

MEMORANDUM

To: Groundwater Advisory Council
From: H. Bokuniewicz
Re: Minutes of the meeting of 30 November 2009
Date: December 17, 2009

PRESENT

R. Alvey
H. Bokuniewicz
J.K. Cochran
S. Colabufo
S. Jones
S. Terracciano
S. Wang

REGRETS

M. Alarcon
N. Bartilucci
L. Koppelman
R. Liebe
R. Mazza
M. Nofi
D. Paquette
A. Rapiejko
K. Roberts
W. Spitz
K. Willis

1. There were no comments on the minutes of the last meeting.
2. Rob Alvey introduced Shumei Wang. Shumei is a Stony Brook student. She is a senior in the Geosciences Department and a volunteer intern with the EPA working on electronic data deliverables.
3. There was a brief discussion of the Edwards Aquifer in Texas because it was the country's first sole source aquifer. The issue there was in large part the protection of endangered species relying on freshwater, surface habitats maintained by the aquifer.
4. Dr. Cochran discussed the use of naturally occurring, radium isotopes to study groundwater discharge into Long Island Sound. This is an ongoing project funded by the NY Sea Grant Institute. Submarine groundwater discharge can be a mix of fresh groundwater from the land and seawater recirculated through the aquifer. It has been shown in other places to be an important pathway for chemical species, like nutrients, metals and organic pollutants, to enter estuaries like Long Island Sound. Even the recirculated sea water may have its chemical composition change in that part of the aquifer referred to as the "subterranean" estuary, which is a chemical reaction zone where fresh groundwater and saline groundwater mix.

Four isotopes of naturally-occurring radium are enriched in groundwater by radioactive decay in the aquifer material and release by chemical watering. Radon also enters

groundwater from the aquifer material by radioactive decay of its parent elements and radon is not removed except by its own radioactive decay.

These isotopes are used to study groundwater by creating a budget of radium or radon fluxes in which one of the terms is the input from submarine groundwater discharge. Other terms in the budget are the flow of water carrying dissolved radium into or out of the Sound, radioactive decay, a supply of dissolved radium from rivers and diffusion of radium from the sea floor. The diffusive flux of radium from the bottom sediments has to be measured along with the radium concentrations in the open water. In Jamaica Bay where this has been done recently, groundwater inputs, although small compared to sewage discharge, were as large or larger than other sources of the nitrogen load.

In Long Island Sound, the advective fluxes were calculated with the help of a numerical, computer model of the tides and currents in the Sound. Thirty-three locations in the Sound and along the Long Island shoreline have been sampled including a time-series of samples over a tidal cycle in the East River. In April, the mean concentration of radium - 224 in the surface water of the Sound was 5.32 ± 1.48 dpm/100L while it was 6.11 ± 1.70 dpm/100L in the bottom water. In July, the concentrations were considerably higher. They were 9.05 ± 4.90 dpm/L in the surface water and 12.79 ± 4.35 dpm/100 L at the bottom. Concentrations of radium -224 were much higher near shore reaching concentrations as high as 65 dpm/100 L. Nearshore water with high concentrations of radium is mixed away from shore to the lower concentrations found in the open Sound. Estimates of the submarine groundwater discharge into the Sound were 88.4×10^{13} L/yr for the data collected in April, 2009 and 57.0×10^{13} L/yr for those measurements made in July, 2009 but a large part of this was recirculated seawater.

5. Dr. Cochran also discussed research being started on zero-valent iron (ZVI). ZVI has been used to form shallow permeable reaction barriers to remove low concentrations of chlorinated organics. Many other contaminants have been shown to be transformed by ZVI (Table 1). It might also be used in denitrification producing nitrogen gas.

EPA has used ZVI for remediation in New Jersey. A problem is to introduce it effectively into groundwater systems. It might be better employed in pump-and-treat systems.

6. At the recent Long Island Water Symposium at NYIT, a proposal was put forth for the creation of a Long Island Aquifer Management Agency. The claim is that such an agency is needed to “consolidate groundwater management and oversight functions . . .”. This would, apparently, not be envisioned as a State agency but rather created in legislation like the Pine Barrens Commission and funded from tax revenue. It may be that new revenues would need to be raised, perhaps by a water tax. Concern was raised about the effectiveness of existing State and county agencies to fulfill their mission in the face of dwindling resources.
7. A proposal has been submitted to Cornell (WRI Grants with the USGS) for continuing study of denitrification.
8. The topics of (a) the reuse of recharge basins and (b) a possible workshop on nitrate inputs to the Sound were both tabled.

9. The next meeting will be on Monday, December 21, 2009 at Stony Brook University, Wang Center 9:30 – 11 AM.
10. A schedule has not yet been set for meetings in 2010.

Table 1

Zero Valent Iron Application

TABLE 3. Common Environmental Contaminants That Can Be Transformed by Nanoscale Iron Particles

Chlorinated methanes

Carbon tetrachloride (CCl₄)
 Chloroform (CHCl₃)
 Dichloromethane (CH₂Cl₂)
 Chloromethane (CH₃Cl)
 Tetrachloromethane (CCl₄)

Chlorinated ethenes

Tetrachloroethene
 Trichloroethene (C₂HCl₃)
cis-Dichloroethene (C₂H₂Cl₂)
trans-Dichloroethene (C₂H₂Cl₂)
 1,1-Dichloroethene (C₂H₂Cl₂)
 Vinyl chloride (C₂H₃Cl)
 Polyhalogenated methanes
 Organochloride Pesticides
 Polychlorinated biphenyl

Heavy metal ions

Arsenic (As(III), As(V))
 Lead (Pb(II))
 Chromium (Cr(VI))

Inorganic anions

Nitrate (NO₃⁻)
 Carbon monoxide (CO)
 Selenate (Se(VI))

Li et al., ES&T 2009