`

MEMORANDUM

To: Groundwater Advisory Council
From: H. Bokuniewicz
Re: Minutes of the meeting of 2 June 2008
Date: June 12, 2008

PRESENT	**REGRETS**
R. Alvey	M. Alarcon
H. Bokuniewicz	N. Bartilucci
S. Colabufo	L. Koppelman
S. Jones	R. Liebe
D. Paquette	R. Mazza
K. Roberts	M. Nofi
W. Spitz	G. Proios
S. Terracciano	A. Rapiejko
K. Willis	
L. Zhou	

1. Editorial revisions had been suggested and were made to the minutes of the last meeting.

2. Lisha Zhou presented the results of her research using weather radar data to examine the distribution of precipitation on Long Island. The NEXRAD data is available, for free, from the National Weather Service. It covers grid boxes 4 x 4 kilometer and has been recorded every 15 minutes in dry periods and every 6 minutes during rainfalls between 1996 and 2007. The best data is between 2004 and 2007. Processing these data is, however, labor intensive; each year contains some 9,000 files that have to be dealt with individually.
   Data from 2007 showed an average annual precipitation as expected, of 42 inches per year ranging from 60 inches in the west to 31 inches in the dryer south and southeast. During the warm season (April to September) the pattern was particularly strong with precipitation of 902 mm in the west and only 311 mm further east. These data compared very well with the rainfall recorded in rain gages available for this time period. The radar unit covering Long Island is in BNL. There is a noticeable band of unreliable data from the location of the unit to the northeast due to partial blockage of the radar beam by a smokestack at BNL. (This obstruction is intended for demolition soon). Other radar units in the northeast have similar problems.

   The 2004 data showed a range in annual precipitation from 57 inches to 32 inches with an average of 45 inches. There was a pattern, similar to 2007, of higher precipitation in the west. This pattern, in the summer is due to the fact that convective storms come from the west and with higher rainfall over the higher relief east of New York City. The distribution compared favorably with that determined by the USGS in 1960 which ranged from 60 inches per year in New York City to 45 inches along the south shore of Long Island. Eleven rain gages were available in 2004 for comparison. Agreement was excellent at nine stations; but the gauged amounts were higher than the radar data at two

stations. These two were in areas of relatively high topographic relief so it may be that the radar beam had been partially blocked by the topography or that the gages in these locations over collected. 2005 showed some anomalously high values for precipitation around BNL. These were twice as high as seen earlier. Upon investigation these values turned out to be "bad data"; some such "bad data" points occur in a few cells in the grid. They are not removed by the NWS routine processing but do not correspond to actual rainfall. Radar stations in the northeast do not overlap on Long Island but they do overlap elsewhere and overlapping data is accounted for in the NWS data processing. There may be some overlap in SW Long Island with a station in New Jersey.

3. The Suffolk County Water Authority has established a "Source Water Protection Award". The press release will come out next week with a formal event later in June. It is intended to impress on the public that they are living over their water supply; water does not come from the Catskills or underground from Connecticut. This is a common problem; at the BNL event in Heckscher State Park for Earth Day it was clear that many people had no idea where their water came from. The Suffolk County Department of Health Services will be involved and, perhaps, will bring it to the State Health Department. Schools, community groups, and businesses are all eligible. Perhaps, the program could be highlighted at the Pine Barrens Research Forum in October.

4. The Water Authority has also launched a rebate program for people who have installed rain gages on their irrigation systems. Many people still mistakenly believe that irrigation is not as big a problem as swimming pools and that watering early in the morning is the "best time" even though everyone's doing the same.

   The rain sensors work by having a piece of cork that swells and turns off the switch when it rains. Some wireless models are now available. Some golf courses use a soil moisture sensor but this required additional wiring and is inconvenient for individual households. They could pay for themselves in three or four waterings.

   To reduce watering needs, artificial turf is fairly common out west and people using it can get rebates and credits. On Long Island, Kentucky blue grass is preferred for sod because it has shallow roots but it is very water-demanding. A deeper-rooted grass could be used for sod but it is generally not available as offered as an upgrade to a lower-maintenance lawn. *Fescue* grass seed would be good since it requires little water but it can be hard to find. It may be possible to reach out to growers through the Cornell Cooperative Extension. We had discussed previously offering some sort of on-line educational quiz or short-course that would reward participants with manufacturer's coupons or SCWA rebates.

5. Rob Alvey is considering a RARE proposal to study coal-tar based parking lot sealants as a source of PAHs in NY in conjunction with LIGRI and the USGS. Coal tar is exempted by EPA because it is a recycled material, but petroleum-based sealants seem to be more benign. The principal problem is with particulates and probably shallow, surface-water. It is not expected to be a source of groundwater contamination but that should be documented.

   The USGS's Trends Program recharge basins and Newbridge Pond in Merrick have found among other things, cesium from the 1952 bomb tests with lead decreasing as leaded fuels were banned as well as an increase in PAH's and chemical changes due to the change in composition of rubber tires.

6. We are planning to host a workshop on in-situ remediation on 29 July 2008 at the University. I will send more information as it becomes available.

7. The USGS (Woods Hole, MA) just completed a study in Manhasset and Northport bays, in which LIGRI participated, to look at nitrogen inputs due to groundwater underflow. Results will not be available until later this year.

   The TMPL of nitrate in Long Island Sound is being re-examined. Non-point sources may be highlighted as well as drainage basins outside of NY State. At a National Monitoring Conference last week, nitrate was one important focus. In the NJ Pine Barrens, alternative wastewater treatments are capable of reducing nitrate loading from small (3.5 acre), developed lots.

8. Jennie Munster is presenting her perchlorate results, Caitlin Young her preliminary nitrate results, and Lisha Zhou, her precipitations results at the NGWA Conference Eastern Regional Ground Water Issues on 23-24 June, 2008 in Ronkonkoma.

   Monday, June 23, 2008 : 3:30 p.m.

   Annual Precipitation Pattern over Long Island Based on Rader Data
   Lisha Zhou

   Accurate measurements of precipitation are very important for all rainfall-related applications. Traditionally, rain gauges physically measure rainfall accumulation at a point and generally provide good quality data for a small area. But the rain gauge networks are not capable of detecting precipitation at the resolution and extent necessary for most hydrometeorology applications. Weather radar measurements of precipitation potentially provide rainfall data with much higher spatial and temporal resolution compared to rain gauges. The radar system (NEXRAD) consists of 159 high resolution Doppler weather radar stations throughout US and selected oversea locations. The radar system generates data every 15 minutes, with spatial resolution of 4*4 km^2. The radar data (Stage III and MPE-Multi-sensor Precipitation Estimator) are available from 1996 – 2005. We are using the radar MPE data to get the precipitation pattern over Long Island. The automated radar data processing system, which was developed by Dr.Xie and his research group in UTSA, implemented by using commercial GIS and a number of Perl scripts and C/C++ programs. Results for 2004 MPE data show more rainfall on areas of higher elevation. In order to evaluate the accuracy of the radar results, I compared the 2004 MPE results with rain gauge results for 11 stations on Long Island. There was good agreement. The annual radar rainfall was on average about 5% less than that for the rain gauges.

   Monday, June 23, 2008 : 4:30 p.m.

   Nonpoint Sources of Perchlorate Contamination to Ground Water

   Jennie Munster[1], Gilbert N. Hanson[1] and W. Andrew Jackson

   Perchlorate in groundwater is a concern based on the likelihood that perchlorate at low levels disrupts normal thyroid functions and due to the possibility of a mandated EPA

drinking water standard of 4 ug/L or less. As of December 2005 the Suffolk County Water Authority identified 104 supply wells with perchlorate concentrations above 0.5 ug/L, some of which have no known sources of perchlorate. We measured concentrations in bulk precipitation, sewage, bleach, road salt, road runoff and soil water collected below fertilized lawns in Suffolk County, NY, as possible nonpoint sources in urban areas.

While bulk precipitation has an average value of 0.2 ug/L ClO_4 (n=108), we found that perchlorate in bulk precipitation collected shortly after the Fourth of July increases to a maximum value of 2.8 ug/L, which we believe is due to fireworks. Soil water beneath lawns that are not fertilized or are fertilized with chemical fertilizer have concentrations between <0.1 to 3.0 ug/L. Soil water beneath lawns treated with organic fertilizer has concentrations ranging from 1 to 625 ug/L. Road runoff in stormwater basins has a maximum concentration of 18.5 ug/L, with an average value of 2.2 ug/L (n=35). Recharge basins that receive road runoff have an average value of 3.0 ug/L (n=10). Sewage from cesspool/septic tanks has an average value of 2.9 ug/L (n=38).

The concentrations measured in this study indicate potential sources of contamination to local groundwater supplies, since the sources we measured directly leach to groundwater. The average concentrations measured are below the NY state drinking water planning level of 5 ug/L. Many individual samples, however, are well above this level. As a result, we have to be concerned about the risk of perchlorate concentrations in groundwater increasing to above the New York State planning level and above the potential EPA drinking water standard.

Tuesday, June 24, 2008 : 9:40 a.m.

Evaluating the Extent of Denitrification in Suffolk County Ground Water

Caitlin Young and Gilbert N. Hanson, Stony Brook University
Nitrate pollution dominantly from septic tank/cess pool sewage and lawn fertilizer has become a concern for Suffolk County Groundwater Authority (SCWA) water supplies. Munster (2004) and Bleifuss (1998) have used anions, cations and $d^{15}N$ and $d^{18}O$ isotopes to distinguish between nitrate contamination sources from lawn fertilization and sewage. Munster, oral communication 2008, suggests that in more densely populated areas using septic tanks sewage is the dominant source of nitrate. Porter et al (1980) suggested that Suffolk County groundwater shows a deficit of nitrate given the high input of nitrogen originating from sewage and lawn fertilizer. Nitrogen from a septic tank/cess pool system enters the unsaturated zone as ammonium. Some of the ammonium in the anaerobic zone around a cess pool can be retained by absorption on the mineral grains and organic material. Nitrogen can also be removed by ammonia volatilization in this zone or later by denitrification after oxidation to nitrate. Given the low pH and oxidizing conditions in the unsaturated zone, ammonia volatilization is unlikely to account for the entire nitrogen deficit. Porter et al (1980) suggested that this imbalance can be explained at least in part by denitrification.

Xu (2005) found, based on dissolved oxygen measurements, that Suffolk County groundwater is oxic, not allowing for denitrification. However, Eh/pH measurements suggest that there are reducing environments which would allow denitrification. We plan to measure denitrification by quantifying excess N_2 by calculating changes in N_2:Ar

ratios. Infiltrating groundwater has the same N_2:Ar ratio as precipitation. Denitrification produces excess N_2 in the groundwater. This excess can be measured using Membrane Inlet Mass Spectrometry (MIMS) which is suitable for detecting even small extents of denitrification.

9. The research arm of EPA (ORD) has been shifting its emphasis towards biofuels and climate change issues but is maintaining studies on hazardous wastes. Underflow, as we've been discussing, is also a topic of EPA research.

10. There are no meetings over the summer. The next meeting will be in September and I will send around a schedule as soon as my academic schedule is set here at the University.

HB/ed
GWminutesjune08.doc