Development of a Basin Plan Amendment and TMDL for the Control of Pyrethroid Pesticide Discharges

INFORMATION DOCUMENT

Board Workshop August 2016

1 INTRODUCTION

Central Valley Regional Water Quality Control Board (Central Valley Water Board) staff has been working with multiple stakeholder groups to develop a pyrethroid pesticide control program. This control program would be established by an amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan). The overall goal for the Pyrethroids Basin Plan Amendment is to establish clear requirements for the control of pyrethroid pesticide discharges that provide reasonable protection of beneficial uses in the Sacramento and San Joaquin River Watersheds, including the Delta. The Pyrethroids Basin Plan Amendment was the subject of a February 2016 Board Workshop on potential regulatory options, as well as a June 2016 Board Information Item on monitoring needs and challenges associated with pyrethroid pesticides.

Based on the discussions at those Board meetings, this document was developed by staff to provide some additional background information in support of the August 2016 Board Workshop on the Pyrethroids Basin Plan Amendment. This document includes background information on the project area, where and when pyrethroids are used, sources and pathways to surface waters, their toxic effects in water, current concentration data, potential controls, and the development of a Basin Plan amendment to address pyrethroids. Following the August Board Meeting staff plans to release for public review a draft proposed Basin Plan Amendment and supporting draft staff report which will include a much more detailed background information summary and analysis.

Pyrethroids are a class of insecticides that are widely used in agriculture and in urban settings, and include 25 active ingredients registered in California. Recent monitoring has identified pyrethroids at levels of concern in waters of the Sacramento River and San Joaquin River watershed in both agricultural and urban areas.

As a result of the observation of pyrethroid contamination, several water bodies in the Sacramento and San Joaquin Valleys have been identified on the Clean Water Act Section 303(d) list (“303(d) List”) as not attaining the water quality standards established in the Water Quality Control Plan for the Sacramento River Basin and the San Joaquin

River Basin (Basin Plan) (SWRCB 2010). The Clean Water Act requires that impaired water body segments on the 303(d) List must be addressed through the development of total maximum daily loads (TMDLs) or be addressed by other agency programs. Additionally, there are many water bodies in the Sacramento River and San Joaquin River basins for which there are no monitoring data, but where there is potential for elevated levels of pyrethroids due to nearby uses.

2 PROJECT AREA

The geographic scope or "Project Area" for the proposed amendment includes the entire area described in the Basin Plan as the Sacramento River and San Joaquin River Basins. The Tulare Lake Basin was not included in the scope and it is covered by a separate Basin Plan. The Project Area is approximately 27.2 million acres and contains over 4.3 million acres of agricultural land (ICF 2010) and over 1.1 million acres (roughly 1,700 square miles) of urban land. Nearly 80 domestic and municipal wastewater treatment plants discharge to surface waters within the proposed Project Area, as well as over 60 municipal separate storm water systems (MS4s).

3 PYRETHROID PESTICIDES

There are 25 pyrethroid active ingredients registered for use in California, however the proposed amendment being developed focuses on six pyrethroids: bifenthrin, cyfluthrin, cypermethrin, esfenvalerate, lambda-cyhalothrin, and permethrin These six pyrethroids have the highest use in the Project Area (Figure 3-1), are frequently detected and associated with toxicity in ambient samples, particularly in sediments, and they have physical-chemical properties and toxicity profiles that indicate they are the most likely to cause water quality impairments. The registered uses of pyrethroids include agricultural crops, nurseries, urban structural and landscaping sites, pre-construction termiticides, and home and garden uses, among others (CDPR 2012, Spurlock and Lee 2008).

3.1 Pyrethroid Use

This section presents information on the use of various pyrethroids over the past decade. Pesticide use data compiled and analyzed in this report were from January 2002 through December 2011. Pyrethroid use data were obtained from the Pesticide Use Report (PUR) database maintained by the California Department of Pesticide Regulation (CDPR 2013).

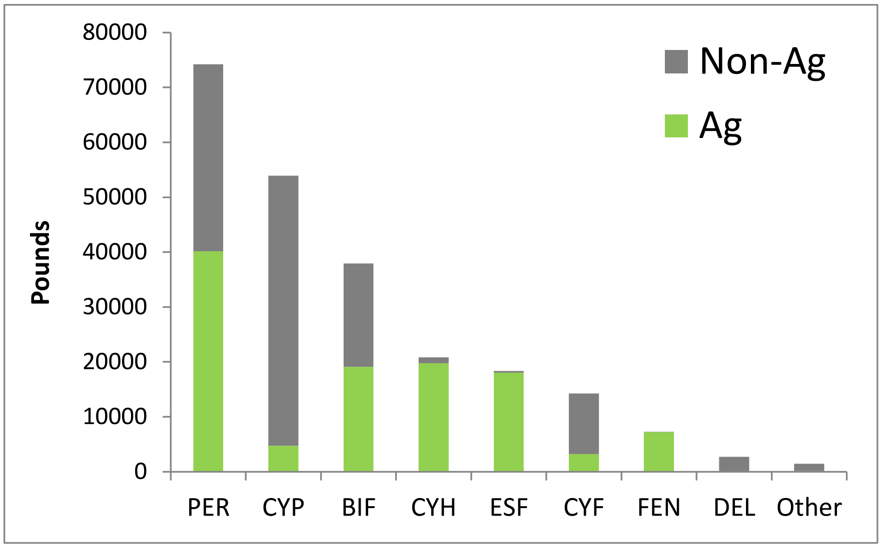

Figure 3-1 Average annual pyrethroid use for the period 2002-2011 in the Project Area
PER = permethrin, CYP = cypermethrin and S-cypermethrin, BIF = bifenthrin, CYH = gamma-cyhalothrin and lambda-cyhalothrin, ESF = esfenvalerate and fenvalerate, CYF = cyfluthrin and beta-cyfluthrin, FEN = fenpropathrin, DEL = deltamethrin, and Other = sum of remaining registered active ingredients.

Pyrethroids are applied in both urban and agricultural areas of the Sacramento and San Joaquin River Basins, with the reported mass applied split almost evenly between agricultural (49%) and non-agricultural (51%) uses. Individual, non-professional pesticide applications by homeowners, local businesses, etc. are not reported to the California Department of Pesticide Regulation (CDPR), and therefore data on these uses are not readily available. The unreported residential use of pyrethroids has been estimated to be about 6.6% of all urban use (TDC Environmental 2008). Pyrethroids are the most commonly available class of pesticides found on the shelves of home improvement stores, accounting for 46% of insecticides in these stores (Osienski et al. 2010).

In the urban areas, pyrethroids are primarily used for structural pest control, which accounted for 92% of reported non-agricultural uses from 2002-2011. The agricultural uses of pyrethroids are diverse and used on a wide variety of crops in the Project Area. The top eight crops based on pounds applied and acres treated were: almonds, alfalfa, tomatoes, rice, walnut, pistachio, peach, and corn.

Both agricultural and non-agricultural uses of pyrethroids increased from the early 1990s to the 2000s and then remained relatively steady, with year-to-year fluctuations. Non-agricultural uses of pyrethroids declined in the years 2008-2010 from their peak in 2004-2007; this trend corresponds with the nationwide economic decline in these years (Figure 3-2). Non-agricultural use increased in 2011 back to levels seen in the mid-2000s, likely due to improvements in the housing market and economy and new product registrations. It is not suspected that other pesticides were taking the place of pyrethroids for non-agricultural uses. Non-agricultural uses are expected to continue to increase back to pre-recession levels as the economy improves.

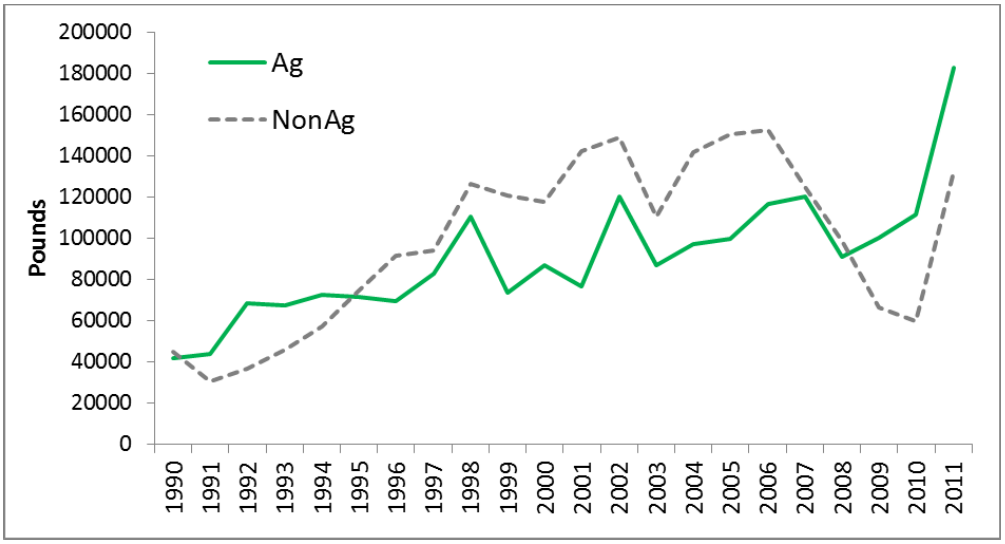

Figure 3-2 Trends in agricultural and non-agricultural use of all pyrethroids in the Project Area

Agricultural use of pyrethroids was relatively steady from 2002-2010, followed by a significant increase in 2011 (Figure 3-2). The number of acres treated increased for many crops from 2010 to 2011, including all of the eight top crops, and it appears that bifenthrin accounts for much of the increased use. Pyrethroid use in agriculture is highest in the summer months, while non-agricultural uses have much less variation across the seasons in the Project Area (Figure 3-3).

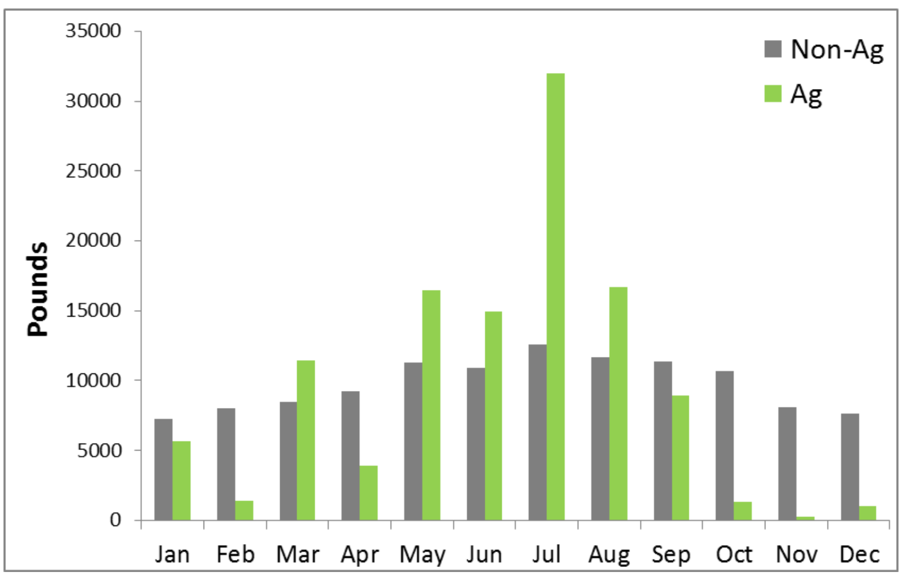

Figure 3-3 Average monthly reported pyrethroid use in the Project Area for 2002–2011

3.2 Sources and Fate of Pyrethroids in Aquatic Ecosystems

3.2.1 Sources and Pathways

The sources of pyrethroid insecticides in the Sacramento River and San Joaquin River basins include runoff and/or drift from both urban and agricultural applications (Weston and Lydy 2010). A fraction of urban and agricultural pyrethroid applications can reach surface water via drift during applications, and during rainfall or irrigation events, when residual pyrethroids can migrate with storm water runoff or irrigation return water, and enter streams, rivers, creeks and sloughs.

Agricultural runoff is a known source of pyrethroids, and they are often bound to sediments and particulate matter in runoff (Domagalski et al. 2010, Gan et al. 2005, Werner et al. 2002, Weston et al. 2004, 2009).

Non-agricultural urban sources of pyrethroids in surface waters have been documented in the Project Area (Weston et al. 2005, Weston and Lydy 2010). Pyrethroids have been detected in storm sewers that collect runoff from residential neighborhoods. Applications to impervious surfaces have much more potential to result in pyrethroids in runoff in urban areas. However, outdoor surface applications of pyrethroids by professional applicators are now restricted with recent changes in labels and regulations.

Wastewater treatment plant (WWTP) effluents have also been identified as a source of pyrethroids to surface waters (Markle et al. 2014, Parry and Young 2013, Weston and Lydy 2010, Weston et al. 2013a). Pathways of pyrethroids to WWTPs have not been clearly identified, but possibilities include indoor uses that enter sewers by being poured down the drain when cleaning or washing items or areas with pyrethroid residues from indoor pest treatments, washing of clothes impregnated with pyrethroids, washing pets containing residual pyrethroids from flea treatments, and underground termite injections reaching leaky sewer laterals. Indoor pyrethroid uses likely represent a significant fraction of total mass loading to wastewater treatment plants and outdoor sources are not likely a significant contributor based on sampling of sewer interceptors in Sacramento (Weston et al. 2013a).

3.2.2 Environmental Fate

Pyrethroids are moderately persistent in the environment and have been detected in sediments and surface waters. These pesticides have a strong tendency to adsorb to particles and are not likely to volatilize. In both soils and in water, pyrethroids can be degraded by hydrolysis, microbial degradation and photolysis. Aerobic degradation half-lives range from 2.9-60 days in sediments for all pyrethroids except for bifenthrin; bifenthrin half-lives range 87.6 to greater than 200 days for the same conditions (Meyer et al. 2013). Bifenthrin may take as long a year to degrade, indicating that this compound in particular has the potential to accumulate in sediments (Meyer et al. 2013). Due to pyrethroids' low solubilities and high tendency to adsorb to soil, they tend to move into surface water via particles in runoff from rainfall and irrigation (Domagalski et al. 2010, Gan et al. 2005, Werner et al. 2002, Weston et al. 2004, 2009). Pyrethroids have low potentials to bioconcentrate in aquatic organisms because they are typically rapidly metabolized or eliminated and do not appear to biomagnify up the food chain (Fojut et al. 2012, Kelley 2003).

3.3 Toxic Effects of Pyrethroids

Aquatic life appears to be the beneficial use that is most sensitive to pyrethroids. Pyrethroids can be acutely toxic to aquatic life at very low concentrations, and aquatic invertebrates are particularly sensitive to these compounds (Fojut et al. 2012). Sublethal effects on both fish and invertebrates have also been documented for pyrethroids, such as reduced growth (Goedkoop et al. 2010), disruption of reproductive functions (Moore and Waring 2001), and impaired swimming performance (Beggel et al. 2011). When present in a mixture, pyrethroids display approximately additive toxicity (Trimble et al. 2009). Human health thresholds for drinking water are orders of magnitude higher than levels which are detected in surface waters and levels which can cause toxic effects on aquatic invertebrates.

4 PYRETHROID CONCENTRATIONS

This section presents a summary of pyrethroid concentrations in surface waters in the Project Area. Pyrethroid pesticides have been detected in water bodies within the Project Area at concentrations that exceed narrative water quality objectives established in the Basin Plan for the protection of aquatic life (Figure 4-1). Data are compared to the most recent evaluation guidelines (Table 4-1), which are based on the 2012 update to the 303(d) list that was recently completed for three Regional Boards (North Coast, Colorado River Basin, and Lahontan).

Table 4-3 and Table 4-2 summarize aqueous and sediment concentration data from the California Environmental Data Exchange Network (CEDEN) database for April 2003 through September 2013 by water body category and compares the data to the evaluation guidelines presented in Table 4-1. Wastewater treatment plant data was available for Vacaville, Stockton, and Sacramento (Parry and Young 2013, Weston and Lydy 2010, Weston et al. 2013a) were also included in the summary of aqueous

Table 4-1 Most recent evaluation guidelines for pyrethroids (SWRCB 2015).

	Water Column (µg/L)[a]	Sediment (µg/g OC)
Bifenthrin	0.0006	0.43
Cyfluthrin	0.00004	1.1
Cypermethrin	0.0002	0.3
Esfenvalerate	1.13	1.5
Lambda-cyhalothrin	0.0005	0.44
Permethrin	0.002	8.9

[a]Water column evaluation guidelines for bifenthrin, cyfluthrin, cypermethrin, lambda-cyhalothrin, and permethrin are intended to be evaluated for a 4-day averaging period (Fojut et al. 2012).

concentration data (Table 4-3). One key limitation of the available data is that in most aqueous samples, the reporting limits are significantly higher than the evaluation guidelines, so not all potential levels of concern are detected. This is a considerable source of uncertainty in both the characterization of the extent of the pyrethroid problem and the potential reductions needed.

Overall, urban water bodies tend to have higher detection frequencies and exceedances of evaluation guidelines than other water body types. Detection frequencies of pyrethroids in sediments are generally higher than in water samples, but exceedances are generally less frequent. In both aqueous and sediment samples, bifenthrin stands out for having the highest detection frequencies and exceedances of evaluation guidelines in all water body types. Bifenthrin has high usage in both urban and agricultural areas, and is more persistent in sediments than the other five pyrethroids.

The detection frequencies of aqueous pyrethroids in water bodies in urban areas varied by compound and were particularly high for bifenthrin (49%; Table 4-3). Bifenthrin also had the highest detection frequency in sediment (89%; Table 4-2). Likewise, bifenthrin had the highest percentage of evaluation guideline exceedances in both water and sediments.

All of the urban water bodies 303(d)-listed for pyrethroids in the project area were listed in 2010 based on sediment toxicity and sediment concentrations of pyrethroids. They include following Sacramento Area waterbodies: Arcade Creek, Chicken Ranch Slough, Strong Rand Slough, Morrison Creek and Elder Creek, and the following four Roseville area waterbodies Pleasant Grove Creek, South Branch Pleasant Grove Creek, Kaseberg Creek and Curry Creek. MS4s are the only sources to these waterbody segments.

For water bodies in agricultural areas, the detection frequency of aqueous pyrethroids is very low, ranging from 0.3-2% for the six pyrethroids (Table 4-3). However, pyrethroids are detected in sediments much more frequently, ranging from 7.5-50% (Table 4-2).

While the aqueous concentration sample size for agricultural waters is large, many of these analyses had detection limits that greatly exceeded the evaluation guidelines to which the results are compared. This is true for samples in all of the water body categories, but it stands out more in the agricultural data set because of the large sample size. The maximum aqueous concentrations detected in agricultural water bodies are generally higher than in other water body categories, although it should be noted that these are whole water concentrations. Whole water concentrations include pyrethroids bound to particles, which is why the maximum concentrations reported are above the aqueous solubilities for some of these compounds. Maximum sediment concentrations detected are also higher in agricultural waters for the four pyrethroids with significant agricultural use (bifenthrin, esfenvalerate, lambda-cyhalothrin and permethrin).

There are five agricultural area water bodies 303(d)-listed for pyrethroids. Ingram Creek (2 segments) was listed based on sediment toxicity and sediment concentrations in 2006. Hospital creek was 303(d)-listed based on sediment toxicity and sediment concentrations in 2010. Mustang creek was 303(d) listed in 2010 based on water column concentrations of permethrin. Del Puerto Creek was listed in 2006 based on both sediment toxicity and sediment concentrations, and was subsequently listed for water column concentrations of bifenthrin in 2010.

In water bodies with mixed urban and agricultural land use, detection frequencies generally fell between what was observed in urban and agricultural water bodies (Table 4-3 and Table 4-2). Similar to urban water bodies, bifenthrin had the highest detection frequency in water and sediments. There are no current pyrethroid 303(d) listings for waterbodies with mixed urban and agricultural land uses.

There were relatively few samples from municipal WWTP effluents, and the data is from three studies that included plants in Sacramento, Stockton, and Vacaville (Table 4-3). All detections of pyrethroids exceeded the evaluation guidelines. The maximum concentrations in effluents were much lower compared to samples collected in ambient waters in urban, agricultural, or mixed use areas. As for all of the sample data in Table 4-3, these concentrations do not account for bioavailability. One of the studies included in the WWTP effluent data set also reported freely dissolved concentrations for six samples (Parry and Young 2013). If the freely dissolved concentrations are compared to the evaluation guidelines for these samples, then only one of six samples exceeds the evaluation guidelines.

Considering all of the water concentration data for pyrethroids, the detection frequencies appear to be quite low, but these data are obscured by reporting limits that in only a few instances are low enough to be equal to the evaluation guidelines. In most aqueous samples, the reporting limits are significantly higher than the evaluation guidelines, so the only detections are exceedances. Analytical methods have greatly improved for pyrethroids over the last decade and in more recent data the reporting limits may be closer to the evaluation guidelines for most pyrethroids. As more aqueous concentration data is gathered with the improved detection limits, it will provide a clearer picture of the attainment of water quality standards in the Project Area.

Overall pyrethroids in sediments were most likely to exceed evaluation guidelines in urban water bodies. In agricultural and mixed water bodies, only bifenthrin had a significant number of exceedances of the evaluation guidelines.

Table 4-2 Sediment concentrations of pyrethroid pesticides in the Sacramento River and San Joaquin River Basin

Bif: bifenthrin, cyf: cyfluthrin, cyp: cypermethrin, esf: esfenvalerate, λ-cy: lambda-cyhalothrin, per: permethrin.

Water Body Type		Bif	Cyf	Cyp	Esf	λ-cy	Per
Water Bodies in Agricultural Areas	Number of Samples	193	188	188	193	193	193
	Number of Detections (% detect)	96 (50%)	14 (7.5%)	14 (7.5%)	65 (34%)	83 (43%)	68 (35%)
	Number of exceedances of evaluation guideline (% exceedances of total samples)	34 (18%)	0 (0%)	1 (0.5%)	6 (3%)	12 (6%)	1 (0.5%)
	Maximum Concentration (ug/g OC)	23	0.26	0.47	8.1	14	14.9
Water Bodies in Urban Areas	Number of Samples	27	27	27	27	27	27
	Number of Detections (% detect)	24 (89%)	15 (56%)	14 (52%)	4 (15%)	16 (59%)	20 (74%)
	Number of exceedances of evaluation guideline (% exceedances of total samples)	14 (52%)	5 (19%)	8 (30%)	0 (0%)	0 (0%)	0 (0%)
	Maximum Concentration (ng/L)	6.2	3	4.9	0.13	0.3	4.8
Water Bodies in Areas with Mixed Urban and Agricultural Land Use	Number of Samples	109	111	111	111	109	109
	Number of Detections (% detect)	86 (79%)	28 (25%)	32 (29%)	27 (24%)	44 (40%)	25 (23%)
	Number of exceedances of evaluation guideline (% exceedances of total samples)	20 (18%)	3 (3%)	8 (7%)	0 (0%)	2 (2%)	0 (0%)
	Maximum Concentration (ng/L)	5.2	1.75	1.6	0.3	1.5	3.2

Table 4-3 Aqueous concentrations of pyrethroid pesticides in the Sacramento River and San Joaquin River Basin
Bif: bifenthrin, cyf: cyfluthrin, cyp: cypermethrin, esf: esfenvalerate, λ-cy: lambda-cyhalothrin, per: permethrin.

Water Body Type		Bif	Cyf	Cyp	Esf	λ-cy	Per
Water Bodies in Agricultural Areas	Number of Samples	1,240	1,236	1,403	1,418	1,306	1,406
	Number of Detections (% detect)	19 (2%)	7 (0.6%)	4 (0.3%)	24 (2%)	20 (2%)	8 (0.6%)
	Number of 4-day Averages	1,123	1,122	1,289	1,292	1,191	1,292
	Number of exceedances of evaluation guideline (% exceedances of total samples)	19 (1.7%)	7 (0.6%)	4 (0.3%)	0 (0%)	20 (2%)	8 (0.6%)
	Maximum Concentration (ng/L)	430	12	77	731	130	230
Water Bodies in Urban Areas	Number of Samples	88	88	88	88	88	88
	Number of Detections (% detect)	43 (49%)	12 (14%)	5 (6%)	0 (0%)	7 (8%)	13 (15%)
	Number of 4-day Averages	52	53	52	52	52	52
	Number of exceedances of evaluation guideline (% exceedances of total samples)	30 (58%)	10 (19%)	4 (8%)	0 (0%)	7 (13%)	11 (21%)
	Maximum Concentration (ng/L)	106	20	10	nd	13	110
Water Bodies in Areas with Mixed Urban and Agricultural Land Use	Number of Samples	108	108	108	130	108	108
	Number of Detections (% detect)	23 (21%)	7 (6%)	7 (6%)	19 (15%)	14 (13%)	12 (11%)
	Number of 4-day Averages	107	107	107	123	107	107
	Number of exceedances of evaluation guideline (% exceedances of total samples)	22 (21%)	6 (6%)	6 (6%)	0 (0%)	13 (12%)	11 (10%)
	Maximum Concentration (ng/L)	272	25	818	10	17	26
Municipal Wastewater Treatment Plant Effluent	Number of Samples	30	24	30	18	30	30
	Number of Detections (% detect)	16 (53%)	1 (4%)	7 (23%)	1 (6%)	9 (30%)	18 (60%)
	Number of 4-day Averages	30	24	30	18	30	30
	Number of exceedances of evaluation guideline (% exceedances of total samples)	16 (53%)	1 (4%)	7 (23%)	0 (0%)	9 (30%)	18 (60%)
	Maximum Concentration (ng/L)	6.3	1.7	17	3.7	5.5	45.3

5 Practices and Actions to Control Pyrethroid Discharges

Effective agricultural management practices to control pyrethroids, many of which are already being implemented, include improved pest management and use of alternative pesticides to reduce pyrethroid use, application practices that reduce potential for overspray and drift, and practices that reduce or slow runoff, and reduce or capture sediments in runoff such as vegetation and improved water management. While these practices are generally effective, it is not known whether the practices will result in consistent attainment of pyrethroid concentrations below the values being considered as targets and/or triggers.

Best management practices for municipal stormwater and wastewater dischargers include education and outreach activities, such as encouraging reduced pesticide use and proper pesticide use, reduced runoff, and pollution prevention activities, such as reducing the municipalities' own use of pesticides, and use of integrated pest management and coordination with regulators of pesticide use. In some cases features such as constructed wetlands can reduce pyrethroid concentrations, but these may not be feasible for many facilities. While these practices can reduce pyrethroid concentrations, they are not known to be able to consistently reduce pyrethroids to levels which would attain water quality standards. This is especially a concern in urban environments since storm water and municipal wastewater dischargers do not have control over the use of pesticides by individuals in their service areas. In these areas, one of the primary means of source control is through the implementation of the authorities of agencies which regulate pesticide use: the California Department of Pesticide Regulation (DPR); County Agricultural Commissioners; and USEPA's Office of Pesticide Programs (OPP). For example, one practice known to be especially effective in urban areas is reduction of applications to impervious surfaces such as driveways. This practice has been required by the Department of Pesticide Regulation, which has authority over how pesticides are applied, through its surface water protection regulations which were adopted in 2012. This provides an example of where regulation of pesticide use may be the most effective.

The regulatory framework being developed includes Board recommendations to the pesticide regulatory agencies, Board actions to continue coordination with these agencies, and regulatory encouragement for dischargers to also coordinate with these agencies. The challenges for urban dischargers of pesticides have been recognized by the State Water Resources Control Board, which as part of the Strategy to Optimize Resource Management of Storm Water (STORMs) is developing a Statewide Framework for Urban Pesticide Reduction that is scheduled for State Water Board consideration in 2018. Central Valley Water Board staff is part of the team participating in the development of that framework. The draft Pyrethroids Basin Plan Amendment is being crafted so that it would be compatible with that potential statewide framework.

6 Development of a Pyrethroids Basin Plan Amendment

The development of a potential Basin Plan amendment to address pyrethroid water quality impairments began with a scoping meeting according to the requirements of the

California Environmental Quality Act (CEQA). At this meeting, staff presented background information on pyrethroid pesticides and the 303(d)-listed water bodies. The staff presentation included potential project alternatives for the geographic scope, potential water quality objectives, implementation provisions and monitoring requirements.

Following the CEQA scoping meeting, several stakeholder meetings were held to discuss potential alternatives for the project, particularly focusing on potential water quality objectives and implementation provisions. After receiving stakeholder input, staff presented nine potential regulatory approaches to the Central Valley Water Board in February 2016 to receive Board feedback on which approaches to focus on. At the August Board Meeting, staff will present a strawman document of a draft proposed regulatory approach. Due to the uncertainty of reductions needed and the effectiveness of the controls, a phased approach is being developed for the draft proposed Basin Plan Amendment. The phased approach would require monitoring and reasonable implementation of best management practices, and commit the board to consideration of adoption of pyrethroid water quality objectives following a period of data collection, implementation and coordination with pesticide regulatory agencies.

The project schedule is given below, showing the public process thus far and planned until a Board Hearing to consider potential adoption.

Project schedule

Date	**Milestone**
October 2012	CEQA Scoping Meeting
September 2014	Stakeholder meeting
October 2014	Stakeholder meeting
November 2014	Stakeholder meeting
May 2015	Stakeholder meeting
November 2015	Stakeholder meeting
January 2016	Stakeholder meeting
February 2016	Board Workshop on potential regulatory approaches and technical issues
1 June 2016	Stakeholder meeting to discuss strawman regulatory approach and seek feedback
23 June 2016	Board information item on monitoring and data collection for pyrethroids
18/19 August 2016	Board workshop to present strawman regulatory approach and seek Board feedback
October 2016	Stakeholder meeting – release Draft Staff Report and draft Basin Plan language prior to this meeting
5/6 December 2016	Board hearing to hear comments on the proposed Basin Plan Amendment
February 2017	Board hearing to consider adoption

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