# The Occurrence of Pesticides in Suffolk County

## Water Quality Monitoring Program

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### Abstract

Pesticide monitoring activities by the Suffolk County Department of Health Services were conducted in cooperation with the New York State Department of Environmental Conservation. The first report on the program, issued in 1998, noted the detection of 24 pesticide related compounds in Long Island groundwater, including eight pesticides that were found in concentrations that exceeded drinking water Maximum Contaminant Levels (MCLs). Since that time, the SCDHS has worked steadily to increase its analytical capabilities. Research has been conducted to determine which pesticides have been used, their active ingredients, and whether or not metabolite or degradate chemicals are formed. Their chemical properties were examined to identify those compounds that may have the potential to leach to Long Island groundwater, and analytical methodologies have been developed or refined to detect trace amounts of the chemicals of concern in water. To date, 52 pesticide related chemicals have been detected in Long Island's groundwater, and 13 of these chemicals have exceeded established drinking water standards. There is concern that some of the most frequently detected pesticide degradates lack a specific drinking water standard, and consequently are categorized as Unspecified Organic Contaminants (UOCs) to which a generic MCL of 50 ug/L is assigned.

### Introduction

The department now has the ability to analyze each water sample for 113 pesticides and pesticide degradate compounds. The program's research and monitoring efforts concentrated on land uses where pesticides are routinely used. Areas investigated included golf courses, vineyards, agricultural and residential use areas. Two-inch PVC profile wells where installed down gradient of the various land uses and sampled at ten foot intervals. Permanent wells were installed at levels where pesticides and herbicides where detected. Additionally private wells and public supply wells were sampled and analyzed.

Basic information regarding pesticide use, which is needed to help evaluate agricultural chemicals, was compiled for the first time in a single document. A comprehensive listing of agricultural pesticides applied in the county was established by specialists at the Suffolk County Cornell Cooperative Extension, creating a complete historical listing of pesticide use data for agricultural crops for the period 1975 through 2000. The active ingredients of 286 herbicides, insecticides, fungicides,

fumigants, and other chemicals were listed along with their trade names and the major crops to which they were applied. A use rating ranging from 0 to 5 was established for each chemical, with 0 being no use, and 5 being major use for each decade from the 1970s through 2000; and, an overall rating for the period of use was also established. The information was used to determine the directions of research and monitoring.

**Results**

Pesticide analyses were conducted on samples from 834 private and non-community wells in Suffolk County. Monitoring this year was concentrated in the five eastern Suffolk towns where prior monitoring data has demonstrated the majority of pesticide impacts to drinking water wells has occurred. Pesticide and pesticide degradate compounds were detected in 422 (50.6%) of the drinking water wells sampled. The new monitoring data indicate that pesticides and/or pesticide degradate compounds can now be detected in virtually all shallow private wells located downgradient of agricultural operations in Suffolk County.

Multiple pesticide residues were found in 323 (38.7%) wells, and 131 (15.7%) wells contained five or more pesticide-related compounds. Four wells (0.5%) contained 10 or more pesticide compounds. Fifty-four (of 834) wells exceeded pesticide related drinking water MCLs**,** and consistent with past monitoring results, 49 (90.7%) of these were impacted by agricultural chemicals. Granular activated carbon (GAC) filtration units have been installed on many of the drinking water sources that exceed standards, but not on those wells containing a mixture of chemicals where no single contaminant exceeds MCLs.

The improvements made to the SCDHS's analytical capabilities this year show that the three most frequently detected pesticides are: 1) metolachlor and its OA and ESA metabolites; 2) the aldicarb metabolites B aldicarb sulfoxide and aldicarb sulfone; and, 3) alachlor and its OA and ESA metabolites. All three active ingredients have been removed from sale in Suffolk County. However, because of their persistence and mobility, these chemical compounds can be expected to continue appearing in groundwater for years to come, and will migrate with groundwater to areas far from their points of application.

Alachlor and metolachlor were widely used for two or more decades prior to the development and implementation of the SCDHS analytical method utilized to detect their respective OA and ESA metabolites. It is likely that these previously undetected degradate chemicals have been significant ground and drinking water contaminants for 20 years**.**

The metabolites of the herbicides alachlor and metolachlor were detected with greater frequency and generally in higher concentrations than the pesticide active ingredients (parent compounds). The two most frequently detected pesticide compounds, metolachlor OA and metolachlor ESA, were found in 207 (24.8%) and 272 (32.6%) of the samples, respectively. Comparatively, the parent compound metolachlor was detected in 42 samples (5.0%). Similarly, the OA and ESA metabolites of alachlor were detected much more frequently than the parent alachlor. Alachlor OA and alachlor ESA were found in 43 (5.2%) and 132 (15.8%) of the samples collected, while parent alachlor was detected in just 14 samples (1.7%).

Metabolites of alachlor and metolachlor co-occurred in 85 (10.2%) of the wells. The frequent combined occurrence of these metabolites in drinking water is of concern because they are structurally similar chemicals (both in the class of acetanilide herbicides), and may have a common mechanism of toxicity. None of these OA and

ESA degradates have specific drinking water MCLs. They are considered UOCs, and are assigned a generic MCL of 50 ug/L each.

New issues emerged as a result of the continued monitoring. Perchlorate was found in 15 of the 117 wells tested for this contaminant. Perchlorate is a constituent of some fertilizers and is a refining impurity of the herbicide sodium chlorate. Additional monitoring is necessary to determine the extent of the contamination.

The findings concerning the frequency and concentrations of herbicide metabolites in groundwaters in eastern Suffolk County may have implications for other areas of research. There is a potential of adverse affects to the Peconic Estuary from the presence of these contaminants in streams and groundwater discharging to surface waters. The herbicidal affect on green algae may provide the trigger mechanism that allows *aureococcus anophagefferens* (brown tide) to out-compete other forms of estuarine algae under certain conditions. According to the *Pesticide Usage Report for Agricultural Crops in Suffolk County 1975-2000* (Cornell Cooperative Extension, January 2001) high agricultural use of the two herbicides preceded the initial brown tide bloom in 1985.

Sampling was conducted at 17 monitoring wells installed to further evaluate groundwater quality relative to vineyards. Pesticides or breakdown products were detected in nine (53%) of the vineyard monitoring wells located at four of the six vineyards sampled. However, in most cases total pesticide concentrations detected were less than 1 ug/L. Average nitrate concentrations among individual vineyards continued to show a wide variation, ranging from a low of 1.8 mg/L to a high of 13.6 mg/L. The overall average nitrate concentration at vineyard monitoring wells was 6.4 mg/L and the median concentration was 4.5 mg/L.

Results of the golf course monitoring this year were consistent with those from prior sampling. Sampling was conducted at 22 monitoring wells installed on or immediately downgradient of cultivated turf to evaluate groundwater quality impacts from golf courses. Pesticide related chemicals were detected in five of the 22 (22.7%) golf course monitoring wells sampled, and no wells exceeded a pesticide related drinking water standard. Nitrate concentrations ranged from no detection to 13 mg/L at the golf course monitoring wells. The average nitrate concentration was 4.7 mg/L and the median concentration was 3.9 mg/L for the 22 wells tested.

Pesticide-related chemicals were detected in 53 (23.5%) of the 226 community supply wells sampled, but only four wells (1.8%) exceeded drinking water Maximum Contaminant Levels (MCLs) in samples of the raw water. Each of the four wells exceeding an MCL are provided with granular activated carbon (GAC) treatment for contaminant reduction. GAC treatment is currently available at approximately one-third of the 53 community wells found to be impacted by pesticide related compounds.

About one-half of all of the community wells impacted by pesticides were less than 200 feet deep; however, approximately 20% of the pesticide-impacted wells were greater than 400 feet deep, indicating that in locations lacking an intervening aquitard, high capacity wells will draw contamination down to deeper levels of the aquifer. As in the private wells tested this year, metolachlor and its OA and ESA degradates have supplanted aldicarb as the most frequently detected pesticide compounds in community water supply wells.

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