Central Valley Water Board
Irrigated Land Regulatory Program

Prioritizing and Selecting Pesticides for Surface Water Monitoring

The following protocol has been developed for evaluating pesticides that are used on irrigated agricultural lands and to identify those that warrant surface water monitoring under the Irrigated Lands Regulatory Program (ILRP). The protocol includes step-by-step instructions and attachments (i.e., list of pesticides with reference values, list of degradates, and groups).

Introduction and Background

The Central Valley Water Board adopted a series of Waste Discharge Requirements for irrigated lands, which include Monitoring and Reporting Program (MRP) requirements for the third-party groups (i.e. Coalitions). Under the MRP Orders, pesticides to be monitored are to be identified by the third-party using the list of pesticides (Executive Officer (EO) List) and a set of evaluation factors and an evaluation process provided by the Central Valley Water Board Executive Officer. Furthermore, the MRP Orders state "The pesticides marked as to be determined […] shall be identified as part of a process that includes input from qualified scientists and coordination with the Department of Pesticide Regulation."

Central Valley Water Board staff convened a Pesticide Evaluation Advisory Workgroup (Workgroup) to provide input on the process for evaluating and identifying pesticides that may require monitoring. The Workgroup consisted of thirteen qualified scientists[1] selected by the Executive Officer through a nomination and selection process. Six meetings of the Workgroup were held in 2014 and early 2015. All Workgroup agendas, meeting materials and summary notes are available online: http://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/regulatory_information/stakeholder_advisory_workgroup/index.shtml

The pesticide evaluation protocol is based largely on the Workgroup discussions and materials developed by the Workgroup during and outside of the formal meetings. Notably, Workgroup members did not reach consensus on the use of US EPA's Human Health Benchmarks and Health Advisories as reference values for ranking and prioritizing pesticide monitoring. It is important to note that benchmarks are not adopted as Basin Plan objectives for human health and that this protocol requires prioritization of monitoring based on Human Health water quality objectives. Additional technical information and input is needed to make a well-informed decision on this issue (i.e., how to utilize Human Health reference values when prioritizing monitoring). Staff plans to convene a working group of technical experts, including drinking water and human health specialists and agency representatives (e.g. Division of Drinking Water, US EPA, Office of Environmental Health Hazard Assessment), to provide guidance on the appropriate use of human health reference values that are not adopted in the Basin Plan. This group will explore the questions and concerns that have been raised by Coalition representatives and others regarding the ranking and potential monitoring of pesticides based on human health reference values. The knowledge gained in this process will be used to update the Pesticide Evaluation Protocol, if needed.

Human health reference values are identified in Attachment A. The protocol described herein requires the Coalitions to generate a ranked list of pesticides based on human health reference values. However, monitoring of these pesticides is not currently required, unless they are identified through the aquatic life ranking and selection process.

Aquatic life reference values are identified in Attachment A. For pesticides without adopted numeric criteria, staff identified the lowest value from the available US EPA adopted acute or chronic criteria or

[1] A qualified scientist is defined in the Orders as "…a person who has earned a professional degree in a scientific discipline that relates to engineering, environmental science, or chemistry with additional experience related to pesticides and water quality, and is familiar with the related local, state, and federal regulations."

the US EPA aquatic life benchmarks. Workgroup members did not reach consensus on the use of the acute/chronic aquatic life benchmarks as reference values. In particular, several workgroup members expressed they believe that the chronic aquatic life reference values are somewhat arbitrary and potentially overly protective. However, it is appropriate to consider the aquatic life benchmarks, including both acute and chronic aquatic life criteria, when selecting the aquatic life reference value for prioritizing the need for monitoring. It is important to note that the reference values in this protocol are not intended to be interpreted or applied as trigger limits, which are determined in a separate process from that used to develop this document.

The key steps in the Pesticide Evaluation Protocol (Figure 1) involve acquiring pesticide use data, identifying the pesticides used in the watershed area under evaluation, creating ranking lists based on aquatic life and human health reference values, evaluating existing monitoring data, evaluating environmental fate factors, determining if analytical methods are available, prioritizing pesticides for monitoring, and submitting a pesticides monitoring proposal in the annual Monitoring Plan Update. In general, the scale of analysis will be a watershed area or areas that are associated with a given monitoring site. Central Valley Water Board staff will review and discuss the pesticide monitoring proposals with the third-party representatives. This protocol allows the Coalitions to propose and use additional criteria for screening pesticides, but they must be documented and reviewed with Central Valley Water Board staff prior to final submittal. The final monitoring plan requires approval by the Executive Officer.

When future substantive updates to the Pesticide Evaluation Protocol are under consideration, Central Valley Water Board staff will provide opportunity for public comment on proposed changes. This will include, but is not limited to, providing a draft update on the appropriate use of human health reference values following input from the technical working group. Updates to the EO List of Pesticides, List of Degradates, and appropriate reference values will also be made available for public review and comment prior to final release.

Executive Officer (EO) List of Pesticides (Attachment A)

The list of pesticides to be considered in the evaluation consists of all pesticides currently registered for agricultural use in California, with the exclusion of oils, clays, polymers, sulfur, solvents, soaps, petroleum, biopesticides, mineral salts[2], adjuvants, pheromones, and "other related" pesticides[3]. Seven pesticides that are exclusively used on rice are also excluded because rice pesticides are evaluated under a rice-specific process. The EO List of Pesticides for Consideration (Attachment A), EO List of Degradates (Attachment A1), and Pesticide Degradates of Concern (Attachment D) will be reviewed and updated annually by Central Valley Water Board staff, in consultation with DPR and EPA. During the annual review period, the aquatic life and human health reference values will be updated as needed.

[2] Certain registered salts are not excluded from consideration because they are a Clean Water Act Priority Pollutant, a regulated drinking water pollutant, or a chemical on the 303(d) list.

[3] The term "other related" in the Chemical Name is used for byproducts of manufacturing active ingredients (a relatively small amount in a formulation). US EPA is phasing out the term; chemicals previously labeled "other related" are accounted for in the content of an active ingredient in newer products.

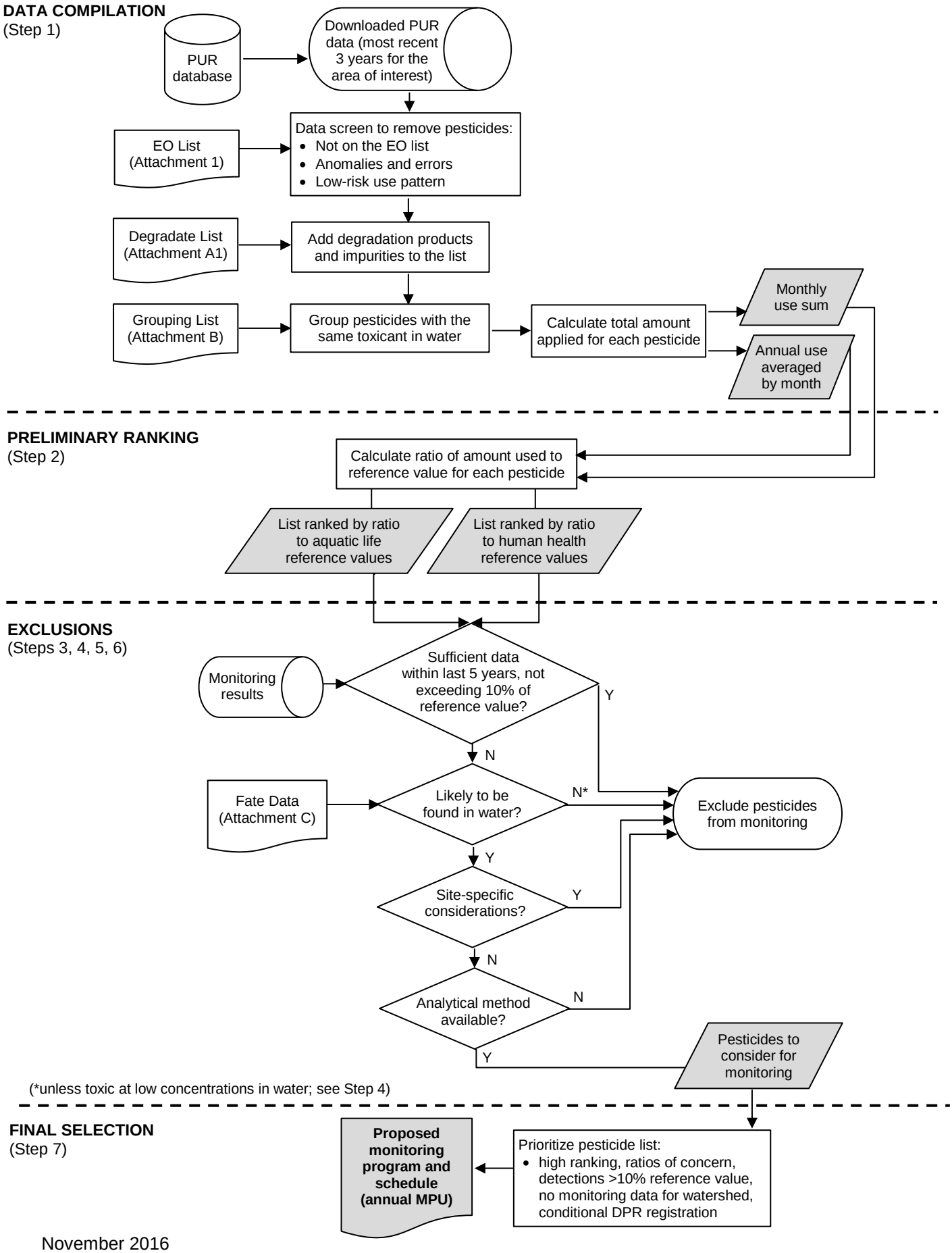

Figure 1. Overview of Pesticide Evaluation Steps

Step-by-Step Instructions for Pesticide Evaluation by the Coalitions

1. Compilation and processing of Watershed Pesticide Use Data (also referred to as amount of active ingredient or pounds of chemical applied)

A. Obtain the most recent three years of pesticide use data (PUR) for the watershed(s) under consideration from the Department of Pesticide Regulation's (DPR) California Pesticide Information Portal (CalPIP) and/or through the county agricultural commissioner.

B. Exclude any pesticides which are not on the provided EO list of pesticides (Attachment A).

C. Screen data to exclude any obvious errors in the pesticide use data (e.g. entry errors, or number of acres treated or pounds of pesticide applied are incorrect). Suspect data may be flagged and evaluated further. Exclusions must be documented.

D. (*Optional*) Identify and document any exclusions of pesticides with low risk use (indoor use only, containerized baits, traps or devices, impregnated materials, spot applications).

E. Determine if any parent compounds on the EO list of degradates (Attachment A1), have reported usage. Add degradates to the list in the same amount as the pounds of applied parent pesticide.[4]

F. Group pesticides with the same toxicant in water according to the grouping list provided (Attachment B).

G. Calculate the quantity of dioxin in the pesticide 2,4-D (total amount of all 2,4-D active ingredients – esters, and acids & salts)[5] and add dioxin to the list.

H. Create two separate lists by calculating the following for each chemical:

a. Cumulative use for each month - sum amounts applied by month over the most recent three years, and divide by three (cumulative monthly average).
b. Annual use averaged by month - sum amounts applied over the most recent three years, and divide by 36.

2. Preliminary Ranking (Relative Risk)

A. Calculate the ratio of the amount of chemical applied to the aquatic life reference value (Attachment A) for each chemical on the cumulative monthly average use list. Sort the list based on the ratios.

B. Calculate the ratio of the amount of chemical applied to the human health reference value (Attachment A) for each chemical on the annual use averaged by month list. Sort the list based on the calculated ratios.

[4] Both parent and degradate pesticide are retained on the list in this step. Some chemicals will be removed from the list in subsequent steps of the evaluation. Any parent pesticides and degradates that remain on the list should be assessed on a case-by-case basis in the final selection for monitoring (see Step 7, Notes).

[5] Dioxin occurs as an impurity with an average concentration 1.1 ng/g. To calculate the dioxin content in pounds, multiply the sum of all applied 2,4-D active ingredients (in pounds) by 0.0000000011 (EPA/600/P-03/002F).

3. Evaluation of Available Monitoring Data

A. Obtain all readily available monitoring data for the pesticide(s) being evaluated in the watershed. At a minimum, the Coalition's monitoring data, data retrieved from CEDEN, DPR and USGS for the area of interest, and relevant information from applicable 303(d) listings should be included.

B. Examine data quality, detection limits relative to reference values, and sample timing relative to application and runoff timing. Data that follows analytical procedures and achieves the prescribed quality assurance and quality control components in accordance with an approved QAPP must be included. Decisions to reject data must be justified and documented and only occur if data do not adhere to accepted procedures or thresholds. Exclude data in which the method is not sufficiently sensitive enough to provide the necessary level of quantification (i.e., the minimum measureable concentration of the pesticide exceeds the reference value).

C. Evaluate the following three considerations for each pesticide based on the remaining data. If the answer to all three questions below is 'Yes', the pesticide under consideration can be excluded from the ranking list:

(a) Are there sufficient quality data[6] to characterize the potential impact of the pesticide in the watershed at vulnerable application and runoff time periods?

(b) Did sampling occur within the last five years?

(c) Are all measured values less than 10% of the reference value?

Document the justification for any exclusions. If sufficient data are not available, or data are older than five years, or observed concentrations are equal or greater than 10% of the reference value, the pesticide should not be excluded in this step.

4. Evaluation of Environmental Fate

Evaluate the environmental fate of each pesticide and identify pesticides unlikely to be found in the water column:

- Exclude pesticides which are likely to partition into sediments (unless those pesticides are toxic at very low concentrations): remove pesticides with a soil adsorption coefficient (K_{oc}) greater than 100,000 and provided aquatic reference value above 1 µg/L.
- Exclude pesticides which are not persistent in an aqueous environment by eliminating those chemicals with a hydrolysis half-life of less than one day.
- Exclude highly volatile pesticides by eliminating all pesticides with both a vapor pressure greater than 1×10^{-4} mPa and a Henry's Law Constant greater than 100 Pa m^3/mol.

Attachment C lists pesticides determined not to be a priority in surface water based on the environmental fate data reviewed by the Central Valley Water Board, and which can be removed in this step. In addition to Attachment C, other pesticides may be excluded by consulting other data sources. Document all exclusions, and the source of the fate data used.

[6] There must be a sufficient quantity of data that reflects peak application and runoff time periods. Professional judgment should be used to determine the quantity of data considered sufficient; the rule of thumb is a minimum of 20 samples in the county of the watershed of interest.

5. Site-specific or Regulatory Considerations (Optional)

Evaluate factors that may justify removal of a pesticide from the list to monitor (and document rationale for decision to exclude), such as:

- Recent (last three years) US Environmental Protection Agency or DPR regulatory controls established and demonstrated to prevent water pollution
- Growers have terminated or greatly reduced use of a pesticide in the last three years (or longer time period if appropriate)
- A management plan for the pesticide in the watershed area of interest has recently been successfully completed and approved by the Executive Officer.

6. Availability of Chemical Analysis Method

Assess the availability of analytical methods, and exclude any pesticides for which there is no commercially available analytical method that can be performed by multiple labs. Document any decisions to exclude pesticides from monitoring, as methods may need to be developed.

7. Final Monitoring Plan Proposal

Evaluate the list to identify which pesticides to propose for monitoring and to determine a monitoring schedule. Prioritize and include pesticides in the monitoring plan using the following criteria*:

a. Highest ranked pesticides (ratio of pesticide use to reference value).

b. Pesticides with ratios similar to or greater than the ratios for pesticides that have been previously associated with identified water quality problems in the watershed.

c. Pesticides with detections greater than 10% of the reference value, unless sampling frequency during vulnerable time periods has been sufficient to capture peak concentrations or there is evidence to demonstrate that values above 10% are an error (e.g. typographical or laboratory error).

d. Pesticides without monitoring data in the entire watershed, particularly pesticides conditionally registered with the DPR due to the potential for surface water pollution.

e. Pesticides on the preliminary ranked list for Human Health that have an adopted numeric water quality objective must be considered further for monitoring. Adopted numeric water quality objectives include MCLs and CTR criteria (see Attachment A). All other pesticides on the ranked Human Health list do not require monitoring at this time (unless identified based on the aquatic life ranking), but should be identified and provided to Central Valley Water Board staff. Staff plans to convene a working group of technical experts to provide guidance on how to appropriately use human health benchmarks as a screening tool.

NOTES:

***** Other criteria for screening pesticides may be considered and evaluated but must be documented and reviewed with Central Valley Water Board staff prior to final submittal.

** Unless an explanation is already provided for exclusions in the steps above, a justification must accompany any decisions not to monitor chemicals with water quality objectives, US EPA criteria, or on the 303(d) list for the waterbody.

******* Coalitions should coordinate with the Central Valley Water Board staff to determine which parent pesticides and pesticide degradates may require monitoring based on the transformation fractions, toxicity and other relevant information. Attachment D lists individual degradates of concern for each parent pesticide.

Attachment A
EO List of Pesticides for Consideration

A list of actively registered chemicals was downloaded on 31 October 2016 from the DPR's website http://www.cdpr.ca.gov/docs/label/actai.htm. In the initial screen the following were removed: oils, clays, polymers, sulfur, solvents, petroleum, biopesticides, soaps, mineral salts, adjuvants, pheromones, and pesticides designated as "other related". The California Product/Label Data database ftp://pestreg.cdpr.ca.gov/pub/outgoing/product/ was queried to identify and exclude any active ingredients found only in products not registered for use for the 'agricultural crops' site group category. Pesticides used exclusively on rice were identified and removed (i.e., bensulfuron methyl, bispyribac-sodium, clomazone, cyhalofop-butyl, orthosulfamuron, propanil, and thiobencarb.

Aquatic Life Reference Values. If a numeric objective is available for the pesticide in the Basin Plan or there is a proposed Basin Plan Amendment, the number was used as the reference value. For remaining pesticides, staff evaluated available US EPA adopted acute or chronic criteria and US EPA benchmark values. The lowest value, whether acute or chronic was selected because those criteria have been determined for the appropriate, most sensitive species. DPRs benchmark equivalents were used if EPA criteria or benchmarks were not available. See table footnotes.

Human Health Reference Values. The lowest of the available values for Maximum Contaminant Levels (primary and secondary MCLs, state and federal) and Numeric Criteria for Priority Toxic Pollutants for the State of California (California Toxics Rule) were selected as human health reference values (i.e, adopted numeric criteria). For pesticides without adopted numeric criteria, the US EPA Human Health Criteria or US EPA Human Health Benchmarks and Drinking Water Health Advisories were included, and should be used in the initial ranking list, but will not require monitoring (unless identified in the aquatic life ranking step). Staff plans to convene a working group of technical experts to address how to appropriately use human health benchmarks as a screening tool. See table footnotes.

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
3866	(S)-CYPERMETHRIN*				
573	1,3-DICHLOROPROPENE	45	(b)	0.5	(e)
5295	1-METHYLCYCLOPROPENE	388	(c)		
422	1-NAPHTHALENEACETAMIDE	22000	(c)	1050	(g)
2247	2-(2,4-DP), DIMETHYLAMINE SALT				
636	2,4-D	12500	(b)	70	(e)
1622	2,4-D, 2-ETHYLHEXYL ESTER	79.2	(b)		
802	2,4-D, BUTOXYETHANOL ESTER				
805	2,4-D, DIETHANOLAMINE SALT	299.2	(b)		
806	2,4-D, DIMETHYLAMINE SALT	3880	(b)		
809	2,4-D, ISOOCTYL ESTER				
810	2,4-D, ISOPROPYL ESTER	130	(b)		
5538	2,4-D, TRIISOPROPANOLAMINE SALT				
5020	2,4-DB ACID	932	(b)		
5336	2,4-DP-P, DIMETHYLAMINE SALT	3880	(b)		
5337	2,4-DP-P, ISOOCTYL ESTER				
638	2,4-XYLENOL	2400	(c)		
549	3-CHLORO-P-TOLUIDINE HYDROCHLORIDE				
838	4-(2,4-DB), DIMETHYLAMINE SALT	1567	(b)		
50	4-AMINOPYRIDINE	1600	(c)		
2254	ABAMECTIN	0.17	(b)	3	(g)
1685	ACEPHATE	150	(b)	8	(g)
5801	ACEQUINOCYL	0.98	(b)	189	(g)
5762	ACETAMIPRID	2.1	(b)	497	(g)
933	ACETIC ACID	15750	(c)		
5338	ACIBENZOLAR-S-METHYL	200	(c)	541	(g)

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
3	ACROLEIN	3	(b)	6	(d)
678	ALACHLOR	1.64	(b)	2	(e)
1846	ALKYL (50%C14, 40%C12, 10%C16) DIMETHYLBENZYL AMMONIUM CHLORIDE			3080	(g)
1912	ALKYL (58%C14, 28%C16, 14%C12) DIMETHYLBENZYL AMMONIUM CHLORIDE			3080	(g)
1847	ALKYL (60%C14, 30%C16, 5%C12, 5%C18) DIMETHYLBENZYL AMMONIUM CHLORIDE			3080	(g)
1854	ALKYL (68%C12, 32%C14) DIMETHYLETHYLBENZYL AMMONIUM CHLORIDE			3080	(g)
[FS1]					
484	ALUMINUM PHOSPHIDE	4.85	(c)	79	(g)
6025	AMETOCTRADIN				
3907	AMINO ETHOXY VINYL GLYCINE HYDROCHLORIDE				
5998	AMINOCYCLOPYRACHLOR	370	(b)	2450	(g)
6057	AMINOCYCLOPYRACHLOR, POTASSIUM SALT			2450	(g)
5928	AMINOPYRALID, TRIISOPROPANOLAMINE SALT			3500	(g)
5963	AMMONIUM NONANOATE				
1744	ANCYMIDOL	292	(b)		
45	ATRAZINE	0.001	(b)	1	(e)
4037	AZOXYSTROBIN	44	(b)	1260	(g)
53	BENEFIN			35	(g)
70	BENSULIDE	290	(b)	35	(g)
1944	BENTAZON, SODIUM SALT	60	(b)	18	(e)
6078	BETA-CONGLUTIN				
3956	BETA-CYFLUTHRIN*	0.034	(b)	168	(g)
5657	BIFENAZATE	150	(b)	70	(g)
2300	BIFENTHRIN*	0.0001	(a)		
79	BORAX				
769	BORIC ACID				
5790	BOSCALID	116	(b)	1526	(g)
83	BROMACIL	6.8	(b)		
2135	BROMADIOLONE	17	(c)		
2288	BROMETHALIN	2.5	(c)		
5036	BROMOXYNIL HEPTANOATE	14.5	(b)		
834	BROMOXYNIL OCTANOATE	2.5	(b)	105	(g)
3947	BUPROFEZIN	165	(c)	23	(g)
2315	CAPRIC ACID				
2316	CAPRYLIC ACID				
104	CAPTAN	13.1	(b)	15	(h)[2]
105	CARBARYL	0.5	(b)	700	(h)[2]
1755	CARBOXIN	370	(b)		
5130	CARFENTRAZONE-ETHYL	12	(c)	210	(g)
5964	CHLORANTRANILIPROLE	4.5	(b)	11060	(g)
3938	CHLORFENAPYR	2.915	(b)	21	(g)
760	CHLORFLURENOL, METHYL ESTER			700	(g)
1512	CHLORMEQUAT CHLORIDE	2800	(b)	350	(g)
1625	CHLOROPHACINONE				
136	CHLOROPICRIN	5.5	(b)	50	(h)[2]
677	CHLOROTHALONIL	0.6	(b)		
141	CHLORPROPHAM	1000	(c)	350	(g)
253	CHLORPYRIFOS	0.015	(a)		

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
2143	CHLORSULFURON	0.35	(b)	140	(g)
179	CHLORTHAL-DIMETHYL	11000	(b)		
3566	CLETHODIM	2	(b)	70	(g)
2249	CLOFENTEZINE	6	(b)	91	(g)
5050	CLOPYRALID, MONOETHANOLAMINE SALT				
2339	CLOPYRALID,TRIETHYLAMINE SALT				
5792	CLOTHIANIDIN	1.1	(b)	686	(g)
[FS2]					
714	COPPER	1.11	(b)	1000	(e)
3550	COPPER AMMONIUM COMPLEX				
3547	COPPER CITRATE CHELATE				
6103	COPPER DIAMMONIUM DIACETATE COMPLEX				
3551	COPPER ETHANOLAMINE COMPLEXES, MIXED				
3549	COPPER ETHYLENEDIAMINE COMPLEX				
3548	COPPER GLUCONATE CHELATE				
151	COPPER HYDROXIDE	8.5	(c)		
5225	COPPER OCTANOATE				
175	COPPER OXIDE (OUS)	103.5	(c)		
156	COPPER OXYCHLORIDE	33	(c)		
162	COPPER SULFATE (BASIC)				
161	COPPER SULFATE (PENTAHYDRATE)				
1615	COPPER TRIETHANOLAMINE COMPLEX				
173	CRYOLITE				
6072	CYANTRANILIPROLE	6.56	(b)		
5930	CYAZOFAMID	87	(b)	6636	(g)
4030	CYCLANILIDE	1700	(c)	49	(g)
516	CYCLOATE	1300	(b)	35	(g)
6003	CYFLUFENAMID				
2223	CYFLUTHRIN*	0.0002	(a)	168	(g)
4002	CYMOXANIL	254	(c)	6	(g)
2171	CYPERMETHRIN*	0.0003	(a)	420	(g)
4000	CYPRODINIL	8	(b)	189	(g)
2286	CYROMAZINE	310	(b)	105	(g)
7	DAMINOZIDE	35500	(b)		
233	DAZOMET	25	(b)		
187	(DDVP) Dichlorvos	0.0058	(b)	4	(g)
3010	DELTAMETHRIN*	0.0041	(b)		
1748	DESMEDIPHAM	10	(c)	280	(g)
198	DIAZINON	0.1	(a)	1.2	(h)[1]
200	DICAMBA	61	(b)		
849	DICAMBA, DIMETHYLAMINE SALT	488500	(b)		
5057	DICAMBA, SODIUM SALT	17300	(b)		
112	DICHLOBENIL	30	(b)	70	(g)
81	DICLORAN	240	(c)	175	(g)
1682	DIDECYL DIMETHYL AMMONIUM CHLORIDE			700	(g)
5024	DIFENOCONAZOLE	5.6	(b)	70	(g)
1992	DIFLUBENZURON	0.00025	(b)	140	(g)
5751	DIFLUFENZOPYR, SODIUM SALT			1820	(g)
5007	DIGLYCOLAMINE SALT OF 3,6-DICHLORO-O-ANISIC ACID				
2004	DIKEGULAC SODIUM	5000000	(c)		
5919	DIMETHENAMID-P	8.9	(b)	350	(g)

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
216	DIMETHOATE	0.5	(b)	15	(g)
4003	DIMETHOMORPH	110	(b)	700	(g)
5822	DINOTEFURAN	6360	(b)	140	(g)
1710	DIOCTYL DIMETHYL AMMONIUM CHLORIDE				
225	DIPHACINONE	900	(c)		
1636	DIPHACINONE, SODIUM SALT				
228	DIPHENYLAMINE	300	(c)	700	(g)
229	DIQUAT DIBROMIDE	0.75	(b)		
1800	DISODIUM OCTABORATE TETRAHYDRATE				
2308	DITHIOPYR	20	(c)		
231	DIURON	2.4	(b)		
[FS3]					
245	DODINE	0.95	(b)	140	(g)
4038	D-TRANS ALLETHRIN*	3.95	(b)	56	(g)
4020	EMAMECTIN BENZOATE			0.5	(g)
259	ENDOSULFAN	0.01	(b)	42	(g)
1356	ENDOTHALL, DIPOTASSIUM SALT	610	(b)		
2056	ENDOTHALL, MONO [N,N-DIMETHYL ALKYLAMINE] SALT	2.3	(b)		
264	EPTC	800	(b)	350	(g)
4040	ESBIOTHRIN*	4.45	(b)	56	(g)
2321	ESFENVALERATE*	0.0003	(a)	13	(g)
2166	ETHALFLURALIN	0.4	(b)	280	(g)
1626	ETHEPHON	2500	(b)	420	(g)
1900	ETHOFUMESATE	300	(b)	1980	(g)
404	ETHOPROP	0.8	(b)	10	(g)
2292	ETOFENPROX	0.17	(b)	259	(g)
5849	ETOXAZOLE	0.13	(b)	322	(g)
5878	FAMOXADONE	5.5		10	(g)
5791	FENAMIDONE	4.7	(b)	198	(g)
1980	FENARIMOL	100	(b)	42	(g)
6029	FENAZAQUIN			350	(g)
3905	FENBUCONAZOLE	330	(c)	210	(g)
1876	FENBUTATIN-OXIDE	0.31	(b)	119	(g)
4032	FENHEXAMID	101	(b)	1190	(g)
5123	FENOXAPROP-P-ETHYL	22	(b)	18	(g)
2234	FENPROPATHRIN*	0.064	(b)	175	(g)
6077	FENPYRAZAMINE	11	(b)		
5784	FENPYROXIMATE	0.016	(b)	350	(g)
5950	FERRIC SODIUM EDTA				
289	FERROUS SULFATE				
3995	FIPRONIL	0.011	(b)	1	(g)
6035	FLAZASULFURON			91	(g)
5886	FLONICAMID	50000	(c)	280	(g)
5815	FLUAZIFOP-P-BUTYL	310	(c)	52	(g)
3898	FLUAZINAM	0.69	(b)	77	(g)
5948	FLUBENDIAMIDE	27.4	(b)	168	(g)
5027	FLUDIOXONIL	19	(b)	210	(g)
6091	FLUENSULFONE				
5090	FLUMICLORAC-PENTYL	94.5	(b)	7000	(g)
5802	FLUMIOXAZIN	0.49	(b)	140	(g)
5949	FLUOPICOLIDE	1.4	(b)	1400	(g)
6004	FLUOPYRAM			84	(g)
5915	FLUOXASTROBIN	217.5	(c)	105	(g)
6098	FLUPYRADIFURONE				
1436	FLURECOL-METHYL				
5918	FLUROXYPYR, 1-METHYLHEPTYL ESTER	56	(b)	7000	(g)

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
2320	FLURPRIMIDOL	840	(b)	105	(g)
2305	FLUTOLANIL	220	(b)	3500	(g)
5971	FLUTRIAFOL	310	(b)	350	(g)
6033	FLUXAPYROXAD			147	(g)
5557	FORCHLORFENURON	3300	(c)	490	(g)
111	FORMETANATE HYDROCHLORIDE	0.5	(b)		
2210	FOSETYL-AL	5900	(c)	17500	(g)
2325	FOSTHIAZATE	61	(b)	1	(g)
5877	GAMMA-CYHALOTHRIN*	0.00024	(b)	7	(g)
3946	GLUFOSINATE-AMMONIUM	72	(b)	42	(g)
139	GLUTARALDEHYDE	11250	(c)		
2997	GLYPHOSATE	1800	(b)	700	(e)
5972	GLYPHOSATE, DIMETHYLAMINE SALT				
1855	GLYPHOSATE, ISOPROPYLAMINE SALT	34700	(b)		
2301	GLYPHOSATE, MONOAMMONIUM SALT				
5820	GLYPHOSATE, POTASSIUM SALT				
3919	HALOSULFURON-METHYL	5.3	(c)	700	(g)
1871	HEXAZINONE	7	(b)		
2303	HEXYTHIAZOX	6.1	(b)	175	(g)
2203	HYDRAMETHYLNON	45	(b)	119	(g)
2238	HYDROGEN CYANAMIDE	100	(b)		
2084	IMAZALIL	740	(c)	175	(g)
5906	IMAZALIL SULFATE				
5757	IMAZAMOX, AMMONIUM SALT	8	(b)		
2257	IMAZAPYR, ISOPROPYLAMINE SALT				
2341	IMAZETHAPYR, AMMONIUM SALT	59200	(b)		
5987	IMAZOSULFURON	1.46	(b)		
3849	IMIDACLOPRID	1.05	(b)	399	(g)
5999	INDAZIFLAM	500	(c)	140	(g)
5331	INDOXACARB	75	(b)	140	(g)
5978	IPCONAZOLE	0.18	(b)	105	(g)
2081	IPRODIONE	120	(b)	350	(g)
5014	IRON PHOSPHATE				
6114	ISOFETAMID				
2289	ISOXABEN	10	(b)		
5451	KRESOXIM-METHYL	29.2	(b)	2520	(g)
2297	LAMBDA-CYHALOTHRIN*	0.0003	(a)	7	(g)
361	LINURON	0.09	(b)	54	(g)
367	MALATHION	0.035	(b)	160	(h)[2]
368	MALEIC HYDRAZIDE				
2130	MALEIC HYDRAZIDE, POTASSIUM SALT				
211	MANCOZEB	47	(b)	35	(g)
5961	MANDIPROPAMID	220	(b)	350	(g)
5059	MCPA, 2-ETHYL HEXYL ESTER	20	(b)		
786	MCPA, DIMETHYLAMINE SALT	130	(b)		
787	MCPA, ISOOCTYL ESTER				
5333	MCPP-P, DIMETHYLAMINE SALT	14	(b)		
5111	MECOPROP-P	45500	(b)		
4011	MEFENOXAM	100	(b)	519	(g)
1955	MEFLUIDIDE, DIETHANOLAMINE SALT			105	(g)
2075	MEPIQUAT CHLORIDE	14400		1365	(g)
5898	MESOSULFURON-METHYL	0.64	(b)	10850	(g)

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
6069	MESOTRIONE	17.7	(b)	49	(g)
378	META-CRESOL				
5935	METAFLUMIZONE	165.5			
2132	METALAXYL	100	(b)		
379	METALDEHYDE	34500	(b)	70	(g)
5983	METCONAZOLE	1050		280	(g)
1689	METHIDATHION	0.66	(b)	11	(g)
375	METHIOCARB	0.1	(b)		
383	METHOMYL	0.7	(b)		
5698	METHOXYFENOZIDE	6.3	(b)	714	(g)
3971	METHYL ANTHRANILATE				
385	METHYL BROMIDE	1300	(b)	48	(f)
1680	METHYL-2,7-DICHLORO-9-HYDROXYFLUORENE-9-CARBOXYLATE				
493	METIRAM			3	(g)
1996	METOLACHLOR	10	(b)		
5990	METRAFENONE	410	(c)	1750	(g)
1692	METRIBUZIN	8.7	(b)		
5763	MILBEMECTIN	2.2	(c)		
34	MSMA	5630	(b)	210	(g)
2245	MYCLOBUTANIL	830	(b)	175	(g)
2000	N6-BENZYL ADENINE				
423	NAA	18050	(c)	1050	(g)
1344	NAA, AMMONIUM SALT			1050	(g)
749	NAA, ETHYL ESTER			1050	(g)
861	NAA, POTASSIUM SALT			1050	(g)
761	NAA, SODIUM SALT			1050	(g)
418	NALED	0.045	(b)	14	(g)
1728	NAPROPAMIDE	1100	(b)	840	(g)
3829	NICOSULFURON	43000	(b)	8750	(g)
439	NITRAPYRIN	920	(c)	210	(g)
396	N-OCTYL BICYCLOHEPTENE DICARBOXIMIDE (MGK-264)			427	(g)
2019	NORFLURAZON	9.7	(b)	105	(g)
5754	NOVALURON	0.03	(b)	77	(g)
1709	OCTYL DECYL DIMETHYL AMMONIUM CHLORIDE				
248	ORTHO-PHENYLPHENOL, SODIUM SALT				
1868	ORYZALIN	15.4	(b)	980	(g)
2017	OXADIAZON	5.2	(b)		
1910	OXAMYL	27	(b)	50	(e)
382	OXYDEMETON-METHYL	5	(b)	0.7	(g)
1973	OXYFLUORFEN	0.33	(b)	210	(g)
1798	OXYTETRACYCLINE HYDROCHLORIDE	47450	(b)	4	(g)
3832	OXYTETRACYCLINE, CALCIUM COMPLEX			4	(g)
2259	PACLOBUTRAZOL	8	(b)		
1601	PARAQUAT DICHLORIDE	0.396	(b)		
464	PCNB	13	(b)	700	(g)
1929	PENDIMETHALIN	5.2	(b)	210	(g)
6093	PENFLUFEN			2660	(g)
5889	PENOXSULAM	3	(b)	1029	(g)
6020	PENTHIOPYRAD	100	(b)	1890	(g)
2008	PERMETHRIN*	0.001	(b)	1750	(g)
2291	PEROXYACETIC ACID				
5931	PEROXYOCTANOIC ACID				
675	PHENMEDIPHAM	86	(c)	1680	(g)
2093	PHENOTHRIN* (d-Phenothrin)	0.47	(b)	49	(g)

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
478	PHORATE	0.21	(b)	4	(g)
335	PHOSMET	0.8	(b)	40	(g)
3541	PHOSPHINE				
6061	PICOXYSTROBIN	1	(b)		
5984	PINOXADEN	1200	(b)	4	(g)
486	PIPERONYL BUTOXIDE	30	(b)	1085	(g)
5788	POLYOXIN D, ZINC SALT				
970	POTASSIUM N-METHYLDITHIOCARBAMATE				
3985	PRALLETHRIN*	0.65	(b)	350	(g)
2236	PRODIAMINE	1.5	(b)		
5497	PROHEXADIONE CALCIUM	1100	(b)	1400	(g)
499	PROMETON	98	(b)		
502	PROMETRYN	1.04	(b)	280	(g)
4022	PROPAMOCARB HYDROCHLORIDE			840	(g)
445	PROPARGITE	7	(b)	280	(g)
2276	PROPICONAZOLE	21	(b)	700	(g)
505	PROPIONIC ACID	11350	(b)		
508	PROPYLENE OXIDE	860	(b)	7	(g)
5856	PROPYLENEGLYCOL MONOLAURATE				
694	PROPYZAMIDE	600	(b)		
6005	PROTHIOCONAZOLE			70	(g)
5232	PYMETROZINE	25	(b)	56	(g)
5759	PYRACLOSTROBIN	1.5	(b)	238	(g)
5865	PYRAFLUFEN-ETHYL	0.89	(b)	1400	(g)
510	PYRETHRINS	0.86	(b)	308	(g)
3959	PYRIDABEN	0.044	(b)	35	(g)
5991	PYRIDALYL	2.1	(b)	238	(g)
5864	PYRIMETHANIL	20	(b)	1190	(g)
4019	PYRIPROXYFEN	0.015	(b)	2450	(g)
3940	PYRITHIOBAC-SODIUM	107	(c)		
6030	PYROXSULAM	2.57	(b)	7000	(g)
5104	QUINCLORAC	500	(b)	2660	(g)
6102	QUINCLORAC, DIMETHYLAMINE SALT	500	(b)		
5787	QUINOXYFEN	27	(c)	1400	(g)
2119	RESMETHRIN*	0.14	(b)	245	(g)
3835	RIMSULFURON	11.6	(b)	826	(g)
190	S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE			7	(g)
5977	SAFLUFENACIL	42	(b)	322	(g)
1170	SALICYLIC ACID				
2177	SETHOXYDIM	210	(b)	980	(g)
603	SIDURON	6	(b)	1050	(g)
531	SIMAZINE	2.24	(b)	4	(e)
5026	S-METHOPRENE	48	(b)		
5133	S-METOLACHLOR	8	(b)		
536	SODIUM CHLORATE	43000	(b)	210	(g)
688	SODIUM CYANIDE	94	(b)		
4013	SODIUM METABORATE TETRAHYDRATE				
5946	SPINETORAM	1585	(c)	174	(g)
3983	SPINOSAD	0.6	(b)	174	(g)
5857	SPIRODICLOFEN	1.95	(b)	98	(g)
5858	SPIROMESIFEN	0.25	(b)	154	(g)
5955	SPIROTETRAMAT	100	(b)		
3834	STREPTOMYCIN SULFATE			350	(g)
554	STRYCHNINE				
5923	SULFENTRAZONE	28.8	(b)	700	(g)

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)		Human Health Reference Value (µg/L)	
2149	SULFOMETURON-METHYL	0.45	(b)	1925	(g)
5136	SULFOSULFURON	1	(b)	1680	(g)
618	SULFURYL FLUORIDE	310	(c)	560	(g)
2195	TAU-FLUVALINATE	0.1	(b)	35	(g)
971	TCMTB	1.05	(c)	70	(g)
3850	TEBUCONAZOLE	12	(b)	203	(g)
3957	TEBUFENOZIDE	4.3	(b)	126	(g)
1810	TEBUTHIURON	50	(b)		
6021	TEMBOTRIONE	5.2	(b)	3	(g)
580	TERRAZOLE	300	(c)	112	(g)
5939	TETRACONAZOLE	190	(b)	51	(g)
1695	TETRAMETHRIN*	1.85	(b)		
587	THIABENDAZOLE	275	(c)	231	(g)
5888	THIACLOPRID	0.97	(b)	28	(g)
5598	THIAMETHOXAM	17.5	(b)	84	(g)
2162	THIDIAZURON	150	(c)	275	(g)
6016	THIENCARBAZONE-METHYL	0.8	(b)	8190	(g)
1696	THIOPHANATE-METHYL	930	(b)	187	(g)
589	THIRAM	21	(b)	105	(g)
2133	TRIADIMEFON	41	(b)	238	(g)
2307	TRIADIMENOL	9600	(c)	24	(g)
49	TRIALLATE	14	(b)	175	(g)
2338	TRIBENURON-METHYL	2	(b)	56	(g)
2170	TRICLOPYR, BUTOXYETHYL ESTER	26	(b)		
2131	TRICLOPYR, TRIETHYLAMINE SALT	5900	(b)		
5321	TRIFLOXYSTROBIN	2.76	(b)	266	(g)
2260	TRIFLUMIZOLE	33	(b)	82	(g)
597	TRIFLURALIN	1.14	(b)		
3875	TRIFLUSULFURON-METHYL	46	(c)	168	(g)
2345	TRINEXAPAC-ETHYL	190	(b)	2240	(g)
5799	TRITICONAZOLE	1000	(c)	1190	(g)
2312	UNICONIZOLE-P	5000	(c)	140	(g)
2270	UREA DIHYDROGEN SULFATE				
626	ZINC PHOSPHIDE	3.8		0.7	(g)
667	ZINC SULFATE				
629	ZIRAM	4.85	(b)	112	(g)
5769	ZOXAMIDE	3.48	(b)	3360	(g)

(a) Numeric water quality objective in the Basin Plan (adopted and 2016 draft)

(b) US EPA Ambient Water Quality Criteria and Aquatic Life Benchmarks (Freshwater, µg/L): https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

(c) https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/aquatic-life-benchmarks-pesticide-registrationDPR's "Benchmark Equivalents" developed by Surface Water Protection Program (Luo et al. 2013: http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/analysis_memos/prioritization_report.pdf)

(d) EPA criteria (water and organism consumption, µg/L), Human Health Criteria Table: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table

(e) Maximum Contaminant Levels (MCLs), National Drinking Water Regulations and California State Water Resources Control Board's MCLs:

https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants

http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Documents/DWdocuments/MCLsEPAvsDWP-2014-07-01.pdf

(f) CTR (Human Health (water and organism consumption, µg/L), Numeric Criteria for Priority Toxic Pollutants for

DPR Code	Common Name	Aquatic Life Reference Value (µg/L)	Human Health Reference Value (µg/L)

the State of California: http://www.waterboards.ca.gov/water_issues/programs/tmdl/records/state_board/2003/ref476.pdf

(g) US EPA Human Health Benchmarks for Pesticides (Chronic or Lifetime, ppb): http://iaspub.epa.gov/apex/pesticides/f?p=HHBP:home

(h) For five chemicals the following are used in the Protocol solely for estimating relative risk for human health and do not require monitoring (Drinking Water Notification Levels and Archived Advisory Levels for Drinking Water were established in response to actual contamination of drinking water supplies and are enforceable state drinking water standards):

[1] Drinking Water Notification Levels: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/notificationlevels.pdf

[2] Archived Advisory Levels for Drinking Water: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/notificationlevels/archivedadvisorylevels.pdf

[3] US EPA Drinking Water Health Advisory:

https://www.epa.gov/dwstandardsregulations/drinking-water-standards-and-health-advisory-tables

***** Monitoring of pyrethroid pesticides in the water column based on this prioritization will be required upon Central Valley Water Board adoption of the Pyrethroid Basin Plan Amendment.

Attachment A1
EO List of Degradates

Parent Pesticide	Degradate Pesticide	CAS number	Aquatic Life Reference Value	Human Health Reference Value
2,4-D	2,4-dichlorophenol (2,4-DCP)	120-83-2		20
2,4-DB				
2,4-DP				
Dichlobenil	2,6-dichlorobenzamide (BAM)	2008-58-4	10,000	32
Fluopicolide				
Chlorpyrifos	3,5,6-trichloro-2-pyridinol (TCP)	6515-38-4	950	
Triclopyr acid				
Triclopyr butoxyethyl ester				
Triclopyr triethylamine salt				
Bifenazate	Bifenazate degradates	multiple	22	70
Bromoxynil Heptanoate	Bromoxynil	1689-84-5		105
Bromoxynil Octanoate				
Thiophanate-methyl	Carbendazim (MBC)	10605-21-7		175
Thiamethoxam	Clothianidin	210880-92-5	1.1	686
Tralomethrin	Deltamethrin	52918-63-5	0.0041	
Naled	Dichlorvos (DDVP)	62-73-7	0.0058	4
Trichlorfon				
Mancozeb	Ethylene thiourea	96-45-7	2	3
Metiram				
Indoxacarb	Indoxacarb degradates	multiple	3.6	140
Dazomet	Methylisothiocyanate (MITC)	556-61-6	25	190
Metam potassium				
Metam sodium				
Pinoxaden	NOA 497854	N/A	960	4
Pyrifluquinazon	Pyrifluquinazon degradates	n/a	0.55	
Difenoconazole	Triazoles	multiple		35
Fenbuconazole				
Ipconazole				
Metconazole				
Myclobutanil				
Paclobutrazol				
Propiconazole				
Prothioconazole				
Tebuconazole				
Tetraconazole				
Triadimefon				
Triadimenol				

Attachment B
Pesticide Grouping List

DPR Code	Common Name	Group #	Group Name
802	2,4-D, BUTOXYETHANOL ESTER	1	2,4-D esters
809	2,4-D, ISOOCTYL ESTER		
810	2,4-D, ISOPROPYL ESTER		
1622	2,4-D, 2-ETHYLHEXYL ESTER		
636	2,4-D	2	2,4-D acids & salts
805	2,4-D, DIETHANOLAMINE SALT		
806	2,4-D, DIMETHYLAMINE SALT		
5538	2,4-D, TRIISOPROPANOLAMINE SALT		
151	COPPER HYDROXIDE	3	COPPER
156	COPPER OXYCHLORIDE		
161	COPPER SULFATE (PENTAHYDRATE)		
162	COPPER SULFATE (BASIC)		
175	COPPER OXIDE (OUS)		
714	COPPER		
1615	COPPER TRIETHANOLAMINE COMPLEX		
3547	COPPER CITRATE CHELATE		
3548	COPPER GLUCONATE CHELATE		
3549	COPPER ETHYLENEDIAMINE COMPLEX		
3550	COPPER AMMONIUM COMPLEX		
3551	COPPER ETHANOLAMINE COMPLEXES, MIXED		
5225	COPPER OCTANOATE		
6103	COPPER DIAMMONIUM DIACETATE COMPLEX		
1855	GLYPHOSATE, ISOPROPYLAMINE SALT	4	GLYPHOSATE
2301	GLYPHOSATE, MONOAMMONIUM SALT		
2997	GLYPHOSATE		
5820	GLYPHOSATE, POTASSIUM SALT		
5972	GLYPHOSATE, DIMETHYLAMINE SALT		
2297	LAMBDA-CYHALOTHRIN	5	LAMBDA-CYHALOTHRIN
5877	GAMMA-CYHALOTHRIN		
2171	CYPERMETHRIN	6	CYPERMETHRIN
3866	(S)-CYPERMETHRIN		
2223	CYFLUTHRIN	7	CYFLUTHRIN
3956	BETA-CYFLUTHRIN		
4038	D-TRANS ALLETHRIN	8	ALLETHRIN
4040	ESBIOTHRIN		
3985	PRALLETHRIN		
2247	2-(2,4-DP), DIMETHYLAMINE SALT	9	2,4-DP-p (dichlorprop)
5336	2,4-DP-P, DIMETHYLAMINE SALT		
5337	2,4-DP-P, ISOOCTYL ESTER		
838	4-(2,4-DB), DIMETHYLAMINE SALT	10	2,4-DB
5020	2,4-DB ACID		
200	DICAMBA	11	DICAMBA
849	DICAMBA, DIMETHYLAMINE SALT		

DPR Code	Common Name	Group #	Group Name
5057	DICAMBA, SODIUM SALT		
5111	MECOPROP-P	12	MCPP-p DMAS
5333	MCPP-P, DIMETHYLAMINE SALT		
786	MCPA, DIMETHYLAMINE SALT	13	MCPA EHE (ester)
787	MCPA, ISOOCTYL ESTER		
5059	MCPA, 2-ETHYL HEXYL ESTER		
5104	QUINCLORAC	14	QUINCLORAC
6102	QUINCLORAC, DIMETHYLAMINE SALT		
1996	METOLACHLOR	15	S-METOLACHLOR
5133	S-METOLACHLOR		
5998	AMINOCYCLOPYRACHLOR	16	aminocyclopyrachlor acid
6057	AMINOCYCLOPYRACHLOR, POTASSIUM SALT		
2339	CLOPYRALID,TRIETHYLAMINE SALT	17	CLOPYRALID
5050	CLOPYRALID, MONOETHANOLAMINE SALT		
225	DIPHACINONE	18	DIPHACINONE
1636	DIPHACINONE, SODIUM SALT		
423	NAA	19	NAA
749	NAA, ETHYL ESTER		
761	NAA, SODIUM SALT		
861	NAA, POTASSIUM SALT		
1344	NAA, AMMONIUM SALT		
1356	ENDOTHALL, DIPOTASSIUM SALT	20	endothall (n,n-dimethylalylamine salt)
2056	ENDOTHALL, MONO [N,N-DIMETHYL ALKYLAMINE] SALT		
2084	IMAZALIL	21	IMAZALIL
5906	IMAZALIL SULFATE		
5788	POLYOXIN D, ZINC SALT	22	ZINC
626	ZINC PHOSPHIDE		
667	ZINC SULFATE		
368	MALEIC HYDRAZIDE	23	MALEIC HYDRAZIDE
2130	MALEIC HYDRAZIDE, POTASSIUM SALT		
79	BORAX	24	BORON
1800	DISODIUM OCTABORATE TETRAHYDRATE		
4013	SODIUM METABORATE TETRAHYDRATE		

Attachment C
Environmental Fate Data (Pesticides that can be excluded in Step 4)

	Environmental Fate*	
Highly volatile	Vapor pressure >10^{-4} mPa	Henry's constant >100 Pa m^3/mol
1,3-dichloropropene	4,850,000/2,980,000	170/101 (cis/trans isomer)
Phosphine	1,060,000	33,269
Sulfuryl fluoride	1,600,000,000	160,000
Partition to sediments	Koc>100,000 ml/g	Reference value >1µg/L
Fludioxonil	145,600	< 19
Hydramethylnon	730,000	45
Not persistent	Hydrolysis DT50 <1** days (at pH 7)	
Acrolein	1.5	
Alachlor	0.5	
Bifenazate	0.8	
Captan	0.6	
Clofentezine	1.4	
Cymoxanil	1.1	
Dazomet	0.2	
Desmedipham	1.0	
Flumiclorac-pentyl	0.8	
Flumioxazine	1.0	
Formetanate	1.5	
Mancozeb	1.3	
Metiram	0.7	
Naled	0.7	
Phenmedipham	0.5	
Phosmet	0.3	
Sulfuryl fluoride	0.3	
Ziram	0.7	

* University of Hertfordshire (2013) The Pesticide Properties DataBase (PPDB) developed by the Agriculture & Environment Research Unit (AERU), University of Hertfordshire, 2006-2013. The 2012 version contains fate data for 1893 chemicals but fate data are not complete for some of the chemicals.

** Rounded to the nearest whole day

Attachment D
Pesticide Degradates of Concern

Parent Pesticide	Degradate Pesticide	CAS number	Aquatic Reference Value	Human Health Reference Value
2,4-D	2,4-dichlorophenol (2,4-DCP)	120-83-2		20
2,4-DB	2,4-dichlorophenol (2,4-DCP)	120-83-2		20
2,4-DP	2,4-dichlorophenol (2,4-DCP)	120-83-2		20
Bifenazate	Bifenazate degradate D1989	613-37-6	125	70
	Bifenazate degradate D-3598	149878-40-0	22	70
	Bifenazate degradate D-9472	n/a	115	70
Bromoxynil Heptanoate	Bromoxynil	1689-84-5		105
Bromoxynil Octanoate	Bromoxynil	1689-84-5		105
Chlorpyrifos	3,5,6-trichloro-2-pyridinol (TCP)	6515-38-4	950	0.005
Dazomet	Methylisothiocyanate (MITC)	556-61-6	25	190
Dichlobenil	2,6-dichlorobenzamide (BAM)	2008-58-4	10000	32
Difenoconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Fenbuconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Fluopicolide	2,6-dichlorobenzamide (BAM)	2008-58-4	10000	32
Indoxacarb	Indoxacarb degradate- (IN-JT333) (methyl-7-chloro-2,5-dihydro -2-[[[4(trifluoromethoxy)phenyl]amino]carbonyl]indeno[1,2e][1,3,4]oxadiazine -4a(3H)-carboxylate)	144171-39-1	3.6	140
	Indoxacarb degradate- (IN-MP819) (Indenol[1 ,2-e][1 ,3,4]oxadlazine-1 (2H)-carboxylic acid, 7-chloro-3,5-dlhydno-2-[[[4-(triftuoromethoxy)phenyl]amino] carbonyl]-, methyl ester)	n/a	32	140
	Indoxacarb degradate (KN127)	n/a	197	140
Ipconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Mancozeb	Ethylene thiourea	96-45-7	2	3
Metam potassium	Methylisothiocyanate (MITC)	556-61-6	25	190
Metam sodium	Methylisothiocyanate (MITC)	556-61-6	25	190
Metconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Metiram	Ethylene thiourea	96-45-7	2	3

Parent Pesticide	Degradate Pesticide	CAS number	Aquatic Reference Value	Human Health Reference Value
Myclobutanil	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Naled	Dichlorvos (DDVP)	62-73-7	0.0058	4
Paclobutrazol	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Pinoxaden	NOA 497854	N/A	960	4
Propiconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Prothioconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Pyrifluquinazon	Pyrifluquinazon degradate IV-01 (1,2,3,4-tetrahydro-3-[(3-pyridylmethyl)amino]-6-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]quinazolin-2-one)	n/a	0.7	
	Pyrifluquinazon degradate IV-02 (1,2,3,4-tetrahydro-3-[(3-pyridylmethyl)amino]-6-[1,2,2,2-tetrafluoro-1-(trifluoromethylene)ethyl]quinazolin-2-one)	n/a	0.55	
	Pyrifluquinazon degradate IV-28 (4-hydroxy-3-[(pyridine-3-ylmethylene)amino]-6-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-3-4-dihydro-1H-quinazolin-2-one)	n/a	1.15	
Tebuconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Tetraconazole	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Thiamethoxam	Clothianidin	210880-92-5	1.1	686
Thiophanate-methyl	Carbendazim (MBC)	10605-21-7		175
Tralomethrin	Deltamethrin	52918-63-5	0.0041	
Triadimefon	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35
	Triazole acetic acid	28711-29-7		35
Triadimenol	1,2,4-triazole	288-88-0		35
	Triazole alanine	114419-45-3		35

Parent Pesticide	Degradate Pesticide	CAS number	Aquatic Reference Value	Human Health Reference Value
	Triazole acetic acid	28711-29-7		35
Triclopyr acid	3,5,6-trichloro-2-pyridinol (TCP)	6515-38-4	950	0.005
Triclopyr butoxyethyl ester	3,5,6-trichloro-2-pyridinol (TCP)	6515-38-4	950	0.005
Triclopyr triethylamine salt	3,5,6-trichloro-2-pyridinol (TCP)	6515-38-4	950	0.005
Trichlorfon	Dichlorvos (DDVP)	62-73-7	0.0058	4