Department of Pesticide Regulation
Environmental Monitoring and Pest Management Branch
830 K Street
Sacramento, CA 95814-5624

**1999**

# Protocol for Monitoring the Concentration of Detected Pesticides in Wells Located in Highly Sensitive Areas Study 182

## I. Background

Previous sampling for pesticides in well water has been conducted either to detect new active ingredients (Ground Water Protection List Monitoring), to help determine if residues found in ground water were due to non-point source agricultural applications (Four-section Survey Monitoring), or to identify new sections with wells containing pesticide residues that had been previously detected in ground water (Adjacent Section Monitoring). Instead of relying upon pesticide detections to identify areas sensitive to the movement of pesticides to ground water, the Department of Pesticide Regulation will propose to identify sensitive areas using soil and depth to ground water data. If this change is made, then Adjacent Section Monitoring will be reduced or eliminated.

The shift from a detection-based program to a preventative program will allow resources to be used for other well sampling studies. The objective of this protocol is to observe temporal changes in pesticide concentration in well water by conducting repeated sampling from a network of wells located in areas highly sensitive to pesticide movement to ground water. This information could be used as one measure of success for changes in the ground water program. Based on data from an age-dating study and from monitoring of aldicarb residues in Humboldt and Del Norte Counties by the North Coast Regional Board, a minimum of 5 years of monitoring may be needed before changes in concentrations are noted in well water.

A well monitoring network should be initiated at this time for two reasons. First, regulations will be proposed this year which incorporate a new system of vulnerability delineation with enforceable management practices to minimize pesticide movement to ground water. This marks the beginning of a new phase in the ground water program. Initiation of a monitoring network of wells would coincide with the changes. Second, the USEPA plans to require states to develop State Management Plans for protection of ground water from pesticide contamination. One of the objectives of State Management Plants is to provide for a monitoring network of wells as a measure of success for new state programs. It is anticipated that this monitoring network will fulfill the monitoring requirement of the State Management Plan.

II. Objective

The objective of this study is to monitor concentrations of pesticides in well water over time in areas where ground water protection management practices will be implemented.

III. Personnel

This study will be conducted by the Environmental Hazards Assessment Program (EHAP) under the general direction of Don Weaver, Senior Environmental Research Scientist. Key personnel are:

| | |
|---|---|
| Project Leader: | Cindy Garretson |
| Senior Staff Scientist: | John Troiano |

Questions concerning the study should be directed to Mark Pepple at 916-324-4086, facsimile 916-324-4088.

IV. Study Design

The wells will be located in two highly sensitive areas in Fresno and Tulare Counties. One sensitive area is typified by sections containing coarse soils and the second area is typified by sections containing hardpan soils. The sub-population of wells for use in this study will be those that had already been sampled by EHAP and where residues of simazine, bromacil, or diuron had been detected.

First, sixty domestic wells will be identified in each vulnerable area. Wells will be chosen where well log information is complete and the depth from which water is being drawn is known. Permission will then be obtained to sample from the wells at least twice a year, in the spring and fall. The data from the initial round of sampling will be analyzed to determine a set of 25-30 wells in each vulnerable area which will be used to continue the monitoring **for at least 5 years**.

## V. Data Analysis

Determining a trend for pesticide concentrations in a well is potentially confounded by the season in which the samples are taken and the factors that affect the travel-time between application of pesticides to surface soil and eventual entrance into the zone of influence around the well. Although the sources of variance are not well described, analysis of the data in the Well Inventory Data Base provides some guidance on the magnitude of the variance contributed by the chemical analytical component. In the Well Inventory Data Base, both primary and backup samples have been analyzed for some samples. The methods used to analyze the backup samples ranged from the same laboratory using the same method to different laboratories using different methods. Table 1 contains the mean and standard deviation for paired analyses in each category. Data were standardized by dividing the concentration measured in the backup sample by the concentration measured in the primary sample. This proportion was then subtracted from 1 and a test was conducted to determine whether or not the mean was equal to zero. If a test indicated difference from zero, then a bias in measurements between sample types would be indicated. Only one test out of 10 potential tests indicated a bias towards higher values for simazine when a different laboratory used the same method to analyze the backup sample.

The range in standard deviation is of interest in that this indicates the expected deviation of the the paired samples. The range of the 10 standard deviations was from 0.175 to 0.586 with a mean of 0.33 (Table 1). The underlying distribution for the standard deviations was not significantly different from a normal distribution. Using this as a guide, upper value for the mean plus the root mean square is approximately at 0.45. This value could be used as a guideline to determine when differences are declared. For example, a difference of 45% could be set as the point where differences in concentration are due to temporal changes rather than to analytical variance. Thus, graphical observation of the changes in concentration over time could be combined with the information on the variance due to the chemical analytical methodology to declare actual temporal trends in the data.