SAMPLING FOR PESTICIDE RESIDUES IN CALIFORNIA WELL WATER

1991 Update
Well Inventory Data Base

Sixth Annual Report to the Legislature,
State Department of Health Services, and the
State Water Resources Control Board

Pursuant to the
Pesticide Contamination Prevention Act

by

DPR Portion: C. Miller Maes, M. Pepple, J. Troiano, D. Weaver, W. Kimaru

SWRCB Portion: Staff

California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management Branch
Environmental Hazards Assessment Program
1220 N Street, Sacramento, CA 95814

EH 92-02

EXECUTIVE SUMMARY

PURPOSE:

The Pesticide Contamination Prevention Act (referred to hereafter as Act, see Appendix A, p. 89), requires that the Director of the Department of Pesticide Regulation (DPR) within the California Environmental Protection Agency maintain a statewide data base of wells sampled for pesticidal active ingredients and that all agencies submit to the Director the results of any well sampling for the active ingredients of pesticides. The Act directs DPR, in consultation with the California Department of Health Services (CDHS) and the State Water Resources Control Board (SWRCB), to annually report: (1) specified information contained in the data base to the Legislature, the CDHS, and the SWRCB; (2) actions taken by the Director and the SWRCB to prevent pesticides from leaching to ground water; and (3) factors contributing to the movement of pesticides to ground water.

BACKGROUND:

The well inventory data base was developed by DPR (then a division of the California Department of Food and Agriculture) in 1983, prior to the passage of the Act in 1985. The purposes of the data base were to centralize reliable information on the occurrence of non-point source contamination of ground water by the agricultural use of pesticides and to facilitate graphical, numerical, and spatial analyses of the data. The contents of the data base were described in the report, Agricultural Pesticide Residues in California Well Water: Development and Summary of a Well Inventory Data Base for Non-Point Sources (Cardozo et al., 1985). To meet the requirements of the Act, both point source (well-defined areas where pollutants are concentrated) and non-point source (contamination that cannot be traced to a single definable location) sampling results are now included in the data base.

This, the 1991 report, is the fifth update to the first annual report (Brown, et al., 1986) and summarizes the results of 49 separate ground water

monitoring studies submitted to DPR between July 1, 1990 and September 1, 1991. The studies were conducted by state and county agencies and private firms. In all, 24,712 records were added to the well inventory data base for the 1991 summary year. Each chemical analysis of a well water sample for a pesticide or related chemical constitutes one record in the data base. A numerical summary of data contained in the data base by report year is in Table 1. A glossary of terms used in this report is in Appendix B (p. 102).

Interpretation of sampling results in the well inventory data base is subject to the following limitations:

1. Only data submitted to DPR between July 1, 1990 and September 1, 1991 are included and discussed in the report;

2. Data included in this report are not the results of a single study. Rather, they are the result of 49 studies, designed and conducted by nine agencies for varying purposes;

3. Pesticidal residue detections in the well inventory do not represent a complete survey of ground water contamination in the state. The detected compounds are limited to only those for which the sample was specifically analyzed. Therefore, the data indicate which pesticides are present in California well water among those pesticides for which analyses were carried out, but not among all pesticides used statewide;

4. Sampling by agencies other than DPR is not necessarily related to suspected agricultural non-point sources of contamination. Consequently, it should not be assumed that the reported results are an indication of which pesticides are more or less likely to leach to ground water as a result of nonpoint-source agricultural use.

Despite these limitations, the information on pesticide residues contained in the well inventory data base can be used in all of the following applications:

1. Displaying the geographic distribution of well sampling;

2. Displaying the known geographic distribution of pesticide residues in wells among those wells sampled;

3. Identifying areas potentially sensitive to pesticide leaching;

4. Designing studies for future sampling.

Table 1. Numerical summary of records contained in the well inventory data base, by year of report.

CATEGORY	REPORT YEAR						CUMULATIVE TOTAL [b]
	1986	1987	1988	1989	1990	1991	
Total analyses [a]	71,093	4,144	39,779	8,096	29,923	24,712	177,661
Confirmed analyses	4,874	1,037	336	619	717	554	8,670
Wells sampled	8,340	525	2,963	749	2,761	1,556	15,238
Wells with confirmed detections	2,243	210	115	180	163	146	3,021
Counties sampled	53	19	41	33	52	30	57
Counties with wells having confirmed detections	16	12	14	20	15	16	37
Pesticides and related compounds sampled for	160	77	168	97	192	165	273
Pesticides and related compounds with confirmed analyses	6	14	10	14	14	11	32
Pesticide residues resulting from non-point source agricultural use	9	8	1	7	6	7	12

a Unconfirmed detections are not included in the totals given. An unconfirmed detection is the detection of a pesticide in a single sample, for a particular well, taken during the time period of an individual monitoring study. Confirmation of the initial positive analysis by a second positive sample was not possible because (1) only a single sample was taken from the well or (2) analyses of all other samples taken from the well during the study were negative for the compound under investigation.

b The cumulative total is not additive. It is a total of the unique items existing in a category (e.g., a single well which had sampling data reported in the 1986, 1988, and 1990 reports is counted one time only).

METHODS:

The Act requires that the Director maintain a statewide data base of wells sampled for pesticide active ingredients. To ensure the integrity of the well inventory data base, criteria have been set by DPR for evaluating sampling results. Data that met the following criteria were added to the data base:

1. Sampling results were for the analyses of agricultural-use pesticides (see Glossary) or their breakdown products;

2. Samples were taken from a well, i.e., from ground water, not surface water or soil;

3. Samples were taken as close to the well head as possible. To obtain a sample that is most representative of the supplying aquifer, samples taken from a port between the well pump and the storage tank are preferable to samples taken from a port located after the storage tank;

4. Samples were obtained from an untreated and unfiltered system;

5. Location of each sampled well had to be identified by at least township/range/section according to the U.S. Geological Survey Public Lands Survey Coordinate system;

6. Data must not have been entered into the data base previously.

The data were coded onto appropriate forms, keypunched onto magnetic tape, and downloaded to a computer. Hard copies of the data were proofread against the original data and edited if necessary. The data were run through computer verification programs, edited again if necessary, and finally entered into the permanent well inventory data base from which summary tables were generated.

MAJOR FINDINGS:

The results of 24,712 analyses of well water samples were submitted to DPR for the 1991 update report. The samples were taken from 1,556 wells in 30 counties and analyzed for an overall total of 165 pesticidal active ingredients and breakdown products.

The detection of 20 pesticides and related compounds in California well waters was reported to DPR between July 1, 1990 and September 1, 1991. The presence of 11 of the compounds in ground water was confirmed: aldicarb sulfone and aldicarb sulfoxide (breakdown products of aldicarb), atrazine, bromacil, ortho-dichlorobenzene, diuron, molinate, prometon, simazine, 2,3,5,6-tetrachloroterephthalic acid (TPA, a breakdown product of the pesticide chlorthal-dimethyl), and xylene. Pesticidal residues were detected and confirmed in 146 wells in 16 counties.

As specified by the Act, after an active ingredient of a pesticide has been detected and confirmed (verified) in the ground waters of the state, the Director shall determine whether the pesticide resulted from agricultural use in accordance with state and federal laws and regulations. DPR has determined that seven of the detected compounds were present in ground water as a result of non-point source agricultural use: aldicarb sulfone, aldicarb sulfoxide, atrazine, bromacil, diuron, prometon, and simazine.

In the 1986 first annual report, the Department concluded that atrazine, bromacil, diuron, prometon, and simazine had been detected in ground water as a result of nonpoint-source agricultural use. Detections of one or more of those compounds due to such use have been previously reported in the following counties: Fresno, Glenn, Kern, Los Angeles, Merced, Orange, Riverside, Stanislaus, Tehama, and Tulare. The 1991 update reports, for the first time, the detection of bromacil in Placer County and atrazine in Sacramento County. The source of those detections is still under investigation by DPR. Aldicarb sulfone, first reported in 1986, and aldicarb sulfoxide, first reported in 1989, were both determined to be present in Del Norte and Humboldt Counties as a result of nonpoint-source agricultural use.

The 1991 update reports detections of aldicarb sulfone and aldicarb sulfoxide in Del Norte County where the parent compound, aldicarb, had been used prior to 1983 in the production of lily bulbs. Because aldicarb is no longer registered for use in Del Norte County, the detections have been referred to the SWRCB. The SWRCB and nine Regional Water Quality Control

Boards implement California's system of water quality control. The SWRCB also adopts regulations and policies to protect water quality.

The use of atrazine, bromacil, diuron, prometon, and simazine will be modified in areas where they were detected and determined to be present in ground water as a result of agricultural use. The detections of two other compounds, molinate and xylene, were investigated by DPR and determined not to be present in ground water as a result of non-point source agricultural use. (See discussion of these investigations on pages 17 and 20.) Those detections have also been referred to the SWRCB. Because the compound ortho-dichlorobenzene is not registered for agricultural use in California, its detection in one well was also referred to the SWRCB. Detections of the remaining compound, TPA, are still under investigation by DPR.

CONCLUSIONS:

DPR has taken the following actions between July 1, 1990 and September 1, 1991 to prevent pesticide contamination of ground water:

1. Proposed and adopted regulations to revise the Specific Numerical Values (SNVs) used to identify pesticides with the potential to leach to ground water. The purpose of the SNVs is to predict which active ingredients are most likely to leach to ground water by establishing numerical thresholds (i.e., SNVs) for the mobility and longevity of an active ingredient in soil;

2. Proposed regulations that would add 38 pesticides to section 6800(b) of the Groundwater Protection List (GWPL). Compounds listed in subsection (b) of the GWPL have been identified as having the potential to leach to ground water because of (1) their physical and chemical properties and (2) language on their label allowing for their application to the soil;

3. Proposed regulations that would establish additional Pesticide Management Zones (see Glossary) for the pesticides atrazine, bromacil, diuron, and simazine;

4. Proposed regulations that would add the pesticide bentazon to section 6800(a) of the GWPL. Compounds found in soil or ground water, pursuant to the Food and Agricultural Code section 13149, as a result of agricultural use are placed in subsection 6800(a) of the GWPL. The proposed regulations would also adopt modifications which result in a high probability that agricultural use of bentazon would not pollute ground waters of the state;

5. Proposed regulations that would allow chemicals listed in section 6800(a) of the GWPL to be used for research purposes in any area of the state authorized by the Director.

Actions taken by the SWRCB in 1991 to prevent pesticides from entering ground water included:

1. Began development of a computerized Pesticide Use Reporting System (PURS) in cooperation with DPR. Output scheduled for production by PURS includes reports and maps;

2. Reviewed DPR's proposed regulations to establish additional Pesticide Management Zones and to revise the SNVs;

3. Reviewed and commented on DPR's draft Pesticide Management Plan. DPR will provide the SWRCB with findings of any determination that a detection of a pesticide in ground water is not due to non-point source agricultural use for appropriate follow-up action;

4. Approved two research projects dealing with pesticides and ground water for funding through Clean Water Act grants made available by the U.S. Environmental Protection Agency (USEPA).

5. Regional Boards conducted investigations and enacted mitigation measures relating to the pollution of ground water by pesticides.

The detection of 20 pesticides and related compounds in California well waters has been reported to DPR between July 1, 1990 and September 1, 1991. The presence of 11 of the compounds in ground water was confirmed. DPR has determined that residues from seven of the chemicals having confirmed detections originated from agricultural non-point sources: aldicarb sulfone, aldicarb sulfoxide, atrazine, bromacil, diuron, prometon, and simazine. Many of the sections where atrazine, bromacil, diuron, prometon, and simazine were detected will be declared PMZs and regulated accordingly. The use of the parent compound, aldicarb, is no longer allowed in Del Norte County where its breakdown products, aldicarb sulfone and aldicarb sulfoxide, were detected. TPA, a breakdown product of chlorthal-dimethyl, is still under review.

Regulation of pesticides to prevent residues from entering ground water as a result of non-point source agricultural use depends on scientific knowledge of how pesticides move to ground water. Factors that contribute to ground water contamination by pesticides used in agriculture include amounts used and method of application, irrigation practices, the physicochemical characteristics of the pesticide, soil type, and climate. The role each factor plays in the contamination process is not fully understood. DPR environmental scientists are continuing their work to understand these factors by conducting field studies on pesticide movement; investigating contaminated wells; compiling extensive data bases; and reviewing the work of other scientists. The knowledge gained from these activities will be used to develop recommendations for pesticide use practices that will prevent ground water contamination by the agricultural use of pesticides.

PREFACE

This report fulfills the requirements contained in section 13152, subdivision (e) of the Food and Agricultural Code, directing the Department of Pesticide Regulation (DPR) to report specified information on sampling for pesticidal residues in California ground water to the Legislature, the California Department of Health Services, and the State Water Resources Control Board (SWRCB) annually by December 1.

This report is the fifth update of the first annual report (Brown, et al., 1986) which summarized results of well water sampling for agricultural-use pesticidal residues from samples taken from 1975 to 1986. The first update (Ames, et al., 1987) summarized data submitted to DPR between September 1, 1986 and August 31, 1987. The second update (Cardozo et al., 1988) summarized data submitted between September 1, 1987 and June 30, 1988. The third update (Cardozo, et al., 1989) summarized data submitted between July 1, 1988 and June 30, 1989. The fourth update (Miller, et al., 1990) summarized data submitted between July 1, 1989 and June 30, 1990.

The Act requires that the annual report give the location of wells for which sampling results were reported. Although well locations are specified by state well number or township/range/section in the data base, listing individual results by township, range, and section in this report is not possible due to the large number of wells sampled. Instead, sampling locations are summarized by county.

The information in this report is presented in four parts: Parts I, II, and III were written by DPR. Part IV was written by the SWRCB.

ACKNOWLEDGEMENTS

The authors wish to thank the following DPR staff for their help in compiling data for the well inventory data base and for their help with producing this report: Elizabeth Fernandez and Jo Ann Baluyut for help with data collection; Brad Winters, Rich Breuer, Elizabeth Fernandez, and Jo Ann Baluyut for help with data processing; Wanjiru Kimaru and Brad Winters for programming; Steve Kishaba for consulting; Elizabeth Fernandez, and Jo Ann Baluyut for word processing; and Linda Heath and Elizabeth Fernandez for graphics. We are also grateful to the many reviewers who contributed substantive and editorial comments.

In addition, we acknowledge the contributions made by staff of cooperating federal, state, local, and private agencies. Finally, we thank the many individuals who, by contributing their data, time, and effort, made this data base and report possible.

DISCLAIMER

The mention of commercial products, their source or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement of such product.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF ACRONYMS AND ABBREVIATIONS

AB 1803	Assembly Bill No. 1803 (Connelly, 1983), Health and Safety Code, sections 4026.2 and 4026.3.
AB 2021	Assembly Bill No. 2021 (Connelly, 1985), Food and Agricultural Code, sections 13141 through 13152.
Act	The Pesticide Contamination Prevention Act of 1985; (AB 2021).
AL	action level
Cal-EPA	California Environmental Protection Agency
3CCR	Title 3, California Code of Regulations
CCRWQCB	Central Coast Region, Regional Water Quality Control Board
DPR	Department of Pesticide Regulation
CDHS	California Department of Health Services
CIMIS	California Irrigation Management Information Systems
1,2-D	propylene dichloride; 1,2-dichloropropane
1,3-D	1,3-dichloropropene
2,4-D	2,4-dichlorophenoxyacetic acid
DBCP	1,2-dibromo-3-chloropropane
DWR	California Department of Water Resources
DCPA	chlorthal-dimethyl
EDB	ethylene dibromide
EHAP	Environmental Hazards Assessment Program
ELISA	enzyme-linked immunosorbent assay
EMPM	Environmental Monitoring and Pest Management Branch (DPR)
ETo	reference evapotranspiration
FAC	Food and Agricultural Code
GC	gas chromatography
GWPA	ground water protection advisory
GWPL	Ground Water Protection List
HAL	health advisory level
HPLC	high performance liquid choromatography
MCL	maximum contaminant level
MDL	minimum detection limit
MRR	minimum reporting requirement
MS	mass spectroscopy
MTP	monomethyl 2,3,5,6-tetrachloroterephthalate acid

NCRWQCB	North Coast Region, Regional Water Quality Control Board
PCA	pest control adviser
PCPA	The Pesticide Contamination Prevention Act of 1985
PDRP	Pesticide Detection Response Process
PMZ	pesticide management zone
ppb	parts per billion
ppm	parts per million
RWQCB	Regional Water Quality Control Board
SNV	specific numerical value
SWRCB	State Water Resources Control Board
TPA	2,3,5,6-tetrachloroterephthalic acid
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

I. WELL INVENTORY DATA BASE

I. WELL INVENTORY DATA BASE

INTRODUCTION

This report contains information about California water wells that were sampled for the presence of pesticide residues. The sampling results were received by the Department of Pesticide Regulation ([DPR] formerly a division of the California Department of Food and Agriculture, now a department within the California Environmental Protection Agency) for the report year July 1, 1990 to September 1, 1991 and entered into the well inventory data base. This report includes a discussion of factors which contribute to the movement of pesticides to ground water as a result of agricultural use, as well as actions taken by DPR and the State Water Resources Control Board (SWRCB) to prevent pesticides from entering ground water.

In 1979, the soil fumigant 1,2-dibromo-3-chloropropane (DBCP) was detected in ground water in Lathrop, California. Since then, studies have been conducted throughout California by various agencies to determine whether pesticide residues have migrated to ground water. In the winter of 1983, the Environmental Hazards Assessment Program (EHAP) of DPR developed the well inventory data base in order to identify reliable information on the occurrence of non-point source (not traceable to a single definable location) contamination of ground water by the agricultural use of pesticides and to facilitate graphical, numerical, and spatial analyses of the data. The contents of the data base were described in the report, Agricultural Pesticide Residues in California Well Water: Development and Summary of a Well Inventory Data Base for Non-Point Sources (Cardozo, et al., 1985).

On January 1, 1986, the Pesticide Contamination Prevention Act (referred to hereafter as Act; see Appendix A, p. 89) added sections 13141 through 13152 to Division 7 of the Food and Agricultural Code (FAC). The Act requires DPR to maintain a statewide data base of wells sampled for the active ingredients of pesticides and to report annually to the Legislature, the SWRCB, and the California Department of Health Services (CDHS), specific

information from the data base, as well as actions taken by the Director of DPR and the SWRCB to prevent pesticides from migrating to ground water. The first annual report, Sampling for Pesticide Residues in California Well Water: 1986 Well Inventory Data Base (Brown et al, 1986), presented data from the 1985 data base, plus additional data received by the Department from early 1984 through August 31, 1986. Since the passage of the Act, both point source (where the contaminant flows in a fairly distinct plume from an identifiable source) and non-point source data are included in the well inventory, although the majority of sampling results are from non-point sources.

This report is the sixth annual report and the fifth update of the 1986 report. Each report has presented a discussion of the well sampling data submitted to the well inventory data base for the report year, as well as the results of investigations made by DPR of detections of pesticides currently registered for agricultural use.

When detections of pesticides in ground water are reported to DPR, they are reviewed for appropriate follow-up action. All detections of pesticides currently registered for agricultural use are investigated by DPR to determine if their presence in ground water is the result of legal agricultural use; i.e., the pesticide was properly applied according to its labelled directions and in accordance with federal and state laws and regulations. DPR response to detections of pesticides in ground water (referred to as the Pesticide Detection Response Process [PDRP]) is established in sections 13149 through 13151 (FAC; see Appendix A, p. 89). During this process, the detection of a pesticidal residue in soil or ground water is investigated, evaluated, and, when necessary, mitigated. Mitigation measures range from the adoption of regulations which modify the agricultural use of a pesticide to reduce its likelihood of reaching ground water to the suspension or cancellation of a pesticide. The PDRP is explained further in Section III (p. 48) of this report.

Cumulatively, twelve pesticide active ingredients or their breakdown products have been identified in the annual reports as having been present in ground water as a result of legal, non-point source agricultural use. Those compounds are: aldicarb and its breakdown products aldicarb sulfone and aldicarb sulfoxide, atrazine, bentazon, bromacil, DBCP, diuron, ethylene

dibromide (EDB), prometon, propylene dichloride (1,2-D), and simazine. Of these chemicals, DBCP, EDB, and 1,2-D are no longer registered for use in California. Aldicarb is no longer registered for agricultural use in Del Norte and Humboldt Counties where it had been detected in ground water; in addition, its use has been modified by regulation in other counties of the state. Regulations have also been proposed to modify the agricultural use of bentazon. Areas found to be sensitive to ground water pollution by atrazine, bromacil, diuron, prometon, or simazine have been designated in regulation as pesticide management zones (PMZs). A PMZ is a geographic survey unit of approximately one square mile, referred to as a section. The agricultural use of a pesticide inside its PMZ is subject to certain ground water protection restrictions and requirements, or may be prohibited, depending on the pesticide.

PMZs were established by regulation in 1989 and 1990 in Contra Costa, Fresno, Glenn, Los Angeles, Merced, Orange, Riverside, and Tulare counties. In 1991, DPR proposed regulations to establish additional PMZs in Fresno, Glenn, Los Angeles, Orange, Riverside, Stanislaus, Tehama, and Tulare counties.

The following categories of detections are referred to SWRCB: detections of pesticides not currently registered for use (e.g., DBCP); detections of pesticides registered for other than agricultural or outdoor uses; and detections of pesticides determined <u>not</u> to be present in ground water as a result of legal agricultural, outdoor institutional, or outdoor industrial use. The SWRCB and nine Regional Water Quality Control Boards implement California's system of water quality control. The SWRCB also adopts regulations and policies to protect water quality.

This report presents the following information:

1. Number of wells sampled;
2. Number of wells, by county, in which pesticidal residues were detected;
3. Status of detected pesticides;
4. Factors contributing to pesticidal movement to ground water as a result of agricultural use;
5. Actions taken to prevent pesticides from entering ground water.

A glossary of terms used in the report is provided in Appendix B, p. 102.

MATERIALS AND METHODS

Data Collection:

Section 13152, subdivision (c) of the Act, requires all agencies which sample wells for pesticides to submit their sampling data and analytical results to DPR for inclusion in the well inventory data base. DPR has notified appropriate agencies of this law and requested them to submit required information on a DPR reporting form, on a form of their own, or on magnetic tape.

All sampling results reported to DPR were appraised to determine if they met the following criteria for inclusion in the well inventory data base:

1. Sampling results were for the analyses of pesticides or pesticidal breakdown products;
2. Samples were taken from a well;
3. Samples were obtained from an untreated and unfiltered system;
4. Location of each sampled well had to be identified by at least township/range/section according to the U.S. Geological Survey's Public Lands Survey Coordinate system;
5. Data must not have been entered into the data base previously.

Agencies supplied well sampling data as published reports, raw laboratory results, or retrievals of information on floppy disks or magnetic tape from other data bases. Published reports were examined to determine if the data met the above criteria. In the case of unpublished laboratory results, verbal confirmation was requested from appropriate agency staff and noted in file records. For evaluation purposes, print-outs were made of data received on floppy disks or magnetic tape.

The Act also requires that DPR, the SWRCB, and CDHS jointly agree on minimum well sampling requirements for all results submitted to DPR. The agencies agreed upon the following minimum reporting requirements, effective December 1, 1986, which are applicable only to well samples taken after that date:

1. State well number (township/range/section/tract/sequence number/ base and meridian);
2. County;
3. Date of sample (month/day/year);
4. Chemical analyzed for;
5. Individual sample concentration, in parts per billion;
6. Minimum detectable limit, in parts per billion;
7. Sampling agency;

8. Analyzing laboratory;
9. Street address of well location;
10. Well type;
11. Sample type (e.g., initial or confirmation).

Optional information to be included when available:

1. Method of analysis;
2. Well depth (in feet);
3. Depths of top and bottom perforations of the well casing (in feet);
4. Depth of standing water in the well at time of sampling (in feet);
5. Year the well was drilled;
6. Whether a driller's log was located;
7. Known or suspected source of contamination.

Data collection required a significant amount of interagency cooperation to ensure that submitted sampling data contained the required information.

Data Preparation:

The analytical results for each pesticide residue or related chemical in a well water sample constitute one record in the well inventory data base. The format used for records in the data base is explained in Appendix C (p. 113).

Unless they were received on computer tape, data that met the prescribed criteria were coded on forms by hand for keypunching. Codes used in the data base are given in Appendix D (p. 118). A number was assigned to each study under which all pertinent records and notes were filed. State well numbers were obtained from the Department of Water Resources (DWR) for DPR studies and noted on the original data sheets. Whenever pesticide residues in ground water were determined to be due to point or non-point source contamination, their analytical records were coded for designation in the data base.

Data Entry into the Permanent Data Base:

The completed coding forms were sent to the Franchise Tax Board for keypunching. After keypunching, the data were returned to DPR and loaded onto a computer. Print-outs of the data were generated, proofread against the original data, and edited as necessary. Data received on computer tape were converted to the well inventory data base format by computer program. An additional program was then run on the transformed data to assign to each record a code (called the sample-type) which designated whether the analysis was negative, confirmed positive, or unconfirmed positive.

Before being added to the permanent well inventory data base, each record was run through the verification programs developed by DPR staff. An explanation of each program follows.

1. Column verification:
   Certain values are allowed for each column in a data base record. The column verification program tests data validity by comparing the values entered in a column to its allowable values. For instance, the third column of the township field may contain either "N" or "S"; any other value will be rejected as an error.

2. Field verification includes the following programs:

a. Township/range/section (T/R/S) verification:
   The townships, ranges, and sections assigned to each county by the U.S. Geological Survey's Public Lands Survey Coordinate System were coded and entered into a computer file. A program was written to compare that file with the values entered for the township, range, and section in each record.

b. Base Meridian verification:
   Six counties in California (Kern, San Luis Obispo, Trinity, Inyo, Siskiyou, and San Bernardino) are intersected by the Public Lands Survey baseline/meridian boundaries. Data for a single well reported with different base meridians but under the same well number would exist as two unique wells in the data base. This program examines the township and range for each well number in the affected counties to verify that the assigned base meridian is accurate.

3. Unique Address verification:
   The well location address for each new record is checked against the existing well location entered for each unique well number in the data base. When a discrepancy is found, the new record is flagged as an error.

Data identified by the computer verification programs as requiring further investigation were examined and edits were made as necessary. The data was then entered into the permanent well inventory data base and summary tables were produced for the annual report.

RESULTS AND DISCUSSION

A total of 24,712 records were added to the well inventory data base for the 1991 summary year. Each record represents an analysis of a ground water sample for the presence of a pesticide or pesticidal breakdown product. The

samples were taken from 1,556 wells in 30 counties. Analyses were run for an overall total of 147 active ingredients and 18 breakdown products. A numerical summary of the records added to the data base annually, including cumulative totals, is presented in Table 1 (p. 161).

The 1991 summary year records are the result of 49 separate well sampling studies submitted to DPR between July 1, 1990 and September 1, 1991. A summary of each study is given in Appendix E (p. 130). A list of the agencies (including number of wells sampled by each) that have submitted data for the 1991 Update Report follows.

State: DPR (620 wells), CDHS (5), the State Department of Water Resources (94), and the North Coast (15) and Central Coast (7) Regional Water Quality Control boards;

County: The Glenn County Agricultural Commissioner's Office (1) and the Santa Clara County Health Department (718);

Private Industry: The Rhone-Poulenc Ag Company (99) and the American Environmental Consulting Firm (1).

All results reported by the above agencies that met DPR criteria and the minimum reporting requirements were added to the well inventory data base.

Every detection of a pesticide currently registered for agricultural use that is reported to DPR is investigated to determine if the compound is present in ground water as the result of non-point source agricultural use. As required by the Act, the detection of a pesticide in ground water must be verified (i.e., confirmed). Therefore, positive sampling results in the well inventory data base are designated as confirmed or unconfirmed detections. Because unconfirmed detections cannot be presented with the confidence of confirmed detections, they are presented separately and are <u>not</u> included in the totals in Table 1.

Positive sampling results submitted by agencies other than DPR are designated as <u>confirmed</u> if a specific compound was detected in two discrete samples taken from the same well during the time period of a single study. However, confirmed detections resulting from non-DPR studies are not subject to regulatory action by the Director without further investigation by DPR to determine if the detection can be verified according to the standards prescribed in the Act.

Section 13149(d) of the Act requires that detections of a pesticide in ground water shall result from an analytical method approved by the Department and shall be verified, within 30 days, by a second analytical method or a second analytical laboratory approved by the Department. Criteria have been set by DPR (Bierman, 1989; see Appendix F, p. 136) for determining whether the detection of a pesticide or its breakdown product in ground water meet the standards of the Act. Detections meeting the criteria are designated as confirmed and are subject to regulatory action by the Director.

An unconfirmed detection is the detection of a pesticide in a single sample, for a particular well, taken during the time period of an individual monitoring study. Confirmation of the initial detection in a second positive sample was not possible because (1) only a single sample was taken from the well or (2) analyses of all other samples taken from the well during the study were negative for the compound under investigation. Unconfirmed detections may represent valid detections of pesticide residues or they may have been due to sample contamination; therefore, they cannot be presented with the same confidence as confirmed detections which have subsequent positive, discrete samples validating the presence of a pesticide.

A negative analysis is a well water sample in which pesticide residues were not detected at or above the minimum detection limit (MDL) of the instruments used for analysis.

Results by County:

A total of 30 counties reported well sampling results for the 1991 update. The number of confirmed and negative analyses by total wells sampled in each county are given in Table 2 (p. 162). Santa Clara County, with 12,853 samples, reported the most analyses for a single county. The samples were taken during a two-year private well testing program carried out by the Santa Clara County Health Department.

The total number of analyses reported and the total number of pesticides analyzed for varied considerably among the respective counties. Santa Clara County analyzed for the most pesticides in a single county with an

overall total of 102 compounds. More than 50 pesticides were analyzed for in each of the following counties: Butte, Merced, Monterey, San Benito, Santa Clara, Santa Cruz, and Stanislaus. In contrast, only ten or fewer pesticides were analyzed for in 15 of the other counties reporting sampling results. This variation is attributable not only to differences in pesticide use among counties, but also to differences in the design of well sampling studies among various agencies. A tabular summary of the pesticides for which analyses were run, by county, appears in Appendix G (p. 140).

Confirmed detections of eight pesticides and three pesticide breakdown products were made in 16 of the 30 counties reporting sampling results. Detection versus frequency of analysis for each compound, by number of wells sampled per county, is given in Table 3 (p. 164). Compounds with confirmed detections were:

- 2,3,5,6-tetrachloroterephthalic acid (TPA, a breakdown product of the active ingredient chlorthal-dimethyl) - detected in seven counties;
- Atrazine - detected in five counties;
- Bromacil and diuron - each detected in four counties;
- Simazine and xylene - each detected in three counties;
- Aldicarb sulfone, aldicarb sulfoxide, ortho-dichlorobenzene, molinate, and prometon - each detected in a single county only.

Counties with confirmed detections were:

- Tulare County, with the confirmation of five distinct compounds, had the most pesticides detected in a single county;
- Fresno County followed with four;
- Los Angeles and Orange Counties each had three;
- Del Norte, Glenn, Placer, and Santa Clara Counties each had two;
- Kern, Lassen, Monterey, Sacramento, San Luis Obispo, Santa Barbara, Santa Cruz, and Stanislaus each had a single compound detected.

The number of pesticides detected and the total number of pesticides and breakdown products analyzed for, by county, is listed in Table 4 (p. 165). The number of counties with confirmed results and the number of counties in which wells were sampled, listed by each compound analyzed for, is presented in Table 5 (p. 166).

Tulare County had 82 wells positive for residues, which accounted for 56% of the total wells with confirmed detections. Fresno County had 12 wells, Del Norte County nine, Orange County eight, and Santa Clara County seven. Of the remaining ten counties, each had five or fewer confirmed wells.

Results by Pesticide or Breakdown Product:

A summary of the number of wells with confirmed pesticide residues, by county and pesticide, is given in Table 6 (p. 173). A summary of unconfirmed detections is given in Table 7 (p. 174). Figure 1 (p. 12), shows California townships with one or more pesticides detected and confirmed in well water. Of the 165 pesticides and breakdown products analyzed for, the detection of 11 separate compounds was confirmed in ground water: aldicarb sulfone and aldicarb sulfoxide (breakdown products of aldicarb), atrazine, bromacil, ortho-dichlorobenzene, diuron, molinate, prometon, simazine, TPA, and xylene. A list of each compound analyzed for, by number of wells with confirmed, negative, and total analyses, is given in Table 8 (p. 175).

Simazine, the most frequently detected pesticide, accounted for 31% of the confirmed analyses. Diuron accounted for 27% of the confirmed analyses. Together, the herbicides simazine, diuron and bromacil accounted for 75% of the total confirmed analyses. California counties reporting confirmed detections of pesticides for the 1991 summary year are shown in Figure 2 (p. 13). A discussion of the status and detection(s) of each compound having confirmed detections follows.

STATUS OF PESTICIDES WITH CONFIRMED DETECTIONS INCLUDED IN THE 1991 UPDATE TO THE DATA BASE:

Aldicarb sulfone, Aldicarb sulfoxide (Key 1 and 2, Figure 2, p. 13)

A total of 164 wells in eight counties were sampled for aldicarb sulfone and aldicarb sulfoxide, breakdown products of aldicarb. The two compounds were detected in Del Norte County where 12 wells were sampled. Residues of both aldicarb sulfone and aldicarb sulfoxide were confirmed in seven wells; aldicarb sulfoxide, only, was confirmed in two other wells. One of the wells having a confirmed detection of aldicarb sulfoxide, also had an

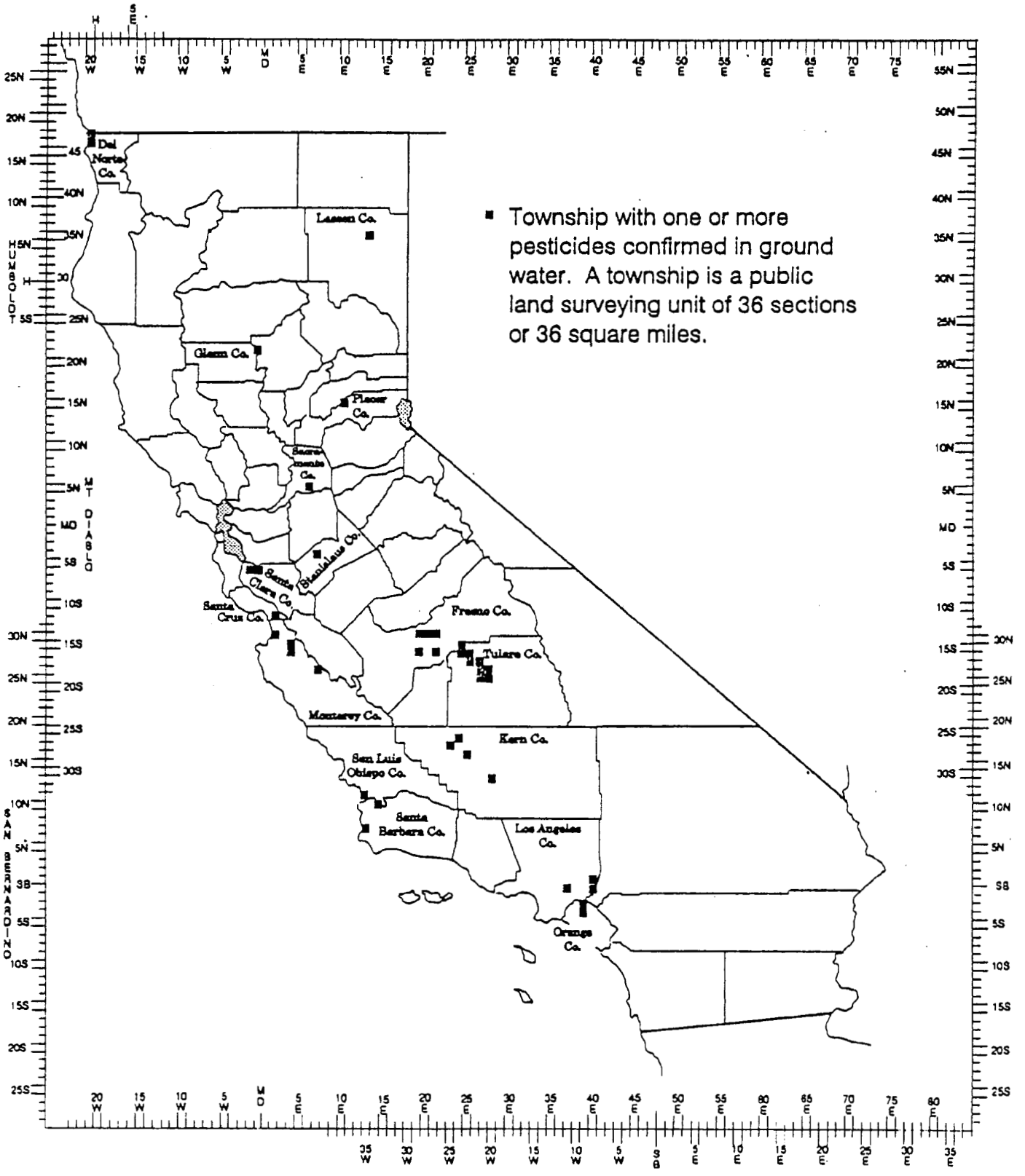


Figure 1. California townships with one or more pesticides detected and confirmed in well water. Results are from sampling reported between July 1990 and September 1991.

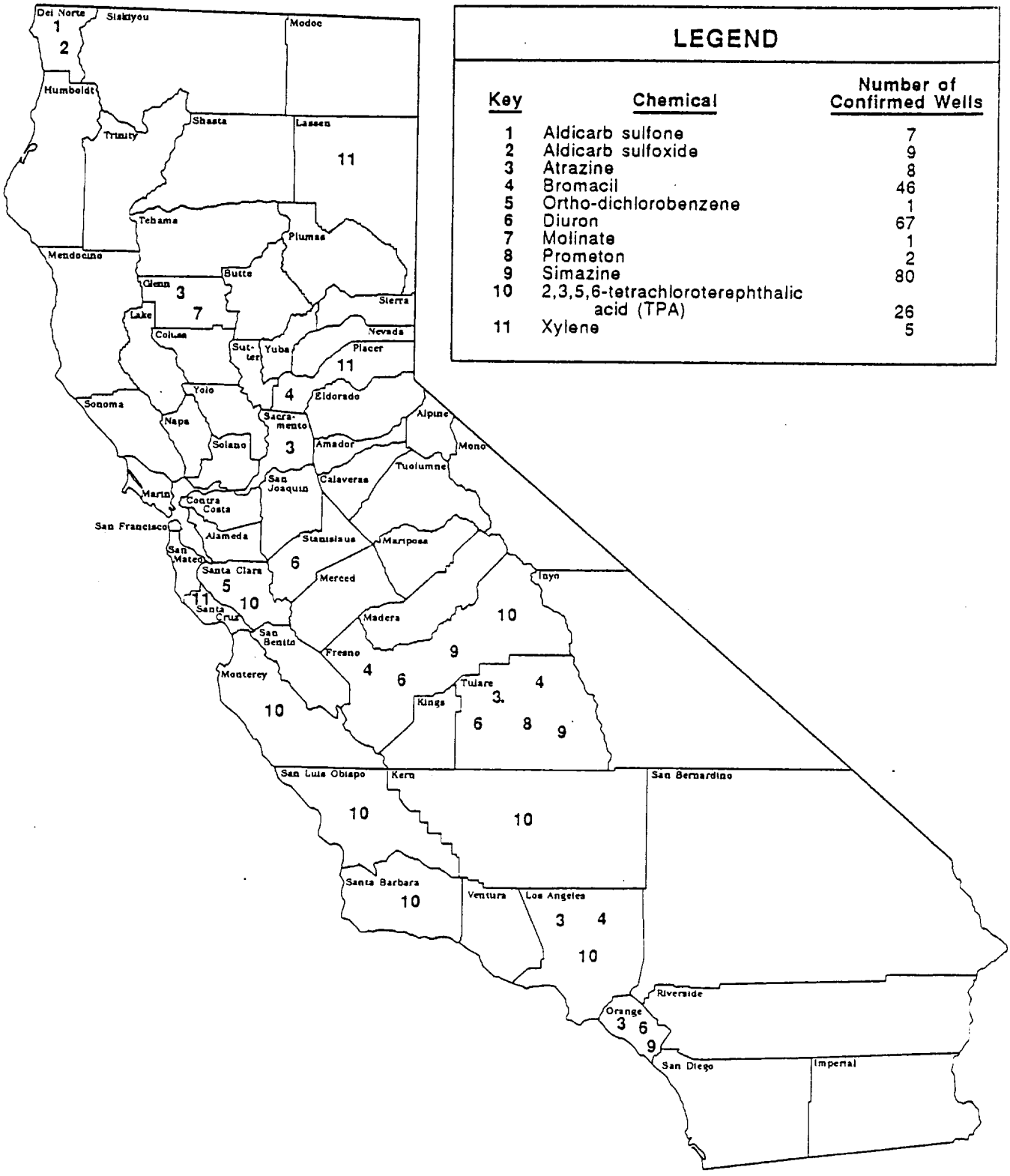


Figure 2. California counties having confirmed detections of pesticides in well water. Results are from sampling reported between July 1990 and September 1991.

unconfirmed detection of aldicarb sulfone. Concentrations of sulfone residues ranged from 0.10 to 0.48 ppb; sulfoxide residues ranged from 0.20 to 0.98 ppb. CDHS has established an action level (AL) of 10 ppb for aldicarb and USEPA has set lifetime health advisory levels (HALs) of 40 ppb for aldicarb sulfone and 10 ppb for aldicarb sulfoxide.
The parent compound, aldicarb, is a systemic acaricide, insecticide, and nematicide used primarily in California to control insects and mites in cotton, sugar beets, dry beans, and ornamental plants. Prior to 1983, aldicarb was also used to control nematodes in lily bulb production fields in Del Norte County. After it was detected in ground water, however, the use of aldicarb was suspended in Del Norte County and the label changed to prohibit its use in Del Norte and Humboldt Counties.

The positive wells were sampled by the California Regional Water Quality Control Board, North Coast Region (NCRWQCB). The NCRWQCB has been conducting an ongoing ground water quality study in the Smith River Plains area of Del Norte County where aldicarb had been used on lily bulbs. Because it is no longer registered for use in Del Norte County, the detections have been referred to the SWRCB.

Aldicarb was reviewed through the PDRP and regulations were adopted in July of 1990 which reduce the maximum rate of aldicarb which may be legally applied to certain agricultural and ornamental crops. The regulations also prohibit the application of aldicarb from September 1 to March 1 of each year, during the time when rain is most likely, to further reduce the likelihood of aldicarb reaching ground water.

Atrazine (Key 3, Figure 2)

Atrazine was detected in 15 wells, and confirmed in eight wells in five counties, out of 526 wells sampled in 25 counties. The detections were made as a result of sampling conducted by DPR. The counties with confirmed detections were Glenn (1 well), Los Angeles (2 wells), Orange (1 wells), Sacramento (1 well), and Tulare (3 wells). Concentrations of detected residues ranged from 0.1 to 0.19 ppb. CDHS has set a maximum contaminant level (MCL) of 3 ppb for atrazine.

Atrazine is a selective herbicide used in California primarily for weed control in corn, sorghum, and other crops. It is also used for nonselective weed control on rights-of-way and in noncropped areas. Atrazine has been previously reviewed through the PDRP. Regulations were adopted prohibiting agricultural, outdoor institutional, and outdoor industrial uses of pesticides containing atrazine within atrazine PMZs.

One of the two confirmed wells in Los Angeles County is located in a section already an atrazine PMZ, negating a need for further regulatory action. The Glenn County well is located in a section that is a proposed atrazine PMZ. The remaining wells in Los Angeles, Orange, Sacramento, and Tulare counties with confirmed detections are still under investigation by DPR. This is the first reported detection of atrazine in Sacramento County. The investigation phase of the PDRP is explained on page 3.

Bromacil (Key 4, Figure 2)

Bromacil was detected in 53 wells, and confirmed in 46 wells in four counties, out of 476 wells sampled in 23 counties. The counties with confirmed bromacil detections were: Fresno (2 wells), Los Angeles (1), Placer (1), and Tulare (42). The detections had concentrations ranging from 0.1 to 15.2 ppb. CDHS has not set an MCL or AL for bromacil; however, USEPA has established a lifetime HAL of 90 ppb for bromacil.

Bromacil is an herbicide used primarily in California for weed control in citrus orchards and on rights-of-way. Bromacil has been reviewed through the PDRP. As a result, DPR adopted regulations which prohibit the agricultural, outdoor institutional, or outdoor industrial uses of bromacil in non-crop areas and on rights-of-way within bromacil PMZs.

All of the detections were made as a result of sampling conducted by DPR. Three of the wells in Tulare County are located in sections that were previously established or recommended as PMZs for bromacil. One section in Fresno County and 37 sections in Tulare County containing wells with confirmed detections of bromacil are adjacent to sections previously established or recommended as PMZs for bromacil and have, therefore, also been recommended as bromacil PMZs. Two wells in Fresno County, the wells

in Los Angeles and Placer Counties, and three wells in Tulare County having confirmed bromacil detections are still under investigation by DPR. This is the first reported detection of bromacil in Placer County.

Ortho-dichlorobenzene (1,2-dichlorobenzene) (Key 5, Figure 2)

Analyses for ortho-dichlorobenzene were run on samples taken from 815 wells in nine counties. Ortho-dichlorobenzene was detected and confirmed at levels of 1.65 and 7.2 ppb in a Santa Clara County well. Ortho-dichlorobenzene is an herbicide, insecticide, solvent, and soil fumigant not currently registered for agricultural use in California. CDHS has established an AL of 130 ppb for the sum of 1,2- and 1,3-dichlorobenzenes. USEPA has set a lifetime HAL, as well as an MCL goal, of 600 ppb for 1,2-dichlorobenzene.

Because ortho-dichlorobenzene is not registered for use in California, it is exempt from the PDRP and the detection has been referred to the SWRCB.

Diuron (Key 6, Figure 2)

Diuron was detected in 79 wells and confirmed in 67 wells in four counties, out of 540 wells sampled in 24 counties. All detections were the result of sampling conducted by DPR. The counties with confirmed detections of diuron are: Fresno (4 wells), Orange (1), Stanislaus (1), and Tulare (61). Residue concentrations ranged from 0.1 to 3.0 ppb. CDHS has not established an MCL or AL for diuron; however, USEPA has established a lifetime HAL of 10 ppb for diuron.

In California, the herbicide diuron is used chiefly for weed control on rights-of-way, in citrus orchards, and for the production of alfalfa crops. Diuron has been reviewed through the PDRP, resulting in regulations that prohibit the agricultural, outdoor institutional, or outdoor industrial uses of diuron in non-crop areas or on rights-of-way within diuron PMZs.

Five of the Tulare County wells are located in sections that are already PMZs for diuron. Three wells in Fresno County and 54 wells in Tulare

County are located in sections adjacent to proposed diuron PMZs. These sections have also been recommended as diuron PMZs. The Orange County and Stanislaus County wells, one well in Fresno County, and two wells in Tulare County, all with confirmed detections of diuron, are still under investigation by DPR.

Molinate (Key 7, Figure 2)

Samples were analyzed from 13 wells in four counties for the presence of molinate. Molinate was detected and confirmed in one well in Glenn County. The concentrations of the confirmed detections were 0.63 and 4.09 ppb. CDHS has established an MCL of 20 ppb for molinate. Molinate is a selective herbicide used to control watergrass in rice.

At the request of the well owner, who had noticed an odor of molinate in water drawn from the well when rice herbicides were used in nearby areas, a sample was taken by the Glenn County Agricultural Commissioner's staff, analyzed, and found to contain molinate at 10 ppb. In response to this single, unconfirmed detection, DPR sampled the original positive well and four nearby wells. Only the original well contained residues of molinate. The original well did not appear to be sealed and the owner stated that the well casing had been open until recently when a cover was added to prevent contamination.

The detection was determined to not be the result of non-point source agricultural use and molinate was removed from the PDRP. The detection has been referred to the SWRCB.

Prometon (Key 8, Figure 2)

Prometon was confirmed in two wells in Tulare County, out of 528 wells sampled in 24 counties. The detections resulted from sampling conducted by DPR. The range of detected residues was 0.11 to 0.32 ppb. CDHS has not set an MCL or AL for prometon, but a lifetime HAL of 100 ppb has been set by USEPA.

Prometon is a nonselective herbicide used in California for weed control primarily in noncrop areas and on rights-of-way. Prometon has been reviewed through the PDRP, resulting in regulations which prohibit the agricultural, outdoor institutional, and outdoor industrial use of pesticides containing prometon within prometon PMZs.

The prometon residues in one of the wells were determined to be the result of non-point source agricultural use and the section containing the positive well was recommended as a PMZ for prometon. The other well containing prometon residues is still under investigation.

Simazine (Key 9, Figure 2)

Simazine was detected in 95 wells in six counties, and confirmed in 80 wells in three counties, out of 519 wells sampled in 25 counties. Except for a detection in Butte County reported by the DWR, all of the detections were a result of sampling conducted by DPR. The counties having confirmed detections were: Fresno (8 wells), Orange (8), and Tulare (64). Concentrations of detections ranged from 0.1 to 2.4 ppb. CDHS has established an MCL of 10 ppb for simazine; USEPA has established a lifetime HAL of 1 ppb for simazine.

Simazine is a selective herbicide used in California to control weeds primarily in vineyards and citrus orchards. Simazine has been previously reviewed through the PDRP, resulting in regulations that prohibit the agricultural, outdoor industrial, or outdoor institutional use of pesticides containing simazine in non-crop areas or on rights-of-way within simazine PMZs.

Four wells in Tulare County, seven wells in Orange County, and three wells in Fresno County were located in sections that have been previously recommended as simazine PMZs. Sixty wells in Tulare County and three wells in Fresno County are located in sections adjacent to PMZs for simazine. These sections have also been recommended as simazine PMZs. The remaining detections (one well in Orange County and two wells in Fresno County) are still under investigation by DPR.

TPA (2,3,5,6-tetrachloroterephthalic acid) (Key 10, Figure 2)

A total of 75 wells in eight counties were sampled for TPA and MTP (monomethyl 2,3,5,6-tetrachloroterephthalate acid), metabolites of the active ingredient chlorthal-dimethyl. Confirmed detections of TPA were made in 26 wells in seven counties. The detections ranged from 0.1 to 15.0 ppb. CDHS has not yet established an MCL or AL for chlorthal-dimethyl or its metabolites in drinking water; however, USEPA has established a lifetime HAL of 4,000 ppb in drinking water for chlorthal-dimethyl and its metabolites.

Chlorthal-dimethyl (also called Dacthal® and DCPA) is a selective, pre-emergent herbicide used in California primarily for weed control in the production of broccoli, onion, cauliflower, and garlic.

In 1989, during its National Pesticide Survey, USEPA detected chlorthal-dimethyl metabolites in two municipal wells: one in Los Angeles County and one in Santa Clara County. Prior to these detections, chlorthal-dimethyl had not been found in California ground water except for its occurrence in three monitoring wells[1] in Monterey County suspected of point source contamination. At that time, five additional wells in the vicinity of the monitoring wells were sampled, but no chlorthal-dimethyl was detected.

In response to the detections made during the National Pesticide Survey, DPR sampled seven wells in Los Angeles County and eight wells in Santa Clara County. Six wells in Santa Clara County and two wells in Los Angeles County had confirmed detections of TPA. DPR then conducted a larger ground water survey for chlorthal-dimethyl and its metabolites in areas of the state where chlorthal-dimethyl is applied to crops. Sixty wells were sampled in seven counties: Fresno, Kern, Los Angeles, Monterey, San Luis Obispo, Santa Barbara, and Tulare. Two wells in Fresno County, five wells

[1] The 1988 Update Well Inventory Report (Cardozo, et.al, 1988) stated in error that chlorthal-dimethyl had been detected in two monitoring wells in Monterey County; it was actually detected and confirmed in three monitoring wells in Monterey County during sampling conducted in 1987 by the Central Coast Regional Water Quality Control Board.

in Kern County, five wells in Monterey County, one well in San Luis Obispo County, and four wells in Santa Barbara County had confirmed detections of TPA. The detections remain under investigation by DPR.

Xylene (Key 11, Figure 2)

Xylene was detected in eight wells, and confirmed in five wells in three counties, out of 827 wells sampled in 12 counties. The counties having confirmed detections were: Santa Cruz (3 wells), Lassen (1), and Placer (1). Concentrations of the residues ranged from 2.2 to 1,100 ppb. CDHS has established a MCL of 1,750 ppb for xylene.

Xylene is registered for use as an active ingredient in agricultural pesticides. Xylene is also used as a solvent in the formulation of certain pesticides and is a manufacturing intermediate for various organic products, including gasoline.

Xylene was detected and confirmed by the Central Coast Region of the Regional Water Quality Control Board in three monitoring wells located at a pesticide application business in Santa Cruz County. In response to the detections, DPR sampled five nearby water wells. (Because monitoring wells are installed for the purpose of measuring certain properties of ground water and are not constructed to the standards required of wells used for drinking water purposes, monitoring wells are not sampled by DPR during investigation of pesticide detections.) Xylene was detected by one laboratory in samples taken from two of the wells at a concentration of 0.3 ppb at an MDL of 0.2 ppb. However, confirmation samples, analyzed by a second laboratory at a MDL of 0.5 ppb, were negative. Additional samples from the positive wells were then analyzed by a second laboratory, using a second analytical method, at a MDL of 0.2 ppb. Xylene was not detected in those samples either. Because the presence of xylene was not confirmed, it was removed from the PDRP.

As a result of sampling for AB 1803, CDHS confirmed the detection of xylene in a small public water system well in Lassen County. In response to the detection, DPR sampled the original positive well and a nearby well; no other wells were found in the area that could be sampled. Xylene was

detected in samples taken from the original well, but was not detected in samples taken from the second well. The analyzing laboratory also reported that other components of gasoline were present in the analyses of the samples taken from the original positive well. From the evidence, it was determined that the xylene residues were not the result of non-point source agricultural use and xylene was removed from the PDRP. The detection has been referred to the SWRCB.

Xylene was also detected and confirmed in a small public water system well in Placer County as a result of sampling for AB 1803 by CDHS. In response to the detection, DPR sampled the original positive well and five others in the same section. Xylene was again detected in the original well, but not in any of the other wells. Other compounds present in the positive samples indicated the presence of gasoline. Accordingly, a determination was made that the xylene residues were not the result of non-point source agricultural use. Xylene was removed from the PDRP and the detections have been referred to the SWRCB.

UNCONFIRMED DETECTIONS

An unconfirmed detection is the detection of a pesticide in a single sample, for a particular well, taken during the time period of an individual monitoring study. Confirmation of the initial detection in a second positive sample was not possible because either (1) only a single sample was taken from the well or (2) analyses of all other samples taken from the well during the study were negative for the compound under investigation. Unconfirmed detections may represent valid detections of pesticide residues or they may have been due to sample contamination; therefore, they cannot be presented with the same confidence as confirmed detections which have subsequent positive, discrete samples validating the presence of a pesticide. Nevertheless, every detection, whether confirmed or unconfirmed, of a pesticide currently registered for agricultural use that is reported to DPR is investigated by follow-up sampling for the detected compound in the area of the initial detection.

Eight of the 17 pesticides or breakdown products with unconfirmed detections also had confirmed detections: aldicarb sulfone, atrazine,

bromacil, diuron, molinate, simazine, TPA, and xylene. Further information on the status of those compounds can be found in the discussion of confirmed detections on pages 11 to 21. A discussion of the unconfirmed detections follows.

Aldicarb sulfone (See also page 11)

An unconfirmed detection of aldicarb sulfone in a Del Norte County well was reported by the NCRWQCB. The well also had a confirmed detection of aldicarb sulfoxide. Both aldicarb sulfone and aldicarb sulfoxide are breakdown products of the active ingredient, aldicarb. The concentration of the unconfirmed detection was 0.13 ppb. USEPA has set a HAL of 40 ppb for aldicarb sulfone. Because aldicarb is no longer registered for use in Del Norte County, the detection was referred to the SWRCB.

Atrazine (See also page 14)

Two wells in Orange County and five wells in Tulare County were reported with unconfirmed detections of atrazine. Although additional samples from each well were analyzed, atrazine was not detected in any confirmation samples.

Bromacil (See also page 15)

Unconfirmed detections of bromacil were reported in two Fresno County wells and five Tulare County wells. Additional samples were taken from the wells and analyzed for the presence of bromacil. However, no bromacil residues were detected.

Carbon disulfide

An unconfirmed detection of carbon disulfide was made in a small public water system well in Santa Barbara County during follow-up sampling conducted by DPR. The detection, at 0.80 ppb, could not be confirmed. CDHS has not set an MCL or AL, nor has USEPA set a lifetime HAL, for carbon disulfide.

Carbon disulfide is the primary breakdown product of the nematicide and fungicide, sodium tetrathiocarbonate, which is currently registered in California for experimental use only. Until 1987, carbon disulfide was also registered as an active ingredient for use as a fumigant.

As reported in the 1990 Update Well Inventory Report, carbon disulfide was initially detected in two small public water system wells in Santa Barbara County by CDHS as a result of monitoring required by AB 1803. In response to the detections, DPR sampled the two original positive wells, as well as two other wells located in the same section. Although other wells were located in the area, permission to sample could not be obtained from owners. Carbon disulfide was detected by one laboratory in a sample from one of the original positive wells at a concentration of 0.80 ppb (at an MDL of 0.50 ppb), but was not detected in samples from any other well. When the same laboratory analyzed another sample from each well using a different analytical method, no carbon disulfide was detected at a MDL of 1.0 ppb. Further, the positive detection was not confirmed by a second laboratory at an MDL of 0.5 ppb.

Because the detections could not be confirmed, carbon disulfide was removed from the PDRP.

Chlorthal-dimethyl and its breakdown products, MTP and TPA

(See also page 19)

Unconfirmed detections of TPA were made in 35 wells in eight counties. Concentrations of the detections ranged from 0.1 to 0.86 ppb. One well in Monterey County with an unconfirmed detection of TPA also had unconfirmed detections of chlorthal-dimethyl (at 0.60 and 0.68 ppb) and MTP (at 2.41 and 2.55 ppb).

Although additional samples from each of the wells were analyzed for the presence of chlorthal-dimethyl, MTP, and TPA, the detections were not able to be confirmed and have been removed from the review process.

2,4-dichlorophenoxyacetic acid (2,4-D)

The herbicide 2,4-D was detected in one well in Butte County at 0.38 ppb and one well in Colusa County at 3.60 ppb, out of 115 wells sampled in eight counties. Neither of the detections could be confirmed. CDHS has set an MCL of 100 ppb for 2,4-D.

Several types of 2,4-D are available: free acid, salts (primarily amine salts), and esters. The dimethylamine salt of 2,4-D is most commonly used. The chemical analysis of a ground water sample for 2,4-D may or may not show the type of 2,4-D detected; however, for the purposes of the Act, identification of the active ingredient is sufficient. The active ingredient 2,4-D is used in California primarily to control broadleaf weeds in wheat, rangeland pasture, landscapes, and noncrop areas.

The detection in Butte County was made as a result of sampling conducted by the Northern District of the DWR for a ground water quality study. In response to the detection, DPR sampled the original well and five nearby wells. Two samples from each well were analyzed (each sample for each well was analyzed by a different laboratory); 2,4-D was not detected in any of the samples. Because the initial detection was unable to be confirmed, 2,4-D was removed from the PDRP.

The Colusa County detection was reported by the Central Valley Regional Water Quality Control Board. The well, located at an aerial pesticide application facility, was sampled as part of a site assessment in preparation for the installation of a new aircraft wash system. In response to the detection, the original well and three other nearby wells were sampled by DPR. Because 2,4-D was not detected in any of the confirmation samples, it was removed from the PDRP.

1,3-dichloropropene (1,3-D)

Residues of 1,3-D were detected in three wells in Santa Clara County, out of 784 wells sampled in ten counties. The unconfirmed detections ranged from 0.84 to 1.70 ppb. CDHS has set an MCL of 0.5 ppb and USEPA has set a ten-day HAL of 30 ppb for 1,3-D in ground water.

The compound 1,3-D is a nematicide and soil fumigant which has historically been used in California for the production of cotton, broccoli, tomatoes, and carrots. All permits for 1,3-D use were suspended in April 1990 because levels were detected in ambient air that were of public health concern.

During its follow-up investigation, DPR sampled the original positive wells and nine other nearby wells. Two samples (each analyzed at a different laboratory) were evaluated from each well. The compound 1,3-D was not detected in any samples. Therefore, 1,3-D was removed from the PDRP.

Dichlorprop

Out of 65 wells sampled in three counties, one well in Butte County contained residues of dichlorprop. The detection, at 6.8 ppb, could not be confirmed. The well containing the dichlorprop residues also had an unconfirmed detection of 2,4-D. No MCLs, ALs, or HALs have been set for dichlorprop by CDHS or USEPA.

Dichlorprop has been used in California primarily for weed control in landscapes and on timberland.

Because all agricultural registrations for dichlorprop became inactive in 1990, it is exempt from the PDRP and the detection has been referred to the SWRCB.

Diuron (See also page 16)

Two wells in Fresno County and ten wells in Tulare County had unconfirmed detections of diuron. Concentrations of the detections ranged from 0.10 to 0.65 ppb.

Because only a single sample was analyzed for diuron from each of the Fresno County wells, the detections are still under investigation by DPR. Two Tulare County wells are located in sections that were previously recommended as diuron PMZs. Although additional samples were analyzed from each of the remaining Tulare County wells, no diuron residues were detected in the confirmation samples.

Endothall

Endothall was detected, but not confirmed, in one Butte County well out of 103 wells sampled in two counties. The concentration of the detected residues was 160.0 ppb. USEPA has set a lifetime HAL and a MCL goal of 100 ppb for endothall.

Endothall is registered for a variety of uses: preemergent and postemergent herbicide, defoliant, desiccant, aquatic algicide, and growth regulator. Endothall is used in California primarily for the production of sugarbeets, potatoes, and cotton, and for landscape maintenance.

Because the property owner refused permission to resample the original well, DPR sampled six nearby wells in the original and adjacent sections. Two samples (each analyzed at a different laboratory) were evaluated from each well. Endothall was not detected in any samples by either laboratory. Therefore, endothall was removed from the PDRP.

Methyl bromide

Methyl bromide was detected, but not confirmed, in a well in Tuolumne County, out of 768 wells sampled in six counties. The concentration of the detection was 1.0 ppb. CDHS has not set an MCL or AL for methyl bromide; however, USEPA has set a lifetime HAL of 10 ppb for methyl bromide.

Methyl bromide is a soil fumigant used in California primarily in orchards and vineyards and for the production of strawberries and nursery stock.

Methyl bromide was detected in a small public water system well during sampling conducted by DHS for AB 1803. In response to the detection, DPR sampled the original positive well and four nearby wells. Two samples (each analyzed by a different laboratory) were taken from each well. Methyl bromide, at a concentration of 1.0 ppb, was detected by one laboratory in a sample from the original positive well. However, the second laboratory was not able to confirm the detection at a MDL of 0.5 ppb. None of the samples from the other wells contained detectable levels

of methyl bromide at MDLs of 1.0 and 0.5 ppb. The original positive well and another nearby well were then resampled. No methyl bromide was detected in either well at a MDL of 0.5 ppb.

Therefore, the single positive well sample was determined to be an unconfirmed detection and methyl bromide was removed from the PDRP.

Molinate

See discussion on page 17.

MTP

See discussion under TPA, page 19.

1,2-D (1,2-dichloropropane, Propylene dichloride)

The nematicide 1,2-D was detected, but not confirmed, in four monitoring wells in Santa Cruz County and eight wells in Del Norte County. The detections were reported by Regional Water Quality Control Boards who are overseeing remediation of the detection sites. In all, samples taken from 771 wells in seven counties were analyzed for the presence of 1,2-D. Concentrations of the unconfirmed detections ranged from 1.8 to 12.0 ppb. CDHS has set an MCL of 5 ppb for 1,2-D.

The active ingredient 1,2-D was formerly used as a soil fumigant to control nematodes in a wide variety of crops. Use of 1,2-D was cancelled in California, effective July 1, 1985, and regulations were adopted to prohibit the registration, sale, or use of any pesticide in which 1,2-D exceeds 0.5% of the total formulation.

Because the detections resulted from historical use of 1,2-D, it is exempt from the PDRP.

Simazine (See also page 18)

Unconfirmed detections of simazine were reported in eleven wells in Tulare County and a single well in each of the following counties: Butte, Fresno, Los Angeles, and Monterey. Concentrations of detections ranged from 0.10 to 1.5 ppb.

The Butte, Fresno, and Monterey County wells are still under investigation by DPR, as are two wells in Tulare County. Additional samples taken from each of the remaining wells in Tulare County and the Los Angeles County well did not contain simazine residues.

TPA

See discussion on page 19.

Xylene

See discussion on page 20.

LIMITATIONS ON INTERPRETING THE DATA

Interpretation of sampling results in the well inventory data base are subject to the following limitations:

1. Only data submitted to DPR between July 1, 1990 and September 1, 1991 are included and discussed in this report.

2. The data included in this report are not the results of a single study. Rather, they are the results of 49 studies, designed and conducted by nine agencies for varying purposes.

3. Pesticide residue detections in the well inventory do not represent a complete survey of ground water contamination in the state. The pesticides detected are limited to those for which the sample was specifically analyzed. Therefore, the data indicate which pesticides are present in California well water among those pesticides for which analyses were carried out, but not among all pesticides used statewide.

4. Sampling by agencies other than DPR is not necessarily related to suspected agricultural non-point sources of contamination. Consequently, it should not be assumed that the submitted results are an indication of which pesticides are more or less likely to leach to ground water as a result of non-point source agricultural use.

Despite these limitations, the information on pesticide residues contained in the well inventory data base can be used in all of the following applications:

1. Displaying the geographic distribution of well sampling;

2. Displaying the known geographic distribution of pesticide residues in wells among those wells sampled;

3. Identifying areas potentially sensitive to pesticide leaching;

4. Designing studies for future sampling.

SUMMARY AND CONCLUSIONS

The detection of 20 pesticides and related compounds in California well waters has been reported to DPR between July 1, 1990 and September 1, 1991. The presence of 11 of the compounds in ground water was confirmed. DPR has determined that residues from eight of the chemicals having confirmed detections originated from agricultural non-point sources: aldicarb sulfone, aldicarb sulfoxide, atrazine, bromacil, diuron, prometon, simazine, and TPA. Many of the sections where atrazine, bromacil, diuron, prometon, and simazine were detected will be declared PMZs and regulated accordingly. The use of the parent compound, aldicarb, is no longer allowed in Del Norte County where its breakdown products, aldicarb sulfone and aldicarb sulfoxide, were detected. TPA, a breakdown product of chlorthal-dimethyl, is still under review.

Regulation of pesticides to prevent residues from entering ground water as a result of agricultural use depends on scientific knowledge of how pesticides move to ground water. Factors that contribute to ground water contamination by pesticides used in agriculture include amounts used and method of application, irrigation practices, the physicochemical characteristics of the pesticide, soil type, and climate. The role each factor plays in the contamination process is not fully understood. DPR environmental scientists are continuing their work to understand these factors by conducting field studies on pesticide movement; investigating contaminated wells; compiling extensive data bases; and reviewing the work of other scientists. The knowledge gained from these activities will be used to develop recommendations for pesticide use practices that will prevent ground water contamination by the agricultural use of pesticides.

II. FACTORS CONTRIBUTING TO PESTICIDAL MOVEMENT TO GROUND WATER AS A RESULT OF AGRICULTURAL USE

II. FACTORS CONTRIBUTING TO PESTICIDAL MOVEMENT TO GROUND WATER AS A RESULT OF AGRICULTURAL USE

Ground water is defined in regulation as "water beneath the surface of the ground, whether or not flowing through known and definite channels" (Water Code, section 1005.1). Ralph C. Heath of the United States Geological Survey (USGS) describes ground water in USGS paper #2220 as follows. "All water beneath the land surface is referred to as underground water. The equivalent term for water on the land surface is surface water. Underground water occurs in two different zones. One zone, which occurs immediately below the land surface in most areas, contains both water and air and is referred to as the unsaturated zone. The unsaturated zone is almost invariably underlain by a zone in which all interconnected openings are full of water. This zone is referred to as the saturated zone. Water in the saturated zone is the only underground water that is available to supply wells and springs and is the only water to which the name ground water is correctly applied. Recharge of the saturated zone occurs by percolation of water from the land surface through the unsaturated zone."

Agricultural pesticides are used on the land surface or in the uppermost region of the unsaturated zone. Effective regulation of the use of pesticides to prevent contamination of California ground water requires (a) an understanding of the processes by which contamination occurs and (b) reliable methods for preventing or mitigating contamination.

BACKGROUND ON SOURCES OF AGRICULTURAL PESTICIDES DETECTED IN GROUND WATER

Ground water contamination can result from either a point or non-point source. Contamination from a point source, such as a spill or at a waste site, is initially deposited and concentrated in a small, well-defined area. Residues leach from upper to lower soil layers, encountering and joining the flow of ground water at that point. The contamination can be traced to its point of origin by locating a specifically-shaped pattern of residues in the ground water called a plume. In contrast, contamination from a non-point source, such as applications of agricultural chemicals to crops, cannot be traced to a single, definable location. Instead, the

contaminants are dispersed over a large, poorly-defined area. When a non-point source results in contamination, locating a distinct residue plume is not possible and contaminant movement is very difficult to predict or trace to its source.

Pesticidal residues in ground water can result from non-agricultural or agricultural activities. Pollution from non-agricultural activity, such as industrial use, is usually attributed to a point source, such as leaks at manufacturing, storage, or waste sites. Industrial point sources have been the subject of considerable scientific research; state and federal agencies have developed techniques to identify contamination sites and to designate mitigation methods (CDHS, 1985; California Assembly Resources Subcommittee on Status and Trends, 1983). Because the land mass affected by point source contamination is usually small, clean-up can be accomplished by removal and treatment of soil or by containment and treatment of the plume of contaminated ground water (Hunt, et al., 1986). In addition, future contamination may be prevented by proper design and placement of storage or waste sites.

Point sources of pesticidal residues in ground water due to agricultural activities include pesticidal storage or disposal sites and applicator wash-down sites. Most of the detections of pesticidal residues in wells cited in the reports Water Quality and Pesticides: a California Risk Assessment Program (Cohen and Bowes, 1984) and The Leaching Fields (Price, et al., 1985) were associated with point sources.

Non-point sources of pesticide residues in ground water due to agricultural use include leaching and direct streaming. **Leaching,** the process by which residues are dissolved in soil water and follow the movement of water through the soil matrix as it recharges a ground water aquifer. This process has been the focus of much research. However, in Tulare County, where a large number of wells have been found to contain residues of simazine, bromacil, and diuron, pesticidal movement to ground water has been suggested to occur as the result of dissolution of residue in water which is then drained from a field into a dry well (Roux et al., 1991). A dry well is a small-diameter hole or pit dug into the ground for the disposal of surface water by infiltration into soil. One use of a dry well for agricultural purposes is to serve as an avenue of disposal of

irrigation tailwater. When used in that way, a dry well could be a conduit for fast movement of pesticidal residues from surface to subsurface soil and, ultimately, to ground water. Thus, the phrase **direct streaming**, the movement of pesticidal residues to ground water through direct routes such as dry wells or macropores, is used here to distinguish it, and other pathways of ground water contamination due to non-point source applications, from the normal leaching process.

FACTORS CONTRIBUTING TO THE MOVEMENT OF PESTICIDES TO GROUND WATER

The Act requires the Department to include in the annual report a discussion of the factors that contribute to the movement of pesticides to ground water. These factors include volume of use, method of application, irrigation practices, physicochemical characteristics of pesticides, soil type, and climate. A discussion of studies conducted by the EHAP on some of these factors follows, with emphasis on the leaching and direct streaming processes. The distinction between leaching and direct streaming is important because development of farm management practices to mitigate ground water contamination depends on the pathway by which pesticidal residues enter ground water.

METHOD OF APPLICATION

Leaching:

Pesticides found in ground water that originate from non-point sources are almost exclusively active ingredients that are applied to the soil. Pesticides that are applied to foliage, such as protective foliar fungicides and many insecticides, may not be important leachers for two reasons: (1) exposure to sun enhances the rate of degradation and (2) concentrations that eventually reach the soil are low enough to allow for rapid degradation before leaching.

Also, there are no known differences in the leaching potential of different pesticide formulations, such as wettable powders, granulars, or emulsifiable concentrates. There has been some research on the use of

slow-release formulations as a method to prevent pesticidal movement through the soil. However, the results to date are still preliminary.

Direct Streaming:

Dissolution of pesticidal residues into runoff water can occur if the method used to apply a pesticide is incomplete. Although many pre-plant herbicides are applied to the soil surface, their actual site of action is the first few inches of soil where weed seeds germinate. In order to complete the application, most of these types of herbicides contain label statements recommending in the absence of sufficient rainfall following application, to water-in the compound by applying a small amount of water by sprinkler irrigation to the treated area in order to move the pesticide from the surface into the soil matrix. If a large rainfall event or heavy irrigation occurs in lieu of a light sprinkler irrigation, there is a greater risk that residues could be physically moved offsite with runoff water.

A recent EHAP study was conducted to measure the concentration of herbicides in water sampled near dry well drainage structures (Braun and Hawkins, 1991). Excess water at the edge of fields occurred as a result of either winter rainfall or runoff from irrigation. Concentrations of herbicides in rain runoff ranged from 2.4 to 1,130 ppb for simazine, 3.1 to 890.5 ppb for diuron, and from non-detectable to 47.2 ppb for bromacil. Concentrations in water collected after irrigation events ranged from non-detectable to 25.2 ppb for simazine, non-detectable to 19.1 ppb for diuron, and from non-detectable to 4.7 ppb for bromacil. The presence of herbicide residue in these samples indicated that further study is needed to determine the effect of application and soil incorporation on mitigating the presence of residues found in water sampled near dry wells.

IRRIGATION PRACTICES

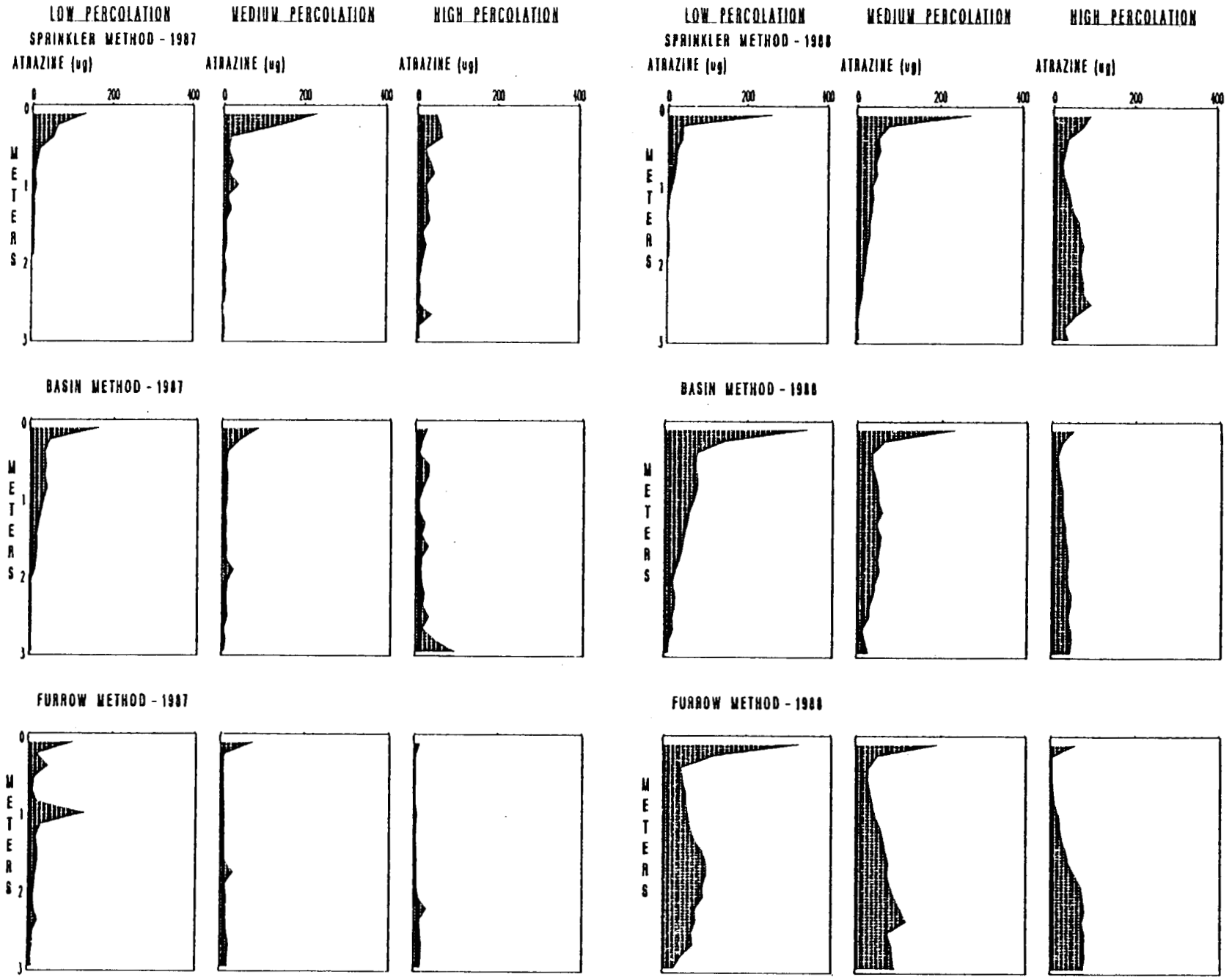
Leaching:

An irrigation study was conducted by the EHAP in 1987 and 1988 to compare the effect of three amounts of deep percolating water (denoted by low, medium, and high) applied by four methods (drip, sprinkler, floor, and furrow) of irrigation on leaching of atrazine, an herbicide that has been

found in ground water (Troiano, et al., 1990). The amount of water added was based on a water budgeting method that used measures of evapotranspiration (ETo), which is an estimate of the amount of water required to replenish that lost from soil evaporation and plant transpiration. ETo values were obtained from the California Irrigation Management Information System (CIMIS) weather station at Fresno, California. Focusing on the sprinkler, flood, and furrow irrigation results, increases in the amount of water applied caused both an increase in downward movement of water and atrazine (Figure 1). Using the location of the center of atrazine mass recovered above 3 meters (9.8 feet) as a measure of downward movement, the center of mass was about 0.6 meters (2 feet) deeper with every 0.5% increase in the level of ETo used to determine the amount of water to apply. Although the slope of this relationship was similar for the three irrigation methods, the magnitude of leaching differed with irrigation method. The center of atrazine mass at each percolation treatment was approximately 0.4 meters (1.3 feet) deeper in basin than in sprinkler irrigation and about 0.6 meters deeper in furrow than in basin irrigation. Because measurement of soil infiltration rates and soil texture were similar between locations, these differences were probably due to method of water application.

A physical explanation for differences in soil water movement between sprinkler and basin irrigation methods was provided through simulations with the LEACHM solute movement model (Wagenet and Hutson, 1989). The LEACHM model was not capable of simulating movement under furrow irrigation. LEACHM models the movement of water flow and solutes in soils with respect to specific site conditions of soil texture and climatic factors. Evaporation of water during the 40 day period was greatest in sprinkler treatments because the low volume and frequent water applications keep the surface soil wetter for a greater portion of time than in basin and furrow treatments. This resulted in less water available for deep percolation. A linear relationship was measured when depth to center of atrazine mass was plotted against percolated water calculated from LEACHM simulations for all sprinkler and basin treatments (Figure 2). The deeper the center of mass, the greater the downward movement of atrazine due to that treatment. The significance of this graph is that differences in

Figure 1. Influence of amount and method of water application on leaching of atrazine. The low percolation treatment corresponds to the least amount of water added and the high percolation treatment to the greatest amount added.

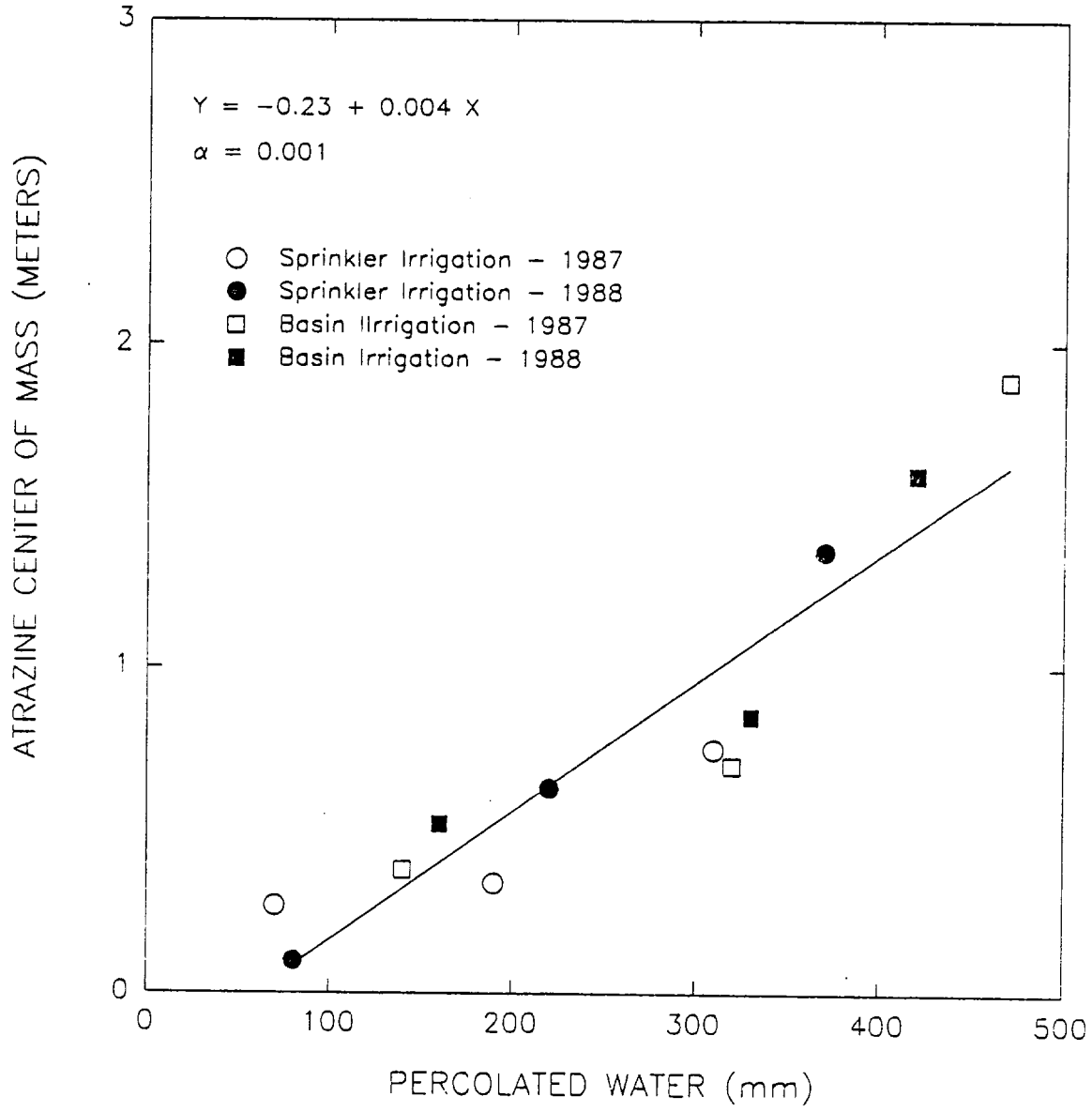


centers of mass between methods of application could be ascribed solely to differences in the amount of percolated water produced by each treatment. According to the equation in Figure 2, depth to center of mass after 40 days increased by approximately 0.4 meters (1.3 feet) for each 0.1 meters (0.3 feet) increment of percolated water. The amount of percolated water was also highly correlated (r=0.86) with the ETo index indicating that under the conditions of this study, these values were surrogate measures for one another. This result provides additional support for the supposition that management of herbicide residue leaching could be accomplished through proper indexing of irrigation water applications but that use of measures such as ETo will have to be modified based on the method of application. However, atrazine moved the deepest under furrowirrigation probably because water was applied to only one-half the soil surface compared to basin irrigation.

In summary, the irrigation study indicated that use of available measures of ETo in conjunction with water budgeting methods could be an effective technique for controlling water and, subsequently, pesticidal movement in soil. However, the use of ETo values in limiting pesticidal movement will require further refinement when applied to different methods of irrigation. Models could aid in defining the requirement specific to each irrigation method for achieving the goal of preventing leaching.

One aspect of pesticide use that may be critical to leaching may be the timing of pesticide applications in relation to irrigation applications. A theory of soil adsorption (Di Toro, 1985) proposes that the longer a pesticide remains in contact with the soil, the more resistant it becomes to leaching because the pesticide becomes more tightly bound to soil over time. Current labels for several of the herbicides detected in California ground water recommend that the compound should be watered into soil with a small amount of water (e.g., 0.25 to 0.50 inches) if sufficient rainfall is not received within a specified period after application. Additions of greater than 0.50 inches of water could leach residue past the weed root zone, away from the intended zone of pesticidal activity. This same result could occur from many small applications of water timed too closely in succession. Therefore, once the pesticide is watered into the zone of activity, the timing of the next irrigation may determine whether or not the pesticide leaches to ground water.

Figure 2. Location of the center of atrazine mass in relation to the amount of percolating water produced by sprinkler and basin irrigations.

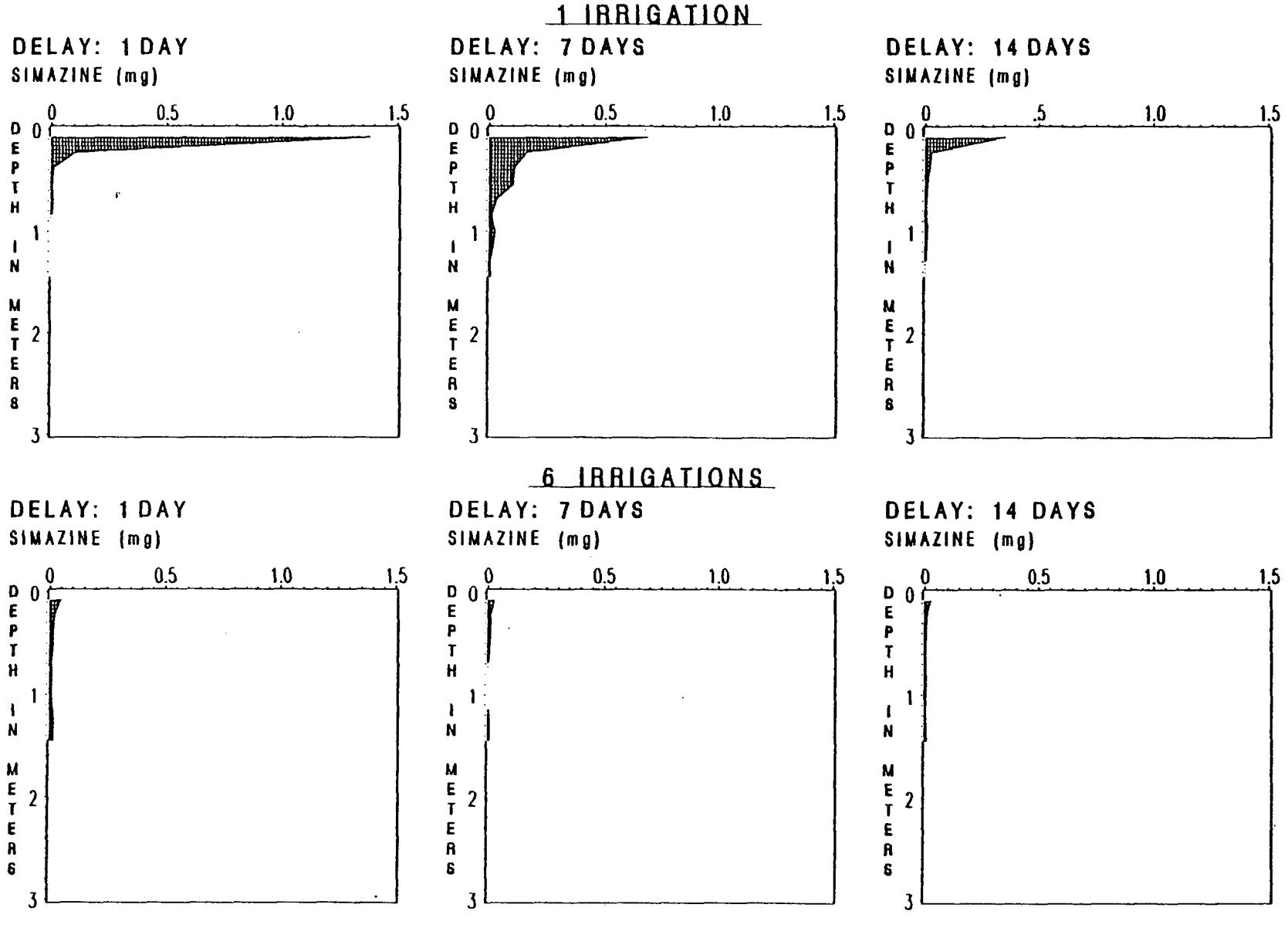


A study was conducted in 1989 (Troiano and Garretson, In Preparation) to determine if leaching of herbicides was reduced by lengthening the time between application of a pesticide and initiation of irrigation treatments. Since the results of this study were inconclusive due to problems with chemical analyses, the study was successfully repeated in the summer of 1990. Bromacil and simazine were broadcast onto soil and immediately incorporated into soil with a 0.5-inch sprinkler application. Irrigation treatments commenced at 1, 7 or 14 days after the application and incorporation of the pesticide. After the initial three-inch flood-irrigation application to each delay-in-irrigation treatment, irrigations were applied one day per week for a six-week period. Results from the study differed between herbicides. After only one irrigation, simazine residue was found to decrease as the delay-in-irrigation interval lengthened from one to 14 days (Figure 3). Only very small amounts of simazine were detected in soil after six irrigations, confirming the fast dissipation of simazine that occurred under the conditions of this study.

In contrast to simazine, the recovery of bromacil was unaffected by delay-in-irrigation treatments. Analysis of soil sampled after one irrigation indicated that there was no effect of delay-in-irrigation on the amount of bromacil recovered (Figure 4). Forty-four per cent of the residue was moved below the six inch-depth after one irrigation. The amount of bromacil recovered after six irrigations was equal to the amount recovered from soil after only one irrigation, but 95% of the residue was moved below 0.15 meters. The downward movement of residues from surficial soil to deeper areas of soil where dissipation rates were slower was probably caused by the lack of degredation. Delay-in-irrigation did not affect the movement of bromacil residues.

Differences in results between bromacil and simazine can be explained by differences in their physicochemical properties. Estimates of soil half-life and water solubility are greater for bromacil than for simazine, and soil adsorption is less for bromacil than for simazine (Johnson, 1991). The practical interpretation of these data is that, under the conditions of this study, delaying irrigations following application of simazine and bromacil had no impact on pesticide leaching.

Figure 3. Effect of a 1, 7, or 14 day delay-in-irrigation on the soil distribution of simazine after 1 and 6 irrigations.



Direct Streaming:

Irrigation management may also be important in controlling off-site movement of pesticides to ground water by direct streaming. Runoff water is commonly produced in surface irrigation systems such as furrow, basin-flooding and border types of irrigation. One goal of research conducted by irrigation scientists is to increase the efficiency of applying irrigation water. Irrigation efficiency is increased, in part, when less water is lost to runoff so that it is utilized on-site by crops. As indicated in the study by Braun and Hawkins (1991), a potential exists for citrus herbicide residue to move off-site with runoff water.

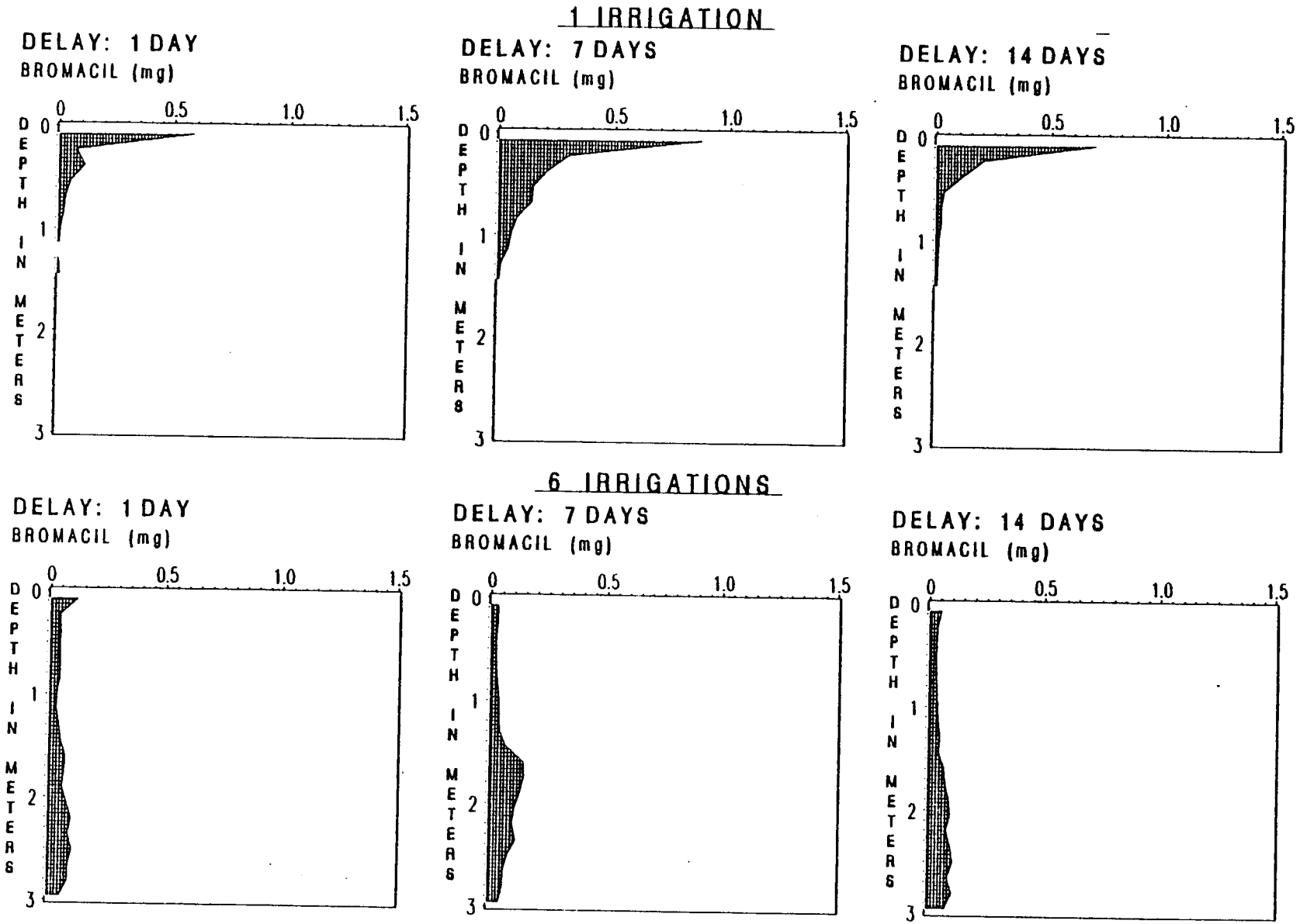
PHYSICOCHEMICAL CHARACTERISTICS OF PESTICIDES

Leaching:

The physicochemical properties the Act associates with the potential of a pesticide to leach through soil are: water solubility, soil adsorption (usually denoted by the coefficient of soil versus water partitioning), hydrolysis half-life due to microbial or chemical activity, field dissipation, and vapor pressure. These characteristics are used in models of pesticidal transport through soils (Rao, 1985). Cohen, et al. (1984) estimated values of the characteristics to act as indicators of leaching potential. In addition, section 13144 (a) (FAC) requires the Department to set Specific Numerical Values (SNVs) for some of these characteristics that are used to identify pesticides with the potential to leach to ground water. The Department has updated the established SNV's described by Wilkerson and Kim (1986) in three reports entitled: Setting Revised Specific Numerical Values (Johnson, 1988, 1989 and 1991).

As indicated in the Irrigation Practices section, a difference in the leaching of bromacil and simazine was measured in the delayed irrigation study. This result was surprising because both compounds have been detected in well water and the study was conducted on sandy soil that was highly conducive to leaching. Differences in the physicochemical

Figure 4. Effect of a 1, 7, or 14 day delay-in-irrigation on the soil distribution of bromacil after 1 and 6 irrigations.



properties of these herbicides indicate that bromacil could be considered a greater threat to leach than simazine. Bromacil has a greater water solubility and it is less reactive with soil as reflected by a lower Koc value (Johnson, 1991).

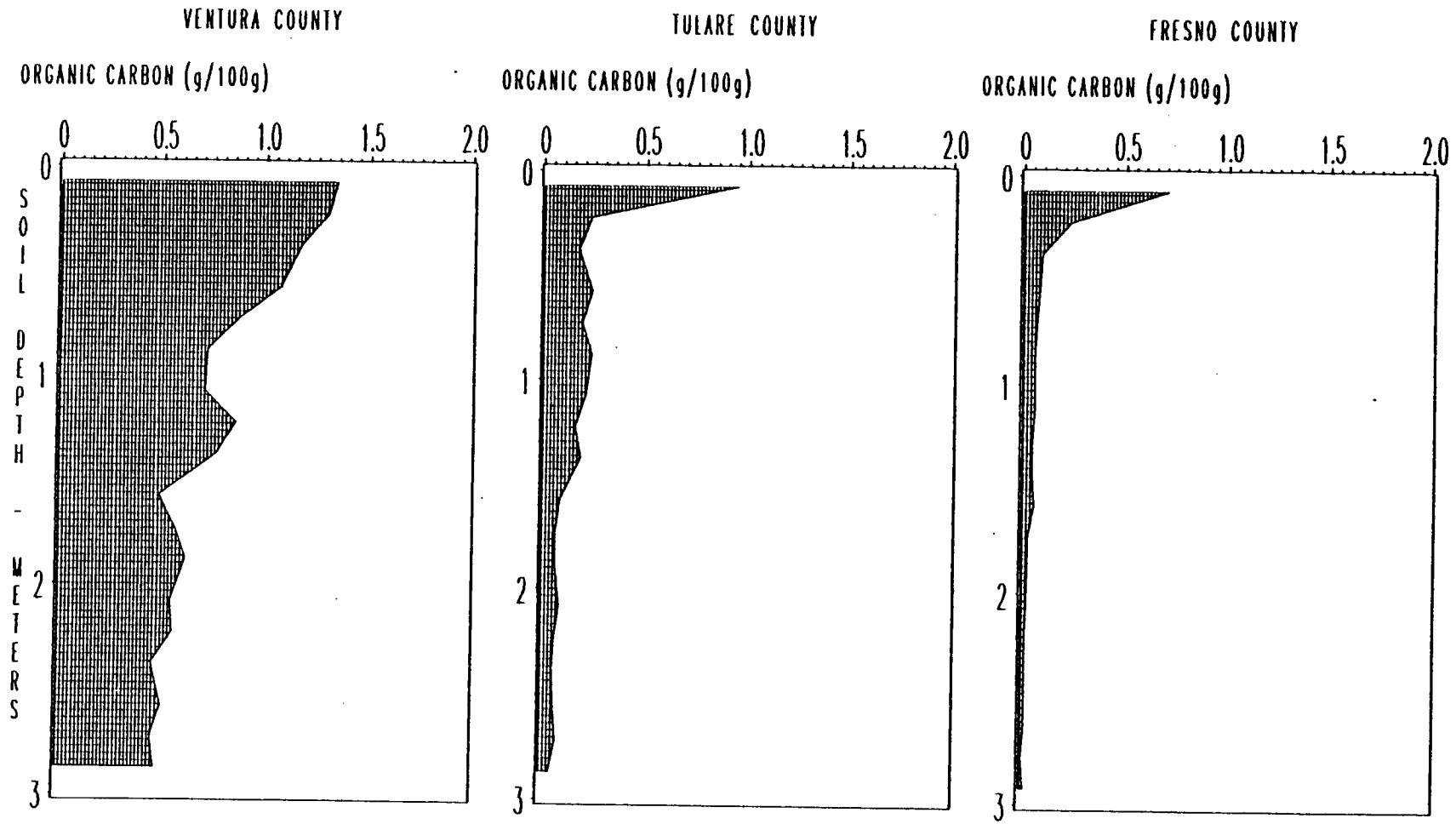
SOIL TYPE AND PROPERTIES

Leaching:

Soil type is an important factor in determining the likelihood of a pesticide to leach to ground water in a given area. Teso et al. (1988) have described the occurrence of DBCP residues in ground water in eastern Fresno County in relation to soil type as a means of predicting the sensitivity of soils in Merced County to pesticide contamination of ground water. DPR has been developing a data base of soil types in mapped portions of California on a section basis; currently, soil types that are present in PMZ's can be identified in a computer file. Evaluation of these data for regulatory use is ongoing.

Results from EHAP soil-coring studies indicate that organic carbon content of soil may be critical in determining the vulnerability of soils to leaching. Soils high in organic carbon tend to have a greater capacity to adsorb pesticides, which could result in increased rates of degradation, and thus, reduced rates of leaching. To test this possibility, soil core data are being compiled and compared to results of environmental sampling over broad areas. For example, one comparison was made between soil cores collected in Ventura County, an area where pesticides have not been found in ground water due to non-point sources and soil cores in Tulare and Fresno Counties, areas that contain PMZs (Figure 5). Soil in Ventura County contained greater organic carbon at all depths than soil in Tulare or Fresno Counties (Welling et al., 1986). The distribution of organic carbon in Tulare and Fresno Counties may be described as a thin layer compared to that in Ventura County. More comparisons of a similar nature are needed to support the use of organic carbon content of soils as a predictive tool for determining future locations of PMZs. Such a tool could reduce reliance on the detection of pesticides in wells as the sole indicator of vulnerable areas.

Figure 5. Comparison of organic carbon content in soil cores taken in Ventura, Tulare and Fresno Counties.



Direct Streaming:

Under dry conditions, certain clay soils, known as Vertisols, develop large, deep cracks that may reach from 1 to 2.2 meters (3.3 to 7.2 feet) in depth. Such soils are known to exist in the Sacramento Valley in areas where pesticides have been detected in ground water. A recent study, funded by DPR, was conducted to measure the location of pesticide residues with respect to cracks in these soils (Graham and Ulery, 1990). Though limited in scope, the authors concluded that detection of residues below the surface layer were apparently related to the presence of cracks in the soil. Movement of residues through soil features such as cracks presents a unique circumstance with respect to mitigating contamination of ground water because in the presence of cracks, any pesticidal active ingredient, regardless of physicochemical characteristics could move to ground water. Controlling pesticide movement could be attained only by management of the soil environment, if possible. This is an example where considerations of pesticidal use must include geographical setting in order to derive effective mitigation decisions.

CLIMATE

Leaching:

Climatic factors, such as precipitation, may override all of the previously mentioned factors in causing ground water contamination. An example of the influence of climate are the residues of aldicarb detected in well water in Del Norte County (Lee, 1983). Because soils in that area are high in organic matter, they may be expected to retard pesticide movement. However, annual rainfall may be over 80 inches (2 meters), with as much as 50 inches (1.3 meters) occurring during the winter months from November to March. Aldicarb was applied in the fall to lily bulb fields to control nematode problems in the soil. The amount of winter rainfall was apparently sufficient to drive pesticide residues to the shallow ground water located at about ten feet, in spite of the high soil organic matter.

A different result was observed in a study recently completed by DPR (Troiano and Garretson, 1988). The effect of winter rain on movement of pesticides in the central San Joaquin Valley was investigated in the Fresno area. Because soils there are sandy, the area might be expected to be

vulnerable to pesticide leaching from winter rainfall. However, winter rainfall is usually much less there than in the Northern Coastal areas (e.g., ten inches in the San Joaquin Valley compared to 50 inches on the North Coast). For the study, an inorganic ion tracer was detected at about the 1.7 meters (5.5 feet) depth in the soil, with some detected down to ten feet (3 meters), the lowest depth sampled. In contrast, most of the pesticide simazine, which is known to leach through soils, was recovered in the first 0.15 meters (0.5 feet) of soil, with some residues detected down to 1.9 meters (6 feet). At this site, there was some retardation in movement of the pesticide compared to water flow. In this situation, the amount of winter rainfall was insufficient to move the major portion of simazine beyond the first six inches of soil. Thus, climatic conditions, such as heavy rainfall, must not be overlooked as important factors in the leaching of pesticides through soils, and they may be important considerations in timing applications of pesticides.

III. ACTIONS TAKEN BY THE DEPARTMENT OF PESTICIDE REGULATION TO PREVENT PESTICIDES FROM ENTERING GROUND WATER AS A RESULT OF AGRICULTURAL USE

III. ACTIONS TAKEN BY THE DEPARTMENT OF PESTICIDE REGULATION TO PREVENT PESTICIDES FROM ENTERING GROUND WATER AS A RESULT OF AGRICULTURAL USE

The Pesticide Contamination Prevention Act (referred to hereafter as Act) added sections 13141 through 13152 to Division 7 of the Food and Agricultural Code ([FAC], see Appendix A, p. 89). The Act authorizes DPR to review, investigate, and, when necessary, mitigate detections of pesticides in ground water.

The Pesticide Detection Response Process

Detections of residues of pesticides in ground water or soil under certain conditions may be the result of monitoring studies conducted by DPR, or may be reported to DPR by local, state, federal, or private agencies that conduct monitoring. DPR response to detections of pesticides in ground water (referred to as the Pesticide Detection Response Process [PDRP]) is established in sections 13149 through 13151 (FAC). During this process, the detection of a pesticide residue in soil or ground water is investigated, evaluated, and, when necessary, mitigated. The investigation phase of the PDRP includes verification of the detection (see Appendix F, p. 135) and an agricultural use determination. If the residue is determined to be the result of agricultural use, the evaluation phase of the PDRP commences when the Department notifies the appropriate registrants of their opportunity to request a hearing. If requested, a hearing of the Pesticide Registration and Evaluation Committee (PREC) subcommittee is held pursuant to sections 13149 and 13150 (FAC). After completion of the hearing, the PREC subcommittee issues its findings to the Director of DPR, who then takes certain actions pursuant to section 13150(d) (FAC). These actions may include the adoption of regulations which modify the agricultural use of a pesticide to reduce its likelihood of reaching ground water or the suspension or cancellation of agricultural use of a pesticide active ingredient in California.

Seven pesticide active ingredients have been reviewed through the PDRP: aldicarb, atrazine, bentazon, bromacil, diuron, prometon, and simazine. Atrazine, bentazon, bromacil, diuron, prometon, and simazine are listed in

section 6800 (a) of Title 3, California Code of Regulations (3CCR). Compounds in section 6800 (a) (3CCR) are listed as restricted materials (see Glossary, p. 110) and are subject to certain use and reporting requirements. Regulations have been adopted, pursuant to section 13150(d)(2) (FAC), that modify the agricultural use of the seven detected compounds so that there is a high probability that such use would not pollute the ground waters of the state.

Agricultural Use Determinations

The agricultural use investigation includes a determination of whether:

(1) the residue detected, be it active ingredient, breakdown product, or any other specified ingredient, is from an economic poison that is registered for agricultural use in California;

(2) the application of such an economic poison in the vicinity of the detection was reasonably likely;

(3) a point source was not a likely cause;

(4) a non-agricultural use of the economic poison was not a likely source; or

(5) a non-pesticidal source was not a likely cause.

DPR responds to the detection of a pesticide in well water by conducting two types of surveys. First, a survey is conducted to locate a second positive well (i.e., a well with a confirmed detection of a pesticide) in the same area as the initial positive well. This helps in determining that the residue did not result from a point source. The well survey consists of collecting water samples from a minimum of five wells that are in the same section as the reported positive well and/or in one or more of the three adjacent sections located closest to the positive well. Well selection is based on proximity to the positive well and availability. Second, a land use survey is conducted to identify potential sources of the contamination. Locations and sizes of crop and non-crop areas (such as natural vegetation, residential or industrial) are identified on the map, and the area immediately surrounding the positive well is carefully investigated.

Twenty-three agricultural use investigations were conducted between July 1, 1990 and June 30, 1991. Well water samples were collected from 16 counties and analyzed for an overall total of 12 active ingredients and one metabolite which are summarized in Table 1. Following those investigations, it was determined that detections of xylene, 2,4-D, captan, molinate, endothall, benomyl, 1,3-D, diazinon, methyl bromide, carbaryl, and carbon disulfide were not attributable to agricultural use. (The benomyl, diazinon, and carbaryl detections were reported in the 1990 annual Update Report.) The detections of TPA, a metabolite of the active ingredient chlorthal-dimethyl, that were made in Los Angeles and Santa Clara counties are still under investigation.

New Pesticide Management Zones (PMZs)

A section of land found to be sensitive to ground water pollution is designated in regulation as a Pesticide Management Zones (PMZ). A section of land is a geographic survey unit of approximately one square mile. The agricultural, outdoor industrial, or outdoor institutional uses of a pesticide inside its PMZ are subject to certain ground water protection restrictions and requirements, or may be prohibited, depending on the pesticide.

An overall total of ten detections of three compounds listed in section 6800 (a) (3CCR) were investigated between July 1, 1990 and June 30, 1991. Presented in Table 2 is a list of the detections in the order of occurrence, the county in which each detection was made, and the final recommendation. As a result of the investigations, four new PMZs (one in each of four counties) were recommended. A recommendation was made for two new PMZs for atrazine, one for simazine, and one for prometon.

Adjacent Section Monitoring

PMZs are established by regulation when a pesticide is detected in ground water or soil under certain conditions and there is evidence that the detection resulted from legal agricultural use. Sections adjacent to a PMZ

Table 1. Detections of pesticide active ingredients, or their metabolites, investigated during the period July 1, 1990 through June 30, 1991, which were reviewed through the Pesticide Detection Response Process (PDRP).

County	Active Ingredient or Metabolite	Recommendation
Los Angeles	TPA (metabolite of Chlorthal-dimethyl	Still under investigation
Santa Clara	TPA (metabolite of Chlorthal-dimethyl	Still under investigation
Glenn	Molinate	Removed from PDRP
Lassen	Xylene	Removed from PDRP
Mono	Xylene	Removed from PDRP
Del Norte	2,4-D	Removed from PDRP
Del Norte	2,4-D	Removed from PDRP
Butte	2,4-D	Removed from PDRP
Butte	Endothall	Removed from PDRP
Glenn	Captan, Benomyl	Removed from PDRP
Glenn	Captan	Removed from PDRP
Solano	Captan	Removed from PDRP
Del Norte	1,3-D	Removed from PDRP
Fresno	1,3-D	Removed from PDRP
Monterey	Diazinon	Removed from PDRP
Tuolumne	Methyl Bromide	Removed from PDRP
Napa	Carbaryl	Removed from PDRP
Fresno	Xylene	Removed from PDRP
Placer	Xylene	Removed from PDRP
San Luis Obispo	Xylene	Removed from PDRP
Tuolumne	Xylene	Removed from PDRP
Santa Barbara	Carbon Disulfide	Removed from PDRP
Santa Cruz	Xylene	Removed from PDRP

Table 2. Detections investigated during the period July 1, 1990 through June 30, 1991 of pesticides (listed in section 6800(a) of Title 3, California Code of Regulations) that have been previously detected in California ground water as a result of agricultural use.

County	Pesticide	Recommendation
Orange	Atrazine	PMZ Not Recommended [1]
Los Angeles	Simazine	PMZ Not Recommended [1]
Tulare	Simazine	PMZ Not Recommended [1]
Tulare	Atrazine	PMZ Not Recommended [1]
	Simazine	PMZ Not Recommended [1]
San Joaquin	Atrazine	PMZ Not Recommended [1]
Los Angeles	Atrazine	New PMZ Recommended
Orange	Atrazine	PMZ Not Recommended [2]
	Simazine	New PMZ Recommended
Tulare	Atrazine	PMZ Not Recommended [1]
	Prometon	New PMZ Recommended
Tulare	Prometon	PMZ Not Recommended [1]
Glenn	Atrazine	New PMZ Recommended

[1] Initial detection could not be confirmed.

[2] A second well with a confirmed detection of atrazine, in the same area as the initial positive well, could not be located.

may also be sensitive to ground water pollution, but because they have not been sampled previously, information on which to base a determination that they should also be designated as PMZs is lacking. Consequently, the Department conducts monitoring adjacent to those sections to determine if these areas are also sensitive to ground water pollution by pesticides.

During the period of July 1, 1990 through June 30, 1991, well sampling was conducted in 71 out of 126 (56%) previously unmonitored sections adjacent to established or proposed PMZs in Tulare County (two of the adjacent sections were located in Fresno County, just across the county line). Well sampling was conducted in two out of ten previously unmonitored adjacent sections in Fresno County. Well samples were screened for atrazine, simazine, prometon, bromacil and diuron. Twenty-two additional sections in Tulare County were examined but not monitored because there were no wells, existing wells were not operating, or permission to sample could not be obtained from well owners.

Results for wells sampled in the two counties are presented in Table 3. Residues of at least one pesticide were found in three of four wells sampled in Fresno County and in 71 out of 127 wells (57%) sampled in Tulare County. Simazine was detected most frequently, 61 wells of 131 sampled (47%), followed by diuron (43%), bromacil (30%), atrazine (2%), and prometon (<1%).

Table 4 shows the number of sections with detections by county and pesticide. Fresno County had two sections with detections and Tulare County had 52. Seventy-four percent of the 73 sections sampled had at least one chemical detected in at least one well. Simazine and diuron, the two most frequently detected pesticides, were found in 63% and 60%, respectively, of the sections sampled.

A land use survey was also conducted in each adjacent section that was monitored. The results of that survey, well sample analyses, and any other available evidence are used to determine whether or not a section should be declared a PMZ.

Table 3. Sampling results from 1990-91 adjacent section monitoring, by number of wells.

	Number of wells containing:					Total wells	
County	atrazine	simazine	prometon	bromacil	diuron	Confirmed positive	Sampled
Fresno	0	3	0	1	3	3	4
Tulare	3	58	1	38	53	71	127
Totals	3	61	1	39	56	74	131

Table 4. Sampling results from 1990-91 adjacent section monitoring, by number of sections.

	Number of sections containing:					Total sections	
County	atrazine	simazine	prometon	bromacil	diuron	Confirmed positive	Sampled
Fresno	0	2	0	1	2	2	2
Tulare	3	44	1	31	42	52	71
Totals	3	46	1	32	44	54	73

Aldicarb Well Survey

In September, 1989, the PREC subcommittee issued a finding to the Director of the Department of Food and Agriculture[1] (CDFA) that aldicarb and its degradation products have polluted and continue to threaten to pollute the ground waters of the state. In response, the Director of the CDFA determined that aldicarb does not pollute or threaten to pollute ground water because it is no longer registered for use in the California counties where it had been detected in ground water. Further, although hundreds of well samples had been collected from other areas of the state where aldicarb is used, no aldicarb residues were detected.

To ensure that the agricultural use of aldicarb does not pollute ground water in counties where it is registered for use, the EHAP monitors for the presence of aldicarb and its breakdown products (aldicarb sulfone and aldicarb sulfoxide) by conducting an annual well survey.

A survey of 47 wells was conducted between September 24 and October 4, 1990 in areas of the San Joaquin Valley where high aldicarb use was reported in 1986, 1987 and 1988. The counties sampled were: Fresno (9 wells), Kern (10), Kings (10), Madera (7), Merced (3), and Tulare (8). Sixty percent of the wells were located in sections where aldicarb was used in 1986, 1987, and 1988, and 20 percent had applications in two of the three years. None of the sampled wells contained detectable aldicarb residues.

Ground Water Protection List Monitoring

The Ground Water Protection List (GWPL) is a list, established in FAC section 13145(d) of the Act and placed in section 6800 (3CCR), of pesticides having the potential to pollute ground water. The GWPL is divided into two sublists. Sublist (a) is comprised of chemicals that have been detected in

[1] Since the creation of DPR within the Cal-EPA, the PREC subcommittee will report such findings to the Director of DPR.

soil or ground water as a result of normal agricultural use. Sublist (b) is comprised of chemicals meeting the conditions specified in FAC section 13145(d). Pesticide active ingredients whose physicochemical properties exceed certain values (called Specific Numerical Values [SNVs]) and are labeled for use under any of the following conditions: (1) application to or injection into the soil; or (2) for application to or injection into soil by chemigation; or (3) application to be followed, within 72 hours, by flood or furrow irrigation; are placed on the GWPL.

In the spring of 1991, a special study (Johnson et al., In Preparation) was conducted (1) to determine if pesticides placed on the GWPL have migrated to ground water and (2) to statistically test the selection process, based on the SNVs, for identifying pesticides with the potential to leach to ground water. Samples were taken for 11 pesticides listed on the GWPL and 36 other pesticides or pesticidal breakdown products. Six different wells were sampled for each active ingredient; in all, a total of 216 wells were sampled. As a result of this sampling, four pesticides were found in ground water: atrazine, bromacil, diuron, and simazine. All four compounds had previously been listed in sublist (a) of the GWPL; no other compounds were detected.

Compliance Monitoring

Regulations to prevent continued ground water contamination in PMZs include prohibiting certain uses of chemicals listed in sublist (a) of the GWPL within their PMZs. To assure compliance with those prohibitions, the Department conducts yearly soil monitoring in approximately 10% of the PMZs for each regulated pesticide.

During the period July 1, 1990 through June 30, 1991, compliance monitoring was conducted for atrazine, simazine, prometon, bromacil and diuron. The number of PMZs selected for monitoring are listed by county in Table 5. A total of 17 PMZs, including five for atrazine, eight for simazine, one each for prometon and bromacil, and two for diuron were monitored. County

Table 5. Locations of PMZs selected for 1990-91 compliance monitoring.

	Number of PMZs monitored for:				
County	atrazine	simazine	prometon	bromacil	diuron
Fresno		1			
Glenn	2		1		
Los Angeles	2	2			
Merced		1			
Orange		1			
Riverside		1			
Tulare	1	2		1	2
Totals	5	8	1	1	2

Table 6. Occurrence of herbicide residues in PMZs selected for 1990-91 compliance monitoring.

		Number of PMZs that:		
Herbicide	No. PMZs Monitored	Contained no residues	Contained residues	Conc. range of residues present
Atrazine	5	4	1	.11-.55 ppm[a]
Simazine	8	2	6	.02-65.0 ppm
Prometon	1	0	1	.04-.12 ppm
Bromacil	1	0	1	.07-.7 ppm
Diuron	2	0	2	.07-.32 ppm

[a] ppm = parts per million on a dry soil weight basis.

Agricultural Commissioners' staff assisted in locating two sites in each selected PMZ where the regulated chemical might have been used based on historical-use patterns. Replicate, shallow soil samples were collected at each site and analyzed for the targeted herbicide.

Atrazine residues were found in one of five monitored PMZs at concentrations ranging from 0.11 to 0.55 parts per million (ppm) (Table 6.). Prometon and bromacil were found in the PMZ in which each was monitored at concentrations of 0.04-0.12 and 0.07-0.7 ppm, respectively. Residues of diuron were found in both diuron PMZs at concentrations ranging from 0.07 to 0.32 ppm. Calculations made from the concentrations found indicated that the residues were not from recent applications. Thus, no further action was required. Simazine residues were found in soil from six of the eight PMZs that were monitored. In five of those PMZs, concentrations ranged from 0.02 to 0.34 ppm and residues were not considered to be from recent applications. However, in one PMZ, the concentrations ranged from 0.40 to 65.0 ppm and calculations made from those concentrations indicated that the residues resulted from a recent application. That finding is currently under investigation.

IV. ACTIONS TAKEN BY THE STATE WATER RESOURCES CONTROL BOARD TO PREVENT PESTICIDES FROM ENTERING GROUND WATER

State of California

Memorandum

To : James W. Wells
Interim Director
Department of Pesticide Regulation
1220 N Street, Room A-414
Sacramento, CA 95814

Date : DEC - 6 1991

Walt Pettit
Executive Director

From : **STATE WATER RESOURCES CONTROL BOARD**

Subject: PESTICIDE CONTAMINATION PREVENTION ACT (AB 2021) ANNUAL REPORT (1991) TO THE LEGISLATURE

The Director of the California Department of Pesticide Regulation (CDPR), in consultation with the State Water Resources Control Board (SWRCB), is required under the Pesticide Contamination Act to report annually to the Legislature any actions taken by the CDPR Director and the SWRCB to prevent economic poisons from migrating to ground waters of the State. The attached report is a summary of actions taken during the past year by the SWRCB and the California Regional Water Quality Control Boards for inclusion in the report to the Legislature.

If we can be of further assistance, please feel free to telephone Jesse M. Diaz, Chief of the Division of Water Quality, at 657-0756. The staff person currently working on this issue is Jack Hodges, and he can be reached at 657-0682.

Attachment

STATE WATER RESOURCES CONTROL BOARD

P.O. Box 100, Sacramento, CA 95801

Legislative and Public Afairs: (916) 657-2390
Water Quality Information: (916) 657-0687
Clean Water Programs Information: (916) 739-4400
Water Rights Information: (916) 657-2170

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARDS

NORTH COAST REGION (1)
1440 Guerneville Road
Santa Rosa, CA 95403
(707) 576-2220

SAN FRANCISCO BAY REGION (2)
2101 Webster Street, Suite 500
Oakland, CA 94612
(415) 464-1255

CENTRAL COAST REGION (3)
81 Higuera Street, Suite 200
San Luis Obispo, CA 93401-5414
(805) 549-3147

LOS ANGELES REGION (4)
101 Centre Plaza Drive
Monterey Park, CA 91754-2156
(213)266-7500

CENTRAL VALLEY REGION (5)
3443 Routier Road, Suite A
Sacramento, CA 95827-3098
(916) 361-5600

Fresno Branch Office
3614 East Ashlan Avenue
Fresno, CA 93726
(209) 445-5116

Redding Branch Office
415 Knollcrest Drive
Redding, CA 96002
(916) 224-4845

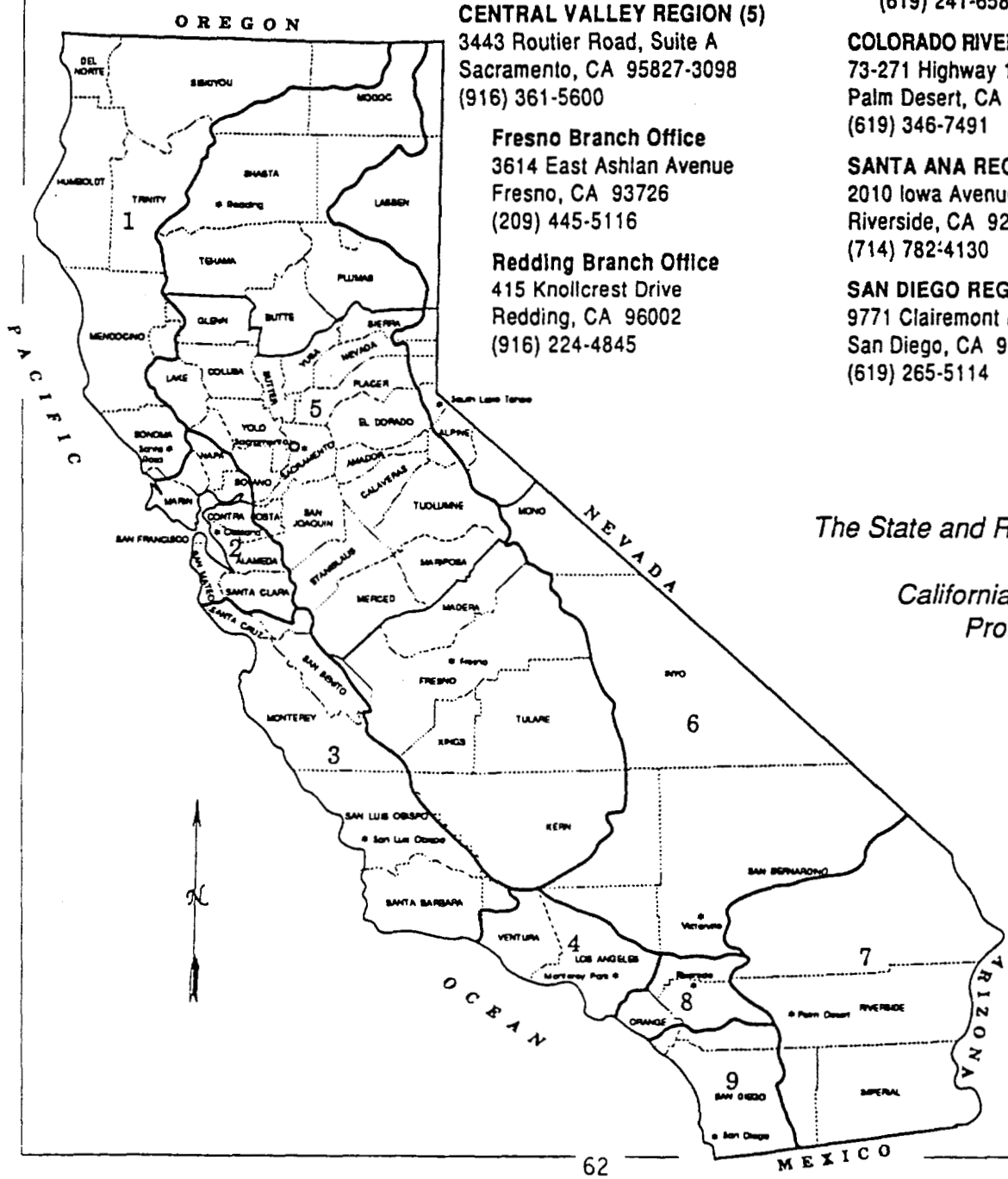
LAHONTAN REGION (6)
2092 Lake Tahoe Blvd., Suite 2
South Lake Tahoe, CA 96150
(916) 544-3481

Victorville Branch Office
Civic Plaza
15428 Civic Drive, Suite 100
Victorville, CA 92392-2359
(619) 241-6583

COLORADO RIVER BASIN REGION (7)
73-271 Highway 111, Suite 21
Palm Desert, CA 92260
(619) 346-7491

SANTA ANA REGION (8)
2010 Iowa Avenue
Riverside, CA 92507
(714) 782-4130

SAN DIEGO REGION (9)
9771 Clairemont Mesa Blvd., Suite B
San Diego, CA 92124
(619) 265-5114



The State and Regional Boards are part of the California Environmental Protection Agency.

16 September 1991

PESTICIDE CONTAMINATION PREVENTION ACT
ANNUAL REPORT TO THE LEGISLATURE
STATE WATER RESOURCES CONTROL BOARD
DECEMBER 1991

Actions taken by the State Water Resources Control Board (SWRCB) and the California Regional Water Quality Control Boards (CRWQCBs) to prevent economic poisons from migrating to ground waters of the State are as follows:

A. SWRCB

The SWRCB, in cooperation with the California Department of Pesticide Regulation (CDPR), is developing a computerized Pesticide Use Reporting System (PURS). Information on pesticide use by type, location, and time is essential for any water quality related investigation. Some surface-applied pesticides may leach through the soil and contaminate ground water. When this occurs, the time ranges from a few months to a few years, depending on the pesticide characteristics (such as water solubility), soil type (such as sandy soil), and local hydrogeology (such as depth to ground water).

Information on the quantity and time of application at a specific geographical location is crucial in any investigation. This type of information and a tool to assist in analyzing the information would be useful in assessing nonpoint sources of contamination relative to pesticide use. Pesticide data collected and stored on magnetic tapes by CDPR includes specific geographical locations of all pesticide application. The volume of pesticide use data on magnetic tapes is approximately one million records per year which makes manual processing infeasible.

The outputs scheduled for production by PURS include five standard reports and two maps. The reports are as follows:

1. Pesticide use by type, amount, and rank of usage in California for a specific year.

2. Pesticide use by type, amount, and rank of usage in a specific county for a particular year.

3. Pesticide use by type and amount by township, range, and section within a county.

4. Line plot of monthly/yearly use of a specific pesticide in a particular county.

5. Histogram of monthly/yearly use of a specific pesticide in a particular county.

The maps are as follows:

1. Statewide pesticide use by year.

2. County pesticide use by year.

When fully operational PURS outputs can be requested on an as-needed basis.

SWRCB staff reviewed CDPR's proposed regulations for Pesticide Management Zones (PMZs). With the assistance of Teale Data Center staff, SWRCB staff has produced Geographic Information System (GIS) maps indicating the pesticide specific PMZs in a particular county, as well as the total PMZs for all the pesticides statewide.

SWRCB staff reviewed CDPR's proposed regulations to revise the Specific Numerical Values (SNVs) and provided comments to the California Environmental Protection Agency (Cal-EPA).

SWRCB staff reviewed and commented on CDPR's draft Pesticide Management Plan. Staff has requested CDPR to provide the findings of any determination that the detection of pesticides in ground water is not due to legal agricultural use. SWRCB staff will forward this information to the CRWQCB staff for appropriate follow-up action.

SWRCB staff approved the following two research projects dealing with pesticides and ground water for funding through the Clean Water Act Sections 205(j)(2) and 604(b) grants made available by the U.S. Environmental Protection Agency (EPA).

1. Strategy for mitigation of DBCP contamination of Kings ground water basin (California State University, Fresno).

2. Developing ground water quality monitoring, management, and protection strategies for the Salinas basin water resources management plan (County of Monterey).

SWRCB staff participated in the Pesticide Container Recycling Project coordinated by the Western Agricultural Chemical Association.

SWRCB staff routinely participate in the CDPR's interagency Pesticide Advisory Committee, Pesticide Registration and Evaluation Committee, and State Environmental Hazard Assessment Committee meetings.

On an ongoing basis, SWRCB staff reviews the CDPR's notices of "Materials Entering Evaluation" for proposed and final registration decisions.

B. CRWQCB

Information on actions to prevent economic poisons from migrating to the ground waters of the State by each of the nine CRWQCBs are listed in Tables 1 through 9.

Table 1 **ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, NORTH COAST REGION 1991**

The California Regional Water Quality Control Board, North Coast Region, referred a number of pesticide-related situations to the local public health authority for action. This is the normal course of action for these types of situations.

Table 2 ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN FRANCISCO BAY REGION 1991

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Alameda	Parker & Amchem	2,4-D	Soil Removal in September 1988 (Work completed). Ground water assessment ongoing. Regional Board order 91-079 specifies schedules for investigations and cleanup.
Contra Costa	Chevron	Endrin, Lindane, Dieldrin, DDT	Submitted closure plan for Class I impoundment. A cut-off well with a ground water extraction trench around the impoundment has been constructed.
Alameda	Jones-Hamilton	Pentachlorophenol	Regional Board Order 89-110 specifies time schedule for investigation/cleanup. Ground water cleanup underway.
Alameda	Port of Oakland (Embarcadero Cove)	Chlordane, Penta-chlorophenol	Department of Health Services has lead additional investigation/cleanup requested.
Alameda	Lincoln Properties (Orsetti Site)	DDE,2,4-D	Alameda County Water District has lead.
Alameda	FMC, Newark	EDB	Regional Board Order 89-055 specified time schedule for investigation and cleanup. Ground water cleanup underway.
Contra Costa	Levin Metals	Aldrin,4,4-DDD,4-DDE o,p-DDT, Dieldrin & BHC	EPA Lead Cleanup.
Contra Costa	FMC, Richmond	DDT, DDD, DDE, Dieldrin Chlordane, Tedion, Endosulfan, Ethion, Carbophenothion, & Heptachlor	DHS Lead Cleanup.
Contra Costa	ICI Americas	Vapan, Derrinol, Ordram	Site cleanup order issued in 1991.

Table 3 **ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL COAST REGION 1991**

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Santa Cruz	WFS-Greengro, Watsonville	1,2-Dichloropropane	Developing Remediation Plan.
Santa Cruz	WFS-Watsonville	DDT,DDD, and Endosulfan (Alpha & Beta)	Contamination assessment underway.
Santa Clara	Castle Veg Tech, Morgan Hill	Toxaphene, Endrin, Lindane, Endosulfan	Contamination assessment underway.
Monterey	WFS-Salinas	Dinoseb	Remedial action underway.
Monterey	Soilservice, King City	1,2 Dibromoethane, EDB, Dichloropropane	Remedial action underway.

Table 4 **ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LOS ANGELES REGION 1991**

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Los Angeles	U.S. Post Office (formerly Challanger Cook Brothers, Inc.) City of Industry	Lindane (gamma-BHC)	Monitoring ongoing.
Los Angeles	Montrose Chemical Company (Torrence)	DDT	Cleanup and Abatement order issued for site assessment and remediation.

Table 5 ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL VALLEY REGION 1991

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Fresno	Thompson Hayward Agriculture & Nutrition	Alpha-BHC, Beta-BHC, Gamma-BHC, Dieldrin, DBCP, Diphenamid, Heptachlor, Haptachlor Epoxide	Site on State Superfund. Contamination assessment ongoing.
	FMC Corporation	Aldrin, Dieldrin, DDT, DDD, DDE, Heptachlor, Lindane, Toxaphene, Ethyl Parathion, Malathion, Ethion, Endosulfan, Diemthoate, Furadan, DNOC, DNBP	Site on StateSuperfund. Remedial investigation/feasibility study in progress.
	Agro-West, Inc.	BHC, Dicofol, Endosulfan, Dacthal, 2,4-D, Diuron, Methomyl, Neburon, Propham	Site on State Superfund. Hydrogeologic assessment report submitted pursuant to the Toxic Pits Cleanup Act.
	Britz, Inc. Five Points	Toxaphene, DDT, Dinoseb	Site on State Superfund. Partial contamination assessment submitted. Additional contamination assessment reported. Closure plans requested.
	Chevron Chemical Company	Toxaphene, Arsenic	Assessment ongoing. Pesticide contaminated soils have been removed.
	Fresno County Wells*	DBCP, EDB, 1,2-D	Pesticides detected in 146 wells (AB 1803 sampling). Assessment ongoing.
	Central Valley Aviation	Unspecified	Assessment ongoing.
	Wilbur-Ellis	Unspecified	Assessment ongoing.
	Union Carbide Test Plot	Aldicarb	Additional contamination assessment ongoing.
	Coalinga Airport	DDT, Chlorpyrifos, DEF, Ethion, Disyston	Contamination assessment requested.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Fresno	UC Agricultural Field Station Westside AFS (Five Points)	Simazine, Diuron, Prometon, MCPA	Both field stations are currently undergoing contamination assessment and installation of monitoring wells.
	UC Agrigultural Field Station Kearney Agricultural Center (Parlier)	DDD, DDE, Simazine Chloroprophan	See above.
	Occidental Chemical/J.R. Simplot	Dieldrin	Surface impoundment excavated and closed. Monitoring of ground water continues.
	Selma Agricultural Supply	DDT, DDE, Dieldrin, Chlordane, Endosulfan	Soil and ground water contamination assessment ongoing.
Kern	Brown & Bryant, Inc. Arvin	1,2-D, 1,3-D, DBCP, EDB, Dinoseb	Site on State Superfund. Contamination assessment report requested.
	Puregro Company Bakersfield	DBCP	Site on State Superfund. Revised remedial action plan requested.
	Guimarra Vineyard	DBCP	Contamination assessment and pond closure plan requested (J.R. Simplot-Edison).
	Dick Garriott Crop Dusting (Bakersfield)	Chlordane, DDE, DDT, PCNB, Triodan I & II, Methoxy Chlor, Carbofuran, Carbaryl, buffencarb, DEF, Tedion, diazinon, chlorophyrifos, ethyl parathion, Endosulfan I & II, Dirron, Dinoseb, dicamba	Cleanup and Abatement Order issued. TPCA site.
	WASCO Airport	Aldrin, Lindane, Endrin, Chlordane, Methoxychlor, DDT, DDD, DDE, Thimet, Malathion, Methylparathion, Paraoxon, Di-syston, Omite, Paraquat	Hydrogeologic Assessment Report completed. Site closure in progress.
	U.S.D.A., Shafter	Dichlobenil, EPTC, Prometryn, DDT, DDE, DOD, Dieldrin, Toxaphene, Silvex, PVCP, Chlorpropham, Ametryn, Atrazine	Developing a closure plan.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Kern	Kern County Wells*	DBCP, 1,2-D, EDB	Pesticides detected in 57 wells (AB 1803 sampling).
Madera	Western Farm Service, Inc.	Dinoseb, DBCP, Dieldrin	Partial hydrogeological assessment report submitted. Additional contaminant assessment requested. Closure plan requested.
	Chowchilla Municipal Airport	Dieldrin, Alpha-BHC, Endosulfan, PCNB, DDT, DDE, Lindane	Contamination assessment requested.
	Madera County Wells*	DBCP, 1,2-D, EDB	DBCP detected in 2 wells (AB 1803 sampling).
Tulare	Mefford Field, City of Tulare	p,p'-DDT, p,p'-DDE, 2,4,5-TP, Dicamba, DNBP, Diuron	Contamination assessment and mitigation reports requested.
	Tulare Airport	2,4-D, DNBP	Assessment ongoing.
	Kaweah Crop Dusters	DDT, 2,4-D, 2,4,5-T, Methoxychlor	Department of Health Services Remedial Action Order issued January 1984. Cleanup of surface impoundment in progress.
	Harmon Field (County of Tulare)	DDT, DDE, TDE, Toxaphene, Methorychlor, Endosulfan, Preldrin	Department of Health Services Action Order issued March 1989. HAR complete. Remedial investigation/feasibility study ongoing.
	Western	Air Aldrin, DDE, Heptachlor, Gamma BHC, Demeton, Malathion, Phorate, Borhan, Divron, Proporor, Siduron, Chlorphyrifos, DEF	Hydrogeologic assessment and closure plan underway pursuant to Toxic Pits Cleanup Act. Cleanup and Abatement order has been issued.
	Tulare County Wells*	1,2-D	1,2-D detected in wells (AB 1803 sampling).
Sacramento	Sacramento Army Depot	Diazinon, Dursban,	Assessment report requested. Federal Superfund work in progress.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Sacramento	McClellan Air Force Base	Aldrin, Alpha-BHC, Beta-BHC, Delta-BHC, Gamma-BHC, (Lindane), 4,4-DDD, 4,4-DDE, 4,4-DDT, Dieldrin, Alpha-endosulfan, Endosulfan Sulfate, Heptachlor, Heptachlor Epoxide, 2,4-D, 2,4,5-T, 2,4,5-TP	Ground water cleanup underway.
San Joaquin	Occidental Chemical	2,4-D, 2,4,5-T, DEF, Toxaphene, Lindane, EDB, DBCP, Dieldrin, Delnav, Dimethoate, Disulfoton, Sevin, Heptachlor, DDT, DDE, DDD, Aldrin, Methylparathion, Ethylparathion	Site remediation occurring pursuant to stipulation and judgement approving settlement (1981).
	Defense Depot Tracy	Bromacil	Assessment ongoing.
	San Joaquin County Wells*	DBCP	Pesticides detected in 18 wells (AB 1803 sampling). Assessment ongoing.
	Sharpe Army Depot Stockton	Bromacil	Assessment ongoing.
	Trinkle & Boys Flying Service	2,4-D, Carbofuran, Chlorpyrifos, Diazinon, Endosulfan, Fenthion, Malathion, Methomyl, Prometon, Prometryn, Simazine, Toluene, Xylene	Assessment ongoing. Monitoring and reporting program issued.
	Marley Cooling	Arsenic, Copper, Chromium	Toxic Pits Cleanup Act site.
	McCormick & Baxter	Pentachlorophenols, Creosote	Toxic Pits Cleanup Act site.
	Navy Communication Station	DDD	Assessment ongoing.
	Triple "E" Produce	Chloroform	Assessment ongoing.
	Brea Agricultural Service (Stockton)	1,2-Dichloroprapane	Investigation ongoing.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Stanislaus	Chemagic (manufacturing site; highly contaminated soil, and moderate levels in ground water).	BHC, DDT	Ongoing monitoring. Ground water treatment alternatives being evaluated. Field inspection and sampling.
	Geer Road Landfill	1,1NCA, 1,1,1TAA, 1,2TCE, TCE, PCA, Freons	Assessment continuing under monitoring program. Corrective action plan submitted.
	Stanislaus County Wells*	DBCP	DBCP detected in 42 wells (AB 1803 sampling). Assessment began February 1987. Ten Modesto City wells are included in a State Superfund Study.
Stanislaus	Union Carbide Test Plots	Aldicarb	Additional assessment work ongoing.
	Shell Agricultrual (Research facility; pesticide in ground water probably the result of use on test plots).	Bladex	Working with Shell on site evaluation. Bladex pollution contained on-site.
	Thunderbolt Riverbank (wood treatment facility).	Chromium	Evaluation of site for contamination and secondary containment of treatment solutions. Ground water extraction appears successful.
	Hawke Dusters (pesticides and possible breakdown products in ground water under rinse water storage pond).	Dicofol, Methomyl, PCNB, Copper	Enforcement action against site owners in order to obtain site assessment and cleanup.
		1,2-DCE, Chloroform, 1,20DCA, 1,1,1-TCA, Carbon Tetrachloride, Bromodichloromethane	Cleanup and abatement order issued. Toxic Pits Cleanup Act site.
	Valley Wood	Copper, Chromium, Arsenic	Out-of-court settlement. Federal Superfund site. Interim cleanup in progress.
	City of Turlock Airport	Dieldrin, Propham, Neburon	Contaminated soil removed. Ground water being monitored.
Merced	Merced County Wells*	DBCP, Atrizine, Simazine	Pesticides detected in 25 wells (AB 1803 sampling).

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Merced	Merced Municipal Airport	DDT, DDD, DDE, Endosulfan, Toxaphene, Alachlor, Endrin, Captan, Dicofol, Methoxychlor	Phase II investigation to determine extent of contamination.
	Hamburg Ranch	DDT and Derivatives, Endosulfan, Toxaphane, Nemacur, Ethylparathion	Determine extent of contamination and develop appropriate action plan.
Sutter	Bowles Flying Service	2,4-D, Bolero, Diuron, Methayl, Ordram, Simazine	Assessment ongoing. Toxic Pits Cleanup Act site. Cease and Desist Order issued.
Yolo	Frontier Fertilizer Company, Davis	EDB	Cleanup and Abatement Order issued. State Superfund initiated.
	DOW Elanco Davis Agricultural Research	Picloram, Dinoseb, 1,2-D, 1,2-Dichloroethane	Cleanup of soils in progress, ground water monitoring continuing.
	Yolo County Wells*	1,2-D, EDB	Pesticides detected in two wells (AB 1803 sampling).
	U.C. Davis Pesticide	Chlorpyrifos, Dicamba, Atrazine, Aldrin	Remediation workplan requested.
Modoc	I'SOT, Inc., Canby	Pentachlorophenol	Contaminated soil removed and Cleanup and Abatement Order rescinded. No further action required
Siskiyou	Roseburg Forest Products Mt. Shasta	Pentachlorophenol	Soil and ground water investigation indicated no site contamination. No further action required.
Shasta	Calaran Lumber Company, Redding	Pentachlorophenol	Cleanup and Abatement Order issued Contaminated soil removed, monitoring wells installed, and ground water monitoring in progress.
	Fibreboard Corporation Burney Operations	Pentachlorophenol	Site cleanup completed and area paved. Monitoring wells installed and ground water monitoring in progress.
	Roseburg Forest Products, Paul Bunyan Facility	Pentachlorophenol	Discharger paved over contaminated soil and installed lysimetes. Monitoring in progress.
	Sierra Pacific Industries, Central Valley	Pentachlorophenol	Dip system removed and area paved. Monitoring of runoff during storm periods indicates PCP still discharging to surface waters. Staff requesting further remediation.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Shasta	Sierra Pacific Industries, Old Champion Facility	Pentachlorophenol	Contaminated soil removed and site considered clean. No further action required.
Tehama	Crane Mills, Paskenta	Pentachlorophenol	Contaminated soil removed and ground water monitoring in progress.
	Louisiana-Pacific, Red Bluff	Pentachlorophenol	Contaminated soil removed and ground water monitoring in progress.
	Waulevo, Inc., Corning	Pentachlorophenol	Tank and contaminated soil removed. No further action required.
Plumas	Siskiyou-Plumas Lumber Company Quincy Operations	Pentachlorophenol	Contaminated soil removed and ground water monitoring wells installed. Monitoring of ground water continuing.
Solano	Wickes Forest Industries	Chrome	Ground water cleanup underway.
Colusa	Moore Aviation (pesticides in ground water under rinse water disposal site).	2,4-D, MCPA	Site cleanup and ground water remediation.
Glenn	Willows Airport (pesticides at low levels in shallow ground water under disposal pond site).	Toxaphene, Endosulfan, Diuron, 2,4-D, Dinoseb, Dicamba	Pond closed, contaminated soil removed, and ongoing ground water monitoring.
Kings	Lemoore N.A.S.	Unspecified	Investigation ongoing.
	Blair Field	2,4-D, Dicofol, Diazinon, Propargite	Investigation of rinse water discharge to earthen ditch.
	Blair Aviation	Trifluralin, Mevinphos, Phorate	Contamination assessment requested.
	Lakeland	DDT, Toxaphene	Toxic Pits Cleanup Act site, hydrogeologic assessment report is late; Cleanup and Abatement Order has been issued. Referred to Attorney General.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Tuolumne	Tuolumne County Wells*	Methylene Chloride	Methylene chloride detected in one well (AB 1803 sampling).

* Number of wells under investigation from AB 1803 sampling.

Fresno County - 30
Kern County - 2
Tulare County - 2
Merced County - 24
Stanislaus County - 1
Yolo County - 2
Tuolumne County - 1

Table 6 **ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LAHONTAN REGION 1991**

As part of its self-monitoring program, the Lake Tahoe Golf Course samples monitoring wells for pesticide active ingredients. On April 25, 1991, pentachloronitrobenzene (active ingredient in fungicide) was detected in three monitoring wells. On May 20, 1991, Regional Board staff collected samples from the wells and split the samples for analyses by both the Region's contract laboratory and by the Lake Tahoe Golf Course's laboratory. Upon this retest, all samples and subsequent self-monitoring reports have shown no detectable levels of pentachloronitrobenzene. Individual domestic supply wells are located near the golf course but were not sampled.

Table 7 ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, COLORADO RIVER BASIN REGION 1991

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Imperial	Central Brave Agricultural Service	4,4-DDE, Endosulfan	Recalcitrant Discharger. Referred to Attorney General for nonpayment of fees.
	City of Brawley	4,4-DDE, Dieldrin	Completing sampling for Hydrogeologic Assessment Report required by Toxic Pits Cleanup Act.
	Visco Flying Service	4,4-DDE, 4,4-DDD, 4,4-DDT, Endosulfan I & II	Impoundment remediated, capped, and closed in place.
	U.C. Davis Agricultural Field Station	Docthal, Diuron	Completing work for Hydrogeological Assessment Report under Toxic Pits Cleanup Act.
	J.R. Simplot Company Sandin Siding Facility	Dieldrin, 4,4-DDT, Endrin	Cleanup and Abatement Order. Site in remediation process.
	Stoker Company	Endosulfan I, II, Dinoseb, 2,4-DB	Closure of surface impoundment.
	Ross Flying Service	4,4-DDD, 4,4-DDE 4,4-DDT, Dieldrin	Closure of surface impoundment. Quarterly monitoring of ground water.
Riverside	West Coast Flying	Endosulfan I & II, Disalfoton,	Recalcitrant Discharger. Referred to Attorney General for nonpayment of fees.
	Woten Aviation Services	Disyston, DEF, Ethylparathion, Methylparathion	Cleanup and Abatement Order.
	Foster Gardner, Inc. (Coachella Facility)	1,2-Dichloroethane, 1,2-Dichloropropane, Ethylene-dibromide	Cleanup and Abatement Order issued October 1991.
	Cy Mouradick & Sons, Inc.	4,4-DDE, Lindane, Dibromochloropropane	Site assessment in progress.
	Farmers Aerial Service, Inc.	4,4-DDE, Endosulfan I	Closure of disposal area.

Table 8

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SANTA ANA REGION 1991

There are currently 99 confirmed detections of pesticides in the Santa Ana Region. Only one of these has been attributed to a point source discharge. Ground water extraction and treatment at this site is being performed under an order issued by the Regional Board. With the exception of this, all detections on this list are from domestic and agricultural production wells. Ninety six of these wells contain dibromochloropropane (DBCP), four contain simazine, and one contains 1,2-dichloropropane (two wells contain both DBCP and simazine).

The presence of DBCP in the Region's ground water has resulted in both an actual and threatened impact on the beneficial use of water as a drinking water supply, as 77 of the 94 wells containing DBCP are drinking water wells.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Orange	Great Western Savings, Irvine	1,2-D, EDB, 1,2-DCA	NDPES permit issued November 1986. Ground water extraction and treatment continuing. Additional monitoring/extraction wells will be installed in November 1991.
Riverside	Sunnymead MWC (Wells 3 & 4 mun.)	DBCP	Both wells were sold to an adjacent water agency (Eastern Municipal Water District) in February 1991. Customers are being served by the new District from other supply sources. District is planning to use one of the wells in the near future.
	Arlington Basin	DBCP	Construction of a seven MGD reverse osmosis plant with partial flow through a GAC unit for treatment of TDS, NO^3 and DBCP was completed in September 1990. About 4 MGD of ground water is treated and 2.7 MGD is bypassed. Treated water is mixed with the bypassed water and discharged to a local channel for ground water recharge purposes. Saltbrine (0.8 MGD) is discharged to the Santa Ana Regional Interceptor which discharges to the ocean via the Orange County sewage treatment plant.
	City of Corona (Well 8, mun.)	Simazine	Well is being completely rehabilitated. Simazine was not detected in the sampling round prior to the start of rehabilitation work. Chemical Use Questionnaires have been sent to nearby potential sources to determine if solely nonpoint source related. Chlorinated solvents have also been found. Site investigation is in progress.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Riverside	Home Gardens CWD (Wells 2 & 3, mun.)	DBCP, Simazine	Water purveyor has closed these wells and is now purchasing water from City of Riverside.
	City of Riverside (Twin Spring, mun.)	DBCP	Well is out of service. No mitigation measures in effect.
	Victoria Farm MWC (Well 01, mun.)	DBCP	Well is being used; DBCP concentration is below Maximum Contaminant Level.
	City of Corona (Well 17, mun.)	Simazine	Well is being used. Trace of DBCP was detected in March 1991 sampling.
	City of Riverside (Russell "B")	Simazine	Water is being used for domestic purposes.
	City of Riverside (1st Street,	DBCP	Well is not being used due to high concentrations of DBCP. No mitigation measures in effect.
	City of Riverside (Electric Street, mun.)	DBCP	Well is being blended with other supply wells, blended water is sampled on a weekly basis.
	City of Riverside (Palmyrita, mun.)	DBCP	Well is not being used due to high concentrations of DBCP. No mitigation measures in effect.
	City of Riverside (3 wells, mun.)	DBCP	Water from Hunt Wells No. 6, 10, and 11 is being blended with other wells in the area.
	City of Riverside (4 wells, emergency, Downtown Riverside)	DBCP	No mitigation measures in effect. These four wells are also contaminated with industrial organic solvents. Investigation is underway to determine the source of the solvents.
	Riverside County Hall Record, (pr)	DBCP	No mitigation measures in effect. VOCs such as TCE and PCE have also been found. Well is used for emergency purposes only.
	Loma Linda University, Arlington, (Wells 1 & 2, mun.)	DBCP	The University is currently working with the City of Riverside to tie into the City domestic water supply distribution system. These two wells will be used for irrigation purposes at the school.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Riverside	Home Gardens School (mun.)	DBCP	Well was abandoned about two years ago. The school is now using water from Home Gardens Water District.
	Lake Hemet MWD (Wells A and B, mun.)	DBCP	One well (Well A) is being used for domestic purposes. Well B is scheduled to be used by a local farmer for irrigation purposes.
	Buschlen, Dwight (mun.)	DBCP	Well was abandoned about four years ago. A second well on the property with no traces of DBCP is being used for drinking water and irrigation.
San Bernardino	Gage System Wells (11 wells, mun.)	DBCP	The City of Riverside operates the Gage System which consists of 13 wells located along the Santa Ana River. These wells are being blended for domestic use. The City of Riverside is currently evaluating findings of a recent study by the U.S. Bureau of Reclamation regarding application of Granular Activated Carbon (GAC) technology to these wells. This study was sponsored by the Bureau and several local water agencies. The City of Riverside is currently facing some difficulties in proceeding with their application, since trace amounts of Radon have been detected in some of these wells.
	Bunker Hill Basin: Crafton/Redlands area (32 wells)	DBCP	The City of Redlands started construction of a 6,000 gpm GAC treatment system in September 1991. This GAC system will treat ground water from two wells. Treated water will be put into the local water supply distribution system. Funding for this system is from the State Board ($2.8 million) and Bond Money through the State Expenditure plan ($1.9 million) which is managed by DHS-TSCP.
	South San Bernardino Company Water District (4 wells, mun.)	DBCP	All four wells are out of service. The City of San Bernardino Water Department purchased the water district in July 1991. The City now supplies all the customers in the area.
	Cucamonga CWD (4 wells, mun.)	DBCP	One well (No. 13) has not been used since last year. The other three wells are standby wells and are used on a limited basis. Water is being purchased from MWD.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
San Bernardino	Monte Vista CWD (3 wells, mun.)	DBCP	All three wells are on stand-by status. Water is being purchased from MWD.
	City of Upland (15 wells, mun.)	DBCP	Seven wells are out of operation. Eight wells are currently being used. Some blending is required to pump these wells.
	City of Loma Linda (6 wells, mun.)	DBCP	Two wells have been abandoned. One well is out of operation due to high nitrates. The other three wells are being used. The City also purchases treated water from the City of San Bernardino.

Table 9

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION 1991

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
San Diego	City of Oceanside Water Utility District (Well no. 12-11S/4W-18L1 S)	1,2-Dichloropropane	This backup drinking water well is located in the San Luis Rey River Valley. 1,2-Dichloropropane of up to 2.3 ppm has been detected in this well. The City of Oceanside is continuing monitoring of this well and reports to the county.
	Truly Nolen Exterminating, Inc.	Aldrin, Dieldrin, Chlordane	This is an on-site abandoned well which allegedly received pesticide wastes several years ago. The pesticide constituents in the soil and ground water include aldrin, dieldrin, and chlordane. Contaminated soil has been removed. Ground water is being monitored.

REFERENCES

Ames, M., C. Cardozo, S. Nicosia, J. Troiano, S. Monk, S. Ali and S. Brown. December, 1987. Sampling for pesticide residues in California well water: 1987 update - well inventory data base. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Bierman, H. 1989. Definition of a second analytical method for the purposes of AB 2021 (memorandum). California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Braun, A. L., and L. S. Hawkins. 1991. Presence of bromacil, diuron, and simazine in surface water runoff from agricultural fields and non-crop sites in Tulare County, California. Pest Management Analysis and Planning Program, Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA. PM 91-1.

Brown, M., C. Cardozo, S. Nicosia, J. Troiano and S. Ali. December, 1986. Sampling for pesticide residues in California well water: 1986 well inventory data base. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

California Assembly Resources Subcommittee on Status and Trends. December, 1983. Draft report, status and trends of California water quality: the impact of the Clean Water Act. Sacramento, California.

California Department of Food and Agriculture. 1990. Pesticide use report: first quarter 1990. CDFA, 1220 N Street, Sacramento, CA 95814.

California Department of Health Services. March, 1985. Draft working document, the California site mitigation decision tree. CDHS Toxic Substances Control Division, Alternative Technology & Policy Development Section. Sacramento, California.

Cardozo, C. L., S. Nicosia and J. Troiano. July,1985. Agricultural pesticide residues in California well water: development and summary of a well inventory data base for non-point sources. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Cardozo, C., M. Pepple, J. Troiano, D. Weaver, B. Fabre, S. Ali and S. Brown. December, 1988. Sampling for pesticide residues in California well water: 1988 update - well inventory data base. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Cardozo, C., C. Moore, M. Pepple, J. Troiano, D. Weaver and SWRCB Staff. December, 1989. Sampling for pesticide residues in California well water: 1989 update - well inventory data base. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Cohen, D. B. and G. W. Bowes. December, 1984. Water quality and pesticides: a California risk assessment program. Vol. 1. State Water Resources Control Board, Toxic Substances Control Program. Sacramento, California.

Cohen, S. Z., S. M. Creeger, R. F. Carsel and C. G. Enfield. 1984. Potential pesticide contamination of groundwater resulting from agricultural uses. In R. F. Krueger, and J. N. Seiber (eds.). Treatment and disposal of pesticide wastes, ACS Symposium Series 259. Washington, DC.

Di Toro, D.M. 1985. A particle interaction model of reversible organic chemical sorption. Chemosphere, 14(10):1503-1538.

Graham, R. C., and A. Ulery. 1990. Distribution of herbicide residues in relation to soil morphology in two Glenn County Vertisol profiles. Submitted to California Department of Food and Agriculture (Now Cal-EPA Department of Pesticide Regulation). Final Report - Contract #3944.

Heath, Ralph C. 1983. Basic Ground-Water Hydrology. United States Geological Survey Water-Supply Paper 2220. Prepared in cooperation with the North Carolina Department of Natural Resources and Community Development. United States Government Printing Office.

Hunt, J., R. N. Sitar and K. S. Udell. August, 1986. Organic solvents and petroleum hydrocarbons in the subsurface: transport and clean-up. Report No. 86-11. Sanitary Engineering and Environmental Health Research Laboratory, University of California, Berkeley.

Johnson, B. November, 1988. Setting revised specific numerical values. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Johnson, B. October, 1989. Setting revised specific numerical values. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Johnson, B. 1991. Setting revised specific numerical values: April, 1991. Environmental Hazards Assessment Program, California Department of Pesticide Regulation, Environmental Hazards Assessment Program, Sacramento, CA. EH 91-6.

Johnson, B., C. Collison, J. Marade and N. Miller. In Preparation. A test of procedures for determining the ground water protection list. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Lee, M. September, 1983. Aldicarb contamination of ground water in Del Norte County (memorandum). California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Marshack, J. B. February 1991. A compilation of water quality goals. California Regional Water Quality Control Board, Central Valley Region. Sacramento, California.

Miller, C., M. Pepple, J. Troiano, D. Weaver and W. Kimaru. December 1, 1990. Sampling for pesticide residues in California well water: 1990 update well inventory data base. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Oshima, R. J. September, 1988. Investigation Phase for Chemicals Entered into the Pesticide Detection Response Process (memorandum). California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Price, P. and W. Umino. March, 1985. The leaching fields: a non-point threat to groundwater. Assembly Office of Research. Sacramento, California.

Rao, P. S. C., A. G. Hornsby and R. E. Jessup. 1985. Indices for ranking the potential for pesticide contamination of groundwater. In Proceedings of the Soil and Crop Science Society of Florida, Vol. 44. University of Florida. Gainsville, Florida.

Roux, P. H., R. H. Halol, and R. H. Ross, Jr. 1991. Small-scale retrospective ground water monitoring study for simazine in different hydrogeological settings. Ground Water Monitor. Rev. Vol 19:173-181.

Russell, H. H., Jackson, D. P. Spath and S. A., Book. 1987. Chemical contamination of California drinking water. Western Journal of Medicine, Vol. 147:(5); pp.615-622.

Snyder, R., D. W. Henderson, W.D. Pruitt, and A. Dong. 1985 California irrigation management information system - final report. California Department of Water Resources, contract No. 53812. University of California, Davis.

Teso, R. R., T. Younglove, M. R. Peterson, D. L. Sheeks III, and R. E. Gallavan. July/August 1988. Soil taxonomy and surveys: classification of areal sensitivity to pesticide contamination of groundwater. Journal of Soil and Water Conservation, July/August 1988. Vol. 43:(4); pp. 348-352.

Troiano, J. and C. Garretson. January, 1988. Effects of seasonal rainfall on pesticide leaching in Fresno County. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Troiano, J., C. Garretson, C. Krauter, and J. Brownell. July, 1990. Atrazine leaching and its relation to percolation of water as influenced by three rates and four methods of irrigation water application. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

Troiano, J. and C. Garretson. In Preparation. Leaching of simazine and bromacil in response to delay in onset of irrigation. California Department of Pesticide Regulation, Environmental Hazards Assessment Program. Sacramento, California.

Wagenet, R. J. and J. L. Hutson. 1989. LEACHM Estimation and Chemistry Model. Center for Environmental Research, Cornell University, Ithaca, N.Y., Vol. 2, Version 2, p. 148.

Welling, R., J. Troiano, R. Maykoski and G. Loughner. August, 1986. Effects of agronomic and geologic factors on pesticide movement in soil: comparison of two ground water basins in California. In Proceedings of the Agricultural Impact on Ground Water - A Conference. August, 198, Omaha, Nebraska; pp. 666-685.

Wilkerson, M. R. and K. D. Kim. December, 1986. The pesticide contamination prevention act: setting specific numerical values. California Department of Food and Agriculture, Environmental Hazards Assessment Program. Sacramento, California.

APPENDICES

A. THE PESTICIDE CONTAMINATION PREVENTION ACT

Assembly Bill No. 2021

CHAPTER 1298

An act to add Article 15 (commencing with Section 13141) to Chapter 2 of Division 7 of the Food and Agricultural Code, relating to water contamination.

[Approved by Governor September 30, 1985. Filed with Secretary of State September 30, 1985.]

LEGISLATIVE COUNSEL'S DIGEST

AB 2021, Connelly. Economic poisons: groundwaters.

(1) Existing law does not require registrants of economic poisons to submit specified information relating to contamination of groundwaters as part of the initial registration or renewal of registration process.

This bill would enact the Pesticide Contamination Prevention Act. The bill would require each registrant of an economic poison registered for agricultural use to submit specified information to the Director of Food and Agriculture, not later than December 1, 1986, relating generally to the impact of the economic poison on water sources. The bill would provide for an extension for submission of some of this information for up to 2 years, as specified, but in no event later than December 1, 1989. Since violation of these provisions would be a misdemeanor, the bill would impose a state-mandated local program. Inadequate information on a particular economic poison would be defined to be a groundwater protection data gap after a specified determination by the director. The director would be prohibited from registering or renewing the registration of an economic poison with a groundwater protection data gap after December 1, 1988, for economic poisons applied with ground-based application equipment or by chemigation and after December 1, 1989, for economic poisons intended for use with other than ground-based application equipment, unless the registrant has been granted a current extension under the bill.

The director would be required to establish the Groundwater Protection List of specified economic poisons and to report specified information to the Legislature, the State Department of Health Services, and the State Water Resources Control Board not later than December 1, 1987, regarding economic poisons, as specified.

The director would be required to perform a soil and water monitoring program pursuant to a specified schedule and would be required to report all monitoring results to the State Department of Health Services and the board.

The bill would require the director, on or before December 1, 1987, and annually thereafter, to request a budget appropriation in order to fund specified activities under the bill.

The bill would also require the director to cancel the registration of economic poisons with specified criteria relating to groundwater findings unless the registrant is granted an extension or the director makes specified findings.

The bill would also require the director to maintain a specified well sampling data base and, not later than June 30, 1986, the director, the State Department of Health Services, and the board, jointly, would be required to establish minimum requirements for well sampling that would apply to all agencies conducting the sampling after December 1, 1986. This requirement would impose a state-mandated local program on local agencies so affected. The director would be required to report annually, commencing on December 1, 1986, to the State Department of Health Services and the board on well sampling, as specified.

(2) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement, including the creation of a State Mandates Claims Fund to pay the costs of mandates which do not exceed $500,000 statewide and other procedures for claims whose statewide costs exceed $500,000.

This bill would provide that reimbursement shall be made pursuant to those statutory procedures and, if the statewide cost does not exceed $500,000, shall be payable from the State Mandates Claims Fund, except that, for certain costs, the bill would provide that no reimbursement is required for a specified reason.

(3) The bill would provide that, notwithstanding Section 2231.5 of the Revenue and Taxation Code, this bill does not contain a repealer, as required by that section; therefore, the provisions of the bill would remain in effect unless and until they are amended or repealed by a later enacted bill.

The people of the State of California do enact as follows:

SECTION 1. Article 15 (commencing with Section 13141) is added to Chapter 2 of Division 7 of the Food and Agricultural Code, to read:

Article 15. The Pesticide Contamination Prevention Act

13141. The Legislature finds and declares all of the following:

(a) It is the right of every citizen in this state to drink safe, potable, wholesome, and pure drinking water.

(b) The health and economic prosperity of rural communities and individual farm families in the state are threatened by contaminated drinking water supplies because of their proximity to the use of pesticides.

(c) Pesticide contaminants and other organic chemicals are being

found at an ever increasing rate in underground drinking water supplies.

(d) The United States Environmental Protection Agency has concluded that evidence of relatively localized levels of pesticide pollution should be treated as a warning of more widespread, future contamination.

(e) Groundwater once polluted cannot be easily cleaned up; thus, there is a considerable potential that groundwater pollution will continue long after actions have been taken to restrict application of the pesticide to land.

(f) Due to the potential widespread exposure to public drinking water supplies from pesticide applications to the land and the resultant risk to public health and welfare, the potential for pollution of groundwater due to pesticide use must be considered in the registration, renewal, and reregistration process.

(g) It is the purpose of this article to prevent further pesticide pollution of the groundwater aquifers of this state which may be used for drinking water supplies.

13142. For the purposes of this article, the following definitions apply:

(a) "Board" means the State Water Resources Control Board.

(b) "Groundwater protection data gap" means that, for a particular economic poison, the director, after study, has been unable to determine that each study required pursuant to subdivision (a) of Section 13143 has been submitted or that each study submitted pursuant to subdivision (a) of Section 13143 is valid, complete, and adequate.

(c) "Henry's Law constant" is an indicator of the escaping tendency of dilute solutes from water and is approximated by the ratio of the vapor pressure to the water solubility at the same temperature.

(d) "Soil adsorption coefficient" is a measure of the tendency of economic poisons, or their biologically active transformation products, to bond to the surfaces of soil particles.

(e) "Pesticide registrant" means a person that has registered an economic poison pursuant to this chapter.

(f) "Agricultural use" has the same meaning as defined in Section 11408.

(g) "Active ingredient" has the same meaning as defined in Section 136 of Title 7 of the United States Code.

(h) "Economic poison" has the same meaning as defined in Section 12753.

(i) "Degradation product" means a substance resulting from the transformation of an economic poison by physicochemical or biochemical means.

(j) "Pollution", for the purposes of this article, means the introduction into the groundwaters of the state of an active ingredient, other specified product, or degradation product of an

active ingredient of an economic poison above a level, with an adequate margin of safety, that does not cause adverse health effects.

(k) "Chemigation" means a method of irrigation whereby an economic poison is mixed with irrigation water before the water is applied to the crop or the soil.

(*l*) "Soil microbial zone" means the zone of the soil below which the activity of microbial species is so reduced that it has no significant effect on pesticide breakdown.

13143. (a) Not later than December 1, 1986, a person that has registered an economic poison in California for agricultural use shall submit to the director the information prescribed in this subdivision. The information shall be submitted for each active ingredient in each economic poison registered. The registrant shall submit all of the following information:

(1) Water solubility.

(2) Vapor pressure.

(3) Octanol-water partition coefficient.

(4) The soil adsorption coefficient.

(5) Henry's Law constant.

(6) Dissipation studies, including hydrolysis, photolysis, aerobic and anaerobic soil metabolism, and field dissipation, under California or similar environmental use conditions.

(7) Any additional information the director determines is necessary.

(b) The director also may require the information prescribed in subdivision (a) for other specified ingredients and degradation products of an active ingredient in any economic poison. The director shall also require this information when the State Department of Health Services or the board submits a written request for the information to the director, if the State Department of Health Services or the board specifies the reasons why they consider the information necessary. The director shall deny the request upon a written finding that, based on available scientific evidence, the request would not further the purposes of this article.

(c) All information submitted pursuant to subdivision (a) shall be presented in English and summarized in tabular form on no more than three sheets of paper with the actual studies, including methods and protocols attached. All information shall, at a minimum, meet the testing methods and reporting requirements provided by the Environmental Protection Agency Pesticide Assessment Guidelines, Subdivision D Series 60 to 64, inclusive, for product chemistry and Subdivision N Series 161 to 164, inclusive, for environmental fate, including information required for degradation products in specific studies. With prior approval from the director, registrants may use specified alternative protocols as permitted by the United States Environmental Protection Agency guidelines, if the director finds use of the protocol is consistent with, and accomplishes the objectives of, this article. Studies conducted on active ingredients in the

formulation of economic poisons shall meet the same testing methods as required for studies conducted on active ingredients. The department, in consultation with the board, may, in addition, require specified testing protocols that are specific to California soil and climatic conditions. The director may give a pesticide registrant an extension of up to two years if it determines that this additional time is necessary and warranted to complete the studies required in paragraph (6) of subdivision (a). No extension of the deadline for these studies shall go beyond December 1, 1989. When seeking the extension, the registrant shall submit to the director a written report on the current status of the dissipation studies for which the extension is being sought. For registrants granted an extension pursuant to this section, Section 13145 shall be effective upon the completion date established by the director.

(d) The director may grant the registrant an extension beyond the one authorized in subdivision (c), if all of the following conditions are met:

(1) The registrant submits a written request to the director for an extension beyond the one granted pursuant to subdivision (c). The request shall include the reasons why the extension is necessary and the findings produced by the study up to the time the request is made.

(2) The director finds that the registrant has made every effort to complete the studies required in paragraph (6) of subdivision (a) within the required time limits of the extension granted pursuant to subdivision (c) and that those studies could not be completed within the required time limits due to circumstances beyond the control of the registrant.

(3) The director establishes a final deadline, not to exceed one year beyond the time limit of the extension granted pursuant to subdivision (c), and a schedule of progress by which the registrant shall complete the studies required in paragraph (6) of subdivision (a).

(e) After December 1, 1986, no registration of any new economic poison shall be granted unless the applicant submits all of the information required by the director pursuant to this article and the director finds that the information meets the requirements of this article.

13144. (a) Not later than December 1, 1986, the department shall establish specific numerical values for water solubility, soil adsorption coefficient (Koc), hydrolysis, aerobic and anaerobic soil metabolism, and field dissipation. The values established by the department shall be at least equal to those established by the Environmental Protection Agency. The department may revise the numerical values when the department finds that the revision is necessary to protect the groundwater of the state. The numerical values established or revised by the department shall always be at least as stringent as the values being used by the Environmental

Protection Agency at the time the values are established or revised by the department.

(b) Not later than December 1, 1987, and annually thereafter, the director shall report the following information to the Legislature, the State Department of Health Services, and the board for each economic poison registered for agricultural use:

(1) A list of each active ingredient, other specified ingredient, or degradation product of an active ingredient of an economic poison for which there is a groundwater protection data gap.

(2) A list of each economic poison that contains an active ingredient, other specified ingredients, or degradation product of an active ingredient which is greater than one or more of the numerical values established pursuant to subdivision (a), or is less than the numerical value in the case of soil adsorption coefficient, in both of the following categories:

(A) Water solubility or soil adsorption coefficient (Koc).

(B) Hydrolysis, aerobic soil metabolism, anaerobic soil metabolism, or field dissipation.

(3) For each economic poison listed pursuant to paragraph (2) for which information is available, a list of the amount sold in California during the most recent year for which sales information is available and where and for what purpose the economic poison was used, when this information is available in the pesticide use report.

(c) The department shall determine to the extent possible, the toxicological significance of the degradation products and other specified ingredients identified pursuant to paragraph (2) of subdivision (b).

13145. (a) Any registrant of an economic poison identified in paragraph (1) of subdivision (b) of Section 13144 shall be subject to a fine of up to ten thousand dollars ($10,000) for each day the groundwater protection data gap exists. In determining the amount of the fine, the director shall consider both of the following:

(1) The extent to which the registrant has made every effort to submit valid, complete, and adequate information within the required time limits.

(2) Circumstances beyond the control of the registrant that have prevented the registrant from submitting valid, complete, and adequate information within the required time limits.

(b) If there is a dispute between the director and a registrant regarding the existence of a groundwater protection data gap and the director desires to levy a fine on the registrant pursuant to this section, the director shall submit the issues of the dispute to the subcommittee created pursuant to subdivision (b) of Section 13150. The subcommittee shall review the evidence submitted by the registrant and the director and make recommendations to the director on whether or not the groundwater data gap exists.

(c) The provisions of subdivisions (a) and (b) shall not apply to pesticide products whose registration has lapsed or has been

cancelled, or to products that have been granted a current extension pursuant to Section 13143.

(d) The director shall, by regulation, establish a list of economic poisons that have the potential to pollute groundwater. The list shall be entitled the Groundwater Protection List. Notwithstanding the provisions of Chapter 3.5 (commencing with Section 11340) of Division 3 of Title 2 of the Government Code, the director shall immediately place all economic poisons identified in paragraph (2) of subdivision (b) of Section 13144 on the Groundwater Protection List and shall regulate the use of these economic poisons if the economic poison is intended to be applied to or injected into the soil by ground-based application equipment or by chemigation, or the label of the economic poison requires or recommends that the application be followed, within 72 hours, by flood or furrow irrigation. The director shall adopt regulations to carry out the provisions of this article. The regulations shall include, but are not limited to, the following:

(1) Any person who uses an economic poison which has been placed on the Groundwater Protection List is required to report to the county agricultural commissioner the use of the economic poison on a form prescribed by the director. The reporting deadline shall conform to the deadline established for the reporting of the use of restricted materials.

(2) Dealers of economic poisons shall make quarterly reports to the director of all sales of economic poisons. This report shall include lists of all sales by purchases.

13146. (a) The director shall not register or renew the registration of an economic poison intended to be applied to or injected into the ground by ground-based application equipment or by chemigation after December 1, 1988, if there is a groundwater protection data gap for that economic poison, unless the registrant has been granted a current extension pursuant to Section 13143.

(b) The director shall not register or renew the registration of an economic poison intended for use with other than ground-based application equipment after December 1, 1989, if there is a groundwater protection data gap for that economic poison, unless the registrant has been granted a current extension pursuant to Section 13143.

(c) If a registrant does not comply with the information requirements of Section 13143, the department shall file the information requirements of Section 13143 in accordance with procedures provided in subparagraph (B) of paragraph (2) of subsection (c) of Section 136a of Title 7 of the United States Code. In order to carry out this section, the director has the same authority to require information from registrants of active pesticide ingredients that the administrator of the Environmental Protection Agency has pursuant to subparagraph (B) of paragraph (2) of subsection (c) of Section 136a of Title 7 of the United States Code.

On or before July 1, 1986, the director shall, by regulation, prescribe procedures for resolving disputes or funding the filing of the information requirements of Section 13143. The procedures may include mediation and arbitration. The arbitration procedures, insofar as practical, shall be consistent with the federal act, or otherwise shall be in accordance with the commercial arbitration rules established by the American Arbitration Association. The procedures shall be established so as to resolve any dispute with the timetable established in Section 13143.

(d) For an active ingredient or economic poison for which a registrant or registrants do not provide the information required pursuant to Section 13143, the director may determine the active ingredient or economic poison to be critical to agricultural production and the director may utilize assessments charged to those registrants of the active ingredient for which the information is required pursuant to Section 13143 in amounts necessary to cover the department's expenses in obtaining the information. The assessment shall be made pursuant to Section 12824. The director may also request an appropriation to be used in combination with assessments to obtain the required information.

13147. On or before December 1, 1987, and annually thereafter, the director shall request a budget appropriation in order to meet the reasonable and anticipated costs of conducting soil and water monitoring pursuant to Section 13148, a review of data submitted pursuant to Section 13143, and the administration of economic poisons placed on the Groundwater Protection List pursuant to this article.

13148. (a) In order to more accurately determine the mobility and persistence of the economic poisons identified pursuant to paragraph (2) of subdivision (b) of Section 13144 and to determine if these economic poisons have migrated to groundwaters of the state, the director shall conduct soil and groundwater monitoring statewide in areas of the state where the economic poison is primarily used or where other factors identified pursuant to Section 13143 and subdivision (b) of Section 13144, including physicochemical characteristics and use practices of the economic poisons, indicate a probability that the economic poison may migrate to the groundwaters of the state. The monitoring shall commence within one year after the economic poison is placed on the Groundwater Protection List and shall be conducted in accordance with standard protocol and testing procedures established pursuant to subdivision (b). Monitoring programs shall replicate conditions under which the economic poison is normally used in the area of monitoring. In developing a monitoring program, the director shall coordinate with other agencies that conduct soil and groundwater monitoring.

(b) Within 90 days after an economic poison is placed on the Groundwater Protection List pursuant to subdivision (d) of Section

13145, the director, in consultation with the board, shall develop a standard protocol and testing procedure for each economic poison identified pursuant to subdivision (d) of Section 13145.

(c) The director shall report all monitoring results to the State Department of Health Services and the board.

13149. (a) Within 90 days after an economic poison is found under any of the conditions listed in paragraph (1), (2), or (3), the director shall determine whether the economic poison resulted from agricultural use in accordance with state and federal laws and regulations, and shall state in writing the reasons for the determination.

(1) An active ingredient of an economic poison has been found at or below the deepest of the following depths:

(A) Eight feet below the soil surface.

(B) Below the root zone of the crop where the active ingredient was found.

(C) Below the soil microbial zone.

(2) An active ingredient of an economic poison has been found in the groundwaters of the state.

(3) The economic poison has degradation products or other specified ingredients which pose a threat to public health and which have been found under the conditions specified for active ingredients in either paragraph (1) or (2).

(b) Upon a determination by the director that an economic poison meets any of the conditions specified in paragraph (1), (2), or (3) of subdivision (a) as a result of agricultural use in accordance with state and federal laws and regulations, the director shall immediately notify the registrant of the determination and of the registrant's opportunity to request a hearing pursuant to subdivision (c).

(c) Any economic poison that meets any of the conditions in subdivision (b) shall be subject to the provisions of Section 13150, provided the registrant of the economic poison requests, within 30 days after the notice is issued, that the subcommittee conduct a hearing, as described in Section 13150. Notwithstanding any other provision of law, if the registrant does not request the hearing within 30 days after the notice is issued, the director shall cancel the registration of the economic poison.

(d) For the purposes of this section, any finding of an economic poison shall result from an analytical method approved by the department and shall be verified, within 30 days, by a second analytical method or a second analytical laboratory approved by the department.

13150. The director may allow the continued registration, sale, and use of an economic poison which meets any one of the conditions specified in Section 13149 if all of the following conditions are met:

(a) The registrant submits a report and documented evidence which demonstrate both of the following:

(1) That the presence in the soil of any active ingredient, other specified ingredient, or degradation product does not threaten to pollute the groundwaters of the state in any region within the state in which the economic poison may be used according to the terms under which it is registered.

(2) That any active ingredient, other specified ingredient, or degradation product that has been found in groundwater has not polluted, and does not threaten to pollute, the groundwater of the state in any region within the state in which the economic poison may be used according to the terms under which it is registered.

(b) A subcommittee of the director's pesticide registration and evaluation committee, consisting of one member each representing the director, the State Department of Health Services, and the board, holds a hearing, within 180 days after it is requested by the registrant, to review the report and documented evidence submitted by the registrant and any other information or data which the subcommittee determines is necessary to make a finding.

(c) The subcommittee, within 90 days after the hearing is conducted, makes any of the following findings and recommendations:

(1) That the ingredient found in the soil or groundwater has not polluted and does not threaten to pollute the groundwaters of the state.

(2) That the agricultural use of the economic poison can be modified so that there is a high probability that the economic poison would not pollute the groundwaters of the state.

(3) That modification of the agricultural use of the economic poison pursuant to paragraph (2) or cancellation of the economic poison will cause severe economic hardship on the state's agricultural industry, and that no alternative products or practices can be effectively used so that there is a high probability that pollution of the groundwater of the state will not occur. The subcommittee shall recommend a level of the economic poison that does not significantly diminish the margin of safety recognized by the subcommittee to not cause adverse health effects.

When the subcommittee makes a finding pursuant to paragraph (2) or (3), it shall determine whether the adverse health effects of the economic poison are carcinogenic, mutagenic, teratogenic, or neurotoxic.

(d) The director, within 30 days after the subcommittee issues its findings, does any of the following:

(1) Concurs with the subcommittee finding pursuant to paragraph (1) of subdivision (c) of Section 13149,

(2) Concurs with the subcommittee finding pursuant to paragraph (2) of subdivision (c) of Section 13149, and adopts modifications that result in a high probability that the economic poison would not pollute the groundwaters of the state,

(3) Concurs with the subcommittee findings pursuant to

paragraph (3) of subdivision (c), or determines that the subcommittee finding pursuant to paragraph (2) of subdivision (c) will cause severe economic hardship on the state's agricultural industry. In either case, the director shall adopt the subcommittee's recommended level or shall establish a different level, provided the level does not significantly diminish the margin of safety to not cause adverse health effects.

(4) Determines that, contrary to the finding of the subcommittee, no pollution or threat to pollution exists. The director shall state the reasons for his or her decisions in writing at the time any action is taken, specifying any differences with the subcommittee's findings and recommendations. The written statement shall be transmitted to the appropriate committees of the Senate and Assembly, the Department of Health Services, and the board.

When the director takes action pursuant to paragraph (2) or (3), he or she shall determine whether the adverse health effects of the economic poison are carcinogenic, mutagenic, teratogenic, or neurotoxic.

13151. Any economic poison identified pursuant to Section 13149 which fails to meet any of the conditions of Section 13150 shall be canceled.

13152. (a) The director shall conduct ongoing soil and groundwater monitoring of any economic poison whose continued use is permitted pursuant to paragraph (3) of subdivision (d) of Section 13150.

(b) Any economic poison monitored pursuant to this section that is determined, by review of monitoring data and any other relevant data, to pollute the groundwaters of the state two years after the director takes action pursuant to paragraph (3) of subdivision (d) of Section 13150 shall be canceled unless the director has determined that the adverse health effects of the economic poison are not carcinogenic, mutagenic, teratogenic, or neurotoxic.

(c) The director shall maintain a statewide data base of wells sampled for pesticide active ingredients. All agencies shall submit to the director, in a timely manner, the results of any well sampling for pesticide active ingredients and the results of any well sampling that detect any pesticide active ingredients.

(d) Not later than June 30, 1986, the director, the State Department of Health Services, and the board shall jointly establish minimum requirements for well sampling that will ensure precise and accurate results. The requirements shall be distributed to all agencies that conduct well sampling. All well sampling conducted after December 1, 1986, shall meet the minimum requirements established pursuant to this subdivision.

(e) The director, in consultation with the State Department of Health Services and the board, shall report the following information to the Legislature, the State Department of Health Services, and the board on or before December 1, 1986, and annually thereafter:

(1) The number of wells sampled for pesticide active ingredients, the location of the wells from where the samples were taken, the well numbers, if available, and the agencies responsible for drawing and analyzing the samples.

(2) The number of well samples with detectable levels of pesticide active ingredients, the location of the wells from which the samples were taken, the well numbers, if available, and the agencies responsible for drawing and analyzing the samples.

(3) An analysis of the results of well sampling described in paragraphs (1) and (2), to determine the probable source of the residues. The analysis shall consider factors such as the physical and chemical characteristics of the economic poison, volume of use and method of application of the economic poison, irrigation practices related to use of the economic poison, and types of soil in areas where the economic poison is applied.

(4) Actions taken by the director and the board to prevent economic poisons from migrating to groundwaters of the state.

SEC. 2. Reimbursement to local agencies and school districts for costs mandated by the state pursuant to this act shall be made pursuant to Part 7 (commencing with Section 17500) of Division 4 of Title 2 of the Government Code and, if the statewide cost of the claim for reimbursement does not exceed five hundred thousand dollars ($500,000), shall be made from the State Mandates Claims Fund, except that no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution for those costs which may be incurred by a local agency or school district because this act creates a new crime or infraction, changes the definition of a crime or infraction, changes the penalty for a crime or infraction, or eliminates a crime or infraction.

SEC. 3. Notwithstanding Section 2231.5 of the Revenue and Taxation Code, this act does not contain a repealer, as required by that section; therefore, the provisions of this act shall remain in effect unless and until they are amended or repealed by a later enacted act.

O

B. GLOSSARY OF TERMS USED IN THE 1991 WELL INVENTORY UPDATE REPORT

AB 1803 - (1983) A law requiring the California Department of Health Services (CDHS) to evaluate each public water system to determine its potential for contamination. The systems are required to conduct specified water analyses and to report those results to the CDHS. Based on the results, the CDHS may require the system to conduct a periodic water analysis and to report to the CDHS the results of the analyses on a quarterly basis.

AB 2021 - See "Pesticide Contamination Prevention Act".

acaricide - A pesticide (miticide) used to control mites and ticks.

Action Level (AL) - Published by CDHS's Office of Drinking water, ALs are based mainly on health affects. ALs are advisory to water suppliers. Although not legally enforceable, the majority of water suppliers have complied with action levels as though they were Maximum Contaminant Levels (MCLs).

active ingredient - The chemical or chemicals in a pesticidal formulation that are biologically active and which are capable, in themselves, of preventing, destroying, repelling or mitigating insects, fungi, rodents, weeds, or other pests.

adsorption - In the context of this report, the surface retention of (in this case, pesticide) molecules of a gas, liquid, or dissolved substance to a solid in such a manner that the adsorbed chemical is slowly made available. Clay and soils high in organic content tend to adsorb pesticides in many instances.

Agricultural Commissioner - For each county in California, the person in charge of the County Department of Agriculture. Under supervision of DPR, the Commissioner enforces the laws and regulations pertaining to agricultural and structural pest control and all other pesticidal uses.

agricultural use - (See also "legal agricultural use" and "legal agricultural use determination".) The use of any pesticide or method or device for the control of plant or animal pests, or any other pests, or the use of any pesticide for the regulation of plant growth or defoliation of plants. It excludes the sale or use of pesticides in properly labeled packages or containers which are intended only for any of the following: home use, use in structural pest control, industrial or institutional use, the control of an animal pest under the written prescription of a veterinarian, local districts, or other public agencies which have entered into and operate under a cooperative agreement with the Dept. of Public Health pursuant to section 2426 of the Health and Safety Code. (Food and Agr. Code, section 11408)

analysis - The determination of the composition of a substance by laboratory methods. In this case, it includes the separation and measurement of a pesticide or its degradation product from the sample matrix.

aquifer - A geologic formation, group of formations, or part of a formation, that is water bearing and which transmits water in sufficient quantity to supply springs and pumping wells.

basin irrigation - A method of watering by confining irrigation water within a radius of the plant stem or trunk by means of a soil dam. Also called flood irrigation.

breakdown product - See "degradation product".

chemigation - The application of pesticides through irrigation water, using irrigation techniques and equipment.

coding - A system whereby specific information concerning the analysis of a well water sample for the presence of pesticides is converted to a code of letters and numbers according to a key (see Appendix D, p. 115) in order to enter the data into the well inventory data base.

confirmed detection (DPR study) - The detection of a compound in two discrete samples taken from a single well during a 30-day time period, and analyzed either by the same laboratory using different methods or by two laboratories using the same method. The verification of the presence of a compound in ground water by this criteria fulfills section 13149(d) (FAC) of the Pesticide Contamination Prevention Act (PCPA) and may be used for regulatory purposes.

confirmed detection (by an agency other than DPR) - For purposes of the well inventory data base, the detection of a compound in two discrete samples taken from the same well during the time period of a single study.

data base record - Each chemical analysis of a well water sample for a pesticide residue or related chemical constitutes one record in the data base. Each record may contain up to 149 columns of data.

defoliant - A compound used to remove foliage from crop plants such as cotton, soybeans, or tomatoes, usually to facilitate harvest.

degradation - The breakdown of a chemical by the action of microbes, water, air, sunlight, or other agents.

degradation product - (See also "metabolite".) A substance resulting from the transformation of a pesticidal active ingredient by biological processes (e.g., microbial action) or physical or chemical processes (e.g., hydrolysis, photolysis, photooxidation).

desiccant - A compound that promotes drying or removal of moisture from plant tissues.

direct streaming - A pathway by which agricultural chemicals may reach ground water; the movement of pesticidal residue in runoff surface water to subsurface soil and, ultimately, ground water, through dry wells, soil cracks, or other direct pathways.

discrete sample - Samples taken separately from a well; not a single sample split into smaller samples.

dry well - A small-diameter hole or pit dug into the ground for the disposal of surface water by infiltration into soil.

economic poison - A pesticide or plant growth regulator; in California, any of the following: any spray adjuvant, any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment. Includes fungicides, herbicides, insecticides, nematicides, rodenticides, desiccants, defoliants, plant growth regulators, etc.

emulsifiable concentrate - A concentrated pesticidal formulation containing organic solvent and emulsifier to facilitate suspension of the active ingredient when diluted with water.

established PMZ - A Pesticide Management Zone (PMZ) (see def.) listed in section 6802, Title 3 of the California Code of Regulations (3CCR).

flood irrigation - See "basin irrigation".

formulation - The way in which a pesticidal product, containing the active ingredient, the carrier, and other additives, is prepared for practical use. Includes preparation as wettable powder, granular, emulsifiable concentrate, etc.

fumigant - Chemical used in the form of a volatile liquid or a gas. Its vapors kill insects, nematodes, fungi, bacteria, seeds, roots, or entire plants; usually applied in an enclosure of some kind or in the soil.

fungicide - A chemical used to kill or inhibit fungi.

granulars - A pesticidal chemical mixed with or coating small pellets or sand-like materials, and applied with seeders, spreaders, or special equipment. Granular pesticides are often used to control or destroy soil pests.

ground water - Water and waterways below the earth's surface, in which all interconnected openings in soil and rock are filled (saturated) with water, that supplies wells and springs.

Ground Water Protection Advisories (GWPA) - Written information given by a licensed Pest Control Adviser, who has successfully completed the Ground Water Protection Training Program given by DPR, that must be submitted by permit applicants before the County Agricultural Commissioner can issue a use permit for allowed uses of a regulated pesticide in a Pesticide Management Zone (PMZ). The GWPA contains specific information for applying the regulated pesticide in a sensitive area (PMZ) in order to prevent or minimize the movement of pesticidal residues to ground water.

Ground Water Protection List (GWPL) - A list, required by PCPA and established in section 6800 (3CCR), of pesticides having the potential to pollute ground water. The GWPL is divided into two sublists. Sublist (a) is comprised of chemicals that have been detected in ground water as a result of legal agricultural use. Pesticidal active ingredients whose physicochemical properties exceed the Specific Numerical Values (see def.) and that are labeled for soil application under certain conditions are

placed on sublist (b) of the GWPL. Chemicals placed on the GWPL are subject to certain restrictions and reporting requirements.

Health Advisory Level (HAL) - An advisory number published by U.S. EPA's Office of Drinking Water and Office of Water Regulations and Standards. Short-term (10 days or less), long-term (7 years or less), and lifetime exposure health advisories for non-carcinogens and suspected human carcinogens are included where data sufficient for derivation of the advisories exist. HALs are a guideline which include a margin of safety to protect human health. For lifetime HALs, water containing pesticides at or below the HAL is acceptable for drinking every day over the course of one's lifetime.

half-life - The time required for a given amount of a substance to be reduced by half due to chemical and/or biological processes.

herbicide - A pesticide used to control unwanted vegetation either before or after its emergence from the soil.

historical agricultural use - The documented use of a chemical that has been applied over time in a specific area for the production of an agricultural commodity.

hydrolysis - In the context of this report, talteration of a pesticide by water.

inert ingredient - An ingredient in a formulation which has no pesticidal action.

initial detection sample - For a single study and a particular well, the initial detection sample for a chemical will be the positive sample with the earliest sampling date and/or time. Replicate samples are coded in relation to the initial detection sample.

insecticide - A pesticide used to control an insect which may be present in any environment.

institutional use - Use within the confines of, or on property necessary for the operation of, buildings such as hospitals, factories, schools, libraries, auditoriums and office complexes.

large water system well - A well supplying 200 or more service connections.

law - State laws are the result of action by the California legislature.

leaching - The process by which residues are dissolved in soil water and follow the movement of water through the soil matrix as it recharges a ground water aquifer.

legal agricultural use - The application of a pesticide, according to its labelled directions and in accordance with federal and state laws and regulations, for agricultural use as defined in Food and Agricultural Code, section 11408. (See "agricultural use".)

legal agricultural use determination - A determination required by section 13149 (FAC) and based upon the following criteria: (1) the detection of a pesticide ingredient or its degradation product that has been confirmed according to DPR criteria; (2) a detection of the same pesticidal ingredient or its degradation product in ground water, verified at a second site within an one-half mile radius of the original detection (a detection in soil at or below eight feet only needs to be verified at a single site); (3) the detected pesticidal ingredient must be formulated in a product which has listed on its label one or more agricultural uses; (4) the application of the agricultural use product(s) in the vicinity of the reported detections should either be documented historically, confirmed by local interviews, or presumed by the identification of a target pest or commodity; (5) the Director may consider a preponderance of evidence as meeting these criteria.

Maximum Contaminant Levels (MCLs) - MCLs are part of the drinking water quality standards adopted by CDHS and by USEPA under the Safe Drinking Water Act. MCLs are formally established in regulation and are enforceable by the CDHS on water suppliers.

Maximum Contaminant Level goals (MCL goals) - MCL goals are promulgated by the USEPA as the first step in establishing MCLs. MCL goals are purely health-based values and are set at "zero" for chemicals classified by the USEPA as "known" and "probable" human carcinogens.

metabolite - In the case of a pesticide, a compound derived from the action upon the pesticide within a living organism (plant, insect, higher animal, etc.). The action varies (oxidation, reduction, etc.) and the metabolite may be more toxic or less toxic than the parent compound. The same derivative may, in some cases, develop through exposure of the pesticide in the environment. (See also "degradation product".)

Minimum Detection Limit (MDL) - The lowest concentration of analyte that a method of analysis can quantify reliably. The MDL is established in protocol for a study either as a result of a method validation study or by using accepted proven analytical methods (e.g., EPA methods).

mitigation measure - An activity to substantially reduce any adverse impact of a given condition.

model - Mathematical equations that represent certain processes. These equations can be implemented in a computer program in order to facilitate calculations and test model predictions against measured data.

modified use - See "use requirement".

monitoring study - See "study".

monitoring well - A well used principally for any of the following purposes: (1) observing ground water levels and flow conditions, (2) obtaining samples for determining ground water quality, or (3) evaluating hydraulic properties of water-bearing strata.

negative analysis - A well water sample in which pesticide residues were not detected at or above the minimum detection limit of the instruments used for analysis.

nematicide - A pesticide used to control nematodes.

nematode - Nematodes are generally microscopic, wormlike animals that live saprophytically in water or soil, or as parasites of plants and animals. Plant parasitic nematodes are also known as eel worms.

non-crop areas - These areas include rights-of-way, golf courses, and cemeteries. There may be agricultural use of pesticides in non-crop areas, e.g., for weed control around buildings on a farm.

non-point source - Contamination which cannot be traced to a small, definable location (compare with "point source"), e.g., applications of agricultural chemicals to crops.

organic matter - Plant and animal debris or remains found in the soil in all stages of decay. The major elements in organic matter are oxygen, hydrogen, and carbon.

parts per billion (ppb) - A way to express the concentration of a chemical in a liquid, a solid, or in air. Since one liter of water weighs one billion micrograms, one microgram of a chemical in one liter of water is equal to one ppb.

pest - Any of the following that is, or is liable to become, dangerous or detrimental to the agricultural or nonagricultural environment of the state: any insect, predatory animal, rodent, nematode, or weed; any form of terrestrial, aquatic, or aerial plant or animal, virus, fungus, bacteria, or other microorganisms (except viruses, fungi, or bacteria) on or in living man or other living animals; anything that the Director of the Calfiornia Department of Food and Agriculture, by regulation, declares to be a pest.

Pest Control Adviser (PCA) - A person licensed by DPR and registered with the County Agricultural Commissioner who makes pest control recommendations. All agricultural use recommendations must be in writing and contain certain information. A PCA must complete continuing education requirements before his/her license may be renewed.

pesticide - See "economic poison".

Pesticide Contamination Prevention Act (PCPA) - (AB 2021) A law, effective January 1, 1986, which added sections 13141 through 13152 to Division 7 of the FAC. The PCPA requires each registrant of an economic poison to submit specified information to the Director of DPR, provides for the establishment of the Ground water Protection List, requires the Director to perform soil and water monitoring, provides for a specific response to the detection of pesticides in soil and ground water, and requires the Director to maintain a specified well sampling data base and to report certain information annually to the Legislature, the CDHS, and the State Water Resources Control Board on well sampling.

Pesticide Detection Response Process (PDRP) - A process, established in sections 13149 through 13151 (FAC) by the PCPA, in which the detection of a pesticide residue in soil (at specific depths) or ground water, is investigated, evaluated, and, when necessary, mitigated. As part of the process, a determination must be made that the detection probably resulted from a legal agricultural-use application of the pesticide. As a result of this process, the use of a pesticide in California may be modified or cancelled.

Pesticide Management Zone (PMZ) - A geographic surveying unit of approximately one square mile which is sensitive to ground water pollution. The use of a pesticide inside a PMZ where it has been detected in ground water is subject to certain ground water protection restrictions and requirements. These include a mandatory Ground Water Protection Advisory which must be obtained before a restricted material's use permit can be issued.

pesticidal residue - In this case, the amount of a pesticidal active ingredient remaining in a soil or ground water sample at the time of analysis.

physicochemical - The types of behavior that a substance exhibits in chemical reactions are called its chemical properties; other characteristics that are typical of a substance are called its physical properties. Taken together, the chemical and physical properties of a substance are called its physicochemical properties.

plume - The elongated (generally cigar-shaped) pattern of a chemical in ground water arising from contamination originating at a spill or other point source.

point source - A source of contamination, such as a spill or at a waste site, that is initially deposited and concentrated in a small, well-defined area. The contamination can be traced to its point of origin by locating a specifically-shaped pattern of residues in the ground water called a plume.

positive detection - A well water sample in which the presence of a pesticide for which it was analyzed is detected. A positive analysis may be designated as confirmed or unconfirmed.

preemergent treatment - Treatment made after a crop is planted but before it or the weeds emerge.

range - A single series or row of townships, each six miles square, extending parallel to, and numbered east and west from, a survey base meridian line. (See "well numbering system".)

recommended PMZ - A section of land that has been identified as sensitive to ground water pollution by specific pesticides and has been proposed to be adopted into section 6802 (3CCR).

record - See "data base record".

registered pesticide - A pesticidal product approved by the USEPA and DPR for use in California.

registrant - A person, or corporation, that has registered an economic poison for use in California and has obtained a certificate of registration from the Department.

regulation - These are adopted by state agencies to implement or clarify statutes enacted by the California Legislature. They can also be adopted in response to federal legislation, court decisions, changing technologies, and concerns for the health and well being of the residents of California.

related compounds - See "degradation products".

replicate sample - A discrete sample taken from a well at the same time as the initial detection sample; not a single sample split into multiple samples.

restricted material - Compounds designated as "Restricted Materials" in section 6400 (3CCR), that for various reasons, are potentially more hazardous to people, animals, or the environment than other pesticides. As a result, the use of these materials is regulated more closely and is permitted only when additional precautionary measures are taken. Certain reporting requirements and dealer responsibilities apply to the use of restricted materials.

right-of-way - The strip of land over which facilities such as highways, railroads, or power lines are built.

sanitary seal - A slurry of cement or clay which fills the annular space between the well casing and the drilled hole, down to a certain depth, to protect the well against contamination or pollution by entrance of surface and/or shallow, subsurface waters.

section - A land unit of 640 acres or one square mile, equal to 1/36 of a township. (See "well numbering system".)

selective pesticide - A pesticide that kills pest individuals, but spares much or most of the other fauna or flora, including beneficial species, through either differential toxic action or through the manner in which the pesticide is used (formulation, dosage, timing, placement, etc.).

slow-release formulation - The incorporation of a pesticide in a permeable covering that permits its release over a period of time at a reduced, but effective rate.

small public water system well - A well serving less than 200 connections.

soil adsorption coefficient (Koc) - A measure of the tendency of pesticidal active ingredients, or their biologically active transformation products, to adhere to the surfaces of soil particles.

Specific Numerical Values (SNV) - Certain numeric threshold values set for the following physical and chemical properties of pesticidal active ingredients: water solubility, soil adsorption coefficient, hydrolysis, aerobic and anaerobic soil metabolism, and field dissipation. The PCPA associates these properties with the longevity and mobility of a chemical in the soil and requires the establishment of SNVs in regulation as a means of predicting which pesticides are likely to leach to ground water.

State Well Number - See "well numbering system".

summary year - The time period, usually July 1st through the following June 30th, during which sampling results for the presence of pesticides in California ground water are collected and processed for inclusion in the well inventory data base. This data is summarized in DPR's annual Well Inventory Report.

township - A public land surveying unit which is a square parcel of land, six miles on each side. The location of a township is established as being so many six-mile units east or west of a north-south line running through an initial point (called the "principal meridian") and so many six-mile units north or south of an east-west line running through another point (called the "baseline"; see also, "well numbering system").

unconfirmed detection - For a particular well, the detection of a pesticide in a single sample during the time period of an individual monitoring study. Confirmation of the initial detection by a second positive sample was not possible because either (1) only a single sample was taken from the well or (2) analyses of all other samples taken from the well during the study were negative.

use requirement - Restrictions established in regulation for the use of certain pesticides. For example, section 6484.1 (3CCR) states that agricultural, outdoor institutional, and outdoor industrial uses of pesticides containing atrazine are prohibited in the Pesticide Management Zones listed in 6802(c) (3CCR).

vapor pressure - A property which indicates the rate of evaporation of a compound. The higher the vapor pressure, the more volatile the compound.

verified - See "confirmed".

volatile - A compound is said to be volatile when it readily evaporates on exposure to air at ordinary temperatures.

water budgeting method - An irrigation plan basing the frequency of irrigations and the amount of water to be applied on a measurement of the amount of water lost by evaporation and plant transpiration (evapotranspiration) and other factors, including the root zone area of the crop and the capacity of the soil to hold water.

water solubility - The ability of a substance to go into solution with water.

well head - The immediate area surrounding the top of a well.

well numbering system - The California well numbering system is based on a rectangular system commonly referred to as the Public Lands Survey. Under this system, all tracts of lands are tied to an initial point and identified as being in a township. A township is a square parcel of land six miles on each side. Its location is established as being so many six-mile units east or west of a north-south line running through the initial point (called the "principal meridian") and so many six-mile units north or south of an east-west line running through the point (called the "baseline"). The meridianal lines parallel to, and east or west of, the principal meridian are called range lines. Every township is further divided into 36 parts called sections. A section is also described as a square parcel of land one mile on a side, each containing 640 acres. Each well in California is assigned a unique number (referred to as the State Well Number) by the Department of Water Resources (DWR). For well numbering purposes, each section of land is divided into sixteen 40-acre tracts. Once the well location is established in the 40 acre tract it is assigned a sequence number which is assigned in chronological order by DWR personnel. The DWR maintains an index of state well numbers to prevent duplication.

wettable powder - A solid (powder) formulation which, on addition to water, forms a suspension.

C. FORMAT OF DATA BASE RECORDS

Format of Records in the Well Inventory Data Base:

Each laboratory analysis of a well water sample for the presence of a pesticidal active ingredient or breakdown product comprises one record in the well inventory data base. Each record may contain up to 149 characters, although the majority of records contain 132 characters.

The data base record format was changed, effective with the 1989 update report. The study number field was expanded from two to four characters. Columns 16, 17, 70, and 112, previously blank spaces, have been incorporated into various record data fields. An example of a well inventory coding sheet, showing the data fields and column numbers, is shown in Figure 1-C. A key to the codes used in the well inventory data base can be found in Appendix D, p. 115. An explanation of the record format follows.

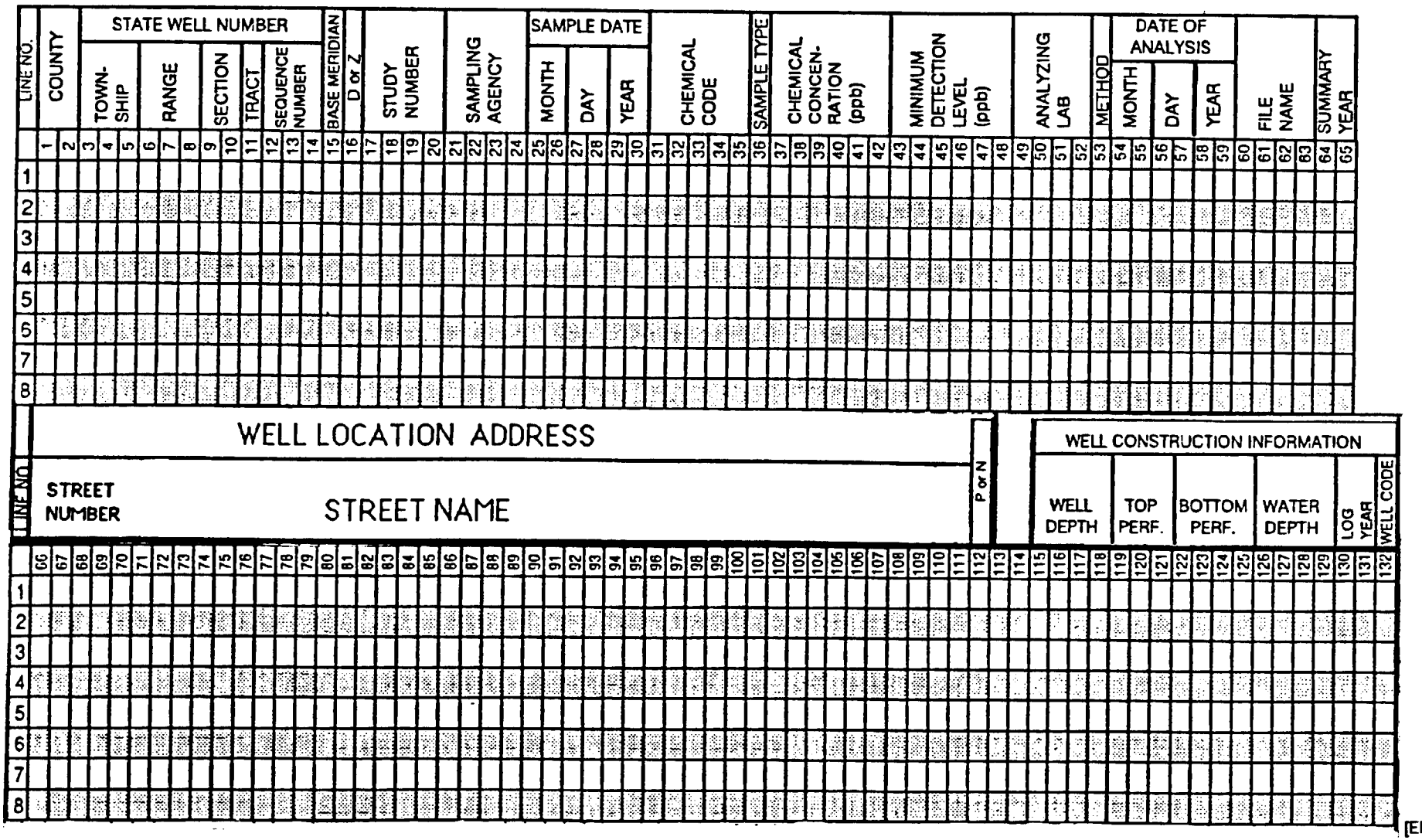
Column Number	Explanation of Data Base Record Fields
1-2	County code: a minimum reporting requirement. This code is consistent with DPR Pesticide Use Report format.
3-14	State well number (township/range/section/tract/sequence number): a minimum reporting requirement. The state well number is based on the U.S. Geological Survey's Public Lands Survey Coordinate System (Davis and Foote, 1966). The DWR uses this system to numerically identify individual wells in California. Township lines (T, cols. 3-5) are oriented from north to south and are 6 miles long. Range lines (R, cols. 6-8) are oriented east to west and are 6 miles wide. A 6 X 6 mile township is divided into 36, 1 mile by 1 mile sections (S, cols. 9-10), numbered consecutively from 1 to 36. Each section is again divided into 16 individual 40 acre tracts (Tr, col. 11) that are identified by letters (A through R, excluding I and O). Wells in a tract are further identified with a sequential number (cols. 12-14) in the order of identification by the DWR.
15	Base line and meridian: this minimum reporting requirement is included in the state well number. The base line/meridian divide the state into three areas: Humboldt, Mount Diablo, and San Bernardino, forming the basic structure for the Township/Range/ Section numbering system.
16	In-house code.
17-20	Study number: numbers were assigned consecutively as studies were obtained. (See Appendix E, p. 127, for a summary of each study).
21-24	Sampling agency code: a minimum reporting requirement.

WELL INVENTORY CODING SHEET

STATE OF CALIFORNIA
DEPARTMENT OF
PESTICIDE REGULATION

ENVIRON. MONITOR. & PEST MGMT.
ENVIRON. HAZARDS ASSESSMENT
1220 N STREET ROOM A-149

Page: ____



[EMPM2]

Figure 1-C. Well inventory data base coding sheet.

Column Number	Explanation of Data Base Record Fields
25-30	Date of sample: a minimum reporting requirement. Day, month, and year of each sampling record is included. The middle month of an indicated period is used when only a season is designated as the sampling date, e.g., "all samples were taken in spring of 1982." However, the precise sampling date is recorded for most studies.
31-35	Chemical code: a minimum reporting requirement. Each chemical is assigned a 5-digit numerical code which corresponds to the chemical codes used in the Pesticide Use Reporting System maintained by the Information Services Branch of DPR. Codes for breakdown products of pesticides are distinguished from their parent compound by the letter "B, C, D, N, or X" preceding the last four digits of the parent compound's code, e.g. 00259 = endosulfan, B0259 = endosulfan sulfate. Pesticides sampled for that have not been registered for use in California are assigned sequential numbers preceded by the letter "U", e.g. U0012 = fenuron.
36	Sample-type: a minimum reporting requirement. Sample-type codes are used to signify whether an analysis is a positive or negative detection; whether a positive sample is the initial or replicate detection; and to denote whether the same laboratory and analyzing method were used for both the confirmation and initial detection samples.
37-42	Chemical concentration: a minimum reporting requirement. Analytical results are recorded in parts per billion (ppb) in scientific notation. Columns 37-40 are the significant figures, column 41 is the sign of the exponent (+ or -), and column 42 is the exponent (power of 10). Trace amounts, non-detected, or less than the minimum detectable limit values are all recorded as non-detected (0.00+0).
43-48	Minimum detection limit (MDL): a minimum reporting requirement. The MDL for the chemical assay is recorded in ppb, in the same format as chemical concentration. The MDL for a given compound may vary by laboratory, date, or year, reflecting differences in analytical techniques.
49-52	Analyzing laboratory: a minimum reporting requirement.
53	Method of analysis: designates the origin of the protocol for the specific, analytical laboratory method.
54-59	Date of analysis: a minimum reporting requirement. Month/day/year.
60-63	File name: internal file designation.

Column Number	Explanation of Data Base Record Fields
64-65	Summary year: indicates the year of the Well Inventory Update Report for which the record was reported. Usually, a summary year is July 1st to the following June 30th.
66-111	Well location information: a minimum reporting requirement. Designates the street name and number or descriptive address of the well.
112	Point or non-point: detections of pesticides in ground water that have been determined to be present due to a point-source (contamination eminating from a specific site, such as a spill or at a waste-site) or non-point source (in the case of agricultural pesticides, leaching to ground water as a result of legal, agricultural use) are designated by a "P" or "N" in this field. Detections that have not had a source determination are designated as "-".
113-114	Road code (street, avenue, etc.).
	Well-construction information (confidential information obtained from well driller reports or well logs)
115-118	Well depth (in feet): the completed well depth, as recorded on the well log.
119-121	Depth to top of perforation (in feet), as recorded on the well log.
122-125	Depth to bottom of perforation (in feet), as recorded on the well log; often corresponds to depth of completed well.
126-129	Water depth: the depth of standing water in the well at time of sampling.
130-131	Log year: year the well was drilled (information obtained from well log, raw data, or verbally from a well owner).
132	Well code: a minimum reporting requirement. This code indicates well use, e.g., private domestic, irrigation, or both.
	Latitude/longitude (entered into the data base separately)
133-140	Latitude: the latitude is expressed in degrees (DD), minutes (MM) and seconds (SS.S). Seconds may be specified to the nearest tenth of a second. The format is DDMMSS.S. (The decimal point is implied and not included in a column.)
141-149	Longitude: the longitude is expressed in degrees (DDD), minutes (MM) and seconds (SS.S). Seconds may be specified to the nearest tenth of a second. The format is DDDMMSS.S. (The decimal point is implied and not included in a column.)

D. EXPLANATION OF CODES USED IN THE 1991 UPDATE REPORT

I. County Codes

Code	County	Code	County	Code	County
01	Alameda	21	Marin	41	San Mateo
02	Alpine	22	Mariposa	42*	Santa Barbara
03	Amador	23	Mendocino	43*	Santa Clara
04*	Butte	24*	Merced	44*	Santa Cruz
05	Calaveras	25	Modoc	45	Shasta
06*	Colusa	26*	Mono	46	Sierra
07	Contra Costa	27*	Monterey	47*	Siskiyou
08*	Del Norte	28*	Napa	48*	Solano
09	El Dorado	29	Nevada	49	Sonoma
10*	Fresno	30*	Orange	50*	Stanislaus
11*	Glenn	31*	Placer	51	Sutter
12	Humboldt	32	Plumas	52	Tehama
13	Imperial	33*	Riverside	53	Trinity
14	Inyo	34*	Sacramento	54*	Tulare
15*	Kern	35*	San Benito	55*	Tuolumne
16*	Kings	36	San Bernardino	56	Ventura
17	Lake	37	San Diego	57*	Yolo
18*	Lassen	38	San Francisco	58	Yuba
19*	Los Angeles	39*	San Joaquin		
20*	Madera	40*	San Luis Obispo		

* Counties for which there are sampling results reported for the 1991 report year.

II. Sampling Agency Code

Code	Agency Name
1080	American Environmental Consulting Firm
1220	Rhone-Poulenc Agricultural Company
2894	California Regional Water Quality Control Board (RWQCB), Region 1 (North Coast)
4323	Department of Pesticide Regulation (DPR) - Environmental Hazards Assessment Program
5050	California Department of Water Resources (DWR)
5060	California Department of Health Services (CDHS) - Sanitary Engineering Branch
5105	Glenn County Agriculture Department

5114	Santa Clara County Health Department
8493	California Regional Water Quality Control Board (RWQCB), Region 3 (Central Coast)

III. Well Study Codes

Study	Agency	Pesticide(s) Analyzed
0023	CDHS	1,3-D; 1,1,2,2-tetrachloroethane; D-D mix; EDB, ortho-dichlorobenzene, methyl bromide, napthalene, and xylene.
0114	SCEHD	AB1803 chemicals (100 separate compounds).
0175	DWR	71 various compounds.
0176	DPR	atrazine, bromacil, diuron, prometon, simazine, and molinate.
0177	DWR	94 various compounds.
0178	RWQCB	aldicarb, aldicarb sulfone, aldicarb sulfoxide, fenamiphos, fenamiphos sulfone, fenamiphos sulfoxide, phorate, phorate sulfone, and phorate sulfoxide.
0179	DWR	70 various compounds.
0180	CDHS	1,3-D; 1,1,2,2,-tetrachloroethane; D-D mix; ortho-dichlorobenzene; atrazine; methyl bromide; simazine; and xylene.
0181	RWQCB	propylene dichloride.
0182	RWQCB	1,2-D; 1,3-D; ortho-dichlorobenzene; methyl bromide; and xylene.
0183	RWQCB	aldicarb, aldicarb sulfone, aldicarb sulfoxide, fenamiphos, fenamiphos sulfone, fenamiphos sulfoxide, phorate, phorate sulfone, and phorate sulfoxide.
0184	DPR	atrazine, bromacil, diuron, prometon, simazine, and 2,4-D.
0185	DPR	atrazine, bromacil, diuron, prometon, simazine, and 2,4-D.
0186	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.
0187	DPR	atrazine, bromacil, diuron, prometon, simazine, and carbaryl.

Well Study Codes (continued)

0188	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.
0189	DPR	atrazine, bromacil, diuron, prometon, simazine, and diazinon.
0190	DPR	atrazine, bromacil, diuron, prometon, simazine, and 1,3-D.
0191	DPR	atrazine, bromacil, diuron, prometon, simazine, and endothall.
0192	DPR	atrazine, bromacil, diuron, prometon, simazine, and 2,4-D.
0193	DPR	aldicarb, aldicarb sulfone, and aldicarb sulfoxide.
0194	DPR	atrazine, bromacil, diuron, prometon, simazine, and methyl bromide.
0195	DPR	atrazine, bromacil, diuron, prometon, simazine, and carbon disulfide.
0196	DPR	chlorthal-dimethyl, MTP, TPA, atrazine, bromacil, diuron, prometon, and simazine.
0197	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.
0198	DPR	atrazine, benomyl, bromacil, diuron, prometon, simazine, and captan.
0199	DPR	atrazine, bromacil, diuron, prometon, simazine, and captan.
0200	DPR	atrazine, bromacil, diuron, prometon, simazine, and captan.
0201	DPR	atrazine, bromacil, diuron, prometon, simazine, and 1,3-D.
0202	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.
0203	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.
0204	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.
0205	DPR	atrazine, bromacil, diuron, prometon, simazine, and xylene.

Well Study Codes (continued)

0206	DPR	47 various compounds.
0207	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0208	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0209	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0210	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0211	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0212	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0213	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0214	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0215	RWQCB	aldicarb, aldicarb sulfone, aldicarb sulfoxide, and propylene dichloride.
0216	DPR	chlorthal-dimethyl, MTP, TPA, atrazine, bromacil, diuron, prometon, and simazine.
0217	DPR	chlorthal-dimethyl, MTP, TPA, atrazine, bromacil, diuron, prometon, and simazine.
0218	GCAD	molinate
0219	AECC	2,4-D; CB screen; and OP screen.
0220	DPR	atrazine, bromacil, diuron, prometon, and simazine.
0221	DPR	aldicarb, aldicarb sulfone, and aldicarb sulfoxide.

IV. Base Meridian Codes

H = Humboldt
M = Mt. Diablo
S = San Bernardino

V. Method of Analysis Codes

E = EPA approved Method
I = In-house
P = P.A.M. (Pesticide Analytical Method)
O = Other

VI. Road Codes

AV = Avenue
BL = Boulevard
CR = Circle
CT = Court
DR = Drive
HY = Highway
LN = Lane
PL = Place
RD = Road
RT = Route
ST = Street
WY = Way

VII. Chemical Codes

Code	Common Name
U0019	1,1,2,2-tetrachloroethane
00600	1,2,4-trichlorobenzene
00185	1,2-dichloropropane
00573	1,3-dichloropropene (1,3-D)
00639	2,4,5-T
00640	2,4,6-trichlorophenol
00636	2,4-D
01820	2,4-DP, isoctrl ester
00221	2,4-dinitrophenol
00837	4(2,4-DB), butoxyethanol ester
U0011	acenapthene
01685	acephate
00678	alachlor
00575	aldicarb
N0575	aldicarb sulfone
X0575	aldicarb sulfoxide
00009	aldrin
00018	ametryne
U0001	aminocarb
U0002	atraton
00045	atrazine
00314	azinophos-methyl
B0314	azinphos-methyl-oa
00055	barban
00053	benefin
01552	benomyl
90359	BHC (other than gamma isomer)
00083	bromacil
00834	bromoxynil octanoate
00292	captafol

(chemical codes, continued)

Code	Common Name
00104	captan
00105	carbaryl
00106	carbofuran
00108	carbon disulfide
00110	carbophenothion
02184	chloramben
00130	chlordane
***CH	chlorinated hydrocarbon screen
00136	chloropicrin
00677	chlorothalonil
00141	chlorpropham
00253	chlorpyrifos
00179	chlorthal-dimethyl
00165	coumaphos
01640	cyanazine
02171	cypermethrin
00180	dalapon
00183	DBCP
00184	DDD
02092	DDE
00186	DDT
00187	DDVP
00566	demeton
00198	diazinon
B0198	diazoxon
00200	dicamba
00112	dichlobenil
00923	dichlorprop, butoxyethanol ester
00346	dicofol
00210	dieldrin
01995	diethatyl-ethyl
00216	dimethoate
00238	dinoseb
00226	diphenamid
00230	disulfoton
00231	diuron
00632	DMPA
00259	endosulfan
B0259	endosulfan sulfate
00260	endothall
00262	endrin
B0262	endrin aldehyde
00264	EPTC
00268	ethion
01900	ethofumesate
00404	ethoprop
00271	ethylene dibromide (EDB)
01857	fenamiphos
N1857	fenamiphos sulfone
X1857	fenamiphos sulfoxide
00181	fensulfothion

(chemical codes, continued)

Code	Common Name
00063	fenthion
U0012	fenuron
01963	fenvalerate
00166	fluometuron
00254	fonofos
00317	heptachlor
B0317	heptachlor epoxide
00321	hexachlorobenzene
00359	lindane (gamma-BHC)
00361	linuron
00367	malathion
00369	maneb
00790	MCPP, diethanolamine salt
00374	MCPPA
00293	merphos
02132	metalaxyl
01697	methamidophos
00375	methiocarb
N0375	methiocarb sulfone
X0375	methiocarb sulfoxide
00383	methomyl
00384	methoxychlor
00385	methyl bromide
00394	methyl parathion
01996	metolachlor
01692	metribuzin
00480	mevinphos
00623	mexacarbate
00402	mirex
00449	molinate
00408	monuron
00409	monuron-TCA
B0179	MTP (monomethyl 2,3,5,6-tetrachloroterephthalate)
00418	naled
00421	napthalene
01728	napropamide
00424	neburon
00592	nitrofen
***OP	organophosphate screen
00578	ortho-dichlorobenzene
90683	ortho-dichlorobenzene, other related
01868	oryzalin
02017	oxadiazon
01910	oxamyl
00382	oxydemeton-methyl
B0459	paraoxon
01601	paraquat dichloride
00459	parathion
00464	PCNB
00478	phorate
N0478	phorate sulfone

(chemical codes, continued)

Code	Common Name
X0478	phorate sulfoxide
00335	phosmet
B0335	phosmet-OA
00499	prometon
00502	prometryn
00511	propachlor
00445	propargite
00504	propazine
00339	propham
00062	propoxur
00506	propylene dichloride (1,2-D)
U0018	prothiofos
00509	pyrazon
00517	ronnel
00190	s,s,s-tributyl phosphorotrithioate
U0004	secbumeton
00603	siduron
00530	silvex
00531	simazine
U0005	simetryn
02006	sulprofos
U0013	swep
01810	tebuthiuron
U0006	terbuthylazine
01691	terbutryn
00305	tetrachlorvinphos
M0179	total chlorthal dimethyl (DCPA, MTP and TPA combined)
00594	toxaphene
C0179	TPA (2,3,5,6-tetrachloroterephthalic acid)
U0007	trichloronate
01189	trichlorophenol
00597	trifluralin
00622	xylene
00629	ziram

VIII. Sample-Type Codes

Sample-type codes are used to signify whether an analysis is a positive or negative detection; whether a positive find is the initial or replicate detection; and to denote whether the same laboratory and analyzing method were used for both the confirmation and initial detection samples.

Definitions:

Initial detection sample:
For a particular well, the initial detection sample for a chemical will be the positive sample with the earliest sampling date and/or time which was made during the time span of a single monitoring study. Replicate samples are coded in relation to the initial detection sample.

Replicate sample:
A discrete sample taken from the same well as the initial detection sample. In reference to a single chemical, discrete samples taken during a single study will be recorded as replicates of the initial detection sample.

Codes:

(I) INITIAL DETECTION SAMPLE, NOT CONFIRMED
- -only one positive analysis
- -method and laboratory may or may not be known
- -no further sampling

(B) INITIAL DETECTION SAMPLE, w/FURTHER QUALITATIVE OR QUANTITATIVE ANALYSES HAVING ALL NEGATIVE RESULTS
- -initial detection with negative subsequent analyses
- -subsequent analyses are assigned the appropriate sample type codes "D" through "L", or "-"

(Q) INITIAL DETECTION SAMPLE, w/ FURTHER ANALYSES
- -initial detection with at least one positive subsequent analysis
- -no qualitative analyses
- -subsequent analyses are assigned the appropriate sample type codes "D" through "L", or "-"

(P) INITIAL DETECTION, w/FURTHER QUANTITATIVE AND QUALITATIVE ANALYSES
- -indicates that beyond the quantitative values recorded for the initial and subsequent analyses, some qualitative analyses were also performed
- -qualitative analyses can be either for the initial or for the subsequent analyses
- -at least one positive subsequent analysis
- -subsequent analyses are coded with the appropriate sample type codes "D" through "L", or "-"

(T) INITIAL DETECTION SAMPLE, ANALYZED FOR A GROUP OF MULTIPLE COMPOUNDS
- -confirmed by replicate samples, analyzed quantitatively for each of the compounds individually, which are coded with the appropriate sample type codes "H" through "L" or "-"

(H) REPLICATE SAMPLE, METHOD- Different, LAB- Same
- -a replicate sample analyzed with a different analytical method(s) but by the same laboratory as the initial detection sample

(J) REPLICATE SAMPLE, METHOD- Different, LAB- Different
- -a replicate sample analyzed with a different analytical method(s) and by a different laboratory as the initial detection sample

(K) REPLICATE SAMPLE, METHOD- Same, LAB- Different
-a replicate sample analyzed with the same analytical method(s) but by a different laboratory as the initial detection sample

(L) REPLICATE SAMPLE, METHOD- Same, LAB- Same
-a replicate sample analyzed with the same analytical method(s) and by the same laboratory as the initial detection sample

(-) REPLICATE SAMPLE, METHOD & LAB NOT SPECIFIED OR NEGATIVE RESULTS
-used when laboratory or analytical methods are unknown for analyses made subsequent to initial detection sample
-used when all discrete samples are negative

(U) UNCONFIRMED DETECTION SAMPLE
-may be more than one positive analysis by the same method
-may be used, also, when all positive, replicate samples from a well are determined to be unconfirmed by weight of evidence

(X) NEGATIVE DETECTION SAMPLE
-analyzed by a multi-residue method or is associated with a sample analyzed by a multi-residue method

IX. Analyzing Laboratory Codes

Code	Laboratory Name
1050	California State University, Fresno Lab
1190	Westco Lab
1220	Rhone-Poulenc Agricultural Company
1340	Enseco-CAL
2371	Appl, Inc., Lab
3102	Eureka Laboratories, Inc. Lab
3334	North Coast, LTD, Lab
4323	California Dept. Food and Agriculture Lab, Sacramento
4530	Columbia Analytical Services
5060	California Dept. Health Services, Berkeley Lab
5113	Sequoia Analytical Lab
5114	Santa Clara County
6025	Santa Clara Co. Health Dept. - Occ. Health & Safety Lab
6554	Central Coast Analytical, Santa Barbara
9527	California Analytical Lab

X. Well (Type) Codes

USGS Code	DPR Code	
	*B =	Both I and D
	*C =	Community well
	*D =	Domestic (private) well (residences)
	*F =	Both D and Y
	G =	Both D and R
	H =	D, I, and R
	*I =	Irrigation & agricultural well
	*L =	Large Water System well (more than 200 service connections)
	*M =	Municipal & irrigation well
	*N =	Non-community well (schools, hospitals, restaurants, filling stations, parks, campgrounds) (see Title 22 of the Health and safety code for more detailed definitions)
	*S =	State Small Water System well (less than 200 service connections)
	*T =	Test, monitoring, or observation well
	*U =	Unknown type of well
	X =	Irrigation and industrial well
	*Y =	Industrial well
(D)	W =	Dewatering well (see USGS definition below)
(C)	( )=	Commercial well (wells reported under this category are assigned an appropriate DPR code, e.g., (I) or (N); see USGS definition below).)
(S)	*R =	Stock (see USGS definition below)
(U)	A =	Unused well (wells reported under this category are assigned an appropriate DPR code, e.g., (T) or (A); see USGS definition below)

* Well types for which there are sampling results in the 1991 data base.

(D) Water is pumped from a dewatering well to dewater a construction or mining site, or to lower the water table for agricultural purposes. A dewatering well differs from a drainage well (U) that is used to drain surface water underground. If water is withdrawn from a well in order to provide drainage by lowering the water table, code (D) is assigned, although the water may be discharged into an irrigation ditch and subsequently used to irrigate land.

(C) Commercial use refers to use by a business establishment that does not fabricate or produce a product. Filling stations and motels are examples of commercial establishments. If some product is manufactured, assembled, remodeled, or otherwise fabricated, use of water for that plant should be considered industrial, even though the water is not used directly in the product or in the manufacturing of the product.

(S) Stock supply refers to the watering of livestock.

(U) Unused means water is not being removed from the site for one of the purposes described above. A test hole, oil or gas well, recharge, drainage, observation, or waste-disposal well will be assigned to this category.

APPENDIX E

SUMMARY OF WELL SAMPLING STUDIES INCLUDED IN THE 1991 WELL INVENTORY DATA BASE

I. DEPARTMENT OF PESTICIDE REGULATION (DPR)

Agency No. 4323: (Environmental Hazards Assessment Program [EHAP])

Study No. 0176 atrazine, bromacil, diuron, prometon, simazine, and molinate; Glenn County; July 1990. 6 wells sampled.

Study No. 0184 atrazine, bromacil, diuron, prometon, simazine, and 2,4-D; Butte County; September 1990. 5 wells sampled.

Study No. 0185 atrazine, bromacil, diuron, prometon, simazine, and 2,4-D; Del Norte County; August 1990. 6 wells sampled.

Study No. 0186 atrazine, bromacil, diuron, prometon, simazine, and xylene; Mono County; September 1990. 6 wells sampled.

Study No. 0187 atrazine, bromacil, diuron, prometon, simazine, and carbaryl; Napa County; October 1990. 6 wells sampled.

Study No. 0188 atrazine, bromacil, diuron, prometon, simazine, and xylene; Placer County; October 1990. 6 wells sampled.

Study No. 0189 atrazine, bromacil, diuron, prometon, simazine, and diazinon; Monterey County; October 1990. 6 wells sampled.

Study No. 0190 atrazine, bromacil, diuron, prometon, simazine, and 1,3-D; Del Norte County; October 1990. 6 wells sampled.

Study No. 0191 atrazine, bromacil, diuron, prometon, simazine, and endothall; Butte County; September 1990. 6 wells sampled.

Study No. 0192 atrazine, bromacil, diuron, prometon, simazine, and 2,4-D; Del Norte County; August 1990. 6 wells sampled.

Study No. 0194 atrazine, bromacil, diuron, prometon, simazine, and methyl bromide; Tuolumne County; October 1990. 5 wells sampled.

Study No. 0195 atrazine, bromacil, diuron, prometon, simazine, and carbon disulfide; Santa Barbara County; November 1990. 4 wells sampled.

Study No. 0196 chlorthal-dimethyl, MTP, TPA, atrazine, bromacil, diuron, prometon, and simazine. Fresno, Kern, Los Angeles, Monterey, San Luis Obispo, Santa Barbara, and Tulare Counties; 60 wells sampled. August 1990.

Study No. 0197 atrazine, bromacil, diuron, prometon, simazine, and xylene; Lassen County; December 1990. 3 wells sampled.

Study No. 0198 atrazine, bromacil, diuron, prometon, simazine, and captan; Glenn County; November 1990. 6 wells sampled.

Study No. 0199 atrazine, bromacil, diuron, prometon, simazine, and captan; Glenn County; November 1990. 6 wells sampled.

Study No. 0200 atrazine, bromacil, diuron, prometon, simazine, and captan; Solano County; November 1990. 5 wells sampled.

Study No. 0201 atrazine, bromacil, diuron, prometon, simazine, and 1,3-D; Fresno County; October 1990. 5 wells sampled.

Study No. 0202 atrazine, bromacil, diuron, prometon, simazine, and xylene; Fresno County; October 1990. 6 wells sampled.

Study No. 0203 atrazine, bromacil, diuron, prometon, simazine, and xylene; San Luis Obispo County; October 1990. 6 wells sampled.

Study No. 0204 atrazine, bromacil, diuron, prometon, simazine, and xylene; Tuolumne County; October 1990. 2 wells sampled.

Study No. 0205 atrazine, bromacil, diuron, prometon, simazine, and xylene; Santa Cruz County; January 1991. 5 wells sampled.

Study No. 0206 47 various compounds; Butte, Colusa, Fresno, Glenn, Kern, Madera, Merced, Monterey, Riverside, Sacramento, San Joaquin, Santa Barbara, Siskiyou, Stanislaus, Solano, Tulare, and Yolo Counties; February and March 1991. 217 wells sampled.

Study No. 0207 atrazine, bromacil, diuron, prometon, and simazine; Tulare County; January 1991. 5 wells sampled.

Study No. 0208 atrazine, bromacil, diuron, prometon, and simazine; Tulare County; January 1991. 5 wells sampled.

Study No. 0209 atrazine, bromacil, diuron, prometon, and simazine; Tulare County; January 1991. 5 wells sampled.

Study No. 0210 atrazine, bromacil, diuron, prometon, and simazine; Tulare County; January 1991. 5 wells sampled.

Study No. 0211 atrazine, bromacil, diuron, prometon, and simazine; Los Angeles County; December 1990. 5 wells sampled.

Study No. 0212 atrazine, bromacil, diuron, prometon, and simazine; Orange County; December 1990. 5 wells sampled.

Study No. 0213 atrazine, bromacil, diuron, prometon, and simazine; San Joaquin County; December 1990. 5 wells sampled.

Study No. 0214 atrazine, bromacil, diuron, prometon, and simazine; Orange County; December 1990. 5 wells sampled.

Study No. 0216 chlorthal-dimethyl, MTP, TPA, atrazine, bromacil, diuron, prometon, and simazine. Los Angeles County; May and July 1990. 6 wells sampled.

Study No. 0217 chlorthal-dimethyl, MTP, TPA, atrazine, bromacil, diuron, prometon, and simazine. Santa Clara County; May and July 1990. 7 wells sampled.

Study No. 0220 atrazine, bromacil, diuron, prometon, and simazine; Fresno and Tulare Counties; April-June 1991. 131 wells sampled.

Study No. 0221 aldicarb, aldicarb sulfone, and aldicarb sulfoxide; Fresno, Kern, Kings, Madera, Merced, and Tulare Counties; September-October 1990. 47 wells sampled.

II. CALIFORNIA DEPARTMENT OF HEALTH SERVICES (CDHS)

Agency No. 5060: (Sanitary Engineering Branch)

Study No. 0023 1,3-D; 1,1,2,2-tetrachloroethane; D-D mix; EDB, ortho-dichlorobenzene, methyl bromide, napthalene, and xylene; Lassen County; August 1990. 4 wells sampled.

Study No. 0180 1,3-D; 1,1,2,2,-tetrachloroethane; D-D mix; ortho-dichlorobenzene; atrazine; methyl bromide; simazine; and xylene; Siskiyou County; June 1987. 1 well sampled.

III. CALIFORNIA DEPARTMENT OF WATER RESOURCES (DWR)

Agency No. 5050:

Study No. 0175 71 various compounds; Merced and Stanislaus Counties; November 1989. 27 wells sampled.

Study No. 0177 94 various compounds; Butte County; August 1990. 40 wells sampled.

Study No. 0179 70 various compounds; Monterey, San Benito, and Santa Cruz Counties; March 1990. 27 wells sampled.

IV. REGIONAL WATER QUALITY CONTROL BOARD (RWQCB)

Agency No. 2894: Region 1 (North Coast)

Study No. 0178 aldicarb, aldicarb sulfone, aldicarb sulfoxide, fenamiphos, fenamiphos sulfone, fenamiphos sulfoxide, phorate, phorate sulfone, and phorate sulfoxide; Del Norte County; July 1990. 10 wells sampled.

Study No. 0181 propylene dichloride; Del Norte County; June 1987. 10 wells sampled.

Study No. 0183 aldicarb, aldicarb sulfone, aldicarb sulfoxide, fenamiphos, fenamiphos sulfone, fenamiphos sulfoxide, phorate, phorate sulfone, and phorate sulfoxide; Del Norte County; July 1990. 10 wells sampled.

Study No. 0215 aldicarb, aldicarb sulfone, aldicarb sulfoxide, and propylene dichloride; Del Norte County; February 1991. 10 wells sampled.

Agency No. 8493: Region 3 (Central Coast)

Study No. 0182 1,2-D; 1,3-D; ortho-dichlorobenzene; methyl bromide; and xylene; Santa Cruz County; September 1990. 7 wells sampled.

V. SANTA CLARA COUNTY HEALTH DEPARTMENT (SCCHD)

Agency No. 5114

Study No. 0114 AB1803 chemicals (101 various compounds); Santa Clara County; 1987-1988. 718 wells sampled.

VI. AMERICAN ENVIRONMENTAL CONSULTING COMPANY

Agency No. 1080:

Study No. 0219 2,4-D; carbamate screen; and organophosphate screen; Colusa County; January 1985. 1 well sampled.

VII. GLENN COUNTY AGRICULTURE DEPARTMENT (GCAD)

Agency No. 5105:

Study No. 0218 molinate; Glenn County; June 1990. 1 well sampled.

VIII. RHONE-POULENC AGRICULTURE CO.

Agency No. 1220:

Study No. 0193 aldicarb, aldicarb sulfone, and aldicarb sulfoxide; Fresno, Kern, Kings, and Tulare Counties; February to June 1990. 95 wells sampled.

APPENDIX F

ANALYTICAL METHODS FOR THE VERIFICATION OF GROUND WATER CONTAMINATION BY PESTICIDES

Verification

All reports of pesticide residues in ground water are considered verified after the following has occurred:

(1) Two discrete samples from the same site have been taken by the Department, no longer than 30 days apart, and have been analyzed by a method approved by the Department and found to contain the substance under investigation. If only a degradation product of the substance under investigation is subsequently detected, then the degradation product itself must be detected in a second discrete sample. This first step of the verification process provides evidence that the well was contaminated and the residue was not due to contamination during sampling and transport or during lab processing and analysis.

(2) The residue has been detected by one laboratory using different analytical methods approved by the Department or by two different laboratories using an analytical method approved by the Department. This second step provides evidence that the residue was precisely identified and could not be due to lab contamination or chemist error.

Definition of Different Analytical Methods

Confirmation of a residue by a second analytical method is intended to increase the confidence in the positive detection of a chemical by the first analytical method. If the measurement procedures of the second method vary only slightly from the first method, it is likely that an erroneous identification in the first determination would also occur in the second. Therefore, the second method should be based on separation and/or detection processes as different from the first method as feasible.

The minimum changes needed in the first method to qualify it for consideration as a second method depend on the specificity of both methods. The following matrix lists the possible combinations where "detection and separation" is defined as a significant change in both detector and separation procedure, "detection" is a significant change in the detector only, and "detection or separation" is a significant change in the detector or separation procedure.

Minimum requirements for procedural changes in a first method to qualify it as a second method:

First Method	Second Method	
	nonspecific	specific
nonspecific	detection & separation	detection only
specific	detection only	detection or separation

Specific Methods

A specific method provides positive identification of the measured chemical. This unequivocal identification implies that the detection system can distinguish the target compound from all other compounds in a given mixture, with or without the need for an additional separation procedure. A method is also considered to be specific if all known interferences yield insignificant responses, i.e., the sensitivity for the interfering compound is less than 0.1% of the sensitivity for the target compound.

Examples for specific methods are spectroscopic techniques like mass spectroscopy (MS) and Fourier transform infrared (FTIR) spectroscopy, which are generally used together with separation techniques like gas chromatography (GC) or high performance liquid chromatography (HPLC).

Nonspecific Methods

All methods that respond to more than one chemical and which use detectors that cannot distinguish between these different chemicals are considered to be nonspecific. Analytical methods that incorporate nonspecific detectors rely completely on separation procedures for identification. The problem with nonspecific detectors is that they can only prove the absence of a chemical when no signal is registered at the proper conditions for the chemical in question. When a signal is measured, however, one can only say that it is likely that the signal is caused by that chemical. But it is not a proven fact, as another component of the unknown mixture might interfere and the detector cannot distinguish between the two.

This definition of nonspecific includes the majority of GC techniques. For example, nitrogen-phosphorus specific detectors used in GC analysis are specific only on the atomic level; they can distinguish nitrogen and phosphorus atoms from other atoms, but they cannot distinguish between one nitrogen-containing chemical and another.

Significant Change

A significant change in detector means a change in detection principle (for GC, a change from a flame photometric detector [FPD] to a conductivity detector, for example). A significant change in the separation procedure is either a change in separation principle (from GC to HPLC, for example) or a change in the separation condition (i.e., using a different type of column), as long as this change will alter the sequence in which the compounds are registered.

Following are examples for the three types of minimum changes (detection and separation, detection only, and detection or separation), given in the previous matrix, that qualify as significant changes:

Case 1

When both the first and the second method are nonspecific, both the detector and the separation procedure have to be changed

significantly. For example, a first method using GC separation and a FPD could use as a second method either a GC with a significantly different column and a nitrogen-phosphorus detector (changing separation conditions and detector) or an HPLC separation with a UV-detector (changing separation principle and detector).

Case 2

When only one of the methods is specific, just the detection principle has to be changed; the separation procedure may be kept the same (GC/FPD and GC/MS using the same column, for example).

Case 3

When both methods are specific, either the detector or the separation procedure may be changed. Examples for these cases are GC/MS and HPLC/MS (keeping the same detector) or GC/MS and GC/FTIR (keeping the same separation conditions).

In the cases (2 and 3) where only a change in detector is needed, it is acceptable to use an integrated system where the effluent of the separation step is split and routed to two detectors. An example for this is GC/MS/FTIR, where the effluent of the GC is analyzed by MS and FTIR simultaneously. As this integrated analytical instrument uses two specific detectors, it counts as both first and second method.

Screening Methods

Special consideration has to be given to qualitative or semi-quantitative methods typically used for screening. Qualitative methods yield only detected/not detected results; semi-quantitative methods indicate the order of magnitude for the concentration of the identified chemical. Samples identified as positive will be forwarded for analysis by a quantitative method.

In this case, the qualitative screen is considered to be the first method. The quantitative method is then selected based on the above criteria for a second method. A second quantitative method (i.e, a third analysis method) is required only when verification is needed not only for the identity of the compound but also for its concentration. Analogously, a qualitative method may be used as a second method if verification of the concentration level is not required. A qualitative method cannot be used as a second method when the first method is qualitative also.

For example: a specific enzyme-linked immunosorbent assay (ELISA) may be used as a first method, even if it is used just as a detected/not detected screen. A nonspecific ELISA qualifies as a second detector for the effluent from an HPLC. Note, however, that any ELISA which shows significant cross-reactivity to other compounds is considered to be nonspecific and would also require a change in the separation procedure.

APPENDIX G

RESULTS BY COUNTY AND PESTICIDE

COUNTY: BUTTE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	40	41	40	41
1,2-d; 1,3-d & C-3 compounds	0	0	40	41	40	41
2,4,5-t	0	0	40	41	40	41
2,4-D	0	0	47	55	47	55
4(2,4-DB), butoxyethanol ester	0	0	40	41	40	41
acephate	0	0	40	41	40	41
aldicarb	0	0	40	41	40	41
aldrin	0	0	40	41	40	41
ametryne	0	0	40	41	40	41
atraton	0	0	40	41	40	41
atrazine	0	0	50	53	50	53
barban	0	0	40	41	40	41
bhc (other than gamma isomer)	0	0	40	82	40	82
bromacil	0	0	11	12	11	12
carbaryl	0	0	40	41	40	41
carbofuran	0	0	40	41	40	41
chlordane	0	0	40	41	40	41
chloropicrin	0	0	40	41	40	41
chlorothalonil	0	0	40	41	40	41
chlorpropham	0	0	40	41	40	41
chlorpyrifos	0	0	40	41	40	41
chlorthal-dimethyl	0	0	40	41	40	41
coumaphos	0	0	40	41	40	41
cyanazine	0	0	40	41	40	41
dalapon	0	0	40	41	40	41
ddd	0	0	40	41	40	41
dde	0	0	40	41	40	41
ddt	0	0	40	41	40	41

COUNTY: BUTTE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
ddvp	0	0	40	41	40	41
demeton	0	0	40	41	40	41
diazinon	0	0	40	41	40	41
dicamba	0	0	40	41	40	41
dichlorprop, butoxyethanol ester	0	0	38	39	38	39
dieldrin	0	0	40	41	40	41
dinoseb	0	0	40	41	40	41
disulfoton	0	0	40	41	40	41
diuron	0	0	50	53	50	53
endosulfan	0	0	40	41	40	41
endosulfan sulfate	0	0	40	41	40	41
endothall	0	0	45	52	45	52
endrin	0	0	40	41	40	41
endrin aldehyde	0	0	40	41	40	41
ethoprop	0	0	40	41	40	41
ethylene dibromide	0	0	40	41	40	41
fensulfothion	0	0	40	41	40	41
fenthion	0	0	40	41	40	41
fenuron	0	0	40	41	40	41
fluometuron	0	0	40	41	40	41
heptachlor	0	0	40	41	40	41
heptachlor epoxide	0	0	40	41	40	41
lindane (gamma-bhc)	0	0	40	41	40	41
linuron	0	0	40	41	40	41
malathion	0	0	40	41	40	41
maneb	0	0	40	41	40	41
mcpp, diethanolamine salt	0	0	40	41	40	41
mcppa	0	0	40	41	40	41

COUNTY: BUTTE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
merphos	0	0	40	41	40	41
methiocarb	0	0	40	41	40	41
methomyl	0	0	40	41	40	41
methoxychlor	0	0	40	41	40	41
methyl bromide	0	0	40	41	40	41
methyl parathion	0	0	40	41	40	41
mevinphos	0	0	40	41	40	41
molinate	0	0	3	3	3	3
monuron	0	0	40	41	40	41
monuron-tca	0	0	40	41	40	41
naled	0	0	40	41	40	41
neburon	0	0	40	41	40	41
ortho-dichlorobenzene	0	0	40	82	40	82
ortho-dichlorobenzene, other rel	0	0	40	82	40	82
oxamyl	0	0	40	41	40	41
paraquat dichloride	0	0	40	41	40	41
parathion	0	0	40	41	40	41
pcnb	0	0	40	41	40	41
phorate	0	0	40	41	40	41
prometon	0	0	50	53	50	53
prometryn	0	0	40	41	40	41
propazine	0	0	40	41	40	41
propham	0	0	40	41	40	41
prothiofos	0	0	40	41	40	41
ronnel	0	0	40	41	40	41
secbumeton	0	0	40	41	40	41
siduron	0	0	40	41	40	41
silvex	0	0	40	41	40	41

COUNTY: BUTTE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
simazine	0	0	50	52	50	52
simetryn	0	0	40	41	40	41
sulprofos	0	0	40	41	40	41
swep	0	0	40	41	40	41
terbuthylazine	0	0	40	41	40	41
terbutryn	0	0	40	41	40	41
tetrachlorvinphos	0	0	40	41	40	41
toxaphene	0	0	40	41	40	41
trichloronate	0	0	40	41	40	41
trichlorophenol	0	0	40	41	40	41
xylene	0	0	40	41	40	41
ziram	0	0	40	41	40	41
TOTAL ANALYTICAL RESULTS		0		4062		4062

COUNTY: COLUSA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
2,4-D	0	0	0	0	0	0
molinate	0	0	3	3	3	3
screen (chlorinated hydrocarbon)	0	0	1	1	1	1
screen (organophosphate)	0	0	1	1	1	1
TOTAL ANALYTICAL RESULTS		0		5		5

COUNTY: DEL NORTE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,3-dichloropropene	0	0	6	12	6	12
2,4-D	0	0	12	24	12	24
aldicarb	0	0	12	45	12	45
aldicarb sulfone	7	24	5	19	12	43
aldicarb sulfoxide	9	32	3	13	12	45
atrazine	0	0	18	18	18	18
bromacil	0	0	18	18	18	18
diuron	0	0	18	18	18	18
fenamiphos	0	0	11	30	11	30
fenamiphos sulfone	0	0	11	30	11	30
fenamiphos sulfoxide	0	0	11	30	11	30
phorate	0	0	11	30	11	30
phorate sulfone	0	0	11	30	11	30
phorate sulfoxide	0	0	11	29	11	29
prometon	0	0	18	18	18	18
propylene dichloride	0	0	7	8	7	8
simazine	0	0	18	18	18	18
TOTAL ANALYTICAL RESULTS		56		390		446

COUNTY: FRESNO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,3-dichloropropene	0	0	5	10	5	10
aldicarb	0	0	32	32	32	32
aldicarb sulfone	0	0	32	32	32	32
aldicarb sulfoxide	0	0	32	32	32	32
atrazine	0	0	33	42	33	42
bromacil	2	4	32	39	34	43
chlorthal-dimethyl	0	0	15	15	15	15
cyanazine	0	0	3	3	3	3
cypermethrin	0	0	3	3	3	3
ddvp	0	0	3	3	3	3
diazinon	0	0	3	3	3	3
diazoxon	0	0	3	3	3	3
dicofol	0	0	3	3	3	3
diethatyl-ethyl	0	0	2	2	2	2
dimethoate	0	0	3	3	3	3
diuron	4	10	30	33	34	43
fenamiphos	0	0	3	3	3	3
fenamiphos sulfone	0	0	3	3	3	3
fenamiphos sulfoxide	0	0	3	3	3	3
metalaxyl	0	0	3	3	3	3
metolachlor	0	0	3	3	3	3
mtp (monomethyl 2,3,5,6-tetracl	0	0	15	15	15	15
naled	0	0	3	3	3	3
paraoxon	0	0	3	3	3	3
parathion	0	0	3	3	3	3
phosmet	0	0	3	3	3	3
phosmet-oa	0	0	3	3	3	3
prometon	0	0	33	42	33	42

COUNTY: GLENN

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
2,4-D	0	0	2	2	2	2
atrazine	1	2	17	17	18	19
benomyl	0	0	6	12	6	12
bromacil	0	0	18	19	18	19
captan	0	0	12	24	12	24
cypermethrin	0	0	3	3	3	3
diuron	0	0	18	19	18	19
molinate	1	2	5	10	6	12
oxadiazon	0	0	3	3	3	3
prometon	0	0	18	19	18	19
simazine	0	0	18	19	18	19
TOTAL ANALYTICAL RESULTS		4		147		151

COUNTY: FRESNO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
prometryn	0	0	3	3	3	3
propargite	0	0	3	3	3	3
s,s,s-tributyl phosphorotrithioa	0	0	3	3	3	3
simazine	8	18	25	26	33	44
tpa (2,3,5,6-tetrachloroterephth	2	2	13	13	15	15
xylene	0	0	6	12	6	12
TOTAL ANALYTICAL RESULTS		34		405		439

COUNTY: KERN

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
aldicarb	0	0	47	48	47	48
aldicarb sulfone	0	0	47	48	47	48
aldicarb sulfoxide	0	0	47	48	47	48
atrazine	0	0	10	10	10	10
bromacil	0	0	10	10	10	10
chlorthal-dimethyl	0	0	10	10	10	10
diuron	0	0	10	10	10	10
mtp (monomethyl 2,3,5,6-tetrachl	0	0	10	10	10	10
oxadiazon	0	0	3	3	3	3
prometon	0	0	10	10	10	10
simazine	0	0	10	10	10	10
tpa (2,3,5,6-tetrachloroterephth	5	5	5	5	10	10
TOTAL ANALYTICAL RESULTS		5		222		227

COUNTY: KINGS

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
aldicarb	0	0	38	38	38	38
aldicarb sulfone	0	0	38	38	38	38
aldicarb sulfoxide	0	0	38	38	38	38
TOTAL ANALYTICAL RESULTS		0		114		114

COUNTY: LASSEN

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	4	8	4	8
1,2-d; 1,3-d & C-3 compounds	0	0	4	8	4	8
1,3-dichloropropene	0	0	4	8	4	8
atrazine	0	0	3	3	3	3
bromacil	0	0	3	3	3	3
diuron	0	0	3	3	3	3
ethylene dibromide	0	0	4	8	4	8
methyl bromide	0	0	4	8	4	8
naphthalene	0	0	4	8	4	8
ortho-dichlorobenzene	0	0	4	16	4	16
ortho-dichlorobenzene, other rel	0	0	4	8	4	8
prometon	0	0	3	3	3	3
simazine	0	0	3	3	3	3
xylene	1	4	5	10	6	14
TOTAL ANALYTICAL RESULTS		4		97		101

COUNTY: LOS ANGELES

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	2	4	13	17	15	21
bromacil	1	2	14	18	15	20
chlorthal-dimethyl	0	0	11	14	11	14
diuron	0	0	15	20	15	20
mtp (monomethyl 2,3,5,6-tetrachl	0	0	11	14	11	14
prometon	0	0	15	20	15	20
simazine	0	0	15	19	15	19
tpa (2,3,5,6-tetrachloroterephth	3	4	7	8	10	12
TOTAL ANALYTICAL RESULTS		10		130		140

COUNTY: MADERA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
aldicarb	0	0	7	7	7	7
aldicarb sulfone	0	0	7	7	7	7
aldicarb sulfoxide	0	0	7	7	7	7
benomyl	0	0	3	3	3	3
TOTAL ANALYTICAL RESULTS		0		24		24

COUNTY: MERCED

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	17	17	17	17
1,3-dichloropropene	0	0	17	17	17	17
2,4,5-t	0	0	17	17	17	17
2,4,6-trichlorophenol	0	0	17	17	17	17
2,4-D	0	0	17	17	17	17
2,4-dinitrophenol	0	0	17	17	17	17
4(2,4-DE), butoxyethanol ester	0	0	17	17	17	17
alachlor	0	0	17	17	17	17
aldicarb	0	0	20	20	20	20
aldicarb sulfone	0	0	3	3	3	3
aldicarb sulfoxide	0	0	3	3	3	3
aldrin	0	0	17	17	17	17
ametryne	0	0	17	17	17	17
aminocarb	0	0	17	17	17	17
atraton	0	0	17	17	17	17
atrazine	0	0	17	17	17	17
azinphos-methyl	0	0	3	3	3	3
azinphos-methyl-oa	0	0	3	3	3	3
barban	0	0	17	17	17	17
benefin	0	0	17	17	17	17
benomyl	0	0	20	20	20	20
bhc (other than gamma isomer)	0	0	17	51	17	51
bromoxynil octanoate	0	0	2	2	2	2
captan	0	0	17	17	17	17
carbaryl	0	0	17	17	17	17
carbofuran	0	0	17	17	17	17
carbophenothion	0	0	17	17	17	17
chlordane	0	0	17	17	17	17

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
chlorothalonil	0	0	17	17	17	17
chlorpropham	0	0	17	17	17	17
cyanazine	0	0	3	3	3	3
dbcp	0	0	17	17	17	17
ddd	0	0	17	17	17	17
dde	0	0	17	17	17	17
ddt	0	0	17	17	17	17
diazinon	0	0	3	3	3	3
diazoxon	0	0	3	3	3	3
dicamba	0	0	17	17	17	17
dichlorprop, butoxyethanol ester	0	0	17	17	17	17
dieldrin	0	0	17	17	17	17
diethatyl-ethyl	0	0	4	4	4	4
dinoseb	0	0	17	17	17	17
diuron	0	0	17	17	17	17
dmpa	0	0	17	17	17	17
endosulfan	0	0	17	34	17	34
endosulfan sulfate	0	0	17	17	17	17
endrin	0	0	17	17	17	17
endrin aldehyde	0	0	17	17	17	17
ethylene dibromide	0	0	17	17	17	17
fenuron	0	0	17	17	17	17
fluometuron	0	0	17	17	17	17
heptachlor	0	0	17	17	17	17
heptachlor epoxide	0	0	17	17	17	17
lindane (gamma-bhc)	0	0	17	17	17	17
linuron	0	0	17	17	17	17
methiocarb	0	0	17	17	17	17

COUNTY: MERCED

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
methomyl	0	0	17	17	17	17
methoxychlor	0	0	17	17	17	17
mexacarbate	0	0	17	17	17	17
monuron	0	0	17	17	17	17
neburon	0	0	17	17	17	17
nitrofen	0	0	17	17	17	17
ortho-dichlorobenzene	0	0	17	17	17	17
ortho-dichlorobenzene, other rel	0	0	17	34	17	34
oxamyl	0	0	17	17	17	17
pcnb	0	0	17	17	17	17
phosmet	0	0	3	3	3	3
phosmet-oa	0	0	3	3	3	3
prometon	0	0	20	20	20	20
prometryn	0	0	17	17	17	17
propazine	0	0	17	17	17	17
propham	0	0	17	17	17	17
propoxur	0	0	17	17	17	17
propylene dichloride	0	0	17	17	17	17
s,s,s-tributyl phosphorotrithioa	0	0	3	3	3	3
siduron	0	0	17	17	17	17
silvex	0	0	17	17	17	17
simazine	0	0	17	17	17	17
simetryn	0	0	17	17	17	17
terbuthylazine	0	0	17	17	17	17
terbutryn	0	0	17	17	17	17
toxaphene	0	0	17	17	17	17
xylene	0	0	17	17	17	17
TOTAL ANALYTICAL RESULTS		0		1320		1320

COUNTY: MONO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	6	6	6	6
bromacil	0	0	6	6	6	6
diuron	0	0	6	6	6	6
prometon	0	0	6	6	6	6
simazine	0	0	6	6	6	6
xylene	0	0	7	12	7	12
TOTAL ANALYTICAL RESULTS		0		42		42

COUNTY: MONTEREY

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	9	9	9	9
1,3-dichloropropene	0	0	9	18	9	18
2,4,5-t	0	0	12	12	12	12
2,4,6-trichlorophenol	0	0	12	12	12	12
2,4-d	0	0	12	12	12	12
2,4-dp, isooctyl ester	0	0	12	12	12	12
2,4-dinitrophenol	0	0	12	12	12	12
4(2,4-DB), butoxyethanol ester	0	0	12	12	12	12
alachlor	0	0	12	12	12	12
aldicarb	0	0	12	12	12	12
aldrin	0	0	12	12	12	12
ametryne	0	0	12	12	12	12
aminocarb	0	0	12	12	12	12
atraton	0	0	12	12	12	12

COUNTY: MONTEREY

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	33	34	33	34
barban	0	0	12	12	12	12
benomyl	0	0	12	12	12	12
bhc (other than gamma isomer)	0	0	12	24	12	24
bromacil	0	0	33	34	33	34
captan	0	0	12	12	12	12
carbaryl	0	0	12	12	12	12
carbofuran	0	0	12	12	12	12
carbophenothion	0	0	12	12	12	12
chlordane	0	0	12	12	12	12
chlorpropham	0	0	12	12	12	12
chlorthal-dimethyl	0	0	14	14	14	14
dbcp	0	0	4	4	4	4
ddd	0	0	12	12	12	12
dde	0	0	12	12	12	12
ddt	0	0	12	12	12	12
diazinon	0	0	6	12	6	12
dicamba	0	0	12	12	12	12
dieldrin	0	0	12	12	12	12
dinoseb	0	0	12	12	12	12
diuron	0	0	33	34	33	34
dmpa	0	0	12	12	12	12
endosulfan	0	0	12	12	12	12
endosulfan sulfate	0	0	12	12	12	12
endrin	0	0	12	12	12	12
endrin aldehyde	0	0	12	12	12	12
ethylene dibromide	0	0	4	4	4	4
fenuron	0	0	12	12	12	12

COUNTY: MONTEREY

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
fenvalerate	0	0	3	3	3	3
fluometuron	0	0	12	12	12	12
heptachlor	0	0	12	12	12	12
heptachlor epoxide	0	0	12	12	12	12
lindane (gamma-bhc)	0	0	12	12	12	12
linuron	0	0	15	15	15	15
metalaxyl	0	0	1	1	1	1
methiocarb	0	0	13	13	13	13
methiocarb sulfone	0	0	1	1	1	1
methiocarb sulfoxide	0	0	1	1	1	1
methomyl	0	0	12	12	12	12
methoxychlor	0	0	12	12	12	12
mexacarbate	0	0	12	12	12	12
monuron	0	0	12	12	12	12
mtp (monomethyl 2,3,5,6-tetrachl	0	0	14	14	14	14
neburon	0	0	12	12	12	12
nitrofen	0	0	12	12	12	12
ortho-dichlorobenzene	0	0	9	9	9	9
ortho-dichlorobenzene, other rel	0	0	9	9	9	9
oxamyl	0	0	12	12	12	12
pcnb	0	0	12	12	12	12
prometon	0	0	33	34	33	34
prometryn	0	0	15	15	15	15
propachlor	0	0	12	12	12	12
propazine	0	0	12	12	12	12
propham	0	0	12	12	12	12
propoxur	0	0	12	12	12	12
propylene dichloride	0	0	9	9	9	9

COUNTY: MONTEREY

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF CONFIRMED	NO. OF WELLS	NO. OF CONFIRMED	NO. OF WELLS	NO. OF CONFIRMED
siduron	0	0	12	12	12	12
silvex	0	0	12	12	12	12
simazine	0	0	32	33	32	33
simetryn	0	0	12	12	12	12
terbuthylazine	0	0	12	12	12	12
terbutryn	0	0	12	12	12	12
toxephene	0	0	12	12	12	12
tpa (2,3,5,6-tetrachlorcterephth	5	5	9	9	14	14
TOTAL ANALYTICAL RESULTS		5		1031		1036

COUNTY: NAPA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF CONFIRM	NO. OF WELLS	NO. OF CONFIRM	NO. OF WELLS	NO. OF CONFIRM
atrazine	0	0	6	6	6	6
bromacil	0	0	6	6	6	6
carbaryl	0	0	6	12	6	12
diuron	0	0	6	6	6	6
prometon	0	0	6	6	6	6
simazine	0	0	6	6	6	6
TOTAL ANALYTICAL RESULTS		0		42		42

COUNTY: ORANGE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	1	2	9	15	10	17
bromacil	0	0	10	18	10	18
diuron	1	2	9	16	10	18
prometon	0	0	10	18	10	18
simazine	8	17	2	2	10	19
TOTAL ANALYTICAL RESULTS		21		69		90

COUNTY: PLACER

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	6	7	6	7
bromacil	1	2	5	5	6	7
diuron	0	0	6	7	6	7
prometon	0	0	6	7	6	7
simazine	0	0	6	7	6	7
xylene	1	3	5	10	6	13
TOTAL ANALYTICAL RESULTS		5		43		48

COUNTY: RIVERSIDE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
methiocarb	0	0	3	3	3	3
methiocarb sulfone	0	0	3	3	3	3
methiocarb sulfoxide	0	0	3	3	3	3
TOTAL ANALYTICAL RESULTS		0		9		9

COUNTY: SACRAMENTO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	1	2	2	2	3	4
bromacil	0	0	1	1	1	1
disulfoton	0	0	2	2	2	2
diuron	0	0	1	1	1	1
prometon	0	0	1	1	1	1
simazine	0	0	1	1	1	1
TOTAL ANALYTICAL RESULTS		2		8		10

COUNTY: SAN BENITO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	9	9	9	9
1,3-dichloropropene	0	0	9	18	9	18
2,4,5-t	0	0	10	10	10	10
2,4,6-trichlorophenol	0	0	10	10	10	10
2,4-D	0	0	10	10	10	10
2,4-DP, isooctyl ester	0	0	10	10	10	10
2,4-dinitrophenol	0	0	10	10	10	10
4(2,4-DB), butoxyethanol ester	0	0	10	10	10	10
alachlor	0	0	10	10	10	10
aldicarb	0	0	10	10	10	10
aldrin	0	0	10	10	10	10
ametryne	0	0	10	10	10	10
aminocarb	0	0	10	10	10	10
atraton	0	0	10	10	10	10
atrazine	0	0	10	10	10	10
barban	0	0	10	10	10	10
benomyl	0	0	10	10	10	10
bhc (other than gamma isomer)	0	0	10	20	10	20
bromacil	0	0	10	10	10	10
captan	0	0	10	10	10	10
carbaryl	0	0	10	10	10	10
carbofuran	0	0	10	10	10	10
carbophenothion	0	0	10	10	10	10
chlordane	0	0	10	10	10	10
chlorpropham	0	0	10	10	10	10
ddd	0	0	10	10	10	10
dde	0	0	10	10	10	10
ddt	0	0	10	10	10	10

COUNTY: SAN BENITO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
dicamba	0	0	10	10	10	10
dieldrin	0	0	10	10	10	10
dinoseb	0	0	10	10	10	10
diuron	0	0	10	10	10	10
dmpa	0	0	10	10	10	10
endosulfan	0	0	10	10	10	10
endosulfan sulfate	0	0	10	10	10	10
endrin	0	0	10	10	10	10
endrin aldehyde	0	0	10	10	10	10
fenuron	0	0	10	10	10	10
fluometuron	0	0	10	10	10	10
heptachlor	0	0	10	10	10	10
heptachlor epoxide	0	0	10	10	10	10
lindane (gamma-bhc)	0	0	10	10	10	10
linuron	0	0	10	10	10	10
methiocarb	0	0	10	10	10	10
methomyl	0	0	10	10	10	10
methoxychlor	0	0	10	10	10	10
mexacarbate	0	0	10	10	10	10
monuron	0	0	10	10	10	10
neburon	0	0	10	10	10	10
nitrofen	0	0	10	10	10	10
ortho-dichlorobenzene	0	0	9	9	9	9
ortho-dichlorobenzene, other rel	0	0	9	9	9	9
oxamyl	0	0	10	10	10	10
pcnb	0	0	10	10	10	10
prometon	0	0	10	10	10	10
prometryn	0	0	10	10	10	10

COUNTY: SAN BENITO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
propachlor	0	0	10	10	10	10
propazine	0	0	10	10	10	10
propham	0	0	10	10	10	10
propoxur	0	0	10	10	10	10
propylene dichloride	0	0	9	9	9	9
siduron	0	0	10	10	10	10
silvex	0	0	10	10	10	10
simazine	0	0	10	10	10	10
simetryn	0	0	10	10	10	10
terbuthylazine	0	0	10	10	10	10
terbutryn	0	0	10	10	10	10
toxaphene	0	0	10	10	10	10

TOTAL ANALYTICAL RESULTS	0	694		694

COUNTY: SAN JOAQUIN

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
alachlor	0	0	3	3	3	3
aldicarb	0	0	3	3	3	3
aldicarb sulfone	0	0	3	3	3	3
aldicarb sulfoxide	0	0	3	3	3	3
atrazine	0	0	8	8	8	8
bromacil	0	0	5	5	5	5
disulfoton	0	0	3	3	3	3
diuron	0	0	5	5	5	5
fenvalerate	0	0	3	3	3	3
fonofos	0	0	3	3	3	3
linuron	0	0	3	3	3	3
metalaxyl	0	0	2	2	2	2
metribuzin	0	0	3	3	3	3
oxydemeton-methyl	0	0	3	3	3	3
prometon	0	0	8	8	8	8
simazine	0	0	5	5	5	5
TOTAL ANALYTICAL RESULTS		0		63		63

COUNTY: SAN LUIS OBISPO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	9	9	9	9
bromacil	0	0	9	9	9	9
chlorthal-dimethyl	0	0	3	3	3	3
diuron	0	0	9	9	9	9
mtp (monomethyl 2,3,5,6-tetrachl	0	0	3	3	3	3
prometon	0	0	9	9	9	9
simazine	0	0	9	9	9	9
tpa (2,3,5,6-tetrachloroterephth	1	1	2	2	3	3
xylene	0	0	6	12	6	12
TOTAL ANALYTICAL RESULTS		1		65		66

COUNTY: SANTA BARBARA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	11	12	11	12
bromacil	0	0	11	12	11	12
carbon disulfide	0	0	4	11	4	11
chlorthal-dimethyl	0	0	7	7	7	7
diuron	0	0	11	12	11	12
methiocarb	0	0	2	2	2	2
methiocarb sulfone	0	0	2	2	2	2
methiocarb sulfoxide	0	0	2	2	2	2
mtp (monomethyl 2,3,5,6-tetrachl	0	0	7	7	7	7
prometon	0	0	11	12	11	12
simazine	0	0	11	12	11	12
tpa (2,3,5,6-tetrachloroterephth	4	4	3	3	7	7
TOTAL ANALYTICAL RESULTS		4		94		98

COUNTY: SANTA CLARA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	715	785	715	785
1,2,4-trichlorobenzene	0	0	44	51	44	51
1,2-d; 1,3-d & C-3 compounds	0	0	41	42	41	42
1,3-dichloropropene	0	0	715	789	715	789
2,4,6-trichlorophenol	0	0	45	52	45	52
2,4-dinitrophenol	0	0	45	52	45	52
acenapthene	0	0	14	18	14	18
acephate	0	0	58	59	58	59
alachlor	0	0	66	67	66	67
aldicarb	0	0	58	59	58	59
aldrin	0	0	108	109	108	109
ametryne	0	0	66	67	66	67
aminocarb	0	0	83	84	83	84
atraton	0	0	66	67	66	67
atrazine	0	0	72	73	72	73
azinphos-methyl	0	0	88	89	88	89
barban	0	0	79	80	79	80
bhc (other than gamma isomer)	0	0	108	109	108	109
bromacil	0	0	89	90	89	90
captafol	0	0	96	97	96	97
captan	0	0	108	109	108	109
carbaryl	0	0	83	84	83	84
carbofuran	0	0	83	84	83	84
carbophenothion	0	0	108	109	108	109
chloramben	0	0	108	109	108	109
chlordane	0	0	108	109	108	109
chloropicrin	0	0	108	109	108	109
chlorpropham	0	0	83	84	83	84

COUNTY: SANTA CLARA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
chlorpyrifos	0	0	66	67	66	67
chlorthal-dimethyl	0	0	116	119	116	119
dbcp	0	0	108	109	108	109
ddd	0	0	108	109	108	109
dde	0	0	108	109	108	109
ddt	0	0	108	109	108	109
demeton	0	0	88	89	88	89
diazinon	0	0	88	89	88	89
dichlobenil	0	0	98	99	98	99
dicofol	0	0	108	109	108	109
dieldrin	0	0	108	109	108	109
dimethoate	0	0	52	53	52	53
dinoseb	0	0	52	53	52	53
diphenamid	0	0	52	53	52	53
disulfoton	0	0	88	89	88	89
diuron	0	0	89	90	89	90
endosulfan	0	0	108	114	108	114
endosulfan sulfate	0	0	108	109	108	109
endothall	0	0	58	59	58	59
endrin	0	0	108	109	108	109
eptc	0	0	58	59	58	59
ethion	0	0	88	89	88	89
ethofumesate	0	0	1	1	1	1
ethylene dibromide	0	0	45	46	45	46
fensulfothion	0	0	88	89	88	89
fenuron	0	0	83	84	83	84
fluometuron	0	0	83	84	83	84
fonofos	0	0	65	66	65	66

COUNTY: SANTA CLARA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
heptachlor	0	0	108	109	108	109
heptachlor epoxide	0	0	108	109	108	109
hexachlorobenzene	0	0	45	52	45	52
lindane (gamma-bhc)	0	0	108	109	108	109
linuron	0	0	83	84	83	84
malathion	0	0	88	89	88	89
maneb	0	0	58	59	58	59
methamidophos	0	0	58	59	58	59
methiocarb	0	0	83	84	83	84
methomyl	0	0	83	84	83	84
methoxychlor	0	0	108	109	108	109
methyl bromide	0	0	714	824	714	824
methyl parathion	0	0	89	90	89	90
metribuzin	0	0	58	59	58	59
mexacarbate	0	0	83	84	83	84
mirex	0	0	108	109	108	109
monuron	0	0	83	84	83	84
mtp (monomethyl 2,3,5,6-tetrachl	0	0	8	10	8	10
naphthalene	0	0	45	52	45	52
napropamide	0	0	58	59	58	59
neburon	0	0	83	84	83	84
ortho-dichlorobenzene	1	2	716	834	717	836
ortho-dichlorobenzene, other rel	0	0	716	811	716	811
oryzalin	0	0	58	59	58	59
oxadiazon	0	0	2	2	2	2
oxamyl	0	0	83	84	83	84
parathion	0	0	88	89	88	89
phorate	0	0	52	53	52	53

COUNTY: SANTA CLARA

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
phosmet	0	0	1	1	1	1
prometon	0	0	72	74	72	74
prometryn	0	0	66	68	66	68
propazine	0	0	66	68	66	68
propham	0	0	83	84	83	84
propoxur	0	0	84	85	84	85
propylene dichloride	0	0	715	765	715	765
pyrazon	0	0	2	2	2	2
secbumeton	0	0	66	68	66	68
simazine	0	0	72	74	72	74
tebuthiuron	0	0	3	3	3	3
terbuthylazine	0	0	66	68	66	68
terbutryn	0	0	66	68	66	68
toxaphene	0	0	108	109	108	109
tpa (2,3,5,6-tetrachloroterephth	6	8	2	2	8	10
trifluralin	0	0	108	109	108	109
xylene	0	0	715	782	715	782
ziram	0	0	58	59	58	59
TOTAL ANALYTICAL RESULTS		10		12843		12853

COUNTY: SANTA CRUZ

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	4	4	4	4
1,3-dichloropropene	0	0	8	12	8	12
2,4,5-t	0	0	5	5	5	5
2,4,6-trichlorophenol	0	0	5	5	5	5
2,4-D	0	0	5	5	5	5
2,4-DP, isooctyl ester	0	0	5	5	5	5
2,4-dinitrophenol	0	0	5	5	5	5
4(2,4-DB), butoxyethanol ester	0	0	5	5	5	5
alachlor	0	0	5	5	5	5
aldicarb	0	0	5	5	5	5
aldrin	0	0	5	5	5	5
ametryne	0	0	5	5	5	5
aminocarb	0	0	5	5	5	5
atraton	0	0	5	5	5	5

COUNTY: SANTA CRUZ

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	10	10	10	10
barban	0	0	5	5	5	5
bencmyl	0	0	5	5	5	5
bhc (other than gamma isomer)	0	0	5	10	5	10
bromacil	0	0	10	10	10	10
captan	0	0	5	5	5	5
carbaryl	0	0	5	5	5	5
carbofuran	0	0	5	5	5	5
carbophenothion	0	0	5	5	5	5
chlordane	0	0	5	5	5	5
chlorpropham	0	0	5	5	5	5
ddd	0	0	5	5	5	5
dde	0	0	5	5	5	5
ddt	0	0	5	5	5	5

COUNTY: SANTA CRUZ

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
dicamba	0	0	5	5	5	5
dieldrin	0	0	5	5	5	5
dinoseb	0	0	5	5	5	5
diuron	0	0	10	10	10	10
dmpa	0	0	5	5	5	5
endosulfan	0	0	5	5	5	5
endosulfan sulfate	0	0	5	5	5	5
endrin	0	0	5	5	5	5
endrin aldehyde	0	0	5	5	5	5
fenuron	0	0	5	5	5	5
fluometuron	0	0	5	5	5	5
heptachlor	0	0	5	5	5	5
heptachlor epoxide	0	0	5	5	5	5
lindane (gamma-bhc)	0	0	5	5	5	5
linuron	0	0	5	5	5	5
methiocarb	0	0	5	5	5	5
methomyl	0	0	5	5	5	5
methoxychlor	0	0	5	5	5	5
methyl bromide	0	0	4	4	4	4
mexacarbate	0	0	5	5	5	5
monuron	0	0	5	5	5	5
neburon	0	0	5	5	5	5
nitrofen	0	0	5	5	5	5
ortho-dichlorobenzene	0	0	8	8	8	8
ortho-dichlorobenzene, other rel	0	0	8	8	8	8
oxamyl	0	0	5	5	5	5
pcnb	0	0	5	5	5	5
prometon	0	0	10	10	10	10

COUNTY: SANTA CRUZ

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
prometryn	0	0	5	5	5	5
propachlor	0	0	5	5	5	5
propazine	0	0	5	5	5	5
propham	0	0	5	5	5	5
propoxur	0	0	5	5	5	5
propylene dichloride	0	0	4	4	4	4
siduron	0	0	5	5	5	5
silvex	0	0	5	5	5	5
simazine	0	0	10	10	10	10
simetryn	0	0	5	5	5	5
terbuthylazine	0	0	5	5	5	5
terbutryn	0	0	5	5	5	5
toxaphene	0	0	5	5	5	5
xylene	3	23	8	13	11	36
TOTAL ANALYTICAL RESULTS		23		398		421

COUNTY: SISKIYOU

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	1	1	1	1
1,2-d; 1,3-d & C-3 compounds	0	0	1	1	1	1
1,3-dichloropropene	0	0	1	1	1	1
atrazine	0	0	1	1	1	1
ethoprop	0	0	6	6	6	6
methyl bromide	0	0	1	1	1	1
ortho-dichlorobenzene	0	0	1	1	1	1
ortho-dichlorobenzene, other rel	0	0	1	1	1	1
simazine	0	0	1	1	1	1
xylene	0	0	1	1	1	1
TOTAL ANALYTICAL RESULTS		0		15		15

COUNTY: SOLANO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
alachlor	0	0	3	3	3	3
atrazine	0	0	5	5	5	5
bromacil	0	0	5	5	5	5
captan	0	0	5	10	5	10
diuron	0	0	5	5	5	5
prometon	0	0	5	5	5	5
simazine	0	0	5	5	5	5
TOTAL ANALYTICAL RESULTS		0		38		38

COUNTY: STANISLAUS

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	10	10	10	10
1,3-dichloropropene	0	0	10	10	10	10
2,4,5-t	0	0	10	10	10	10
2,4,6-trichlorophenol	0	0	10	10	10	10
2,4-D	0	0	10	10	10	10
2,4-dinitrophenol	0	0	10	10	10	10
4(2,4-DB), butoxyethanol ester	0	0	10	10	10	10
alachlor	0	0	10	10	10	10
aldicarb	0	0	10	10	10	10
aldrin	0	0	10	10	10	10
ametryne	0	0	10	10	10	10
aminocarb	0	0	10	10	10	10
atraton	0	0	10	10	10	10
atrazine	0	0	11	11	11	11
barban	0	0	10	10	10	10
benefin	0	0	10	10	10	10
benomyl	0	0	10	10	10	10
bhc (other than gamma isomer)	0	0	10	30	10	30
bromacil	0	0	1	1	1	1
captan	0	0	10	10	10	10
carbaryl	0	0	10	10	10	10
carbofuran	0	0	10	10	10	10
carbophenothion	0	0	10	10	10	10
chlordane	0	0	10	10	10	10
chlorothalonil	0	0	10	10	10	10
chlorpropham	0	0	10	10	10	10
dbcp	0	0	10	10	10	10
ddd	0	0	10	10	10	10

COUNTY: STANISLAUS

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
dde	0	0	10	10	10	10
ddt	0	0	10	10	10	10
dicamba	0	0	10	10	10	10
dichlorprop, butoxyethanol ester	0	0	10	10	10	10
dieldrin	0	0	10	10	10	10
dinoseb	0	0	10	10	10	10
diuron	1	2	10	10	11	12
dmpa	0	0	10	10	10	10
endosulfan	0	0	10	20	10	20
endosulfan sulfate	0	0	10	10	10	10
endrin	0	0	10	10	10	10
endrin aldehyde	0	0	10	10	10	10
ethylene dibromide	0	0	10	10	10	10
fenuron	0	0	10	10	10	10
fluometuron	0	0	10	10	10	10
fonofos	0	0	3	3	3	3
heptachlor	0	0	10	10	10	10
heptachlor epoxide	0	0	10	10	10	10
lindane (gamma-bhc)	0	0	10	10	10	10
linuron	0	0	10	10	10	10
methiocarb	0	0	10	10	10	10
methomyl	0	0	10	10	10	10
methoxychlor	0	0	10	10	10	10
metribuzin	0	0	3	3	3	3
mexacarbate	0	0	10	10	10	10
monuron	0	0	10	10	10	10
neburon	0	0	10	10	10	10
nitrofen	0	0	10	10	10	10

COUNTY: STANISLAUS

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
ortho-dichlorobenzene	0	0	10	10	10	10
ortho-dichlorobenzene, other rel	0	0	10	20	10	20
oxamyl	0	0	10	10	10	10
pcnb	0	0	10	10	10	10
prometon	0	0	11	11	11	11
prometryn	0	0	10	10	10	10
propazine	0	0	10	10	10	10
propham	0	0	10	10	10	10
propoxur	0	0	10	10	10	10
propylene dichloride	0	0	10	10	10	10
siduron	0	0	10	10	10	10
silvex	0	0	10	10	10	10
simazine	0	0	11	11	11	11
simetryn	0	0	10	10	10	10
terbuthylazine	0	0	10	10	10	10
terbutryn	0	0	10	10	10	10
toxaphene	0	0	10	10	10	10
xylene	0	0	10	10	10	10
TOTAL ANALYTICAL RESULTS		2		760		762

COUNTY: TULARE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
aldicarb	0	0	22	22	22	22
aldicarb sulfone	0	0	22	22	22	22
aldicarb sulfoxide	0	0	22	22	22	22
atrazine	3	6	151	240	154	246
azinphos-methyl	0	0	3	3	3	3
azinphos-methyl-oa	0	0	3	3	3	3
bromacil	42	87	115	163	157	250
bromoxynil octanoate	0	0	1	1	1	1
chlorthal-dimethyl	0	0	6	6	6	6
ddvp	0	0	3	3	3	3
dicofol	0	0	3	3	3	3
dimethoate	0	0	3	3	3	3
diuron	61	135	95	119	156	254
fenamiphos	0	0	3	3	3	3
fenamiphos sulfone	0	0	3	3	3	3
fenamiphos sulfoxide	0	0	3	3	3	3
metolachlor	0	0	3	3	3	3
molinate	0	0	1	1	1	1
mtp (monomethyl 2,3,5,6-tetrachl	0	0	6	6	6	6
naled	0	0	3	3	3	3
oxydemeton-methyl	0	0	3	3	3	3
paraoxon	0	0	3	3	3	3
parathion	0	0	3	3	3	3
prometon	2	4	154	249	156	253
propargite	0	0	3	3	3	3
simazine	64	136	89	105	153	241
tpa (2,3,5,6-tetrachloroterephth	0	0	6	6	6	6
TOTAL ANALYTICAL RESULTS		368		1004		1372

COUNTY: TUOLUMNE

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
atrazine	0	0	7	7	7	7
bromacil	0	0	7	7	7	7
diuron	0	0	7	7	7	7
methyl bromide	0	0	5	11	5	11
prometon	0	0	7	7	7	7
simazine	0	0	7	7	7	7
xylene	0	0	2	4	2	4
TOTAL ANALYTICAL RESULTS		0		50		50

COUNTY: YOLO

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
bromoxynil octanoate	0	0	3	3	3	3
disulfoton	0	0	1	1	1	1
TOTAL ANALYTICAL RESULTS		0		4		4

APPENDIX H

TABLES ONE THROUGH NINE

Table 1. Numerical summary of records contained in the well inventory data base, by year of report.

CATEGORY	REPORT YEAR						CUMULATIVE TOTAL [b]
	1986	1987	1988	1989	1990	1991	
Total analyses [a]	71,093	4,144	39,779	8,096	29,923	24,712	177,661
Confirmed analyses	4,874	1,037	336	619	717	554	8,670
Wells sampled	8,340	525	2,963	749	2,761	1,556	15,238
Wells with confirmed detections	2,243	210	115	180	163	146	3,021
Counties sampled	53	19	41	33	52	30	57
Counties with wells having confirmed detections	16	12	14	20	15	16	37
Pesticides and related compounds sampled for	160	77	168	97	192	165	273
Pesticides and related compounds with confirmed analyses	6	14	10	14	14	11	32
Pesticide residues resulting from non-point source agricultural use	9	8	1	7	6	7	12

a Unconfirmed detections are not included in the totals given. An unconfirmed detection is the detection of a pesticide in a single sample, for a particular well, taken during the time period of an individual monitoring study. Confirmation of the initial positive analysis by a second positive sample was not possible because (1) only a single sample was taken from the well or (2) analyses of all other samples taken from the well during the study were negative for the compound under investigation.

b The cumulative total is not additive. It is a total of the unique items existing in a category (e.g., a single well which had sampling data reported in the 1986, 1988, and 1990 reports is counted one time only.)

Table 2. Confirmed, negative and total results for counties in which sampling was reported. Results are from sampling reported between July 1990 and September 1991.

COUNTY	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF SAMPLES	NO. OF WELLS	NO. OF SAMPLES	NO. OF WELLS	NO. OF SAMPLES
BUTTE	0	0	57	4062	57	4062
COLUSA	0	0	4	5	4	5
DEL NORTE	9	56	23	390	32	446
FRESNO	12	34	103	405	115	439
GLENN	2	4	24	147	26	151
KERN	5	5	55	222	60	227
KINGS	0	0	38	114	38	114
LASSEN	1	4	5	97	6	101
LOS ANGELES	4	10	12	130	16	140
MADERA	0	0	10	24	10	24
MERCED	0	0	47	1320	47	1320
MONO	0	0	7	42	7	42
MONTEREY	5	5	38	1001	43	1006
NAPA	0	0	6	42	6	42
ORANGE	8	21	2	69	10	90
PLACER	1	5	5	43	6	48
RIVERSIDE	0	0	3	9	3	9
SACRAMENTO	1	2	4	8	5	10
SAN BENITO	0	0	10	694	10	694
SAN JOAQUIN	0	0	37	63	37	63
SAN LUIS OBISPO	1	1	8	65	9	66
SANTA BARBARA	4	4	9	94	13	98

Table 2. (continued)

COUNTY	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF SAMPLES	NO. OF WELLS	NO. OF SAMPLES	NO. OF WELLS	NO. OF SAMPLES
SANTA CLARA	7	10	720	12843	727	12853
SANTA CRUZ	3	23	14	398	17	421
SISKIYOU	0	0	7	15	7	15
SOLANO	0	0	8	38	8	38
STANISLAUS	1	2	16	760	17	762
TULARE	82	368	127	1004	209	1372
TUOLUMNE	0	0	7	50	7	50
YOLO	0	0	4	4	4	4
TOTAL	146	554	1410	24158	1556	24712

Table 3. Comparison of confirmed versus total number of counties and wells sampled and analyses made for the eleven pesticides and breakdown products having confirmed detections. Results are from sampling reported between July 1990 to September 1991.

PESTICIDE DETECTED	CONFIRMED			TOTAL		
	WELLS	ANALYSES	COUNTIES	WELLS	ANALYSES	COUNTIES
aldicarb sulfone	7	24	1	164	196	8
aldicarb sulfoxide	9	32	1	164	198	8
atrazine	8	16	5	526	649	25
bromacil	46	95	4	476	596	23
diuron	67	149	1	540	669	24
molinate	1	2	1	13	19	4
ortho-dichlorobenzene	1	2	1	815	988	9
prometon	2	4	1	528	656	24
simazine	80	171	3	519	639	25
TPA	26	29	7	75	77	8
xylene	5	30	3	827	954	12

Table 4. The number of pesticides with confirmed detections in well water and the total number of pesticides for which analyses were done, by county. Results are from sampling reported between July 1990 and September 1991.

COUNTY	NUMBER OF PESTICIDES DETECTED AND CONFIRMED	NUMBER OF PESTICIDES SAMPLED FOR
BUTTE	0	96
COLUSA	0	3
DEL NORTE	2	17
FRESNO	4	34
GLENN	2	11
KERN	1	12
KINGS	0	3
LASSEN	1	14
LOS ANGELES	3	8
MADERA	0	4
MERCED	0	83
MONO	0	6
MONTEREY	1	78
NAPA	0	6
ORANGE	3	5
PLACER	2	6
RIVERSIDE	0	3
SACRAMENTO	1	6
SAN BENITO	0	68
SAN JOAQUIN	0	16
SAN LUIS OBISPO	1	9
SANTA BARBARA	1	12
SANTA CLARA	2	102
SANTA CRUZ	1	70
SISKIYOU	0	10
SOLANO	0	7
STANISLAUS	1	74
TULARE	5	27
TUOLUMNE	0	7
YOLO	0	2

Table 5. The number of counties with confirmed results and the number of counties in which samples were taken, for each pesticide and related chemical. Results are from sampling reported between July 1990 and September 1991.

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
1,1,2,2-tetrachloroethane	0	9
1,2,4-trichlorobenzene	0	1
1,2-dichloropropane, 1,3-D and related C-3 compounds	0	4
1,3-dichloropropene	0	10
2,4,5-T	0	6
2,4,6-trichlorophenol	0	6
2,4-D	0	8
2,4-DP, isooctyl ester	0	3
2,4-dinitrophenol	0	6
4(2,4-DB), butoxyethanol ester	0	6
acenapthene	0	1
acephate	0	2
alachlor	0	8
aldicarb	0	14
aldicarb sulfone	1	8
aldicarb sulfoxide	1	8
aldrin	0	7
ametryne	0	7
aminocarb	0	6
atraton	0	7
atrazine	5	25

Table 5. (continued)

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
azinphos-methyl	0	3
azinphos-methyl-oa	0	2
barban	0	7
benefin	0	2
benomyl	0	7
BHC (other than gamma isomer)	0	7
bromacil	4	23
bromoxynil octanoate	0	3
captafol	0	1
captan	0	8
carbaryl	0	8
carbofuran	0	7
carbon disulfide	0	1
carbophenothion	0	6
chloramben	0	1
chlordane	0	7
chloropicrin	0	2
chlorothalonil	0	3
chlorpropham	0	7
chlorpyrifos	0	2
chlorthal-dimethyl	0	9
coumaphos	0	1
cyanazine	0	3
cypermethrin	0	2

Table 5. (continued)

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
dalapon	0	1
DBCP	0	4
DDD	0	7
DDE	0	7
DDT	0	7
DDVP	0	3
demeton	0	2
diazinon	0	5
diazoxon	0	2
dicamba	0	6
dichlobenil	0	1
dichlorprop, butoxyethanol ester	0	3
dicofol	0	3
dieldrin	0	7
diethatyl-ethyl	0	2
dimethoate	0	3
dinoseb	0	7
diphenamid	0	1
disulfoton	0	5
diuron	4	24
DMPA	0	5
endosulfan	0	7
endosulfan sulfate	0	7
endothall	0	2

Table 5. (continued)

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
endrin	0	7
endrin aldehyde	0	6
EPTC	0	1
ethion	0	1
ethofumesate	0	1
ethoprop	0	2
ethylene dibromide	0	6
fenamiphos	0	3
fenamiphos sulfone	0	3
fenamiphos sulfoxide	0	3
fensulfothion	0	2
fenthion	0	1
fenuron	0	7
fenvalerate	0	2
fluometuron	0	7
fonofos	0	3
heptachlor	0	7
heptachlor epoxide	0	7
hexachlorobenzene	0	1
lindane (gamma-BHC)	0	7
linuron	0	8
malathion	0	2
maneb	0	2
MCPP, diethanolamine salt	0	1

Table 5. (continued)

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
MCPPA	0	1
merphos	0	1
metalaxyl	0	3
methamidophos	0	1
methiocarb	0	9
methiocarb sulfone	0	3
methiocarb sulfoxide	0	3
methomyl	0	7
methoxychlor	0	7
methyl bromide	0	6
methyl parathion	0	2
metolachlor	0	2
metribuzin	0	3
mevinphos	0	1
mexacarbate	0	6
mirex	0	1
molinate	1	4
monuron	0	7
monuron-tca	0	1
MTP	0	8
naled	0	3
naphthalene	0	2
napropamide	0	1
neburon	0	7

Table 5. (continued)

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
nitrofen	0	5
ortho-dichlorobenzene	1	9
ortho-dichlorobenzene, other related	0	9
oryzalin	0	1
oxadiazon	0	3
oxamyl	0	7
oxydemeton-methyl	0	2
paraoxon	0	2
paraquat dichloride	0	1
parathion	0	4
PCNB	0	6
phorate	0	3
phorate sulfone	0	1
phorate sulfoxide	0	1
phosmet	0	3
phosmet-oa	0	2
prometon	1	24
prometryn	0	8
propachlor	0	3
propargite	0	2
propazine	0	7
propham	0	7
propoxur	0	6
propylene dichloride	0	7

Table 5. (continued)

PESTICIDE	NUMBER OF COUNTIES WITH CONFIRMED RESULTS	NUMBER OF COUNTIES SAMPLED
prothiofos	0	1
pyrazon	0	1
ronnel	0	1
s,s,s-tributyl phosphorotrithioate	0	2
screen (chlorinated hydrocarbon)	0	1
screen (organophosphate)	0	1
secbumeton	0	2
siduron	0	6
silvex	0	6
simazine	3	25
simetryn	0	6
sulprofos	0	1
swep	0	1
tebuthiuron	0	1
terbuthylazine	0	7
terbutryn	0	7
tetrachlorvinphos	0	1
toxaphene	0	7
TPA	7	8
trichloronate	0	1
trichlorophenol	0	1
trifluralin	0	1
xylene	3	12
ziram	0	2

Table 6. Summary of wells with confirmed detections of residues by county and pesticide. Results are from sampling reported between July 1990 and September 1991.

COUNTY	aldicarb sulfone	aldicarb sulfoxide	atrazine	bromacil	ortho-dichloro-benzene	diuron	molinate	prometon	simazine	TPA	xylene	Total Discrete Wells by County
Del Norte	7	9										9
Fresno				2		4			8	2		12
Glenn			1				1					2
Kern										5		5
Lassen											1	1
Los Angeles			2	1						3		4
Monterey										5		5
Orange			1			1			8			8
Placer				1							1	1
Sacramento			1									1
San Luis Obispo										1		1
Santa Barbara										4		4
Santa Clara					1					6		7
Santa Cruz											3	3
Stanislaus						1						1
Tulare			3	42		61		2	64			82
Total Discrete Wells by Chemical	7	9	8	46	1	67	1	2	80	26	5	

Table 7. Summary of wells with unconfirmed detections by county and pesticide. Results are from sampling reported between July 1990 and September 1991.

COUNTY	aldicarb sulfone	atrazine	bromacil	carbon disulfide	chlorthal-dimethyl	2,4-D	1,3-D	dichlor-prop	diuron	endothall	methyl bromide	molinate	MTP	1,2-D	simazine	TPA	xylene	Total Discrete Wells by County
Butte						1		1		1					1			3
Colusa						1												1
Del Norte	1													8				8
Fresno			2						2						1	9		12
Glenn												1						1
Kern																5		5
Los Angeles					1										1	5		6
Monterey		2											1		1	10		10
Orange																		2
San Luis Obispo				1												2		2
Santa Barbara							3									3		4
Santa Clara																		3
Santa Cruz														4			3	6
Tulare		5	5						10						11	1		27
Tuolumne											1							1
Total Discrete Wells by Chemical	1	7	7	1	1	2	3	1	12	1	1	1	1	12	15	35	3	

Table 8. The number of confirmed, negative, and total wells sampled and number of analyses made, for each pesticide or breakdown product for which analyses were done. Results are from sampling reported between July 1990 and September 1991.

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
1,1,2,2-tetrachloroethane	0	0	809	884	809	884
1,2,4-trichlorobenzene	0	0	44	51	44	51
1,2-dichloropropane, 1,3-D and related C-3 compounds	0	0	86	92	86	92
1,3-dichloropropene	0	0	784	895	784	895
2,4,5-T	0	0	94	95	94	95
2,4,6-trichlorophenol	0	0	99	106	99	106
2,4-D	0	0	115	135	115	135
2,4-DP, isooctyl ester	0	0	27	27	27	27
2,4-dinitrophenol	0	0	99	106	99	106
4(2,4-DB), butoxyethanol ester	0	0	94	95	94	95
acenapthene	0	0	14	18	14	18
acephate	0	0	98	100	98	100
alachlor	0	0	126	127	126	127
aldicarb	0	0	316	352	316	352

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
aldicarb sulfone	7	24	157	172	164	196
aldicarb sulfoxide	9	32	155	166	164	198
aldrin	0	0	202	204	202	204
ametryne	0	0	160	162	160	162
aminocarb	0	0	137	138	137	138
atraton	0	0	160	162	160	162
atrazine	8	16	518	633	526	649
azinphos-methyl	0	0	94	95	94	95
azinphos-methyl-oa	0	0	6	6	6	6
barban	0	0	173	175	173	175
benefin	0	0	27	27	27	27
benomyl	0	0	66	72	66	72
BHC (other than gamma isomer)	0	0	202	326	202	326
bromacil	46	95	429	501	475	596
bromoxynil octanoate	0	0	6	6	6	6

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
captafol	0	0	96	97	96	97
captan	0	0	179	197	179	197
carbaryl	0	0	183	191	183	191
carbofuran	0	0	177	179	177	179
carbon disulfide	0	0	4	11	4	11
carbophenothion	0	0	162	163	162	163
chloramben	0	0	108	109	108	109
chlordane	0	0	202	204	202	204
chloropicrin	0	0	148	150	148	150
chlorothalonil	0	0	67	68	67	68
chlorpropham	0	0	177	179	177	179
chlorpyrifos	0	0	106	108	106	108
chlorthal-dimethyl	0	0	222	229	222	229
coumaphos	0	0	40	41	40	41
cyanazine	0	0	46	47	46	47

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
cypermethrin	0	0	6	6	6	6
dalapon	0	0	40	41	40	41
DBCP	0	0	139	140	139	140
DDD	0	0	202	204	202	204
DDE	0	0	202	204	202	204
DDT	0	0	202	204	202	204
DDVP	0	0	46	47	46	47
demeton	0	0	128	130	128	130
diazinon	0	0	140	148	140	148
diazoxon	0	0	6	6	6	6
dicamba	0	0	94	95	94	95
dichlobenil	0	0	98	99	98	99
dichlorprop, butoxyethanol ester	0	0	65	66	65	66
dicofol	0	0	114	115	114	115
dieldrin	0	0	202	204	202	204

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
diethatyl-ethyl	0	0	6	6	6	6
dimethoate	0	0	58	59	58	59
dinoseb	0	0	146	148	146	148
diphenamid	0	0	52	53	52	53
disulfoton	0	0	134	136	134	136
diuron	67	149	473	520	540	669
DMPA	0	0	54	54	54	54
endosulfan	0	0	202	236	202	236
endosulfan sulfate	0	0	202	204	202	204
endothall	0	0	103	111	103	111
endrin	0	0	202	204	202	204
endrin aldehyde	0	0	94	95	94	95
EPTC	0	0	58	59	58	59
ethion	0	0	88	89	88	89
ethofumesate	0	0	1	1	1	1

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
ethoprop	0	0	46	47	46	47
ethylene dibromide	0	0	120	126	120	126
fenamiphos	0	0	17	36	17	36
fenamiphos sulfone	0	0	17	36	17	36
fenamiphos sulfoxide	0	0	17	36	17	36
fensulfothion	0	0	128	130	128	130
fenthion	0	0	40	41	40	41
fenuron	0	0	177	179	177	179
fenvalerate	0	0	6	6	6	6
fluometuron	0	0	177	179	177	179
fonofos	0	0	71	72	71	72
heptachlor	0	0	202	204	202	204
heptachlor epoxide	0	0	202	204	202	204
hexachlorobenzene	0	0	45	52	45	52
lindane (gamma-BHC)	0	0	202	204	202	204

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
linuron	0	0	183	185	183	185
malathion	0	0	128	130	128	130
maneb	0	0	98	100	98	100
MCPP, diethanolamine salt	0	0	40	41	40	41
MCPPA	0	0	40	41	40	41
merphos	0	0	40	41	40	41
metalaxyl	0	0	6	6	6	6
methamidophos	0	0	58	59	58	59
methiocarb	0	0	183	185	183	185
methiocarb sulfone	0	0	6	6	6	6
methiocarb sulfoxide	0	0	6	6	6	6
methomyl	0	0	177	179	177	179
methoxychlor	0	0	202	204	202	204
methyl bromide	0	0	768	889	768	889
methyl parathion	0	0	129	131	129	131

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
metolachlor	0	0	6	6	6	6
metribuzin	0	0	64	65	64	65
mevinphos	0	0	40	41	40	41
mexacarbate	0	0	137	138	137	138
mirex	0	0	108	109	108	109
molinate	1	2	12	17	13	19
monuron	0	0	177	179	177	179
monuron-tca	0	0	40	41	40	41
MTP	0	0	74	79	74	79
naled	0	0	46	47	46	47
naphthalene	0	0	49	60	49	60
napropamide	0	0	58	59	58	59
neburon	0	0	177	179	177	179
nitrofen	0	0	54	54	54	54
ortho-dichlorobenzene	1	2	814	986	815	988

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
ortho-dichlorobenzene, other related	0	0	814	982	814	982
oryzalin	0	0	58	59	58	59
oxadiazon	0	0	8	8	8	8
oxamyl	0	0	177	179	177	179
oxydemeton-methyl	0	0	6	6	6	6
paraoxon	0	0	6	6	6	6
paraquat dichloride	0	0	40	41	40	41
parathion	0	0	134	136	134	136
PCNB	0	0	94	95	94	95
phorate	0	0	103	124	103	124
phorate sulfone	0	0	11	30	11	30
phorate sulfoxide	0	0	11	29	11	29
phosmet	0	0	7	7	7	7
phosmet-oa	0	0	6	6	6	6
prometon	2	4	526	652	528	656

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
prometryn	0	0	166	169	166	169
propachlor	0	0	27	27	27	27
propargite	0	0	6	6	6	6
propazine	0	0	160	163	160	163
propham	0	0	177	179	177	179
propoxur	0	0	138	139	138	139
propylene dichloride	0	0	771	842	771	842
prothiofos	0	0	40	41	40	41
pyrazon	0	0	2	2	2	2
ronnel	0	0	40	41	40	41
s,s,s-tributyl phosphorotrithioate	0	0	6	6	6	6
screen (chlorinated hydrocarbon)	0	0	1	1	1	1
screen (organophosphate)	0	0	1	1	1	1
secbumeton	0	0	106	109	106	109
siduron	0	0	94	95	94	95

Table 8. (continued)

PESTICIDE	CONFIRMED		NEGATIVE		TOTAL	
	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES	NO. OF WELLS	NO. OF ANALYSES
silvex	0	0	94	95	94	95
simazine	80	171	439	468	519	639
simetryn	0	0	94	95	94	95
sulprofos	0	0	40	41	40	41
swep	0	0	40	41	40	41
tebuthiuron	0	0	3	3	3	3
terbuthylazine	0	0	160	163	160	163
terbutryn	0	0	160	163	160	163
tetrachlorvinphos	0	0	40	41	40	41
toxaphene	0	0	202	204	202	204
TPA	26	29	47	48	73	77
trichloronate	0	0	40	41	40	41
trichlorophenol	0	0	40	41	40	41
trifluralin	0	0	108	109	108	109
xylene	5	30	822	924	827	954
ziram	0	0	98	100	98	100
TOTAL SAMPLE RESULTS		554		24158		24712