MEMORANDUM

To: Groundwater Advisory Council
From: H. Bokuniewicz
Re: Minutes of the meeting of 24 March 2008
Date: April 15, 2008

PRESENT
I. Abbene
R. Alvey
N. Bartilucci
H. Bokuniewicz
S. Colabufo
G. Hanson
R. Liebe
R. Mazza
A. Monitt
A. Papabi
D. Paquette
K. Roberts
W. Spitz
S. Terracciano
C. Young

REGRETS
M. Alarcon
S. Jones
L. Koppelman
M. Nofi
G. Proios
A. Rapiejko
K. Willis

1. There were no comments on the minutes of the last meeting. Tom Shanahan has sent out another “legislative report”; I will forward it to the committee. We’re also proceeding with the WebEx on sealcoat runoff.

2. Caitlin Young presented results of the ongoing SBU nitrate study, showing the 2007 data from lysimeters in turf-grass plots fertilized with either organic or commercial fertilizer. In 2007 the sites using chemical fertilizers registered higher levels of soil nitrate than those using organic fertilizers in the fall, perhaps because of differential leaching. Monitoring wells at the water table in the Oakdale chemically fertilized plot showed a loss of nitrate in the vadose zone. This may be due to denitrification and a study has begun to measure denitrification. Ammonium and nitrogen enter groundwater from the atmosphere, fertilizer application and septic systems. Of these sources septic tank/cesspools are the largest contributors of nitrate. Ammonium and organic nitrogen entering the soil around a cesspool can be oxidized to create nitrate that further leaches into the groundwater. Some ammonia may be lost by ammonification, the formation of ammonia gas that is released to the atmosphere. Denitrification was raised as an important process in the Suffolk County groundwater nitrogen budget by Porter in 1980.
A study prepared for Suffolk County Department of Health had the opinion that about half of the nitrate expected to enter Long Island Sound was denitrified before reaching the shoreline. The numbers used in this study were based on a study in Florida that found a 61% loss of nitrate in the vadose zone and 35% loss of nitrate in the aquifer itself. Denitrification is a microbially mediated process that requires common soil bacteria to transform nitrate to nitrogen gas. This reduction of nitrate to nitrogen gas happens in hypoxic or anoxic environments using organic carbon as an electron donor. Long Island aquifers may be too well oxygenated for denitrification to occur. Previous Eh/pH measurements suggest oxygenated groundwater but dissolved oxygen measurements can be incorrect due to atmospheric contamination. Other data, like that discussed earlier suggest denitrification. There have been few direct measurements of denitrification anywhere, and none on Long Island.

Nitrogen/Argon measurements can be used to detect denitrification. The N2/Ar ratio is constant in the atmosphere and as a result in the dissolved gases in precipitation that infiltrates into the groundwater. In the aquifer, denitrification will change the ratio by adding dissolved N2 gas to the groundwater. A membrane inlet mass spectrometer (MIMS) can accept small samples and measure N2/Ar in dissolved gas from groundwater to accuracy of 0.003%; 1 ppm nitrate would be recognized as an N2/Ar ratio of 40.8, above the atmospheric value of 38.2. Studies will be done at Northport and Fire Island on shallow monitoring well samples collected with a low-flow pump. Supply well samples from the same areas will be collected at the same time so data will represent conditions in the shallow waters that undergo submarine groundwater discharge as well as the deeper groundwater that is used for public consumption. The USGS is working on Fire Island in collaboration with the National Park Service and investigators from Woods Hole.

3. Steve Terracciano reported on long-term studies done by the USGS that show an increase in nitrate over the years. Some wells showed a linear increase in nitrate levels from 1 to 2 mg/L to near 10mg/L while wells were pumping but levels dropped abruptly when pumping was stopped. In one case, the nitrate levels in one well dropped even though the pumpage continued but a nearby well has been turned off.

Monitoring wells at 300 or 400 feet show anoxic conditions and high iron but little or no nitrate but it seems that oxygenated water with higher nitrate is being drawn deeper into the aquifer with pumpage. There may be other factors, however, as the elimination of point sources of nitrate.

In the Carmens River at Yaphank, chlorine concentrations rose from 7 mg/L in 1967 to 20 mg/L in 1997 due to road salt. Because pumping draws down oxygen and nitrate in deep wells, levels decrease when pumping stops and, in Nassau nitrate levels are now lower in the overlying water than they are in the deep aquifers. Nitrogen, of course, is added by lawn fertilizers, pet wastes, etc. but operational factors in the wells are also controlling factors, not only pumping but, in individual wells, practices like backwashing with freshwater could be having an impact. A two-dimensional box model with variable pumping might be used to investigate the operational factors in more detail.

4. The Suffolk County Comprehensive Study also looked at increasing levels of nitrate in private wells. It appears that nitrate levels have increased (1987 to 2005) with levels increasing in public supply wells screened in the glacial aquifer by 38%, to an average of 3.38 mg/L and by 67%, to 1.6 mg/L, for those in the Magothy. Some 10% of private
wells exceeded the drinking water MCL and almost 30% of private wells exceed GMZ target concentration of 4 and 6 mg/L nitrate. We will try to get an update on the Study at a future meeting.

5. Recent news articles on pharmaceuticals in city water supplies have attracted attention. They were published as if this was a new development, and in the public consciousness it probably is but Mark Benotti published his work in *Environmental Science and Technology* years ago. The levels are very low, and there seems to be no reason to believe that there are any health risks for groundwater supplies. Sewage treatment plants are not designed to remove pharmaceuticals, but there may be other treatments, boiling perhaps. Hospitals incinerate waste pharmaceuticals but, as far as we know, pharmacies are not required to “take back” waste medicines. We don’t know if there are disposal regulations for pharmacies.

6. The ban on fall fertilizing may not be a definite solution to a nitrate issue. People may “double-up” in the summer or “stockpile”, intentionally or not, fertilizer for fall applications or, of course, still able to buy it. Pre-emergent treatments, as for crab-grass, are only sold in fertilizer mixes so the herbicide must be applied with fertilizers. The lysimeter studies show the importance of the timing of fertilizer applications with respect to the growing season and rainfall. Golf courses, which are managed by professionals, are less of a problem than private lawns, on which fertilizer is applied “on the first warm Sunday” rather than at optimum times or applied on a fixed schedule by lawn services.

7. The next meeting will be on **Monday, April 28 at Dvirka and Bartilucci in Woodbury from 9:30 AM to 11:30 AM.**