SAMPLING FOR PESTICIDE RESIDUES IN CALIFORNIA WELL WATER

1994 Update
Well Inventory Data Base

Ninth Annual Report to the Legislature,
State Department of Health Services,
Office of Environmental Health Hazard Assessment,
and the State Water Resources Control Board

Pursuant to the
Pesticide Contamination Prevention Act

by

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EXECUTIVE SUMMARY

PURPOSE

The Pesticide Contamination Prevention Act (PCPA, see Appendix A) requires the Director of the Department of Pesticide Regulation (DPR) within the California Environmental Protection Agency to maintain a statewide data base of wells sampled for active ingredients of pesticide products. It also requires all agencies to submit to the Director the results of any well sampling for the active ingredients of pesticides. The PCPA 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, the Office of Environmental Health Hazard Assessment, 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, before the passage of the PCPA 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 PCPA, both point source (where the contaminant flows in a fairly distinct plume from an identifiable source) and non-point source (contamination that cannot be traced to a single definable location) sampling results are now included in the data base.

This 1994 report is the ninth annual report. In 1992, a cumulative report on the entire contents of the data base was issued (Maes, *et al.*, 1992); this is the second update to the 1992 report. A numerical summary of the data contained in the data base by report year is given in Table 1. A glossary of terms used in this report is in Appendix B.

Table I-1. Summary of well sampling results included in the Department of Pesticide Regulation's (DPR) well inventory database, by report year, for data reported through June 30, 1994.

CATEGORY	REPORT YEAR 1986	1987	1988	1989	1990	1991	1992	1993	1994	TOTAL (a)
Total wells sampled	8987	574	3074	752	2784	1557	4741	2324	2839	18944
Wells with no detections	6583	317	2791	543	2550	1351	3985	1945	2414	14986
Wells with detections (b)	2404	257	283	209	234	206	756	379	425	3958
Wells with verified detections (c)	44	29	4	140	93	133	67	80	37	584
Total counties sampled	53	20	41	33	53	30	52	46	50	58
Counties with no detections	30	6	24	11	27	11	24	25	30	14
Counties with detections (b)	23	14	17	22	26	19	28	21	20	44
Counties with verified detections (c)	5	3	3	16	8	14	9	17	10	30
Total pesticides and related compounds analyzed	160	79	167	96	191	186	125	112	114	287
Pesticides and related compounds with no detections	144	64	142	81	164	166	85	83	95	208
Pesticides and related compounds with detections (b)	16	15	25	15	27	20	40	29	19	79
Pesticides and related compounds with verified detections (c)	8	6	5	9	6	9	5	10	6	20
Pesticides and related compounds detected in ground water as the result of legal, agricultural use (d)	9	8	1	7	6	7	5	11	5	14

(a) The total is not additive. It is a total of the unique times existing in a category (e.g. a single well that had sampling data reported in the 1986, 1988, and 1990 reports is counted one time only. Similarly, if a pesticide is detected in 1986, 1988, and 1990, it is counted one time only).
(b) Verified and unverified detections are included in the total.
(c) Detections are designated as verified if residues of a compound are detected in one sample as a result of an analytical method approved by DPR and verified within 30 days in a second discrete sample taken from the well by a second analytical method or a second analytical laboratory approved by DPR.
(d) Legal, agricultural use is the application of a pesticide, according to its labeled directions and in accordance with federal and state laws and regulations. Agricultural use is defined in Food and Agricultural code Section 11408.

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, 1993 and June 30, 1994 are included and discussed in this report.*

2. *Data included in this report are not the results of a single study. Rather, they are the result of 44 studies, designed and conducted by four agencies for varying purposes using different sampling and analytical methods.*

3. *Pesticide residue detections recorded 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 non-point source agricultural use.*

Despite these limitations, the well inventory is a unique archive of ground water sampling data for a single state. Although data bases containing the results of ground water monitoring for pesticides have been compiled in at least nine other states, only California centralizes monitoring results from all sampling agencies into a single repository on an ongoing basis.

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; and*

4. *Designing studies for future sampling.*

METHODS

All sampling results reported to DPR were reviewed to determine if they met the following criteria for inclusion in 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 obtained from an untreated and unfiltered system;*

4. *Location of each sampled well was identified by at least township/range/section according to the U.S. Geological Survey Public Lands Survey Coordinate system; and*

5. *Data had not been entered into the data base previously.*

The data were entered into a computer and checked with computer verification programs for accuracy.

MAJOR FINDINGS, July 1, 1993 through June 30, 1994

A total of 56,587 records were added to the well inventory data base for the 1994 update report. Each chemical analysis of a well water sample for a pesticide or related chemical constitutes one record in the data base.

Altogether, samples were taken from 2,839 wells in 50 of California's 58 counties and analyzed for an overall total of 114 pesticide active ingredients and breakdown products. The data represent 44 well sampling surveys conducted by four agencies from 1986 through 1994 that were reported to DPR from July 1, 1993 through June 30, 1994.

Detections of 19 of the 114 compounds were reported. Of those, verified detections were made of five herbicides (atrazine, bromacil, diuron, prometon, and simazine) and an herbicide breakdown product (deisopropyl-atrazine).

Detections are designated as verified if residues of a compound are detected using an analytical method approved by the Department, and verified within 30 days in a second discrete sample taken from the well, by a second analytical method or a second analytical laboratory approved by the Department.

Verified detections were not made of 13 compounds reported as detected because either (1) follow-up sampling has not yet been completed by DPR; (2) follow-up sampling was not conducted by DPR because the compound reported detected was not registered for agricultural use; or (3) analyses of all other samples taken by DPR in response to the positive sample were negative for the compound under investigation. Negative follow-up samples may result from different analytical methods or MDLs used, from false positives (i.e., a negative sample was recorded as a positive due to laboratory error), or from delays (sometimes years) in reporting the initial detection to DPR.

Detections of pesticides that are not currently registered for use, pesticides registered for other than agricultural, outdoor industrial, or outdoor institutional uses, and detections of pesticides in ground water which are determined not to be the result of legal agricultural use, are referred to the SWRCB for appropriate action. The SWRCB and nine Regional Water Quality Control Boards are responsible for protecting the beneficial uses of water in California and for controlling all discharges of waste into waters of the State.

Verified detections of all six compounds have been reported previously in various areas of the state. Pesticides found for the first time were atrazine in Yolo County, prometon in Stanislaus County, and simazine in Colusa County.

Altogether, pesticide residues were detected and verified in 37 wells in ten counties. Two or more of the compounds were found in 17 of the wells. Simazine (verified in 28 wells) was found most frequently, followed by diuron (16 wells), atrazine (13 wells), bromacil (4 wells), prometon (1 well), and deisopropyl-atrazine (1 well). Of the 37 wells with verified detections, 20 were private drinking-water wells, 13 were public

drinking-water wells, two were non-drinking-water wells, and the use of two wells was unknown.

Agricultural applications were determined by DPR to be the source of residues of new detections of five compounds found in ground water: atrazine, bromacil, diuron, prometon, and simazine. DPR is currently investigating a new detection of deisopropyl-atrazine to determine the source of those residues. As a result of well monitoring and land use surveys conducted during the period July 1, 1993 through June 30, 1994, and investigations completed by DPR for monitoring studies conducted prior to July 1, 1993, 41 wells in ten counties were determined by DPR to contain pesticide residues as a result of non-point source, legal agricultural use. Simazine (30 wells) was detected most frequently due to such use, followed by diuron (15 wells), atrazine (14 wells), bromacil (9 wells), and prometon (1 well). Two or more compounds were detected in 18 of the 41 wells. In all, pesticide residues in ground water were determined to be the result of non-point source, legal agricultural use in the following counties: Colusa, Fresno, Glenn, Los Angeles, Merced, Riverside, San Joaquin, Solano, Tulare, and Yolo.

For the first time, non-point source, legal agricultural use was determined to be the cause of pesticide residues in ground water in Colusa, San Joaquin, Solano, and Yolo counties, and of residues of atrazine and prometon in ground water in Merced County. Previously, detections of atrazine, bromacil, diuron, prometon, and simazine (singly or in combination) resulting from agricultural use were reported in Contra Costa, Fresno, Glenn, Kern, Los Angeles, Merced, Orange, Placer, Riverside, San Bernardino, Stanislaus, Tehama, Tulare, Ventura, and Yuba counties.

Because of their detection in ground water, use of atrazine, bromacil, diuron, prometon, and simazine is controlled in Pesticide Management Zones (PMZs). A PMZ is a geographic surveying unit of approximately one square mile (a section) that is designated in regulation as sensitive to ground water pollution. During the period July 1, 1993 through June 30, 1994, a total of 34 new PMZs were recommended (singly or in combination) for atrazine, bromacil, diuron, prometon, and simazine in Colusa, Fresno, Glenn, Kern, Los Angeles, Merced, Riverside, San Joaquin, Solano, Tulare, and Yolo counties. These were the first PMZs for Colusa, San Joaquin, Solano, and Yolo counties.

Historical agricultural applications are considered by DPR to be the source of residues of three other compounds that were detected in ground water: 1,2-dibromo-3-chloropropane (DBCP); 1,2-dichloropropane (1,2-D); and ethylene dibromide (EDB). Unverified detections of DBCP were reported in 329 wells; 1,2-D in five wells; and EDB in 14 wells. Because those compounds are no longer registered for use in California, the detections were referred to the SWRCB.

Factors that contribute to ground water contamination by pesticides used in agriculture include amounts used, method of application, irrigation practices, the physicochemical characteristics of the pesticide, soil type, and climate. Regulation of pesticide use to prevent residues from entering ground water as a result of non-point source agricultural use involves knowledge of how pesticides move to ground water. 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 is being used to develop pesticide use practices that will prevent further ground water contamination by the agricultural use of pesticides.

Actions taken by the SWRCB and the California Regional Water Quality Control Boards (RWQCBs) in 1994 to prevent pesticides from migrating to ground water follow:

A. SWRCB staff participated in the following activities:

1. Regularly attended meetings sponsored by DPR, including the interagency Pesticide Advisory Committee, Pesticide Registration and Evaluation Committee, and Pest Management Advisory Committee, and the Interagency Coordinating Committee for Agricultural Regulatory Programs. The latter committee, formed in August 1993, will initially focus on identifying all regulatory programs for state and federal lands that impact the rice industry. If the committee is successful, its scope may be expanded to include other sectors of the agricultural industry.

2. Conferred with U.S. Geological Survey scientists to discuss studies dealing with pesticides and water quality.

3. Continued in the development, in cooperation with DPR staff, of a schedule and outline for establishing the Management Agency Agreement that will further coordinate pesticide and water quality management activities and uphold the provisions of the Memorandum of Understanding between the two agencies.

4. Prepared text summarizing the SWRCB/RWQCBs' responsibilities for two drafts of the State Ground Water Protection Plan for Pesticides being developed by DPR.

5. Submitted a workplan to U.S. Environmental Protection Agency pursuant to Section 106 of the Clean Water Act for Federal Fiscal Year 1994 funding for pesticides and ground water-related work.

6. Reviewed on an ongoing basis DPR Notices of "Materials Entering Evaluation" and advised DPR on potential water quality impacts of pesticide registration and use decisions.

7. Worked on adapting the Pesticide Use Retrieval System database queries of 1990 and 1991 pesticide usage in select watersheds within the State.

8. In response to Coastal Zone Act Reauthorization Amendments, initiated a review of the State's Non-point Source Program for reducing off-site movement of pesticides from agricultural operations.

9. Reviewed the Federal Safe Drinking Water Act Amendments of 1994 and provided comments to the National Ground Water Protection Council.

B. RWQCBs' staff participated in the following activities:

Site contamination assessment investigations, development and implementation of remediation plans (including soil and ground water clean-up), and monitoring. In addition, some situations involving pesticide detections in soil and water were referred to appropriate agencies for follow-up action.

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 pesticide residues in California ground water to the Legislature, the California Department of Health Services, the Office of Environmental Health Hazard Assessment, and the State Water Resources Control Board (SWRCB) annually by December 1.

This is the ninth annual report and the second update of the 1992 cumulative report (Maes *et al.*, 1992) which summarized ground water sampling results for agricultural-use pesticides that were reported to DPR between November 1, 1983 and July 1, 1992. The first update (1993) presented data reported to DPR during the period July 1, 1992 through June 30, 1993. This report presents data reported to DPR during the period July 1, 1993 through June 30, 1994.

The Pesticide Contamination Prevention Act (PCPA) requires that the annual report give the location of wells for which sampling results were reported. Although well locations are specified by (at least) township, range, and 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: Sections I, II, and III were written by staff of DPR. Section IV was written by staff of the SWRCB.

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DISCLAIMER

The mention of commercial products, their source or their use in this report is not to be construed as either an actual or implied endorsement of such product.

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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
ACDEH	Alameda County Department of Envirronmental Health
AL	action level
AR	active registration
BDPA	The Birth Defect Prevention Act of 1984 (SB 950)
CAL	California Action Level
Cal/EPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
3CCR	Title 3, California Code of Regulations
CDHS	California Department of Health Services
CIMIS	California Irrigation Management Information Systems
CISWP	California Inland Surface Waters Plan
CUI	currently under investigation
CVRWQCB	Central Valley Regional Water Quality Control Board
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
DCPA	chlorthal-dimethyl
DDD	1,1-dichloro-2,2-bis(p-chlorophenyl) ethane
DDT	dichloro diphenyl trichloroethane
DPR	Department of Pesticide Regulation
DRASTIC	a model used for predicting areas vulnerable to ground water contamination

DWR	California Department of Water Resources
EDB	ethylene dibromide
EHAP	Environmental Hazards Assessment Program
ELISA	enzyme-linked immunosorbent assay
EMPM	Environmental Monitoring and Pest Management Branch (DPR)
EPTC	s-ethyl dipropylthiocarbamate (eptam)
ETo	reference evapotranspiration
ETU	ethylene thiourea
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 chromatography
Koc	soil adsorption coefficient
MAD	mosquito abatement district
MCL	maximum contaminant level
MDL	minimum detection limit
MRR	minimum reporting requirement
MS	mass spectroscopy
MTP	monomethyl 2,3,5,6-tetrachloroterephthalate acid
NAS	National Academy of Science
NCRWQCB	North Coast Regional Water Quality Control Board
ND	not detected
NR	not registered
NWQO	numerical water quality objective

PAC	Pesticide Advisory Committee
PCA	pest control advisor
PCPA	Pesticide Contamination Prevention Act of 1985 (AB 2021)
PDRP	Pesticide Detection Response Process
PMZ	pesticide management zone
ppb	parts per billion
ppm	parts per million
PREC	Pesticide Registration Evaluation Committee
RWQCB	Regional Water Quality Control Board
SB 950	The Birth Defect Prevention Act
SCS	Soil Conservation Service
SEHAC	State Environmental Hazards Assessment Committee
SMP	State Management Plan
SNARL	suggested no-adverse-response-level
SNV	specific numerical value
SWRCB	State Water Resources Control Board
TPA	2,3,5,6-tetrachloroterephthalic acid
TRS	township/range/section
USDA	United States Department of Agriculture
USFS	United States Forest Service
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
YCEHS	Yolo County Environmental Health Services

I. WELL INVENTORY DATA BASE

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INTRODUCTION

This report presents information about California water wells that were sampled for the presence of pesticide residues. The sampling results were compiled during the period July 1, 1993 through June 30, 1994 by the Department of Pesticide Regulation (DPR, a department within the California Environmental Protection Agency [Cal/EPA]). The results are an update to the report *Sampling for Pesticide Residues in California Well Water: 1993 Update Well Inventory Data Base* (Maes *et al.*, 1993). The report includes a discussion of actions taken by DPR and the State Water Resources Control Board ([SWRCB] also part of Cal/EPA), including the nine Regional Water Quality Control Boards (RWQCBs), to prevent pesticides from entering ground water (Sections II and IV). Also included in this report is a discussion of factors contributing to the movement of pesticides to ground water as a result of agricultural use (Section III).

BACKGROUND

Until 1979, very little well water sampling was conducted in California to determine if pesticide residues had reached ground water because it was believed that pesticides did not have sufficient mobility or longevity in soil to migrate to ground water. In 1979, however, the soil fumigant 1,2-dibromo-3-chloropropane (DBCP) was detected in ground water in Lathrop, California. That discovery prompted widespread testing, and many areas of DBCP contamination were found. Testing for other pesticides followed and, since then, studies have been conducted throughout California by various agencies to determine whether pesticide residues have migrated to ground water.

In 1983, the Environmental Hazards Assessment Program (EHAP) of DPR developed the well inventory data base in order to archive reliable information on the occurrence of non-point source (not traceable to a single definable location) contamination of ground water due to 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 (PCPA, see Appendix A,) added sections 13141 through 13152 to Division 7 of the Food and Agricultural Code (FAC). The PCPA requires DPR to maintain a statewide data base of wells sampled for the active ingredients of pesticides (FAC section 13152[c]) and to report annually to the Legislature, the SWRCB, the California Department of Health Services (CDHS), and the Office of Environmental Health Hazard Assessment 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 (FAC section 13152[e]). The first annual report pursuant to the PCPA, *Sampling for Pesticide Residues in California Well Water: 1986 Well Inventory Data Base* (Brown, *et al.*, 1986), presented data from the original data base, plus additional data received by DPR from early 1984 through August 31, 1986. Since the passage of the PCPA, 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. The majority of wells with pesticide detections appear to be from non-point sources.

This report is the ninth annual report and the second update of the report, *Sampling for Pesticide Residues in California Well Water: 1992 Well Inventory Data Base, Cumulative Report 1986-1992* (Maes, *et al.*, 1992). Each report discussed well sampling data submitted to the well inventory data base for the report year, as well as the results of DPR investigations of detections of pesticides currently registered for agricultural use.

It should be noted that data included in the well inventory for the 1994 report are not the results of a single study. Rather, they are the result of 44 separate monitoring surveys, designed and conducted by four agencies for various purposes, and do not represent a comprehensive study of ground water contamination in the state by agricultural-use pesticides. The data indicate only which pesticides are present in California well water among the pesticides analyzed for in areas where samples were taken, but not among all pesticides used statewide.

Despite these limitations, the well inventory is a unique archive of ground water sampling data for a single state. Although data bases have been compiled in at least nine other states for the results of ground water monitoring for pesticides, only

California centralizes monitoring results from all sampling agencies into a single collection point on an ongoing basis.

Sections I, II, and III of this report contain the following information:

Number of wells sampled;
Number of wells, by county, that had detections of pesticide residues;
Status of detected pesticides;
Factors contributing to pesticide movement to ground water as a result of agricultural use;
Actions taken by DPR to prevent pesticides from entering ground water.

Section IV of the report contains a summary of actions taken by the SWRCB and the RWQCBs to prevent pesticides from migrating to ground water.

A glossary of terms used in the 1994 report is provided in Appendix B.

Materials and methods used for data collection, data preparation, and data entry into the data base are given in Appendix C.

CONTENTS OF THE WELL INVENTORY DATA BASE

Format for Reporting Results

The 1992 cumulative report was a comprehensive summary of all sampling results added to the data base since its inception in November 1983, and the first report to discuss number of wells with detections resulting from the legal, agricultural use of pesticides. Prior to 1992, well inventory reports emphasized the number of wells with confirmed, positive samples. In 1989, however, precise and comprehensive criteria (Biermann, 1989) were established for verifying detections of pesticide residues in ground water as specified by the PCPA (FAC section 13149(3)(d)). Since then, only wells with verified detections of pesticide residues (see below) are subject to DPR regulatory action. Therefore, detections are summarized separately in this part of the report as follows: (1) by total number of wells sampled and total number of wells with verified detections and (2) positive, unverified samples. A numerical summary of all well sampling results included in the well inventory, by report year, is given in Table I-1 (Appendix D).

Criteria for Classifying Records Added to the Well Inventory Data Base

Each record in the well inventory data base represents a well water sample analyzed for a pesticide residue. Each record was classified according to those analytical results as follows:

(1) Well water samples in which pesticide residues were not detected at or above the minimum detection limit (MDL) of the method used for analysis were designated as *negative*.

(2) Positive samples were designated as *unconfirmed* when pesticide residues were detected in only a single sample during the time period of a single monitoring survey. 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 survey were negative for the compound under investigation.

(3) Positive samples were designated as *confirmed* if a specific compound was detected in two discrete samples taken from a single well during the time period of a single monitoring survey. Confirmed detections may be either verified or unverified.

(4) Confirmed detections are *verified* if they meet the criteria specified in FAC section 13149(d) of the PCPA. Section 13149(d) requires that the detection of a pesticide in ground water result from an analytical method approved by DPR and that the initial detection be verified within 30 days by a second analytical method or a second analytical laboratory approved by DPR. Criteria have been set by DPR (Biermann, 1989; see Appendix E) for determining whether the detection of a pesticide or its breakdown product(s) in ground water meets the standards of section 13149(d). Wells with verified detections of pesticide residues are subject to regulatory action by the Department as outlined in Section II.

SUMMARY OF DATA BASE CONTENTS BY TOTAL WELLS SAMPLED AND WELLS WITH VERIFIED DETECTIONS

RESULTS BY REPORTING AGENCY

Sampling Distribution

The results from 44 well sampling surveys were reported to DPR for inclusion in the well inventory during the period July 1, 1993 through June 30, 1994. The data represent a total of 2,839 wells in 50 counties that were sampled for an overall total of 114 pesticide active ingredients and breakdown products. The four state agencies submitting data for the 1994 report were:

DPR (221 wells sampled);
CDHS (2,565 wells);
DWR (67 wells);
San Francisco Bay RWQCB (11 wells).

The surveys were conducted from 1986 through 1994. Some wells were sampled by more than one agency. A summary of each survey is presented in Appendix F.

Of the 2,839 wells sampled, 2,572 (90%) were public drinking water wells; 228 (8%) were private drinking water wells; 34 (1%) were non-drinking water wells; and the use of three (0.1%) wells was unknown.

Type of Wells with Verified Detections

Verified detections were made in a total of 37 wells. Of those, 20 (55%) were private drinking water wells, 13 (34%) were public drinking water wells, two (5%) were non-drinking water wells, and the use of two (5%) wells was unknown.

RESULTS BY PESTICIDE

Sampling Distribution

Sampling results for 114 pesticide active ingredients and breakdown products were reported. A list of the compounds by total number of counties and wells sampled, number of wells with unverified detections, and number of wells with verified detections, is given in Appendix D, Table I-2.

Sampling frequency varied among the pesticides. For example, 12 compounds

were each analyzed for in at least 1,200 wells; 53 other pesticides were each analyzed for in less than 50 wells. The six pesticides most frequently analyzed for, by number of wells sampled, were DBCP (1,488 wells); 1,2-dichloropropane [1,2-D] (1,436); 1,1,2,2-tetrachloroethylene (1,421); methyl bromide (1,412); ortho-dichlorobenzene (1,411); and xylene (1,395).

Wells with Verified Detections

Overall, a total of six compounds were found in the 37 wells with verified detections. Two or more of the compounds were found in 17 of the wells (46%). Simazine was found most frequently (verified in 28 wells), followed by diuron (16 wells), atrazine (13 wells), bromacil (4 wells), prometon (1 well), and deisopropyl-atrazine (1 well). A summary of wells with verified detections, by county and pesticide, is given in Appendix D, Table I-3. California counties with verified detections of pesticides in ground water are shown in Figure 1.

RESULTS BY COUNTY

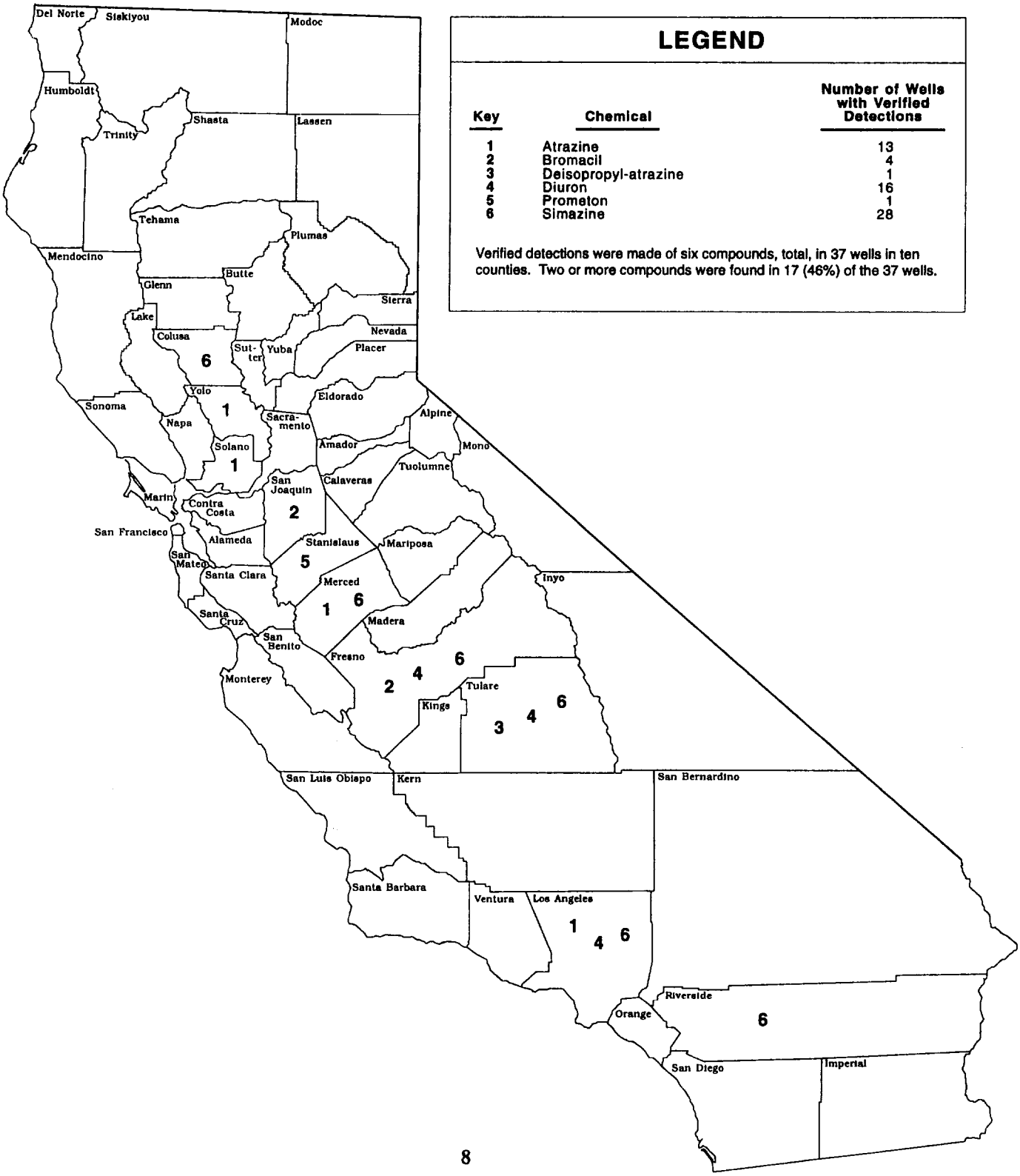
Sampling Distribution

Sampling results were reported for 50 of California's 58 counties for the 1994 report. A tabular summary, by county, of the pesticides for which analyses were run (including number of wells with negative, positive, and verified detections, and total number of wells sampled for each compound) appears in Appendix G. A comparison, by county, of total pesticides analyzed for and total number of wells sampled versus number of wells with verified, negative, and unverified detections is given in Table I-4.

The total number of pesticides analyzed per county ranged from six (Placer County) to 77 (Merced County). More than 25 compounds were sampled in half of the 50 counties in which wells were sampled (Table I-4).

The number of wells sampled per county ranged from one (Del Norte, San Francisco, Sierra, Sutter and Tuolumne counties) to 508 (Los Angeles County). Of the 2,839 total wells sampled, over half (1,529) were located in six counties: Los Angeles (508 wells), San Bernardino (262), Fresno (235), Kern (187), Santa Clara (184), and Tulare (153). One reason for this variation is differences in design of well sampling studies among various agencies.

Figure I-1. California counties with confirmed detections of pesticide residues in ground water that were verified pursuant to Food and Agricultural Code Section 13149(d). Results are for data reported to the Department of Pesticide Regulation during the period July 1, 1993 through June 30, 1994.



LEGEND

Key	Chemical	Number of Wells with Verified Detections
1	Atrazine	13
2	Bromacil	4
3	Deisopropyl-atrazine	1
4	Diuron	16
5	Prometon	1
6	Simazine	28

Verified detections were made of six compounds, total, in 37 wells in ten counties. Two or more compounds were found in 17 (46%) of the 37 wells.

Counties with Wells with Verified Detections

Verified detections were made in a total of ten counties. Fresno County had ten wells with verified detections; Los Angeles County, eight wells; Riverside and Tulare counties, four wells each; and Colusa and Yolo counties three wells each. The remaining four counties (Merced, San Joaquin, Solano, and Stanislaus) each had fewer than three wells with verified detections.

The most pesticides detected and verified in a single county was three. Verified detections of three compounds were made in Fresno, Los Angeles and Tulare counties. Verified detections of two compounds were made in Colusa and Merced counties. A single compound was verified in each of the remaining five counties.

Counties with First-time, Verified Detections

For the first time, verified detections of pesticides previously found in other areas of California were made in the following counties: atrazine in Yolo County, prometon in Stanislaus County, and simazine in Colusa County.

STATUS OF PESTICIDES AND PESTICIDE BREAKDOWN PRODUCTS WITH VERIFIED DETECTIONS INCLUDED IN THE 1994 UPDATE TO THE DATA BASE

Atrazine (Key 1, Figure 1)

Atrazine is a selective herbicide used in California primarily for non selective weed control on rights-of-way and in non cropped areas. Other major uses include weed control in corn, sorghum, and other crops (Cal/EPA, 1992). It is also used. Atrazine was reviewed through the Pesticide Detection Response Process (PDRP) pursuant to FAC sections 13149 through 13151, which is described in Section II. As a result, DPR adopted regulations which prohibit the agricultural, outdoor institutional, and outdoor industrial use of pesticides containing atrazine within atrazine Pesticide Management Zones (PMZs). A PMZ is a geographic surveying unit of approximately one square mile (a section) that is designated in regulation as sensitive to ground water pollution.

During the period July 1, 1993 through June 30, 1994, detections of atrazine residues were verified in 13 wells in four counties out of 1,317 wells sampled in 35 counties. Concentrations of verified detected residues ranged from 0.089 to 0.88 parts per billion

(ppb). CDHS has set a maximum contaminant level (MCL, see glossary) of 3.0 ppb for atrazine. The counties with verified detections were Los Angeles (8 wells), Merced (1 well), Solano (1 well), and Yolo (3 wells). This was the first verified detection of atrazine in Yolo County.

Bromacil (Key 2, Figure 1)
Bromacil is an herbicide used in California primarily for weed control in citrus orchards (Cal/EPA, 1992). 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. Bromacil was also made a restricted material for which a permit can only be issued for crop uses if growers submit a ground water protection advisory written by a licensed pest control advisor (PCA) who has completed an approved ground water protection course within the previous two years.

During the period July 1, 1993 through June 30, 1994, bromacil residues were verified in four wells in two counties out of 733 wells sampled in 32 counties. The verified detections had concentrations ranging from 0.057 to 1.26 ppb. The U.S. Environmental Protection Agency (USEPA) has established a lifetime health advisory level (HAL) of 90.0 ppb for bromacil. Counties with verified detections were Fresno (3 wells) and San Joaquin (1 well).

Deisopropyl-atrazine (Key 3, Figure 1)
Deisopropyl-atrazine is a metabolite of the pesticide active ingredients atrazine and simazine.

Deisopropyl-atrazine was verified in a Tulare County well out of two wells sampled in two counties. Concentrations ranged from 0.20 to 0.29 ppb. MCLs or HALs have not been set for deisopropyl-atrazine. However, the maximum level of combined residues of atrazine and deisopropyl-atrazine did not exceed the MCL of 3.0 ppb for atrazine set by CDHS.

Diuron (Key 4, Figure 1)
In California, the herbicide diuron is used mainly for weed control on rights-of-way, in citrus orchards, and alfalfa fields (Cal/EPA, 1992). Diuron has been reviewed through the PDRP. As a result, DPR adopted 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. Diuron was also made a restricted material for which a permit can only be issued for crop uses if growers submit a ground water protection advisory written by a licensed PCA who has completed an approved ground water protection course within the previous two years.

During the period July 1, 1993 through June 30, 1994, diuron residues were verified in 16 wells in three counties out of 420 wells sampled in 29 counties. Concentrations of the verified residues ranged from 0.08 to 1.93 ppb. The USEPA has set a lifetime HAL of 10.0 ppb for diuron. Counties with verified detections were Fresno (8 wells), Los Angeles (6 wells), and Tulare (2 wells).

Prometon (Key 5, Figure 1)
Prometon is an herbicide used primarily in California for landscape maintenance (Cal/EPA, 1992). Prometon has been reviewed through the PDRP. As a result, DPR adopted regulations which prohibit the agricultural, outdoor institutional, and outdoor industrial use of pesticides containing prometon within prometon PMZs.

During the period July 1, 1993 through June 30, 1994, prometon residues were verified in one well in Stanislaus County out of 261 wells sampled in 26 counties. Concentrations ranged from 0.46 to 1.70 ppb. The USEPA has set an HAL of 100.0 ppb for prometon. These were the first verified detections of prometon in Stanislaus County.

Simazine (Key 6, Figure 1)
Simazine is an herbicide used in California primarily to control weeds in vineyards, citrus orchards, and on rights-of-way (Cal/EPA, 1992). Simazine has been reviewed through the PDRP. As a result, DPR adopted 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. Simazine was also made a restricted material for which a permit can only be issued for crop uses if growers

submit a ground water protection advisory written by a licensed PCA who has completed an approved ground water protection course within the previous two years.

During the period July 1, 1993 through June 30, 1994, simazine residues were verified in 28 wells in six counties out of 1,328 wells sampled in 37 counties. Concentrations of the verified detections ranged from 0.05 to 0.7 ppb. CDHS has set an MCL of 10.0 ppb for simazine. Counties with verified detections were Colusa (3 wells), Fresno (9 wells), Los Angeles (8 wells), Merced (1 well),
Riverside (4 wells), and Tulare (3 wells). This was the first verified detection of simazine in Colusa County.

SUMMARY OF DATA BASE CONTENTS BY POSITIVE, UNVERIFIED SAMPLES

Of the 56,587 records (samples) added to the well inventory for the 1994 update report, 1,610 were unverified, positive samples. These samples did not result in verified detections because either (1) follow-up sampling has not yet been completed by DPR; (2) follow-up sampling was not conducted by DPR because the compound reported detected was not registered for agricultural use; or (3) analyses of all other samples taken by DPR in response to the positive sample were negative for the compound under investigation. 1,562 of the 1,610 positive samples (97%) were for compounds not registered for agricultural use. Negative follow-up samples may result from delays (sometimes years) in reporting the initial detection to DPR. A summary of all positive samples (verified and unverified) added to the data base for the 1994 update report is given in Table I-5.

Overall, positive, unverified samples were taken from 392 wells in 18 counties for a total of 16 pesticide active ingredients and one breakdown product. Four of the compounds with unverified samples also had verified detections: atrazine, bromacil, diuron, and simazine. Six of the compounds with unverified, positive samples are not registered for use in California: 1,2-D; DBCP; EDB; dalapon; picloram; and dichlorprop. Another compound, naphthalene, is registered for use in California, but not for agricultural use. Information on those samples has been reported to the SWRCB. Detections of pesticides that are not currently registered for use, pesticides registered for other than agricultural, outdoor industrial, or outdoor institutional uses, and detections of pesticides in ground water which are determined not to be the result

of legal agricultural use, are all referred to the SWRCB for appropriate action. The SWRCB and nine RWQCBs are responsible for protecting the beneficial uses of water in California and for controlling all discharges of waste into waters of the State.

Five were pesticide active ingredients currently registered for agricultural use: bentazon, chlorthal-dimethyl, endothall, paraquat, and xylene. The remaining compound, carbon disulfide, is the primary breakdown product of the nematicide and fungicide, sodium tetrathiocarbonate, which is currently registered in California for experimental use only. Residues of both carbon disulfide and xylene can result from non-pesticidal sources.

LIMITATIONS ON INTERPRETING THE DATA

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

1. *This report discusses and includes only data submitted to DPR between July 1, 1993 and June 30, 1994.*

2. *The data included in this report are not the results of a single study. Rather, they are the results of 44 studies, designed and conducted by four 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, by those agencies, 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:

Displaying the geographic distribution of well sampling;

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

Identifying areas potentially sensitive to contamination by legal, agricultural applications of pesticides; or

Designing studies for future sampling.

SUMMARY

During the period July 1, 1993 through June 30, 1994, results were reported for 2,839 wells, located in 50 counties, that were sampled for an overall total of 114 pesticide active ingredients and breakdown products. The data represent 44 well sampling surveys conducted by four agencies from 1986 through 1994.

Of the 114 compounds for which analyses were reported, 19 pesticide active ingredients or breakdown products were reported detected in 425 wells in 20 counties. Verified detections were made of six compounds in 37 wells in ten counties. Two or more compounds were found in 17 of the 37 wells (46%). Of those, 20 were private drinking water wells, 13 were public drinking water wells, two were non-drinking water wells, and the use of two wells was unknown.

Of the six compounds with verified detections, simazine was found most frequently (detected in 28 wells), followed by diuron (16 wells), atrazine (13 wells), bromacil (4 wells), prometon (1 well), and deisopropyl-atrazine (1 well).

Verified detections of pesticides previously found in other areas of California were made in the following counties for the first time: atrazine in Yolo County, prometon in Stanislaus County, and simazine in Colusa County.

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

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

ENVIRONMENTAL HAZARDS ASSESSMENT PROGRAM

The Environmental Monitoring and Pest Management Branch's Environmental Hazards Assessment Program (EHAP) performs the lead role for implementing DPR's environmental protection programs. EHAP personnel design and conduct field studies of air, soil, surface, and ground water to determine the environmental fate of pesticides and conduct monitoring surveys to determine the presence of residues in ground water. All ground water wells reported to DPR with positive pesticide detections are investigated. DPR utilizes results of these investigations to take actions and write regulations which prevent pesticide contamination of ground water.

STATE MANAGEMENT PLAN FOR PESTICIDES

The U.S. Environmental Protection Agency (U.S. EPA) issued a plan entitled *Pesticides and Ground Water Strategy* (U.S. EPA 1991). That outlines their strategy to require states to prepare State Management Plans (SMP):

> *"In the event the U.S. EPA determined that the SMP requirement is necessary for a chemical, its legal sale and use would be confined to states with an acceptable SMP approved by U.S. EPA. U.S. EPA will be applying SMPs as label requirements, so that the product can be legally used only in states with an approved SMP." (p. ES-10)*

With funding from the U.S. EPA, DPR, in coordination with other agencies such as the SWRCB and CDHS, prepared a preliminary draft of a generic SMP titled *State of California Management Plan for Pesticides and Ground Water Protection (Generic)* (Stoddard, 1993). In addition, U.S. EPA published and distributed the final Federal guidance document in 1994 for preparing generic and chemical-specific SMPs that U.S. EPA is planning to require under future federal regulations.

MANAGEMENT AGENCY AGREEMENT BETWEEN DPR AND SWRCB

In 1991, DPR and the SWRCB signed a Memorandum of Understanding (Appendix H). This agreement recognizes DPR as the lead agency for pesticide regulation in California and the SWRCB as the lead agency for water quality

management. Outlined in general terms, the agreement would promote the following: 1) technical and policy consultations through formal channels; 2) implementation of a pesticide detection notification system; 3) sharing information on the use of pesticides, impacts of pesticides on water systems, and efforts to mitigate impacts; 4) sharing information on pesticide formulations and environmental fate; 5) consultation on water quality objectives and regulations related to water quality; 6) participation in the development of policies related to pesticide use and water quality; 7) the development and implementation of management practices through a process that first involves voluntary compliance, if necessary DPR regulatory authority, and, ultimately, SWRCB authority only if other methods fail; 8) implemention of management practices through a process that first involves a voluntary compliance followed by a regulatory program, if necessary; and 9) establishing an implementation plan for the MOU.

In 1993 a joint memo (Appendix H) was issued by the Director of DPR and the Executive Director of SWRCB to serve as interim guidance for implementing the MOU until the Management Agency Agreement (MAA) between DPR and SWRCB is developed.

The MAA, the implementation plan for the MOU, will serve as a road map for solving pesticide-related water quality problems. The intent of the MAA is to ensure that pesticides registered in California are used in ways that protect water quality and the beneficial uses of water, while acknowledging the need for pest management. A detailed outlineof the MAA is planned for review and comment in 1995.

GROUND WATER PROTECTION TRAINING

DPR has conducted ground water protection training for licensed pest control advisors (PCAs) since 1989. This training is part of a comprehensive program designed to protect ground water from contamination due to the agricultural use of pesticides. In areas of California where certain pesticides detected in ground water have been determined to be due to non-point source, legal agricultural use, pesticide management zones (PMZs) have been established. A PMZ is a one square mile area that has been determined to be vulnerable to ground water pollution. The use of a pesticide inside its PMZ is subject to certain requirements. A ground water protection advisory (GWPA), written by a licensed PCA who has attended DPR-sponsored ground water protection training, must be submitted before a permit can be issued by the County Agricultural

Commissioner for application of a regulated pesticide for crop uses in its PMZ. The GWPA contains specific information for applying a regulated pesticide in a PMZ so as to reduce the potential for movement of the chemical into ground water.

Three-hour ground water protection training sessions were held in Visalia, Fresno, Sacramento, and San Bernardino in February of 1994. This training addressed environmental and application factors which influence the migration of pesticides to ground water as well as management practices that need to be followed to minimize this occurrence. The 1994 training program emphasized proper chemigation practices, weed control alternatives, ground water protection advisories, and wellhead protection.

THE PESTICIDE DETECTION RESPONSE PROCESS (conducted pursuant to sections 13149 through 13151 [FAC] of the PCPA)

Under the provisions of the Pesticide Detection Response Process (PDRP), EHAP responds to all reports of positive detections of pesticides in ground water, from its own sampling program or from well sampling conducted by other state and federal agencies or non-governmental entities. EHAP determines if the reported detection could have resulted from a currently registered pesticide, and if the chemical's presence in ground water is due to legal agricultural use; i.e., the pesticide was properly applied according to its labeled directions and in accordance with federal and state laws and regulations. Detections of pesticides that are not currently registered for use, pesticides registered for other than agricultural, outdoor industrial, or outdoor institutional uses, and detections of pesticides in ground water which are determined not to be the result of legal agricultural use, are referred to the SWRCB for appropriate action. The SWRCB and nine RWQCBs are responsible for protecting the beneficial uses of water in California and for controlling all discharges of waste into waters of the State.

In order for an initial detection of a pesticide in ground water to be verified, FAC section 13149(d) of the PCPA requires that the detection of a pesticide or its breakdown products must be by an analytical method approved by DPR and must be verified, within 30 days, by a second analytical method or analytical laboratory approved by the Department. DPR set criteria (Bierman, 1989; see Appendix E) for meeting these requirements. Verified detections which are determined to be present as the result of legal agricultural use, are subject to regulatory action by the Director of DPR. Reported detections not verified in follow-up sampling are removed from the

PDRP. When residues of a registered compound are detected and verified in ground water for the first time, and determined by the Director of DPR to result from legal, agricultural use, a special review is triggered pursuant to FAC section 13150. The purpose of the review is to determine whether continued registration, sale, and use of the compound will be allowed. A subcommittee of the Pesticide Registration and Evaluation Committee holds a hearing, evaluates information, and makes recommendations to the Director of DPR who then makes a determination regarding continued use of the compound in California.

DPR conducts two types of surveys during an investigation of pesticides in ground water. First, a well monitoring survey is conducted by EHAP field personnel in the same land section containing the reported positive well and the three closest sections to that section in order to locate a second well containing verified detections of the pesticide under investigation. Second, a land use survey is conducted which determines whether the land is used for crop production or other activities not related to agricultural use. These surveys help determine if a pesticide residue is present due to a possible point source or due to legal agricultural use. Possible point source detections are referred to the SWRCB for further investigation. During the PDRP, EHAP investigates, evaluates and, when necessary, mitigates reported positive detections of pesticides in ground water. Mitigation measures can range from adopting regulations which modify the agricultural use of a pesticide to suspending or cancelling a pesticide's registration. The investigative phase includes verifying the reported detection. A determination of agricultural use is made when the following criteria are met:

- *the residue detected (active ingredient, breakdown product, or any other specified ingredient) is from a pesticide that is registered for agricultural use in California;*
- *the application of such a pesticide in the vicinity of the detection was reasonably likely;*
- *a point source was not a likely cause;*
- *a non-agricultural use of the pesticide was not a likely source;*
- *a non-pesticide source was not a likely cause; and*
- *the pesticide should be present in another adjacent section or verified within a second site within ½ mile radius of original determination.*

Actions Taken by DPR on Reported Detections

A total of 19 pesticide active ingredients and breakdown products were reported to DPR with positive detections from July 1, 1993 through June 30, 1994. EHAP completed well monitoring surveys according to the PDRP for eight of these chemicals: atrazine, bromacil, clorthal-dimethyl, deisopropyl-atrazine, diuron, paraquat, prometon, and simazine.

Investigations of detections of xylene in Los Angeles and Santa Cruz counties have been completed. Additional xylene detections in Kern, Los Angeles, and Riverside counties are currently under investigation. Reported detections of bentazon, carbon disulfide, and endothall are also currently under investigation.

EHAP did not conduct investigations for seven of 19 detected chemicals because they are no longer registered for use in California (DBCP, 1,2-D, EDB, dalapon, dichlorprop, and picloram) or are not currently registered for agricultural use in California (naphthalene). Those detections were referred to the SWRCB.

Monitoring Surveys for Pesticides Previously Reviewed Through the PDRP

DPR conducted monitoring surveys in 13 counties for new detections of five compounds previously reviewed through the PDRP: atrazine, simazine, bromacil, prometon, and diuron. As a result, verified detections were made in the following counties: diuron in one well, simazine in two wells, diuron and simazine in three wells, and bromacil, diuron and simzine in three wells in Fresno County; atrazine, diuron, and simazine in five wells in Los Angeles County; simazine in one well in Merced County; simazine in three wells in Riverside County; bromacil in one well in San Joaquin County; atrazine in one well in Solano County; and atrazine in three wells in Yolo County.

Reported detections in wells in the following counties were not verified because (1) residues were not detected in follow-up sampling or (2) the original positive well could not be resampled and no other wells were available for sampling in a four-section area near the well. These detections were a reported detection of atrazine in Ventura County; two simazine detections in Fresno County; one detection of simazine and prometon in Fresno County; three simazine detections in Merced County; two simazine, one atrazine, and one prometon detection in Kern County; three simazine

and two atrazine detections in Tulare County; one simazine detection each in Yolo and Colusa counties; and one diuron detection in San Luis Obispo County.

Monitoring Surveys for Pesticides Not Previously Reviewed Through the PDRP

Monitoring surveys were conducted by DPR in three counties for compounds not previously reviewed through the PDRP. Results of those surveys are listed by county in Table II-1. EHAP sampled wells for chlorthal-dimethyl in Colusa County, paraquat in Tehama County, and xylene in Los Angeles County in response to reports of positive detections of these compounds by the Department of Health Services and the Department of Water Resources. None of the compounds were detected in follow-up sampling and were removed from the PDRP.

Well water samples taken during monitoring surveys were also analyzed for five herbicides previously found in California well water: atrazine, bromacil, diuron, prometon, and simazine. As a result, verified detections were made as follows: simazine in two wells in Colusa county; atrazine and simazine in two wells in Los Angeles County; and atrazine, diuron, and simazine in one well in Los Angeles County. A positive detection of simazine and diuron in one well in Tehama County was unconfirmed. These detections initiated a follow-up study that is currently under investigation. The results of this study will be included in the 1995 Well Inventory Report.

Table II-1. Detections of pesticide active ingredients investigated by the Department of Pesticide Regulation between July 1, 1993 through June 30, 1994, which were reviewed through the Pesticide Detection Response Process (PDRP).

Active Ingredient	County	Result of Investigation
clorthal-dimethyl	Colusa (two surveys)	Not detected in follow-up sampling (ND); removed from the PDRP.
xylene	Los Angeles (three surveys)	ND, removed from PDRP.
paraquat	Tehama (two surveys)	ND, removed from PDRP.

ADJACENT SECTION MONITORING

DPR samples wells located in land sections adjacent to PMZs to determine whether they are also vulnerable to pesticides reaching ground water. The results of this sampling, in conjunction with information EHAP gathers during land use surveys, are used to determine whether an adjacent section should also be declared a PMZ.

EHAP sampled wells in seven previously unmonitored sections adjacent to PMZs in Tulare County between July 1, 1993 and June 30, 1994. Four additional sections were examined but were not monitored because no wells could be located, wells were not operating, or permission to sample could not be obtained from well owners. A verified detection of simazine was made in one well out of a total of eleven wells sampled. One new simazine PMZ was recommended as a result of this detection. Based on a preponderance of evidence, one other section adjacent to two PMZs, was also recommended to be a PMZ.

AGRICULTURAL USE DETERMINATIONS

As a result of well monitoring and land use surveys conducted from July 1, 1993 through June 30, 1994, and investigations completed by DPR for monitoring studies conducted prior to July 1, 1993, a total of 41 wells in ten counties were determined to contain pesticide residues as a result of non-point source, legal agricultural use (see Table II-2). Simazine (30 wells) was detected most frequently due to such use, followed by diuron (15 wells), atrazine (14 wells), bromacil (9 wells), and prometon (1 well). Two or more compounds were detected in 18 of the 41 wells.

DPR recommended a total of 34 new PMZs as a result of the determinations. The new PMZs are: two simazine PMZs in Colusa County; one simazine, two simazine and diuron and two simazine, diuron, and bromacil PMZs in Fresno County; one atrazine PMZ in Kern County; one atrazine, one bromacil, three simazine and diuron, one atrazine and simazine, one atrazine and bromacil, and one atrazine, diuron, and simazine PMZs in Los Angeles County; one simazine and one atrazine, simazine, and prometon PMZs in Merced County; two simazine PMZs in Riverside County; two bromacil PMZs in San Joaquin County; one atrazine PMZ in Solano County; four simazine, two diuron, and one simazine and bromacil PMZs in Tulare County; and one simazine and two atrazine PMZs in Yolo County (see Table II-3). In addition, DPR completed an investigation for a monitoring study conducted in Glenn County for

Table II-2. Number of wells with detections of pesticide active ingredients registered for use as of June 30, 1994 that were determined, pursuant to Food and Agricultural Code section 13149, by the Department of Pesticide Regulation (DPR) to be present in ground water as the result of non-point source, legal agricultural use. Results are given by county for investigations conducted by DPR from July 1, 1993 through June 30, 1994. Detections due to such use were made in a total of 41 wells. Two or more compounds were found in 18 of the 41 wells.

County	Atrazine	Bromacil	Diuron	Prometon	Simazine	Total wells, by county
Colusa					2	2
Fresno		3	7		9	9
Glenn				1		1
Los Angeles	10	2	6		8	11
Merced					1	1
Riverside					4	4
San Joaquin		1				1
Solano	1					1
Tulare		3	2		5	7
Yolo	3				1	4
Total wells, by chemical	**14**	**9**	**15**	**1**	**30**	**41**

Table II-3. Number of Pesticide Management Zones (PMZs) recommended by the Department of Pesticide Regulation during July 1, 1993 through June 30, 1994.

County	Chemical	# of PMZs
Colusa	simazine	2
Fresno	simazine	1
	simazine and diuron	2
	simazine, diuron, and bromacil	2
Glenn	prometon	1
Kern	atrazine and simazine	1
Los Angeles	atrazine	1
	bromacil	1
	simazine and diuron	3
	atrazine and simazine	1
	atrazine and bromacil	1
	atrazine, diuron, and simazine	1
Merced	simazine	1
	atrazine, simazine, and prometon	1
Riverside	simazine	2
San Joaquin	bromacil	2
Solano	atrazine	1
Tulare	diuron	2
	simazine	4
	simazine and bromacil	1
Yolo	simazine	1
	atrazine	2
Total PMZs		**33**

prometon prior to July 1, 1993. A prometon PMZ was recommended as a result of this study.

These were the first PMZs recommended for Colusa, San Joaquin, Solano, and Yolo counties and the first atrazine and prometon PMZs recommended for Merced County. PMZs are not enforced in a county until they are approved in regulation, unless the Agricultural Commissioner determines that a substantial adverse impact may result from the use of a pesticide. The Agricultural Commissioner may adopt regulations, deny, or condition a pesticide permit for their county, based on this adverse impact. Each regulation must be approved by the Director of DPR before it is enforced.

BENTAZON MONITORING

Historically, approximately 98 percent of use of the herbicide bentazon was used on rice fields in California. In 1989, bentazon was detected in wells in ten counties where rice was a major crop. DPR suspended the registration of bentazon as a result of those detections until a full review could be conducted through the PDRP. The review resulted in DPR adopting regulations in January 1992 which added bentazon to the Ground Water Protection List (GWPL,section 6800(a) (3CCR)), prohibited the use of bentazon on rice, prohibited all uses of bentazon from September 1 through March 31, limited bentazon use to non-irrigated or sprinkler-irrigated sites during April through July, and prohibited bentazon use entirely in Del Norte and Humboldt counties. In the PDRP findings, DPR's Director stated that the Department would continue to monitor for the presence of bentazon in ground water in areas where it was applied after the establishment of the use modifications.

EHAP sampled a total of twelve wells in Monterey, San Mateo, Santa Barbara, and Santa Clara counties in June of 1993. Over one-half of all reported bentazon use in 1992 was applied in these counties. These four counties are also far removed from rice-growing areas with historical uses of bentazon. EHAP located wells in land sections where bentazon had been applied. Atrazine, bromacil, diuron, prometon, and simazine were also analyzed for as part of the survey. Pesticide residues were not detected in any of the monitored wells.

COMPLIANCE MONITORING

Regulations to prevent further ground water contamination in PMZs include prohibiting certain uses of chemicals on sublist (a) of the GWPL within their PMZs. Agricultural, outdoor industrial, and outdoor institutional use of atrazine within atrazine PMZs or prometon within prometon PMZs is prohibited. Non-crop and rights-of-way uses of bromacil, diuron, or simazine are prohibited within their respective PMZs. To ensure compliance with those prohibitions, EHAP conducts yearly soil monitoring in approximately ten percent of the PMZs for each regulated pesticide. Monitoring is carried out according to the "Protocol for monitoring pesticides for which some or all uses are prohibited in Pesticide Management Zones".

EHAP conducted compliance monitoring for atrazine, bromacil, diuron, prometon, and simazine from July 1, 1993 through June 30, 1994. The number of PMZs selected for monitoring of each herbicide is listed by county in Table II-4. A total of eighteen PMZs were monitored, including four that were monitored for two herbicides, five that were monitored for three herbicides, and one PMZ monitored for four herbicides. Sixteen PMZs were sampled for simazine, five for atrazine, one for prometon, five for bromacil, and eight for diuron. Monitoring sites were selected in each PMZ at locations where the regulated chemical(s) might have been used based on historical use patterns. Replicate, shallow soil samples were collected at each site and analyzed for the herbicide under investigation.

Soil samples collected from atrazine, prometon, and simazine PMZs were analyzed using an enzyme linked immunosorbent assay (ELISA, Goh, *et al.*, 1993). This method provides a measure of total triazine residues but does not distinguish among atrazine, prometon, simazine, and other triazine herbicide residues. Results are reported as simazine equivalents because a measure of individual triazine herbicide concentrations cannot be obtained by this method. As a standard practice, compliance soil samples that contained more than 1,000 parts per billion (ppb, or 1 part per million [ppm]) of triazine herbicide as measured by ELISA, were routinely analyzed by a gas chromatographic (GC) method to determine the actual concentration of the regulated triazine(s). Analyses of samples collected from bromacil or diuron PMZs were performed using HPLC methods. For any soil sample containing a minimum of 2 ppm of bromacil or 3 ppm of atrazine, diuron, prometon, or simazine, a calculation is performed. The concentration of herbicide and total weight of soil collected are used to estimate the total quantity of active ingredient. A back calculation is performed to

determine the rate of active ingredient that would need to be applied to the same soil surface area to reach that concentration. That rate is compared to the lowest rate for crop or non-crop use indicated on the pesticide label. If the mean of the calculated rates for the five soil samples taken from a monitoring location equals or exceeds that minimum label rate, the residue is considered to have potentially resulted from a recent application. An investigation is then conducted to determine whether and by whom a recent application was made.

Triazine residues, simazine equivalent (SEQ) ranging in concentration from 20 to 520 ppb of SEQ were detected in a prometon PMZ and in two of three atrazine PMZs that were monitored (see Table II-5). Thirteen of sixteen simazine PMZs contained 20 to 18,210 ppb of SEQ. Five samples from three different PMZs in Fresno County contained SEQ concentrations greater than 1,000 ppb. However, follow-up analysis by GC and back calculations indicated the the residues were not from recent applications. Five samples from a site in one PMZ in Glenn County also contained concentrations greater than 1,000 ppb. The mean concentration for the five samples collected at that monitoring site indicated that the residues of simazine could have resulted from a recent application. EHAP sent this finding to DPR's Pesticide Use Enforcement Branch and the Glenn County Agricultural Commissioner for further investigation.

Bomacil residues were detected in three out of five bromacil PMZs at concentrations ranging from 50 to 240 ppb. Residues of diuron were detected in seven out of eight diuron PMZs at concentrations ranging from 50 to 610 ppb. The results did not indicate that recent applications had been made.

GROUND WATER PROTECTION LIST MONITORING

The Ground Water Protection List (GWPL) is a list of pesticides having the potential to pollute ground water. It is required pursuant to FAC section 13145(d) and placed in section 6800 (3CCR). The GWPL is divided into sublists (a) and (b). Sublist (a) is comprised of chemicals detected in the soil or ground water as a result of legal, agricultural use. Sublist (b) is comprised of chemicals that meet the conditions specified in FAC section 13145(d). These are pesticide active ingredients whose physiochemical properties exceed or are less than certain values (called specific numerical values or SNVs, [Johnson, 1991]) and are labeled for use under any of the following conditions: (1) intentional application to or injection into the soil, by ground-based application

Table 4-II. Pesticide Management Zones (PMZs) selected by the Department of Pesticide Regulation for Compliance Monitoring during 1993-1994.

	Number of PMZs monitored for: (a)				
County	**Atrazine**	**Prometon**	**Simazine**	**Bromacil**	**Diuron**
Fresno	0	0	4	0	0
Glenn	3	1	3	0	0
Tulare	2	0	9	5	8
Totals	5	1	16	5	8

(a) A total of 18 PMZs were monitored; 8 were sampled for one herbicide, 4 for two herbicides, 5 for three herbicides and 1 for four herbicides.

Table 5-II. Occurrence of herbicide residues in Pesticide Management Zones selected by the Department of Pesticide Regulation for Compliance Monitoring during 1993-199

		Number of PMZs that:		
Herbicide	**Were Monitored**	**Contained no residues**	**Contained Residues**	**Conc. range (ppb)**
Atrazine	5	3	2	20-520
Prometon	1	0	1	20-520 (a)
Simazine	16	3	13	20-18,210 (a)
Bromacil	5	2	3	50-240
Diuron	8	1	7	50-610

(a) Soil sampled for atrazine, prometon and simazine was analyzed using enzyme linked immunosorbent assay (ELISA) which does not differentiate among various triazine herbicides. Analytical results were reported as simazine equivalents which may include simazine and/or other triazine residues.

equipment or by chemigation or (2) recommendation that the application be followed, within 72 hours, by flood or furrow irrigation. In order to determine whether these sublist (b) chemicals have migrated to ground water, DPR is required to conduct monitoring for materials on the GWPL.

Chemicals on the GWPL are prioritized for various factors to determine in which order and to what extent the pesticides should be monitored in California. Pesticide active ingredients that have been detected in ground water due to non-point sources in other states or those given a high priority for risk assessment on the list of pesticide active ingredients created for implementing the Birth Defect Prevention Act (SB950), are considered first priority for monitoring investigations. EHAP samples between 25 and 40 wells for these priority pesticides. DPR selects second priority pesticides based on physiochemical factors and upon the amount of active ingredient sold per year. EHAP samples 15 to 25 wells for the pesticides on the list in this group per year. The remaining pesticides on the list are given third priority. EHAP samples 10 to 15 wells in this group per year.

DPR prioritized and placed 48 pesticide active ingredients on the GWPL in 1992. Twenty-four pesticides were placed in the first priority group. A total of 87 wells in 15 counties were sampled for five pesticides from the first priority group during July 1, 1993 through June 30, 1994. A range of five to 34 wells were sampled for each pesticide. Sampling results, by county and pesticide, are presented in Table II-6. None of the compounds from sublist (b) of the GWPL were detected in any of the wells. However, verified detections were made of pesticides on sublist (a): atrazine in one well in Merced County; prometon in one well in Stanislaus County; simazine in one well each in Colusa and Riverside counties; and diuron in one well in Tulare County. These detections triggered follow-up studies, which EHAP has initiated.

The wells sampled during July 1, 1993 through July 1, 1994 together with wells sampled in the previous two to three years have satisfied the GWPL sampling requirements for the pesticides 2,4-D dimethylamine salt, cyanazine, hexazinone, metribuzin, and fenamiphos. These pesticides were not detected in any of the samples.

Table II-6. Number of wells sampled, by county, for pesticide active ingredient placed on the Ground Water Protection List (Title 3, California Code of Regulations, section 6800 (b)). Results are for sampling conducted by the Department of Pesticide Regulation during July 1, 1993 through June 30, 1994.

County	2,4-D	Cyanazine	Hexazinone	Metribuzin	Fenamiphos
Colusa				7	
Kern					4
Kings		3			
Madera					6
Merced		6			
Modoc				2	
Riverside					7
Sacramento		3			
San Joaquin	5				6
Santa Barbara					6
Shasta			4		
Siskiyou			6	5	
Stanislaus			6		
Tulare		8			
Ventura		5			5
Totals	5	25	16	14	34

SUMMARY

During the period July 1, 1993 through June 30, 1994, EHAP sampled 221 wells in 24 counties. The samples were analyzed for a total of 22 pesticide active ingredients and breakdown products.

Verified detections were made in 37 wells throughout 10 counties of six compounds: atrazine, bromacil, deisopropyl-atrazine, diuron, prometon, and simazine.

DPR determined that residues of atrazine, bromacil, diuron, prometon, and simazine had reached ground water as the result of legal, agricultural use in a total of 41 wells in ten counties: Colusa, Fresno, Glenn, Los Angeles, Merced, Riverside, San Joaquin, Solano, Tulare, and Yolo. Simazine (30 wells) was detected most frequently due to such use, followed by diuron (15 wells), atrazine (14), bromacil (9), prometon (1). Two or more compounds were detected in 18 of 41 wells. Deisopropyl-atrazine was verified in one well and is currently under investigation to determine whether its presence was due to agricultural use.

A total of 34 PMZs were recommended: eight in Los Angeles County, seven in Tulare County, five in Fresno County, three in Yolo County, two each in Colusa, Merced, Riverside, and San Joaquin counties, and one each in Glenn, Kern, and Solano counties.

III. FACTORS CONTRIBUTING TO PESTICIDE MOVEMENT TO GROUND WATER AS A RESULT OF AGRICULTURAL USE

III. FACTORS CONTRIBUTING TO PESTICIDE MOVEMENT TO GROUND WATER AS A RESULT OF AGRICULTURAL USE

INTRODUCTION

The PCPA requires the Department to include in the annual report an analysis of the factors that contribute to the movement of pesticides to ground water.

USING MULTIPLE FACTORS TO IDENTIFY AREAS VULNERABLE TO GROUND WATER CONTAMINATION BY PESTICIDES IN CALIFORNIA

For the past four years, EHAP scientists have been developing an approach that integrates several factors for the purpose of identifying areas vulnerable to non-point source ground water contamination by pesticides.

This approach, integrating data from climatic, soil, and geographic data and analyses of their combined influence on the movement of pesticides to ground water, was discussed in previous reports (Maes, *et al.*, 1992 and Maes, *et al.*, 1993). During the past year, EHAP scientists conducted well monitoring studies and field investigations as they continued to examine this new method of identifying vulnerable areas in California. The results of those investigations are currently being evaluated.

FACTORS CONTRIBUTING TO THE MOVEMENT OF PESTICIDES TO GROUND WATER

Factors contributing to the movement of pesticides to ground water include pesticide use practices, irrigation practices, physicochemical characteristics of pesticides, soil type, and climate. Two routes by which pesticide residues can move to ground water are leaching and direct streaming. Leaching is the process by which pesticide residues are dissolved in soil water and follow the movement of water through the soil matrix as it recharges a ground water aquifer. Direct streaming is the movement of pesticide residues to ground water through direct routes such as dry wells (drainage wells) or soil macropores. A summary of information from recent studies conducted by EHAP on the effect of these factors, including the leaching and direct streaming processes, follows.

Pesticide Use Practices

Leaching

Herbicides found in ground water as a result of non-point source contamination 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 sunlight enhances the rate of degradation and (2) concentrations that eventually reach the soil are low enough to allow for degradation before leaching.

The formulation in which pesticides are applied, such as wettable powders, granulars, or emulsifiable concentrates, does not seem to affect the leaching potential of the pesticides. There has been some research on the use of slow-release formulations as a method to prevent pesticide movement through the soil. However, the results to date are still preliminary.

Direct Streaming

Pathways for direct streaming, the movement of pesticide residue in runoff surface water to subsurface soil and, ultimately, ground water, include dry wells, soil cracks, or other direct routes. A DPR study was conducted to measure the concentrations of herbicides in water sampled near dry well drainage structures (Braun and Hawkins, 1991). Excess standing water occurred at the edge of fields 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 indicates that further study is needed to determine the effect of application and soil incorporation on mitigating the presence of residues found in surface water moving off treated fields to dry wells.

Although many pre-emergent herbicides are applied to the soil surface, their actual site of action is the first few inches of soil where weed seeds germinate. To complete the application, most of these types of herbicides contain label statements recommending shallow incorporation or irrigation sufficient to wet the soil to the depth of several inches to the treated area in order to move the pesticide from the surface into the soil

matrix. If heavy rainfall or heavy irrigation follows application, there is a greater risk that residues could be physically moved offsite with excess runoff water.

Irrigation Practices

Leaching

An irrigation study was conducted by the EHAP in 1987 and 1988 (Troiano, *et al.*, 1990). The study compared the effect of low, medium and high amounts of percolating water applied by drip, sprinkler, floor, and furrow irrigation on leaching of atrazine. 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 what is lost from soil evaporation and plant transpiration. 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 subsequent pesticide movement in soil. However, the use of ETo values in limiting pesticide movement will require further refinement when applied to different methods of irrigation. Models may help define the requirements needed for each irrigation method to prevent leaching.

One aspect of pesticide use critical to leaching may be the timing of pesticide application in relation to irrigation applications. A theory of soil adsorption 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 (Di Toro, 1985). Current labels for several of the herbicides detected in California ground water recommend that the compound should be moved into soil with a small amount of water (e.g., 0.25 to 0.50 inches) if sufficient rainfall does not fall within a specified period after application. Additions of greater than 0.50 inches of water could leach residue past the intended zone of herbicidal activity. This could also result 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 downward in soil.

A study was conducted in 1990 to determine if leaching of herbicides was reduced by lengthening the time between application of an herbicide and initiation of irrigation treatments (Troiano and Garretson, 1993). Bromacil and simazine were broadcast onto the soil and immediately incorporated with a 0.50-inch sprinkler application of water. Irrigation treatments were started at 1, 7 or 14 days after the application and

incorporation of the pesticide. Lengthening the time between herbicide application and initiation of irrigation did not affect depth of leaching. However, results differed between herbicides. Bromacil moved deeper than simazine, probably because of its different 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). In this study, delaying irrigations following application of simazine and bromacil had no impact on herbicide leaching.

Direct Streaming

Irrigation management may also be important in controlling off-site movement of pesticides to ground water by direct streaming. As indicated in the study by Braun and Hawkins (1991), a potential exists for herbicide residue to move off-site with runoff water. Runoff water is commonly produced in surface irrigation systems such as furrow, basin-flooding and border types of irrigation which can be very inefficient. One goal of research conducted by irrigation scientists is to increase the efficiency of applying irrigation water which can reduce the runoff and the potential of pesticides to contaminate ground water.

Physicochemical Characteristics of Pesticides

Leaching

The physicochemical properties which the PCPA associates with the potential of a pesticide to leach through soil are water solubility, soil adsorption (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 pesticide transport through soils (Rao, *et al.* 1985). Cohen *et al.* (1984) estimated values of the characteristics to act as indicators of leaching potential. In addition, FAC section 13144(a) requires DPR 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. DPR 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).

Soil Type and Properties

Leaching

Soil type could be 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 PMZs can be identified in a computer file. Evaluation of these data for regulatory use is ongoing.

Direct Streaming

Under dry conditions, certain clay soils, known as vertisols, develop large, deep cracks that may reach from 3 to 7 feet (1 to 2 meters) in depth. Such soils are known to exist in the Sacramento Valley in areas where pesticides have been detected in ground water. A 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 the study was limited in scope, the authors concluded that detection of residues below the surface layer was apparently related to the presence of cracks in the soil. In this case, soil management practices may be the best approach to controlling pesticide movement. This is an example where appropriate management practices may be affected by geographical location.

Climate

Leaching

An example of the influence of climate is the detection of aldicarb residues 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, total annual rainfall may exceed 6.67 feet (2 meters), with as much as 4.2 feet (1.3 meters) occurring during the fall and winter months from November to March. Aldicarb was normally 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 aldicarb residues to the shallow ground water located as little as 10 feet (3 meters) below the soil surface, in spite of the high soil organic matter.

A different result was observed in a DPR study (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 averages 10 inches (0.25 meters) in the San Joaquin Valley compared to 4.2

feet (1.3 meters) on the North Coast. For the study, an inorganic ion tracer was detected at about the 5.5 feet (1.7 meter) depth in the soil, with some detected down to 10 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 0.5 feet (0.15 meters) of soil, with some residues detected down to 6 feet (1.9 meters). At this site, 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.

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

ate of California

Memorandum

To : James W. Wells, Director
Department of Pesticide Regulation
1020 N Street, Room A-100
Sacramento, CA 95814

Date: OCT 23 1994

Walt

Walt Pettit
Executive Director
From : STATE WATER RESOURCES CONTROL BOARD
901 P Street, Sacramento, CA 95814
Mail Code G-8

Subject: PESTICIDE CONTAMINATION PREVENTION ACT (AB 2021) NINTH ANNUAL REPORT (1994) TO THE LEGISLATURE

The attached report is a summary of actions taken during the past year by the State Water Resources Control Board and the California Regional Water Quality Control Boards for inclusion in your report to the Legislature as required under the Pesticide Contamination Prevention Act.

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 Valerie Van Way, and she can be reached at 657-0583.

Attachment

cc: James M. Strock (with attachment)
Secretary for Environmental Protection
California Environmental Protection Agency
555 Capitol Mall, Suite 235
Sacramento, CA 95814

bc: (all with attachment)
All Regional Water Board Executive Officers

Fresno, Redding, and Victorville Offices

Barbara Evoy, Chief (without attachment)
Office of Program Evaluation

PESTICIDE CONTAMINATION PREVENTION ACT
ANNUAL REPORT TO THE LEGISLATURE
STATE WATER RESOURCES CONTROL BOARD
DECEMBER 1994

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

A. SWRCB

SWRCB staff participated in the following activities:

- Regularly attended meetings sponsored by the Department of Pesticide Regulation (DPR), including the interagency Pesticide Advisory Committee (PAC), Pesticide Registration and Evaluation Committee (PREC), Pest Management Advisory Committee, and the Interagency Coordinating Committee for Agricultural Regulatory Programs. The latter committee, formed in August 16, 1993, will initially focus on identifying all regulatory programs for State and Federal lands that impact the rice industry. If the Committee is successful, its scope may be expanded later to include other sectors of the agricultural industry.

- Conferred with U.S. Geological Survey scientists to discuss studies dealing with pesticides and water quality.

- Continued in the development, in cooperation with DPR staff, of a schedule and outline for establishing the Management Agency Agreement that will further coordinate pesticide and water quality management activities and uphold the provisions of the Memorandum of Understanding between the two agencies.

- Prepared text summarizing the SWRCB/RWQCBs' responsibilities for two drafts of the State Ground Water Protection Plan for Pesticides being developed by DPR.

- Submitted a workplan to U.S. Environmental Protection Agency (USEPA) pursuant to Section 106 of the Clean Water Act (CWA) for Federal Fiscal Year (FFY) 1994 funding for pesticides and ground water-related work.

- Reviewed on an ongoing basis DPR Notices of "Materials Entering Evaluation" and advised DPR on potential water quality impacts of pesticide registration and use decisions.

- Worked on adapting the Pesticide Use Retrieval System database queries of 1990 and 1991 pesticide usage in select watersheds within the State.

- Submitted a workplan to USEPA pursuant to Section 106 of the CWA for FY 1994 funding for pesticides and ground water-related work.

- In response to Coastal Zone Act Reauthorization Amendments, initiated a review of the State's Nonpoint Source Program for reducing off-site movement of pesticides from agricultural operations.

- Reviewed the Federal Safe Drinking Water Act Amendments of 1994 and provided comments to the National Ground Water Protection Council.

B. RWQCBs

Information on actions to prevent economic poisons from migrating to the ground waters of the State by each of the nine RWQCBs (Figure IV-1) are listed in Tables IV-1 through IV-9.

Figure IV-1. State Water Resources Control Board and California Regional Water Quality Control Boards.

STATE WATER RESOURCES CONTROL BOARD

P.O. BOX 100, Sacramento, CA 95812-0100

Legislative and Public Affairs: (916) 657-2390
Water Quality Information: (916) 657-0687

Clean Water Programs Information: (916) 227-4400
Water Rights Information: (916) 657-2170

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARDS

NORTH COAST REGION (1)
5550 Skylane Blvd., Ste. A
Santa Rosa, CA 95403
(707) 576-2220

SAN FRANCISCO BAY REGION (2)
2101Webster Street, Ste. 500
Oakland, CA 94612
(510) 286-1309

CENTRAL COAST REGION (3)
81 Higuera Street, Ste. 200
San Luis Obispo, CA 93401-5427
(805) 542-4633

LOS ANGELES REGION (4)
101 Centre Plaza Drive
Monterey Park, CA 91754-2156
(213) 266-7552

CENTRAL VALLEY REGION (5)
3443 Routier Road
Sacramento, CA 95827-3098
(916) 255-3056

FRESNO BRANCH OFFICE
3614 East Ashlan Avenue
Fresno, CA 93726
(209) 445-5357

REDDING BRANCH OFFICE
415 Knollcrest Drive
Redding, CA 96002
(916) 224-4845

LAHONTAN REGION (6)
2092 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150
(916) 542-5435

VICTORVILLE BRANCH OFFICE
15428 Civic Drive, Ste. 100
Victorville, CA 92392-2383
(619) 241-6583

COLORADO RIVER BASIN REGION (7)
73-720 Fred Waring Dr. Ste. 100
Palm Desert, CA 92260
(619) 776-8952

SANTA ANA REGION (8)
2010 Iowa Avenue, Ste. 100
Riverside, CA 92507-2409
(909) 782-4901

SAN DIEGO REGION (9)
9771 Clairemont Mesa Blvd., Ste. B
San Diego, CA 92124
(619) 467-2952

STATE OF CALIFORNIA
Pete Wilson, Governor

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
James M. Strock, Secretary

STATE WATER RESOURCES CONTROL BOARD
John P. Caffrey, Chair

9/21/94
FEES-PROGRAM

Table IV-1.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, NORTH COAST (REGION 1), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Del Norte	Smith River Plains	Aldicarb, 1,2-D	Ongoing monitoring program.
Humboldt	U.S. Forest Service Nursery McKinleyville	Dithiocarbamate	USFS monitoring with RWQCB support.
	Blue Lake Forest Products	Pentachlorophenol, Tetrachlorophenol, Copper 8-quinolinolate	State Superfund Site with ongoing assessment.
	Carlotta Lumber Company	Pentachlorophenol, Tetrachlorophenol	Ongoing contamination assessment and cleanup.
	Beaver Lumber Company, Arcata	Pentachlorophenol, Tetrachlorophenol	Contamination cleanup.
	Sun Valley Bulb Farms	Chlorothalonil, Dithiocarbamate, Oxamyl	Ongoing monitoring and assessment to prevent discharges to surface water and ground water is under RWQCB direction.
Mendocino	L-P Corporation Covelo	Pentachlorophenol	Contamination assessment.
	Marcel Peterson	Chlordane	Remediation underway.
Siskiyou	Stone Forest Industries, Happy Camp	Pentachlorophenol, Tetrachorophenol	Ongoing contamination assessment and cleanup.
	Hi-Ridge Lumber Company	Pentachlorophenol, Tetrachlorophenol	Ongoing contamination assessment and cleanup.
Trinity	Pine Mountain Lumber Company	Pentachlorophenol, Tetrachlorophenol	Ongoing contamination assessment and cleanup.
	Stone Forest Industries, Burnt Ranch	Pentachlorophenol, Tetrachlorophenol	Ongoing contamination assessment.

Table IV-2.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN FRANCISCO BAY (REGION 2), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Alameda	Parker & Amchem	2,4-D	Soil removal in September 1988 (work completed). Ground water assessment ongoing. RWQCB Order. No. 91-079 specifies schedules for investigations and cleanup.
	Jones-Hamilton	Pentachlorophenol	RWQCB Order No. 89-110 specified time schedule for investigation/cleanup. Ground water cleanup underway.
	Port of Oakland, Embarcadero C ove	Chlordane, Pentachlorophenol, DDT, Endosulfan, Chlordane, 2,3,7,8-TCDD, DDD	Department of Health Services (DHS) has lead and has approved a Remedial Action Plan including continuous ground water monitoring.
	Lincoln Properties (Orsetti Site)	DDE, 2,4-D	Alameda County Water District has lead. Ground water cleanup underway.
	Peerless Southern Pacific Railroad	Pentachlorophenol	City of Berkeley Health Department has lead. Previous soil removal under Department of Toxic Substances Control (DTSC) lead. Additional soil and ground water investigations required.
	FMC, Newark	EDB	RWQCB Order No. 89-055 specified time schedule for investigation and cleanup. Ground water cleanup underway.
	Old Santa Rita Road, Pleasanton	Dicamba, Dichloroprop 2,4-D, 2,4,5-T	Pesticide found in grab water samples. Three monitoring wells may be installed onsite. Alameda County Environmental Health Department lead site.
Contra Costa	Chevron	Endrin, Lindane, Dieldrin, DDT	Submitted closure plan for Class I impoundment. A cut-off wall with a ground water extraction trench around the impoundment has been constructed.
	Levin Metals	Aldrin, 4,4'-DDD, 4,4'-DDE, o,p,-DDT, Dieldrin, BHC	U.S. Environmental Protection Agency (USEPA) lead on-site cleanup.
	FMC, Richmond	DDT, DDD, DDE, Dieldrin, Chlordane, Tedion, Endosulfan, Ethion, Carbophenothion, Heptachlor	DHS lead on-site cleanup.
Marin	Former Sonoma Mosquito Abatement District, San Rafael	5 MWs on-site (EPA Method 8080). MW-1 detected DDD, DDE, DDT, and Dieldrin; MW-2 detected DDD, DDE, DDT; MW-3 detected DDD, DDE; DDT; MW-4 detected DDD; and MW-5 detected DDD and DDT.	DTSC lead site. Some soil removal has already taken place. DTSC asking for permanent multilayer clay cap and remediation or encapsulation of remaining soil plus a deed restriction. No response from Mosquito Abatement District to DTSC's request.

Table IV-3.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL COAST (REGION 3), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Monterey	Monterey Soilservice, King City	EDB, 1,2-D, DDT, DBCP, Toxaphene	Remediation
	NH_3 Service Company, Salinas	1,2-D	Remediation underway
	WFS-Salinas	Dinoseb	Interim remediation
Santa Barbara	J.R. Simplot Inc., Guadalupe	Benzene, Toluene, Xylenes	Remediation underway
Santa Clara	Castle-Veg-Tech, Morgan Hill	Toxaphene, Endrin, Lindane, Endosulfan	Remedial design
Santa Cruz	PUREGRO, Watsonville	1,2-D	Remedial
	WFS-Greengro, Watsonville	1,2-D, Endosulfan	Remedial design
	WFS, Watsonville	DDT, DDD, Toxaphene	Remedial design

Table IV-4.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LOS ANGELES (REGION 4), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Los Angeles	Dominquez Park Landfill Redondo Beach Solid Waste Assessment Test (SWAT) File No. 89-094	Bis (2-ethylhexyl) phthalate	Additional ground water monitoring was required.
	Bixby Village Sanitary Landfill (City Dump Salvage No. 1) Long Beach SWAT File No. 56-35	Aldrin, Beta-BHC, Alpha-BHC, Bis (2-ethlhexyl) phthalate, Delta-BHC, 4,4'-DDE, 4,4'-DDT, 1,4-Dichlorobenzene, Dieldrin, 2,4-Di-nitrophenol, Endosulfan I, Endrin, Endrin aldehyde, Lindane, Heptachlor	Monitoring has not adequately demonstrated that the subject disposal site is not the source of pollutants and listed pesticides detected in ground water monitoring wells downgradient of the disposal site. Two additional semiannual sampling events must be performed for U.S. Environmental Protection Agency (USEPA) Method 625. A workplan must be submitted to the RWQCB.
	Market Place Sanitary Landfill (City Dump Salvage No. 2) Long Beach SWAT File No. 60-98	Alpha-BHC, Bis (2-ethylhexyl) phthalate, Delta-BHC, 4,4'-DDE, 4,4'-DDT, Endosulfan I, Lindane, Heptachlor	Monitoring has not adequately demonstrated that the subject disposal site is not the source of pollutants and listed pesticides detected in ground water monitoring wells downgradient of the disposal site. Two additional semi-annual sampling events must be performed for USEPA Method 625. A workplan must be submitted to the RWQCB.
	Studebaker-Loynes Sanitary Landfill (City Dump Salvage No. 3) Long Beach SWAT File No. 59-173	Alpha-BHC, Bis (2-ethylhexyl) phthalate, 4,4'-DDD, 4,4'-DDE, Di-n-octyl-phthalate, Endosulfan I, Endosulfan II, Endrin, Lindane, Heptachlor	Monitoring has not adequately demonstrated that the subject disposal site is not the source of pollutants and listed pesticides detected in ground water monitoring wells downgradient of the disposal site. Two additional semiannual sampling events must be performed for USEPA Method 625. A workplan must be submitted to the RWQCB.

Table IV-4 continued

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Los Angeles	Peter Pitchess Honor Rancho Landfill, Castaic Junction SWAT File No. 75-014	Bis (2-ethylhexyl) phthalate	It appears that the subject landfills may have affected ground water in the vicinity with pesticide and other compounds. Two additional semi annual SWAT monitoring events were required. A workplan was also required.
	Royal Boulevard Land Reclamation Site, Torrance SWAT File No. 61-25	Lindane, 1,3-Dichloropropene	The site is monitoring ground water pursuant to their closure requirements.
	Port Disposal Landfill, Wilmington SWAT File No. 52-113	Bis (2-ethylhexyl) phthalate, Di-n-Octyl-phyhalate	Chemical compounds were detected in the excess of the regulatory levels, and the site was directed to submit a workplan to assess the nature and extent of the releases and to develop a corrective action program.
	Port Disposal Banning Pit and Macco Pit, Wilmington SWAT File Nos. 54-172 and 54-104	Bis (2-ethylhexyl) phthalate, Napthalene, Di-n-Butyl phathalate, 2-Methyl-naphthalene	Chemical compounds were detected in excess of the regulatory levels, and the site was directed to submit a workplan to assess the nature and extent of the releases and to develop a corrective action program.
	City of Compton Landfill SWAT File No. 55-151	Di(2-ethylhexyl) phthalate (DEHP), Di-n-Octyl-phthalate	Two semi-annual ground water monitoring events were required.

Table IV-5. **ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL VALLEY (REGION 5 - SACRAMENTO), IN 1994**

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Colusa	Moore Aviation	2,4-D, (4-chloro-2methylphenoxy) acetic acid (MCPA)	Site cleanup and ground water remediation. Soils bioremediation appears to be nearing completion. Ground water remediation continuing.
Merced	Merced Municipal Airport	1,2 Dichlorobenzene, 1,2 Dichloroethane, 1,2 Dichloroethane (cis) 1,2 Dichloroethane (trans), 1,3 Dichloropropane (cis), Alachlor, Benzene, Captan, Carbophenothion (trithion), Chloroform, DDT (total), Dicofol, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Endrin ketone, Ethylbenzene, Heptachlor epoxide, Methoxychlor, Tetrachloroethane, Toluene, Toxaphene, TPH-diesel, TPH-gasoline, Trichloroethylene (TCE), Vinyl chloride, Xylenes	Cleanup levels and remedial options being determined.
	J.R. Simplot, Winton	1,2-DCP, Dieldrin, Benefin, 1,2,3,-TCP, DBCM, DBCP, Endrin, Alachlor	Cleanup and Abatement Order issued. Additional assessment required.
	BAC Pritchard	Chromium, Arsenic, Copper	Soil Closure Plan Health Risk Assessment being reviewed by DTSC which is lead agency for the soil contamination. Ground water extraction and treatment system going through startup period. Ground water plume defined.
Sacramento	Sacramento Army Depot	Diazinon, Chlorpyrifos	Assessment report requested. Federal Superfund work in progress. Cleanup of pesticides completed. (Drop from list in 1995).
	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. For the last 4-5 years, no pesticides found in ground water. (Drop from list in 1995).

Table IV-5 continued
(Sacramento)

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
San Joaquin	Occidental Chemical	EDB, DBCP, Sulfolane, others suspected, but never detected.	Site remediation occurring pursuant to stipulation and judgement approving settlement (1981).
	Defense Depot, Tracy	Dieldrin, Simazine	Assessment ongoing as part of the site-wide remedial investigations.
	Sharpe Army Depot, Stockton	Bromacil	Assessment ongoing.
	Marley Cooling	Arsenic, Copper, Chromium	Ground water cleanup underway.
	U.S. Navy Communication Station	DDD, DDE	Assessment ongoing. Soil removal action has occurred.
	Triple "E" Produce	Chloroform	Bioremediation began 9/93 and is ongoing.
	Pure Gro/Brea Agricultural Service, Stockton	1,2-DCP, Chloroform, Dibromochloromethane	Soil and ground water investigation ongoing. Four monitoring wells installed.
Solano	Wickes Forest Industries	Chromium (CR^{3+} and CR^{6+}), Arsenic, Copper	Ground water cleanup underway.
Stanislaus	Chemurgic	BHC, DDT	Ongoing monitoring. Revised Cleanup and Abatement Order to be issued. Soil cleanup to start summer 1994, ground water source control in 1995.
	Rhone-Poulenc (formerly Union Carbide) Test Plots	Aldicarb	Additional assessment work ongoing. Monitoring will end this summer. Looks as if site will soon be closed.
	Shell Agricultural Research Facility; (pesticides in ground water probably the result of use on test plots).	Bladex, Atrazine, Chloroform, Planavin (nitralin), 1,1-DCE, DBCP, Nitrate	Additional plume definition requested May 1991; not done.

Table IV-5 continued
(Sacramento)

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Stanislaus	Valley Wood	Copper, Chromium, Arsenic	Out-of-court settlement. Federal Superfund site. Interim cleanup in progress.
	City of Turlock Airport		Cleanup completed.
Sutter	Bowles Flying Service	2,4-D, Bolero, Diuron, Metalaxyl, Ordram, Simazine	Assessment ongoing. Toxic Pits Cleanup Act (TPCA) site. Cease and Desist Order issued. USEPA looking at this site.
Yolo	Frontier Fertilizer Company, Davis	EDB	State Superfund initiated. DTSC installing interim ground water treatment system. USEPA conducting investigation to determine extent.
	U.C. Davis	Chlorpyrifos, Dicamba, Atrazine, Aldrin, Simazine, Dieldrin, Endrin, DDT	Cleanup and Abatement Order issued. Additional assessment required.
	J.R. Simplot, Courtland	EDB, 2,4-DB, Dicofol, Dicamba, 2,4,5-TP, Carbophenthion, DDT, Dieldrin	Cleanup and Abatement Order issued. Must complete final assessment before beginning remediation.

Table IV-5.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL VALLEY (REGION 5 - FRESNO), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Fresno	Thompson Hayward Agriculture & Nutrition	Alpha-BHC, Beta-BHC, Gamma-BHC, Dieldrin, DBCP, Diphenamid, Heptachlor, Heptachlor Epoxide	State Superfund site. Contamination assessment ongoing.
	Occidental Chemical/J.R. Simplot	Dieldrin	Monitoring of ground water continues.
	FMC Corporation	Aldrin, Dieldrin, DDT, DDD, DDE, Heptachlor, Lindane, Toxaphene, Ethyl Parathion, Malathion, Ethion, Endosulfan, Dimethoate, Furadan, DNOC (4,6-Dinitro-o-cresol), Dinoseb	State Superfund site. Remedial investigation/feasibility study in progress.
	Britz, Inc., Five Points	Toxaphene, DDT, Dinoseb	State Superfund site. Remedial investigation and health assessment report submitted. Soil and ground water remediation feasibility study also submitted. Additional contamination assessment ongoing.
	Fresno County Wells	DBCP, EDB, 1,2-D	Pesticides detected in 146 wells (AB 1803 sampling). San Joaquin Valley DBCP Advisory Committee is overseeing studies on remedial alternatives for DBCP problems.
	Coalinga Airport	DDT, Chlorpyrifos, DEF, Ethion, Disyston	Contamination assessment needed.
	Union Carbide Test Plot	Aldicarb	Additional contamination assessment needed.
	Spain Air	Ethion, DEF, Parathion, Thithion, Dinoseb, Paraquat, DDE, DDT, Endosulfan II	Assessment needed.
Kern	Brown & Bryant, Inc., Arvin	1,2-D, 1,3-D, DBCP, EDB	Federal Superfund site. USEPA has prepared Remedial Information Feasibility Study Report.
	Puregro Company, Bakersfield	DBCP	State Superfund site. Further assessment conducted. The waste discharge requirements for closure of a former dry well were issued June 1994.

Table IV-5 continued
(Fresno)

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Kern	Guimarra Vineyard	DBCP	Contamination assessment and pond closure plan needed (J.R. Simplot-Edison).
	Dick Garriott Crop Dusting, Bakersfield	Chlordane, DDE, DDT, PCNB, Endosulfan I & II, Methoxychlor, Carbofuran, Carbaryl, Bufencarb, DEF, Tedion, Diazinon, Chlorpyrifos, Ethyl Parathion, Diuron, Dinoseb, Dicamba	Cleanup and Abatement Order issued in 1993. TPCA site. Hazard Assessment Report completed also in 1993. Work in progress to determine extent of ground water degradation. Impoundment is covered.
	Wasco Airport	Aldrin, Lindane, Endrin, Chlordane, Methoxychlor, DDT, DDD, DDE, Thimet, Malathion, Methyl Parathion, Paraoxon, Disyston, Omite, Paraquat	Site closed and with Chapter 15 cap in 1993. Waste Discharge Requirements also adopted in 1993.
	USDA, Shafter	Dichlobenil, EPTC, Prometryne, DDT, DDE, DDD, Dieldrin, Toxaphene, Silvex, PCP, Chlorpropham, Ametryn, Atrazine	Developing a closure plan.
	Brown and Bryant, Inc., Shafter	Chlordane, DDD, DDE, DDT, Dieldrin, Endrin, Heptachlor, Toxaphene	State Superfund site. Contamination assessment ongoing.
	Kern County Wells	DBCP, 1,2-D, EDB	Pesticides detected in 57 wells (AB 1803 sampling). No assessment underway.
Madera	Chowchilla Municipal Airport	Dieldrin, Alpha-BHC, Endosulfan, PCNB, DDT, DDE, Lindane	Contamination assessment needed.
	Madera County Wells	DBCP, 1,2-D, EDB	DBCP detected in 2 wells (AB 1803 sampling). No assessment underway.
	Western Farm Service, Inc.	Dinoseb, DBCP, Dieldrin	Assessment ongoing. Impoundment closed.
Kings	Lemoore N.A.S.	Unspecified	Investigation ongoing.
	Blair Field	2,4-D, Dicofol, Diazinon, Propargite	Assessment needed.
	Blair Aviation	Trifluralin, Mevinphos, Phorate	Contamination assessment needed.
	Lakeland Dusters	DDT, Toxaphene	Contaminated soils excavated and stockpiled on-site. Remediation underway.

Table IV-5 continued
(Fresno)

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Tulare	Mefford Field, City of Tulare	p,p'-DDT, p,p'-DDE, 2,4,5-TP, Dicamba, Dinoseb, Diuron	Contamination assessment and mitigation reports needed.
	Tulare Airport	2,4-D, Dinoseb	Assessment needed.
	Kaweah Crop Dusters	DDT, 2,4-D, 2,4,5-T, Methoxychlor	DHS Remedial Action Order issued January 1984. Cleanup ongoing.
	Tulare County Wells	1,2-D	1,2-D detected in wells (AB 1803 sampling). No assessment underway.
Tuolumne	Tuolumne County Wells	Methylene Chloride	Methylene chloride detected in one well (AB 1803 sampling).
Yuba	Beale Air Force Base	Lindane	Ground water investigation underway.

Table IV-6.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LAHONTAN (REGION 6), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Inyo	Haiwee Reservoir	Copper sulfate	Potential ground water contamination will be evaluated.

Table IV-7. **ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, COLORADO RIVER BASIN (REGION 7), IN 1994**

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	Contaminated soil excavated and transported to Class I facility. Site closed.
	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	Dacthal, Diuron	Completed remedial work, site closed in place.
	J.R. Simplot Company, Sandin Siding Facility	Dieldrin, 4,4'-DDT, Endrin	Cleanup and Abatement Order issued. Site in remediation.
	Stoker Company	Endosulfan I & II, Dinoseb, 2,4-DB	Land treatment facility undergoing closure.
	Ross Flying Service	4,4'-DDD, 4,4'-DDE 4,4'-DDT, Dieldrin	Closure of surface impoundment.
Riverside	West Coast Flying	Endosulfan I & II, Disulfoton	Recalcitrant Discharger. Referred to Attorney General for nonpayment of fees.
	Woten Aviation Services	Disyston DEF, Ethyl Parathion, Methyl Parathion	Cleanup and Abatement Order issued. USEPA has lead in cleanup.
	Foster Gardner, Inc., Coachella Facility	1,2-Dichloroethane, 1,2-D, Ethylene Dibromide	Cleanup and Abatement Order issued October 1991 by RWQCB. Imminent and Substantial Endangerment Order issued by DTSC on August 21, 1992.
	Farmers Aerial Service, Inc.	4,4'-DDE, Endosulfan I	Closure of disposal area.
	Coachella Valley Mosquito Abatement District	DDT	Under investigation.
	Crop Production Services, Blythe (Formerly Pure Gro MW-24)	1,2 Dichloropropane	Undergoing cleanup.

Table IV-8.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SANTA ANA (REGION 8), IN 1994

Currently there are 102 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 RWQCB. With the exception of this case, all detections on this list are from domestic and agricultural production wells. Ninety nine wells contain dibromochloropropane (DBCP), four contain simazine, and one contains 1,2-dichloropropane. Three 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 since 80 of the 97 wells containing DBCP are drinking water wells.

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Orange	Great Western Savings, Irvine	1,2-D, EDB, 1,2-Dichloroethane (DCA)	National Pollutant Discharge Elimination System (NPDES) permit issued November 1986. Ground water extraction and treatment continuing. Permit was extended for another five years.
Riverside	Sunnymead Mutual Water Company (North and South Well)	DBCP	Both wells were sold to Eastern Municipal Water District in February 1991. Customers are being served by the new District from other supply sources. North Well has been completely rehabilitated. The South Well will be used for emergency purposes only.
	Arlington Basin	DBCP	Construction of a 7 million gal/day (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 MGD is bypassed. Treated water is mixed with the bypassed water and discharged to a local channel for ground water recharge purposes. Salt brine (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 has been completely rehabilitated. Simazine was not detected in the sampling after rehabilitation work. No further action being taken.

Table IV-8 continued

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Riverside	Home Gardens City Water District (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 after water is blended with water purchased from the City of San Bernardino.
	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 DBCP	Water is being blended with other supply wells in the area.
	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 bi-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 Tetrochloroethylene and Perchloroethylene have also been found. Well is used for emergency purposes only.

Table IV-8 continued

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
Riverside	Loma Linda University, Arlington, (Wells 1 & 2, mun.)	DBCP	The University water supply system is tied into the City of Riverside domestic water supply distribution system. These two wells are used for irrigation purposes at the school.
	City of Riverside (Moor-Griffith, mun.)	DBCP	Well is out of service.
	Home Gardens School (mun.)	DBCP	Well was abandoned about three years ago. The school is now using water from Home Gardens Water District.
	Lake Hemet MWD (Wells A and B, mun.)	DBCP	Well A is being used for domestic purposes. No trace of DBCP has been found during the past two rounds of sampling. Well B is being used by a local farmer for irrigation purposes.
	Buschlen, Dwight (mun.)	DBCP	Well was abandoned about six years ago. A second well on the property with traces of DBCP is being used for irrigation only.
	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. Trace amounts of radon have been detected in some of these wells. The City installed three deep wells in the area to increase blending capacity. New well will be in operation soon.
San Bernardino	Bunker Hill Basin: Crafton/Redlands area (32 wells)	DBCP	The City of Redlands started construction of a 6,000 gpm granular activated carbon (GAC) treatment system in September 1991. This GAC system treats ground water from two wells. Treated water is being put into the local water supply distribution system. Funding for this system is from the SWRCB ($2.8 million) and bond money through the State Expenditure Plan ($1.9 million) which is managed by DTSC. The system has been on line since May 1993.

Table IV-8 continued

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
San Bernardino	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	Well No. 13 has not been used since 1991. The other three wells are standby wells and are used on a limited basis. Water is being purchased from MWD.
	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)	DBCP	Eleven wells are out of operation. Four wells are currently being used and are being blended with other supply wells.
	City of Loma Linda (6 wells, mun.)	DBCP	Two wells have been abandoned. One well is out of operation due to high nitrates. DBCP concentration in all the wells is the MCL. The City also purchases treated water from the City of San Bernardino.

Table IV-9.

ACTIONS TAKEN BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO (REGION 9), IN 1994

COUNTY	SITE	PESTICIDE	PREVENTION ACTION
San Diego	City of Oceanside Water Utility District (Well No. 12-11S/ 4W-18L1 S)	1,2-Dicloropropane (1,2 DCP)	This backup drinking water well is located in the San Luis Rey River Valley. 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 State's DHS.
	Truly Nolen Exterminatin g, 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. Trace levels still exist in ground water. No further monitoring required. (RWQCB lead)
	San Pasqual Valley Union School (three wells)	Ethylene dibromide	Three drinking water wells impacted above MCL for Ethylene dibromide. City of San Diego monitored/sampled wells until last year wells washed out by flood, 1993.

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.

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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.

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B. GLOSSARY OF TERMS USED IN THE 1994 UPDATE REPORT

AB 1803 - (1983) A law that required the California Department of Health Services (DHS) to evaluate each public water system to determine its potential for contamination. The systems were required to conduct specified water analyses and to report those results to the DHS. Monitoring required by AB 1803 was completed in June 1989. Based on sampling results, the DHS may require a system to conduct periodic water analyses and to report to the DHS 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 DHS'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 pesticide formulation that are biologically active and 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 pesticide 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 Health Services pursuant to section 2426 of the Health and Safety Code. (Food and Agriculture 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 around the plant stem or trunk by means of a soil dam. Also called flood irrigation.

Birth Defect Prevention Act (BDPA) - (SB 950, 1984) A law requiring DPR to acquire certain toxicological data for registered pesticides in order to make a scientific determination that their uses will not cause significant adverse health effects. The BDPA prohibits the registration of any new pesticide active ingredient if required mandatory health effects studies are missing, incomplete, or invalid. Pesticide active ingredients already registered that are identified as having the potential to cause significant adverse health effects following a thorough review by DPR scientific staff will be canceled.

breakdown product - See *degradation product.*

Cal/EPA - California Environmental Protection Agency. Comprised of the Department of Pesticide Regulation, the Department of Toxic Substances Control, the Integrated Waste Management Board, the Water Resources Control Board, the Air Resources Board, and the Office of Environmental Health Hazard Assessment.

CCR (3CCR) - Californnia Code of Regulations. Title 3, California Code of Regulations (3CCR).

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 C, p. 106) in order to enter the data into the well inventory data base.

confirmed detection - 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 monitoring survey.

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, soybean, or tomato, usually to facilitate harvesting.

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 pesticide active ingredient by biological processes (e.g., microbial action) or physical or chemical processes (e.g., hydrolysis, photolysis, photo oxidation).

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 pesticide 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 and filled with gravel or other material 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 pesticide 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 definition) listed in section 6802, Title 3 of the California Code of Regulations (3CCR).

FAC - Food and Agricultural Code.

flood irrigation - See *basin irrigation*.

formulation - The way in which a pesticide 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 - A 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.

granular - A pesticide 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 beneath the surface of the ground, whether or not flowing through known and definite channels.

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 pesticide residues to ground water.

Ground Water Protection List (GWPL) – A list, required by the 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. Sublist (b) contains pesticide active ingredients whose physicochemical properties exceed or are less than the specific numerical values (see definition) and that are labeled for soil application under certain conditions. Chemicals placed on the GWPL are subject to certain restrictions and reporting requirements.

Health Advisory Level (HAL) – An advisory number published by USEPA'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. Water containing pesticides at or below the lifetime 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, no longer registered for such use, that has been applied over time in a specific area for the production of an agricultural commodity.

hydrolysis – In the context of this report, alteration 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 public water system well - A well supplying 200 or more service connections.

law - State laws (statutes and regulations) are the result of action by the California legislature.

leaching - A pathway by which agricultural chemicals may reach ground water; 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 label 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 Food and Agricultural Code (FAC) 13149 and based upon the following criteria: (1) the detection of a pesticide ingredient or its degradation product that has been verified according to DPR criteria; (2) a detection of the same pesticide ingredient or its degradation product in ground water, verified at a second site in either an adjacent section or within ½ mile radius of the original, verified detection; (3) the detected pesticide 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.

macropore - Space in soil, occupied by air and water, that allows the ready movement of air and percolating water.

Maximum Contaminant Levels (MCLs) - MCLs are part of the drinking water quality standards adopted by DHS and by USEPA under the Safe Drinking Water Act. MCLs are formally established in regulation and are enforceable by the DHS 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 reliably quantify. 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 - Any artificial excavation by any method for the purpose of monitoring fluctuations in ground water levels, quality of underground waters, or the concentration of contaminants in underground waters.

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 microscopic, worm like 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 chemical 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.

permit - Permits are issued by County Agricultural Commissioners for the use of chemicals that have been designated as restricted pesticides. Restricted pesticides, for various reasons, are potentially more hazardous than other pesticides.

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 on or in living humans or other living animals; anything that the Director of the California Department of Food and Agriculture or Director of the Department of Pesticide Regulation declares, by regulation, 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 DHS, 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 canceled.

Pesticide Management Zone (PMZ) - A geographic surveying unit of approximately one square mile (a section) that is designated in regulation as sensitive to ground water pollution. The use of a pesticide inside its PMZ is subject to certain ground water protection restrictions and requirements.

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

physicochemical properties - 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.

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 in the ground water called a plume.

positive detection – A well water sample in which the presence of a pesticide chemical is detected at or above the minimum detection limit of the analytical instruments used for analysis of the compound under investigation. 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 (one square mile) identified by DPR as sensitive to ground water pollution by specific pesticides, not yet adopted into regulation in section 6802 (3CCR).

record – See *data base record.*

registered pesticide – A pesticide 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 (one square mile) equal to 1/36 of a township. (See *well numbering system.*)

selective pesticide - A pesticide that kills specific pest species, 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 fewer than 200 connections.

soil adsorption coefficient (Koc) - A measure of the tendency of compound such as pesticide 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 pesticide 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 identifying pesticides with the potential to pollute ground water.

State Well Number - See *well numbering system.*

survey - In the context of this report, well monitoring conducted by an agency or private firm for a specified length of time in a designated area.

summary year - The time period, usually July 1 through the following June 30, 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. These data are 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*).

triazines - A class of chemical compounds derived from any of three isomeric compounds, each having three carbon and three nitrogen atoms in a six-membered ring. Triazines are strong inhibitors of photosynthesis. Atrazine, prometon, and simazine are triazines.

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 physical property that indicates the rate of evaporation of a compound. The higher the vapor pressure, the more volatile the compound.

verified (DPR study) - The detection of a pesticide or a pesticide breakdown product in two discrete samples taken from a single well during a 30-day time period, and analyzed either by the same laboratory using different analytical methods or by two laboratories using the same method. The analytical methods used must be approved by DPR. Verification of the presence of a compound in ground water by this criteria fulfills section 13149(d) (FAC) of the PCPA and may be used for regulatory purposes.

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

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 property of a substance to dissolve in water.

water well - any artificial excavation constructed by any method for the purpose of extracting water from, or injecting water into, the underground.

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 meridional 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 powder formulation that, on addition to water, forms a suspension.

C. MATERIALS AND METHODS USED FOR COLLECTION, PREPARATION, AND ENTRY OF DATA INTO THE DATA BASE

MATERIALS AND METHODS:

Data Collection

Section 13152, subdivision (c) of the PCPA requires all government agencies that 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. DPR has also contacted private companies that conduct well sampling for pesticides to request those sampling results for the well inventory.

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

1. *Sampling results were for the analyses of pesticides or pesticide 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 were identified by at least township/range/section according to the U.S. Geological Survey's Public Lands Survey Coordinate system;*
5. *Data had not 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 their 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 the 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 PCPA also requires DPR, the SWRCB, and CDHS to 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, and 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 J.

Unless they were received on computer tape, data that met the prescribed criteria were transcribed onto forms for data entry. A number was assigned to each sampling survey under which all pertinent records and notes were filed. When possible, state well numbers were obtained from the Department of Water Resources (DWR) and noted on the original data sheets for DPR surveys.

Data Entry into the Permanent Data Base

The completed coding forms were sent to the Franchise Tax Board for data entry. The data were returned to DPR on magnetic tape 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 (see page 8).

Before being added to the permanent well inventory data base, each record was run through 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 existing well location information for that 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 edited as necessary. The data were then entered into the permanent well inventory data base and summary tables were produced for the annual report.

D. TABLES, SECTION I

Table I-1. Summary of well sampling results included in the Department of Pesticide Regulation's (DPR) well inventory database, by report year, for data reported through June 30, 1994.

CATEGORY	REPORT YEAR 1986	1987	1988	1989	1990	1991	1992	1993	1994	TOTAL (a)
Total wells sampled	8987	574	3074	752	2784	1557	4741	2324	2839	18944
Wells with no detections	6583	317	2791	543	2550	1351	3985	1945	2414	14986
Wells with detections (b)	2404	257	283	209	234	206	756	379	425	3958
Wells with verified detections (c)	44	29	4	140	93	133	67	80	37	584
Total counties sampled	53	20	41	33	53	30	52	46	50	58
Counties with no detections	30	6	24	11	27	11	24	25	30	14
Counties with detections (b)	23	14	17	22	26	19	28	21	20	44
Counties with verified detections (c)	5	3	3	16	8	14	9	17	10	30
Total pesticides and related compounds analyzed	160	79	167	96	191	186	125	112	114	287
Pesticides and related compounds with no detections	144	64	142	81	164	166	85	83	95	208
Pesticides and related compounds with detections (b)	16	15	25	15	27	20	40	29	19	79
Pesticides and related compounds with verified detections (c)	8	6	5	9	6	9	5	10	6	20
Pesticides and related compounds detected in ground water as the result of legal, agricultural use (d)	9	8	1	7	6	7	5	11	5	14

(a) The total is not additive. It is a total of the unique times existing in a category (e.g. a single well that had sampling data reported in the 1986, 1988, and 1990 reports is counted one time only. Similarly, if a pesticide is detected in 1986, 1988, and 1990, it is counted one time only).
(b) Verified and unverified detections are included in the total.
(c) Detections are designated as verified if residues of a compound are detected in one sample as a result of an analytical method approved by DPR and verified within 30 days in a second discrete sample taken from the well by a second analytical method or a second analytical laboratory approved by DPR.
(d) Legal, agricultural use is the application of a pesticide, according to its labeled directions and in accordance with federal and state laws and regulations. Agricultural use is defined in Food and Agricultural code Section 11408.

Table I-2. Pesticide active ingredients and breakdown products with analytical results added to the well inventory data base for the 1994 report year, by total number of counties and wells sampled and number of wells with verified and unverified detections. Results are for data reported during the period July 1, 1993 through June 30, 1994.

Pesticide or Breakdown Product	Number of Counties Sampled	Number of Wells Sampled (1)	Wells with Unverified Detections	Wells with Verified Detections
1,1,2,2-tetrachloroethane	47	1421		
1,2,4-trichlorobenzene	47	1348		
1,2-dichloropropane (propylene dichloride)	47	1436	5	
1,3-dichloropropene (1,3-D)	47	1356		
2,4,5-t	13	75		
2,4-D	35	801		
2,4-D, dimethylamine salt	1	5		
3-hydroxycarbofuran	17	196		
4(2,4-DB), dimethylamine salt	1	1		
acrolein	1	2		
alachlor	22	684		
aldicarb	21	414		
aldicarb sulfone	18	172		
aldicarb sulfoxide	18	172		
aldrin	16	205		
ametryne	1	1		
atrazine	35	1317	4	13
azinphos-methyl	2	5		
benefin	1	3		
bentazon, sodium salt	26	710	2	
bhc (other than gamma isomer)	7	31		
bromacil	32	733	2	4
butachlor	9	75		
butylate	1	1		
captafol	1	3		
carbaryl	18	194		
carbendazim	1	3		
carbofuran	27	703		
carbon disulfide	3	12	2	
chlordane	27	813		
chlordecone	1	2		
chlorobenzilate	2	6		
chloroneb	1	4		
chlorothalonil	16	190		
chlorpyrifos	1	1		
chlorthal-dimethyl	3	14	2	
cyanazine	20	194		

1. Most wells were sampled for more than one compound.

Table I-2 continued.

Pesticide or Breakdown Product	Number of Counties Sampled	Number of Wells Sampled (1)	Wells with Unverified Detections	Wells with Verified Detections
dalapon	17	190	5	
dbcp	26	1488	329	
ddd	7	30		
dde	7	31		
ddt	7	31		
deethyl-atrazine	1	1		
deisopropyl-atrazine	2	2		1
demeton	5	32		
diazinon	28	571		
dicamba	10	92		
dichlobenil	1	3		
dichlorprop	1	39	1	
dicofol	2	4		
dieldrin	16	201		
dimethoate	24	424		
dinoseb	16	195		
diphenamid	1	1		
diquat dibromide	10	106		
disulfoton	5	32		
diuron	29	420	19	16
endosulfan	7	31		
endosulfan sulfate	7	32		
endothall	11	108	1	
endrin	32	812		
endrin aldehyde	6	28		
ethion	1	2		
ethyl parathion	1	2		
ethylene dibromide	27	1389	14	
fenamiphos	8	45		
fenamiphos sulfone	6	33		
fenamiphos sulfoxide	6	34		
glyphosate, isopropylamine salt	27	621		
heptachlor	27	817		
heptachlor epoxide	27	816		
hexachlorobenzene	18	247		
hexazinone	22	193		
lindane (gamma-bhc)	32	817		

Table I-2 continued.

Pesticide or Breakdown Product	Number of Counties Sampled	Number of Wells Sampled (1)	Wells with Unverified Detections	Wells with Verified Detections
malathion	1	2		
methiocarb	15	139		
methomyl	17	192		
methoxychlor	32	809		
methyl bromide	47	1412		
methyl parathion	1	2		
methylene chloride	1	5		
metolachlor	7	70		
metribuzin	22	229		
mevinphos	4	30		
mirex	1	2		
molinate	26	941		
mtp (monomethyl 2,3,5,6-tetrachloroterep	1	8		
naled	1	3		
naphthalene	47	1379	9	
ortho-dichlorobenzene	47	1411		
oryzalin	2	11		
oxamyl	20	258		
paraquat bis(methylsulfate)	6	25		
paraquat dichloride	8	63	4	
parathion	1	2		
permethrin	1	4		
picloram	14	180	2	
prometon	26	261		1
prometryn	29	685		
propachlor	7	75		
propazine	1	5		
propoxur	15	135		
s,s,s-tributyl phosphorotrithioate	1	3		
silvex	34	783		
simazine	37	1328	3	28
simetryn	4	30		
terbutryn	4	30		
thiobencarb	26	889		
toxaphene	32	814		
tpa (2,3,5,6-tetrachloroterephthalic acid)	1	8		
triadimefon	1	3		
trifluralin	1	5		
vernolate	1	3		
xylene	47	1395	7	
TOTAL	50	2839	392	37

Table I-3. Summary of wells with verified detections of residues, by county and pesticide. Results are for data reported during the period July 1, 1993 through June 30, 1994.

County	atrazine	bromacil	deiso-propyl-atrazine	diuron	prometon	simazine	Total discrete wells by county
Colusa						3	3
Fresno		3		8		9	10
Los Angeles	8			6		8	8
Merced	1					1	2
Riverside						4	4
San Joaquin		1					1
Solano	1						1
Stanislaus					1		1
Tulare			1	2		3	4
Yolo	3						3
Total discrete wells by chemical	13	4	1	16	1	28	

Table I-4. Comparison, by county, of total pesticides sampled for, and total number of wells sampled versus number of wells with unverified, verified, and negative detections. Results are for data reported during the period July 1, 1993 through June 30, 1994.

County	Total # of Pesticides Sampled	Total Wells Sampled	Wells With Unverified Detections	Wells With Verified Detections	Wells With No Detections
ALAMEDA	45	16	3		13
AMADOR	72	3			3
BUTTE	12	89	2		87
COLUSA	26	28	4	3	21
CONTRA COSTA	57	6			6
DEL NORTE	8	1			1
EL DORADO	10	16			16
FRESNO	74	235	115	10	110
GLENN	8	2			2
HUMBOLDT	24	5			5
INYO	15	5			5
KERN	41	187	20		167
KINGS	8	3			3
LAKE	21	14			14
LASSEN	12	5			5
LOS ANGELES	72	508	21	8	475
MADERA	40	8			8
MENDOCINO	21	8			8
MERCED	77	71	15	2	55
MODOC	15	5			5
MONO	39	9			9
MONTEREY	58	86			86
NAPA	17	11			11
ORANGE	48	74	1		73
PLACER	6	8			8
PLUMAS	8	2			2
RIVERSIDE	49	137	10	4	123
SACRAMENTO	40	44			44
SAN BERNARDINO	48	262	67		195
SAN DIEGO	8	8			8
SAN FRANCISCO	11	1			1
SAN JOAQUIN	54	78	20	1	55
SAN LUIS OBISPO	61	73	17		56
SAN MATEO	33	29			29
SANTA BARBARA	39	77			77
SANTA CLARA	39	184			184
SANTA CRUZ	19	45	1		44
SHASTA	24	25			25
SIERRA	8	1			1
SISKIYOU	21	11			11
SOLANO	68	23		1	22
SONOMA	37	35			35
STANISLAUS	56	114	44	1	69
SUTTER	8	1			1
TEHAMA	24	39	4		35
TULARE	63	153	41	4	109
TUOLUMNE	8	1			1
VENTURA	60	57	6		51
YOLO	23	18		3	15
YUBA	20	18	1		17
TOTAL	**114**	**2839**	**392**	**37**	**2414**

Table I-5. Status, as of June 30, 1994, of all reported detections of pesticide active ingredients and breakdown products in ground water that were added to the Department of Pesticide Regulation(DPR) well inventory data base during the period July 1, 1993 through June 30, 1994.

Compound Detected Registration Status Type of Compound	Total Number of Counties and Wells Sampled	Counties and Number of Wells with Detections	Range of Concentrations Detected (ppb)	Water Quality Criteria (ppb)	Comments
1,2-dichloropropane (1,2-D) (propylene dichloride) Not registered for use in California (NR) fumigant	47 counties 1436 wells	Fresno, 2 Kern, 3	0.3 - 1.9	DHS MCL 5.0	Source of residues was determined by DPR to be due to historical non-point source, legal agricultural use. Regulations were adopted in 1985 that prohibit the use or sale of pesticides in California in which 1,2-D exceeds 0.5% of the total formulation.
atrazine active registration (AR) herbicide	35 counties 1317 wells	Fresno, 1 Los Angeles,10 Merced, 1 Orange, 1 Solano, 1 Yolo, 3	0.089 - 1.9	DHS MCL 3.0	Source of residues in eight Los Angeles County wells, one Solano County well, and three Yolo County wells was determined by DPR to be due to non-point source, legal agricultural use. Detections in one Fresno County well and one Merced County well are currently under investigation (CUI) by DPR. No further sampling was conducted for positive, unverified samples reported for two wells in Los Angeles County and one well in Orange County because the wells are located in sections that have already been recommended as Pesticide Management Zones (PMZs) by DPR.
bentazon, sodium salt AR herbicide	26 counties 710 wells	Tehama, 1 Yuba, 1	0.3 - 2.0	DHS MCL 18.0	Detection of bentazon in one well in Tehama County is CUI. No further sampling was conducted for a positive, unverified detection reported in a Yuba County well because DPR had previously sampled the well and determined that residues were the result of historical applications of bentazon to rice paddies. Regulations were adopted in January 1992 that prohibit the use of bentazon in rice.
bromacil AR herbicide	32 counties 733 wells	Fresno, 3 Los Angeles, 1 San Joaquin, 1 Tulare, 1	0.057 - 1.26	none	Source of residues in three Fresno County wells and one San Joaquin County well was determined by DPR to be due to non-point source, legal agricultural use. Detections in a single sample in one Los Angeles county well and one Tulare County well were not verified in other samples taken from the wells.

DHS MCL: Maximum Contaminant Level (MCL) adopted by DHS under the Safe Drinking Water Act. MCLs are formally established in regulation and are enforceable by DHS on water suppliers.

Table I-5 continued.

Compound Detected Registration Status Type of Compound	Total Number of Counties and Wells Sampled	Counties and Number of Wells with Detections	Range of Concentrations Detected (ppb)	Water Quality Criteria (ppb)	Comments
carbon disulfide breakdown product	3 counties 12 wells	San Luis Obispo, 2	0.2 - 2.0	none	Carbon disulfide is the primary breakdown product of the nematicide and fungicide, sodium tetrathiocarbonate. Detections are CUI by DPR
chlorthal-dimethyl AR herbicide	3 counties 14 wells	Colusa, 2	1.2 - 1.6	none	ND in follow-up monitoring.
dalapon NR herbicide	17 counties 190 wells	Ventura, 5	1.0 - 17.0	none	Referred to the State Water Resources Control Board (SWRCB).
dbcp NR fumigant	26 counties 1488 wells	Fresno, 113 Kern, 16 Los Angeles, 11 Merced, 12 Riverside, 9 San Bernadino, 65 San Joaquin, 20 Stanislaus, 44 Tulare, 38 Ventura, 1	0.1 - 4.33	DHS MCL 0.2	Use suspended in 1979. Source of residues considered by DPR to be from historical non-point source, legal agricultural use.
deisopropyl-atrazine metabolite	2 counties 2 wells	Tulare, 1	0.20 - 0.29	none	CUI by DPR.
dichlorprop NR herbicide	1 county 39 wells	Butte, 1	6.8	none	Referred to SWRCB.

Table I-5 continued.

Compound Detected Registration Status Type of Compound	Total Number of Counties and Wells Sampled	Counties and Number of Wells with Detections	Range of Concentrations Detected (ppb)	Water Quality Criteria (ppb)	Comments
diuron AR herbicide	29 counties 420 wells	Fresno, 8 Los Angeles, 8 Merced, 1 San Luis Obispo, 15 Tehama, 1 Tulare, 2	0.5 - 5.3	none	Source of residues in seven Fresno County wells and six Los Angeles County wells was determined by DPR to be due to non-point source, legal agricultural use. Detections in one Fresno County well, one Los Angeles County well, seven San Luis Obispo County wells, one Tehama County well, and two Tulare County wells are CUI. Positive, unverified samples taken from one well in Los Angeles county, one well in Merced County, and three wells in San Luis Obispo County were not verified in follow-up samples taken from the wells.
endothall AR herbicide	11 counties 108 wells	Butte, 1	100	USEPA MCL 100	Detection is CUI by DPR.
ethylene dibromide NR fumigant	27 counties 1389 wells	Alameda, 3 Fresno, 5 Los Angeles, 2 Merced, 1 Tulare, 2 Ventura, 1	0.1 - 4.3	DHS MCL 0.02	Not registered for use in California since January 1987. Source or residues considered by DPR to be due to historical non-point source, legal agricultural use.
naphthalene NR fumigant	47 counties 1379 wells	Fresno, 1 Los Angeles, 1 Merced, 2 San Bernadino, 2 Santa Cruz, 1 Stanislaus, 1 Tullare, 1	0.6 - 29.0	none	Naphthalene is no longer registered for agricultural use; referred to SWRCB.
paraquat dichloride AR herbicide	8 counties 63 wells	Colusa, 2 Tehama, 2	1.04 - 16.0	none	Detections in a single sample in two wells in Tehama County were not verified in follow-up samples taken by DPR. Detections in two wells in Colusa County are CUI.

USEPA MCL: MCL adopted by the U.S. Environmental Protction Agency (USEPA) under the Safe Drinking Water Act. MCLs are enforceable by the California Department of Health Services (DHS) on water suppliers.

Table I-5 continued.

Compound Detected Registration Status Type of Compound	Total Number of Counties and Wells Sampled	Counties and Number of Wells with Detections	Range of Concentrations Detected (ppb)	Water Quality Criteria (ppb)	Comments
picloram NR herbicide	14 countties 180 wells	Fresno, 1 Tulare, 1	0.1 - 1.1	USEPA MCL 500	Referred to SWRCB.
prometon AR herbicide	26 counties 261 wells	Stanislaus, 1	0.46 - 1.7	none	Detection in Stanislaus County is CUI.
simazine AR herbicide	37 counties 1328 wells	Colusa, 3 Fresno, 9 Kern, 1 Los Angeles, 8 Merced, 1 Orange, 1 Riverside, 2 Tehama, 1 Tulare, 3	0.05 - 0.7	DHS MCL 4.0	Source of residues in two Colusa County wells, nine Fresno County wells, eight Los Angeles County wells, one Merced County well, three Riverside County wells, and one Tulare County well was determined by DPR to be due to non-point source, legal agricultural use. Detections in one well in Riverside County, one well in Tehama County, and two wells in Tulare County are CUI. Detections in a single sample in one well in Colusa County, one well in Kern County , and one well in Orange County were not verified in other samples taken from the wells.
xylene AR solvent	47 counties 1395 wells	Kern, 1 Los Angeles, 4 Riverside, 1 Santa Cruz, 1	0.7 - 84.0	none	Detections in a single sample in three wells in Los Angeles County were not verified in other samples taken from the wells. Detections in another well in Los Angeles County, one well in Kern County, and one well in Riverside County are CUI. Other detections of xylene in the Santa Cruz County well were previously reported and investigated by DPR. Because other components of gasoline were found in the follow-up samples, the detections were referred to the SWRCB.

E. 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:

	Second Method	
First 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 percent 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 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.

F. SUMMARY OF WELL SAMPLING SURVEYS INCLUDED IN THE 1994 UPDATE REPORT

I. CALIFORNIA DEPARTMENT OF HEALTH SERVICES
(Sanitary Engineering Branch)

Study No. 0023 Sampled for numerous chemicals in 49 counties: Alameda, Amador, Butte, Colusa, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Humbolt, Inyo, Kern, Lake, Lassen, Los Angeles, Madera, Mendocino, Merced, Modoc, Mono, Monterey, Napa, Orange, Placer, Plumas, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Tuolume, Ventura, Yolo, Yuba counties; July 1992 through June 1993; 2,565 wells sampled.

II. CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
(San Francisco Bay Region)

Study No. 0316 carbofuran, diazinon, dimethoate, diuron, molinate, prometon, 1,2-D, simazine, 2,4-D, fenamiphos, oryzalin; June 1993; Napa and Sonoma counties; 11 wells sampled.

III. CALIFORNIA DEPARTMENT OF WATER RESOURCES

Study No. 0339 chlorthal-dimethyl, dalapon, DBCP, dinoseb, endothall, EDB, methylene chloride, silvex, simazine, picloram 2,4-D, paraquat dichloride, bentazon, dichlorprop; Butte, Colusa, Tehama counties; June 1993 through December 1993; 67 wells sampled

VI. DEPARTMENT OF PESTICIDE REGULATION
(Environmental Hazards Assessment Program)

Study No. 0302 atrazine, bromacil, diuron, prometon, prometryn, simazine, cyanazine, metribuzin, hexazinone; Merced County; July 1993; 5 wells sampled.

Study No. 0303 atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Merced County; July 1993; 4 wells sampled.

Study No. 0304 atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Fresno County; July 1993; 3 wells sampled.

Study No. 0306 atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Kern County; July 1993; 5 wells sampled.

Study No. 0307 atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Yolo County September 1993; 1 well sampled.

Study No. 0308	2,4-D dimethylamine salt, atrazine, bromacil, cyanazine, deethyl-atrazine, deisopropyl-atrazine, diuron, fenamiphos, fenamiphos sulfone, fenamiphos sulfoxide, hexazinone, metribuzin, prometon, prometryn, and simazine; Colusa, Kern, Kings, Madera, Merced, Modoc counties; August 1993 through April 1994; 87 wells sampled.
Study No. 0309	atrazine, bromacil, diuron, prometryn, simazine, cyanazine, metribuzin, hexazinone; Tulare County; August 1993; 11 wells sampled.
Study No. 0310	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Yolo County; September 1993; 5 wells sampled.
Study No. 0311	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazione; Los Angeles County; October 1993; 5 wells sampled.
Study No. 0312	atrazine, bromacil, diuron, prometon, prometryn, simazine, xylene, cyanazine, metribuzin, hexazinone; Los Angeles County; October 1993; 6 wells sampled.
Study No. 0313	atrazine, bromacil, diuron, prometon, prometryn, simazine, cyanazine, metribuzin, hexazinone; Merced County; November 1993; 5 wells sampled.
Study No. 0314	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Los Angeles County; November 1993; 4 wells sampled.
Study No. 0315	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; San Joaquin; November 1993; 3 wells sampled.
Study No. 0318	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Ventura County; December 1993; 3 wells sampled.
Study No. 0319	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; San Luis Obispo County; December 1993; 5 wells sampled.
Study No. 0321	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Los Angeles County; November 1993; 2 wells sampled.
Study No. 0322	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Los Angeles County; November 1993; 2 wells sampled.
Study No. 0323	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Solano County; November 1993; 1 well sampled.
Study No. 0324	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Los Angeles County; November 1993; 1 well sampled.

Study No. 0325	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Merced County; January 1994; 4 wells sampled.
Study No. 0326	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Colusa County; March 1994; 2 wells sampled.
Study No. 0327	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Riverside County; February 1994 through June 1994; 5 wells sampled.
Study No. 0328	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Tehama County; April 1994; 6 wells sampled
Study No. 0329	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Fresno County; March 1994; 5 wells sampled.
Study No. 0330	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Fresno County; March 1994; 5 wells sampled.
Study No. 0331	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Colusa County; April 1994; 2 wells sampled.
Study No. 0333	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Colusa County; April 1994; 6 wells sampled.
Study No. 0334	paraquat dichloride; Tehama County; April 1994; 6 wells sampled.
Study No. 0336	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Fresno County; April 1994; 4 wells sampled.
Study No. 0337	atrazine, bromacil, diuron, prometon, simazine, cyanazine, metribuzin, hexazinone; Fresno County; March 1994; 5 wells sampled.
Study No. 0338	atrazine, bromacil, diuron, prometon, prometryn, simazine, cyanazine, metribuzin, hexazinone; Monterey, San Mateo, Santa Barabara, Santa Clara counties June 1994; 12 wells sampled.
Study No. Z081	One section was recommended as a PMZ for atrazine and one section was recommended as an atrazine and bromacil PMZ based on previous monitoring; Los Angeles County; February 8, 1994; no wells sampled.
Study No. Z082	One section in Los Angeles County recommended as a bromacil PMZ based on previous monitoring, land use surveys, and proximity to surrounding PMZs; February 8, 1994; no wells sampled.
Study No. Z099	One section in Tulare County recommended as a diuron PMZ due to previous monitoring, land use surveys, and proximity to surrounding PMZs; December 1, 1993; no wells sampled.

Study No. Z235 One section in Glenn County recommended as a PMZ for prometon based on previous monitoring, land use surveys, and proximty to surrounding PMZs; June 30, 1994; no wells sampled.

Study No. Z238 One section in Yolo County recommended as PMZ for simazine based on previous monitoring, land use surveys, and proximity to surrounding PMZs; May 6, 1994; no wells sampled.

Study No. Z241 One section in Tulare County was recommended as PMZ for simazine due to previous monitoring, land use surveys, and proximity to PMZs; December 22, 1994; no wells sampled.

Study No. Z243 One section in Tulare County was recommended as PMZ for bromacil and simazine due to previous monitoring, land use surveys, and proximity to surrounding PMZs; December 22, 1994; no wells sampled.

Study No. Z245 One section in Tulare County was recommended as simazine PMZ based on previous monitoring, land use surveys, and proximity to surrounding PMZs; December 1, 1994; no wells sampled.

Study No. Z246 One section in Tulare County was recommended as PMZ for diuron based on previous monitoring, land use of surveys, and proximity to surrounding PMZs; December 1, 1994; no wells sampled.

G. RESULTS BY COUNTY AND PESTICIDE

Appendix F. Part 1. Counties without a detection of any pesticide or breakdown product.
Value represents total wells analyzed for a compound. Most wells analyzed for multiple compounds.

Pesticide or Breakdown Product	AMADOR	CONTRA COSTA	DEL NORTE	EL DORADO	GLENN	HUMBOLDT	INYO	KINGS	LAKE	LASSEN
1,1,2,2-tetrachloroethane	1	4	1	15	2	3	4		14	3
1,2,4-trichlorobenzene	3	4	1	11	2	3	4		14	3
1,2-dichloropropane (propylene dichloride)	3	4	1	15	2	3	4		14	3
1,3-dichloropropene (1,3-D)	3	4	1	11	2	3	4		14	3
2,4,5-t	2	1								
2,4-D	2	5				1			5	
3-hydroxycarbofuran	2	2								
acrolein	2									
alachlor	2	5								
aldicarb	2	5								
aldicarb sulfone	2	2								
aldicarb sulfoxide	2	2								
aldrin	2	2								
atrazine	2	6				1		3	1	
azinphos-methyl	2									
bentazon, sodium salt	2	5								
bhc (other than gamma isomer)	2									
bromacil	2	6				1		3		
butachlor		4								
carbaryl	2	2								
carbofuran	2	6					3		1	
chlordane	2	6					3		5	
chlordecone	2									
chlorobenzilate	2									
chlorothalonil	2	6								
cyanazine								3		
dalapon	2	2								
dbcp	2	6		1		1	3			
ddd	2									
dde	2									
ddt	2									
deethyl-atrazine								1		
deisopropyl-atrazine								1		
demeton	2									
diazinon	2	6				1				
dicamba	2									
dieldrin	2	2								
dimethoate	2	6								
dinoseb	2	2								
diquat dibromide	2	2								2
disulfoton	2									
diuron	2	3						3		

Appendix F, Part 1 continued

Pesticide or Breakdown Product	MADERA	MENDOCINO	MODOC	MONO	MONTEREY	NAPA	PLACER	PLUMAS	SACRAMENTO	SAN DIEGO
1,1,2,2-tetrachloroethane	2	6	3	9	76	2		2	25	8
1,2,4-trichlorobenzene	2	6	3	9	76	2		2	22	8
1,2-dichloropropane (propylene dichloride)	2	6	3	9	76	11		2	25	8
1,3-dichloropropene (1,3-D)	2	6	3	9	76	2		2	22	8
2,4,5-t									14	
2,4-D	1	1		7	42	9	8		14	
3-hydroxycarbofuran				3	29					
acrolein										
alachlor	1			3	39					
aldicarb				5	29					
aldicarb sulfone				3	20					
aldicarb sulfoxide				3	20					
aldrin	1				29				14	
atrazine	7	7	2	3	41				6	
azinphos-methyl										
bentazon, sodium salt	1			3	12					
bhc (other than gamma isomer)									14	
bromacil	7		2	3	15				6	
butachlor					33					
carbaryl				3	29					
carbofuran		6		5	33	8				
chlordane	1	1		5	42				14	
chlordecone				5						
chlorobenzilate										
chlorothalonil					7					
cyanazine	6				2				3	
dalapon					33					
dbcp	1			3	42				2	
ddd									14	
dde									14	
ddt									14	
deethyl-atrazine										
deisopropyl-atrazine										
demeton										
diazinon	1			3	13	9			3	
dicamba					30					
dieldrin	1				29				14	
dimethoate	1			3	11	9			3	
dinoseb					33					
diquat dibromide					26					
disulfoton										
diuron	6		2		2	8				

Appendix F, Part 1 continued

Pesticide or Breakdown Product	SAN FRANCISCO	SAN MATEO	SANTA BARBARA	SANTA CLARA	SHASTA	SIERRA	SISKIYOU	SONOMA	SUTTER	TUOLUMNE
1,1,2,2-tetrachloroethane		18	16	159	20	1	4	28	1	1
1,2,4-trichlorobenzene		18	15	157	20	1	4	28	1	1
1,2-dichloropropane (propylene dichloride)		18	16	159	20	1	4	30	1	1
1,3-dichloropropene (1,3-D)		18	15	159	20	1	4	28	1	1
2,4,5-t										
2,4-D		11	19	77			1	4		
3-hydroxycarbofuran	1							1		
acrolein										
alachlor		6	49	75						
aldicarb	1			82				1		
aldicarb sulfone	1							1		
aldicarb sulfoxide	1							1		
aldrin										
atrazine		8	74	81	5		6	8		
azinphos-methyl										
bentazon, sodium salt		13	23	81						
bhc (other than gamma isomer)										
bromacil		8	23	79	5		6			
butachlor								1		
carbaryl	1							1		
carbofuran	1		54	84	1			3		
chlordane		6	62	77				2		
chlordecone										
chlorobenzilate										
chlorothalonil				41						
cyanazine		2	10	4						
dalapon										
dbcp			66	77						
ddd										
dde										
ddt										
deethyl-atrazine										
deisopropyl-atrazine										
demeton										
diazinon		6	57	75	1			2		
dicamba										
dieldrin										
dimethoate		6		74				2		
dinoseb										
diquat dibromide										
disulfoton										
diuron		2	66	45	4		6	1		

Appendix F, Part 1 continued

Pesticide or Breakdown Product	AMADOR	CONTRA COSTA	DEL NORTE	EL DORADO	GLENN	HUMBOLDT	INYO	KINGS	LAKE	LASSEN
endosulfan	2									
endosulfan sulfate	2									
endothall	2	3								2
endrin	2	6				1			5	
endrin aldehyde	2									
ethion	2									
ethyl parathion	2									
ethylene dibromide	2	6		4		1	3			
fenamiphos										
fenamiphos sulfone										
fenamiphos sulfoxide										
glyphosate, isopropylamine salt	2	6				1	3		3	
heptachlor	2	6					3		5	
heptachlor epoxide	2	6					3		5	
hexachlorobenzene	2	2								
hexazinone										
lindane (gamma-bhc)	2	6				1			5	
malathion	2									
methiocarb	2	1								
methomyl	2	2								
methoxychlor	2	6				1			5	
methyl bromide	3	4	1	11	2	3	4		14	3
methyl parathion	2									
metolachlor		4								
metribuzin		2								
mirex	2									
molinate	2	6				1				
naphthalene	3	4	1	11	2	3	4		14	3
ortho-dichlorobenzene	3	4	1	11	2	3	4		14	3
oryzalin										
oxamyl	2	2								
paraquat bis(methylsulfate)	2	1								2
paraquat dichloride	2	1								2
parathion	2									
picloram	2	2								
prometon								3		
prometryn	2	6				1				
propachlor		4								
propoxur	2	1								
silvex	2	5				1			5	
simazine	2	6				1		3	1	
thiobencarb	2	6				1				
toxaphene	2	6				1			5	
xylene	1	4	1	15	2	3	4		14	3
TOTAL NUMBER WELLS SAMPLED	**3**	**6**	**1**	**16**	**2**	**5**	**5**	**3**	**14**	**5**

Appendix F, Part 1 continued

Pesticide or Breakdown Product	MADERA	MENDOCINO	MODOC	MONO	MONTEREY	NAPA	PLACER	PLUMAS	SACRAMENTO	SAN DIEGO
endosulfan									14	
endosulfan sulfate									14	
endothall					26					
endrin	1	1		9	42		8		14	
endrin aldehyde									14	
ethion										
ethyl parathion										
ethylene dibromide	1			3	42				2	
fenamiphos	6					9				
fenamiphos sulfone	6									
fenamiphos sulfoxide	6									
glyphosate, isopropylamine salt	1	2		3	29					
heptachlor	1	1		5	42				14	
heptachlor epoxide	1	1		5	42				14	
hexachlorobenzene					33					
hexazinone	6		2		2					
lindane (gamma-bhc)	1	1		9	42		8		14	
malathion										
methiocarb					3					
methomyl				3	29					
methoxychlor	1	1		9	42		8		14	
methyl bromide	2	6	3	9	76	2		2	24	8
methyl parathion										
metolachlor					31					
metribuzin	6		2		2					
mirex										
molinate	1			3	13				3	
naphthalene	2	6	3	9	76	2		2	22	8
ortho-dichlorobenzene	2	6	3	9	76	2		2	24	8
oryzalin						9				
oxamyl				3	29					
paraquat bis(methylsulfate)										
paraquat dichloride										
parathion										
picloram					33					
prometon	6		2		2	9			3	
prometryn	7			3	15				3	
propachlor					33					
propoxur					3					
silvex	1	1		7	42		8		14	
simazine	7	7	2	3	41	9			6	
thiobencarb	1			3	14				3	
toxaphene	1	1		9	42		8		14	
xylene	2	6	3	9	76	2		2	23	8
TOTAL NUMBER WELLS SAMPLED	**8**	**8**	**5**	**9**	**86**	**11**	**8**	**2**	**44**	**8**

Appendix F, Part 1 continued

Pesticide or Breakdown Product	SAN FRANCISCO	SAN MATEO	SANTA BARBARA	SANTA CLARA	SHASTA	SIERRA	SISKIYOU	SONOMA	SUTTER	TUOLUMNE
endosulfan										
endosulfan sulfate										
endothall										
endrin		6	35	77	1		1	2		
endrin aldehyde										
ethion										
ethyl parathion										
ethylene dibromide			66	77						
fenamiphos			6					2		
fenamiphos sulfone			6							
fenamiphos sulfoxide			6							
glyphosate, isopropylamine salt	1		49	83				1		
heptachlor		6	62	77				2		
heptachlor epoxide		6	62	77				2		
hexachlorobenzene		8		43						
hexazinone		2	10	4	4		6			
lindane (gamma-bhc)		6	35	77	1		1	2		
malathion										
methiocarb	1									
methomyl	1							1		
methoxychlor		6	35	77	1		1	2		
methyl bromide		18	16	159	20	1	4	28	1	1
methyl parathion										
metolachlor								1		
metribuzin		2	10	4			6			
mirex										
molinate		6	62	77	1					
naphthalene		18	15	158	20	1	4	28	1	1
ortho-dichlorobenzene		18	16	159	20	1	4	28	1	1
oryzalin								2		
oxamyl	1		1					1		
paraquat bis(methylsulfate)										
paraquat dichloride										
parathion										
picloram										
prometon		2	10	4	4		6	2		
prometryn		8	23	79	1					
propachlor								1		
propoxur	1									
silvex		11	19	77	1		1	2		
simazine		8	74	81	5		6	10		
thiobencarb		6	62	77	1					
toxaphene		6	35	77	1		1	2		
xylene		18	16	156	20	1	4	28	1	1
TOTAL NUMBER WELLS SAMPLED	**1**	**29**	**77**	**184**	**25**	**1**	**11**	**35**	**1**	**1**

Appendix F, Part 2. Counties with a detection of any pesticide or breakdown product. Number of unverified (U) or verified (V) detections, and the total number of wells sampled for each pesticide or breakdown product. A blank represents 0.

	Alameda			Butte			Colusa			Fresno		
Pesticide or Breakdown Product	V	U	Total	V	U	Total	V	U	Total	V	U	Total
1,1,2,2-tetrachloroethane			11			49			7			56
1,2,4-trichlorobenzene			11			49			7			55
1,2-dichloropropane (propylene dichloride)			11			49			7		2	57
1,3-dichloropropene (1,3-D)			11			49			7			54
2,4,5-t			2									7
2,4-D			7			5						61
2,4-D, dimethylamine salt												
3-hydroxycarbofuran			2									38
4(2,4-DB), dimethylamine salt												
alachlor			7									36
aldicarb			7									39
aldicarb sulfone			2									21
aldicarb sulfoxide			2									21
aldrin			2									31
ametryne												
atrazine			7						25		1	84
azinphos-methyl												
benefin												
bentazon, sodium salt			7						5			61
bhc (other than gamma isomer)												1
bromacil			7						25	3		62
butachlor												17
butylate												
captafol												
carbaryl			2									30
carbendazim												
carbofuran			7									57
carbon disulfide												
chlordane			7									57
chlorobenzilate												
chloroneb												
chlorothalonil			7									23
chlorpyrifos												1
chlorthal-dimethyl								2	13			1
cyanazine									18			22
dalapon									5			21
dbcp			5						5		113	192
ddd												1
dde												1
ddt												1
deisopropyl-atrazine												
demeton												6
diazinon			5									34
dicamba												27
dichlobenil												
dichlorprop					1	39						
dicofol												1
dieldrin			2									30
dimethoate			7									34
dinoseb												27
diphenamid												1

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Alameda			Butte			Colusa			Fresno		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
diquat dibromide												
disulfoton												6
diuron									25	8		23
endosulfan												1
endosulfan sulfate												2
endothall					1	4						1
endrin			7									56
endrin aldehyde												1
ethylene dibromide		3	5						5		5	179
fenamiphos												
fenamiphos sulfone												
fenamiphos sulfoxide												
glyphosate, isopropylamine salt			7									54
heptachlor			7									57
heptachlor epoxide			7									57
hexachlorobenzene			11									21
hexazinone									18			22
lindane (gamma-bhc)			7									57
methiocarb			2									17
methomyl			2									31
methoxychlor			7									57
methyl bromide			11			49			7			54
methylene chloride									5			
metolachlor												17
metribuzin									25			29
mevinphos												6
molinate			7									60
mtp (monomethyl 2,3,5,6-tetrachloroterep									8			
naled												
naphthalene			11			49			7		1	54
ortho-dichlorobenzene			12			49			7			54
oxamyl			2									38
paraquat bis(methylsulfate)												
paraquat dichloride								2	4			
permethrin												
picloram											1	27
prometon							1		25			28
prometryn			6						18			62
propachlor												17
propazine												
propoxur			2									17
s,s,s-tributyl phosphorotrithioate												
silvex			7									61
simazine			7			4	3		25	9		83
simetryn												6
terbutryn												6
thiobencarb			7									54
toxaphene			7									57
tpa (2,3,5,6-tetrachloroterephthalic acid)									8			
triadimefon												
trifluralin												
vernolate												
xylene			11			49			7			55
TOTAL NUMBER WELLS SAMPLED			**16**			**89**			**36**			**235**

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Kern			Los Angeles			Merced			Orange		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
1,1,2,2-tetrachloroethane			123			275			24			50
1,2,4-trichlorobenzene			73			269			24			50
1,2-dichloropropane (propylene dichloride)		3	123			275			24			50
1,3-dichloropropene (1,3-D)			73			273			27			50
2,4,5-t			41						5			1
2,4-D						119			28			22
2,4-D, dimethylamine salt												
3-hydroxycarbofuran						5			6			1
4(2,4-DB), dimethylamine salt												1
alachlor			18			122			26			9
aldicarb			1			35			21			6
aldicarb sulfone						9			6			1
aldicarb sulfoxide						9			6			1
aldrin						12			4			
ametryne												1
atrazine			63	8	10	238	1		52		1	25
azinphos-methyl									3			
benefin									3			
bentazon, sodium salt			54			96			28			11
bhc (other than gamma isomer)						5			3			
bromacil			17		1	61			49			21
butachlor						6						1
butylate												1
captafol									3			
carbaryl						9			6			1
carbendazim									3			
carbofuran			34			57			23			9
carbon disulfide												
chlordane			31			111			25			10
chlorobenzilate						4						
chloroneb						4						
chlorothalonil			4			35			3			
chlorpyrifos												
chlorthal-dimethyl												1
cyanazine			9			20			24			
dalapon						33			17			2
dbcp		16	92		11	315		12	41			9
ddd						5			3			
dde						5			3			
ddt						5			3			
deisopropyl-atrazine												
demeton									5			
diazinon			8			17			21			21
dicamba						5			5			
dichlobenil									3			
dichlorprop												
dicofol									3			
dieldrin						12			1			
dimethoate			8			36			17			
dinoseb						36			18			2
diphenamid												

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Kern			Los Angeles			Merced			Orange		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
diquat dibromide									4			
disulfoton									5			
diuron			13	6	8	50		1	24			
endosulfan						5			3			
endosulfan sulfate						5			3			
endothall									16			
endrin			29			121			26			22
endrin aldehyde						5						
ethylene dibromide			92		2	313		1	35			9
fenamiphos			4									
fenamiphos sulfone			4									
fenamiphos sulfoxide			4									
glyphosate, isopropylamine salt			36			41			22			8
heptachlor			31			113			25			10
heptachlor epoxide			31			113			25			10
hexachlorobenzene						9			14			1
hexazinone			9			20			18			
lindane (gamma-bhc)			29			124			28			22
methiocarb						5			5			1
methomyl						9			6			1
methoxychlor			29			118			25			22
methyl bromide			123			275			24			50
methylene chloride												
metolachlor						6						
metribuzin			9			20			23			
mevinphos			34						5			
molinate						202			27			25
mtp (monomethyl 2,3,5,6-tetrachloroterep												
naled									3			
naphthalene			73		1	280		2	24			50
ortho-dichlorobenzene			123			275			24			50
oxamyl						11			20			2
paraquat bis(methylsulfate)						5						
paraquat dichloride						5						
permethrin						4						
picloram						34			18			
prometon			9			20			29			
prometryn			17			61			43			21
propachlor						9						
propazine						5						
propoxur						5			1			1
s,s,s-tributyl phosphorotrithioate									3			
silvex			41			119			28			22
simazine		1	63	8		239	1		51		1	25
simetryn									5			
terbutryn									5			
thiobencarb			34			202			9			4
toxaphene			29			124			25			22
tpa (2,3,5,6-tetrachloroterephthalic acid)												
triadimefon									3			
trifluralin						5						
vernolate									3			
xylene		1	123		4	306			24			2
TOTAL NUMBER WELLS SAMPLED			**187**			**508**			**71**			**74**

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Riverside			San Bernadino			San Joaquin			San Luis Obispo		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
1,1,2,2-tetrachloroethane			9			110			37			42
1,2,4-trichlorobenzene			9			109			33			40
1,2-dichloropropane (propylene dichloride)			9			110			37			42
1,3-dichloropropene (1,3-D)			9			109			33			40
2,4,5-t									2			4
2,4-D									2			29
2,4-D, dimethylamine salt									5			
3-hydroxycarbofuran			25			113			4			27
4(2,4-DB), dimethylamine salt												
alachlor			78			73			5			34
aldicarb			29			37			4			27
aldicarb sulfone						2			4			27
aldicarb sulfoxide						2			4			27
aldrin						2			2			12
ametryne												
atrazine			120			118			27			72
azinphos-methyl												
benefin												
bentazon, sodium salt			25			112			2			29
bhc (other than gamma isomer)												3
bromacil			71			3	1		30			30
butachlor						2						
butylate												
captafol												
carbaryl						2			4			27
carbendazim												
carbofuran			35			111			4			59
carbon disulfide									2		2	7
chlordane			40			117			5			71
chlorobenzilate												
chloroneb												
chlorothalonil			31			3						3
chlorpyrifos												
chlorthal-dimethyl												
cyanazine			13						15			5
dalapon			3			41						1
dbcp		9	98		65	175		20	42			71
ddd												2
dde												3
ddt												3
deisopropyl-atrazine												
demeton												
diazinon			59			4			15			
dicamba						2						
dichlobenil												
dichlorprop												
dicofol												
dieldrin						2			2			12
dimethoate			59			3			15			5
dinoseb			3			41						1
diphenamid												

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Riverside			San Bernadino			San Joaquin			San Luis Obispo		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
diquat dibromide			8			38						
disulfoton												
diuron			13			2			15		15	38
endosulfan												3
endosulfan sulfate												3
endothall			8			36						
endrin			40			114			5			57
endrin aldehyde												3
ethylene dibromide			98			153			24			71
fenamiphos			7						6			
fenamiphos sulfone			7						5			
fenamiphos sulfoxide			7						6			
glyphosate, isopropylamine salt			36			111			2			50
heptachlor			40			117			5			71
heptachlor epoxide			40			117			5			71
hexachlorobenzene			3			40			2			8
hexazinone			13						15			5
lindane (gamma-bhc)			40			113			5			57
methiocarb									4			27
methomyl									4			27
methoxychlor			40			114			5			57
methyl bromide			9			110			33			42
methylene chloride												
metolachlor												
metribuzin			13						15			5
mevinphos												
molinate			81			91			12			68
mtp (monomethyl 2,3,5,6-tetrachloroterep												
naled												
naphthalene			9		2	109			33			40
ortho-dichlorobenzene			9			110			33			40
oxamyl			3			36						28
paraquat bis(methylsulfate)												
paraquat dichloride												
permethrin												
picloram			3			39						1
prometon			13						15			5
prometryn			71			3			30			32
propachlor												
propazine												
propoxur									4			27
s,s,s-tributyl phosphorotrithioate												
silvex			25			110			2			29
simazine	4		120			118			27			69
simetryn												
terbutryn												
thiobencarb			81			94			12			63
toxaphene			40			114			5			57
tpa (2,3,5,6-tetrachloroterephthalic acid)												
triadimefon												
trifluralin												
vernolate												
xylene		1	10			109			34			42
TOTAL NUMBER WELLS SAMPLED			**134**			**262**			**78**			**73**

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Santa Cruz			Solano			Stanislaus			Tehama		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
1,1,2,2-tetrachloroethane			27			18			17			5
1,2,4-trichlorobenzene			27			18			17			5
1,2-dichloropropane (propylene dichloride)			27			18			17			6
1,3-dichloropropene (1,3-D)			27			18			17			5
2,4,5-t									10			
2,4-D			13			10			18			1
2,4-D, dimethylamine salt												
3-hydroxycarbofuran						7			8			
4(2,4-DB), dimethylamine salt												
alachlor						14			21			
aldicarb						16			8			
aldicarb sulfone						7			8			
aldicarb sulfoxide						7			8			
aldrin						10			19			
ametryne												
atrazine			22	1		11			52			12
azinphos-methyl												
benefin												
bentazon, sodium salt			13			10			16		1	22
bhc (other than gamma isomer)						3						
bromacil			22			11			30			12
butachlor						7						
butylate												
captafol												
carbaryl						7			8			
carbendazim												
carbofuran						16			9			
carbon disulfide						3						
chlordane						14			24			
chlorobenzilate												
chloroneb												
chlorothalonil						11						
chlorpyrifos												
chlorthal-dimethyl												
cyanazine						1						12
dalapon						7			2			1
dbcp						10		44	80			
ddd						3						
dde						3						
ddt						3						
deisopropyl-atrazine												
demeton									13			
diazinon			22			10			21			
dicamba						7			2			
dichlobenil												
dichlorprop												
dicofol												
dieldrin						10			19			
dimethoate			22			7			8			
dinoseb						7			2			1
diphenamid												

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Santa Cruz			Solano			Stanislaus			Tehama		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
diquat dibromide						7						
disulfoton									13			
diuron						1			7		1	12
endosulfan						3						
endosulfan sulfate						3						
endothall						2						
endrin						14			26			
endrin aldehyde						3						
ethylene dibromide						10			38			
fenamiphos												
fenamiphos sulfone												
fenamiphos sulfoxide												
glyphosate, isopropylamine salt						14			7			
heptachlor						14			24			
heptachlor epoxide						14			23			
hexachlorobenzene						13			8			
hexazinone						1			7			12
lindane (gamma-bhc)						14			26			
methiocarb						7			8			
methomyl						7			8			
methoxychlor						14			26			
methyl bromide			27			18			17			6
methylene chloride												
metolachlor						7						
metribuzin						8			13			12
mevinphos									13			
molinate			22			10			28			
mtp (monomethyl 2,3,5,6-tetrachloroterep												
naled												
naphthalene		1	45			18		1	18			5
ortho-dichlorobenzene			27			18			17			6
oxamyl						7			8			
paraquat bis(methylsulfate)						7						
paraquat dichloride						7					2	34
permethrin												
picloram						7						1
prometon						1	1		20			12
prometryn			22			8			23			12
propachlor						7						
propazine												
propoxur						7			8			
s,s,s-tributyl phosphorotrithioate												
silvex			13			10			18			1
simazine			22			11			52		1	12
simetryn									13			
terbutryn									13			
thiobencarb			22			12			26			
toxaphene						14			26			
tpa (2,3,5,6-tetrachloroterephthalic acid)												
triadimefon												
trifluralin												
vernolate												
xylene		1	27			18			17			5
TOTAL NUMBER WELLS SAMPLED			**45**			**23**			**114**			**40**

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Tulare			Ventura			Yolo			Yuba		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
1,1,2,2-tetrachloroethane			68			43			12			10
1,2,4-trichlorobenzene			68			43			12			9
1,2-dichloropropane (propylene dichloride)			68			43			12			10
1,3-dichloropropene (1,3-D)			68			43			12			9
2,4,5-t			7			18						
2,4-D			57			21			11			11
2,4-D, dimethylamine salt												
3-hydroxycarbofuran			32			28						
4(2,4-DB), dimethylamine salt												
alachlor			31			30						
aldicarb			32			27						
aldicarb sulfone			28			28						
aldicarb sulfoxide			28			28						
aldrin			31			32						
ametryne												
atrazine			76			54	3		6			
azinphos-methyl												
benefin												
bentazon, sodium salt			57			21					1	1
bhc (other than gamma isomer)												
bromacil		1	76			42			6			
butachlor			4									
butylate												
captafol												
carbaryl			32			28						
carbendazim												
carbofuran			32			43						
carbon disulfide												
chlordane			31			44						
chlorobenzilate												
chloroneb												
chlorothalonil			4			5						
chlorpyrifos												
chlorthal-dimethyl												
cyanazine			19			8			6			
dalapon			11		5	8						1
dbcp		38	101		1	48						
ddd												
dde												
ddt												
deisopropyl-atrazine	1		1									
demeton			6									
diazinon			51			43						
dicamba			11									1
dichlobenil												
dichlorprop												
dicofol												
dieldrin			31			32						
dimethoate			51			35						
dinoseb			11			8						1
diphenamid												

Appendix F, Part 2 continued

Pesticide or Breakdown Product	Tulare			Ventura			Yolo			Yuba		
	V	U	Total	V	U	Total	V	U	Total	V	U	Total
diquat dibromide						8						
disulfoton			6									
diuron	2		19			27			6			
endosulfan												
endosulfan sulfate												
endothall						8						
endrin			31			32			11			10
endrin aldehyde												
ethylene dibromide		2	101		1	48						1
fenamiphos						5						
fenamiphos sulfone						5						
fenamiphos sulfoxide						5						
glyphosate, isopropylamine salt			32			17						
heptachlor			31			46						
heptachlor epoxide			31			46						
hexachlorobenzene			4			25						
hexazinone			11			8			6			
lindane (gamma-bhc)			31			32			11			10
methiocarb			28			28						
methomyl			32			27						
methoxychlor			31			32			11			10
methyl bromide			68			43			12			9
methylene chloride												
metolachlor			4									
metribuzin			17			8			6			
mevinphos			6									
molinate			57			42						
mtp (monomethyl 2,3,5,6-tetrachloroterep												
naled												
naphthalene		1	69			43			12			9
ortho-dichlorobenzene			68			43			12			9
oxamyl			32			28						
paraquat bis(methylsulfate)						8						
paraquat dichloride						8						
permethrin												
picloram		1	4			8						1
prometon			25			8			6			
prometryn			68			42			6			
propachlor			4									
propazine												
propoxur			28			28						
s,s,s-tributyl phosphorotrithioate												
silvex			57			21			11			11
simazine	3		76			54			6			
simetryn			6									
terbutryn			6									
thiobencarb			51			42						
toxaphene			31			32			11			9
tpa (2,3,5,6-tetrachloroterephthalic acid)												
triadimefon												
trifluralin												
vernolate												
xylene			68			43			12			10
TOTAL NUMBER WELLS SAMPLED			**153**			**57**			**18**			**18**

H. MEMORANDUM OF UNDERSTANDING BETWEEN THE STATE WATER RESOURCES CONTROL BOARD AND THE CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
STATE WATER RESOURCES CONTROL BOARD
AND THE
CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION
FOR THE PROTECTION OF
WATER QUALITY (SURFACE AND GROUND WATER)
FROM POTENTIALLY ADVERSE
EFFECTS OF PESTICIDES

BACKGROUND

The State Water Resources Control Board (SWRCB) and the California Department of Pesticide Regulation (CDPR) have responsibilities relating to the protection of water quality from the potentially adverse effects of pesticides. Both agencies believe that the State will benefit by a unified and cooperative program to address water quality problems related to the use of pesticides.

The purpose of this Memorandum of Understanding (MOU) between the SWRCB and CDPR is to ensure that pesticides registered in California are used in a manner that protects water quality and the beneficial uses of water while recognizing the need for pest control.

The Food and Agricultural Code, as amended by the 1991 Governor's Reorganization Plan No. 1, charges CDPR with the responsibility of ensuring the orderly regulation of pesticides while protecting the quality of the total environment (including water quality) and the health, and safety of the public.

SCOPE

This MOU is intended to assure that the respective authorities of the SWRCB and CDPR, relative to the protection of water quality and beneficial uses from impairment by the use of pesticides, will be exercised in a coordinated and cohesive manner designed to eliminate overlap of activities, duplication of effort, and inconsistency of action. To that end, this MOU establishes principles of agreement regarding activities of the signatory agencies, identifies primary areas of responsibility and authority between these agencies, and provides methods and mechanisms necessary to assure ongoing coordination of activities relative to such purposes. This MOU also describes how the agencies will work cooperatively to achieve the goals of the respective agencies.

STATUTORY AUTHORITIES

The Porter-Cologne Water Quality Control Act establishes a comprehensive water quality control program for California. The Federal Clean Water Act adds additional water quality control provisions to be implemented nationwide. The SWRCB and the nine California Regional Water Quality Control Boards (CRWQCB) are responsible for protecting the beneficial uses of water in California and for controlling all discharges of waste into waters of the State. The SWRCB sets overall State policy, adopts or approves all water quality control plans, and hears petitions to review CRWQCB decisions. The CRWQCBs have primary responsibility for permitting, inspection, and enforcement actions. The CRWQCBs implement and enforce the policies adopted by the SWRCB.

CDPR is the lead agency for pesticide regulation in California. California law requires CDPR to register and regulate the use of pesticides and protect public health and safety by providing for environmentally sound pest management.

The Pesticide Contamination Prevention Act of 1985 (Article 15, Chapter 2, Division 7 of the Food and Agricultural Code) authorizes CDPR to:

1. Collect and analyze environmental fate data on all pesticides registered for agricultural use in California to determine ground water data gaps and identify and monitor potential ground water contaminants;

2. Review any pesticide or related chemical found in ground water or in soil under certain conditions to determine if that chemical pollutes or threatens to pollute ground water as a result of legal agricultural use and take appropriate corrective action when necessary; and

3. Compile and maintain a statewide database of wells sampled for pesticide active ingredients and to make an annual report on that inventory and any corrective actions taken by CDPR and/or the SWRCB.

The Pesticide Contamination Prevention Act (Act) also prescribes a cooperative working relationship between CDPR, as the lead agency, and the SWRCB for the purpose of protecting ground water from pesticide pollution as a result of agricultural uses. A subcommittee of CDPR's Pesticide Registration and Evaluation Committee (PREC) is established by the Act for this purpose.

The local administration of CDPR's pesticide regulatory program is the responsibility of the County Agricultural Commissioners (Commissioners), with coordination, supervision, and training provided by CDPR. The Commissioners enforce pesticide laws and regulations and evaluate permit requests for the use of restricted pesticides. In addition, the Commissioners monitor and inspect pesticide handling and use operations, investigate suspected pesticide misuse, and take enforcement action against violators.

PRINCIPLES OF AGREEMENT

The SWRCB and CDPR agree that the use of certain pesticides may degrade water quality and threaten beneficial uses. To protect the State's water, it is necessary to prevent water pollution by pesticides by establishing water quality objectives and by implementing control measures for those pesticides which have a potential to unreasonably affect beneficial uses.

In order to provide for better protection of water quality and beneficial uses for the people of California, the SWRCB and CDPR mutually agree to:

1. Promote both technical and policy consultations concerning pesticide water quality issues through formal channels, such as standing interagency committees and SWRCB workshops and meetings, as well as through informal staff exchanges of information. The SWRCB and CRWQCBs and CDPR will consult during the early stages of planning any investigation related to pesticides and water quality. The agencies will provide technical assistance to each other upon request.

2. Implement a pesticide detection notification system to ensure mutual awareness of pesticide finds in the waters of the State. Results of pesticide monitoring will be provided in an expeditious manner. Results of pesticide monitoring related to ground water will be provided in compliance with "Minimum Reporting Requirements for Well Sampling" approved by the SWRCB, California Department of Food and Agriculture, and California Department of Health Services in July 1986. Reporting requirements and procedures for data referrals relative to surface water will be described in an implementation document.

3. Collect, exchange, and disseminate information on (a) the use of pesticides, (b) impacts on the quality of the State's waters from such uses, and (c) any efforts to mitigate those impacts.

4. Share information on pesticide formulations and environmental fate and toxicity of active ingredients, inert ingredients, and break-down products. Procedures to protect proprietary information will be described in an implementation document.

5. Consult each other in developing or revising water quality objectives for pesticides and in developing or revising regulations which may impact water quality.

6. Participate in the development of State policies, guidelines, and management plans relative to pesticide use and water quality control.

7. Promote the development and implementation of Best Management Practices (BMPs) whenever necessary to protect the beneficial uses of the waters of the State from the potentially adverse effects of the use of certain pesticides. CDPR's plans to implement BMPs, as furnished to the SWRCB and/or CRWQCBs, should (a) describe the nature of the actions which are necessary to achieve the objectives, including recommendations for appropriate actions by any entity, public or private; (b) set a time schedule for actions to be taken; and (c) describe the points of application and the monitoring to be undertaken to determine compliance with the water quality objectives.

8. Implement BMPs initially upon voluntary compliance to be followed by regulatory-based encouragement of BMPs as circumstances dictate. Mandatory compliance will be based, whenever possible, on CDPR's implementation of regulations and/or pesticide use permit requirements. However, the SWRCB and CRWQCBs retain ultimate responsibility for compliance with water quality objectives. This responsibility may be implemented through the SWRCB and CRWQCBs' Basin Planning Programs or other appropriate regulatory measures consistent with applicable authorities and the provisions of the Nonpoint Source Management Plan approved by the SWRCB in November 1988.

9. Develop an implementation plan to (a) provide uniform guidance and direction to the CRWQCBs and to the Commissioners regarding the implementation of this MOU, (b) describe in detail procedures to implement specific sections of this MOU, and (c) make specific the respective roles of units within the signatory agencies.

DISPUTE AND CONFLICT RESOLUTION

It is the desire of both agencies to establish a speedy, efficient, and informal method for the resolution of interagency conflicts. Conflicts between the SWRCB and CRWQCBs, CDPR, and the Commissioners which cannot otherwise be informally resolved will be referred to the Executive Director of the SWRCB and the Director of CDPR. Conflicts which cannot be resolved at this level will be elevated to the Secretary of the California Environmental Protection Agency.

To assist the Executive Director of the SWRCB and the Director of CDPR in resolving conflicts, two staff persons will be appointed by the Chairman of the SWRCB and the Director of CDPR representing the interests of the SWRCB and CRWQCBs and CDPR and Commissioners, respectively.

This MOU shall become effective upon the date of final signature and shall continue in effect until modified by the mutual written consent of both parties or until terminated by either party upon a thirty (30) day advance written notice to the other party.

STATE WATER RESOURCES CONTROL BOARD

W. Don Maughan — Dec. 23, 1991

W. Don Maughan, Chairman — Date

CALIFORNIA DEPARTMENT OF PESTICIDE REGULATION

James W Wells — Dec. 23, 1991

James W. Wells, Interim Director — Date

State of California

Memorandum

To : EM & PM Program Supervisors and Managers
Environmental Monitoring and Pest Management

Date : February 26, 1993

Place : Sacramento

Phone: 4-1141

From : Department of Pesticide Regulation John S. Sanders, Acting Chief
Environmental Monitoring and Pest Management

Subject : Implementing the MOU with the State Water Board

Attached for your information is a copy of a joint memo issued by Director Jim Wells and State Water Board Executive Director Walt Petit as interim guidance for implementing the principles of agreement in our memorandum of understanding (MOU). Please familiarize yourself with both the MOU and this guidance memo. If you have any questions concerning consultation with the State and Regional Water Boards or how the MOU might affect your projects, please see Steven Monk or me. The same suggestion applies if you or your staff encounter any issues with the Boards which are not consistent with the MOU or this guidance.

I would also like to take this opportunity to institute a specific process of consultation regarding interim guidance III. (c)(3) for notice of field monitoring activities. Starting immediately, a copy of all approved study protocols will be sent to both the State and appropriate Regional Water Board. The State Water Board copy will go to the attention of Jack Hodges, the interim MOU coordinator, at the address indicated in the attached memo. To expedite your mailing to the Regional Board within whose boundaries the study is to be conducted, I am also attaching a list of designated contacts and a list of mailing addresses for each Regional Board Office.

With your assistance, the MOU will become a workable reality. Thank you.

Attachments

cc: Steven Monk

Recycled Paper

SUBNAME Sanders

California Environmental Protection Agency
James M. Strock, Secretary for Environmental Protection

State of California
Pete Wilson, Governor

DEPARTMENT OF PESTICIDE REGULATION
James W. Wells, Director

Executive Office 93-3

January 4, 1993

TO: ALL SWRCB DIVISION CHIEFS
ALL DPR BRANCH CHIEFS
ALL REGIONAL BOARD EXECUTIVE OFFICERS
ALL COUNTY AGRICULTURAL COMMISSIONERS

SUBJECT: IMPLEMENTING THE PESTICIDES-WATER QUALITY MEMORANDUM OF UNDERSTANDING (MOU)

The Department of Pesticide Regulation (DPR) and the State Water Resources Control Board (SWRCB) executed a Memorandum of Understanding (MOU) on December 23, 1991, to ensure that pesticides registered in California are used in a manner that protects water quality and the beneficial uses of water while recognizing the need for pest control. The MOU established principles of agreement regarding activities of both agencies, identifies primary areas of responsibility and authority between these agencies, and provides methods and mechanisms necessary to assure ongoing coordination of activities at both the State and local levels.

In order to provide for better protection of water quality and beneficial uses for the people of California, the SWRCB and DPR mutually agreed, in part, to develop an implementation plan to (1) provide uniform guidance and direction to the Regional Water Quality Control Boards (RWQCBs) and to the County Agricultural Commissioners (CACs) regarding the implementation of this MOU, (2) describe in detail procedures to implement specific sections of this MOU, and (3) make specific the respective roles of units within both agencies.

Despite our mutual best efforts, the implementation document has not been completed. We remain committed to making the drafting of an implementation plan and/or a water quality management plan a high priority activity leading to an eventual Management Agency Agreement.

However, it has come to our attention that, in the absence of a completed implementation document, many staff at the State and local levels of both agencies remain unaware of the MOU and its principles of agreement and/or are unsure of its implications for their respective assignments and projects. In fact, the CACs were informed that "the MOU places no immediate requirements on county staff or programs" until an implementation document has been developed.

In January, 1992, such instructions made sense, but today we cannot afford to delay any longer the integration of the MOU and its principles of agreement into policy development and program implementation. We have long ago agreed to exercise our respective authorities "in a coordinated and cohesive manner designed to eliminate overlap of activities, duplication of effort, and inconsistency of action." While coordination is occurring, efforts could be improved. Therefore, we have mutually agreed to provide the following interim guidance for implementation of our MOU.

I. Appointment of Staff Persons for Dispute Resolution

The MOU declares, and we reaffirm, that it is the mutual intent of both agencies to resolve any interagency conflicts in "a speedy, efficient, and informal" way. However, in the event that conflict resolution between any parties to this agreement (SWRCB, RWQCBs, DPR, or CACs) cannot be reached informally, the dispute will be referred to the SWRCB Executive Director and DPR Director.

The MOU specifies that "two staff persons will be appointed" by each agency to "assist the Executive Director of the SWRCB and the Director of DPR in resolving conflicts." Jesse M. Diaz, Chief of the Division of Water Quality, and Jack Hodges, Chief of the Nonpoint Source Agriculture Unit, will be appointed by Eliseo M. Samaniego, Acting Chairman, to these roles on behalf of the SWRCB. Ronald J. Oshima, Assistant Director for the Division of Enforcement, Environmental Monitoring, and Data Management, and Steven C. Monk, Regulatory Coordinator, will be appointed by James W. Wells, Director, to represent DPR in these roles.

II. Designation of State-Level Interim MOU Coordinators

To facilitate the integration of the MOU principles of agreement into the mainstream of policy development and program implementation at both the State and local levels, we hereby designate two State-level interim MOU coordinators. Jack Hodges and Steven Monk will serve their respective agencies in this role. The MOU Coordinators will be the key point of contact on <u>all</u> matters related to the implementation of the MOU. In that capacity, Jack and Steven should be added to any appropriate State and local "interested parties" mailing lists. The MOU Coordinators will be a source of information, will facilitate interagency contacts, and generally

promote the MOU principles of agreement. Jack and Steven can be reached as follows:

Jack Hodges, Chief
Nonpoint Source Agriculture Unit
Division Of Water Quality
STATE WATER RESOURCES CONTROL BOARD
901 P Street, P.O. Box 100
Sacramento, California 95801-0100
(916) 657-0682 or 8-437-0682
FAX (916) 657-2388

Steven C. Monk,
Regulatory Coordinator
DEPARTMENT OF PESTICIDE REGULATION
Environmental Monitoring
1220 N Street, P.O. Box 942871
Sacramento, California 94271-0001
(916) 654-1141 or 8-464-1141
FAX (916) 654-0539

III. Implementation of Interim Staff Guidance

It is not our intent to disrupt the ongoing activities of either state or local programs. On the other hand, we fully intend that the process of integration and coordination begin in earnest. Therefore, we are providing the following interim guidelines for implementation:

(a) Appropriate staff should be informed of the existence of the MOU and provided access to a reference copy.

(b) It is our intent that interagency staff communication take place at all levels in a frequent and meaningful manner. Staff should be encouraged to seek and provide technical assistance, and to explore the opportunities for joint projects. In addition, we propose that an interagency staff briefing be convened at least quarterly to highlight existing and proposed projects of mutual interest. On a routine basis, Jesse Diaz, Ron Oshima, and the MOU Coordinators will coordinate these briefings and ensure that appropriate staff are invited to discuss items of mutual interest. An executive summary of each quarterly briefing will be sent to the CACs, RWQCBs, and appropriate State staff.

(c) To facilitate consultation "during the early stages of planning", staff should be informed to, at least, contact the MOU Coordinators in any of the following situations <u>when related to pesticides and water quality</u>:

(1) <u>Prior</u> to the issuance of any public notice of either:

regulations; or workshops, hearings, or public meetings where policies or projects of mutual interest will be discussed or adopted.

(2) Prior to the release of any pertinent reports.

(3) Prior to finalizing the study design or contract workplan for any field monitoring or other investigations of mutual interest.

(4) Prior to proposing legislation, budget change proposals, or grant workplans which impact mutual program interests.

(5) Prior to setting or revising any water quality objectives or other standards.

(6) During the development of policies, guidelines, and management plans for federal and/or State projects.

(d) To "implement a pesticide detection notification system", staff should be informed to, at least, contact the MOU Coordinators as soon as any pesticide detections are confirmed in violation of any water quality objective or other known standard. In the case of surface water detections which do not violate an objective or standard, monitoring results should be made available within a reasonable period after the study is completed.

All ground water sampling results, both positive and negative, must be reported in a timely manner to DPR pursuant to the Pesticide Contamination Prevention Act of 1985. Minimum reporting requirements for ground water sampling were established by DPR, SWRCB, and the Department of Health Services in 1986. To obtain a copy of the minimum reporting requirements or to report sampling results, please contact:

Candace Maes
Associate Environmental Research Scientist
Environmental Monitoring and Pest Management Branch
Department of Pesticide Regulation
1220 N Street, P.O. Box 942871
Sacramento, California 94271-0001
(916) 654-1141 or 8-461-1441
FAX (916) 654-0539

(e) While recognizing that the SWRCB and RWQCBs retain ultimate responsibility for compliance with water quality objectives, staff should ensure that programs and workplans are consistent with and support DPR's responsibility to develop and implement voluntary and regulatory-based "best management practices" to control the potentially adverse impacts of pesticide use on water quality.

Finally, we would encourage staff to operate under the following maxim --when in doubt, consult. A reason for designating the MOU Coordinators is to encourage staff to presume that consultation promotes efficient and effective discharge of our respective roles and responsibilities.

Thank you all for your assistance in giving substance and value to the MOU and our principles of agreement.

DEPARTMENT OF PESTICIDE REGULATION

James W. Wells, Director — Jan. 5, 1993 Date

STATE WATER RESOURCES CONTROL BOARD

Walter G. Pettit, Executive Director — Jan 19, 1993 Date

cc: Jesse M. Diaz, Water Quality Division Chief
Ronald J. Oshima, Assistant Director
Jack Hodges
Steven Monk

J. 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 pesticide active ingredient or breakdown product comprises one record in the well inventory data base. The maximum record length is 136 characters.

An example of a well inventory coding sheet, showing the data fields and column numbers, is shown in Figure J-1 on the following page. A key to the codes used in the well inventory data base may be obtained from DPR by writing to the address listed on the title page of this report. 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 six miles long. Range lines (R, cols. 6-8) are oriented east to west and are six miles wide. A six-mile-by six-mile township is divided into 36 one-mile-by-one- 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.
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: _____

LINE NO.	COUNTY	STATE WELL NUMBER: TOWN-SHIP	STATE WELL NUMBER: RANGE	STATE WELL NUMBER: SECTION	STATE WELL NUMBER: TRACT	STATE WELL NUMBER: SEQUENCE NUMBER	BASE MERIDIAN D or Z	STUDY NUMBER	SAMPLING AGENCY	SAMPLE DATE: MONTH	SAMPLE DATE: DAY	SAMPLE DATE: YEAR	CHEMICAL CODE	SAMPLE TYPE	CHEMICAL CONCEN-RATION (ppb)	MINIMUM DETECTION LEVEL (ppb)	ANALYZING LAB	METHOD	DATE OF ANALYSIS: MONTH	DATE OF ANALYSIS: DAY	DATE OF ANALYSIS: YEAR	FILE NAME	SUMMARY YEAR
	1 2	3 4 5	6 7 8	9 10	11	12 13 14	15	16 17 18 19 20	21 22 23 24	25 26	27 28	29 30	31 32 33 34 35	36	37 38 39 40 41 42	43 44 45 46 47 48	49 50 51 52	53	54 55	56 57	58 59	60 61 62 63	64 65
1																							
2																							
3																							
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5																							
6																							
7																							
8																							

LINE NO.	WELL LOCATION ADDRESS: STREET NUMBER	WELL LOCATION ADDRESS: STREET NAME	P or N	WELL CONSTRUCTION INFORMATION: WELL DEPTH	WELL CONSTRUCTION INFORMATION: TOP PERF.	WELL CONSTRUCTION INFORMATION: BOTTOM PERF.	WELL CONSTRUCTION INFORMATION: WATER DEPTH	WELL CONSTRUCTION INFORMATION: LOG YEAR	WELL CONSTRUCTION INFORMATION: WELL CODE	LATITUDE	LONGITUDE
	66 67 68 69 70	71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100	101	102 103 104 105	106 107 108	109 110 111 112	113 114 115 116	117	118	119 120 121 122 123 124 125 126 127	128 129 130 131 132 133 134 135 136
1											
2											
3											
4											
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6											
7											
8											

[EMPM2]

7/91

Figure J-1. 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 only when a season is designated as the sampling date; e.g., "all samples were taken in the 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 five-digit numerical code which corresponds to the chemical codes used in the Pesticide Use Reporting System maintained by the Information Systems 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). Trace amounts, non-detected, or less than the minimum detectable limit values are all recorded as non-detected.
43-48	Minimum detection limit (MDL): a minimum reporting requirement. The MDL for the chemical assay is recorded in ppb. 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 1 to the following June 30.
66-100	Well location information: a minimum reporting requirement. Designates the street name and number or descriptive address of the well.
101	Point or non-point: detections of pesticides in ground water that have been determined to be present due to a point-source (contamination emanating from a specific site, such as a spill or at a waste-site) or non-point source (not traceable to a single definable location) are designated by a P or N in this field. Detections that have not had a source determination are designated as –.
102-105	Well depth (in feet), as recorded on the well log.
106-108	Depth to top of perforation (in feet), as recorded on the well log.
109-112	Depth to bottom of perforation (in feet), as recorded on the well log; often corresponds to depth of completed well.
113-116	Water depth: the depth of standing water in the well at the time of sampling.
117-118	Log year: year the well was drilled (information obtained from well log, raw data, or verbally from a well owner).
119	Well code: a minimum reporting requirement. This code indicates well use; e.g., private domestic, irrigation, or both.
120-127	Latitude: the latitude is expressed in degrees (DD), minutes (MM), and seconds (SS). 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.)
128-136	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.)