

**WATER QUALITY MONITORING  
PROGRAM TO DETECT PESTICIDES  
IN GROUNDWATERS OF  
NASSAU AND SUFFOLK COUNTIES, NY**

**Annual Report for the New York State  
Department of Environmental Conservation  
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SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES  
Clare B. Bradley, M.D., M.P.H.  
Commissioner

DIVISION OF ENVIRONMENTAL QUALITY  
Vito Minei, P.E., Director

BUREAU OF GROUNDWATER RESOURCES  
Martin Trent, Project Manager

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### **New York State Department of Environmental Conservation** Division of Solid & Hazardous Materials

#### **Suffolk County Department of Health Services**

##### Bureau of Drinking Water

<i>Paul Ponturo, P.E.</i>	<i>Mary LaFlair</i>
<i>Thomas Martin</i>	<i>Dan Morris</i>
<i>Susan Dodson</i>	<i>Kathleen Newcomer</i>
<i>Jerry Felice</i>	<i>Jeffrey Veryzer</i>
<i>Robert Hessner</i>	<i>Carol Lee Igoe</i>
<i>Donald Van de Water</i>	

##### Bureau of Groundwater Resources

<i>Ron Paulsen</i>	<i>Geralynn Rosser</i>
<i>Andrew Rapiejko</i>	<i>Sy Robbins</i>
<i>Ralph Milito</i>	<i>Frank Iannazzo</i>
<i>Frank Basile</i>	<i>Brian Boogertman</i>
<i>Edward Olson</i>	<i>Brian Robinson</i>

##### Public and Environmental Health Laboratory

<i>Kenneth M. Hill</i>	<i>Robin Carpenter</i>
<i>Richard Hollowell</i>	<i>JoAnn Laager</i>
<i>George Matthews</i>	<i>Barbara Veryzer</i>
<i>Kim Duggan-McFall</i>	<i>Theresa Ryther</i>
<i>Paul Ames</i>	<i>Lynne Revellese</i>
<i>Suzanne McConnell</i>	<i>Anthony Condos</i>

#### **Nassau County Department of Public Works**

##### Water Management Unit

*Loretta Dionisio Tim Maloney Peter Maniscalco Jr.*

#### **Nassau County Health Department**

*Paul Young*

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## EXECUTIVE SUMMARY

The Suffolk County Department of Health Services (SCDHS) conducted this study in cooperation with the New York State Department of Environmental Conservation, Division of Solid & Hazardous Materials, under Contract #004068. The study was authorized, in part, by the New York State Pesticide Reporting Law, Chapter 279, Laws of 1996, as a continuation of prior investigations of pesticide occurrences in Long Island groundwater and drinking water. The initial report for the state under this program, issued in June 1999, provided an overview of pesticide occurrences.

The objectives of the program during SFY 1999-2000 were defined in the work plan approved by the state, and included three projects. The first two were intended to examine groundwater quality proximate to two specific land uses that are both expanding rapidly on Long Island – vineyards and golf courses. The third project was a continuation of the sampling program to help identify pesticides and their breakdown product compounds that leach to groundwater by sampling wells in high pesticide use areas. This project collected samples from vulnerable public and monitoring well locations in Nassau County, and from mostly private wells in Suffolk County, which were analyzed in order to better assess the potential for public health and environmental impacts from pesticide use. An additional project proposed in the work plan, creation of a catalogue of agricultural pesticides utilized on Long Island, was postponed until the next fiscal year.

All water analyses for this project were conducted by the SCDHS Public and Environmental Health Laboratory (PEHL), which maintains certification by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program. Eight analytical methods, examining each water sample for 78 pesticide-related chemicals, were proposed for the project. Research and development efforts during the course of the study resulted in two major analytical advances, so that by the end of the study, some 100 pesticides and their degradation products were being analyzed for by the SCDHS lab.

### ***Vineyard Monitoring Results***

In order to assess groundwater quality in relation to viticulture, three shallow permanent monitoring wells were installed at each of five Long Island vineyards. Results from the first round of vineyard monitoring analyses indicated the detection of two pesticide compounds – metalaxyl and simazine – neither of which exceeded its respective drinking water standard. These initial results suggest that groundwater impacts from wine grapes on Long Island may be limited. However, the findings are based on a data set resulting from one round of monitoring for the current list of analytes. Analyses for additional chemicals at the 15 vineyard wells as analytical capabilities are expanded will enhance future monitoring efforts.

### ***Golf Course Monitoring Results***

The pesticide monitoring report issued in June 1999 presented the results of prior reconnaissance monitoring of groundwater quality from 31 wells located at 18 Long Island golf courses. During the current study, additional groundwater information was collected from monitoring wells specifically placed to measure potential “worst case” impacts of golf course chemical applications,

i.e., immediately downgradient of tees and greens, whenever possible. Vertical profile wells were utilized to ascertain the aquifer levels showing the greatest impacts of golf course chemical use. Sampling was conducted at 18 specifically placed monitoring wells located at eight golf courses, including some nationally prominent courses with very highly maintained turf.

Data from this round of groundwater monitoring at golf courses were consistent with those contained in the June 1999 monitoring report. Pesticides were detected in only two (11%) of the 18 golf course monitoring wells. The compounds metalaxyl and TCPA (tetrachloroterephthalic acid, a breakdown product of dacthal) were found in one well each. Neither chemical exceeded its respective drinking water Maximum Contaminant Level (MCL). The compiled two years of monitoring data suggest that, for the chemicals analyzed, current turf management practices at the golf courses monitored are effective in controlling pesticide impacts on groundwater.

### ***High Pesticide Use Area Monitoring Results***

The monitoring report of June 1999 indicated that the vast majority of pesticide detections in Long Island drinking water supplies have been found in wells located hydraulically downgradient of agricultural and other high pesticide use areas. The purpose of this project was to continue to test wells located in higher risk areas of Nassau and Suffolk Counties. Additional private wells in Suffolk County that had not previously been sampled for pesticides under this program were a focus for testing.

A total of 1,491 private wells have been tested since October 1997, and they have provided valuable monitoring points for determining the presence of pesticides in groundwater. More than one-third (35.6%) of all private wells tested have contained detectable pesticide concentrations, and more than 10 percent have exceeded pesticide-related drinking water standards. Private wells have accounted for nearly two-thirds (65.8%) of all Long Island wells found to contain detectable pesticide concentrations during the monitoring program. As this project was designed to bias sampling toward higher pesticide use areas, these percentages should not be interpreted to apply to all geographic areas of Nassau and Suffolk.

Analytical advances implemented during the year resulted in the detection of 12 additional pesticide and pesticide degradate compounds. A total of 44 pesticide-related chemicals have been detected since the inception of the monitoring program. Three new compounds were detected this year in concentrations exceeding standards – metolachlor, DBCP and cyanazine. All three of these chemicals have been removed from sale on Long Island.

The June 1999 pesticide monitoring report found that banned or discontinued pesticides accounted for 88% of the wells exceeding drinking water MCLs. In the current study, 94.5% of pesticide contaminants exceeding MCLs are prohibited from use on Long Island. The pesticide registration process now requires an examination of a chemical's ability to leach to groundwater before it is approved for use. Depending on the ability of the older chemicals to persist in the environment, improvements in groundwater quality over time may be expected.

The most frequently detected pesticides and degradates are those with the greatest environmental persistence. They are generally compounds that are, or were, intensively or widely applied, and tend to be highly mobile in groundwater. Monitoring this year again demonstrated that aldicarb metabolites continue to be the most frequently detected pesticide compounds, while the parent compound is rarely detected. The dacthal degradate TCPA remained the second most frequently detected, while its parent compound is also rarely detected. These chemicals are followed in frequency of detection by metolachlor and its degradation products, metolachlor OA and metolachlor ESA, and by metalaxyl. Aldicarb and dacthal have long been removed from the Long Island market, but their metabolites still persist in groundwater.

The data indicate that pesticide metabolite and degradate compounds may be of at least as great concern as many of the parent pesticide products. A limited amount of testing of private wells utilizing the newly developed method for detection of herbicide degradation products showed that 43.6% of the wells sampled contained degradation products of simazine, alachlor and/or metolachlor, while only 7.2% of these wells contained detectable concentrations of the parent compounds. The new data suggest that these pesticide degradates may occur significantly more often in groundwater than the parent compounds.

## **Introduction**

The Suffolk County Department of Health Services (SCDHS) conducted this study in cooperation with the New York State Department of Environmental Conservation, Division of Solid & Hazardous Materials, under Contract #004068. The study was authorized, in part, by the New York State Pesticide Reporting Law, Chapter 279, Laws of 1996, as a continuation of prior investigations of pesticide occurrences in Long Island's ground and drinking waters. Groundwater quality in relation to pesticides is a key environmental issue on Long Island, where groundwater is the sole source of drinking water for Nassau and Suffolk County residents. The initial report for the state under this program, issued in June 1999, provided an overview of pesticide occurrences in Long Island groundwater.

## **Objectives**

The objectives of the program during SFY 1999-2000 were defined in the work plan approved by the state, and included three projects. The first two were intended to examine groundwater quality proximate to two specific land uses that are both expanding rapidly on Long Island – vineyards and golf courses. Vineyards now represent a significant percentage of agricultural acreage on the East End, and their chemical applications differ from those used on traditional agricultural crops such as potatoes and other vegetables. Likewise, the increased popularity of golf for recreation has resulted in the construction of many more courses around the island, most on former farmland. A preliminary reconnaissance of groundwater quality at golf courses last year indicated that groundwater impacts, and pesticide occurrences, were less than expected based upon the analytes tested at the time. A more in-depth examination for a wider range of chemicals, and including sampling at some of Long Island's best courses with high levels of turf maintenance, was therefore made a part of the current work plan.

The third project was a continuation of the sampling program to help identify pesticides and their breakdown products that leach to groundwater by sampling wells in high pesticide use areas. This project involved the collection of samples from vulnerable public water supply and monitoring wells in Nassau County, and from private and other wells in Suffolk County, in order to better assess the potential for public health and environmental impacts from pesticide use. An additional project proposed in the work plan, creation of a catalogue of agricultural pesticides utilized on Long Island, was postponed until next fiscal year.

## **Water Quality Analyses & Quality Assurance**

All water analyses for this project were conducted by the SCDHS Public and Environmental Health Laboratory (PEHL), which maintains certification by the NYSDOH Environmental Laboratory Approval Program. The analytical quality control measures utilized are detailed in the Quality Assurance Program Plan (QAPP) for the Suffolk County Public and Environmental Health Laboratory dated December 1998. Eight analytical methods, examining each water sample for 78 pesticide related chemicals, were proposed for the project. The SCDHS laboratory is credited with the development of two of these methods – EPA Method 531.1 (carbamate pesticide analysis) and

the HPLC/LC-GC/MS method for determination of dacthal degradation products.

As recommended by the 1999 pesticide monitoring report, the SCDHS laboratory expanded its capabilities in order to increase the number of pesticide analytes tested. Research and development efforts resulted in two major analytical advances. First, the analytical capabilities of EPA Method 525.2 were increased from 36 to 49 pesticide compounds in October 1999 to include many of the most commonly applied pesticide and herbicide chemicals used on Long Island. Second, in response to special monitoring projects last year that indicated degradation products of several widely used herbicides have a significant potential to leach to groundwater, a new liquid chromatography/mass spectrometry (LC/MS) methodology was instituted in February 2000. The new method analyzes for 12 breakdown product compounds of the herbicides atrazine, simazine, alachlor and metolachlor. In addition, imidacloprid, one of the most widely used insecticides on Long Island, is also analyzed by this method.

As a result of these improved capabilities, one hundred pesticide and pesticide degradates can now be analyzed by the SCDHS PEHL. A summary of the nine analytical methods that were employed for the samples in this project is contained in Table 1. A complete listing of analytes and detection limits for each chemical is contained in Appendix VIII and in the project QAPP. Detection limits will differ by analytical objectives, methods, and laboratory practices. Results for some monitoring wells jointly sampled for this project with the United States Geological Survey (USGS) differed for some compounds due to the detection limits employed by the two laboratories.

Table 1  
Analytical Methods Performed

Analytes	Method	Analytes	Method
nitrate	NYSDOH ELAP 2489	semi-volatile organics	EPA 525.2
metals	EPA 200.8	carbarnates	EPA 531.1
volatile organics	EPA 524.2/624	herbicide degradation products	SCDHS LC/MS
chlorinated pesticides	EPA 505	dacthal degradation products	SCDHS HPLC/LC - GC/MS
microextractables	EPA 504		

Many of the pesticides and breakdown products detected in this and prior studies do not have drinking water standards or specific Maximum Contaminant Levels (MCLs) established by state or federal regulatory agencies. For most of these compounds, the Unspecified Organic Compound (UOC) limit of 50 ug/L that is contained in Part 5 of the NYS Sanitary Code is applied. Although considered to be protective of public health, the UOC standard is non-specific, and it was recommended in the June 1999 report that the State Health Department establish drinking water standards (MCLs) for all frequently detected pesticides and degradation products.

## **Vineyard Monitoring Project**

### ***Background***

For decades on Long Island, potatoes were the dominant crop grown. Development pressures and the eastern push of suburbia into once rural farm country is responsible for much of the loss of agricultural acreage. However, Suffolk County remains the leading agricultural producer in New York State in terms of the value of crop sales. Alternative crops, such as sweet corn, nursery stock, sod, specialty vegetables and wine grapes, are now grown on many former potato farms. Since the first planting of wine grapes in the early 1970s at Cutchogue on Long Island's North Fork, the industry has expanded to 20 vineyards encompassing an estimated 2,000 acres.

### ***Methods***

In order to evaluate groundwater quality relative to vineyards, three shallow monitoring wells were installed at each of five Long Island vineyards. The location of the vineyards are shown on the map in Appendix I. The monitoring wells were screened just below the water table in order to detect chemicals applied locally to the wine grapes, and to minimize the potential for detecting groundwater impacts from upgradient land uses.

Well installation and sampling were conducted in accordance with SCDHS protocols. Two-inch diameter PVC monitoring wells were installed using hollow stem augers. The depth to the water table from the land surface ranged from 15 to 59 feet, and averaged 36.5 feet. The monitoring wells were placed downgradient of vine blocks either in, or adjacent to, the fields, and were generally screened within the top ten feet of the aquifer below the water table. Complete listings of well depths and screen intervals are contained in Tables 9 through 15 in Appendix II.

Samples were collected from each monitoring well after purging a minimum of three casing volumes of water in accordance with SCDHS protocols. At the Macari Vineyard, additional samples were collected from an existing SCDHS monitoring well (S-53333) located upgradient of the vines, and also from two on-site irrigation wells. A vertical profile well (S-113120) was installed and sampled at the Osprey's Dominion Vineyard. This well was left with the screen at the top level sampled, just below the water table, for future monitoring.

### ***Results and Findings***

A summary of the analytical results for all vineyard well tests is presented in Table 2; a more detailed compilation of results is contained in Tables 9 through 15 in Appendix II. The data represent only the first round of analytical results in what is hoped will be a multi-year monitoring program.

Overall, pesticides were detected at three of the five vineyard sites, but in just three (20%) of the 15 vineyard wells sampled. The fungicide metalaxyl (trade name Ridomil) was detected in two of the monitoring wells, and the herbicide simazine (trade name Princep) was found in one well. The concentrations of metalaxyl and simazine residues found did not exceed drinking water MCLs. Groundwater at all sites was found to be relatively acidic, ranging in pH from 5.2 to 7.4, with an average of 5.9 and a median of 5.7, which is similar to the values found in rainwater. These low pH values may be significant, since they increase the tendency of some pesticides to leach from the soil

and to persist in the groundwater environment. Nitrate results are discussed in Appendix IX.

Table 2  
Vineyard Monitoring Summary

Monitoring Site	Avg. DTW *	Avg. pH	Avg. Nitrate (mg/L)	Pesticides Detected (ug/L)
Paumanok	15	5.4	2.0	ND
Lieb	43	5.7	12.5	0.24 metalaxyl
Pugliese	33	5.8	2.1	ND
Macari	59	6.1	14.0	0.2 metalaxyl
Osprey's Dominion	32	6.4	3.2	0.2 simazine

\*Depth to water (feet).

### ***Conclusions***

Results from the first round of vineyard monitoring analyses indicated the detection of two pesticide compounds – metalaxyl and simazine – neither of which exceeded its respective drinking water standard. These initial results suggest that groundwater impacts from wine grapes on Long Island may be limited. However, the findings are based on a data set resulting from one round of monitoring for the current list of analytes. Analyses for additional chemicals at the 15 vineyard wells will enhance future monitoring efforts as analytical capabilities are expanded.

### **Golf Course Monitoring Project**

#### ***Background***

The results of prior monitoring of 31 wells at 18 Long Island golf courses were reported in the pesticide monitoring study issued in June 1999. The monitoring included sampling of 17 monitoring wells, 13 golf course clubhouse wells, and one irrigation well. Pesticides or pesticide degradation products were present in seven of the 31 wells tested. Three pesticide-related compounds were found: dacthal breakdown product tetrachloroterephthalic acid (TCPA), diethylhexyl-phthalate (DEHP), and metalaxyl. TCPA was the only compound found to exceed its drinking water MCL. In the present study, additional groundwater information was obtained from monitoring wells specifically placed to measure potential “worst case” impacts of golf course chemical applications.

#### ***Methods***

The 13 shallow monitoring wells previously installed on three county-owned golf courses were selected for an additional round of monitoring, and five new monitoring wells were proposed at several private courses. As on-course drilling at privately-owned clubs presented certain logistical problems, vertical profile wells were installed immediately downgradient of each private course on a public right-of-way in order to sample groundwater recharged at each site. The locations of the golf course monitoring sites are shown on the map in Appendix I.

Based upon the results obtained from sampling multiple levels at each of the vertical profile wells, new permanent monitoring wells were installed at the aquifer level where the greatest impacts

(highest pesticide and/or nitrate concentrations) were observed. Well installation and sampling were conducted in accordance with SCDHS protocols. Two-inch diameter PVC monitoring wells were installed using hollow stem augers. Samples were collected from each monitoring well after purging a minimum of three casing volumes of water. A complete listing of monitoring well depths and screen locations are contained in Tables 16 through 19 in Appendix III.

**Results and Findings**

A summary of analytical results for the 18 fixed monitoring wells are contained in Tables 16 through 19 in Appendix III, while summaries for the five vertical profile wells are presented in Tables 20 through 24 in Appendix IV. Pesticide or breakdown products were found in two (11%) of the 18 wells. The fungicide metalaxyl (Ridomil) and TCPA, a breakdown product of the herbicide dacthal, were each detected in one well, and neither compound exceeded its drinking water MCL. These pesticide detections occurred at the two sites with the greatest depth to the water table, possibly indicating a lack of significant degradation in the unsaturated zone.

The deeper aquifer segments in the vertical profile well drilled at the Islands End Country Club showed TCPA concentrations present just above the salt/fresh water interface, but they were not found in the upper aquifer segments. This suggests that the TCPA contamination was from an upgradient source unrelated to the golf course.

Table 3 summarizes the monitoring results obtained at the five new permanent golf course wells that were installed based upon an evaluation of the vertical profile monitoring.

Table 3  
Privately Owned Golf Courses Monitoring Summary

Site	Type	DTW*	Nitrate (mg/L)	Pesticides Detected (ug/L)
Maidstone Club	private	12	5.5	ND
Shinnecock Hills GC	private	33	1.3	ND
National Golf Links	private	6	3.1	ND
Islands End CC	semi-priv	45	2.7	1.4 metalaxyl
Indian Hills CC	priv	62	3.6	30 TCPA

\*Depth to water (feet).

A summary of the second round (1999) of monitoring for the three county-owned golf courses is presented in Table 4. The analytical results obtained are consistent with those found in the initial round of monitoring in 1998. There were no pesticides detected in the 13 wells at the three (county-owned) public courses. The 1998 finding of DEHP in one of the 13 wells was not confirmed in the retesting. The nitrate results presented in Tables 3 and 4 are discussed in Appendix IX.

Table 4  
Public Golf Course Monitoring Summary

Site	# Wells	Avg DTW*	Avg Nitrate (mg/L)	Avg Total N (mg/L)	Pesticides Detected
Indian Island GC	4	11	4.1	5.8	ND
Timber Point GC	5	7	1.6	2.1	ND
West Sayville GC	4	6	1.9	2.7	ND

\*Depth to water (feet).

### **Conclusions**

Data from this round of groundwater monitoring at golf courses were consistent with those contained in the June 1999 monitoring report. Pesticides were detected in two (11%) of the 18 golf course wells. The compounds metalaxyl and TCPA (tetrachloroterephthalic acid) were found in one well each. Neither chemical exceeded its respective drinking water Maximum Contaminant Level (MCL). The compiled two years of golf course monitoring data suggest that in general turf management practices at the courses monitored are effectively controlling pesticide impacts on groundwater for the chemicals analyzed. Additional data from these wells should continue to be gathered as new analytical capabilities are developed.

### **Sampling of Wells in High Pesticide Use Areas**

#### **Background**

*The NYSDEC Water Quality Monitoring Program to Detect Pesticides in Groundwaters of Nassau and Suffolk Counties Final Report (June 1999) documented that the vast majority of pesticide contaminated drinking water supplies are wells located near or hydraulically downgradient of agricultural land uses. The study reported that 38.5% of all private wells tested in Suffolk County contained detectable levels of pesticides, and in agricultural areas more than 50% of private wells showed traces of pesticide compounds. For wells that exceeded pesticide-related drinking water MCLs, 89% were located within the five townships of eastern Suffolk County, and 91% contained agricultural chemicals, while 9% were impacted by other sources. While these figures provide an overview of the magnitude of the pesticide contamination issue, they were subject to sampling bias, and should not be viewed as statistical estimates of the overall percentages of impacted wells in agricultural areas or throughout Long Island, or for all types of wells.*

The 1990 U.S. Census indicated that 37,000 private wells exist within the five eastern townships of Suffolk County. The SCDHS estimates that 6,000 to 7,000 of these wells are located sufficiently close to agricultural operations and other high pesticide use areas (e.g., golf courses, utility rights-of-way) that sampling of these wells for pesticides would provide a significant public health benefit to well owners, while providing important monitoring points for detecting the occurrence of pesticides and pesticide degradation products.

#### **Methods**

The purpose of this project was to continue to test wells located in higher risk areas of Nassau and

Suffolk Counties. This year, a total of 885 wells were sampled, including 178 wells in Nassau County and 707 wells in Suffolk. Sites were selected based on prior monitoring results, proximity to pesticide use areas, and groundwater flow directions. Private wells that had not previously been sampled for pesticides under this program were sought for testing.

**Results & Findings**

Monitoring this year again demonstrated that aldicarb metabolites, aldicarb sulfoxide and aldicarb sulfone, continue to be the most frequently detected pesticide compounds, while the parent compound is rarely detected. Aldicarb was removed from use on Long Island potato crops 20 years ago, yet its breakdown products have proven to be extremely persistent in groundwater. The dacthal degradate tetrachloroterephthalic acid (TCPA) remained the second most frequently detected, while its parent compound is also rarely detected. The dacthal label was amended in 1988 to prevent its continued use in Suffolk County. These chemicals are followed in frequency of detection by metolachlor and its degradation products, metolachlor OA and metolachlor ESA, and by metalaxyl.

Table 5 lists the number of detections and the number of wells exceeding an MCL by well type for each county for the current monitoring. Pesticides were again detected in every type of well tested this year. Public supply wells impacted with pesticide levels exceeding MCLs have either been restricted from use or been provided with granular activated carbon filtration.

Table 5  
Pesticide Results by Well Type

Well Type	# Wells Tested			# Pesticide Detections			# Wells > MCLs		
	Suffolk	Nassau	Total	Suffolk	Nassau	Total	Suffolk	Nassau	Total
Monitoring	22	102	124	10	15	25	4	1	5
Private	604	0	604	189	0	189	40	0	40
Community	28	76	104	6	3	9	2	1	3
Non-Comm	53	0	53	19	0	19	5	0	5
Totals	707	178	885	224	18	242	51	2	53

Private wells in Suffolk County remain the most vulnerable to pesticide impacts. Of the 604 private wells sampled this year, 189 (31.3%) contained detectable pesticide concentrations, and 40 (6.6%) exceeded drinking water MCLs. These statistics may not be reflective of private well quality overall in the county due to sampling bias in the study design. Some other factors are also important in interpreting the significance of these findings. The vast majority of wells found to exceed drinking water MCLs have exceeded standards for chemicals that have been banned from use on Long Island. Some of the most frequently detected chemicals, e.g., TCPA and metolachlor, do not have specific drinking water MCLs so that the UOC standard of 50 ug/L is applied to them. Depending upon the concentration established above or below 50 ug/L, chemical specific MCLs may greatly increase, or decrease, the number of pesticide detections exceeding standards.

It may be significant that newly developed LC/MS method for herbicide degradation products was not available for analysis for the vast majority of the monitoring effort to date. A random sampling of 55 private wells in eastern Suffolk using the method for analysis of herbicide breakdown products showed that 43.6% contained degradation products of simazine, alachlor, and/or metolachlor, while only 7.2% of these wells contained detectable concentrations of the parent compounds. The new data suggest that these pesticide degradates may occur significantly more often in groundwater than the parent compounds. Therefore, the actual percentage of wells with detectable traces of pesticide related compounds in high pesticide use areas may be greater than previously reported.

Table 6 details, for each county, the number of wells tested, the number and percent of wells containing detectable pesticide concentrations, and the number and percent of wells exceeding drinking water MCLs for the time periods of the study to date. The June 1999 pesticide monitoring report found that banned or discontinued pesticides accounted for 88% of the wells exceeding drinking water MCLs. In the current study, 94.5% of pesticide contaminants exceeding MCLs are prohibited from use on Long Island. The pesticide registration process now requires an examination of a chemical's ability to leach to groundwater before it is approved for use. Depending on the ability of the older chemicals to persist in the environment, improvements in groundwater quality over time may be expected.

Table 6  
Pesticide Detections by County

Study Period	# Wells Tested	# Detects	% Detects	# > MCLs	% > MCLs
Nassau 1999- 2000	178	18	10.1	2	1.1
Nassau 1997- 1998	405	38	9.4	6	1.5
Suffolk 1999- 2000	707	229	32.4	53	7.5
Suffolk 1997- 1998	1,853	521	28.1	185	10.0
Totals	3,143	806	25.6	246	7.8

Pesticides were detected in 14 Nassau County monitoring wells and in the raw water at four Nassau County community supply wells (two of which had previously been sampled in 1998). Two Nassau wells exceeded MCLs for long banned soil fumigants: community supply well N-8010, which contained 0.32 ug/L ethylene dibromide (EDB), and community supply well N-9211, which contained 0.2 ug/L 1,2-dibromo 3-chloropropane (DBCP).

Table 25 in Appendix V lists the wells found to contain pesticides in Nassau. Of the wells in Nassau in which pesticides were detected, one-half were less than 100 feet deep, and only three exceeded 200 feet in depth. Fewer pesticide-impacted wells have been found in Nassau County as compared to Suffolk for several reasons beyond just the number of sampling points, including: 1) the majority of pesticide contaminants detected to date have occurred as a result of past agricultural chemical use, and Suffolk County retains the majority of the remaining agricultural acreage on Long Island; and, 2) Nassau is nearly entirely served by public water systems with few private wells existing, and none

have been tested under the program.

The percentage of wells found to contain pesticides, and the percent exceeding MCLs, are consistent with prior monitoring under this program. Since the inception of the project in October 1997, a total of 3,143 wells have been tested throughout all geographic regions of both Nassau and Suffolk Counties. The testing program represents a broad spectrum of well types, well depths, and geographic locations, with higher pesticide use areas being targeted for more intensive testing. Fewer wells were tested in Nassau County than in Suffolk, 583 versus 2,560, and more intensive sampling was performed in agricultural areas of Suffolk served by shallow private wells. Pesticide related compounds were detected in 806 (25.6%) wells of all types, and 246 (7.8%) of these exceeded drinking water MCLs. While these figures provide an overview of the magnitude of the pesticide contamination issue, they should not be viewed as a statistical estimate of the average number of impacted wells in all areas of Long Island, or for all types of wells, due to the inherent sampling bias in the project design.

Since the initiation of the monitoring program in October 1997, and excluding any repeat samples, a total of 1,491 individual private wells have been tested in Suffolk County (see Table 7). More than one-third (35.6%) of these private wells have contained detectable pesticide concentrations, and over 10 percent have exceeded pesticide-related drinking water MCLs. These statistics may not be reflective of private well quality overall in the county due to sampling bias in the study design. As previously noted, two other factors influence interpretation of these findings: 1) the vast majority of wells found to exceed drinking water MCLs exceeded standards for chemicals that have been eliminated from use on Long Island; and, 2) some of the most commonly detected chemicals, e.g., TCPA and metolachlor, do not have specific drinking water MCLs and the UOC standard of 50 ug/L is applied to them.

Table 7  
Pesticides in Private Wells in Suffolk County

Study Period	# Wells Tested	# Detects	% Detects	# > MCLs	% > MCLs
Oct 1997-Dec 1998	887	342	38.6	115	13.0
Feb 1999-Feb 2000	604	189	31.3	40	6.6
Totals	1,491	531	35.6	155	10.4

A summary of public supply well tests in Suffolk County (community and non-community), where pesticides were detected is contained in Tables 26 and 27 in Appendix VI.

Twenty-two (22) monitoring wells were tested in Suffolk County, primarily located in agricultural areas or near electric utility substations. The results of pesticide detections in the monitoring wells are summarized in Table 28 in Appendix VI. Two notable results were obtained during the monitoring. In the first instance, a concentration of 83 ug/L metolachlor was detected in monitoring well S-112329 in Water Mill. The MCL for metolachlor is currently the 50 ug/L UOC standard. In the second case, a cyanazine concentration of 3.3 ug/L was found in monitoring well S-51566 in

Riverhead. The cyanazine lifetime Health Advisory Level (HAL) is 1 ug/L. Land uses near both wells are largely agricultural. At this time it is unknown if these occurrences are related to agricultural run-off, spills or dumping, rather than to allowed labeled uses of the chemicals. Both findings will require further investigation to determine potential sources of the contamination.

***New Analyses and Findings***

Of the 100 pesticides and degradates in water that can now be analyzed by the SCDHS PEHL, 34 of these chemicals were detected during the current phase of the study. The analytical advances implemented this year resulted in the detection of 12 additional pesticide or pesticide breakdown products (Table 8), bringing the total number of chemicals detected for the project to 44 pesticide-related compounds.

Table 8  
New Pesticide Compounds Detected This Year

alachlor ESA	DBCP	imidacloprid
alachlor OA	deisopropylatrazine	metolachlor ESA
bromacil	dichlobenil	metolachlor OA
cyanazine	disulfoton sulfone	terbacil

Three new compounds were detected in concentrations exceeding MCLs this year – metolachlor, DBCP and cyanazine. All three chemicals have been removed from sale. The chemical formulation of the herbicide metolachlor (trade name Dual) is being changed to use the isomer s-metolachlor (trade name Dual Magnum) as the primary active ingredient. This new product is not registered for use on Long Island. Under an agreement with USEPA, chemical manufacturers were to cease all cyanazine production by December 31, 1999 for use in the United States. However, existing stocks of the herbicide may be used until December 31, 2002. All uses of the soil fumigant DBCP were canceled in 1979, with the exception of pineapples in Hawaii; this use was canceled in 1985.

Table 29 in Appendix VII lists the pesticide chemicals detected this year, the number of detections, the number of wells that exceeded an MCL, and highest concentrations found. Compounds that are no longer registered for use on Long Island are highlighted in the table. The major new finding in the monitoring program this year is that the degradation products of several commonly used herbicides, including alachlor, atrazine, simazine and metolachlor, appear to leach to groundwater in significant concentrations. Additional monitoring for these compounds is being conducted for the year 2000 work plan, the results of which will help define the extent of the contamination from these degradation products.

***Conclusions***

Since the inception of the project in October 1997, a total of 3,143 wells have been tested throughout all geographic regions of Nassau and Suffolk Counties. Testing has included a broad spectrum of well types (i.e., 822 public supply wells, 1,491 private water wells, and 830 monitoring wells), well depths, and geographic areas, with suspected high pesticide use areas being targeted for more

intensive testing. Fewer wells were tested in Nassau than in Suffolk, 583 versus 2,560, and more intensive sampling was done in agricultural areas of Suffolk served by shallow private wells. Pesticide-related compounds were detected in 806 (25.6%) of the wells sampled, and 246 (7.8%) of these wells exceeded drinking water standards. While these figures provide an overview of the magnitude of the pesticide contamination issue, they were subject to sampling bias, and should not be viewed as statistical estimates of the overall percentages of impacted wells in all areas of Long Island, or for all types of wells.

The data continue to show that private wells, particularly those located in agricultural areas of eastern Suffolk County, are susceptible to pesticide impacts. A total of 1,491 private wells have been tested since October 1997, and they have proven to be valuable monitoring points for determining the presence of pesticides in groundwater. More than one-third (35.6%) of all private wells tested have contained detectable pesticide concentrations, and more than 10 percent have exceeded pesticide-related drinking water standards. Nearly two-thirds (65.8%) of all pesticide detections on Long Island since the inception of the monitoring program have occurred in private wells. These statistics may not be reflective of private well quality overall in Suffolk County due to the sampling bias in the study design.

Analytical advances implemented during the year resulted in the detection of 12 additional pesticide and breakdown product compounds. A total of 44 pesticide-related chemicals have been detected since the inception of the monitoring program. Three new compounds were detected this year in concentrations exceeding standards – metolachlor, DBCP and cyanazine. All three chemicals have been removed from sale.

The most frequently detected pesticides and degradates are those with the greatest environmental persistence. They are generally compounds that are, or were, intensively or widely applied, and tend to be highly mobile in groundwater. Monitoring this year again demonstrated that aldicarb metabolites, aldicarb sulfoxide and aldicarb sulfone, continue to be the most frequently detected pesticide compounds, while the parent compound is rarely detected. Aldicarb was removed from use on Long Island potato crops 20 years ago, yet its breakdown products have proven to be extremely persistent in groundwater. The dacthal degradate tetrachloroterephthalic acid remained the second most frequently detected pesticide, while its parent compound is also rarely detected. The dacthal label was amended in 1988 to prevent its continued use in Suffolk County. These chemicals are followed in frequency of detection by metolachlor and its degradation products, metolachlor OA and metolachlor ESA, and by metalaxyl.

Pesticide metabolite and degradate compounds are now of at least as great concern as many of the parent pesticide products. A limited amount of testing of private wells utilizing the newly developed method for detection of herbicide degradation products showed that 43.6% of the wells sampled contained degradation products of simazine, alachlor and/or metolachlor, while only 7.2% of these wells contained detectable concentrations of the parent compounds. The new data suggest that these pesticide degradates may occur significantly more often in groundwater than the parent compounds. Therefore, the actual percentage of wells with detectable traces of pesticide related compounds in high pesticide use areas may be greater than previously reported.

Appendix I  
Vineyard & Golf Course Locations

Suffolk County  
Department of Health Services  
Division of Environmental Quality

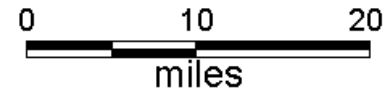
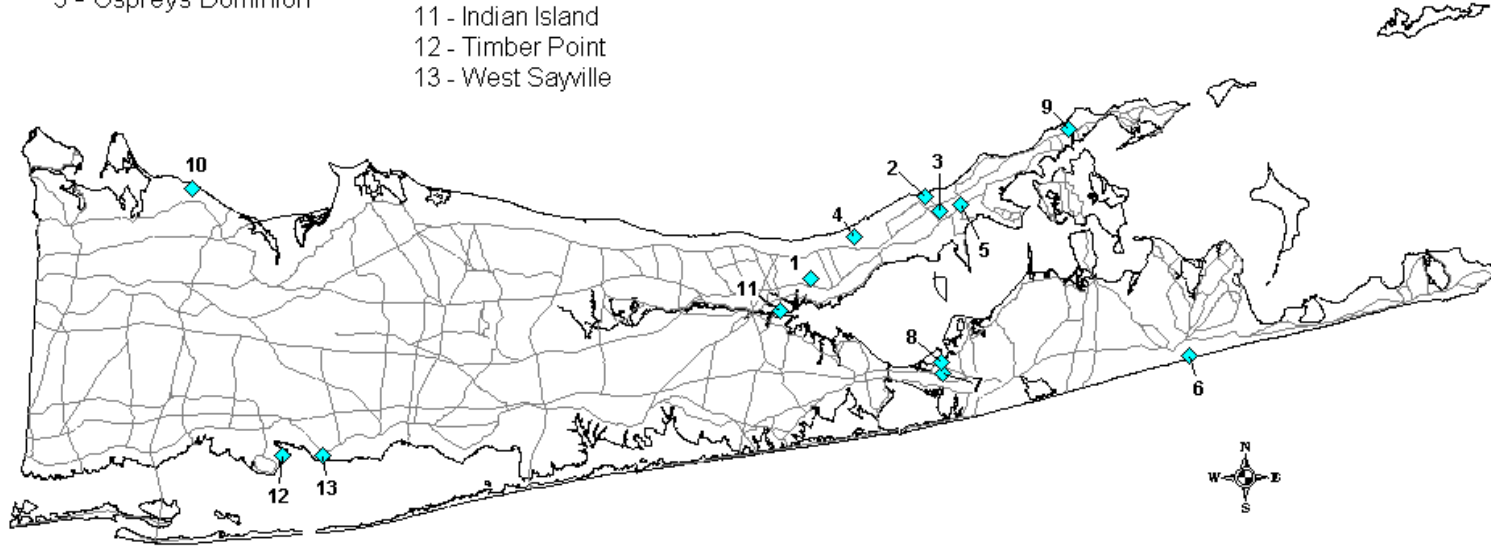


Vineyard Sites

- 1 - Paumanok
- 2 - Lieb
- 3 - Pugliese
- 4 - Macari
- 5 - Ospreys Dominion

Golf Courses

- 6 - Maidstone
- 7 - Shinnecock
- 8 - National
- 9 - Islands End
- 10 - Indian Hills
- 11 - Indian Island
- 12 - Timber Point
- 13 - West Sayville



AJR 07/26/00  
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**APPENDIX II**

Table 9

PAUMANOK VINEYARD, TUTHILL LANE, AQUEBOGUE

Well Name/#	JV-1	JV-3	JV-4
Sample Date	081299	081899	081899
Depth to Water (feet)	28	33	34
Screen Depth (feet)	30-40	30-40	30-40
pH	5.2	5.4	5.7
Conductivity (umho)	140	228	168
Chloride (mg/L)	25	57	29
Sulfate (mg/L)	21	21	34
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	2.0	2.7	1.4
As (ug/L)	<2	<2	<2
Cd (ug/L)	<1	1.1	<1
Cu (ug/L)	<1	<1	1.05
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND

**APPENDIX II**

Table 10

**LIEB VINEYARD, OREGON ROAD, CUTCHOGUE**

Well Name/#	CV-1	CV-2	CV-3
Sample Date	081899	081899	081899
Depth to Water	59	59	59
Screen Depth	60-70	60-70	60-70
pH	5.7	5.7	5.7
Conductivity (umho)	258	249	317
Chloride (mg/L)	23	22	33
Sulfate (mg/L)	10	9	53
NH <sub>3</sub> (mg/L)	<0.02	0.09	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	12.1	14.5	10.8
As (ug/L)	<2	<2	<2
Cd (ug/L)	<1	<1	<1
Cu (ug/L)	<1	<1	2.17
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	0.24 metalaxyl	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND

**APPENDIX II**

Table 11

PUGLIESE VINEYARD, BRIDGE LANE, CUTCHOGUE

Well Name/#	A	B	C
Sample Date	111099	111099	111099
Depth to Water	33	33	34
Screen Depth	51-56	33-38	32-37
pH	5.9	5.9	5.6
Conductivity (umho)	138	158	116
Chloride (mg/L)	10	16	14
Sulfate (mg/L)	24	33	22
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	2.3	1.3	2.6
As (ug/L)	<2	,2	<2
Cd (ug/L)	<1	<1	<1
Cu (ug/L)	<1	<1	<1
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND

**APPENDIX II**

Table 12

**MACARI VINEYARD, BERGEN AVENUE, MATTITUCK**

Well Name/#	MA-17	MA-50	MA-64
Sample Date	120799	120799	120799
Depth to Water	40	41	49
Screen Depth	41-46	47-52	49-54
pH	6.1	6.3	5.8
Conductivity (umho)	411	414	339
Chloride (mg/L)	17	26	30
Sulfate (mg/L)	96	95	65
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	0.03	<0.02	<0.02
NO <sub>3</sub> (mg/L)	12.6	17.7	11.7
As (ug/L)	<2	<2	<2
Cd (ug/L)	<1	<1	<1
Cu (ug/L)	2.24	2.25	1.27
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	0.2 metalaxyl	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	0.22 <sup>B</sup> aldicarb sulfone	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND

B - below MDL

**APPENDIX II**

Table 13

MACARI VINEYARD, BERGEN AVENUE, MATTITUCK

Well Name/#	East Irrigation Well	West Irrigation Well	Upgradient Well S-53333
Sample Date	020900	020900	020900
Depth to Water	na	na	43
Screen Depth	na	na	61-71
pH	6.3	6.2	6.3
Conductivity (umho)	384	201	169
Chloride (mg/L)	30	17	12
Sulfate (mg/L)	132	48	31
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	12.2	7.5	1.5
As (ug/L)	<2	<2	<2
Cd (ug/L)	<1	<1	<1
Cu (ug/L)	136	199	1.33
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	7.7 aldicarb sulfoxide 11. aldicarb sulfone 0.5 oxamyl	2.3 aldicarb sulfoxide 3.6 aldicarb sulfone	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND

**APPENDIX II**

Table 14

OSPREYS DOMINION, PECONIC LANE, PECONIC

Well Name/#	S-115429 (OD28)	S-115430 (OD12)	S-113120
Sample Date	100699	100699	100799
Depth to Water	15	15	15
Screen Depth	15-20	15-20	20-30
pH	5.7	6.0	7.4
Conductivity (umho)	187	149	202
Chloride (mg/L)	28	17	26
Sulfate (mg/L)	20	25	33
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	0.04
NO <sub>3</sub> (mg/L)	4.1	1.7	3.7
As (ug/L)	<2	<2	<2
Cd (ug/L)	<1	<1	<1
Cu (ug/L)	<1	<1	3.46
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	0.2 simazine	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND

**APPENDIX II**

Table 15

OSPREYS DOMINION, PECONIC LANE, PECONIC

Well Name/#	S-113120 Vertical Profile					
Sample Date	100799	100699	100699	100699	100699	100699
Depth to Water	15	15	15	15	15	15
Screen Depth	20-30	40-50	60-70	80-90	100-110	144-154
pH	7.4	6.2	6.2	6.2	6.2	7.7
Conductivity (umho)	202	206	421	448	393	232
Chloride (mg/L)	26	10	30	28	29	24
Sulfate (mg/L)	33	36	99	113	99	20
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	0.05
NO <sub>2</sub> (mg/L)	0.04	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	3.7	7.4	10.7	10.0	9.2	0.3
As (ug/L)	<2	<2	<2	<2	<2	6.26
Cd (ug/L)	<1	<1	<1	<1	<1	<1
Cu (ug/L)	3.46	<1	<1	<1	<1	<1
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	3.4 aldicarb sulfoxide 2.8 aldicarb sulfone	6.6 aldicarb sulfoxide 5. aldicarb sulfone	1.7 aldicarb sulfoxide 1.2 aldicarb sulfone	0.25 <sup>B</sup> aldicarb sulfoxide 0.16 <sup>B</sup> aldicarb sulfone
TCPA (ug/L) Method HPLC/UV	ND	3 <sup>B</sup>	4 <sup>B</sup>	ND	ND	ND

B - below MDL

**APPENDIX III**  
**Table 16**  
**GOLF COURSE MONITORING SITES**

Site	Maidstone	Shinnecock	National	Islands End	Indian Hills
Sample Date	120899	120899	120899	010600	020300
Depth to Water	12	33	6	50	62
Screen Depth	50-60	40-50	50-60	60-65	105-115
pH	-	-	-	-	6.0
Conductivity (umho)	-	-	-	-	166
Chloride (mg/L)	25	7	21	91	16
Sulfate (mg/L)	24	7	20	52	21
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	5.5	1.3	3.1	2.7	3.6
As (ug/L)	<2	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1	<1
Cu (ug/L)	3.97	4.36	3.26	1.48	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND	ND	ND
Chlorinated Pesticides (ug/L) - Method 505	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) - Method 525.2	ND	ND	ND	1.4 metalaxyl	0.14 <sup>B</sup> metalaxyl
Carbamate Pesticides (ug/L) - Method 531.1	ND	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	ND	30

B - below MDL

**APPENDIX III**

Table 17

**INDIAN ISLAND GOLF COURSE MONITORING WELLS**

Well #	1	2	3	4
Sample Date	080399	082599	080399	080399
Depth to Water	13	10	10	10
Screen Depth	15-20	15-20	15-20	35-40
pH	-	6.6	-	-
Conductivity (umho)	-	765	-	-
Chloride (mg/L)	34	157	76	300
Sulfate (mg/L)	29	48	22	40
NH <sub>3</sub> (mg/L)	<0.02	6.32	0.06	0.24
NO <sub>2</sub> (mg/L)	<0.02	0.06	<0.02	<0.02
NO <sub>3</sub> (mg/L)	4.2	0.5	11.	0.6
As (ug/L)	<2	2.02	<2	<2
Cd (ug/L)	<1	<1	<1	<1
Cu (ug/L)	<1	1.88	14.5	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	26 methylsulfide 28 dimethyl- disulfide	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	ND

**APPENDIX III**

Table 18

**TIMBER POINT GOLF COURSE MONITORING WELLS**

Well #	1S	1D	2	4S	4D
Sample Date	072999	072999	072999	072999	113099
Depth to Water	7	7	7	7	7
Screen Depth	5-10	25-30	10-15	10-15	30-35
pH	-	-	-	-	5.7
Conductivity (umho)	-	-	-	-	58
Chloride (mg/L)	5	10	34	8	6
Sulfate (mg/L)	14	20	31	11	7
NH <sub>3</sub> (mg/L)	0.05	0.89	1.55	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	2.8	<0.2	<0.2	3.2	1.8
As (ug/L)	<2	4.14	8.1	<2	<2
Cd (ug/L)	<1	<1	<1	<1	<1
Cu (ug/L)	<1	1.09	<1	1.18	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	2 methyl sulfide	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	ND	ND

**APPENDIX III**

Table 19

**WEST SAYVILLE GOLF COURSE MONITORING WELLS**

Well #	1S	1D	3S	4D
Sample Date	072299	072299	072299	072299
Depth to Water	10	9	3	0
Screen Depth	10-15	35-40	20-25	0-4
pH	-	-	-	-
Conductivity (umho)	-	-	-	-
Chloride (mg/L)	4	18	23	27
Sulfate (mg/L)	17	22	14	14
NH <sub>3</sub> (mg/L)	<0.02	2.74	0.31	0.24
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	1.6	3.3	0.8	1.9
As (ug/L)	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1
Cu (ug/L)	<1	<1	<1	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND	5 MTBE
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	ND

**APPENDIX IV**

Table 20

MAIDSTONE CLUB VERTICAL PROFILE WELL							
Sample Date	092299						
Depth to Water	12 feet						
Screen Depth	10-15	20-25	30-35	40-45	50-55	60-65	70-75
Chloride (mg/L)	18	23	30	27	26	20	17
Sulfate (mg/L)	34	19	20	24	29	25	10
NH <sub>3</sub> (mg/L)	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	2.8	1.5	2.0	2.3	5.0	5.0	2.5
As (ug/L)	<2	<2	<2	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1	<1	<1	<1
Cu (ug/L)	<1	<1	<1	<1	<1	<1	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND	2 chloro-form	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	7 <sup>B</sup>	14	ND	ND

B - below MDL

**APPENDIX IV**

Table 21

SHINNECOCK HILLS VERTICAL PROFILE WELL				
Sample Date	091399			
Depth to Water	33 feet			
Screen Depth	40-45	50-55	60-65	70-75
Chloride (mg/L)	8	12	11	10
Sulfate (mg/L)	6	10	10	9
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	1.5	0.4	1.3	1.3
As (ug/L)	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1
Cu (ug/L)	<1	<1	<1	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	2 chlorodifluoro-methane	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	ND

**APPENDIX IV**

Table 22

NATIONAL GOLF LINKS VERTICAL PROFILE WELL						
Sample Date	092399	091499				
Depth to Water	6 feet					
Screen Depth	15-20	25-30	35-40	45-50	55-60	65-70
Chloride (mg/L)	9	10	12	23	19	56
Sulfate (mg/L)	8	8	10	20	18	12
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	1.3	1.5	2.4	5.0	5.8	1.4
As (ug/L)	<2	<2	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1	<1	<1
Cu (ug/L)	19.4	<1	<1	<1	1.72	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	ND	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	ND	ND	ND

**APPENDIX IV**

Table 23

ISLANDS END CC VERTICAL PROFILE WELL						
Sample Date	092099					
Depth to Water	50 feet					
Screen Depth	50-55	60-65	70-75	80-85	90-95	100-105
Chloride (mg/L)	20	93	42	27	66	976
Sulfate (mg/L)	14	40	34	30	62	59
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	0.03
NO <sub>2</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>3</sub> (mg/L)	0.4	2.8	1.5	4.5	7.3	4.8
As (ug/L)	<2	<2	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1	<1	<1
Cu (ug/L)	<1	<1	<1	<1	<1	2.81
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	1 chloro-form	2 chloro-form	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	0.56 metalaxyl	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	ND	ND	ND	101	15	ND

**APPENDIX IV**

Table 24

INDIAN HILLS CC VERTICAL PROFILE WELL						
Sample Date	100599			092899		
Depth to Water	62 feet					
Screen Depth	80-85	90-95	100-105	110-115	120-125	130-135
Chloride (mg/L)	14	14	16	15	13	10
Sulfate (mg/L)	9	8	14	8	18	<4
NH <sub>3</sub> (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
NO <sub>2</sub> (mg/L)	-	-	-	-	<0.02	<0.02
NO <sub>3</sub> (mg/L)	2.2	2.5	3.1	2.7	2.0	1.7
As (ug/L)	<2	<2	<2	<2	<2	<2
Cd (ug/L)	<1	<1	<1	<1	<1	<1
Cu (ug/L)	<1	<1	<1	<1	<1	<1
Hg (ug/L)	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Volatile Organic Compounds (ug/L) Method 524.2/624	ND	ND	0.7 MTBE	ND	ND	ND
Chlorinated Pesticides (ug/L) Method 505	ND	ND	ND	ND	ND	ND
EDB/DBCP (ug/L) Method 504	ND	ND	ND	ND	ND	ND
Semi-Volatile Pesticides (ug/L) Method 525.2	ND	ND	ND	ND	ND	ND
Carbamate Pesticides (ug/L) Method 531.1	ND	ND	ND	ND	ND	ND
TCPA (ug/L) Method HPLC/UV	4 <sup>b</sup>	16	30	ND	ND	ND

B - below MDL

**APPENDIX V**

Table 25

Nassau Wells With Pesticide Detections (ug/L)

Type	Depth	Date	Well#	Location	As	atrazine	bromacil	chlordane	DBCP	1,2DCA	dieldrin	EDB	metalaxyl	simazine	TCPA
C	269	081399	N-9211	Glen Cove	-	-	-	-	0.2	-	-	-	-	-	23
C	159	110599	N-3704	W Hempstead	-	2.6	-	-	-	-	-	-	-	0.9	-
C	166	092499	N-12639	Sands Point	-	-	-	-	-	-	-	-	-	-	22
M	53	061899	N-9660	Massapequa	-	-	-	-	-	-	0.41	-	-	-	-
M	199	062199	N-8309	Muncey Park	-	-	-	-	-	-	-	-	-	-	27
M	148	071999	N-10605	Locust Grove	2.45	-	-	-	-	-	-	-	-	-	-
M	88	072299	N-9271	Kings Point	2.85	-	-	-	-	-	-	-	-	-	-
C	220	072399	N-8010	Roslyn	-	-	-	-	-	0.8	-	0.32	-	-	-
M	37	072999	N-8875	Massapequa	-	-	-	-	-	-	-	-	-	0.25	-
M	90	081299	N-9896	Kings Point	3.67	-	-	-	-	-	-	-	-	-	-
M	28	081999	N-11675	Sea Cliff	-	-	-	-	-	-	-	-	-	-	19
M	44	083099	N-1129	Lakeview	-	-	5.1	-	-	-	-	-	-	-	-
M	40	100599	N-9054	Baldwin	10.8	-	-	-	-	-	-	-	-	-	-
M	110	111099	N-9115	Glen Cove	3.63	-	-	-	-	-	-	-	-	-	-
M	250	111099	N-4639	Glen Cove	2.16	-	-	-	-	-	-	-	0.42	3.0	-
M	48	111899	N-10002	Lakeview	-	-	-	-	-	-	0.57	-	-	-	-
M	14	120299	N-9510	Uniondale	-	-	-	0.41	-	-	-	-	-	-	-
M	148	120899	N-10606	Locust Grove	2.33	-	-	-	-	-	-	-	-	-	-

C = community supply well

M = monitoring well

**APPENDIX VI**

Table 26  
Suffolk Community Public Water Supply Wells With Pesticide Detections (ug/L)

Date	Well#	Location	Community	NO <sub>3</sub> (mg/L)	alachlor	DBCP	metolachlor	simazine	TCPA	tebuthiuron
080499	S-05068	Greenlawn WD #2 Stony Hill Rd	Centerport	5.2	-	0.05	-	-	-	-
082499	S-71715	SCWA #6 Knight St - RAW	Shoreham	6.9	-	-	-	-	148	-
082499	S-71715	SCWA #6 Knight St - FILTERED	Shoreham	7.0	-	-	-	-	ND	-
082499	S-22362	SCWA #1 Schuyler Dr - RAW	Commack	3.4	-	-	-	0.73	-	1.3
082499	S-22362	SCWA #1 Schuyler Dr - FILTERED	Commack	3.3	-	-	-	ND	-	ND
082499	S-30088	SCWA #1 North Country Rd	Miller Place	5.3	0.39	-	-	-	-	-
082699	S-115103	SCWA #1 Rocky Point Rd	East Marion	0.3	-	-	1.5	-	15	-
082699	S-15795	SCWA #4-8 Islands End - CLOSED	East Marion	5.8	-	-	-	-	92	-

**APPENDIX VI**

Table 27

Suffolk Non-Community Public Water Supply Wells with Pesticide Detections (ug/L)

Date	Location	Community	NO <sub>3</sub> (mg/L)	As	aldicarb	1,2 DCP	metalaxyl	prometon	TCPA
060999	Peconic Dunes well 1	Southold	11.1	-	1.32	-	-	-	-
060999	Peconic Dunes well 2	Southold	14.2	-	20.3	-	-	-	-
081199	McCabes Beach	Southold	ND	2.77	-	-	-	-	-
083099	Camp Edey	Bayport	4.1	-	-	-	-	-	163
100699	Camp Edey - RETEST	Bayport							193
092099	Station Bistro	Water Mill	5.6	-	-	0.7	-	-	-
100699	Eastport Commons	Eastport		-	-	-	-	-	67
111699	Macari Vineyards	Mattituck	9.4	-	11.2	-	-	-	-
111699	Lenz Winery	Peconic	11.9	-	4.8	-	-	-	-
111699	Vande Wetering Greenhouses	Jamesport	9.8	-	3.3	-	-	-	-
112299	Paumanok Vineyards	Aquebogue	6.1	-	4.5	-	-	-	-
112299	Pellegrini Vineyards	Cutchogue	2.4	-	-	-	0.32	-	-
112299	North Fork CC	Cutchogue	5.2	-	1.36	-	-	-	-
120699	Bidwell Vineyards	Cutchogue	6.8	-	11.6	-	-	-	-
122099	Braun Oyster	Cutchogue	6.1	-	4.7	-	-	-	-
122799	Hargrave Vineyards	Cutchogue	9.3	-	0.5	-	-	-	-
122799	Dalys Old Mill Inn	Mattituck	12.4	-	0.52	-	-	-	-
122999	North Shore Mall	Miller Place	8.1	-	0.53	-	0.26	-	-
012400	Mattituck Lanes	Mattituck	4.5	-	-	-	-	0.55	-
021400	Pizza Place	Bridgehampton	5.5	-	-	-	0.49	-	-

**APPENDIX VI**

Table 28  
Suffolk Monitoring Wells With Pesticide Detections (ug/L)

Well#	Location	NO <sub>3</sub> mg/L	alchl ESA	aldi- carb	atra- zine	cyana- zine	imida- clopid	meta- laxyl	metola- chlor	met-chlor OA	met-chlor ESA	sima- zine	other	Sample Date
S-71569	Peconic Bay Bd, Jamesport	12.6	na	7.6	-	-	-	1.8	0.3	na	na	-	-	083199
S-51566	Reeve Ave, Riverhead	5.6	na	3.0	0.84	3.3	-	-	0.7	na	na	-	0.5 oxamyl	083199
S-112329	Hayground Rd, Water Mill	2.4	na	-	-	-	-	-	83.	na	na	-	-	090899
S-112329	Hayground Rd, Water Mill	na	-	-	-	-	-	-	2.6	0.77	0.39	-	0.24 prometon	010600
S-112499	Rensslear Dr, Commack	12.3	na	-	-	-	-	-	-	na	na	5.4	2.4 tebuthiurn	091499
S-63825	Route 27A, Great River	1.3	na	-	-	-	-	-	-	na	na	2.5	0.9 tebuthiurn	091599
B-1	Hubbard Ave, Aquebogue	18.3	-	-	-	-	-	-	-	2.88	7.14	-	-	031000
B-2	Peconic Bay Bd, Jamesport	18.4	-	-	-	-	0.81	2.5	0.35	40.4	39.7	-	0.27 endosulf <sup>1</sup>	031000
B-3	Terry La, Orient	20.4	3.23	-	-	-	-	-	-	0.66	2.72	-	-	031000
B-4	Daniels La, Sagaponack	6.6	-	-	-	-	-	0.85	-	3.93	7.37	-	-	031100
B-5	Pauls La, Water Mill	8.1	-	-	-	-	-	-	-	11.5	25.7	-	-	031100

na = not analyzed at the time (analysis initiated 020100)

1 = endosulfan sulfate

**APPENDIX VII - TABLE 29 - Pesticide Chemicals Detected Apr 1999 - Feb 2000**  
 (Chemicals in shaded areas use on Long Island has been discontinued since the date indicated.)

CHEMICAL	MDL Fg/L	MCL Fg/L	# DETECTS			# > MCL			Highest Conc. Fg/L
			Nassau	Suffolk	Total	Nassau	Suffolk	Total	
alachlor 1999	0.2	2	0	8	8	0	1	1	7.8
alachlor OA <sup>1</sup> 1999	0.4	50*	-	2	2	0	0	0	3.33
alachlor ESA <sup>1</sup> 1999	0.2	50*	-	9	9	0	0	0	11.8
aldicarb sulfoxide+sulfone 1980	0.5	7	0	119	119	0	26	26	28.
arsenic	2	50	7	5	12	0	0	0	10.8
atrazine	0.2	3	1	5	6	0	0	0	2.6
bromacil	0.5	50	1	0	1	0	0	0	5.1
cadmium 1992	1	5		25	25		1	1	5.34
carbofuran 1983	0.5	40	0	2	2	0	0	0	4.3
chlordane 1983	1	2	1	1	2	0	0	0	0.68
cyanazine	0.2	1	0	1	1	0	1	1	3.3
deisopropylatrazine <sup>1</sup>	0.2	4	-	3	3	-	0	0	0.69
1,2 dibromo 3-chloropropane 1979	0.02	0.2	1	1	2	1	0	1	0.2
dichlobenil	0.2	50*	0	1	1	0	0	0	0.26
1,2 dichloroethane	0.5	5	1	1	2	0	0	0	1.0
1,2 dichloropropane 1987	0.5	5	0	19	19	0	1	1	5.0
dieldrin 1983	0.2	5	2	1	3	0	0	0	1.07
disulfoton sulfone	0.2	50	0	6	6	0	0	0	1.5
ethylene dibromide (EDB) 1983	0.02	0.05	1	3	4	1	2	3	0.32
endosulfan sulfate	0.2	50	0	4	4	0	0	0	0.31
imidacloprid <sup>1</sup>	0.2	50*	-	1	1	0	0	0	0.81
metalaxyl	0.2	50	1	39	40	0	0	0	2.6
methomyl	0.5	50	0	2	2	0	0	0	0.94
metolachlor	0.2	50	0	18	18	0	1	1	83.
metolachlor OA <sup>1</sup>	0.3	50*	-	21	21	0	0	0	40.4
metolachlor ESA <sup>1</sup>	0.3	50*	-	24	24	0	0	0	39.7
metribuzin	0.2	50	0	3	3	0	0	0	0.41
oxamyl 1983	0.5	50	0	5	5	0	0	0	1.4
prometon	0.5	50	0	2	2	0	0	0	0.55
simazine	0.2	4	3	8	11	0	1	1	5.4
tebuthiuron	0.5	50	0	3	3	0	0	0	2.4
terbacil	0.5	50	0	1	1	0	0	0	0.6
tetrachloroterephthalic acid 1988	10	50	4	53	57	0	19	19	353.
1,2,3-trichloropropane	0.5	5	0	12	12	0	0	0	3.0

1 = only 70 total analyses conducted, none performed on samples from Nassau County wells

\* = presumed 50 ug/L Unspecified Organic Compound MCL

**APPENDIX VIII - ANALYTICAL METHODS, ANALYTES & MDLs**

**Herbicide Breakdown Product Analysis (ug/L)**  
**SCDHS – LC/MS**

<u>Analyte</u>	<u>MDL ug/L</u>
Didealkylatrazine (G-28273)	0.8
Deisopropylatrazine (28279)	0.2
Deethylatrazine (G-30033)	0.4
Imidacloprid	0.2
Alachlor OA (oxanilic acid)	0.4
Alachlor ESA (sulfonic acid)	0.2
CGA-37735 (metolachlor breakdown prod.)	0.2
Metolachlor OA (CGA-51202)	0.3
Metolachlor ESA (CGA-354743)	0.3
CGA-41638 (metolachlor breakdown prod.)	0.3
CGA-40172 (metolachlor breakdown prod.)	0.3
CGA-67125 (metolachlor breakdown prod.)	0.3
G-34048 (2-hydroxyatrazine)	0.3

**Chlorinated Pesticide Analysis**  
**EPA Method 505**

<u>Analyte</u>	<u>MDL ug/L</u>
4,4-DDE	0.2
4,4-DDD	0.2
4,4-DDT	0.2
Alachlor	0.5
Aldrin	0.2
alpha-BHC	0.2
beta-BHC	0.2
Chlordane	1.
Dacthal	0.2
delta-BHC	0.2
Dieldrin	0.2
Endosulfan I	0.2
Endosulfan II	0.2
Endosulfan sulfate	0.2
Endrin	0.2
Endrin aldehyde	0.2
gamma-BHC (Lindane)	0.2
Heptachlor	0.2
Heptachlor epoxide	0.2
Methoxychlor	0.5

**Microextractable Analysis**  
**EPA Method 504**

<u>Analyte</u>	<u>MDL ug/L</u>
1,2-dibromoethane	0.02
1,2-dibromo-3-dichloropropane	0.02

**Semi-Volatile Organic Analysis**  
**EPA Method 525.2 (ug/L)**

<u>Analyte</u>	<u>MDL ug/L</u>
Hexachlorocyclopentadiene	1.
Hexachlorobenzene	0.2
Simazine	0.2
Atrazine	0.2
Metribuzin	0.2
Alachlor	0.2
Propachlor	0.2
Diazinon	0.2
Metalaxyl	0.2
Tebuthiuron	0.5
Acetochlor	0.2
Malathion	0.5
Isofenphos	0.5
Trifluralin	0.5
Pentachloronitrobenzene	0.2
Vinclozolin	0.5
Pendimethalin	0.2
Iprodione	0.5
EPTC	0.2
Dinoseb	0.5
Cyanazine	0.2
Napropamide	0.2
Bloc	0.2
Resmethrin	0.2
Metolachlor	0.2
Dacthal	0.2
Butachlor	0.2
Bis(2-ethylhexyl)adipate	0.5
Bis(2-ethylhexyl)phthalate	2.
Benzo-a-pyrene	0.2
Bromacil	0.5
Prometon	0.5
Pentachlorobenzene	0.2
Disulfoton	0.5
Ethofumesate	0.2
Chlorpyrifos	0.2
Cyfluthrin	0.2
Benfluralin	0.5
Chlorothalonil	1.
Triadimefon	0.5
Iodofenphos	0.2
Permethrin	0.2
Terbufos	0.2
Terbacil	0.5
Disulfoton sulfone	0.2
Kelthane	0.5
Methoprene	0.2
Sumithrin	0.2
Dichlobenil	0.2

**Dacthal Breakdown Product Analysis  
SCDHS HPLC/LC-GCMS**

<u>Analyte</u>	<u>MDL ug/L</u>
Monomethyltetrachloroterephthalate	10
Tetrachloroterephthalic acid (TCPA)	10

**Carbamate Pesticide Analysis  
EPA Method 531.1**

<u>Analyte</u>	<u>MDL ug/L</u>
1-Naphthol	0.5
3-Hydroxycarbofuran	0.5
Aldicarb sulfone	0.5
Aldicarb sulfoxide	0.5
Aldicarb	0.5
Carbaryl	0.5
Carbofuran	0.5
Methiocarb	0.5
Methomyl	0.5
Oxamyl	0.5
Propoxur	0.5

**Standard Inorganic Analyses**

pH	-
conductivity	umho
chloride	1 mg/L
sulfate	1 "
ammonia	0.02 "
nitrite	0.02 "
nitrate + nitrite	0.2 "

**METAL ANALYSES  
EPA Method 200.8**

<u>Analyte</u>	<u>MDL ug/L</u>
Aluminum	5
Antimony	1
Arsenic	2
Barium	5
Beryllium	1
Cadmium	1
Chromium	1
Cobalt	1
Copper	1
Lead	1
Manganese	1
Mercury	0.4
Molybdenum	1
Nickel	1
Selenium	2
Silver	5
Thallium	1
Thorium	1
Titanium	1
Vanadium	1
Zinc	50

**METAL ANALYSES  
Method SM#183111**

<u>Analyte</u>	<u>MDL ug/L</u>
iron	0.1 mg/L
sodium	1 mg/L

**Volatile Organic Analysis  
EPA Method 524.2/624**

<u>Analyte</u>	<u>MDL ug/L</u>
1,2-Dichlorobenzene(o)	0.5
1,2,4-Trimethylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,2,3-Trichloropropane	0.5
1,2-Dichloropropane	0.5
1,3,5-Trimethylbenzene	0.5
1,1,2-Trichloroethane	0.5
1,1-Dichloroethane	0.5
1,1,1-Trichloroethane	0.5
1,2-Dichloroethane	0.5
1,2,4,5-tetramethylbenzene	0.5
1,1-Dichloroethene	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,4-Trichlorobenzene	0.5
1,2,3-Trichlorobenzene	0.5
1,3 dichloropropane	0.5
1,1,-Dichloropropene	0.5
1,4-Dichlorobutane	0.5
1,1-Dichloroethene	0.5
1,1,2,2-Tetrachloroethane	0.5
1-Bromo-2-chloropropane	0.5
1-Methylethylbenzene	0.5
2,3-Dichloropropene	0.5
2,2-Dichloropropane	0.5
2-Bromo-1-chloropropane	0.5
2-Butanone(MEK)	20.
2-Chlorotoluene	0.5
3-Chlorotoluene	0.5
4-Chlorotoluene	0.5
Benzene	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromodichloromethane	0.5
Bromoform	0.5
Bromomethane	0.5
Carbon tetrachloride	0.5
Chlorodifluoromethane	0.5
Chloroethane	0.5
Chloroform	0.5
Chloromethane	0.5
Chlorobenzene	0.5
cis-1,2-Dichloroethene	0.5
cis-1,3-Dichloropropene	0.5

**APPENDIX VIII - ANALYTICAL  
METHODS, ANALYTES & MDLs**

**Volatile Organic Analysis (cont.)**

**EPA Method 524.2/624**

<u>Analyte</u>	<u>MDL ug/L</u>
Dibromomethane	0.5
Dichlorodifluoromethane	0.5
Dimethyldisulfide	0.5
Ethenylbenzene (Styrene)	0.5
Ethylbenzene	0.5
Freon 113	0.5
Hexachlorobutadiene	0.5
Isopropyltoluene(p-cymene)	0.5
m,p-Dichlorobenzene	0.5
m-Xylene	0.5
Methy-tert-butyl-ether	0.5
Methyl sulfide	0.5
Methylene chloride	0.5
n-Butylbenzene	0.5
n-Propylbenzene	0.5
Naphthalene	0.5
o-Xylene	0.5
p-Diethylbenzene	0.5
p-Xylene	0.5
sec-Butylbenzene	0.5
T.Chlorotoluene	0.5
T.Xylene	0.5
tert-Butylbenzene	0.5
Tetrachloroethene	0.5
Tetrahydrofuran	20.
Toluene	0.5
trans-1,3-Dichloropropene	0.5
trans-1,2-Dichloroethene	0.5
Trichloroethene	0.5
Trichlorofluoromethane	0.5
Vinyl chloride	0.5

031500

## **Appendix IX Nitrogen Monitoring Results**

### ***Background***

As part of the pesticide monitoring program, groundwater samples were also collected for inorganic chemical analysis, which is standard SCDHS procedure. Of particular interest were the nitrogen concentrations, which often give clues as to the origin of the groundwater sampled (i.e., the land uses at the points of recharge). Prior studies, including the previous pesticide monitoring program, had indicated that agricultural activities often produced nitrate nitrogen concentrations that exceed the 10 mg/L drinking water standard. Previous results on golf courses had been mixed, and little was known about nitrogen concentrations relative to vineyards.

### ***Vineyard Results***

This year's monitoring data indicated a significant difference in average nitrate concentrations among the vineyards. Nitrate concentrations ranged from 1.3 to 17.7 mg/L in the 15 individual monitoring wells, with an average concentration of 6.7 mg/L and a median concentration of 3.7 mg/L (see Tables 9 to 14 in Appendix II). The data showed that ammonia and nitrite did not contribute significantly to total nitrogen concentrations. The three vineyards with the lowest nitrate concentrations averaged from 2.0 to 3.2 mg/L, while the two vineyards with the highest nitrate concentrations averaged 12.5 and 14.0 mg/L (see Table 2, page 4).

There is some evidence that the cause of elevated nitrate concentrations at the two vineyards with the highest concentrations may be related to chemical applications to prior (pre-wine grape) crops planted on the land. The average depth to water was greatest at the two vineyards with highest nitrate concentrations (average 51 feet versus an average of 27 feet at lower nitrate wells), which may indicate longer travel times in the unsaturated zone. Nitrogen applied to prior crops may not yet have fully leached through the soil column to the water table. In addition, the detection of a trace amount of aldicarb sulfone, a degradate of the potato pesticide aldicarb (Temik), in one monitoring well with high nitrate at Macari Vineyard is a clear indication that chemicals applied to prior crops still exist in the soils.

A second relationship between nitrate and vineyards may be evident in that the sites with higher average nitrate concentrations also had the youngest vines. The elevated nitrate concentrations may be due to the possibility of more recent chemical applications to prior non-grape crops, or they may have originated from fertilizers applied to help establish the vines. The reasons for the wide range of nitrate concentrations among the sites needs to be further investigated.

Other factors that may influence the pesticide and nitrate concentrations found in groundwater at vineyards include: pesticide and fertilizer application practices, e.g., the amount of active ingredient, rates, timing and type (i.e., leaching potential) of chemicals applied; the methods of application (e.g., recycling sprayer, soil or foliar applications); the types and amounts of cover crop planted; and, soil types and differing irrigation practices.

An existing SCDHS monitoring well (S-53333), located upgradient of the vineyard with the highest average nitrate concentrations, contained a nitrate concentration of 1.5 mg/L, and no pesticides were detected in this well. The lack of significant nitrate and pesticide contamination in the upgradient

well indicates that the impacts detected in the vineyard monitoring wells originated on-site. Two irrigation wells (of unknown depth) sampled at the site (Macari Vineyard) show elevated nitrate impacts and two insecticides presumably applied to potato crops previously grown on the land: aldicarb (trade name Temik), and oxamyl (trade name Vydate). The data indicate chemicals applied to prior (pre-wine grape) crops are still present in the aquifer beneath the vineyard.

***Golf Course Results***

The average nitrate concentration found in the five new wells installed this year was 3.2 mg/L (see Table 16, Appendix III). Total nitrogen values were not significantly different from the nitrate concentrations reported, since free ammonia and nitrite were not detected in the samples.

Average nitrate concentrations for the second round of monitoring at the 13 wells located at three county-owned golf courses ranged from 1.6 mg/L to 4.1 mg/L (see Table 4, page 6), with an overall average of 2.5 mg/L, while in 1998 the overall average nitrate concentration was 5.9 mg/L for these same wells. Free ammonia concentrations contributed to total nitrogen concentrations at the county owned courses, probably due to the shallow depth to the water table (see Tables 17 to 19 in Appendix III).

The overall nitrate concentration detected this year in all 18 golf course monitoring wells averaged 2.7 mg/L, with a median concentration of 2.3 mg/L, which are slightly less than those reported for the prior year's monitoring, when the average nitrate was 4.3 mg/L, and the median was 2.6 mg/L.

***High Pesticide Use Areas Results***

Each of the 707 wells of all types sampled in Suffolk County were tested for nitrate as well as pesticide parameters. A total of 78 (11.0%) of these wells exceeded the nitrate MCL of 10 mg/L this year, compared to 10.8% (166 of 1,539 wells) that exceeded the standard as documented in the June 1999 report.

Table 30 summarizes the number of private wells found to exceed the nitrate MCL. Of the 604 private wells tested in Suffolk County, 68 wells (11.3%) exceeded the nitrate standard, while the June 1999 study found that 74 (12.7%) of the 583 private wells sampled contained more than 10 mg/L nitrate.

Table 30  
Nitrate in Private Wells in Suffolk County

Study Period	# Wells Tested	# Wells > 10 mg/L	% Wells > 10 mg/L
Oct 1997-Dec 1998	583	74	12.7
Feb 1999-Feb 2000	604	68	11.3
Totals	1,187	142	12.0