

South Bay/Fairfield-Suisun Trace Organic Contaminants in Effluent Study

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San Jose/Santa Clara WPCP	Order 98-052	Provision 9
Sunnyvale WPCP	Order 98-053	Provision 12
Palo Alto Regional WQCP	Order 98-054	Provision 3
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I. Background

The purpose of this low-level organic contaminant monitoring project is to comply with an NPDES permit provision for Fairfield-Suisun and three South Bay publicly owned treatment works (POTWs) operated by the cities of Palo Alto, San Jose, and Sunnyvale. Effluents from each of these plants were sampled on four occasions. The Fairfield-Suisun Sewer District also participated in this study but was only sampled twice. The objectives of this study are:

- 1) To determine the concentrations of the organic pollutants (polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs), and polychlorinated dibenzo-dioxins and furans (“dioxins”), specified in Table 1) in POTW effluents using techniques with the most sensitive methods practicable, and
- 2) To assess sources of variation in the results from three different laboratories: the labs will only be designated as LabA, LabB, and LabC for the purposes of this report. All three labs have had previous experience analyzing for organic contaminants in environmental samples, albeit one of the labs does not regularly perform these analyses for solid phase extracts from ambient waters, the method used to collect samples for this study.

The analytes included in this study are currently monitored for the RMP or are on the priority pollutants list of the California Toxics Rule (CTR). As municipal wastewater effluent is one possible pathway of these contaminants into the Bay, detecting and quantifying their concentrations in wastewater are necessary for making appropriate management decisions. Great improvements in source reduction and treatment technologies made in recent times have greatly reduced effluent contaminant concentrations, and many of the methods employed for measuring concentrations of trace organic contaminants have not been sensitive enough to quantify these reduced levels in effluent. Therefore, conservative estimates of chemical loading have been used that often assume concentrations at measurement detection limits or at some fraction (typically half) thereof; generally methods with the lowest detection limits practicable are desired to minimize overestimates. This is the most comprehensive study of trace organic contaminants in effluent in the San Francisco Bay region to date, using the most sensitive methods currently available.

Trace level measurement of organic contaminants in sediment and tissue samples is now fairly routine, with NIST and other agencies conducting periodic intercomparison exercises for these matrices. However, measurement of organic contaminants in water samples is somewhat more difficult and less standardized, in part because of the hydrophobic nature of many of these contaminants; their low solubility in water results in low dissolved concentrations, with a large fraction adsorbed to fine suspended particles. Low concentrations combined with the extensive handling involved in preconcentration and cleanup of samples can result in relatively large variability in measurement. This study includes comparison of results from three analytical laboratories in order to assess

some of this variability and to assess if differences between POTWs or seasons could be detected in spite of the anticipated analytical variability.

A. Previous Effluent Studies

Results from previous studies of effluent and ambient waters are presented below to provide a context by which to compare concentrations found in this study.

1. Local studies

Locally, there have been some previous efforts to measure organic contaminants in municipal wastewater effluent. Measurements of total PCBs in several San Francisco Bay area treatment plant effluents made from 1970-1979 were compiled in the 1995 RMP Annual Report (Risebrough 1997); concentrations ranged from 12,000-4,800,000 pg/L. More recently in 1998, measurements of effluent from one San Francisco Bay Area treatment plant yielded total PCB concentrations ranging 300-2,000 pg/L (unpublished data). Although the data are sparse, they are consistent with a significant decrease of PCB use and environmental inputs since the early 1970s. Data from this study discussed later suggest continued decrease, either from decreasing inputs or improving wastewater treatment technologies, or both.

2. Other regions

Preliminary unpublished data for several recent samples from POTWs taken by the New York State Department of Environmental Conservation measured total PCB concentrations in roughly the same concentration range, from 200-3,800 pg/L (Litten 2000). These results are not directly comparable, because the NYSDEC analyses included measurement for all 209 PCB congeners. If only congeners targeted (or co-eluting with target congeners) for this study are included, the total PCBs measured in these New York samples are in the range of 100-2,050 pg/L. From these results it is apparent that “total” PCBs measured in the RMP and this study typically account for slightly over half of true “total” PCBs as measured by EPA method 1668A, which includes all congeners. The relative susceptibility of the true total to matrix interferences and other measurement errors is unknown but might reasonably be expected to be proportional to the number of individual congeners included.

Southern California municipal wastewater treatment plants also regularly monitor concentrations of organic contaminants in effluent. Table 2 lists recent reporting limits for various contaminants monitored by agencies in that region (Raco-Rands 1998). Major differences between that monitoring effort and this study are that PCBs are reported as Aroclors, and the reporting limits are much higher. Although reporting limits are a small multiple of detection limits (generally a factor of 3 or 10 times higher), reporting limits of these Southern California agencies are at least three orders of magnitude higher than detection limits for this study. For example, the minimum reporting limit for any Aroclor was 0.025 µg/L (25,000 pg/L). Not surprisingly, these agencies reported no detections of most of these contaminants. Because of the large samples and preconcentration steps used, there were relatively few non-detects for the contaminants in this study.

B. Ambient Monitoring

Because one aim of water pollution control plants is to prevent degradation of receiving waters, knowledge of the ambient receiving water conditions provides an important benchmark to which effluent concentrations can be compared.

1. San Francisco Bay region

In the San Francisco Estuary, the Regional Monitoring Program for Trace Substances (RMP) has been monitoring concentrations of organic contaminants in water, sediment, and biota for the past seven years. Many of the analytes included in this study are currently measured by the RMP. Two of the labs involved in this study have been involved in measuring organic contaminants for RMP, and the sampling methodology is largely equivalent to that used by RMP for ambient estuarine waters. Major deviations in this study from the RMP methodology are that the samples are larger (400-700 L per sample, nearer the sample sizes described below for monitoring in Southern California, as compared to usual RMP samples of 100 L collected per site), and extracts are split for analysis among multiple labs. RMP has previously split samples for intercomparison of organic analyses, but only in tissue and sediment matrices, where the raw sample, rather than an extract, can be easily split.

RMP does not regularly analyze chlorophenols, toxaphene, or the dibenzodioxins and dibenzofurans in water, sediment, or transplanted bivalve tissues in its base "Status and Trends" monitoring. However, it does analyze a few organic compounds not measured in this study: PAHs and alkylated PAHs (about one dozen additional), the organophosphate pesticides Diazinon and Chlorpyrifos, and the organochlorine pesticide Mirex.

Concentrations of total PAHs measured by the RMP have exceeded 400,000 pg/L in the South Bay for two samples taken in 1995, which are among the highest ever measured in the program. However, concentrations recently have been somewhat more moderate, ranging from 9,120 to 234,390 pg/L for samples taken in 1997. When reduced to the set of PAHs included in this study, total PAH concentrations ranged from 8,600 to 195,930 pg/L in 1997 samples from the South Bay. Thus although PAH compounds measured in this study do not include all those in the RMP, they account for most of the total PAH mass. Data from this study to be discussed later indicate that effluent PAH concentrations fall near the lower end of those found in ambient sampling for the RMP.

In 1995, PCBs measured at two South Bay stations were also among the highest ever found in the RMP, totaling 4,070 and 6,010 pg/L. Because the congeners monitored by the RMP are identical to those in this study, no reduction of either data set is necessary to make comparisons. The two highest concentrations of total PCBs found at the South Bay stations were 3,060 and 4,540 pg/L in 1997. Total PCBs at Davis Point ranged from 80 to 290 pg/L in 1997. Results from this study discussed later will show that effluent PCB concentrations are largely comparable to or lower than ambient concentrations.

Table 1. Organic Contaminants Analyzed

alpha-HCH			Heptachlor Epoxide
beta-HCH			Hexachlorobenzene
gamma-HCH			PAHs ⁴
Chlordane ¹			PCBs ⁵
DDT ²			TCDD ⁶
Dieldrin			
Endosulfan ³			
Endrin			
Toxaphene			
2,4,6 -Trichlorophenol* (required only for San Jose)			
¹ Chlordane	² DDT	³ Endosulfan	⁴ PAHs
alpha-Chlordane	o, p'-DDD	Endosulfan-alpha	Acenaphthylene
cis-Nonachlor	o, p'-DDE	Endosulfan-beta	Anthracene
gamma-Chlordane	o, p'-DDT	Endosulfan-sulfate	1,2-Benzanthracene
Heptachlor	p, p'-DDD		3,4-Benzofluoranthene
Heptachlor Epoxide	p, p'-DDE		Benzo(k)fluoranthene
Oxychlordane	p, p'-DDT		1,12-Benzoperylene
trans-Nonachlor			Benzo(a)pyrene
			Chrysene
			Dibenzo(a,h)anthracene
			Fluorene
			Indeno(1,2,3-c,d)pyrene
			Phenanthrene
			Pyrene
⁵ PCBs (IUPAC)		⁶ TCDD (dibenzodioxins and dibenzofurans)	
PCB 008	PCB 101	2,3,7,8-TCDD	
PCB 018	PCB 105	Total TCDD	
PCB 028	PCB 110	1,2,3,7,8-PeCDD	
PCB 031	PCB 118	1,2,3,4,7,8-HxCDD	
PCB 033	PCB 128	1,2,3,6,7,8-HxCDD	
PCB 044	PCB 132	1,2,3,7,8,9-HxCDD	
PCB 049	PCB 138	Total HxCDD	
PCB 052	PCB 141	1,2,3,4,6,7,8-HpCDD	
PCB 056	PCB 149	Total HpCDD	
PCB 060	PCB 151	OCDD	
PCB 066	PCB 153	2,3,7,8-TCDF	
PCB 070	PCB 156	Total TCDF	
PCB 074	PCB 158	1,2,3,7,8-PeCDF	
PCB 087	PCB 170	2,3,4,7,8-PeCDF	
PCB 095	PCB 174	Total PeCDF	
PCB 097	PCB 177	1,2,3,4,7,8-HxCDF	
PCB 099	PCB 180	1,2,3,6,7,8-HxCDF	
	PCB 183	2,3,4,6,7,8-HxCDF	
	PCB 187	1,2,3,7,8,9-HxCDF	
	PCB 194	Total HxCDF	
	PCB 195	1,2,3,4,6,7,8-HpCDF	
	PCB 201	1,2,3,4,7,8,9-HpCDF	
		Total HpCDF	
		OCDF	

RMP also regularly monitors a number of pesticides, including many of the organochlorine pesticides included in this study such as DDTs and chlordanes. Total DDT concentrations (the sum of 6 DDT compounds: o,p' DDT, o,p' DDD, o,p' DDE, p,p' DDT, p,p' DDD, and p,p' DDE) at Davis Point ranged from 530 to 1,600 pg/L during 1997, while chlordanes concentrations were lower, ranging from 170 to 310 pg/L. Concentrations in ambient water from RMP South Bay stations were comparable: total DDTs were found at 150 to 2,170 pg/L, total chlordanes ranged from 20 to 410 pg/L. Concentrations of organochlorine compounds reported by the RMP in water samples are generally corrected for surrogate recoveries as well.

2. Southern California

The Southern California Coastal Water Research Project (SCCWRP) also has monitored ambient waters for PAHs, DDTs, and PCBs (Zeng et al. 1998). Samples were collected by solid phase extraction using methods similar to those of the RMP and this study, with an Infiltrax 100 system deployed at various depths in the water column. The sample volume processed depended on the length of deployment and the pumping speed, ranging from 1100 to 2300 liters, two to four times larger than samples collected in this study. Dissolved (XAD adsorbed) and particulate (glass fiber filtered) phase fractions were analyzed separately by SCCWRP, and added to get total water column concentrations. Total PAHs, the sum of a compound list similar to that used by RMP, was measured as high as 8,800 pg/L for one ambient site in 1996. When restricted to compounds included in this study, the sum of PAHs totaled 900 pg/L.

Concentrations of total PCBs (the sum of congeners in a list similar but not identical to the RMP list) found in 1997 samples ranged from 60 to 1,140 pg/L (Zeng et al. 1998). For samples taken in 1995 and 1996, SCCWRP measured PCB concentrations below detection limits at all sites save one in 1996, which measured 4,300 pg/L total (Tran and Zeng 1997). Ambient PCB concentrations found by SCCWRP therefore cover a range similar to those found by RMP.

The total of dissolved DDT compounds in the 1997 study ranged from 600 to 15,800 pg/L, with p,p'DDE comprising a majority (~70%) of the total. In 1995 and 1996, samples ranged from 200 to 11,700 pg/L total DDTs. In comparison, RMP DDT totals generally fall at the lower end of this range.

At some of the sites, duplicate samples were collected in 1997. Relative standard deviations (RSDs) for total DDTs averaged 14% for the dissolved phase fraction and 25% for the particulate phase. When the fractions were summed to determine total DDTs for the whole water sample, RSDs averaged 19%. Variability in 1995 and 1996 samples was somewhat higher, averaging 62%, 18%, and 49% RSDs for total PAHs, DDTs, and PCBs respectively. These RSDs are within the range typically found for these classes of organic compounds in NIST intercomparisons, although RSDs above 50% for intra-lab results are unusual.

In the cited studies conducted by SCCWRP, measurements were not corrected for surrogate recoveries. Spikes were added at concentrations of 400,000 and 80,000 pg/L for PAH and PCB surrogate standards, respectively. Recoveries averaged 64% for PAHs and 70% for PCB surrogates. These recoveries are within the range (typically 30-150%)

Table 2. Reporting limits of constituents in effluents from the largest municipal wastewater treatment facilities in Southern California 1996 (Raco-Rands 1998).

	HTP	JWPCP	CSDOC	PLWTP
Chlorinated phenols ^a (µg/L)				
2,4,6-Trichlorophenol	1	2	6.5	3.4
Total DDT (µg/L)				
o,p'-DDD	0.006	0.02	0.02	0.02
p,p'-DDD	0.003	0.02	0.04	0.03
o,p'-DDE	0.004	0.03	0.02	0.04
p,p'-DDE	0.003	0.01	0.01	0.02
o,p'-DDT	0.004	0.02	0.01	0.02
p,p'-DDT	0.013	0.02	0.04	0.02
Total PCB (µg/L)				
PCB-1016	0.046	0.5	0.3	0.6
PCB-1221	0.034	0.8	0.3	ND
PCB-1232	0.033	0.5	0.3	ND
PCB-1242	0.04	0.9	0.3	0.07
PCB-1248	0.057	0.08	0.3	ND
PCB-1254	0.025	0.4	0.3	ND
PCB-1260	0.065	0.1	0.3	0.3
PAHs (µg/L)				
Acenaphthene	1	2	8.4	1.2
Acenaphthylene	1	2	7.4	0.9
Anthracene	1	0.018, 0.024	5.7	1.2
Benzo(A)Anthracene	1	0.023	9.8	1.2
Benzo(A)Pyrene	1	0.031	2.6	7.4
Benzo(B)Fluoranthene	1	0.014	2.8	0.8
Benzo(G,H,I)Perylene	1	0.013	10	7
Benzo(K)Fluoranthene	1	0.008	1.7	1
Chrysene	1	0.091	2.9	1.4
Dibenzo(A,H)Anthracene	1	0.023, 0.079	10	7.8
Fluoranthene	1	2	5.7	1.3
Fluorene	1	0.079	8	1.1
Indeno(1,2,3-C,D)Pyrene	1	0.014	10	7.4
Naphthalene	1	3	4.6	1.6
Phenanthrene	1	0.31	6.7	0.9
Pyrene	1	0.068	5.1	1.5

^a Gas chromatography/mass spectrometry (GC/MS) method. ND = Not determined.

HTP = Hyperion Treatment Plant, City of Los Angeles.

JWPCP = Joint Water Pollution Control Plant, County Sanitation Districts of Los Angeles County.

CSDOC = County Sanitation Districts of Orange County.

PLWTP = Point Loma Wastewater Treatment Plant, City of San Diego.

prescribed for trace organic analyses. Because reported RMP results are adjusted for surrogate recoveries, SCCWRP results should be adjusted upward (or occasionally downward) for surrogate recoveries before making comparisons.

II. Approach

A. Sampling Methodology

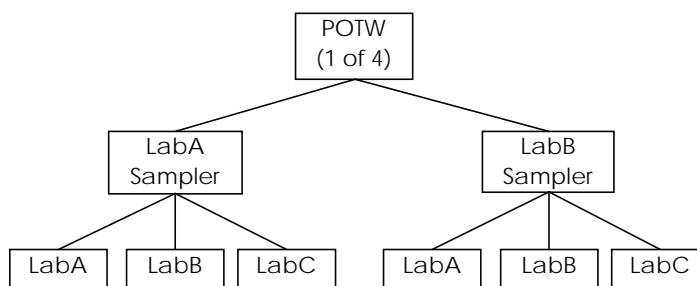
This study was designed to evaluate variability in both sample collection and analysis and to examine if any differences between effluents and seasons could be detected. Two

laboratories, LabA and LabB, collected samples during the first event to examine differences in sample collection. The two sampling systems were of nearly identical design, using the same types of filters and column adsorbent. Split fractions of each sample were distributed among three labs in order to evaluate analytical variability for the major contaminant classes. The labs collecting, preparing subsamples, and analyzing subsamples are illustrated in the schematic in Figure 1.

Figure 1 Sampling and Analysis Plan for This Study

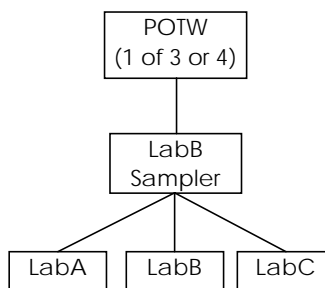
November 99 Sampling Event

<u>Description</u>	<u>Total #</u>
POTWs SJ/SC, Sunny, PA, FS	4
Samples Collected	8
Sample Extracts Analyzed (particulate & dissolved composited)	24



February/July or April 2000 Sampling Events

<u>Description</u>	<u>Total #</u>
POTWs SJ/SC, Sunny, PA, (+FS in April)	3 or 4
Samples Collected	3 or 4
Sample Extracts Analyzed (particulate & dissolved composited)	9 or 12



Because of the low concentrations of organic analytes typically present in ambient water or final effluents, a preconcentration step is generally required in order to detect many trace organic contaminants. This is often achieved by liquid-liquid extraction into water-immiscible organic solvents. Another method is solid phase extraction, which consists of adsorption onto a hydrophobic stationary phase such as XAD-2 followed by extraction with organic solvents. This is the method selected for collecting samples of organic

contaminants in ambient estuarine water for the RMP, and this was the method used for this study of POTW effluents in the same region. Because the concentrations of organic contaminants found in previous effluent samples were similar to those of ambient waters, and because sufficient material for multiple analyte types and splitting of subsamples among three labs was needed, a preconcentration of large volume effluent samples was required.

The first collection run was made November 8-18, 1999. On November 8, 9, 10, and 12, staff from LabB collected samples by pre-concentrating organic contaminants from 400 liters of effluent from each POTW using an Infiltrax 300 system with glass fiber filter cartridges and XAD-2 resin columns prepared by LabA. These samples were sent to LabA for dioxin analysis. The first sampling event in November 1999 also included side-by-side sampling involving two Infiltrax samplers and sampling crews at each of the four POTWs for all other contaminants (November 15-18). In that round, each lab collected samples using filters and XAD-2 columns prepared by their own staff. After spiking the samples with several surrogate organochlorine and PAH compounds, the two laboratories extracted their respectively collected samples and split the extracts three ways. One fraction of each sample was analyzed in-house by each laboratory, and the other portions were sent for analysis to the two other laboratories contracted in this study.

For the February 9-11, April 24-27, and July 5-7, 2000 sampling runs, one laboratory (LabB) collected larger samples (ca. 660 liters) to be split among the analyzing laboratories; LabC and LabB each received 130 liters equivalent, similar to the November event, for measuring PAHs, PCBs, and pesticides, and LabA received extract equivalent to approximately 400 liters for analyzing those compounds in addition to dioxins. In April, all four POTWs were sampled, but in February and July, Fairfield-Suisun was not sampled.

Although both teams that collected samples in November 1999 used Infiltrax 300 systems to collect samples, there were small differences in their modes of operation. Because of low suspended particulate concentrations in the sampled effluents, both sampling teams were able to run the effluent through only one glass fiber filter cartridge (nominal pore size 1 μm) for each POTW sampled. Both teams collected samples using a pumping rate of approximately 1.4 L/min. After passing effluent through the glass fiber filter cartridge, LabA opted to collect with a single large stainless steel column packed with 250 g of XAD-2 resin, while LabB elected to split the flow after the glass fiber filter cartridge and pass the effluent through a parallel pair of Teflon columns packed with 75 g of XAD-2 each (150 g of XAD-2 total per sample). The other collection difference was the manner in which labs obtained material for trichlorophenol analysis; LabA measured trichlorophenol from a fraction of the effluent extract. LabB collected a separate whole effluent sample, more strictly following the published EPA method.

This study was also designed in part to capture other factors independent of collection and analytical methodology. Differences in wastewater treatment processes may influence characteristics of final effluents, which would be expected to have important bearing upon contaminant concentrations. Changes in influent contaminant concentrations due to seasonal chemical use patterns or changes in inputs, although not measured in this study, might also be expected to influence final effluent contaminant concentrations. Sampling

included one wet-weather event in February for three of the POTWs. This occurred in the midst of a period of near daily rains beginning in early January 2000, so these samples were not expected to show any spike in contaminant concentrations that might be found in a “first flush” after a long period of dry weather.

B. Analytical Methodology

For analysis of PAHs in the effluent extracts, all laboratories used gas chromatographic separation followed by mass spectrometric detection (GC/MS). Incomplete extraction and other potential losses were accounted for by spiking filter cartridges and columns with solutions of a suite of isotopic (deuterated) PAH standards prior to extraction. Raw PAH concentrations were corrected based upon recoveries of the surrogate deuterated PAHs. In the first sampling event, LabA added surrogates at concentrations an order of magnitude higher than LabB, which added them at concentrations closer to the concentrations of unlabelled PAHs (~20,000 pg/L versus ~1,000 pg/L per labeled surrogate compound, respectively). Subsequent surrogate additions by LabA were made at lower concentrations (~2,000 pg/L). Generally recoveries of surrogates can approach nearer 100% when added at high concentrations. Ideally surrogates are added at concentrations close to those of the target analytes; high surrogate concentrations and recoveries can lead to overestimates of analyte recoveries, thus underestimating actual analyte concentrations.

For analysis of organochlorine pesticides (OCPs) and PCBs, the methods of the analytical labs diverged further. LabA initially elected to combine gas chromatographic separation with low-resolution mass spectrometry for quantitation, which was upgraded to high-resolution mass spectrometry (HRMS) when they found interferences too abundant to successfully quantify analytes in the first sample set. LabB and LabC chose electron-capture detection following their gas chromatographic separations (GC/ECD). With HRMS, LabA was able to use stable isotope surrogates to quantitate most PCB congeners individually by a mass dilution method. Electron capture detectors are unable to distinguish analytes from their stable isotopic analogs, and chromatographic elutions generally cannot resolve structurally identical isotope compounds. Therefore LabB and LabC determined recoveries for PCB congeners and OCPs based on only a few added surrogate compounds, since none of the surrogates could be isotopic analogs of the target analytes. However, to mitigate the effects of co-elution and matrix interferences, LabB and LabC confirmed results via dual column (DB-5 and DB-17) GC/ECD analyses.

Concentrations of 2,4,6-trichlorophenol were determined by LabA and LabB via acetylation followed by GC/MS. The principal difference between the labs, as indicated previously in the description of collection methods, was the form of effluent sample used for derivatization. LabA derivatized a fraction of the effluent extract; LabB used a whole effluent sample collected separately.

Only LabA determined toxaphene and dibenzodioxin and dibenzofuran concentrations. Total toxaphene analysis was carried out by high-resolution gas chromatography / low-resolution mass spectrometry (HRGC/LRMS) with the spectrometer operated in an electron capture negative ionization mode. Dioxin and furan analysis was conducted by HRGC/HRMS in a modification of USEPA Method 1613B.

III. Results and Discussion

Concentrations for each of the analytes for each sampling date, location, and analytical laboratory are presented in tabular form in Appendix A. All compounds indicated as “not detected” (ND) by the lab are assigned values of zero in calculating totals and averages. Unexpectedly high or low values are indicated in shaded cells in the Appendix A tables. Those numbers that lie far outside the expected range (concentrations both high and large multiples greater than samples measured by other labs or found at other sites) are appended with alphabetic flags and not included in calculations of totals and averages for their respective compound classes. Because of the large number of compounds analyzed, discussion of results will generally focus on totals of compound classes rather than individual compounds.

A. QA/QC Data

Because they provide a gauge by which other sources of variability can be evaluated, the quality assurance and quality control data supplied by each lab constitute an important baseline of performance. These measures include method sensitivity, sample contamination, precision, and accuracy. Laboratories often take slightly different approaches to addressing these issues.

In order to assess precision, LabB ran “instrument duplicates” of selected samples; after cleanup, two or more injections of extract fractions from selected samples were run on the GC and the analytes for that fraction were quantified. In general, the differences between replicate measurements of individual extract fractions were fairly small; for November 1999 samples RSDs for PAH instrument replicates averaged 3%, RSDs of PCB replicates averaged 6%, and RSDs for OCPs averaged 10%. LabB checked measurement accuracy by comparing its calibrations to standard solutions traceable to NIST, because no standard reference materials yet exist for analysis of trace level organic contaminants in water. Deviations from NIST values of PCB congeners averaged $\pm 11\%$. Recoveries of OCPs averaged within $\pm 9\%$ from target values, and PAHs were within $\pm 5\%$ of their target values. Results for all sample groups are summarized in Table 3.

Assessment of analytical precision was made by LabA through replicate measurements of “ongoing precision and recovery” (OPR) samples (Table 3). These are periodic measurements of extracts from spiked blanks, one typically run with each analysis batch. OPR spikes were made by LabA at the middle to high end of their calibration range for

Table 3. Summary of RSD% for Instrument Duplicates and % Deviation from Target Recovery for NIST Standards and OPR Spikes

		PAH	PCB	OCP
LabA*	RSD %	6	22	17
LabC*	RSD %	23	13	-
LabB	RSD %	3	6	10
	% Deviation	5	11	9

* RSD % and % Recovery Deviation values are identical because OPR spikes were used to evaluate both precision and recovery

PAHs (~2,000-3,000 ng/ml in final extract). In addition to evaluating precision with OPR samples, LabA used those samples to gauge method accuracy. Because the spikes were made at moderate to high concentrations, in general OPR recoveries were quite high, averaging $\pm 6\%$ of target values for PAHs, $\pm 22\%$ for PCBs, and $\pm 17\%$ for OCPs. Spikes were made at lower concentrations for PCBs and OCPs (typically in the range 10-100 ng/ml in final extract), which may in part explain the more variable recoveries for those compounds. These recoveries would rate well in a NIST intercomparison exercise (z-score of 1), although the OPR matrix is simpler than is typically used in those exercises.

LabC also evaluated precision and accuracy by replicate measurement of calibration verification standards (separate from those used in calibration). These were similar to the OPR measurements of LabA and analyses of NIST standards by LabB. RSDs for repeated analyses of a PAH verification mix averaged $\pm 23\%$ of target values. Relative deviations from the target values for PAHs above the limit of quantitation (10 times the detection limit) were well within LabC's QC acceptance criterion of $\pm 35\%$. Similar results were found for LabC's analysis of a PCB calibration confirmation mix; RSD for individual congeners averaged 13%. These results also indicate good precision and accuracy.

Contaminant concentrations in extraction and field blanks were below detection limits for most analytes. In the cases where blank contamination was measurable, a few exceeded 30% of concentrations in individual samples, the threshold employed by RMP for flagging field measurements when blank contamination is found in the analysis batch. Samples with low concentrations relative to blank contamination were not included in calculations of compound group totals. In this study, data for only a few samples analyzed for PAHs had significant contamination that required their exclusion, as noted by a letter "B" instead of a numerical value in data tables in Appendix A.

Determination of method detection limits was not included in the scope of this study. The effort required to derive method detection limits for measuring organic contaminants in ambient water is not trivial; it would require replication of nearly all tasks in the study, from sample collection, to extraction, to splitting extracts among labs for analyses. In this case, extrapolation from each lab's "sample detection limit" or "instrument detection limit" was deemed sufficient for our purposes. Typically the sample/instrument detection limit (SDL/IDL) represents the smallest level of signal that might be reliably distinguished above the noise. As an estimate, the ratio between instrument detection limits and method detection limits (MDLs) will be approximately 1:4 (APHA 1998). Limits of quantitation are typically about a factor of 3 higher than MDLs (~10 times IDLs). Median IDLs for the three labs are shown in Table 4.

Table 4. Summary of Median Instrument Detection Limits (pg/L)

	PAH	PCB	OCP
LabA	10	0.1	2
LabC	10	2.8	2.5
LabB	22	1	1

B. Resolving Interferences

Because identification of compounds using an electron capture detection (ECD) method is made primarily by retention time, and the mixture of compounds in environmental samples is complex and unpredictable, often there are possibilities for co-elution with known and unknown interfering compounds during analyses. Chromatographic methods using ECD often benefit from confirmation using a second column of a different length or stationary phase material, where shifts in retention time may be sufficient to separate target analytes from interfering compounds. Even if some previously resolved peaks are lost to co-elution, the additional elution increases the odds of seeing a compound separated from interferences on at least one of the columns. Both labs using ECD quantified PCBs and OCPs for two column (DB-5 and DB-17) separations.

Mass spectrometric methods have the advantage of ion mass data in addition to retention time to provide better resolution from interferences and more certainty in compound identifications. With such data, analysis from a second column separation is usually not needed for confirmation. Although mass spectrometric methods may in theory have an advantage in identification and quantitation, NOAA/NIST noted that there was no correlation of analysis methods to measurement accuracy (i.e. Z-scores) among labs participating in a recent intercomparison study of organic contaminants in sediment and fish tissue (Schantz et al. 1999). Accurate quantitation, even with mass spectrometric methods, depends in great part upon the analyst's ability to distinguish stray signals from those of the target analytes.

Because analyses of organic contaminants at trace levels are often susceptible to biases that may not be detected by conventional QA measures, additional QA review is necessary to ensure the integrity of the reported data. Based on knowledge of the chemical characteristics and typical relative concentrations of organic contaminants in environmental samples, concentrations of the target contaminants were compared to results for related compounds to identify potentially erroneous data. Compounds that were more abundant in the original technical mixtures and are more stable and recalcitrant in the environment are expected to exist in higher concentrations than the less abundant or less stable isomers. For example, the para-para-substituted DDT compounds (p,p'-DDT, p,p'-DDE, p,p'-DDD) were more abundant in the original DDT mixtures than their respective ortho-para-isomers (o,p'-DDT, o,p'-DDE, o,p'-DDD). Therefore, the p,p'-DDT compounds are generally found at higher concentrations (e.g. in samples from the Bay measured by RMP). Furthermore, several contaminants chemically transform into other toxic compounds and are usually measured within predicted ranges of concentrations compared to their metabolites (e.g. heptachlor epoxide/heptachlor). PCB congener concentrations also follow general patterns of distribution based on the original concentrations in Aroclor mixtures. Interference caused by matrix constituents or co-elution of compounds on the column is a common obstacle to quantifying trace concentrations of organic contaminants, especially when electron-capture detectors are used. When results are reported outside the range of expected relative concentrations, and the laboratory cannot identify the source of variability, values are qualified to indicate uncertainty in the results. If the reported values do not deviate much from the expected range, they are generally allowed to stand and are included in calculations of "totals" for

their respective compound classes. However, if the reported concentrations deviate greatly from the expected range and are clearly higher than observed in past analyses or current sample splits, it can be reasonably concluded that the results are erroneous.

In this study, suspect values were first flagged for review by the analyzing laboratory. Sometimes on reanalysis of the sample or reexamination of the data, the laboratory would find an error in identification or quantitation. For erroneous data for which no obvious causes could be found or corrected, the numbers are listed as originally reported but for the purposes of this report are qualified and excluded from calculations of averages or compound class totals.

Great care should be exercised in using information on congener ratios of common Aroclor mixtures and other such heuristic methods, for some of the same reasons that interpreting environmental PCBs only as mixtures of Aroclors has limitations. Reliance on such patterns in data interpretation can lead to inadvertent censoring of data. In one case, a laboratory's analyses of sediment samples at one site were complicated by unusually high recoveries of PCB 209, used in their surrogate spikes (Hetzl 2000). It was later found that the samples had high concentrations of that congener prior to spiking.

In a few cases, a lab found that neither the extraction and cleanup steps nor the chromatographic elution were sufficient to separate interfering compounds in the sample matrix from the target analytes. To remedy this problem, LabB elected to reanalyze some of those samples using low-resolution mass spectrometry. However, they did not have sufficient confidence in the quantitation to provide concentrations for individual PCB congeners; values for "total PCBs" determined by LabB via GC/LRMS are given as PCB totals without being assigned to individual PCB congeners in the appendix tables. In some cases labs identified matrix interference problems by an "M" in place of a value in the tables in Appendix A.

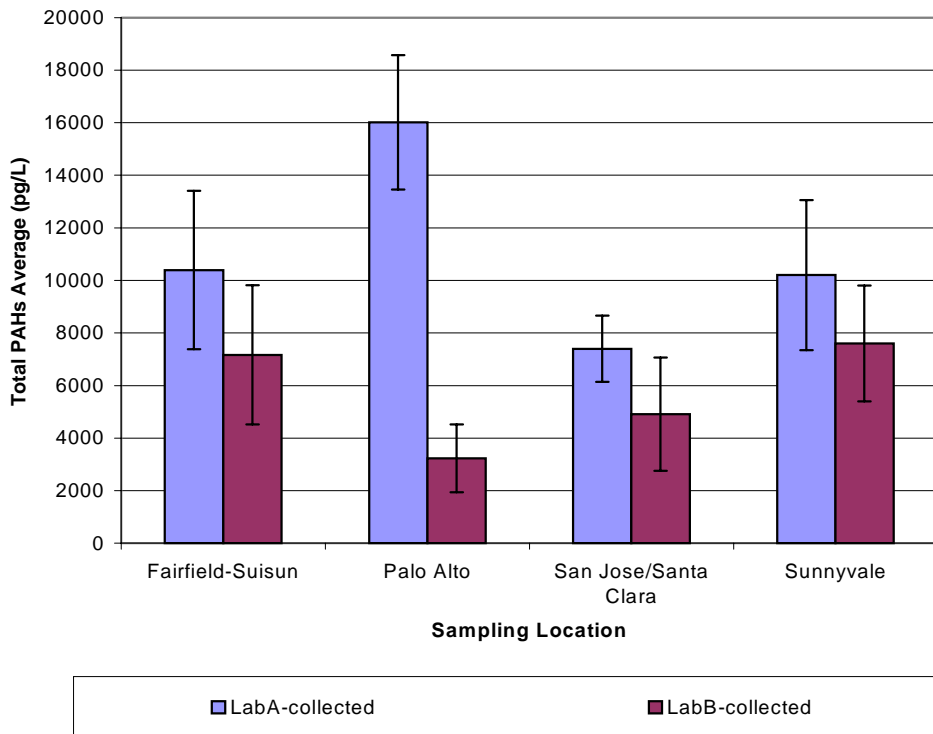
The possibility of confirming one lab's results against two others is one advantage of having three labs analyze the same samples in this study. At low concentrations it may be difficult to establish which lab's measurement is most accurate, but a single high measurement by one lab in the absence of concurrence by any of the others indicates a likely erroneous measurement. Such questionable values were flagged with "Q" in the Appendix A tables. In general PAHs were the least troublesome compounds; large deviations from the other labs' values (a heuristic of > 2000 pg/L or 10x difference) were found for one compound in a sample for LabA, and for three compounds in another sample for LabC. PCBs were slightly more difficult for the labs, with LabB typically giving an value grossly different (using a similar heuristic of ~10x difference) from the other labs for one congener every two samples, and LabC gave differing results an average of five congeners each sample. Pesticides were the most difficult for the labs, with an average one erroneous value per two samples for LabA, slightly over 3 per sample for LabB, and over 1 per sample for LabC. The prevalence of erroneous values may be indicative of the susceptibility of analytical methods to interferences. PAHs were the least troublesome because those concentrations were highest, and all three labs used GC/MS. PCBs and OCPs were more difficult for the three labs because of lower concentrations and were more troublesome for the two labs using GC/ECD, even with dual column confirmation.

C. Differences Between Collection Methods

1. PAHs

Concurrent sampling by two of the labs during the November sampling event allowed evaluation of how large a role sampling methodology might play in measurement of contaminants. For samples collected in November by LabA, lab average total PAHs, combining the four November sampling sites, were 10,500, 8,350, and 12,310 pg/L when measured by LabA, LabB, and LabC, respectively (Figure 2). Samples collected at the same time by LabB averaged 7,320, 3,360, and 6,490 pg/L in total PAHs, respectively. This difference was dominated by the Palo Alto sample, where the sample collected by LabA was the highest in the November set, measuring 13,550 pg/L in total PAHs (Figure 3). In contrast, the average of total PAHs measured in the Palo Alto sample collected by LabB at the same site was 3,230 pg/L, only 24% of the LabA sample. This large difference between the Palo Alto November samples collected by the two labs indicates significant influence of collection methodology despite the similarities between methods used by LabA and LabB. Differences in total PAHs also existed between LabA- and LabB-collected samples for sites other than Palo Alto in November, but typically these differences were smaller. The LabB-collected samples averaged 68%, 64%, and 75% of the LabA-collected samples at the Fairfield-Suisun, San Jose/Santa Clara, and Sunnyvale POTWs, respectively.

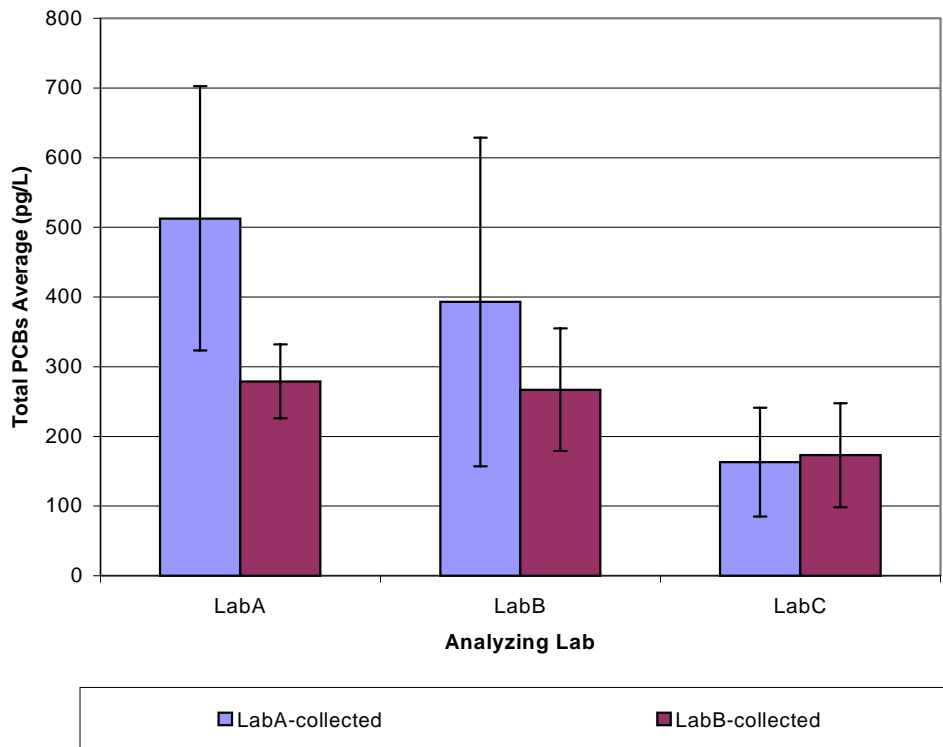
Figure 3. Total PAHs for November 1999 Samples, Site Averages



Because November total PAHs were highest for Palo Alto in LabA-collected samples and lowest for LabB-collected samples, regardless of the analyzing lab, it is likely that differences measured reflect real differences between total PAH concentrations in the collected samples. It is difficult to tell whether the LabA-collected sample is high because of contamination, or if the LabB sample is low because of low sample retention and recovery; both appear equally probable. For example, benzo(b)fluoranthene and benzo(k)fluoranthene are highest in the LabA-collected Palo Alto sample; these compounds amount to an average of 4,000 pg/L per sample (of ~13,550 pg/L average total PAHs for Palo Alto). In comparison, LabA-collected samples at the other three sites typically contained less than 1,000 pg/L of these compounds together. Conversely, the LabB-collected sample may be unusually deficient in pyrene. LabB-collected samples from other POTWs in November averaged 900-2,800 pg/L of pyrene in analyses by the three labs, but pyrene averaged only 100 pg/L in the Palo Alto sample. Thus it appears differences between collected samples may be dominated by differences in only a few compounds. Although contamination of blanks in these sample batches was not found, because of the random and sporadic nature of contamination, the possibility of contamination in the sample cannot be ruled out.

In spite of the dominant influence of the Palo Alto sample in causing the difference between averages of total PAHs collected by the two labs, the smaller but more systematic differences in samples collected at other sites cannot be neglected. When total PAHs from only the other three sites are considered, the average and standard deviation of the ratios between collected samples (LabB:LabA) are 0.69 and 0.14, respectively.

Figure 4. Total PCBs for November 1999 Samples, Lab Averages



This ratio is significantly different ($p < 0.05$, in general p above 0.1 is regarded as insignificant) from a null hypothesis of there being no difference between the labs' sample collections (i.e. a ratio = 1.0). The average LabB:LabA ratio of the Palo Alto samples (0.24) is also sufficiently outside the range of ratios for other sites that it can be considered to belong to a different population. This is also evident from linear regression of LabA versus LabB results. Although the correlation between the total PAHs from LabA and LabB-collected samples is poor with all sites included ($R^2 = 0.02$), removal of the Palo Alto samples results in a much better correlation ($R^2 = 0.82$). There may therefore be a systematic bias in PAH collection arising from differences in sample collection methods.

2. PCBs

For samples collected in November by LabA, total PCBs for the four November sampling sites averaged together were 513, 393, and 163 pg/L when measured by LabA, LabB, and LabC, respectively (Figure 4). Samples collected at the same time by LabB averaged 279, 267, and 173 pg/L in total PCBs, respectively. For PCBs, the difference between the Fairfield-Suisun samples was largest, differing by a factor of two. Although LabC found little difference in total PCBs between the samples collected by LabA and LabB, the larger number of questionable values from likely matrix interferences in analyses by LabC may mask differences found by LabA and LabB between their sample collections.

Figure 5. Total PCBs for November 1999 Samples, Site Averages

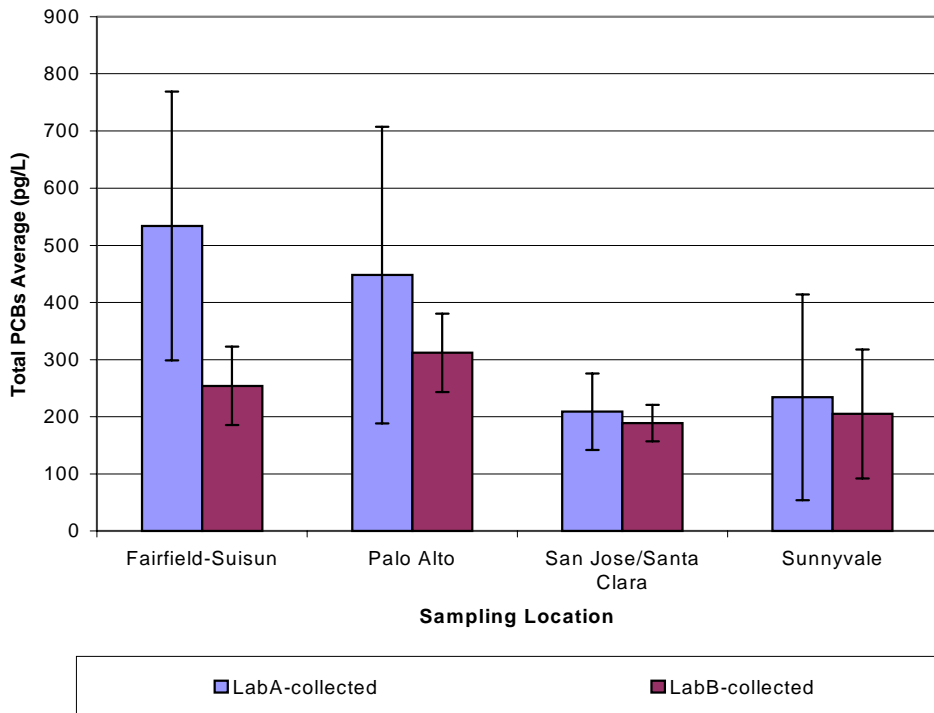
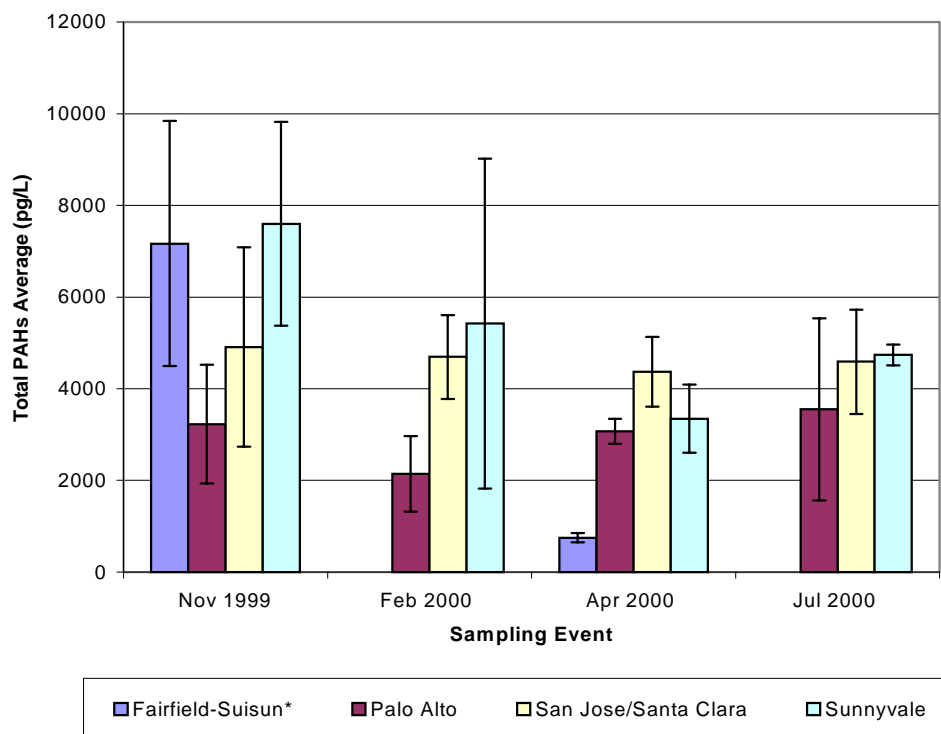


Figure 6. Total PAHs for November 1999 - July 2000 Samples, Site Averages

In samples collected by LabA in November, total PCB measurements averaged among the analyzing labs were 534, 448, 209, and 234 pg/L for Fairfield-Suisun, Palo Alto, San Jose/Santa Clara, and Sunnyvale, respectively (Figure 5). Samples collected at those same sites by LabB averaged 254, 312, 189, and 205 pg/L of total PCBs, respectively. The ratios of LabB:LabA-collected average total PCBs (i.e. averages of the three analytical labs) for the four POTWs were 0.48, 0.70, 0.91, and 0.88 in November. The mean of these ratios, 0.74 (standard deviation of 0.20), is not significantly different from the null hypothesis (1.0) at a high confidence level ($p \sim 0.3$). Although paired t-tests applied to results from each site individually indicate that differences between LabA and LabB collections were also generally not highly significant (probabilities that they were identical sample groups ranged from $p = 0.15$ to 0.74), when applied to all of the samples collectively, the fact that nearly all measurements for samples collected by LabB were lower resulted in a significant difference ($p < 0.05$) overall. Thus PCBs may also be affected by collection differences between labs.

3. OCPs

Paired t-tests for LabA and LabB-collected total chlordane results in November were similar to those for PCBs; applied to each site separately, p ranged from 0.15 to 0.82. However, unlike PCBs or PAHs, because samples collected by LabA were neither predominantly higher or lower than the LabB samples, p for the entire set was only 0.24. Differences in total DDTs were even less significant. When differences for each site were considered individually, p ranged from 0.24 to 0.84, and p for the entire sample set was 0.57. Results for the other pesticide groups (endosulfans, BHCs), also indicated little

significance of any influence of the collecting lab ($p = 0.20$ for both groups, when considering data from all sites at once).

For the other OCPs, evaluation of possible collection differences was not attempted, given inter-lab analytical variability with RSDs frequently above 50% for individual compounds and the relatively large number of compounds not quantified due to matrix interference or likely erroneous values. Any biases arising from collection differences would likely be in the same range as found for total PAHs and PCBs (typically under 50%) and thus would be obscured by the analytical variability.

Because the two labs analyzing trichlorophenol collected samples by different means (whole effluent versus a fraction of extract), collection and analytical differences could not be evaluated separately. Results for trichlorophenol are presented in Appendix A.

4. Causes of collection/extraction differences

Possible causes of the differences between samples collected by the two labs may be found in details of the sampling methods. Although both labs used samplers that were mechanically similar and operated at approximately the same pumping rate, differences in the arrangements of their XAD-2 columns may have been sufficient to cause differences in sample adsorption efficiency and breakthrough. LabA used a single large stainless steel column containing 250 g of XAD-2 resin, whereas LabB used a pair of 75g Teflon columns connected in parallel after the glass-fiber filter to permit higher flow. The smaller Teflon columns are similar to those used by SCCWRP in ambient water sampling with an Infiltrax 100 system (Zeng et al. 1998). Although the samples collected for that program were generally larger, from 1100 to 2300 L, the deployments typically lasted 3 to 5 days with continuous pumping. These 400-700 L samples were collected over 8-12 hours, and with parallel columns, each column only saw 200-350 L of sample in that period of time, a rate equivalent to 600 L collected per day (24 hours) per column.

Assuming that the void volumes per mass of adsorbent remain the same in both the large steel column and smaller Teflon column packings, the volume of the large column will be proportional to the mass of adsorbent it holds, 250 g versus the two 75 g Teflon columns in parallel (150 g). It quickly becomes apparent that retention time in the large column will be approximately 65% longer than in the parallel small columns for equivalent flow rates (as was the case for these two samplers operated concurrently). Although retention time is not the only important factor in determining column efficiency, all other things being equal, longer retention times will permit more adsorption until equilibrium is reached. Thus unless columns are operating at or near a pseudo-equilibrium with the liquid phase passing through, increased retention time will likely result in a larger mass of contaminant adsorbed onto a larger column. With a larger column, the larger mass of adsorbent also decreases the likelihood that equilibrium saturation will be reached. Whether column size alone is sufficient to cause an average difference of 30% in retention is unknown, and it cannot explain the discrepancy of the Palo Alto samples, where the differential in retention time and adsorbent mass were identical, but the difference in total PAHs collected was even larger.

The less pronounced impact of the collecting/extracting lab on the other contaminant groups may be largely a reflection of the lower concentrations of those contaminants in

effluent samples. Small differences in nominal concentrations become relatively large at low concentrations, thus any differences of collection or extraction between the labs would be overshadowed by analytical variability. Differences in methods of quantitation among labs (i.e. ECD versus MS) may also have had an influence on this variability.

D. Seasonal Differences

1. PAHs

Because the causes of differences in PAH and PCB concentrations between samples collected by the two labs are not yet fully understood, evaluations of seasonal differences in contaminant concentrations were restricted to samples collected by LabB, the only lab that collected samples on all four sampling events. Only one sampling event, February 2000, occurred during a period of wet weather, and thus any effects of higher inflows into the plants and dilution or contaminants due to rainwater infiltration into the sewer systems might only be observed in that sample. Averages of measurements for each sample are shown in Figure 6. Error bars on the columns indicate standard deviations on total PAH measurements for the three analytical labs averaged.

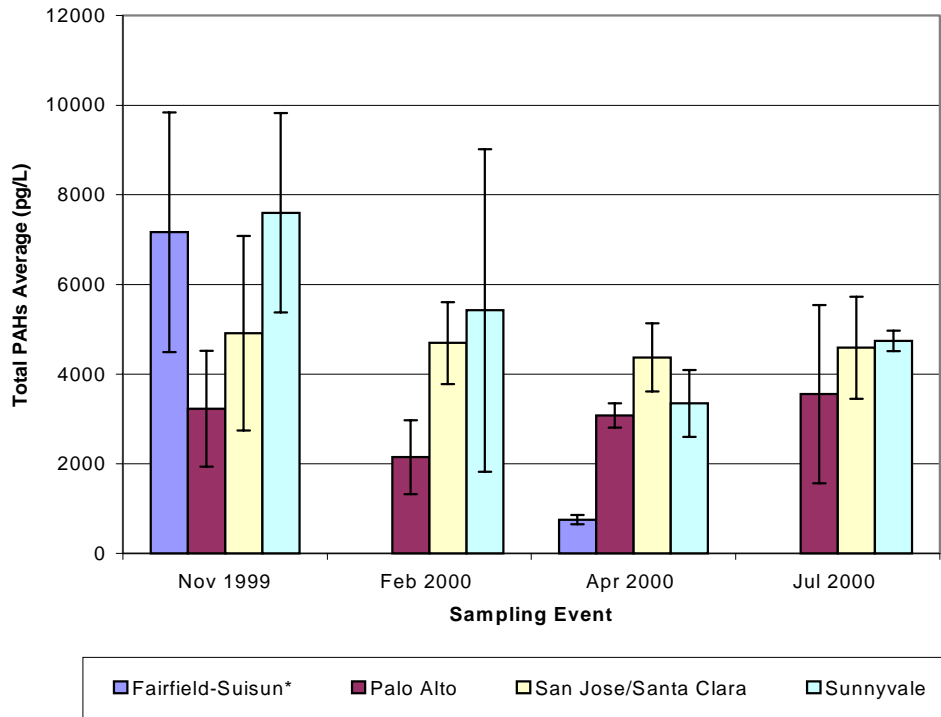
Although there was variability among measurements by different labs, one would not expect any correspondence of analytical variability to the months in which samples are collected. Therefore, aggregating lab results from split samples to derive averages is possible without losing distinctions between sampling events. However, changes with season in effluent of one plant will not necessarily be reflected in effluent of other plants, so averaging results of different plants might mask seasonal changes in effluent concentrations. Significance of relationships between results of different sampling events are therefore best determined either through ratios, regressions, or by t-tests on paired individual measurements or sampling event site averages. All of these methods can indicate trends between different sampling events.

In many cases, the differences in total PAHs between sampling events were insignificant because of large inter-lab variability in the analyses. Because no February or July samples were taken at Fairfield-Suisun, only a ratio of November:April samples (9.85) could be determined for that site (Table 5). The differences among lab results for the Fairfield-Suisun samples were moderate in November (RSD = 37%) and good in February (RSD = 13%), so although variability in lab analyses might amount to some of the difference, the large difference in total PAHs between those samples may still be significant. In those samples, and between February and April samples at San Jose/Santa Clara, p was 0.15 or better. Paired t-tests also showed the greatest significance of differences between those

Table 5. Ratios of Total PAHs for Paired Sampling Events, Site Averages (n=3)

Site	Nov:Feb		Feb:April		April:July	
	Mean	SD	Mean	SD	Mean	SD
Fairfield-Suisun*	9.85	4.30				
Palo Alto	1.50	0.33	0.69	0.23	1.05	0.52
San Jose/Santa Clara	1.08	0.53	1.07	0.02	0.96	0.07
Sunnyvale	1.70	0.69	1.69	1.05	0.71	0.18

* Nov-Apr ratio because no February sample taken at Fairfield-Suisun

Figure 6. Total PAHs for November 1999 - July 2000 Samples, Site Averages

sample pairs as well. Thus despite analytical variability, differences between some sampling events at the POTWs were large enough to be distinguished from the analytical noise.

When a linear regression is applied to data from the three sites measured in all sampling events, they show a very weak relationship between November and February values, with a R^2 of 0.58. Linear regressions on February:April and April:July show little correlation, with R^2 of 0.08 and 0.06, respectively. Thus even when differences between sampling events for the various sites are significant, these differences may be due more to changes in influent inputs or treatment processes specific to each site rather than systematic differences between seasons throughout the region.

2. PCBs

Results from all three labs were averaged for each sampling event and site. Total PCBs averaged less than 350 pg/L at all sites for all sampling events (Figure 7). Concentrations of PCBs in effluent do not appear to fluctuate as much as for PAHs; the largest differences in concentrations between sampling events at any site were a factor of two.

Just as for PAHs, PCBs were not measured at Fairfield-Suisun in February or July, so only the ratio of total PCBs for November:April samples (3.77) could be determined for that site. Differences in total PCBs between sampling events were insignificant for all pairings shown in Table 6, as is also evident from the large overlap in error bars (indicating standard deviation of sample means) in Figure 7. The averages of the ratios between November:February PCB totals ranged from 3.77 to 0.74, but because standard deviations of these ratios were almost as large, none of these differences was significant at a 90% confidence level. Paired t-tests also showed little significance in differences for most samples.

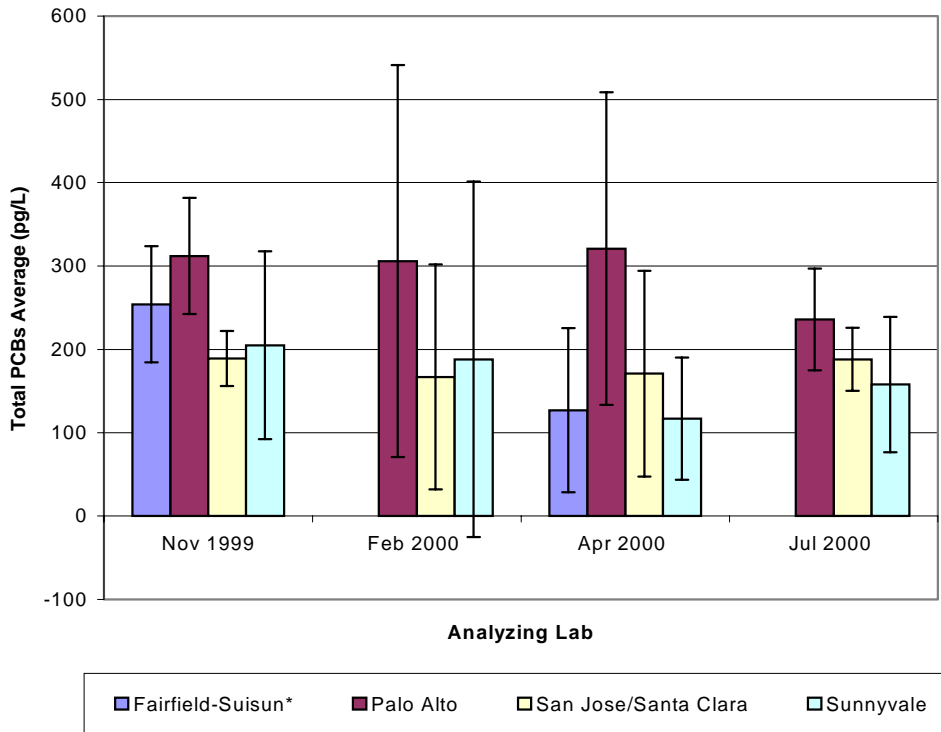
Table 6. Ratios of Total PCBs for Paired Sampling Events, Site Averages (n=3)

Site	Nov:Feb		Feb:April		April:July	
	Mean	SD	Mean	SD	Mean	SD
Fairfield-Suisun*	3.77	3.56				
Palo Alto	1.33	0.61	0.89	0.17	1.45	1.02
San Jose/Santa Clara	2.24	2.22	0.97	0.16	0.86	0.60
Sunnyvale	1.22	0.76	1.71	0.90	0.74	0.42

* Nov-Apr ratio because no February sample taken at Fairfield-Suisun

When a linear regression is applied to data from Palo Alto, San Jose/Santa Clara, and Sunnyvale (the three sites collected during all events), they show a weak relationship between November and February values, with a R² of 0.59. A linear regression on

Figure 7. Total PCBs for November 1999 - July 2000 Samples, Site Averages



February:April data show better correlation (0.72), but the slope is 1.03, indicating measurements show neither a general upward or downward trend between those events.

3. OCPs

Averages of total chlordanes, DDTs, and BHCs are shown in Figures 8, 9, and 10 respectively. Because there were relatively large analytical differences between lab measurements of the sample splits for these compounds, there were generally no significant differences between sampling events for these study sites.

Tables 7, 8, and 9 summarize the results of t-tests between paired sampling events for samples from the POTW sites. Nearly none of the differences are highly significant, with the exception of total chlordanes at Sunnyvale for the April and July samples. Given the variability in chlordanes measured in other samples, it may just be by chance that all three labs' chlordanes measurements were lower in the July sample than in April.

Because inter-lab analytical variability for other individual OCP compounds were generally large (over 50%), comparisons among sampling events were not attempted. Analytical variability would obscure any differences among samples given the large inter-lab differences and the small number of replicate analyses; at best there are 3 results per sample, but samples with a relatively large number of possibly erroneous values, matrix interferences, and non-detects in the pesticide results preclude the possibility of finding meaningful significant differences among samples.

Figure 8. Total Chlordanes for November 1999 - July 2000 Samples, Site Averages

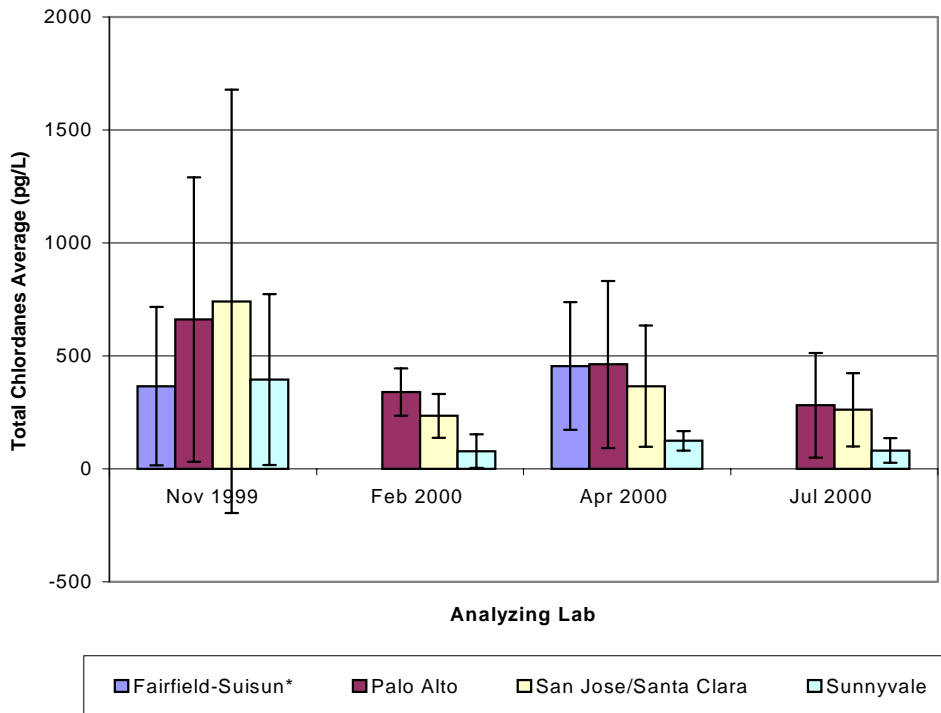


Figure 9. Total DDTs for November 1999 - July 2000 Samples, Site Averages

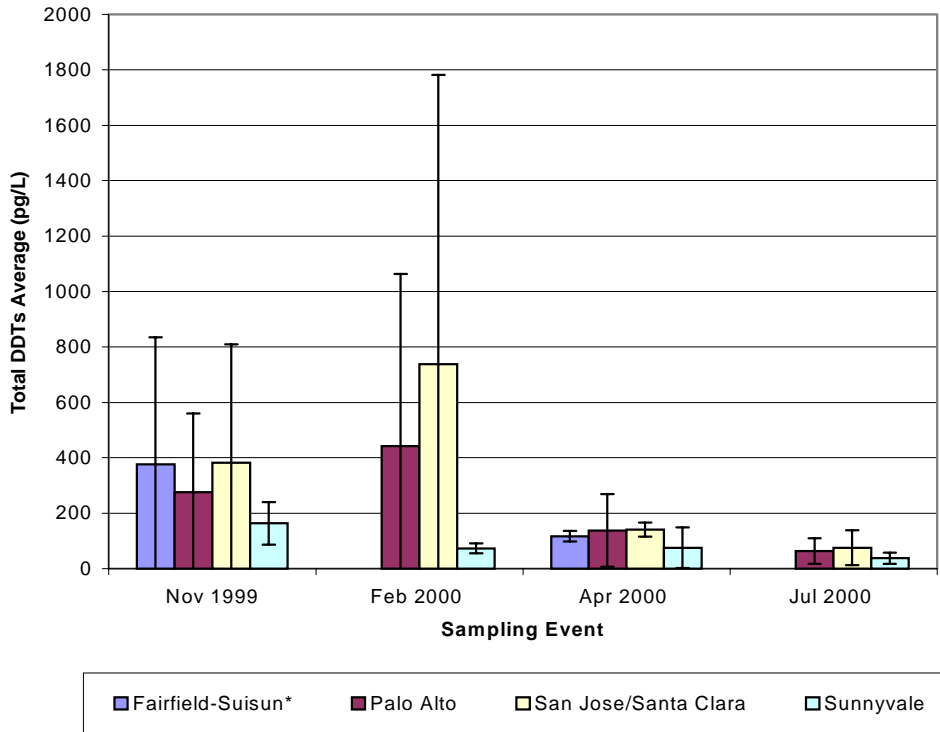


Figure 10. Total BHCs for November 1999 - July 2000 Samples, Site Averages

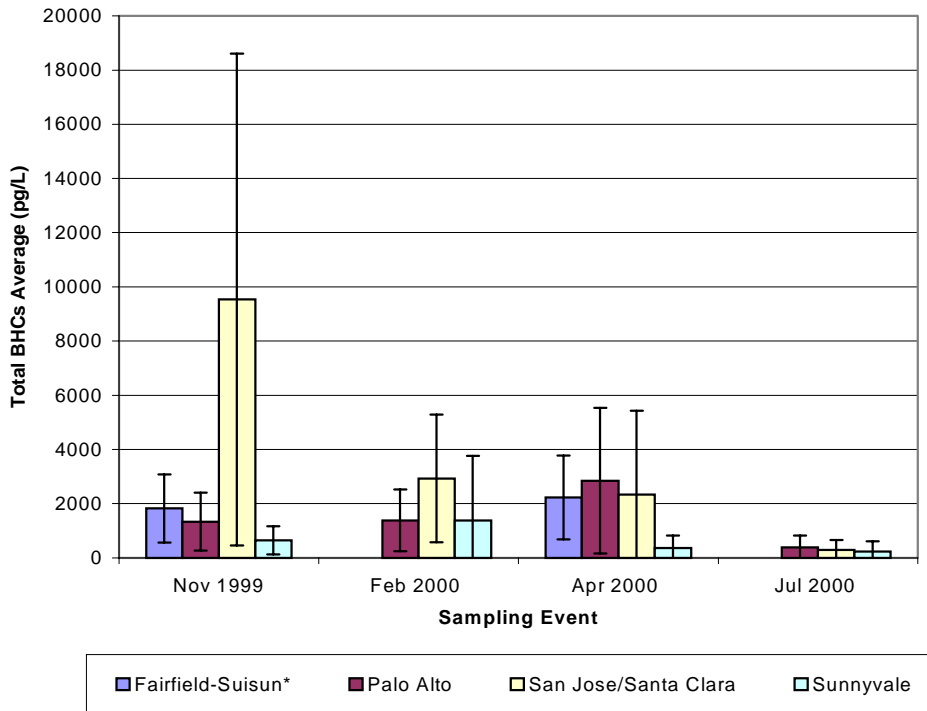


Table 7. Paired T-tests (“p”) Results, Total Chlordanes (n=3)

Site	Nov:Feb	Feb:April	April:July
Fairfield-Suisun*	0.25		
Palo Alto	0.43	0.41	0.40
San Jose/Santa Clara	0.43	0.41	0.40
Sunnyvale	0.52	0.75	0.03

* Nov-Apr ratio because no February sample taken at Fairfield-Suisun

Table 8. Paired T-tests (“p”) Results, Total DDTs (n=3)

Site	Nov:Feb	Feb:April	April:July
Fairfield-Suisun*	0.41		
Palo Alto	0.42	0.42	0.29
San Jose/Santa Clara	0.42	0.42	0.29
Sunnyvale	0.22	0.59	0.32

* Nov-Apr ratio because no February sample taken at Fairfield-Suisun

Table 9. Paired T-tests (“p”) Results, Total BHCs (n=3)

Site	Nov:Feb	Feb:April	April:July
Fairfield-Suisun*	0.49		
Palo Alto	0.27	0.69	0.39
San Jose/Santa Clara	0.27	0.69	0.39
Sunnyvale	0.61	0.47	0.79

* Nov-Apr ratio because no February sample taken at Fairfield-Suisun

4. Dioxins and furans

Only LabA analyzed for dibenzo-dioxins and furans. Results are presented in tabular format in Appendix A. TEQs (2,3,7,8-TCDD equivalents) are calculated using World Health Organization 1998 (WHO-98) toxicity equivalence factors as recommended in the CTR implementation plan, and TEQs are presented as summary totals rather than concentration totals given for other compound classes. No discernable pattern in seasonal distribution of dioxins and furans is apparent, as the TEQs range from 22 to 154 fg/L, averaging 44 to 74 fg/L for the four sampling events.

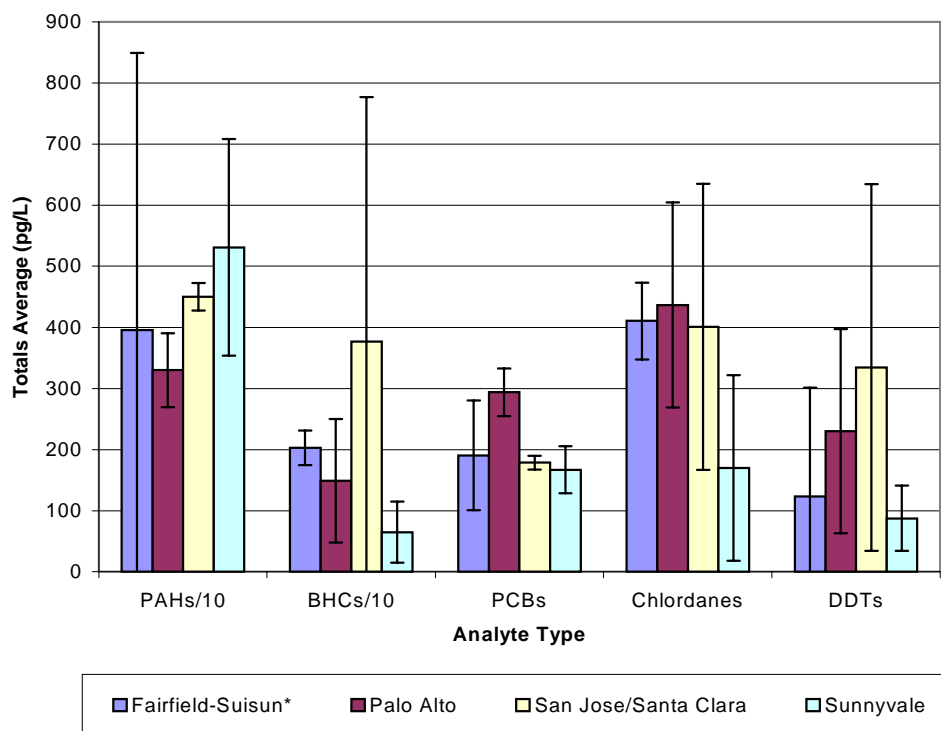
The uncertainty arising from analytical variability will tend to mask most seasonal differences, unless those differences are large. Given this variability and the small sample size of only three measurements of any site for each sampling event, very few significant differences are observed for any of the analyte classes.

E. Differences Among POTWs

1. PAHs

No discernable patterns in total PAH concentrations emerge from comparing differences among POTWs. Averages of total PAHs, combining all sampling events, are presented in Figure 11 for Fairfield-Suisun (2 sampling events), Palo Alto, San Jose/Santa Clara, and Sunnyvale, (Figure 11 total PAHs are shown divided by 10 to fit the same scale as other compounds). Standard deviations for the site averages are shown as error bars. The large RSDs indicate high temporal variability in samples collected at most of these POTWs, the only exception being San Jose/Santa Clara. Because San Jose/Santa Clara was the largest plant in this study, its consistency in effluent concentrations may represent an inertial effect of processing large volumes; temporal spikes of contaminants from individual sources will tend to mix with other influent flows, resulting in a less variable signal at discharge.

Figure 11. Totals Averaging All Sampling Events, Site Averages



As noted previously in the description of seasonal differences, the changes between sampling events are not similar among plants; some rise while others fall from one sampling event to the next. In contrast to San Jose/Santa Clara's consistent PAH concentrations, Fairfield-Suisun's concentrations differed by nearly a factor of ten between its two samples. Total PAHs in most POTW samples are dominated by a few compounds: fluorene, phenanthrene, and pyrene. These three PAHs account for an average $75 \pm 11\%$ of the total PAHs in all samples. As in samples from the other sites, Fairfield-Suisun's PAH total was dominated by fluorene, phenanthrene, and pyrene; in

the November 1999 sample, they were present at their usual substantial concentrations (all greater than 1,000 pg/L each), accounting for 80% of the total PAHs in that sample. Although the total of those compounds decreased by a factor of ten in the May 2000 sample, the sum of all other compounds also decreased proportionally, and those three compounds still accounted for 78% of the total. Therefore the differences between Fairfield-Suisun samples from these events are not likely to be due to contamination.

2. PCBs

Averages of total PCBs over all sampling events were 191, 294, 179, and 167 pg/L for Fairfield-Suisun (2 sampling events), Palo Alto, San Jose/Santa Clara, and Sunnyvale, respectively (Figure 11). Relative standard deviations of these averages were 47%, 13%, 6%, and 23%, respectively. Much like for PAHs, average concentrations of PCBs in San Jose/Santa Clara effluents varied the least between sampling events. The differences in average total PCBs between Palo Alto and San Jose/Santa Clara or Palo Alto and Sunnyvale may be significant ($p < 0.05$ for either pairing with Palo Alto), but comparing averages may obscure some inter-lab analytical variability.

3. OCPs

Concentrations of total chlordanes, DDTs, and BHCs generally differed greatly between sample events for the various POTWs. Given the wide range of concentrations measured for these pesticides, few patterns of distribution based on POTW location are apparent. Differences between Fairfield-Suisun and Sunnyvale average total BHC and chlordane concentrations may be significant ($p < 0.05$ and ~ 0.10 respectively), but given the small number of samples and large analytical variability for individual compounds, these apparent differences may largely be artifacts of chance.

F. Analytical Differences

1. PAHs

Table 10 shows each lab's results for each sampling event, averaged for the three POTWs sampled for all events (i.e. excluding Fairfield-Suisun). For most sampling events, LabB's PAH totals are somewhat lower than those of the other two labs. Many of the differences in total PAHs seem to arise from differences in results of only a few abundant compounds, e.g. chrysene, fluorene, and phenanthrene. In many samples, two of the labs found substantial concentrations of these compounds, while LabB did not detect any or found lower concentrations.

Table 10. Total PAHs November 1999 to July 2000, Lab Averages (n=3)

Lab	Nov	Feb	Apr	Jul
LabA	6670	5950	3990	4150
LabB	3100	2760	3850	3990
LabC	5970	3550	2960	4740

Although the relative standard deviation on average total PAHs for each sample is

generally good to fair (under 40% for most samples), relative standard deviations on individual compounds are not as good. The averages of RSDs for individual compounds are often two times or more higher than for the compound groups evaluated as totals. This is not entirely unexpected; if one models each lab's measurement for an individual compound as an underlying "true" value plus some random error component, the errors above and below the true value for individual compounds will tend to cancel each other out in aggregate measures such as totals for each class of compounds, leading to smaller RSDs. On the other hand, for each sample, RSDs for each compound individually will encompass three values at most (one for each analyzing lab) and thus be highly influenced by the error component in each measurement. In addition, taking an average of RSDs is equivalent to collecting absolute values of all the error components, as there are no negative RSDs.

2. PCBs

Such behavior of aggregate statistics is also apparent in the PCB results. Again, RSDs of averaged "total PCBs" tend to be much smaller than averages of RSDs for individual PCB congeners. However, RSDs on total PCBs are in general larger than those for PAHs in these samples, for reasons mentioned previously; most of the PCBs and other organochlorine compounds are found at concentrations nearer their detection limits. Because detection limits are in part defined by the random error of background noise and other signal interferences, the random error component inherently becomes relatively large for analytes measured at lower concentrations.

Table 11. Total PCBs November 1999 to July 2000, Lab Averages (n=4)

Site	Nov	Feb	Apr	Jul
LabA	279	175	181	215
LabB	267	432	302	215
LabC	173	81	69	151

a) N=3 for February and July sampling events

In contrast to PAHs, it appears that LabB on average measured higher concentrations of PCBs than the other labs. Part of the difference may lie in the labs' respective handling of surrogate standards. LabB, which collected all the samples for the results shown in Table 11, spiked the filters and columns of collected samples with organochlorine and PAH surrogates prior to extraction. It then extracted the filters and XAD-2 columns, and split the samples, which then included some fraction of the added surrogates (ideally 100%, but no measurements were made at that point). After cleanup and analyses of samples, LabB adjusted its "raw" instrument results for recovery of the surrogates. LabA also measured the surrogates added by LabB, but corrected for reported values using only isotopic surrogates added by themselves on receipt of the extraction splits. LabA recoveries of the surrogates added by LabB were in the range 50-130%, with most of the recoveries in the lower and middle end of that range (60-90%). As a result, LabB reported (recovery adjusted) results are likely around 25% higher than LabA results, which are adjusted for losses within LabA but not for any processes occurring before they received their extract sub-sample splits. Similarly, LabC found interferences with the surrogate

compounds and thus was unable to quantify those compounds to adjust for recoveries, which would also lead to lower PCB values than the LabB adjusted results.

IV. Conclusions

One of the primary objectives of this study was to determine the concentrations of organic compounds in POTW effluents using techniques with the most sensitive methods practicable. To that end, this study examined three labs with previously demonstrated capability of analyzing organic compounds in environmental samples. Most of the increased sensitivity was obtained through preconcentration of very large effluent samples. Although determination of true method detection limits was not included in the scope of this study, estimates from lab-provided instrument/sample detection limits indicate likely method detection limits often two orders of magnitude or better than for common methods used previously in other programs and studies.

An advantage of using more sensitive measurement methods is in decreasing the range of probable concentrations for samples when a compound is not detected by the analysis. Because in exercises such as load calculations, concentrations of undetected compounds are often assigned values at the quantitation limit or some fraction thereof, lower detection limits for trace organic contaminants can redefine the lower bound of contaminant loads. Totals and averages for compounds and compound groups in this study are currently calculated assuming that the concentration of any compound not detected is zero. However, summary information can be recalculated based on assumptions of concentrations at the estimated MDL or some fraction thereof.

Total concentrations of compound classes (e.g. total PCBs) measured in this study in some cases fall below detection limits for individual compounds in effluent monitoring programs mentioned previously. They are also well in line with previous results for ambient and effluent monitoring the region. Many of these compounds were found at concentrations comparable to or lower than those found in local ambient samples.

For PCBs, the results may indicate a continued decreasing trend in environmental and effluent concentrations, which started after the phasing out of PCBs began several decades ago. Average total PCB concentrations in this study fall at the low end of the range for a relatively recent previous study and are generally comparable to the ambient concentrations in the receiving waters to which these POTWs discharge. A number of individual congeners were not detected, even with the low detection limits for this study. Assigning undetected compounds concentrations at their MDLs would greatly increase the totals of some of these compound groups, particularly in the case of PCBs due to the sheer number of congeners. However, adding 10 pg/L (an estimated MDL based on lab provided IDLs) of approximately 40 congeners still would yield totals well within the range of previous results.

The second major objective of this study was to assess sources of variation in effluent concentrations of trace organic compounds: differences in collection methodology, analytical methodology, seasons/sampling events, and among treatment plants. The results of this study indicate:

Minor differences in collection methods resulted in a fairly systematic difference between samples collected by the two teams in November 1999. PAH and PCB concentrations in samples collected by LabB were often about 25-50% lower than those in samples collected by LabA.

Differences among lab results were often not systematic for many individual compounds, but for compounds evaluated as groups, some biases arising from differences in lab methods became apparent.

One analytical method, high-resolution mass spectrometry (HRMS), appeared less prone to quantitation difficulties and errors arising from environmental interferences.

Seasonal/sampling event differences, although largely obscured by analytical variability, did not follow any predictable patterns even when significant differences were found. Concentrations would increase at some sites but decrease at others from one sampling event to the next.

Differences among treatment plants were also largely obscured by analytical variability; none of the plants were consistently significantly higher or lower than any of the others for any compound group.

These findings are discussed in slightly more detail below.

The differences in PAH/PCB collection between LabA and LabB might have been avoided by more rigid adherence to developed methods (e.g. maintaining smaller sample sizes or lower flow rates used in previous studies) or better understanding of the influence of operating conditions. However, cases such as the high and low total PAHs found in the Palo Alto samples, which were collected by LabA and LabB respectively, under the same operating conditions as at other sites, defy such easy explanations and remedies. One would have expected a similar bias as found at other sites (up to ~50% lower in the LabB sample), rather than the over four-fold difference that was found.

All the labs were generally operating well within common QA/QC guidelines established by EPA and NIST. However, for what are essentially identical samples, splits of a single extract, the large inter-lab variability among analyzed sample splits in most cases precluded meaningful analysis of any differences between samples from different seasons or sites. Although with three laboratories analyzing samples it is possible to eliminate any value that disagrees with results of the other two labs, we generally did not do this unless results were very far out of the expected range; values an order of magnitude higher or lower than the other labs' results were generally flagged and not included in calculation of compound averages and group totals. Even eliminating only such grossly erroneous data has a great impact, as some of the eliminated values for individual compounds were easily larger than the totals for their respective compound groups.

Internal consistency checks such as use of expected ratios of PCB congeners or OCP isomers and metabolites provided additional quality control, helping to eliminate erroneous values arising from unknown interferences. However, even such beneficial checks come with a price; although unreasonably high values might be eliminated, such methods provide no guidance for determining where in the possible range of

concentrations an analyte might be found. Thus a PCB congener expected at 50-100 pg/L but measured at 1,000 pg/L is flagged and essentially eliminated. Because they contribute zero to the totals, much as non-detects would, such flagged results may have been in part what led to the slightly lower PCB totals for LabC; some of the samples LabC analyzed had a large number of PCB congeners with erroneously high values, and thus none of those congeners were counted for those samples.

Although a NOAA/NIST intercomparison exercise analyzing organic contaminants in marine sediments and tissues found no obvious correlation of measurement accuracy to methods of detection, in our small sample, it appears that GC/HRMS may be a “gold standard” for analysis of trace level contaminants. Of all the results for organochlorine compounds, results from LabA using this method were least subject to internal inconsistencies arising from interferences. Although this method appears less susceptible to interferences overall, HRMS still requires the expertise of skilled operators and careful examination of the data. In spite of HRMS’s advantages, possibly erroneous results from LabA were still found, underscoring the need for careful examination of data for internal consistency as well as periodic external comparison such as intercalibration exercises.

All the labs involved in this study have previously participated in intercalibration exercises and analyzed samples of certified reference materials and standards either for this or other studies, and given that they have all performed satisfactorily in analyses of those reference materials (generally sediment or tissue samples), it appears that improving comparability of lab results does not merely depend on requiring labs to participate in periodic intercomparison exercises. In this project we found that one of the labs, even though it is experienced in organochlorine analysis of sediment and tissue, was not able to generate reliable data for PCBs or organochlorine pesticides in some samples. The cause of this problem is not known, but may be related to the analysis of a matrix not usually encountered by this lab. A major limitation of the application of existing reference materials and intercomparison exercises for analysis of water samples is the fact that the contaminants of interest typically occur at much higher concentrations in solid phase matrices. Ideally regular intercomparison exercises for trace organic contaminants in water would be established, but the logistics of ensuring that participating labs obtained sufficient quantities of identical water samples are difficult to fathom. Distribution of splits from extracted columns and filters, much like for this study, is one possible solution, but such a study could not address issues of sample retention from the original matrix.

Another of the difficulties arising from idiosyncrasies in lab methodologies originates from differences in surrogates among labs. Intercomparison studies need to solely focus on establishing consensus values for concentrations of contaminants. The multiple functions of this study, to both determine contaminant concentrations and evaluate sample collection and analysis variability, worked at cross-purposes. Each lab is accustomed to its own suite of surrogates and makes calculations of the original sample concentration based on these recoveries. The incompatibility of isotope surrogates with ECD methods prevented LabA from using its usual mix due to the requirement for splits with the other labs, and corrections for recoveries made by LabB for samples it collected

resulted in larger differences from other labs in final results, even though these concentrations are likely nearer the actual environmental concentrations. Ideally these functions should be addressed separately; for determination of environmental concentrations, each lab should handle only its own samples from collection to final results, and for intercalibrations, labs should measure samples without any surrogates applied beforehand.

The results from this study underscore the importance of careful selection and QA oversight in contracting labs for analysis of organic compounds at trace levels. Despite the use of methods in this study that are generally considered state-of-the-art, the inter-lab differences found in these results indicate that careful consideration of reported results in the context of historic data and other internal and external checks requiring a degree of professional judgment are still needed in addition to more routine evaluations of accuracy and precision.

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Appendix A.
Tables of Analytical Results

Table 1. Total dioxin concentrations in effluent water samples, 1999-2000.

Samples collected and analyzed by LabA . ND = below detection limits.

Effluent Site	2,3,7,8-TCDD	Total TCDD	1,2,3,7,8-PeCDD	Total PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDD	Total HxCDD	1,2,3,4,6,7,8-HpCDD	Total HpCDD	OCDD
	fg/L	fg/L	fg/L	fg/L	fg/L	fg/L	fg/L	fg/L	fg/L	fg/L	fg/L
November 1999											
Fairfield-Suisun	37	37	19	19	10	150	39	199	143	143	611
Palo Alto	5.3	5.3	7.2	7.2	ND	11	4.0	15	98	98	631
San Jose/Santa Clara	15	15	7.2	7.2	ND	38	11	50	148	148	563
Sunnyvale	30	30	7.3	7.3	6.1	69	20	95	399	399	1370
avg. conc (fg/L)	22	22	10	10	4.0	67	19	90	197	197	794
RSD (%)	65%	65%	56%	56%	121%	89%	82%	89%	69%	69%	49%
February 2000											
Palo Alto	ND	ND	9.4	9.4	ND	6.1	3.2	9.3	48	48	235
SJSC	ND	ND	10	10	5.2	13	6.3	24	56	56	348
Sunnyvale	ND	ND	7.7	7.7	ND	ND	ND	ND	44	44	262
avg. conc (fg/L)	ND	ND	9.2	9.2	1.7	6.3	3.2	11	49	49	282
RSD (%)	.	.	15%	15%	173%	102%	99%	109%	13%	13%	21%
May 2000											
Fairfield-Suisun	ND	ND	17	17	3.5	4.0	ND	7.5	28	28	132
Palo Alto	14	14	15	15	6.5	15	11	32	65	65	250
San Jose/Santa Clara	ND	ND	13	13	2.5	6.1	4.0	13	37	37	210
Sunnyvale	12	12	11	11	5.4	11	11	27	50	50	249
avg. conc (fg/L)	6.5	6.5	14	14	4.5	8.9	6.5	20	45	45	210
RSD (%)	116%	116%	19%	19%	40%	53%	84%	59%	35%	35%	26%
July 2000											
Palo Alto	8.3	8.3	6.8	6.8	ND	5.5	ND	5.5	68	68	313
San Jose/Santa Clara	141	141	6.6	6.6	ND	ND	ND	ND	30	30	180
Sunnyvale	33	33	ND	ND	ND	5.3	ND	5.3	38	38	392
avg. conc (fg/L)	61	61	4.5	4.5	ND	3.6	ND	3.6	45	45	295
RSD (%)	116%	116%	87%	87%	.	87%	.	87%	44%	44%	36%

Table 2. Total furan concentrations in effluent water samples, 1999-2000.

Samples collected and analyzed by LabA . ND = below detection limits.

Effluent Site	2,3,7,8-TCDF fg/L	Total TCDF fg/L	1,2,3,7,8-PeCDF fg/L	2,3,4,7,8-PeCDF fg/L	Total PeCDF fg/L	1,2,3,4,7,8-HxCDF fg/L	1,2,3,6,7,8-HxCDF fg/L	1,2,3,7,8,9-HxCDF fg/L	2,3,4,6,7,8-HxCDF fg/L	Total HxCDF fg/L	1,2,3,4,6,7,8-HpCDF fg/L	1,2,3,4,7,8,9-HpCDF fg/L	Total HpCDF fg/L	OCDF fg/L
November 1999														
Fairfield-Suisun	293	293	25	11	36	7.6	4.1	ND	4.0	16	ND	6.1	6.1	117
Palo Alto	171	171	24	18	43	12	ND	ND	2.6	15	182	ND	182	45
San Jose/Santa Clara	43	43	ND	ND	ND	5.8	ND	ND	ND	5.8	ND	ND	ND	28
Sunnyvale	27	27	ND	ND	ND	5.8	3.4	ND	4.0	13	ND	ND	ND	14
avg. conc (fg/L)	133	133	12	7.4	20	7.8	1.9	ND	2.6	12	46	1.5	47	51
RSD (%)	93%	93%	115%	122%	116%	38%	117%	.	71%	36%	200%	200%	191%	90%
February 2000														
Palo Alto	134	134	27	28	55	26	14	ND	15	55	258	7.5	266	50
SJSC	156	156	27	40	67	25	20	13	16	74	306	8.9	315	112
Sunnyvale	35	35	8.4	11	19	9.3	7.7	ND	4.4	21	263	ND	263	32
avg. conc (fg/L)	108	108	21	26	47	20	14	4.5	12	50	276	5.5	281	65
RSD (%)	59%	59%	52%	55%	52%	46%	44%	173%	55%	53%	10%	88%	10%	65%
May 2000														
Fairfield-Suisun	89	89	15	22	37	20	11	ND	8.7	40	33	ND	33	18
Palo Alto	187	187	43	52	94	34	25	4.2	16	79	42	6.7	49	27
San Jose/Santa Clara	79	79	13	21	34	19	14	3.9	11	48	228	5.4	233	53
Sunnyvale	93	93	27	39	66	23	21	2.8	16	63	33	4.1	37	16
avg. conc (fg/L)	112	112	24	34	58	24	18	2.7	13	57	84	4.1	88	29
RSD (%)	45%	45%	57%	43%	49%	29%	36%	70%	29%	30%	114%	72%	110%	60%
July 2000														
Palo Alto	128	128	7.9	ND	7.9	14	4.8	ND	4.4	24	38	ND	38	39
San Jose/Santa Clara	47	47	ND	ND	ND	6.1	ND	ND	ND	6.1	24	ND	24	39
Sunnyvale	13	13	3.9	ND	3.9	ND	ND	ND	ND	ND	25	4.5	30	41
avg. conc (fg/L)	63	63	3.9	ND	3.9	6.8	1.6	ND	1.5	10	29	1.5	31	40
RSD (%)	95%	95%	100%	.	100%	106%	173%	.	173%	124%	27%	173%	23%	2%

Table 3. Total PAH concentrations in effluent water samples in November, 1999.

Samples collected by LabA . CE = coeluted. NA = data not available, ND = below detection limit, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals.

Effluent Site	Analyzing Lab	Total PAHs (a,c)	Total PAHs (b,d)	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	11906	11906	380	270	460	190	580	51	87	980	49	1300	59	4500	3000
	LabB	6900	6900	2400	ND	CE	1500	290	1400	300	280	ND	ND	730	NA	ND
	LabC	12370	12370	200	300	570	370	130	190	190	890	20	2100	90	4260	3060
Avg. conc. (pg/L)		12024	10392	993	190	515	687	333	547	192	717	23	1133	293	4380	2020
RSD (%)		82%	29%	123%	87%	15%	103%	68%	136%	55%	53%	107%	94%	129%	4%	87%
Palo Alto	LabA	11340	11340	160	230	450	430	Q 7400	570	160	3900	310	1200	910	2400	620
	LabB	13510	13510	1000	ND	CE	5200	850	690	ND	2500	290	1200	1300	NA	480
	LabC	15810	15810	100	160	450	3660	830	810	120	3450	380	1800	1060	2360	630
Avg. conc. (pg/L)		14777	13553	420	130	450	3097	840	690	93	3283	327	1400	1090	2380	577
RSD (%)		38%	16%	120%	91%	0%	79%	2%	17%	89%	22%	14%	25%	18%	1%	15%
San Jose/Santa Clara	LabA	7639	7639	270	370	160	130	110	61	ND	400	ND	1400	38	3400	1300
	LabB	6030	6030	1700	290	CE	240	ND	360	140	190	ND	1700	110	NA	1300
	LabC	8530	8530	100	360	280	130	60	280	200	310	20	2300	60	2940	1490
Avg. conc. (pg/L)		8530	7400	690	340	220	167	57	234	113	300	7	1800	69	3170	1363
RSD (%)		60%	17%	127%	13%	39%	38%	97%	66%	91%	35%	173%	25%	53%	10%	8%
Sunnyvale	LabA	11132	11132	290	600	610	220	360	87	150	740	ND	1200	75	3000	3800
	LabB	6960	6960	230	500	CE	500	120	320	100	440	ND	1100	150	NA	3500
	LabC	12520	12520	200	720	720	280	240	200	160	740	20	1900	130	2490	4720
Avg. conc. (pg/L)		11341	10204	240	607	665	333	240	202	137	640	7	1400	118	2745	4007
RSD (%)		40%	28%	19%	18%	12%	44%	50%	58%	24%	27%	173%	31%	33%	13%	16%

a = average concentration calculated as sum of averages.

b = average concentration calculated by average of Total PAH's.

c = RSD calculated by average of RSD's.

d = RSD calculated by RSD of Total PAH's.

Table 4. Total PAH concentrations in effluent water samples in November, 1999 and February, 2000.
 Samples collected by LabB. M = matrix interference. ND = below detection limit.

Effluent Site	Analyzing Lab	Total PAHs (a,c)	Total PAHs (b,d)	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	9282	9282	120	230	310	150	220	29	40	660	6.6	1400	16	4000	2100
	LabB	4160	4160	440	190	ND	170	ND	ND	ND	360	ND	1100	ND	ND	1900
	LabC	8060	8060	100	140	280	160	120	40	20	580	ND	1400	ND	3420	1800
Avg. conc. (pg/L)		7167	7167	220	187	197	160	113	23	20	533	2.2	1300	5.3	2473	1933
RSD (%)		75%	37%	87%	24%	87%	6.3%	97%	90%	100%	29%	173%	13%	173%	87%	7.9%
Palo Alto	LabA	4120	4120	ND	ND	130	120	200	52	30	720	ND	860	38	1800	170
	LabB	1740	1740	230	ND	ND	190	ND	ND	ND	360	ND	960	ND	ND	ND
	LabC	3820	3820	100	40	90	120	70	40	30	590	20	1000	30	1540	150
Avg. conc. (pg/L)		3227	3227	110	13	73	143	90	31	20	557	6.7	940	23	1113	107
RSD (%)		89%	40%	105%	173%	91%	28%	113%	89%	87%	33%	173%	8%	88%	87%	87%
San Jose/Santa Clara	LabA	6475	6475	70	360	170	100	130	47	25	360	ND	1600	23	2600	990
	LabB	2430	2430	460	170	ND	ND	ND	ND	ND	130	ND	870	ND	ND	800
	LabC	5830	5830	ND	260	150	100	60	60	ND	320	ND	1600	ND	2320	960
Avg. conc. (pg/L)		4912	4912	177	263	107	67	63	36	8.3	270	ND	1357	7.7	1640	917
RSD (%)		89%	44%	140%	36%	87%	87%	103%	88%	173%	46%	.	31%	173%	87%	11%
Sunnyvale	LabA	9417	9417	160	400	400	230	390	120	110	660	57	1400	90	2200	3200
	LabB	5120	5120	290	320	ND	360	ND	ND	ND	460	ND	840	150	ND	2700
	LabC	8260	8260	200	580	450	210	160	70	100	580	20	1200	50	2050	2590
Avg. conc. (pg/L)		7599	7599	217	433	283	267	183	63	70	567	26	1147	97	1417	2830
RSD (%)		60%	29%	31%	31%	87%	31%	107%	95%	87%	18%	113%	25%	52%	87%	11%
February 2000																
Palo Alto	LabA	3024	3024	19	59	150	120	140	49	7.0	520	12	1100	38	680	130
	LabB	1385	1385	230	ND	ND	125	ND	ND	ND	148	ND	260	ND	597	25
	LabC	2030	2030	20	30	40	100	30	20	ND	270	10	1030	30	390	60
Avg. conc. (pg/L)		2146	2146	90	30	63	115	57	23	2.3	313	7.3	797	23	556	72
RSD (%)		90%	38%	136%	99%	123%	12%	130%	107%	173%	61%	88%	59%	88%	27%	75%
San Jose/Santa Clara	LabA	5577	5577	69	200	260	140	170	80	58	450	12	1000	38	1900	1200
	LabB	4758	4758	490	198	151	156	54	ND	ND	219	ND	550	ND	1900	1040
	LabC	3750	3750	30	350	180	100	70	50	60	250	10	1140	60	940	510
Avg. conc. (pg/L)		4695	4695	196	249	197	132	98	43	39	306	7.3	897	33	1580	917
RSD (%)		61%	19%	130%	35%	29%	22%	64%	93%	87%	41%	88%	34%	93%	35%	39%
Sunnyvale	LabA	9260	9260	370	470	290	160	200	68	75	460	21	2500	46	2500	2100
	LabB	2132	2132	M	M	270	189	42	ND	ND	310	ND	M	21	M	1300
	LabC	4870	4870	100	490	250	110	70	ND	60	290	ND	1960	60	1170	310
Avg. conc. (pg/L)		7014	5421	235	480	270	153	104	23	45	353	7.0	2230	42	1835	1237
RSD (%)		65%	66%	81%	2.9%	7.4%	26%	81%	173%	88%	26%	173%	17%	47%	51%	73%

a = average concentration calculated as sum of averages.
 b = average concentration calculated by average of Total PAH's.
 c = RSD calculated by average of RSD's.
 d = RSD calculated by RSD of Total PAH's.

Table 5. Total PAH concentrations in effluent water samples in May and July, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. B = blank contamination >3x MDL, NA = data not available, ND = below detection limits, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals.

Effluent Site	Analyzing Lab	Total PAHs (a,c)	Total PAHs (b,d)	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluorene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
May 2000																
Fairfield-Suisun	LabA	757	757	ND	24	5.8	8.3	16	4.7	ND	86	ND	250	2.4	350	10
	LabB	851	851	140	ND	51	ND	ND	ND	ND	ND	ND	200	ND	460	ND
	LabC	650	650	30	50	10	10	ND	ND	ND	50	ND	290	ND	190	20
Avg. conc. (pg/L)		753	753	57	25	22	6.1	5.3	1.6	ND	45	ND	247	0.8	333	10
RSD (%)		110%	13%	130%	101%	112%	88%	173%	173%	.	95%	.	18%	173%	41%	100%
Palo Alto	LabA	3327	3327	ND	39	62	48	440	35	16	760	16	790	41	980	100
	LabB	3106	3106	240	ND	480	450	56	ND	ND	240	ND	680	ND	960	ND
	LabC	2790	2790	40	30	50	380	60	20	ND	480	10	1030	50	550	90
Avg. conc. (pg/L)		2806	3074	93	23	56	293	58	18	5.3	493	8.7	833	30	830	63
RSD (%)		74%	9%	138%	89%	15%	73%	5%	96%	173%	53%	93%	21%	88%	29%	87%
San Jose/Santa Clara	LabA	5075	5075	25	120	120	95	120	41	19	350	5.5	1000	19	2200	960
	LabB	4483	4483	580	150	100	128	ND	ND	ND	165	ND	710	ND	1900	750
	LabC	3560	3560	50	210	100	70	40	20	ND	220	10	1150	30	1170	490
Avg. conc. (pg/L)		4192	4179	38	160	107	98	53	20	6.3	245	5.2	953	16	1757	733
RSD (%)		63%	19%	47%	29%	11%	30%	115%	101%	173%	39%	97%	23%	93%	30%	32%
Sunnyvale	LabA	3557	3557	83	130	110	140	160	37	22	310	ND	590	35	1200	740
	LabB	3964	3964	ND	136	130	148	ND	ND	ND	140	ND	570	ND	2200	640
	LabC	2520	2520	30	280	90	70	60	20	ND	190	ND	660	50	640	430
Avg. conc. (pg/L)		3347	3347	38	182	110	119	73	19	7.3	213	ND	607	28	1347	603
RSD (%)		68%	22%	112%	47%	18%	36%	110%	97%	173%	41%	.	8%	91%	59%	26%
July 2000																
Palo Alto	LabA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LabB	2565	2565	190	ND	787	65	21	ND	ND	369	ND	440	ND	693	ND
	LabC	5840	5840	Q 9070	Q 1610	680	980	150	B	Q 530	890	B	2740	400	Q 5650	B
Avg. conc. (pg/L)		4644	4203	190	ND	734	523	86	ND	ND	630	ND	1590	200	693	ND
RSD (%)		91%	55%	.	.	10%	124%	107%	.	.	59%	.	102%	141%	.	.
San Jose/Santa Clara	LabA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LabB	4638	4638	680	22	209	106	46	21	ND	127	ND	770	62	2061	534
	LabC	3430	3430	60	150	B	B	ND	B	40	170	ND	1400	30	1580	B
Avg. conc. (pg/L)		4469	4034	370	86	209	106	23	21	20	149	ND	1085	46	1821	534
RSD (%)		79%	21%	118%	105%	.	.	141%	.	141%	20%	.	41%	49%	19%	.
Sunnyvale	LabA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LabB	4772	4772	120	ND	219	106	20	ND	ND	184	ND	1500	42	2471	110
	LabC	4950	4950	1260	150	B	90	ND	B	20	130	B	1960	30	1310	B
Avg. conc. (pg/L)		5026	4861	690	75	219	98	10	ND	10	157	ND	1730	36	1891	110
RSD (%)		74%	3%	117%	141%	.	12%	141%	.	141%	24%	.	19%	24%	43%	.

a = average concentration calculated as sum of averages.
b = average concentration calculated by average of Total PAH's.
c = RSD calculated by average of RSD's.
d = RSD calculated by RSD of Total PAH's.

Table 6a. Total PCB concentrations in effluent water samples in November, 1999.

Samples collected by LabA . NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 008	PCB 018	PCB 028	PCB 031	PCB 033	PCB 044	PCB 049	PCB 052	PCB 060	PCB 066	PCB 070	PCB 074	PCB 087
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	667	667	11	19	44	53	11	26	26	66	15	20	37	16	17
	LabB	672	672	NA	63	45	NA	.	34	38	71	27	M	47	37	11
	LabC	262	262	ND	.	ND	Q 407	ND	ND	ND	106	48	ND	52	3.0	ND
Avg. conc. (pg/L)		645	534	5.5	41	30	53	5.5	20	21	81	30	10	45	19	9.3
RSD (%)		108%	44%	141%	76%	87%	.	141%	89%	91%	27%	56%	141%	17%	92%	92%
Palo Alto	LabA	675	675	19	41	55	52	17	ND	ND	88	ND	53	82	ND	21
	LabB	502	502	NA	42	81	NA	.	45	23	64	11	45	16	16	10
	LabC	167	167	ND	.	ND	59	ND	19	21	15	24	ND	ND	ND	8.0
Avg. conc. (pg/L)		499	448	10	42	45	56	8.5	21	15	56	12	33	33	5.3	13
RSD (%)		116%	58%	141%	2%	91%	9%	141%	106%	87%	67%	103%	87%	133%	173%	54%
San Jose/Santa Clara	LabA	282	282	16	37	31	27	9.0	16	17	27	8.0	11	14	9.0	ND
	LabB	195	195	NA	13	37	NA	.	17	6.0	18	2.5	14	8.4	3.3	4.6
	LabC	151	151	Q 230	.	ND	ND	ND	36	ND	ND	Q 158	19	Q 130	15	ND
Avg. conc. (pg/L)		245	209	16	25	23	14	4.5	23	7.7	15	5	15	11	9.1	1.5
RSD (%)		119%	32%	.	68%	88%	141%	141%	49%	112%	92%	74%	28%	35%	64%	173%
Sunnyvale	LabA	428	428	11	18	27	24	61	14	16	29	8.0	11	15	7.0	4.0
	LabB	203	203	NA	5.6	26	NA	.	7.4	3.5	24	4.5	6.0	5.7	1.7	4.5
	LabC	70	70	ND	.	ND	M	ND	Q 106	ND	ND	Q 386	ND	20	Q 54	ND
Avg. conc. (pg/L)		287	234	5.5	12	18	24	31	11	6.5	18	6.3	5.7	14	4.4	2.8
RSD (%)		106%	77%	141%	74%	87%	.	141%	44%	129%	88%	40%	97%	53%	86%	87%

a = average concentration calculated as sum of averages.
 b = average concentration calculated by average of Total PCB's.
 c = RSD calculated by average of RSD's.
 d = RSD calculated by RSD of Total PCB's.

Table 6b. Total PCB concentrations in effluent water samples in November, 1999.

Samples collected by LabA . ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 095	PCB 097	PCB 099	PCB 101	PCB 105	PCB 110	PCB 118	PCB 128	PCB 132	PCB 138	PCB 141	PCB 149	PCB 151
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	667	667	35	14	20	43	16	44	45	ND	8.0	27	ND	20	5.0
	LabB	672	672	Q 620	19	M	Q 390	50	43	14	4.8	M	29	3.2	13	Q 120
	LabC	262	262	ND	ND	16	.	ND	ND	ND	ND	.	ND	Q 52	18	.
Avg. conc. (pg/L)		645	534	18	11	18	43	22	29	20	1.6	8.0	19	1.6	17	5.0
RSD (%)		108%	44%	141%	90%	16%	.	116%	87%	117%	173%	.	87%	141%	21%	.
Palo Alto	LabA	675	675	38	8.0	16	39	16	35	38	ND	ND	29	ND	20	ND
	LabB	502	502	20	5.0	6.5	28	4.9	16	17	1.7	4.4	11	1.4	8.3	2.4
	LabC	167	167	ND	ND	ND	.	5.0	ND	ND	ND	.	ND	Q 29	4.0	.
Avg. conc. (pg/L)		499	448	19	4.3	7.5	34	8.6	17	18	0.57	2.2	13	0.70	11	1.2
RSD (%)		116%	58%	98%	93%	107%	23%	74%	103%	104%	173%	141%	110%	141%	77%	141%
San Jose/Santa Clara	LabA	282	282	13	ND	7.0	14	5.0	9.0	12	ND	ND	ND	ND	ND	ND
	LabB	195	195	10	3.2	2.3	6.2	2.2	4.8	5.1	0.31	6.3	2.0	0.47	2.8	1.0
	LabC	151	151	ND	ND	12	.	31	ND	24	ND	.	ND	Q 27	10	.
Avg. conc. (pg/L)		245	209	7.6	1.1	7.1	10	13	4.6	14	0.10	3.2	0.67	0.24	4.3	0.50
RSD (%)		119%	32%	89%	173%	68%	55%	125%	98%	70%	173%	141%	173%	141%	121%	141%
Sunnyvale	LabA	428	428	19	6.0	7.0	22	5.0	26	19	ND	10	17	ND	19	ND
	LabB	203	203	20	2.7	2.7	16	2.1	9.4	8.0	0.88	3.9	8.2	1.4	7.5	3.2
	LabC	70	70	ND	ND	ND	.	ND	13	Q 122	ND	.	25	Q 125	ND	.
Avg. conc. (pg/L)		287	234	13	2.9	3.2	19	2.4	16	14	0.29	7.0	17	0.70	8.8	1.6
RSD (%)		106%	77%	87%	104%	109%	22%	106%	54%	58%	1.7	62%	50%	141%	108%	141%

a = average concentration calculated as sum of averages.

b = average concentration calculated by average of Total PCB's.

c = RSD calculated by average of RSD's.

d = RSD calculated by RSD of Total PCB's.

Table 6c. Total PCB concentrations in effluent water samples in November, 1999.

Samples collected by LabA . ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 153	PCB 156	PCB 158	PCB 170	PCB 174	PCB 177	PCB 180	PCB 183	PCB 187	PCB 194	PCB 195	PCB 201	
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	667	667	23	ND	ND	ND	ND	ND	6.0	ND	ND	ND	ND	ND	
	LabB	672	672	68	8.3	4.1	11	4.8	2.8	13	4.1	4.6	0.87	1.7	.	
	LabC	262	262	ND	ND	ND	Q 32	10	.	.	ND	9.0	ND	ND	.	
Avg. conc. (pg/L)		645	534	30	2.8	1.4	5.5	4.9	1.4	10	1.4	4.5	0.29	0.57	ND	
RSD (%)		108%	44%	114%	173%	173%	141%	101%	141%	52%	173%	99%	173%	173%	.	
Palo Alto	LabA	675	675	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	ND	ND	
	LabB	502	502	12	0.75	1.3	1.1	1.0	0.56	2.4	0.77	2.4	0.53	ND	.	
	LabC	167	167	ND	ND	ND	Q 80	9.0	.	ND	ND	ND	3.0	ND	.	
Avg. conc. (pg/L)		499	448	4.0	0.25	0.43	0.55	3.3	0.28	0.80	2.9	0.8	1.2	ND	ND	
RSD (%)		116%	58%	173%	173%	173%	141%	148%	141%	173%	151%	173%	136%	.	.	
San Jose/Santa Clara	LabA	282	282	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	LabB	195	195	21	0.25	0.33	0.83	0.31	ND	1.0	0.32	0.74	0.28	ND	.	
	LabC	151	151	1.0	ND	3.0	Q 190	ND	.	Q 15	ND	ND	Q 15	ND	.	
Avg. conc. (pg/L)		245	209	7.3	0.08	1.1	0.42	0.10	ND	0.50	0.11	0.25	0.14	ND	ND	
RSD (%)		119%	32%	162%	173%	148%	141%	173%	.	141%	173%	173%	141%	.	.	
Sunnyvale	LabA	428	428	21	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	
	LabB	203	203	13	1.7	0.56	1.9	1.9	0.80	3.5	0.93	2.5	1.0	ND	.	
	LabC	70	70	12	ND	ND	M	ND	.	ND	ND	Q 37	ND	ND	.	
Avg. conc. (pg/L)		287	234	15	0.57	0.19	1.0	0.63	0.40	5.2	0.31	1.3	0.33	ND	ND	
RSD (%)		106%	77%	32%	173%	173%	141%	173%	141%	119%	173%	141%	173%	.	.	

a = average concentration calculated as sum of averages.

b = average concentration calculated by average of Total PCB's.

c = RSD calculated by average of RSD's.

d = RSD calculated by RSD of Total PCB's.

Table 7a. Total PCB concentrations in effluent water samples in November, 1999 and February, 2000.

Samples collected by LabB. NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

* Total PCB measured by GC/MS. Lab was unable to quantify individual congeners by their usual method (ECD) because of excess matrix interference.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 008	PCB 018	PCB 028	PCB 031	PCB 033	PCB 044	PCB 049	PCB 052	PCB 060	PCB 066	PCB 070	PCB 074	PCB 087
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	334	334	2.5	7.5	15	9.7	2.8	11	8.5	26	7.1	12	25	8.3	11
	LabB	209	209	NA	7.8	5.9	M	.	3.3	2.2	5.5	1.0	2.8	7.3	1.6	14
	LabC	218	218	14	.	23	Q 200	ND	ND	5.0	ND	Q 99	22	Q 95	8.0	17
Avg. conc. (pg/L)		286	254	8.3	7.7	15	10	1.4	4.8	5.2	11	4.1	12	16	6.0	14
RSD (%)		66%	27%	99%	3%	58%	.	141%	118%	60%	130%	107%	78%	77%	63%	22%
Palo Alto	LabA	309	309	7.3	18	29	21	7.9	17	13	32	8.8	15	23	10	4.9
	LabB	383	383	NA	51	66	M	.	26	19	46	1.0	17	33	10	2.1
	LabC	244	244	Q 220	.	ND	Q 104	ND	22	25	36	14	27	16	33	Q 55
Avg. conc. (pg/L)		360	312	7.3	34	32	21	4.0	22	19	38	7.9	20	24	18	3.5
RSD (%)		63%	22%	.	67%	104%	.	141%	21%	32%	19%	82%	33%	35%	76%	57%
San Jose/Santa Clara	LabA	220	220	6.4	16	19	13	3.2	12	8.4	21	5.1	9.1	15	6.2	4.2
	LabB	193	193	NA	10	27	M	.	7.3	6.2	22	0.27	6.5	11	4.5	5.7
	LabC	154	154	Q 65	.	18	35	ND	ND	ND	3.0	ND	18	38	8.0	3.0
Avg. conc. (pg/L)		216	189	6.4	13	21	24	1.6	6.4	4.9	15	1.8	11	21	6.2	4.3
RSD (%)		69%	17%	.	35%	24%	65%	141%	94%	90%	70%	160%	54%	67%	28%	31%
Sunnyvale	LabA	253	253	3.9	6.6	11	9.0	3.8	8.9	7.9	18	4.1	7.0	13	4.3	4.7
	LabB	285	285	NA	10	28	M	.	13	6.5	23	1.2	6.6	12	2.0	7.4
	LabC	76	76	ND	.	13	ND	ND	ND	7.0	41	ND	Q 102	ND	ND	7.0
Avg. conc. (pg/L)		238	205	2.0	8.4	17	4.5	1.9	7.1	7.1	27	1.8	6.8	8.2	2.1	6.4
RSD (%)		65%	55%	141%	30%	54%	141%	141%	90%	10%	45%	118%	4%	87%	103%	23%
February 2000																
Palo Alto	LabA	214	214	6.7	17	20	15	5.8	12	8.8	20	5.7	8.6	14	6.9	3.6
	LabB	573 *	573 *	NA	29	18	15	.	16	7.9	12	4.3	7.4	12	2.0	2.5
	LabC	131	131	Q 105	ND	ND	Q 91	ND	Q 112	22	29	4.2	28	37	ND	ND
Avg. conc. (pg/L)		195	306	6.7	15	13	15	2.9	14	13	20	4.7	15	21	3.0	2.0
RSD (%)		85%	77%	.	95%	87%	0%	141%	20%	61%	42%	18%	78%	66%	120%	91%
San Jose/Santa Clara	LabA	167	167	3.5	18	15	14	2.0	8.6	6.4	14	4.5	6.2	10	4.3	2.7
	LabB	302	302	NA	28	41	33	.	15	13	21	2.4	8.9	9.3	7.6	5.8
	LabC	32	32	Q 960	ND	ND	ND	ND	ND	ND	Q 230	ND	Q 340	Q 240	ND	ND
Avg. conc. (pg/L)		187	167	4	15	19	16	1.0	8.0	6.5	17	2.3	7.6	10	4.0	2.8
RSD (%)		92%	81%	.	93%	111%	106%	141%	96%	101%	27%	98%	25%	4%	96%	102%
Sunnyvale	LabA	144	144	2.1	5.2	6.1	5.4	1.5	4.3	3.8	9.2	2.2	3.4	6.3	2.4	2.8
	LabB	420 *	420 *	NA	NA	NA	NA	.	NA	NA	NA	NA	NA	NA	NA	NA
	LabC	ND	ND	Q 16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Avg. conc. (pg/L)		77	188	2	2.6	3.1	2.7	0.8	2.2	1.9	4.6	1.1	1.7	3.2	1.2	1.4
RSD (%)		141%	113%	.	141%	141%	141%	141%	141%	141%	141%	141%	141%	141%	141%	141%

a = average concentration calculated as sum of averages.

b = average concentration calculated by average of Total PCB's.

c = RSD calculated by average of RSD's.

d = RSD calculated by RSD of Total PCB's.

Table 7b. Total PCB concentrations in effluent water samples in November, 1999 and February, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

* Total PCB measured by GC/MS. Lab was unable to quantify individual congeners by their usual method (ECD) because of excess matrix interference.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 095	PCB 097	PCB 099	PCB 101	PCB 105	PCB 110	PCB 118	PCB 128	PCB 132	PCB 138	PCB 141	PCB 149	PCB 151
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	334	334	21	6.5	12	33	6.8	32	21	1.4	4.0	13	2.1	10	2.7
	LabB	209	209	15	8.2	13	20	4.2	22	21	1.3	6.2	10	1.8	12	3.3
	LabC	218	218	11	ND	4.0	.	ND	18	48	ND	.	ND	Q 30	17	.
Avg. conc. (pg/L)		286	254	16	4.9	10	27	3.7	24	30	0.90	5.1	7.7	2.0	13	3.0
RSD (%)		66%	27%	32%	88%	50%	35%	94%	30%	52%	87%	31%	89%	10%	27%	13%
Palo Alto	LabA	309	309	12	3.0	6.3	15	4.7	17	12	0.95	2.0	7.8	1.1	5.1	1.1
	LabB	383	383	16	6.0	Q 51	22	3.7	14	16	1.4	3.0	7.3	1.3	6.1	1.7
	LabC	244	244	ND	ND	Q 42	.	29	9.0	9.0	ND	.	9.0	Q 25	Q 58	.
Avg. conc. (pg/L)		360	312	9.4	3.0	6.3	18	12	13	12	0.8	2.5	8.0	1.2	5.6	1.4
RSD (%)		63%	22%	90%	100%	.	25%	115%	30%	27%	90%	28%	11%	13%	13%	29%
San Jose/Santa Clara	LabA	220	220	9.1	2.5	4.4	12	3.1	13	8.8	0.64	1.5	6.8	0.87	4.6	1.3
	LabB	193	193	13	4.5	6.3	16	1.9	6.2	10	1.4	2.0	6.0	0.87	5.7	1.4
	LabC	154	154	ND	ND	5.0	.	ND	ND	Q 27	ND	.	ND	ND	4.0	.
Avg. conc. (pg/L)		216	189	7.5	2.3	5.2	14	1.7	6.4	10	0.68	1.7	4.3	0.58	4.8	1.4
RSD (%)		69%	17%	91%	97%	19%	20%	93%	102%	11%	103%	19%	87%	87%	18%	7%
Sunnyvale	LabA	253	253	12	2.8	5.6	16	3.7	16	10	1.3	3.8	17	3.0	11	3.2
	LabB	285	285	21	5.0	8.9	24	2.7	14	13	2.4	5.9	14	3.0	14	4.0
	LabC	76	76	ND	ND	Q 22	.	ND	ND	Q 170	Q 410	ND	ND	ND	ND	.
Avg. conc. (pg/L)		238	205	11	2.6	7.3	20	2.1	15	11	1.2	4.9	10	2.0	8.2	3.6
RSD (%)		65%	55%	95%	96%	32%	28%	90%	12%	16%	97%	31%	88%	87%	88%	16%
February 2000																
Palo Alto	LabA	214	214	7.2	2.2	3.8	10	3.2	11	8.1	0.66	1.3	6.0	0.94	3.7	0.90
	LabB	573 *	573 *	4.5	8.1	4.0	5.7	2.3	8.7	5.3	1.1	3.6	2.1	0.65	2.3	3.8
	LabC	131	131	ND	ND	Q 43	ND	1.5	ND	ND	ND	.	ND	Q 34	8.4	ND
Avg. conc. (pg/L)		195	306	3.9	3.4	3.9	5.2	2.3	6.6	4.5	0.59	2.5	2.7	0.80	4.8	1.6
RSD (%)		85%	77%	93%	122%	4%	95%	36%	88%	92%	94%	66%	113%	26%	67%	127%
San Jose/Santa Clara	LabA	167	167	5.3	1.6	3.3	7.3	2.4	8.1	6.7	0.63	1.2	5.5	0.79	3.1	0.84
	LabB	302	302	18	5.9	5.3	13	8.3	12	10	0.65	6.4	6.2	2.1	7.1	3.1
	LabC	32	32	Q 110	ND	ND	ND	ND	ND	ND	ND	16	.	12	ND	ND
Avg. conc. (pg/L)		187	167	11	2.5	2.9	6.7	3.6	6.8	5.7	5.8	3.8	8.0	0.9	3.4	1.3
RSD (%)		92%	81%	76%	122%	93%	96%	120%	92%	92%	154%	97%	47%	109%	105%	122%
Sunnyvale	LabA	144	144	5.6	1.7	3.3	9.0	2.5	9.0	7.0	0.9	2.1	10	1.9	7.1	2.0
	LabB	420 *	420 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LabC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Avg. conc. (pg/L)		77	188	2.8	0.85	1.7	4.5	1.3	4.5	3.5	0.44	2.1	5.0	1.0	3.6	1.0
RSD (%)		141%	113%	141%	141%	141%	141%	141%	141%	141%	141%	.	141%	141%	141%	141%

a = average concentration calculated as sum of averages.

b = average concentration calculated by average of Total PCB's.

c = RSD calculated by average of RSD's.

d = RSD calculated by RSD of Total PCB's.

Table 7c. Total PCB concentrations in effluent water samples in November, 1999 and February, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

* Total PCB measured by GC/MS. Lab was unable to quantify individual congeners by their usual method (ECD) because of excess matrix interference.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 153	PCB 156	PCB 158	PCB 170	PCB 174	PCB 177	PCB 180	PCB 183	PCB 187	PCB 194	PCB 195	PCB 201
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999															
Fairfield-Suisun	LabA	334	334	11	1.2	1.9	0.69	1.2	0.71	1.9	0.86	1.9	0.35	ND	0.20
	LabB	209	209	11	0.51	1.4	0.43	0.85	0.42	2.2	0.59	2.3	ND	ND	.
	LabC	218	218	16	ND	ND	Q 1070	3.0	.	Q 224	4.0	8.0	ND	ND	.
Avg. conc. (pg/L)		286	254	13	0.57	1.1	0.56	1.7	0.57	2.1	1.8	4.1	0.12	ND	0.20
RSD (%)		66%	27%	22%	106%	90%	33%	69%	36%	11%	104%	83%	173%	.	.
Palo Alto	LabA	309	309	6.5	0.90	1.2	0.59	0.94	0.48	1.5	0.56	1.2	0.24	ND	ND
	LabB	383	383	7.7	0.31	0.37	0.67	1.1	0.80	2.1	0.34	1.7	0.30	ND	.
	LabC	244	244	ND	ND	ND	Q 355	7.0	.	Q 20	ND	ND	8.0	ND	.
Avg. conc. (pg/L)		360	312	4.7	0.40	0.52	0.63	3.0	0.64	1.8	0.30	1.0	2.8	ND	ND
RSD (%)		63%	22%	88%	113%	117%	9%	114%	35%	25%	94%	91%	157%	.	.
San Jose/Santa Clara	LabA	220	220	5.0	0.71	0.85	0.58	0.70	0.29	1.7	0.71	1.5	0.32	ND	ND
	LabB	193	193	7.2	0.42	0.31	1.1	0.87	0.32	2.6	0.39	2.2	0.34	0.46	.
	LabC	154	154	ND	ND	Q 29	8.0	ND	.	Q 42	ND	3.0	ND	11	.
Avg. conc. (pg/L)		216	189	4.1	0.38	0.58	3.2	0.52	0.31	2.2	0.37	2.2	0.22	3.8	ND
RSD (%)		69%	17%	91%	95%	66%	128%	88%	7%	30%	97%	33%	87%	163%	.
Sunnyvale	LabA	253	253	14	0.95	3.4	2.8	4.8	2.4	5.9	3.4	6.1	0.96	0.46	0.44
	LabB	285	285	15	1.3	0.69	3.5	4.5	2.2	8.7	2.4	6.2	1.3	0.46	.
	LabC	76	76	ND	ND	ND	8.0	Q 270	.	ND	ND	Q 180	ND	Q 47	.
Avg. conc. (pg/L)		238	205	10	0.75	1.4	4.8	4.7	2.3	4.9	1.9	6.2	0.75	0.46	0.44
RSD (%)		65%	55%	87%	90%	132%	59%	4%	6%	91%	90%	1%	89%	0%	.
February 2000															
Palo Alto	LabA	214	214	4.9	0.64	0.74	0.48	0.70	0.35	1.3	0.5	0.91	0.23	0.062	0.062
	LabB	573 *	573 *	2.2	ND	ND	0.36	0.52	ND	0.62	0.62	0.46	ND	ND	.
	LabC	131	131	Q 27	ND	ND	Q 130	Q 25	ND	ND	ND	ND	1.1	ND	.
Avg. conc. (pg/L)		195	306	3.6	0.21	0.25	0.42	0.61	0.12	0.64	0.38	0.46	0.46	0.021	0.062
RSD (%)		85%	77%	54%	173%	173%	20%	21%	173%	102%	88%	100%	132%	173%	.
San Jose/Santa Clara	LabA	167	167	4.8	0.61	0.69	0.64	0.80	0.37	1.5	0.53	1.2	0.32	0.08	ND
	LabB	302	302	7.2	1.1	0.5	1.3	1.4	0.93	3.2	1.2	1.4	0.6	1.0	.
	LabC	32	32	ND	ND	Q 9.3	ND	ND	ND	Q 1100	ND	ND	ND	3.9	.
Avg. conc. (pg/L)		187	167	4.0	0.58	0.59	0.65	0.75	0.43	2.4	0.58	0.87	0.30	1.6	ND
RSD (%)		92%	81%	92%	97%	25%	101%	97%	108%	51%	104%	87%	97%	121%	.
Sunnyvale	LabA	144	144	10	0.77	1.0	1.9	2.3	1.2	4.4	1.5	3.5	0.84	0.32	0.21
	LabB	420 *	420 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	.
	LabC	ND	ND	ND	ND	ND	ND	ND	ND	Q 210	ND	ND	ND	ND	.
Avg. conc. (pg/L)		77	188	4.9	0.39	0.50	1.0	1.2	0.6	4.4	0.75	1.8	0.42	0.16	0.21
RSD (%)		141%	113%	141%	141%	141%	141%	141%	141%	.	141%	141%	141%	141%	.

a = average concentration calculated as sum of averages.
 b = average concentration calculated by average of Total PCB's.
 c = RSD calculated by average of RSD's.
 d = RSD calculated by RSD of Total PCB's.

Table 8a. Total PCB concentrations in effluent water samples in May and July, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data. * Total PCB measured by GC/MS. Lab was unable to quantify individual congeners by their usual method (ECD) because of excess matrix interference.

Effluent Site	Analyzing Lab	Total PCBs (a,c)		Total PCBs (b,d)													
		pg/L	pg/L	PCB 008	PCB 018	PCB 028	PCB 031	PCB 033	PCB 044	PCB 049	PCB 052	PCB 060	PCB 066	PCB 070	PCB 074	PCB 087	
May 2000																	
Fairfield-Suisun	LabA	127	127	3.2	18	18	11	3.1	6.1	4.7	10	3.8	4.9	6.7	3.1	1.4	
	LabB	225	225	13	11	29	26	.	10	11	21	M	5.8	14	5.7	2.7	
	LabC	28	28	Q 986	ND	ND	Q 646	ND	Q 90	ND	ND	Q 89	Q 48	Q 110	ND	ND	
Avg. conc. (pg/L)		149	127	8.1	10	16	18	1.6	8.0	5.1	10	3.8	5.3	10	2.9	1.4	
RSD (%)		86%	78%	86%	95%	93%	56%	141%	34%	104%	102%	11%	49%	97%	98%		
Palo Alto	LabA	252	252	6.5	18	21	17	6.3	15	13	27	6.5	10	15	6.4	4.3	
	LabB	533	533	Q 59	57	74	56	.	31	38	49	M	M	35	15	10	
	LabC	177	177	Q 65	ND	ND	92	ND	5.4	ND	ND	ND	23	19	ND	ND	
Avg. conc. (pg/L)		338	321	6.5	25	32	55	3	17	17	25	3.3	16	23	7.1	4.9	
RSD (%)		99%	58%		117%	120%	68%	141%	76%	114%	97%	141%	59%	47%	106%	107%	
San Jose/Santa Clara	LabA	210	210	10	28	23	19	5.1	11	8.5	18	5.1	6.8	11	4.6	ND	
	LabB	271	271	NA	38	33	Q 83	.	16	14	25	7.4	8.4	17	6.2	4.9	
	LabC	33	33	Q 1930	ND	ND	ND	ND	ND	ND	Q 566	ND	Q 184	Q 621	Q 962	ND	
Avg. conc. (pg/L)		205	171	10	22	19	10	2.6	8.9	7.6	21	4.2	7.6	14	5.4	1.6	
RSD (%)		91%	72%		90%	91%	141%	141%	91%	95%	22%	91%	15%	31%	21%	173%	
Sunnyvale	LabA	135	135	1.3	5.2	8.3	7.0	1.8	5.2	.	11	2.5	3.4	7.4	2.5	2.6	
	LabB	179	179	15	M	M	M	.	14	16	23	M	M	M	M	5.0	
	LabC	36	36	ND	ND	ND	ND	ND	ND	ND	ND	ND	Q 53	Q 109	ND	ND	
Avg. conc. (pg/L)		137	117	5.5	2.6	4.2	3.5	0.90	6.4	8.1	11	1.3	3.4	7.4	1.3	2.5	
RSD (%)		105%	63%	153%	141%	141%	141%	141%	110%	141%	102%	141%			141%	99%	
July 2000																	
Palo Alto	LabA	306	306	13	29	32	23	9.1	16	12	28	7.8	14	20	9.3	4.7	
	LabB	203	203	10	6.6	18	Q 2.4	.	1.7	29	15	7.5	4.2	13	14	4.1	
	LabC	198	198	16	.	ND	28.9	ND	16	ND	17	10	ND	ND	ND	5.6	
Avg. conc. (pg/L)		252	236	13	18	17	26	4.6	11	14	20	8.4	6.1	11	7.7	4.8	
RSD (%)		87%	26%	26%	89%	97%	16%	141%	74%	107%	35%	15%	118%	93%	92%	16%	
San Jose/Santa Clara	LabA	224	224	7.2	29	22	22	3.6	11	8.4	18	6.4	8.4	13	6.1	3.0	
	LabB	191	191	8.2	13	20	22	.	7.0	13	11	7.1	5.0	8.2	2.7	3.0	
	LabC	149	149	52	.	ND	ND	ND	ND	5.7	14	8.8	1.6	ND	4.8	7.9	
Avg. conc. (pg/L)		197	188	23	21	14	15	1.8	6.0	8.9	14	7.4	5.0	7.1	4.5	4.6	
RSD (%)		88%	20%	114%	52%	87%	87%	141%	93%	39%	24%	17%	68%	93%	38%	61%	
Sunnyvale	LabA	115	115	2.9	3.2	6.1	4.9	0.94	3.0	3.0	5.8	1.5	2.2	4.2	1.6	2.3	
	LabB	252 *	252 *	NA	NA	NA	NA	.	NA	NA	NA	NA	NA	NA	NA	NA	
	LabC	107	107	7.9	.	ND	ND	ND	ND	51.1	0.24	ND	4.4	35	Q 59	ND	
Avg. conc. (pg/L)		116	158	5.4	3.2	3.1	2.5	0.47	1.5	27	3.0	0.75	3.3	20	1.6	1.2	
RSD (%)		131%	52%	65%		141%	141%	141%	141%	126%	130%	141%	47%	111%		141%	

a = average concentration calculated as sum of averages.
 b = average concentration calculated by average of Total PCB's.
 c = RSD calculated by average of RSD's.
 d = RSD calculated by RSD of Total PCB's.

Table 8b. Total PCB concentrations in effluent water samples in May and July, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.
 * Total PCB measured by GC/MS. Lab was unable to quantify individual congeners by their usual method (ECD) because of excess matrix interference.

Effluent Site	Analyzing Lab	Total PCBs (a,c)	Total PCBs (b,d)	PCB 095	PCB 097	PCB 099	PCB 101	PCB 105	PCB 110	PCB 118	PCB 128	PCB 132	PCB 138	PCB 141	PCB 149	PCB 151
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
May 2000																
Fairfield-Suisun	LabA	127	127	3.1	1.1	1.8	4.5	1.7	5.0	4.5	0.41	0.67	3.2	0.35	1.5	0.56
	LabB	225	225	16	10	M	8.7	2.6	13	6.1	0.61	0.79	2.8	0.89	3.5	3.9
	LabC	28	28	ND	ND	ND	13	0.51	3.6	ND	ND	.	Q 74	ND	Q 52	ND
Avg. conc. (pg/L)		149	127	6.3	3.7	0.90	8.8	1.6	7.2	3.5	0.34	0.73	3.0	0.4	2.5	1.5
RSD (%)		86%	78%	133%	148%	141%	50%	66%	70%	90%	91%	12%	9%	108%	57%	142%
Palo Alto	LabA	252	252	10	2.8	4.7	11	3.8	14	11	1.1	1.5	7.9	1.2	4.2	1.0
	LabB	533	533	M	38	11	M	4.3	27	26	3.4	5.2	8.9	2.3	11	10
	LabC	177	177	ND	ND	3.3	ND	2.6	0.44	ND	4.8	.	0.22	ND	ND	ND
Avg. conc. (pg/L)		338	321	4.8	14	6.2	5.5	3.6	14	12	3.1	3.4	5.7	1.2	5.0	3.7
RSD (%)		99%	58%	141%	156%	63%	141%	25%	96%	105%	60%	78%	84%	98%	109%	151%
San Jose/Santa Clara	LabA	210	210	6.7	1.9	3.2	7.9	2.3	10	7.2	0.50	ND	5.3	0.76	3.0	0.81
	LabB	271	271	24	5.0	4.3	14	2.3	11	9.0	0.70	2.8	3.3	1.1	6.3	3.2
	LabC	33	33	Q 522	ND	21	ND	ND	ND	ND	Q 28	.	12	ND	ND	ND
Avg. conc. (pg/L)		205	171	15	2.3	10	7.2	1.5	6.9	5.4	0.60	1.4	6.8	0.61	3.1	1.3
RSD (%)		91%	72%	79%	110%	105%	96%	87%	87%	88%	24%	141%	65%	90%	102%	124%
Sunnyvale	LabA	135	135	5.6	1.5	2.7	8.3	2.3	8.1	6.7	0.93	2.0	8.5	1.5	5.5	1.5
	LabB	179	179	M	5.8	5.4	M	2.9	14	11	1.1	4.1	7.5	2.9	13	4.2
	LabC	36	36	ND	ND	ND	ND	Q 57	ND	ND	Q 60	.	30	ND	ND	ND
Avg. conc. (pg/L)		137	117	2.8	2.4	2.7	4.2	2.6	7.5	5.8	1.0	3.1	15	1.5	6.0	1.9
RSD (%)		105%	63%	141%	124%	100%	141%	16%	96%	93%	11%	49%	84%	99%	104%	112%
July 2000																
Palo Alto	LabA	306	306	7.5	3.1	4.9	12	4.0	13	11.0	1.1	2.1	8.3	1.2	4.9	1.4
	LabB	203	203	15	7.8	2.8	5.0	1.6	23	4.7	0.60	1.2	2.4	0.31	3.6	4.0
	LabC	198	198	12	40	10	12	ND	ND	ND	ND	.	4.2	6.1	9.0	2.7
Avg. conc. (pg/L)		252	236	12	17	6.0	10	1.9	12	5.2	0.57	1.6	5.0	2.5	5.8	2.7
RSD (%)		87%	26%	34%	118%	64%	42%	107%	97%	105%	97%	41%	61%	123%	48%	48%
San Jose/Santa Clara	LabA	224	224	4.4	2.0	3.3	8.7	2.4	7.9	7.6	0.66	1.8	6.5	1.2	3.7	1.2
	LabB	191	191	21	3.9	1.9	6.5	1.5	6.9	3.7	0.56	1.5	2.5	0.84	2.9	1.4
	LabC	149	149	5.2	16	ND	ND	ND	1.3	ND	ND	.	ND	ND	ND	7.6
Avg. conc. (pg/L)		197	188	10	7.4	1.7	5.1	1.3	5.4	3.8	0.41	1.7	3.0	0.68	2.2	3.4
RSD (%)		88%	20%	90%	105%	95%	89%	94%	66%	101%	87%	12%	109%	91%	88%	107%
Sunnyvale	LabA	115	115	2.6	1.4	2.5	6.8	2.1	6.3	5.8	0.88	2.3	9.0	1.8	4.4	1.2
	LabB	252 *	252 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	LabC	107	107	Q 154	ND	ND	ND	ND	ND	ND	ND	.	ND	ND	6.9	ND
Avg. conc. (pg/L)		116	158	2.6	0.70	1.3	3.4	1.1	3.2	2.9	0.44	2.3	4.5	0.90	5.6	0.60
RSD (%)		131%	52%		141%	141%	141%	141%	141%	141%	141%		141%	141%	31%	141%

a = average concentration calculated as sum of averages.
 b = average concentration calculated by average of Total PCB's.
 c = RSD calculated by average of RSD's.
 d = RSD calculated by RSD of Total PCB's.

Table 8c. Total PCB concentrations in effluent water samples in May and July, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

* Total PCB measured by GC/MS. Lab was unable to quantify individual congeners by their usual method (ECD) because of excess matrix interference.

Effluent Site	Analyzing Lab	Total PCBs (a,c)		Total PCBs (b,d)												
		pg/L	pg/L	PCB 153	PCB 156	PCB 158	PCB 170	PCB 174	PCB 177	PCB 180	PCB 183	PCB 187	PCB 194	PCB 195	PCB 201	
May 2000																
Fairfield-Suisun	LabA	127	127	2.1	0.32	0.50	0.41	0.46	0.17	0.46	0.21	0.30	0.08	ND	ND	
	LabB	225	225	3.0	0.56	1.1	0.54	0.49	1.2	0.56	0.51	0.26	ND	0.35		
	LabC	28	28	6.4	ND	ND	Q 365	Q 31	Q 41	ND	ND	ND	ND	4.2		
Avg. conc. (pg/L)		149	127	3.9	0.29	0.53	0.48	0.48	0.69	0.34	0.2	0.19	0.03	1.5	ND	
RSD (%)		86%	78%	59%	96%	103%	19%	4%	106%	88%	107%	87%	173%	154%		
Palo Alto	LabA	252	252	6.0	1.0	1.0	0.90	0.75	0.38	1.2	0.56	1.0	0.30	0.14	ND	
	LabB	533	533	7.7	1.7	0.36	0.65	1.2	0.59	3.2	2.3	2.2	ND	0.20		
	LabC	177	177	11	ND	ND	Q 56	2.6	ND	ND	ND	ND	11	2.4		
Avg. conc. (pg/L)		338	321	8.2	0.87	0.45	0.78	1.5	0.32	1.5	0.94	1.1	3.9	0.90	ND	
RSD (%)		99%	58%	30%	96%	112%	23%	64%	92%	110%	125%	102%	167%	141%		
San Jose/Santa Clara	LabA	210	210	4.3	0.60	0.63	0.60	1.0	0.28	1.5	0.47	1.1	0.41	ND	ND	
	LabB	271	271	5.8	0.84	ND	0.72	1.0	0.84	2.5	1.1	1.5	ND	0.19		
	LabC	33	33	ND	ND	ND	Q 69	Q 45	ND	Q 1920	ND	ND	ND	ND		
Avg. conc. (pg/L)		205	171	3.4	0.48	0.21	0.66	1.0	0.37	2.0	0.52	0.9	0.14	0.063	ND	
RSD (%)		91%	72%	89%	90%	173%	13%	4%	115%	35%	105%	90%	173%	173%		
Sunnyvale	LabA	135	135	7.0	0.73	1.0	1.7	1.8	0.89	3.5	1.4	2.7	0.60	0.24	0.15	
	LabB	179	179	13	1.0	ND	2.2	3.2	1.8	6.2	1.8	4.3	ND	0.47		
	LabC	36	36	ND	ND	ND	Q 41	ND	ND	ND	Q 55	ND	Q 22	5.8		
Avg. conc. (pg/L)		137	117	6.7	0.58	0.33	1.9	1.7	0.89	3.2	1.6	2.3	0.30	2.2	0.15	
RSD (%)		105%	63%	98%	90%	173%	17%	96%	100%	96%	18%	93%	141%	145%		
July 2000																
Palo Alto	LabA	306	306	6.9	0.72	1.2	0.64	0.75	0.32	1.2	0.51	1.1	ND	ND	0.067	
	LabB	203	203	2.7	0.35	0.65	2.5	0.40	0.35	0.81	ND	0.25	ND	ND		
	LabC	198	198	6.7	ND	ND	ND	1.3	ND	ND	ND	ND	0.1	0.8	ND	
Avg. conc. (pg/L)		252	236	5.4	0.36	0.62	1.1	0.80	0.22	0.67	0.17	0.45	0.04	0.25	0.034	
RSD (%)		87%	26%	44%	101%	97%	124%	54%	87%	91%	173%	128%	173%	141%		
San Jose/Santa Clara	LabA	224	224	6.5	0.54	0.88	0.75	1.0	0.44	1.6	0.62	1.4	0.37	ND	0.095	
	LabB	191	191	3.1	2.0	0.35	7.2	0.51	0.76	1.1	0.48	0.71	ND	ND		
	LabC	149	149	14.0	ND	ND	Q 42	ND	1.0	ND	ND	3.6	ND	4.4	ND	
Avg. conc. (pg/L)		197	188	7.9	0.85	0.41	4.0	0.50	0.73	0.90	0.37	1.9	0.12	1.5	0.048	
RSD (%)		88%	20%	71%	122%	108%	115%	99%	38%	91%	89%	79%	173%	173%	141%	
Sunnyvale	LabA	115	115	8.3	0.80	0.88	1.9	2.5	1.4	4.1	1.2	3.1	1.3	0.55	0.16	
	LabB	252 *	252 *	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
	LabC	107	107	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.4	
Avg. conc. (pg/L)		116	158	4.2	0.40	0.44	1.0	1.3	0.70	2.1	0.60	1.6	0.65	0.28	0.79	
RSD (%)		131%	52%	141%	141%	141%	141%	141%	141%	141%	141%	141%	141%	141%	113%	

a = average concentration calculated as sum of averages.

b = average concentration calculated by average of Total PCB's.

c = RSD calculated by average of RSD's.

d = RSD calculated by RSD of Total PCB's.

Table 9a. Total pesticide concentrations in effluent water samples in November, 1999.

Samples collected by LabA . Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. ND = below detection limits, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals.

Effluent Site	Analyzing Lab	alpha-Chlordane	gamma-Chlordane	cis-Nonachlor	trans-Nonachlor	Heptachlor	Heptachlor Epoxide	Oxychlordane	Total Chlordanes	o,p'-DDD	o,p'-DDE	o,p'-DDT	p,p'-DDD	p,p'-DDE	p,p'-DDT	Total DDTs
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	240	230	34	140	ND	ND	310	954	25	19	86	39	280	19	468
	LabB	120	37	22	90	Q 160	110	680	1059	25	Q 880	Q 180	75	360	11	471
	LabC	ND	ND	124	34	ND	80	ND	238	ND	ND	ND	35	ND	9.0	44
Avg. conc. (pg/L)		120	89	60	88	ND	63	330	750	17	10	43	50	213	13	328
RSD (%)		100%	139%	93%	60%	.	90%	103%	60%	87%	141%	141%	44%	89%	41%	75%
Palo Alto	LabA	420	420	32	170	ND	122	68	1232	39	7.6	6.8	55	200	54	362
	LabB	Q 860	310	20	150	92	310	82	964	64	76	32	160	340	63	735
	LabC	8.0	2.0	6.0	15	13	3.0	ND	47	8.0	5.0	35	10	9.0	ND	67
Avg. conc. (pg/L)		214	244	19	112	35	145	50	748	37	30	25	75	183	39	388
RSD (%)		136%	89%	67%	76%	142%	107%	88%	83%	76%	136%	63%	103%	91%	87%	86%
San Jose/Santa Clara	LabA	240	230	28	99	ND	75	ND	672	40	ND	22	48	150	31	291
	LabB	190	220	100	58	130	330	120	1148	14	91	59	270	120	3.4	557
	LabC	12	ND	24	ND	32	15	ND	83	24	42	77	382	33	ND	558
Avg. conc. (pg/L)		147	150	51	52	54	140	40	634	26	67	53	233	101	11	469
RSD (%)		81%	87%	84%	95%	125%	119%	173%	84%	50%	52%	53%	73%	60%	148%	33%
Sunnyvale	LabA	110	120	17	55	ND	ND	620	922	33	6.6	ND	19	140	ND	199
	LabB	77	97	79	26	12	130	340	761	4.2	14	Q 350	24	210	18	270
	LabC	171	ND	73	97	ND	ND	ND	341	Q 122	Q 231	Q 129	ND	85	ND	85
Avg. conc. (pg/L)		119	72	56	59	4.0	43	320	675	19	10	ND	14	145	6.0	185
RSD (%)		40%	88%	61%	60%	173%	173%	97%	44%	109%	51%	.	88%	43%	173%	51%

Table 9b. Total pesticide concentrations in effluent water samples in November, 1999.

Samples collected by LabA . NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

Effluent Site	Analyzing Lab	Endosulfan-alpha	Endosulfan-beta	Endosulfan Sulfate	Total Endosulfans	alpha-BHC	beta-BHC	gamma-BHC	Aldrin	Dieldrin	Endrin	Hexachlorobenzene	Toxaphene	2,4,6-Trichlorophenol
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999														
Fairfield-Suisun	LabA	ND	ND	130	130	69	140	Q 4200	200	104	ND	110	ND	.
	LabB	ND	ND	98	98	92	Q 4100	140	.	210	260	350	.	.
	LabC	.	.	.	.	ND	ND	785	138	ND	34	61	.	.
Avg. conc. (pg/L)		ND	ND	114	114	54	70	463	169	105	98	174	ND	.
RSD (%)		.	.	20%	20%	89%	141%	99%	26%	100%	144%	89%	.	.
Palo Alto	LabA	ND	ND	467	467	110	540	2500	96	439	ND	380	350	.
	LabB	NA	ND	220	220	190	1100	1400	.	440	ND	370	.	.
	LabC	.	.	.	.	7.0	ND	126	ND	ND	ND	54	.	.
Avg. conc. (pg/L)		ND	ND	344	344	102	547	1342	48	293	ND	268	350	.
RSD (%)		.	.	51%	51%	90%	101%	89%	141%	87%	.	69%	.	.
San Jose/Santa Clara	LabA	ND	ND	337	337	110	600	7900	ND	213	ND	250	240	560000
	LabB	28	22	140	190	310	440	2700	.	140	190	120	.	.
	LabC	.	.	.	.	ND	ND	M	51	ND	ND	67	.	.
Avg. conc. (pg/L)		14	11	239	264	140	347	5300	26	118	63	146	240	560000
RSD (%)		141%	141%	58%	39%	112%	90%	69%	141%	92%	173%	65%	.	.
Sunnyvale	LabA	ND	ND	63	63	80	610	1200	ND	50	ND	160	ND	.
	LabB	85	ND	150	235	46	670	700	.	52	90	460	.	.
	LabC	.	.	.	.	ND	967	ND	507	ND	ND	343	.	.
Avg. conc. (pg/L)		43	ND	107	149	42	749	633	254	34	30	321	ND	.
RSD (%)		141%	.	58%	82%	96%	26%	95%	141%	87%	173%	47%	.	.

Table 10a. Total pesticide concentrations in effluent water samples in November, 1999 and February, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals.

Effluent Site	Analyzing Lab	alpha-Chlordane	gamma-Chlordane	cis-Nonachlor	trans-Nonachlor	Heptachlor	Heptachlor Epoxide	Oxychlordane	Total Chlordanes	o,p'-DDD	o,p'-DDE	o,p'-DDT	p,p'-DDD	p,p'-DDE	p,p'-DDT	Total DDTs
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999																
Fairfield-Suisun	LabA	69	57	9.2	35	1.4	60	11	242	6.5	1.6	2.2	13	83	8.3	115
	LabB	74	199	17	58	94	118	202	762	72	12	20	650	112	39	905
	LabC	23	ND	5.0	ND	13	44	9.0	94	22	19	34	14	10	12	111
Avg. conc. (pg/L)		55	85	10	31	36	74	74	366	34	11	19	226	68	20	377
RSD (%)		51%	120%	58%	94%	140%	53%	150%	96%	102%	81%	85%	163%	77%	85%	121%
Palo Alto	LabA	190	160	13	66	8.4	34	16	487	10	ND	6.3	19	90	20	145
	LabB	620	235	20	134	102	Q 570	248	1359	21	104	Q 74	182	236	59	602
	LabC	14	43	ND	19	37	16	9.0	138	13	23	Q 51	22	25	ND	83
Avg. conc. (pg/L)		275	146	11	73	49	25	91	661	15	42	6.3	74	117	26	277
RSD (%)		113%	66%	93%	79%	98%	50%	149%	95%	39%	129%	.	125%	92%	114%	102%
San Jose/Santa Clara	LabA	140	130	14	56	4.9	40	9.1	394	16	2.2	6.9	24	96	22	167
	LabB	590	800	114	139	Q 871	Q 920	160	1803	81	42	63	480	95	113	874
	LabC	5	ND	ND	ND	ND	23	ND	28	26	ND	12	44	5.0	20	107
Avg. conc. (pg/L)		245	310	43	65	2	31	56	742	41	15	27	183	65	52	383
RSD (%)		125%	138%	146%	108%	141%	38%	159%	126%	85%	160%	114%	141%	80%	103%	111%
Sunnyvale	LabA	45	44	7.4	23	0.8	5.4	2.1	128	5.9	ND	1.6	10	58	4.3	80
	LabB	66	98	30	411	30	84	109	828	1.2	12	Q 144	26	145	47	232
	LabC	ND	6.0	223	ND	ND	ND	2.0	231	Q 97	ND	5.0	ND	174	ND	179
Avg. conc. (pg/L)		37	49	87	145	10	30	38	396	4	4.2	3	12	126	17	163
RSD (%)		91%	94%	136%	160%	167%	158%	164%	96%	94%	173%	73%	110%	48%	152%	47%
February 2000																
Palo Alto	LabA	150	130	10	55	5.6	100	11	461	12	1.5	3.2	16	60	20	113
	LabB	190	ND	M	NA	Q 459	Q 272	87	277	96	ND	Q 130	920	67	76	1159
	LabC	27	ND	52	83	Q 258	36	85	283	ND	13	Q 201	44	ND	ND	57
Avg. conc. (pg/L)		122	43	31	69	5.6	68	61	340	36	4.8	3.2	327	42	32	443
RSD (%)		69%	173%	96%	28%	67%	71%	31%	145%	147%	.	157%	87%	123%	140%	
San Jose/Santa Clara	LabA	110	110	17	58	6.1	16	ND	317	17	ND	5.4	24	76	23	145
	LabB	107	ND	66	85	Q 350	Q 230	Q 54.9	258	130	0.83	37	1460	218	98	1944
	LabC	70	ND	ND	ND	58	ND	ND	129	ND	ND	Q 136	23	ND	103	125
Avg. conc. (pg/L)		96	37	28	48	32	8.1	ND	235	49	0.28	21	502	98	75	738
RSD (%)		23%	173%	124%	91%	115%	141%	41%	144%	173%	105%	165%	113%	60%	141%	
Sunnyvale	LabA	48	47	10	33	1.1	4.3	4.3	147	8.9	ND	3.7	13	54	10	90
	LabB	72	ND	8.9	NA	Q 47	Q 29	7.4	88	34	NA	NA	37	NA	4.9	76
	LabC	ND	ND	ND	ND	ND	ND	ND	ND	12	ND	6.0	37	ND	ND	55
Avg. conc. (pg/L)		40	16	6.1	17	0.6	2.2	3.9	79	18	ND	4.8	29	27	5.0	73
RSD (%)		92%	173%	87%	141%	141%	141%	95%	94%	76%	.	33%	48%	141%	101%	24%

Table 10b. Total pesticide concentrations in effluent water samples in November, 1999 and February, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

Effluent Site	Analyzing Lab	Endosulfan-alpha	Endosulfan-beta	Endosulfan Sulfate	Total Endosulfans	alpha-BHC	beta-BHC	gamma-BHC	Aldrin	Dieldrin	Endrin	Hexachlorobenzene	Toxaphene	2,4,6-Trichlorophenol
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
November 1999														
Fairfield-Suisun	LabA	ND	ND	92	92	35	67	2900	ND	156	ND	.	ND	.
	LabB	54	27	18	99	13	550	1407	.	107	Q 270	91	.	.
	LabC	.	.	.	.	ND	11	490	ND	32	10	.	.	.
Avg. conc. (pg/L)		27	14	55	96	16	209	1599	ND	98	5.0	91	ND	.
RSD (%)		141%	141%	95%	5%	111%	142%	76%	.	64%	141%	.	.	.
Palo Alto	LabA	ND	ND	138	138	53	230	1900	ND	135	ND	.	ND	.
	LabB	110	217	57	384	171	Q 34200	1517	.	251	Q 450	471	.	.
	LabC	.	.	.	.	14	42	86	ND	19	3.0	.	.	.
Avg. conc. (pg/L)		55	109	98	261	79	136	1168	ND	135	1.5	471	ND	.
RSD (%)		141%	141%	59%	67%	103%	98%	82%	.	86%	141%	.	.	.
San Jose/Santa Clara	LabA	ND	ND	210	210	78	710	9400	0.75	90	ND	.	ND	.
	LabB	ND	ND	5.0	5.0	154	3100	15016	.	454	Q 500	1008	.	1162000
	LabC	.	.	.	.	ND	19	132	14	22	ND	.	.	.
Avg. conc. (pg/L)		ND	ND	108	108	77	1276	8183	7.4	189	ND	1008	ND	1162000
RSD (%)		.	.	135%	135%	100%	127%	92%	127%	123%	.	.	.	.
Sunnyvale	LabA	ND	4.2	28	33	33	280	660	ND	28	ND	.	ND	.
	LabB	13	ND	185	198	19	330	570	.	32	Q 259	240	.	.
	LabC	.	.	.	.	ND	15	31	18	ND	91	.	.	.
Avg. conc. (pg/L)		6.5	2.1	107	115	17	208	420	9.0	20	46	240	ND	.
RSD (%)		141%	141%	104%	101%	96%	81%	81%	141%	87%	141%	.	.	.
February 2000														
Palo Alto	LabA	ND	ND	417	417	40	330	1500	0.64	248	ND	220	ND	.
	LabB	15	Q 890	360	375	Q 566	716	1480	.	270	Q 550	180	.	.
	LabC	.	.	.	.	36	43	ND	48.77	60	22	74	.	.
Avg. conc. (pg/L)		7.5	ND	389	396	38	363	993	25	193	11	158	ND	.
RSD (%)		141%	.	10%	7%	8%	93%	87%	138%	60%	141%	48%	.	.
San Jose/Santa Clara	LabA	ND	ND	134	134	47	340	4600	ND	64	ND	71	ND	100000
	LabB	ND	ND	230	230	Q 2380	630	2800	.	154	Q 2610	291	.	.
	LabC	.	.	.	.	164	194	ND	194.60	43	ND	498	.	.
Avg. conc. (pg/L)		ND	ND	182	182	105	388	2467	97	87	ND	287	ND	100000
RSD (%)		.	.	37%	37%	78%	57%	94%	141%	68%	.	74%	.	.
Sunnyvale	LabA	19	25	80	124	34	200	3900	ND	29	2.3	41	ND	.
	LabB	ND	ND	111	111	M	M	M	.	31	Q 100	NA	.	.
	LabC	.	.	.	.	ND	ND	ND	ND	ND	ND	ND	.	.
Avg. conc. (pg/L)		10	13	95	118	17	100	1950	ND	20	1.1	21	ND	.
RSD (%)		141%	141%	23%	8%	141%	141%	141%	.	87%	141%	141%	.	.

Table 11a. Total pesticide concentrations in effluent water samples in May and July, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. NA = data not available, ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals.

Effluent Site	Analyzing Lab	alpha-Chlordane	gamma-Chlordane	cis-Nonachlor	trans-Nonachlor	Heptachlor	Heptachlor Epoxide	Oxychlordane	Total Chlordanes	o,p'-DDD	o,p'-DDE	o,p'-DDT	p,p'-DDD	p,p'-DDE	p,p'-DDT	Total DDTs
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
May 2000																
Fairfield-Suisun	LabA	69	48	10	31	1.7	119	12	290	19	0.58	2.9	50	34	12	118
	LabB	106	89	0.31	45	22	329	191	781	Q 330	M	0.31	Q 1060	120	15	136
	LabC	53	ND	Q 125	Q 328	Q 1036	190	51	294	ND	ND	Q 978	92	ND	4.6	97
Avg. conc. (pg/L)		76	46	4.9	38	12	213	85	455	10	0.29	1.6	71	51	11	117
RSD (%)		36%	97%	132%	26%	121%	50%	111%	62%	141%	141%	114%	42%	120%	51%	17%
Palo Alto	LabA	180	170	15	65	12	64	28	534	12	1.4	2.3	35	59	10	120
	LabB	356	379	11	Q 315	Q 502	Q 840	46	792	Q 664	M	0.55	Q 3800	183	93	277
	LabC	9.1	ND	18	12	Q 88	ND	23	62	ND	Q 13	Q 131	16	ND	ND	16
Avg. conc. (pg/L)		182	183	15	38	12	32	32	462	6.0	1.4	1.4	26	81	34	137
RSD (%)		95%	104%	24%	98%	.	141%	38%	80%	141%	.	87%	52%	116%	149%	95%
San Jose/Santa Clara	LabA	110	110	11	48	7.3	49	7.5	343	Q 57	1.5	3.7	20	73	14	112
	LabB	155	159	4.7	131	Q 273	156	40	646	16	0.72	ND	Q 960	109	35	160
	LabC	110	ND	ND	ND	Q 66	ND	ND	110	ND	ND	Q 413	32	ND	118	150
Avg. conc. (pg/L)		125	90	5.2	60	7.3	69	16	366	7.8	0.74	1.9	26	61	56	141
RSD (%)		21%	91%	105%	111%	.	117%	134%	73%	141%	101%	141%	33%	92%	99%	18%
Sunnyvale	LabA	40	33	6.8	21	0.92	8.2	2.5	112	7.6	1.1	2.0	17	44	7.5	79
	LabB	M	68	2.2	69	M	0.91	33	173	10	M	ND	Q 197	80	56	146
	LabC	48	41	ND	ND	Q 315	ND	ND	89	ND	ND	Q 122	ND	ND	ND	ND
Avg. conc. (pg/L)		44	47	3.0	30	0.92	3.0	12	125	5.9	0.55	1.0	8.5	41	21	75
RSD (%)		14%	39%	116%	118%	.	148%	155%	35%	89%	141%	141%	141%	97%	144%	97%
July 2000																
Palo Alto	LabA	190	170	15	75	ND	78	ND	528	13	1.8	4.8	21	60	14	115
	LabB	102	91	21	34	Q 110	Q 870	Q 100	248	Q 550	ND	5.6	Q 1010	46	Q 94	52
	LabC	28	20	ND	ND	17	4.4	ND	69	9.0	ND	Q 7070	16	ND	ND	25
Avg. conc. (pg/L)		107	94	12	36	8.5	41	ND	282	11	0.60	5.2	19	35	7.0	64
RSD (%)		76%	80%	90%	103%	141%	126%	.	82%	25%	173%	11%	18%	89%	141%	72%
San Jose/Santa Clara	LabA	120	110	13	52	11	47	8.6	361	Q 67	1.8	6.7	21	73	20	123
	LabB	69	96	37	64	54	Q 302	30	350	Q 108	0.59	9.3	Q 730	50	40	100
	LabC	13	7.8	5.0	23	16	ND	10	75	ND	ND	Q 65	ND	ND	3.9	3.9
Avg. conc. (pg/L)		67	71	18	46	27	23	16	262	ND	0.80	8.0	11	41	21	75
RSD (%)		80%	78%	91%	45%	87%	141%	74%	62%	.	115%	23%	141%	91%	85%	83%
Sunnyvale	LabA	30	23	ND	17	ND	5.4	ND	75	ND	0.86	1.2	15	31	3	51
	LabB	83	Q 350	48	7.2	Q 170	Q 212	Q 265	138	13	M	9.2	Q 293	NA	26	48
	LabC	12	ND	ND	2.8	16	ND	ND	30	11	ND	3.8	ND	ND	ND	15
Avg. conc. (pg/L)		41	12	16	9.0	8.0	2.7	ND	81	8.0	0.43	4.7	7.5	16	10	38
RSD (%)		89%	141%	173%	81%	141%	141%	.	67%	88%	141%	86%	141%	141%	149%	53%

Table 11b. Total pesticide concentrations in effluent water samples in May and July, 2000.

Samples collected by LabB. Lightly shaded values are marginally outside range of expected congener ratios or results of other labs. ND = below detection limits, M = matrix interference, Q = questionable data far outside reasonable expectations based on sample's congener ratios and/or results from other labs, not included in calculations or totals, . = no data.

Effluent Site	Analyzing Lab	Endosulfan-alpha	Endosulfan-beta	Endosulfan Sulfate	Total Endosulfans	alpha-BHC	beta-BHC	gamma-BHC	Aldrin	Dieldrin	Endrin	Hexachlorobenzene	Toxaphene	2,4,6-Trichlorophenol	
		pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L	pg/L
May 2000															
Fairfield-Suisun	LabA	ND	11	100	111	27	76	2800	0.41	196	19	27	ND	.	
	LabB	85	ND	104	189	207	405	2711	.	247	0.49	304	.	.	
	LabC	.	.	.	.	87	362	ND	ND	78	ND	414	.	.
Avg. conc. (pg/L)		43	5.5	102	150	107	281	1837	0.21	174	6.3	248	ND	.	
RSD (%)		141%	141%	3%	37%	86%	64%	87%	141%	50%	167%	80%	.	.	
Palo Alto	LabA	ND	39	263	302	30	280	2800	10	184	22	74	ND	.	
	LabB	260	ND	374	634	Q 990	Q 1420	5390	.	10	71	1115	.	.	
	LabC	.	.	.	.	5.4	28	ND	9.2	16	ND	29	.	.
Avg. conc. (pg/L)		130	20	319	468	18	154	2730	10	70	31	406	ND	.	
RSD (%)		141%	141%	25%	50%	98%	116%	99%	6%	141%	117%	151%	.	.	
San Jose/Santa Clara	LabA	89	87	375	551	68	530	5300	0.47	136	12	190	ND	140000	
	LabB	8.8	ND	218	227	Q 1210	191	97	.	130	6.9	200	.	576000	
	LabC	.	.	.	.	330	483	ND	Q 345	136	ND	56	.	.
Avg. conc. (pg/L)		49	44	297	389	199	401	1799	0.47	134	6.3	149	ND	358000	
RSD (%)		116%	141%	37%	59%	93%	46%	169%	.	3%	96%	54%	.	86%	
Sunnyvale	LabA	4.6	4.3	35	44	32	360	470	0.24	29	2.4	48	ND	.	
	LabB	17	ND	ND	17	M	M	M	.	63	9.1	253	.	.	
	LabC	.	.	.	.	34	211	ND	ND	73	Q 124	ND	.	.
Avg. conc. (pg/L)		11	2.1	18	31	33	285	235	0.1	55	5.8	100	ND	.	
RSD (%)		81%	141%	141%	63%	5%	37%	141%	141%	42%	82%	134%	.	.	
July 2000															
Palo Alto	LabA	ND	14	230	244	199	ND	ND	Q 3585	65	320	76	.	.	
	LabB	160	58	257	475	470	414	Q 2010	.	Q 271	229	19	.	.	
	LabC	.	.	.	.	17	36	13	43	21	ND	6.3	.	.
Avg. conc. (pg/L)		80	36	244	360	228	150	6.3	43	43	183	34	.	.	
RSD (%)		141%	87%	8%	45%	100%	153%	141%	.	73%	90%	111%	.	.	
San Jose/Santa Clara	LabA	23	28	140	191	114	ND	3.2	Q 5013	73	Q 340	110	.	130000	
	LabB	ND	94	333	427	440	274	Q 225	.	93	Q 8.7	44	.	767000	
	LabC	.	.	.	.	ND	32	ND	7.4	ND	Q 51	ND	.	.
Avg. conc. (pg/L)		12	61	237	309	185	102	1.6	7.4	55	.	51	.	448500	
RSD (%)		141%	77%	58%	54%	124%	147%	141%	.	88%	.	108%	.	100%	
Sunnyvale	LabA	15	ND	61	76	32	ND	ND	Q 470	30	Q 270	43	.	.	
	LabB	8.2	22	400	430	285	380	Q 810	.	Q 248	Q 56	66	.	.	
	LabC	.	.	.	.	ND	ND	15	ND	56	ND	ND	.	.
Avg. conc. (pg/L)		12	11	231	253	106	127	7.7	ND	43	ND	36	.	.	
RSD (%)		41%	141%	104%	99%	148%	173%	141%	.	43%	.	92%	.	.	