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May 15, 2001

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1515 Clay Street, #1400
Oakland, CA 94612

CALIFORNIA REGIONAL WATER

MAY 17 2001

QUALITY CONTROL BOARD

Re: PCBs TMDL Data

Dear Ms. Barsamian:

The Draft Report *PCBs and Clams in Creeks: The Results of An Environmental Partnership* discusses the results of preliminary sampling for PCBs in resident and transplanted clams in Santa Clara County streams. The Draft Report (dated January 2001) was prepared by the Silicon Valley Toxics Coalition Clean Streams/Clean Bay Community Monitoring Project, a partnership of the Silicon Valley Toxics Coalition (SVTC), San Jose's Pioneer High School, and the City of San Jose Environmental Services Department.

The information contained in this Report may assist the Regional Board in development of the 303(d) list for 2002.

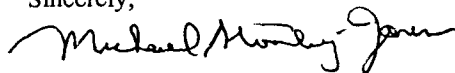
The Draft Report includes chemical analytical results of the PCB sampling at the following Santa Clara County locations: three in the Guadalupe River watershed, one in Coyote Creek and one in the Sunnyvale East Channel. Clams were transplanted for an 11-week period beginning on May 18, 2000.

The City of San Jose's Environmental Services Department laboratory prepared samples and conducted chemical analysis. Sample handling and preparation followed California State Mussel Watch protocols. Analysis followed EPA method 8082 (with modifications for additional congener analytes) using a dual column gas chromatograph with electron capture detectors and with confirmation, where possible, using a gas chromatograph mass spectrometer.

Additional chemical analysis of two of the samples was conducted by CRG Marine Laboratories of Torrance, California for quality control. These results are being incorporated into the Final Report *PCBs and Clams in Creeks* (in preparation). The Final Report is expected following the conclusion of the 2nd Phase of the Clean Streams/Clean Bay project in June 2001 and internal review of the Final Draft Report by the Santa Clara Basin Watershed Management Initiative.

If there are any questions regarding this information, please contact Virginia Robinson, SVTC Community Projects Coordinator, at 408-287-6707.

Sincerely,



Michael Stanley-Jones
Manager, Sustainable Water Program

cc: Fred Hetzel
RWQCB TMDL Section

**PCBs and Clams in Creeks
The Results of An Environmental Partnership**

By

Richard McMurtry

Volunteer

Silicon Valley Toxics Coalition
Clean Streams/Clean Bay Project
Final Phase II Monitoring Report
January 2001

PCBs and Clams in Creeks

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Summary

This report discusses the results of preliminary sampling for PCBs in resident and transplanted clams in Santa Clara County streams conducted by a partnership of the Silicon Valley Toxics Coalition (SVTC), San Jose's Pioneer High School, and the City of San Jose's Environmental Services Department. This report addresses only the chemical analytical results of the PCB sampling, not the educational and partnership aspects of the project. These latter aspects will be addressed in the final project report.

Clams (*Corbicula fluminea*) were collected from Putah Creek, near Davis, CA and the San Joaquin River near Stockton and then transplanted to five locations in Santa Clara County, CA. These locations were: three in the Guadalupe River watershed, one in Coyote Creek and one in the Sunnyvale East Channel. Clams were transplanted for an 11-week period beginning on May 18, 2000. At the time the clams were transplanted, resident clams were also collected from the Guadalupe River and Coyote Creek. A subset of the Putah Creek and San Joaquin River clams was segregated for analysis as an indicator of the PCB concentration of the transplanted clams at the time of their deployment.

The City of San Jose's Environmental Services Department laboratory prepared samples and conducted chemical analysis. Sample handling and preparation followed California State Mussel Watch protocols. Analysis followed EPA method 8082 (with modifications for additional congener analytes) using a dual column gas chromatograph with electron capture detectors and with confirmation, where possible, using a gas chromatograph mass spectrometer.

Comparing the three Guadalupe Watershed stations, lipid-normalized PCB concentrations in clams at the downstream Trimble Road station were about six times the concentration in clams at the mid-watershed station at Pioneer High School. The PCB concentration in clams at the mid-watershed station at Pioneer High School was about one-half that of the clams at the upper-watershed station at Rincon Creek. Hence, concentrations were greater both upstream and downstream of the Pioneer HS station.

Comparing the downstream stations in the three streams, total lipid-normalized PCB concentrations in clams in the Guadalupe River at Trimble Road were about three times the concentration in the clams in Coyote Creek at Montague Expressway or Sunnyvale East Channel at Tasman Drive.

Background

In December 1999, the Silicon Valley Toxics Coalition initiated the Clean Streams/Clean Bay Project in partnership with San Jose's Pioneer High School and the City of San Jose's Environmental Services Department (ESD). The Toxics Coalition provides technical direction and training for the project; Pioneer High School provides teacher support and student person power to perform field sampling and information dissemination; and ESD provides laboratory analytical services. In addition, during project start-up, the San Francisco Estuary Institute and Applied Marine Services provided technical assistance with the details of clam collection and transplantation.

The purpose of the project is to: 1) conduct field research on the distribution of PCBs in Santa Clara Valley Watersheds, with emphasis on the Guadalupe River Watershed, 2) use the sampling results to plan additional investigations that will result in identify sources of this type of pollution, 3) build community ownership of pollution problems by involving students in watershed research and information dissemination, 4) educate students about stream pollution, watershed awareness, environmental field sampling and environmental advocacy, and 5) demonstrate the effectiveness of school-environmental organization-public agency partnerships in addressing pollution problems.

This report focuses exclusively on a discussion of the monitoring results; subsequent reports will address the educational and partnership aspects of the project. This element is intended to assist state and local agencies in the execution of their efforts to reduce PCBs in Bay Area fish pursuant to the requirements of the Clean Water Act. This element is intended to determine 1) whether transplanted clams can be useful in identifying segments of streams where PCBs are elevated, 2) which streams in the Santa Clara Basin could be contributing a relatively greater amount of PCBs to San Francisco Bay, and 3) where to focus efforts to locate terrestrial and instream sediment sources of PCBs.

Study questions

The questions to be addressed by this study were:

- 1) Can transplanted bivalves be used to detect differences in bio-available PCBs, between different Santa Clara County streams?
- 2) Can transplanted bivalves be used to detect differences in bio-available PCBs between different stream reaches within a given stream?

The hypotheses of this study were:

- 1) PCB concentrations in transplanted clams are not the same among watersheds.
- 2) PCB concentrations in transplanted clams are not the same within watersheds.

Methods

Collecting Clams

Guadalupe Creek at Pioneer High School	In Guadalupe Creek behind Pioneer High School about 2000' upstream of the confluence of Guadalupe Creek and Alamitos Creek, along SE bank	121.8803°W, 37.2413°N
Guadalupe Creek at Trimble Road	In Guadalupe Creek under the Trimble Road bridge, between center column supports for bridge	121.9365°W, 37.3822°N
Coyote Creek at Montague Expressway	In Coyote Creek under the Montague Expressway bridge, in gap between supporting center walls of bridge	121.9141°W, 37.3963°N
Sunnyvale East Channel at Tasman Drive	In Sunnyvale East Channel under the Tasman Drive bridge, close to western wall	122.0486°W, 37.4022°N

Above coordinates are approximations based on scaling from a USGS Quadrangle.

Sample Collection

Sample collection was conducted in conformance with bivalve sections of "Sample Collection and Preparation: Sampling and Processing Trace Metal and Synthetic Organic Samples of Marine Mussels, Freshwater Clams, Marine and Freshwater Fish and Sediments", DFG Method 102 (in draft).

Laboratory Procedures

Sample Handling and Tissue Preparation:

The laboratory analyzed 14 samples – 1 set of resident clams each from the Coyote Creek and Guadalupe River, 1 set of time-zero clams each from San Joaquin River and Putah Creek, 2 sets of clams from each of the five sampling stations. At each of the five sampling stations, there was a set of clams transplanted from Putah Creek and a set of clams transplanted from the San Joaquin River.

The laboratory of the City of San Jose, Environmental Services Department, prepared samples according to California State Mussel Watch protocols. *Corbicula fluminea* clams were frozen at -20° C immediately upon receipt. Consistent with this protocol, depuration was not conducted. Before dissection, batches of clams were thawed and inspected for mortality. Empty shells were removed, counted and discarded. Dissections were done using precleaned disposable stainless steel and plastic scalpels. A new scalpel was used for each batch. Tissue was dissected into a tared, certified precleaned 250 ml glass jar with Teflon cap liner. Shell length, tissue weight and reproductive condition were recorded for each clam.

Composite tissue samples were homogenized using an Omni Macro® tissue homogenizer model number 17505 with titanium generator. Each sample was ground slowly at first to break down large pieces of tissue. Speed was gradually increased to avoid foaming or heating of the sample. Homogenization continued until the sample had a smooth consistency (no detectable pieces) and uniform color. The generator was cleaned after each homogenization to prevent cross contamination of samples. The cleaning procedure

consisted of three tap water rinses, three scrub washes with Liquinox® laboratory detergent, three more rinses with tap water, three deionized water rinses, three rinses with reagent grade methanol, and three final rinses with NannoPure® 18.5 megohm water.

PCB analysis:

Homogenate was desiccated in a Labconco® Freezone 4.5 freeze dry system at -40° C for 24 hours. The samples were then extracted with acetone and methylene chloride. Extraction for tissues followed EPA method 3540 (soxhlet) using 1:1 acetone:methylene chloride solvent. The extract was then sent through cleanup steps using gel chromatography (EPA 3640) and florisil cleanup (EPA 3620). Analysis followed EPA method 8082. Instrumental analysis was performed using a Hewlett Packard 6890 capillary gas chromatograph with dual electron capture detectors (GC/ECD) utilizing Restek Rtx-CLPesticides (30m, 0.32mm ID, 0.5um df) and Restek Rtx-CLPesticides2 (30m, 0.32mm ID, 0.25um df) as the primary and secondary columns respectively. Compounds quantified on the primary column were checked against standards using a Hewlett Packard 5972 gas chromatograph mass spectrometer for confirmation.

The modified PCB congener list analyzed was:

8,18,28,44,52,66,77,101,105,118,126,128,138,153,170,180,187,195,206,209.

The method detection limit was 1 ppb for each congener.

QC Summary

Various modifications were made to QA/QC measures described in EPA method 8082 to economize while still meeting the goals of the study. Since the pilot was designed to address relative rather than absolute levels of PCBs between sites, only a broad level of quality assurance was built into the analysis. These quality checks include a Matrix Spike (MS) and Matrix Spike Duplicate (MSD), used to assess recovery and reproducibility, and an external standard. When absolute measurements are required, internal standards and surrogates are used to test quantitation and extraction performance respectively. Since the objectives of this study included only a relative comparison component, internal standard was not included. This change precludes measurement of matrix bias, which if present would affect quantitation. As a further cost saving step, a standard reference material (SRM) was also omitted. The SRM is obtained from a certified source and is used to test the quantification and identification capabilities of the analytical methods. Without these measures, accurate estimates of concentration are not possible. However, the MS, MSD and external standard should be sufficient to provide confidence in the precision needed for relative comparisons between samples.

Results

Concentration Comparisons

Wet weight PCB concentrations were adjusted to dry weight to account for moisture content differences and then lipid-normalized by dividing by percent lipid content to account for differences in lipid content. At each station and in the time-zero subset, the values from San Joaquin River (SJR) and Putah Creek (PC) source clams were averaged. Time Zero refers to the subset of clams from the San Joaquin River and Putah Creek that were analyzed at the time of transplantation as an indicator of concentration at the time of transplantation. Results are depicted in Table 1 below and graphically in Figure 2.

Table 1: Lipid-Normalized PCB Concentrations in Clam Tissue

Station->	Sunnyvale East Channel at Tasman Dr	Coyote Creek at Montague Expressway	Guadalupe River at Trimble Road	Guadalupe Creek at Pioneer High School	Guadalupe Creek at Rincon Creek	Time Zero
Units->	"Units"	"Units"	"Units"	"Units"	"Units"	"Units"
SJR Clams	94	81	224	45	90	23
PC Clams	169	144	386	45	77	33
Mean	131	112	305	45	83	28
Std Dev	53	45	114	0	9	7
Rounded to nearest 50 units	100	100	300	50	100	50

- 1) Comparing the three Guadalupe River stations, lipid-normalized PCB concentrations in clams at the downstream Trimble Road station were about 6 times the corresponding concentration in clams at the mid-watershed station at Pioneer High School (about 300 units versus about 50 units).
- 2) The total lipid-normalized PCB concentration in clams at the mid-watershed station at Pioneer High School were less than one-half the concentration of clams at the uppermost Guadalupe Creek watershed station at Rincon Creek (about 50 units versus about 100 units).
- 3) Comparing the downstream stations in the three streams, total lipid-normalized PCB concentrations in clams in the Guadalupe River at Trimble Road were about 3 times the concentration in the clams in Coyote Creek at Montague Expressway or Sunnyvale East Channel at Tasman Blvd (about 300 units versus about 100 units).

Congener Pattern

The PCB congener profiles displayed a somewhat different pattern at the Guadalupe Creek at Rincon Creek station in the upper watershed compared to the pattern displayed by the lower watershed stations, such as the Guadalupe River at Trimble Road (see Figures 3a, 3b, and 3c).

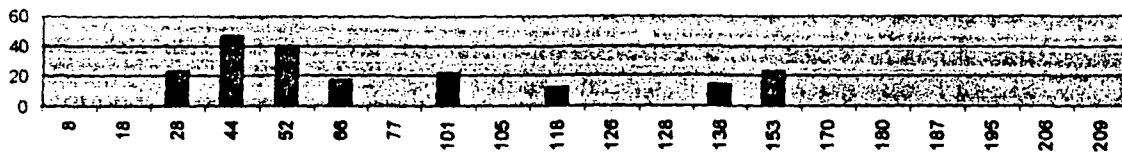
The relative concentrations of the congeners are generally consistent with other datasets of PCBs collected in the San Francisco Bay Region and with Aroclor composition. In the upper watershed, there is a higher proportion of lower weight congeners (indicative of Aroclor 1242 or 1248), and in the lower watershed sites, there is a higher proportion of higher weight congeners, including PCB 180 and 187, (indicative of Aroclor 1260).

However, there were a number of uncharacteristic patterns in the ratios of the lower PCB congeners, 18,28,44, and 52. Therefore, additional sampling is needed before firm conclusions in this regard can be made.

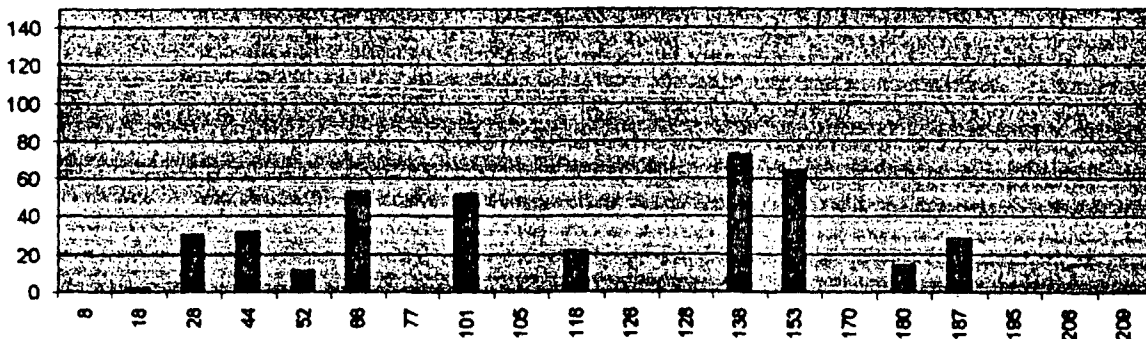
If subsequent sampling confirms the congener pattern differences, then the fact that the Guadalupe Creek at Rincon Creek Station has a different congener pattern than the lower watershed station at Trimble Road and the Rincon Creek station appears to have a higher concentration than the mid-watershed station at Pioneer High School, it is possible that a distinct source of PCBs may exist in the upper watershed above the confluence with Rincon Creek.

Figure 3A: Comparison of Congener Pattern between Upper and Lower Guadalupe Watershed Stations

Guadalupe Creek @ Rincon: SJ Clams



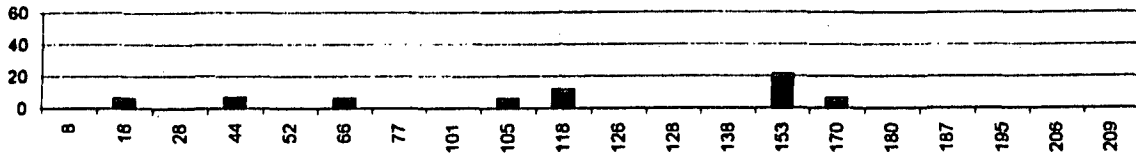
Guadalupe River @ Trimble: SJ Clams



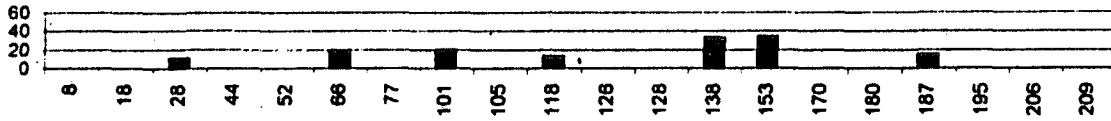
The above charts shows a possible shift in the congener pattern between the Guadalupe Creek station at Rincon Creek in the upper watershed and the Guadalupe River at Trimble Road station in the lower Guadalupe River. The top chart above displays the data from the upper watershed station at Guadalupe Creek at Rincon Creek. It shows a higher percentage of lower weight congeners. The second chart displays data from the Guadalupe River at Trimble Road station and shows a higher percentage of higher weight

Figure 3c: Congener Pattern Interstation Comparisons: San Joaquin River Clams
Using Calculated Dry Weight Concentrations

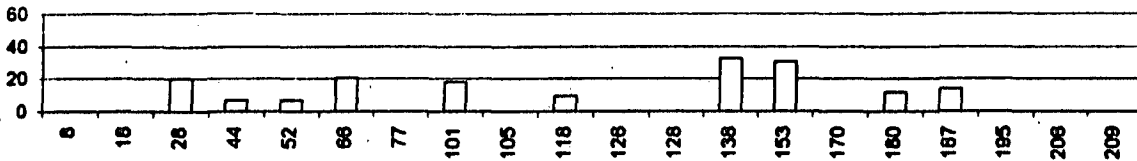
T-Zero: San Joaquin clams



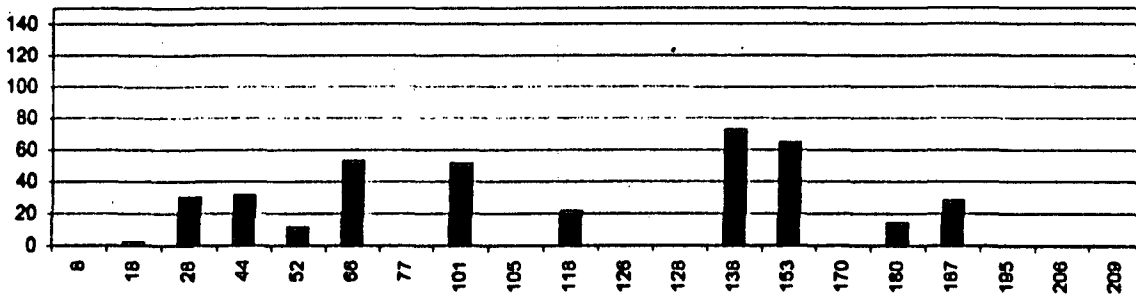
Sunnyvale East: San Joaquin Clams



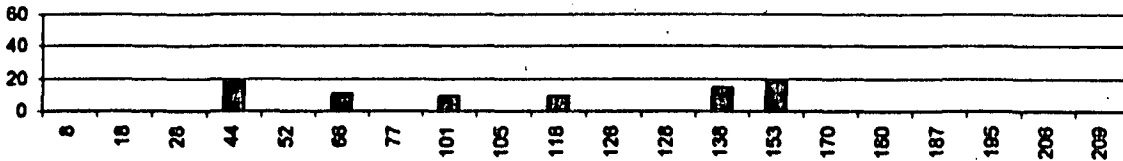
Coyote Creek @ Montague: SJ Clams



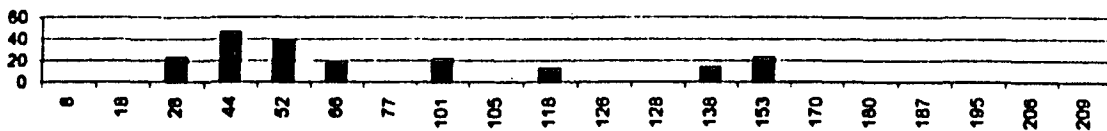
Guadalupe River @ Trimble: SJ Clams



Guadalupe @ Pioneer HS: SJ Clams



Guadalupe Creek @ Rincon: SJ Clams

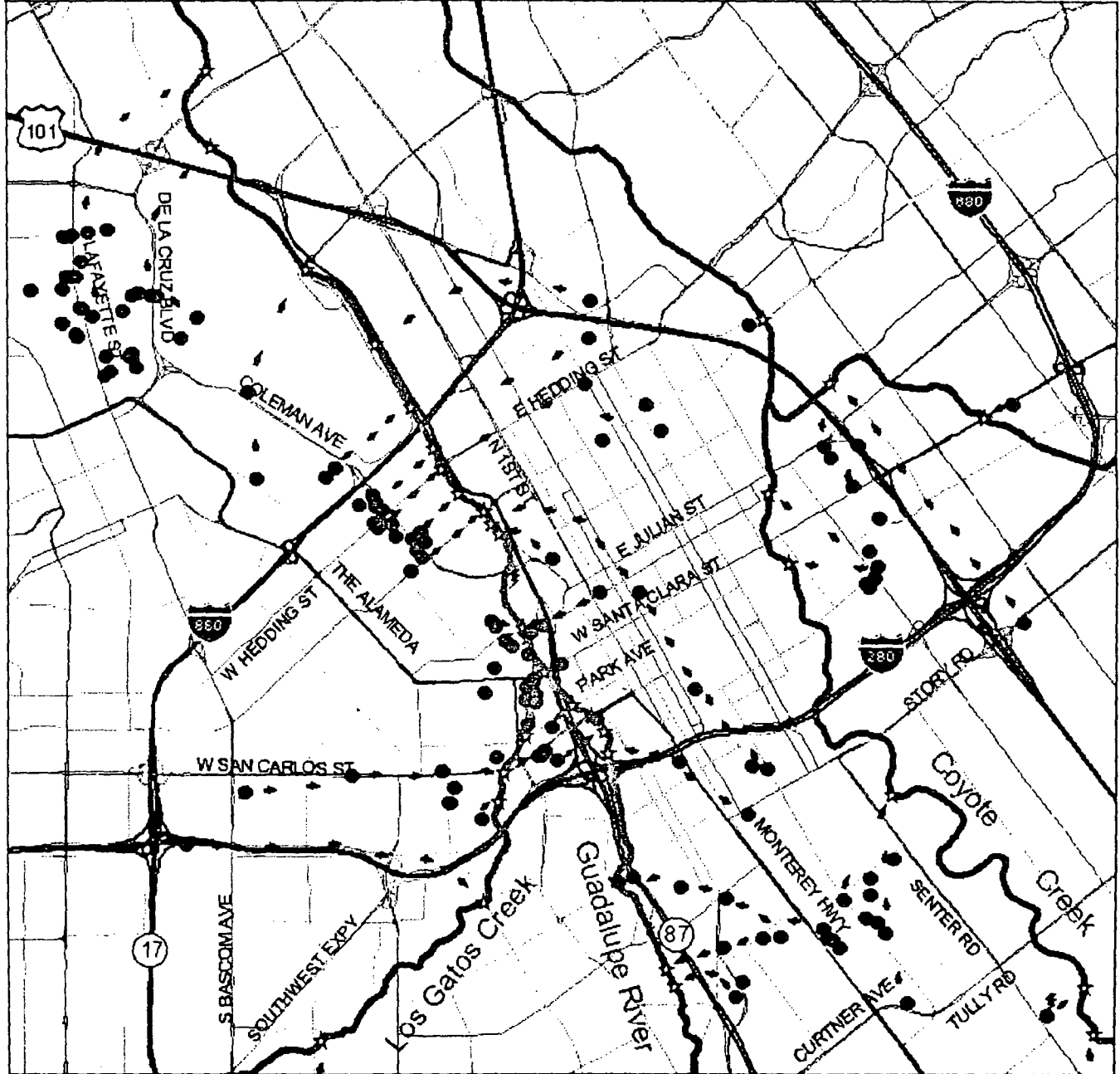


Stream Discharge Points of Potential PCB Sources in San Jose, CA
 Silicon Valley Toxics Coalition
 September 2000

Figure 4



- Potential Sources
- ★ Stormwater Outfalls
- ⚡ Electrical Substation
- ↑ Direction of Flow
- Major Roads
- Streams



Results

The potential PCB sites on the Guadalupe River system are concentrated in the 7-mile stretch between a point one-half mile south of Alma Avenue and a point one-half mile north of Trimble Road. Within this stretch, most potential PCB sources lie within the 2-1/2 mile stretch between I280 and I880 but there is also a large cluster of potential sources in Santa Clara discharging stormwater to the north and south of Trimble Road and a substantial cluster of potential sources on Los Gatos Creek within a mile of the confluence of Los Gatos and the Guadalupe.

The potential PCB sources on the Coyote Creek system are fewer than on the Guadalupe yet dispersed along a 6-mile stretch of the creek. There is a cluster along route 101 that discharges to Lower Silver Creek at a point one-quarter mile upstream of its confluence with Coyote Creek and another cluster that discharges into Coyote Creek three-quarters of a mile south of I280. There is also an electrical substation that discharges south of Curtner Avenue.

Conclusions

- 1) PCB concentrations in clams at the downstream Guadalupe River at Trimble Road station were about six times the concentration in clams at the mid-watershed Guadalupe Creek at Pioneer High School station.
- 2) PCB concentrations in clams at the Guadalupe Creek at Pioneer High School station were about one-half the concentration in clams at the upper watershed Guadalupe Creek at Rincon Creek station.
- 3) PCB concentrations in clams at the lower Guadalupe River at Trimble Road station had about three times the concentration of those at the Coyote Creek at Montague Expressway and Sunnyvale East Channel at Tasman Drive stations.
- 4) Stormdrain discharge points of industries that may have used PCBs in the 1950s and 1960s are clustered most heavily on the Guadalupe River between I280 and I880, in the reach just north of Trimble Road, and, on Los Gatos Creek, in the reach just south of the confluence of Los Gatos Creek with Guadalupe River.

Recommendations

- 1) Conduct further monitoring on the lower Guadalupe River using transplanted clams and sediment to determine if there are isolatable stream reaches that have elevated levels of bioavailable PCBs.
- 2) Conduct further monitoring in the upper Guadalupe Creek watershed above the confluence with Rincon Creek using clams and sediment to determine if there are isolatable stream reaches that have elevated levels of bioavailable PCBs.
- 3) Develop a monitoring plan for the next phase of study with input from the Watershed Management Initiative and the Regional Monitoring Program participants. Design the next phase of the study with sufficient sample size, replicate samples at each station, and laboratory QA/QC to enable quantitation of results.

**Clean Streams/Clean Bay Project
PCB Concentrations in Clams: August 2000 Sampling
Calculated Dry Weight and Lipid-Normalized Concentrations**

**Silicon Valley Toxics Coalition
Attachment 2**

10/23/2000

File: cleanclams2000rev

Source: City of San Jose ESD Laboratory

Concentrations in ppb wet weight from total tissue of *Corbicula fluminea* harvested from indicated sites on 8/2/2000. Each station had 2 bag of clams - one from San Joaquin River clams and one from Putah Creek. Concentrations represent, for each clam source, composite of all clams harvested at station indicated.

Sample Location->	Sunnyvale East Channel		Coyote Creek @ Montague Expressway		Guadalupe River @ Trimble Road		Guadalupe Creek @ Pioneer High School		Guadalupe Creek@ Rincon Creek		
	Sample Number->	008	009	010	011	012	013	014	015	016	017
Clam Source->	SanJoaquin	Putah Cr.	SanJoaquin	Putah Cr.	SanJoaquin	Putah Cr.	SanJoaquin	Putah Cr.	SanJoaquin	Putah Cr.	
Units->	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
Congener											
8	0	0	0	0	ND	0	0	0	0	0	0
18	0	0	0	0	2	9	0	0	0	0	13
28	11	0	20	22	30	28	0	27	23	22	
52	0	0	7	0	11	15	0	0	39	0	
44	0	25	7	23	32	35	18	20	47	31	
66	20	24	20	26	53	93	11	10	17	0	
101	21	18	18	22	51	77	9	0	22	0	
77	0	0	0	0	0	0	0	0	ND	0	
118	14	15	9	11	22	37	9	0	13	0	
153	35	43	31	42	64	117	18	10	23	15	
105	0	0	0	0	ND	10	0	0	0	0	
138	34	45	32	46	73	123	15	9	14	12	
126	0	0	0	0	0	0	0	0	0	0	
187	16	22	14	23	28	50	0	0	0	0	
128	0	0	0	0	0	11	0	0	0	0	
180	0	12	12	18	14	32	0	0	0	0	
170	0	0	0	11	0	19	0	0	0	0	
195	0	0	0	0	0	0	0	0	0	0	
206	0	0	0	0	0	0	0	0	0	0	
209	0	0	0	0	0	0	0	0	0	0	
Total Dry Wt	150	203	170	245	381	656	80	77	198	92	
Total Lipid-Normalized	94	169	81	144	224	386	45	45	90	77	
%Moisture	88.0	90.2	85.2	86.2	87.4	87.3	86.5	88.6	86.2	91.1	
%Lipid	1.6	1.2	2.1	1.7	1.7	1.7	1.8	1.7	2.2	1.2	

NOTE: The computerized laboratory printouts reported concentrations to the nearest .01 ppb; however, the detection limit was 1 ppb. In the above table, dry weight values for each congener were calculated using the wet weight laboratory printout and the percent moisture data and rounding the result to the nearest ppb. Wet weight values between .01 and .99 ppb are listed as 0. Values reported as "ND" on the laboratory printouts are indicated here as "ND"

Total PCBs dry weight was calculated by summing the calculated values for each congener that was not indicated as being zero or non-detect. The resulting sum was rounded to the nearest ppb. Lipid-normalized concentrations were calculated by dividing the total dry weight value by the lipid content in percent.

Attachments:

1. PCB Concentrations in Clams: May 2000 Sampling
2. PCB Concentrations in Clams: August 2000 Sampling
3. PCB Concentrations: Mean and Standard Deviation

Appendices:

1. Chain of Custody Documentation
2. Field Notes
3. Length, Wet and Reproductive Status in Clams Harvested May 2000
4. Wet Weight PCB Concentrations in Clams Harvested May 2000
5. Data Summary, including Dry Weight and Lipid Normalized PCB Concentrations, for Clams Harvested May 2000
6. Length, Wet and Reproductive Status in Clams Harvested Aug 2000
7. Summary of Length, Wet and Reproductive Status of Clams Harvested Aug 2000
8. Wet Weight PCB Concentrations in Clams Harvested Aug 2000
9. Dry and Lipid-Normalized Weight PCB Concentrations in Clams Harvested Aug 2000
10. Laboratory Data Sheets – May 2000 Sampling Event
11. Laboratory Data Sheets – August 2000 Sampling Event
12. Congener Profiles: Comparison of Resident and Transplanted Clams
13. Photographs of Sampling Locations and Field Work