question: will there be a reduced supply of water in the southwestern counties of Maryland in the future? The area is growing and several authors have mentioned that such a problem might exist by 2044. David Andreasen in 2007 has made mention of this possibility ***if*** nothing is done to curtail the current usage and growth rate in this area. Fortunately, he did not just raise the issue, ***he also made suggestions*** as to help solve or delay the inevitable.

Withdrawals from public-supply wells operated by the Anne Arundel County Department of Public Works on average totaled approximately 26 million gallons per day in 2002. Of that amount 2.2, 17.2, and 6.2 million gallons per day were pumped from the Upper Patapsco, Lower Patapsco, and Patuxent aquifers, respectively.

In response to increased pumping, water levels in southern Anne Arundel County have dropped to as much as 90 feet below sea level. Currently there is adequate available drawdown to sustain the withdrawals. Average-day water demand, however, is projected to increase nearly three-fold to 73 million gallons per day by 2040, with an estimated maximum-day withdrawal of 140 million gallons per day.

An increase of that magnitude could cause significant drawdown resulting in: (1) water levels falling below the regulatory management level in some areas; (2) well operational problems; (3) increased pumping costs; and (4) reduced stream base flow (flow coming from groundwater).

To minimize this regional drawdown effect on increased future demand, Andreasen proposed that ***withdrawals*** from Anne Arundel County's public-supply wells ***be optimized*** using a numerical, three-dimensional ground-water-flow ***model***. This model proposed ***varying and alternating the pumping rates*** from different wells to prevent the drawdown levels from exceeding regulatory management levels in the aquifers.

The results of this study indicate that sufficient ground water is available to supply the projected demand through 2040 (73 Mgal/d average day) from the Anne Arundel County Department of Public Works well fields, while at the same time supplying ground water to other users in the County as well as the surrounding counties (including Baltimore City).

Meeting the projected demand will require construction of new wells and well fields. When withdrawals are optimized using Andreasen's model to minimize drawdown, simulated water levels did not fall below the State-mandated management level near the well fields by the end of the simulation period (2044). However, the increased withdrawals resulted in relatively deep water levels that increased pumping lift, which would lead to greater energy costs. In addition, the increased withdrawals may eventually reduce base flow to streams within the recharge (outcrop) areas of the aquifers pumped.

Fortunately, ***northern AAC*** uses the Upper and Lower Patapsco aquifers for the majority of their users and these aquifers seem to re-supply themselves in between periods of variable pumping.

One of the authors (Klepczynski) worked with theoretical models in another field and in that field models did not accurately predict the future because the physical parameters used in the models were subject to change. For groundwater, (1) the parameters used to predict an aquifer's response may vary unpredictably with time; and (2) the water in some areas of an aquifer may be depleted faster than the aquifer can resupply it. In addition, there are external factors that may not be accurately included in the model such as population growth, salt-water intrusion, climate change, etc.

Unfortunately, Charles County and the Eastern Shore have additional complications to their water supply. Charles County does not have enough water to sustain their projected growth. It must get additional water from other nearby sources. On the Eastern shore, the wells have to be significantly deeper than those for AAC. Hence, pumping and water treatment costs are significantly higher almost to the point of being prohibitive.

At this point in time, the situation is not dire. The ***suspected*** looming shortfalls caused by some unplanned depletion of aquifers or inadequately modelled growth in domestic and agricultural usage can be offset by planning to develop safe, reliable alternative water resources. **One such possible alternative source** is the use of Reclaimed Water (RCW). RCW is one of the most reliable alternate water supplies available, because wastewater discharge, unlike surface water supplies, does not depend on precipitation and is relatively well controlled through regulation and treatment. It is already being done at a moderate scale in Charles County. As the Water Reuse Foundation has reported, the use of RCW for **non-potable** applications reduces demands on other water resources, encourages a higher level of control over the fate of pollutants, and minimizes discharges into the environment. These are a few of the things to consider when investigating the possible use of RCW in Anne Arundel and nearby counties.

References:

1. David C. Andreasen, "*Optimization Of Ground-Water Withdrawals In Anne Arundel County, MD From The Upper Patapsco, Lower Patapsco, And Patuxent Aquifers Projected Through*", 2014, Maryland Geological Survey.
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3. Stephen A. Davis, "*Guidebook for Water Reuse On-Site Inspection*", 2012, Water Research Foundation.