

**Case Study Investigating Elevated Levels of
PCBs in Storm Drain Sediments
in the
Pulgas Creek Pump Station Drainage
San Carlos, California**



**San Mateo Countywide
Stormwater Pollution
Prevention Program**

June 2003

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BACKGROUND

Polychlorinated biphenyls (PCBs) have been found in fish caught in San Francisco Bay at levels thought to pose a health risk to humans consuming those fish. As a result, the State Water Resources Control Board listed San Francisco Bay as impaired by PCBs in the 2002 Clean Water Act Section 303(d) list. Field surveys performed in surrounding watersheds by Bay area stormwater management agencies, including the San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP), have revealed urban areas with elevated levels of PCBs in storm drain sediments (KLI 2001a and 2002, Gunther et al. 2001). Urban runoff may therefore contribute to the PCBs problem in the Bay. During FY 2001/02, the stormwater agencies began performing case studies in some of the elevated areas in an attempt to begin identifying PCBs sources and developing controls.

STOPPP (2002b) performed one such case study during FY 2001/02. The areas investigated were the drainages to the Bradford and Broadway pump stations in Redwood City and the South Maple pump station in South San Francisco. STOPPP tested storm drain sediment samples from each of the three drainages. A sediment sample from a storm drain inlet at 245 Spruce Avenue in the South Maple pump station had high PCBs concentrations relative to the other case study samples. STOPPP researched current and historical land use at the Spruce Avenue property. The research revealed businesses that historically occupied this property that may have used PCBs (such types of historical businesses are typically found in industrial areas), but did not identify any specific sources.

This report presents the results of additional PCBs case study work performed by STOPPP during FY 2002/03. Follow-up work was performed at the Pulgas Creek pump station drainage, an industrial area located in the City of San Carlos (Figure 1). PCBs were initially detected in the Pulgas Creek pump station drainage at levels of 2,257 ug/Kg in sample SMC-023 (pump station sump), 1,222 ug/Kg in sample SMC-021 (manhole at Bayport Avenue and Center Street), and 291 ug/Kg in sample SMC-022 (composite of three storm drain inlets). These three samples were collected in September 2001 as part of the second year of a regional survey (KLI 2001a). Two of these locations were re-sampled and six new locations in the drainage were sampled during this study.

The overall goal of the case study work was to gather data that will assist California Regional Water Quality Control Board, San Francisco Bay Region (Regional Board) staff and the Clean Estuary Partnership prepare the urban runoff implementation portion of the PCBs TMDL for San

Francisco Bay. Specific objectives include:

- attempting to determine whether ongoing inputs of PCBs to urban runoff exist (e.g., erosion of surface soils containing PCBs and leaks from equipment containing PCBs).
- identifying potential source areas (e.g., individual properties) and controllable sources of PCBs to urban runoff, if any.
- developing additional data useful for assessing the feasibility of PCBs stormwater control measures.

The case study work also contributes to the fulfillment of provision C.2 of STOPPP's National Pollutant Discharge Elimination System permit adopted by the Regional Board in 1999.

FIELD SAMPLING AND CHEMICAL ANALYSIS METHODS

The general strategy of the field program was to try to narrow potential source areas by collecting storm drain sediment samples from various locations within the two storm drain line networks feeding the pump station. This included collecting a sample adjacent to a PG&E substation located at Center Street and Industrial Road (Figure 1).

Sediment samples were collected during October 2002. Kinnetic Laboratories, Inc. (KLI) of Santa Cruz, California performed the sampling. Storm drain maps provided by the City of San Carlos were used to help select appropriate sampling locations in the field. Sampling locations were limited to accessible areas where sediments were present. The sediment samples were shipped to Columbia Analytical Services, Inc. of Kelso, Washington and analyzed for PCB congeners, particle size (Puget Sound Protocol with hydrogen peroxide digestion), percent moisture and total organic carbon. The Appendix contains a report prepared by KLI documenting the fieldwork and chemical analysis results. The fieldwork and laboratory analysis were performed in accordance with the second year joint stormwater agency project Quality Assurance Project Plan (KLI 2001b).

RESULTS

PCBs were detected at concentrations ranging from 3 to 11,521 ug/Kg (Table 1) in samples collected from the following four general areas (Figure 1):

- the Pulgas Creek pump station
- storm drain lines northwest of the pump station
- storm drain lines southeast of the pump station
- Pulgas Creek

Pulgas Creek pump station

The Pulgas Creek pump station sump was re-sampled (SMC-023). PCBs were detected at 6,195 ug/Kg, which was higher than the concentration measured in September 2001 (2,257 ug/Kg).

Storm Drain Lines Northwest of the Pump Station

Sediment was sampled from the three locations in the storm drain lines northwest of the pump station. PCBs were found at 306 ug/Kg in sample SMC-042 collected from a manhole at Bransten Road and Industrial Road. Samples SMC-043 and SMC-044 were obtained from grated inlets that drop directly into the main storm drain line on Industrial Road. PCBs were detected at 316 ug/Kg and 30 ug/Kg in these samples, respectively. SMC-044 was the first accessible site upstream of the pump station in the northwest direction.

Storm Drain Lines Southeast of the Pump Station

Sediment samples were also collected from three locations in the storm drain lines southeast of the pump station. The manhole at Bayport Avenue and Center Street was re-sampled (SMC-021) and PCBs were detected at 1,817 ug/Kg. PCBs were detected at 1,222 ug/Kg in a sample from this location collected during September 2001. PCBs were detected at 181 ug/Kg in sample SMC-046, collected from a grated inlet that drops directly into the main storm drain line on Industrial Road. SMC-046 was the first accessible site upstream of the pump station in the southeast direction. Samples SMC-047 and SMC-047FR (a field replicate submitted blindly to the analytical laboratory) were collected from the Industrial Road storm drain line at a point accessed by a manhole adjacent to 1411 Industrial Road. This location is adjacent to the PG&E substation at the corner of Industrial Road and Center Street. PCBs were detected at 11,521 ug/Kg and 10,662 ug/Kg in these samples, respectively, which were the highest concentrations of PCBs found during this study.

Pulgas Creek

A sediment sample from Pulgas Creek (SMC-045) had the lowest concentration of PCBs detected during this study (3 ug/Kg). It should be noted that the creek does not normally drain to the pump station; rather, the pump station discharges to the creek. However, during high flows it is possible that water and sediment from the creek could enter the pump station. Runoff from the Caltrain railroad track right-of-way enters Pulgas Creek just upstream of SMC-045.

Distribution of PCB Congeners

The Appendix, Figure 3 illustrates the distribution of PCB congeners in samples collected to date from the Pulgas Creek pump station drainage. The following samples have a distribution of PCBs congeners that somewhat resembles the distribution in the pump station sump samples (SMC-023) collected during September 2001 and this study (October 2002):

- SMC-047 and SMC-047FR, southeast storm drain line branch, Industrial Road adjacent to the PG&E substation.
- SMC-046, southeast storm drain line branch, Industrial Road between the SMC-047 location and the pump station.
- SMC-043, northwest storm drain line branch, Industrial Road near Bransten Road.

The concentrations of PCBs in the samples from Pulgas Creek (SMC-045) and the drop inlet adjacent to 981 Industrial Road (SMC-044) are generally too low to provide reliable information on the distribution of PCBs congeners.

DISCUSSION

During the late 1970s, the U.S. EPA banned the manufacture and tightly restricted the use of PCBs. Before that time, PCBs were widely used by many industries because of their low electrical conductivity, high boiling point, chemical stability and flame retardant properties (Binational Toxics Strategy, 1999). Applications included electrical transformers and capacitors, hydraulic fluids, flame retardants, lubricants, paints, inks, dyes, sealants and plasticizers. The use of hydraulic fluids containing PCBs may have resulted in relatively large releases to the environment, since hydraulic systems were designed to leak slowly to provide lubrication (Binational Toxics Strategy, 1998). PCBs are often referred to as a “legacy” pollutant, meaning there are relatively few current uses, but past uses have left large amounts in the environment.

PCBs were found in storm drain sediments throughout the Pulgas Creek pump station drainage. Many types of historic businesses in old industrial areas such as the study area could have used PCBs in the above applications, potentially resulting in releases of PCBs to surface soils and/or storm drains. Since PCBs are highly persistent in the environment, surface soils or accumulated storm drain sediments could potentially contain PCBs released many years ago.

STOPPP previously researched known PCBs use and/or release sites in San Mateo County (STOPPP 2002a). This research did not reveal any sites within the study area. In general, because of the widespread and unregulated historic use of PCBs, the identity and location of most PCBs sites are probably unknown.

During this study, STOPPP contacted hazardous materials inspection staff with the San Mateo County Environmental Health Department and pretreatment inspection staff with the South Bayside Systems Authority regarding the study area. The inspectors were aware of only one specific site, 977 Bransten Rd., where PCBs were used, stored or released in the study area (Figure 1). STOPPP performed a preliminary review of public records on 977 Bransten Rd. available at the California EPA Department of Toxic Substances Control (DTSC) in Berkeley, California. The site is a soil and groundwater investigation and remediation site located across the street from the City of San Carlos’ corporation yard. A 1989 document refers to the “California Oil Recyclers, Inc. facility at 977 Bransten Road, San Carlos, California” (Aquifer Sciences, Inc., 1989). PCBs were detected at concentrations as high as 67,000 ug/Kg in “near surface soils” (Aquifer Sciences, Inc., 1991 and Conservtech, 1994). STOPPP’s consultant collected storm drain sediment samples SMC-022 and SMC-042 from storm drain inlets and a manhole on Bransten Rd (Figure 1). PCBs were detected at 291 and 306 ug/Kg, respectively (Table 1).

Sample SMC-047 and field replicate SMC-047R were collected from a manhole adjacent to the PG&E substation located at the corner of Industrial Road and Center Street (Figure 1). These samples contained the highest concentrations of PCBs found during this study, suggesting the PCBs in these samples originate from a major source in the drainage. This is corroborated by the similar congener distributions found among SMC-047, SMC-047R and samples collected from the pump station sump (SMC-023), which collects sediment from the entire drainage. However, sample SMC-043, collected in a different part of the drainage (northwest storm drain line branch), also had a similar congener distribution. It should be noted that attempts to link different samples to a single source based on congener distributions may be confounded by factors such as weathering of PCBs in the environment and the possibility of multiple PCBs sources. It should also be noted that SMC-046, the only sample collected between SMC-

047/SMC-047R and the pump station (SMC -023), had a relatively low concentration of PCBs (181 ug/Kg).

One of the largest uses of PCBs has been in electrical equipment such as transformers. The limited data gathered to date raise the possibility that the PG&E substation has been a major PCBs source in the Pulgas Creek pump station drainage. However, further data would need to be collected before any conclusions could be drawn regarding PCBs sources in the drainage. Furthermore, even if the substation has been a PCBs source, there appear to be other sources of PCBs in the drainage given the widespread spatial distribution of PCBs found in storm drain sediments.

NEXT STEPS

STOPPP is committed to working with the Regional Board and other Bay area agencies to reduce the levels of PCBs in San Francisco Bay and will:

- request that Regional Board staff work with PG&E to facilitate further investigation related to the relatively high levels of PCBs found in storm drain sediment samples SMC-047 and SMC-047R. These samples were collected at a location adjacent to the PG&E substation at the corner of Industrial Road and Center Street in San Carlos.
- request that Regional Board staff work with the DTSC to investigate whether the site at 977 Bransten Rd. has contributed or continues to contribute sediments containing PCBs to the the storm drain system in the study area. Relatively high levels of PCBs have reportedly been found in near surface soils at this site.
- continue to support efforts to develop and implement the San Francisco Bay PCBs TMDL, in coordination with the Bay Area Stormwater Management Agencies Association, the Clean Estuary Partnership and the Regional Monitoring Program. STOPPP currently participates in relevant committees and work groups of these organizations.
- perform additional work during FY 2003/04 emphasizing the continuing process of identifying and addressing controllable sources of PCBs in urban runoff, if any. The type of work and the location of any specific study area will be determined by STOPPP's Watershed and Monitoring Subcommittee.

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Figure 1
Pulgas Creek Pump Station Drainage

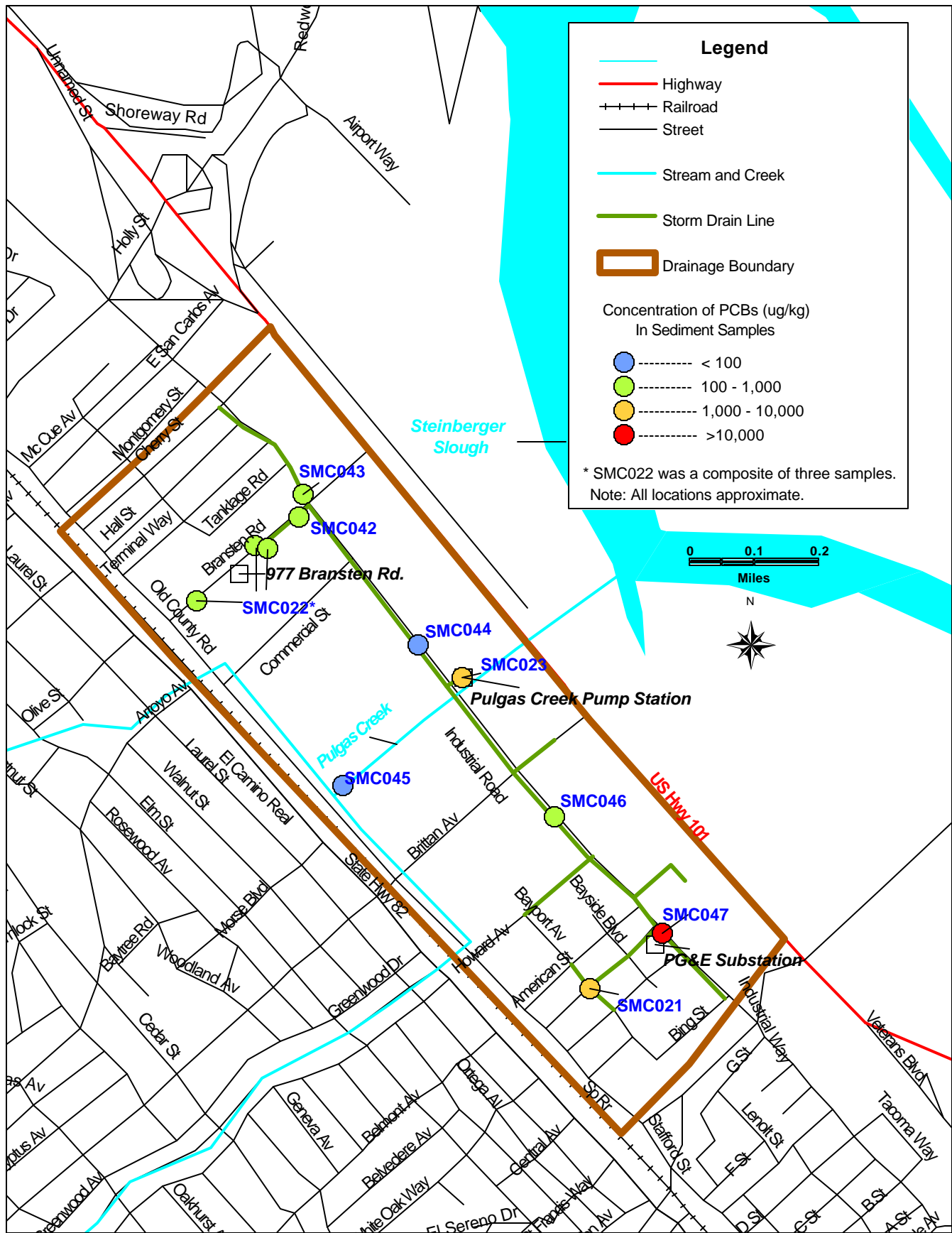


Table 1 – Chemical Analysis Results Summary

Sample Number	Description¹	Date Collected	Total PCBs²	Percent Fines³	Total PCBs Normalized to Fines²
SMC-023	Pulgas Creek pump station sump.	09-25-01	2,257	9	25,044
SMC-023	Pulgas Creek pump station sump.	10-03-02	6,195	11	54,290
SMC-021	Manhole at intersection of Bayport Avenue and Center Street.	09-20-01	1,222	40	3,018
SMC-021	Manhole at intersection of Bayport Avenue and Center Street.	10-03-02	1,817	4	43,993
SMC-022	Composite from three inlets on Bransten Road.	09-20-01	291	11	2,709
SMC-042	Manhole on Bransten Road near Industrial Way.	10-03-02	306	30	1,008
SMC-043	Drop inlet on Industrial Way near Bransten Road.	10-03-02	316	3	11,906
SMC-044	Drop inlet adjacent to 981 Industrial Road.	10-03-02	30	5	605
SMC-045	Pulgas creek just east of Old County Road.	10-03-02	3	26	11
SMC-046	Drop inlet adjacent to 1121 Industrial Road.	10-03-02	181	5	3378
SMC-047	Manhole adjacent to 1411 Industrial Road.	10-03-02	11,521	5	226,350
SMC-047FR ⁴	Manhole adjacent to 1411 Industrial Road.	10-03-02	10,662	3	322,118

¹See Figure 1 for sample locations.

²All concentrations in ug/Kg.

³Percent fines indicates the organic-free fraction less than 62.5 microns.

⁴FR – Field Replicate.

APPENDIX



OCEANOGRAPHIC & ENVIRONMENTAL CONSULTING

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January 22, 2003

Mr. Jon Konnan
EOA, Inc.
1410 Jackson Street
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Re: County of San Mateo PCBs Case Study

Sediments were sampled from storm drainages associated with sample sites SMC021 (Bayport Avenue and Center Street), SMC022 (Bransten Road), and SMC023 (Pulgas Creek Pump Station) collected during year two of the "Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs and Organochlorine Pesticides." Elevated PCB levels of 1222 ug/Kg at SMC021, 291 ug/Kg at SMC022, and 2257 ug/Kg at SMC023 were measured in bulk sediment from samples collected in September 2001. Sites SMC021 and SMC022 both drain to the Pulgas Creek Pump Station (SMC023). On 3 October 2002, nine samples, including one field replicate, were collected in association with the Pulgas Creek Pump Station sub-drainage area between Industrial Road and Old County Road. Descriptions of the sampling locations, sampling site designations, and qualitative descriptions of the sediments are included in Attachment 1. Locations of each site are shown on Figures 1 through 2. Figure 1 shows the generalized location of the Pulgas Creek case study area. Figure 2 shows the sampling site locations for the Pulgas Creek case study area case study area.

Data from this survey are summarized in Tables 1 and 2. Data tables include field replicates and laboratory duplicates. All QA/QC data were reviewed and found to meet overall program data quality objectives.

The Pulgas Creek Pump Station (SMC023) was re-sampled and had a measurable PCB level of 6195 ug/Kg. This was considerably higher than the value measured in 2001 (2257 ug/Kg). Three different source directions were investigated for the Pulgas Creek Pump Station drainage area.

The first sub-drainage area investigated was from northwest of the pump station. This sub-drainage area encompasses Old County Road to the west, Cherry Street to the north,

Highway 101 to the east, and approximately Commercial Street to the south. Flow in this sub-drainage area flows to Industrial Road and then southeast down Industrial Road to the Pulgas Creek Pump Station. Sediment was sampled from the three locations including one manhole at the intersection of Bransten Road and Industrial Road, and two grated drop inlets on Industrial Road. The manhole sampled at Bransten Road and Industrial Road (SMC042 – Storm Main 1276) would receive flow from the three sampling locations sampled in 2001 to form the Bransten Road composite sample SMC022. The concentration of PCBs measured in sediments collected at SMC042 was 306 ug/Kg. This was very similar to the composite sample SMC022 (291 ug/Kg) taken in 2001. The first grated drop inlet on Industrial Road sampled (SMC043 – Storm Main 1634), though upstream of input from the Bransten Road storm drain line, again had PCB levels similar to SMC042 and SMC022. The PCB level measured at sampling site SMC043 was 316 ug/Kg. The second grated drop inlet on Industrial Road sampled (SMC044 – Storm Main 1494) had the lowest measured PCB level (30 ug/Kg) in this sub-drainage area.

The second sub-drainage area investigated was from south-southeast of the pump station. This sub-drainage area encompasses Old County Road to the west, Bing Street to the south, Highway 101 to the east, and between Howard Avenue and Brittan Avenue to the north. Flow in this sub-drainage area flows to Industrial Road and then northwest up Industrial Road to the Pulgas Creek Pump Station. Sediment was sampled from three locations including a grated drop inlet on Industrial Road, one manhole on Industrial Road, and a re-sampling of the manhole at Bayport Avenue and Center Street (SMC021 – Storm Main 1453). The measured level of PCBs was somewhat similar in sediments sampled at SMC021 during this event and that measured in 2001 (respectively 1817 and 1222 ug/Kg). Sediment collected from the grated drop inlet on Industrial Road (SMC046 – Storm Main 1486) had a measured level of PCBs of 181 ug/Kg. This was the first accessible site upstream of the pump station and would collect runoff from most of this sub-drainage area. The third site sampled in this sub-drainage area was a manhole on Industrial Road (SMC047 – Storm Main 1381) just upstream of the input of the Center Street storm drain line. An original sample and a field replicate (submitted blindly to the analytical laboratory) were collected from this site. Both the sample and field replicate had very high PCB levels measuring respectively 11521 and 10662 ug/Kg.

The third sub-drainage area investigated was Pulgas Creek (SMC045). A sample was collected close to where Pulgas Creek flows out from under Old County Road. A sample from this site would encompass drainage from primarily Pulgas Creek west of both Old County Road and the railroad line. PCBs were measured at very low levels (2.8 ug/Kg) in sediments collected from this site.

The distribution of PCB homologs in each sample are summarized in Figure 3. Sediment trapped in the intake well of the Pulgas Creek Pump Station come from sources throughout the drainage area. When multiple sources of PCBs from different Aroclor formulations exist within the drainage it is often difficult to determine the characteristics of these sources especially with complications introduced by aerobic and anaerobic weathering.

In this particular case, sites with higher concentrations of PCBs generally fell into two categories with strong similarities to homolog compositions typical of either Aroclor 1248 or 1260. Most sites with moderately high levels of PCBs had relative concentrations of homologs most similar to Aroclor 1260. This is evidenced by the relatively high contributions of heptachlorobiphenyls. PCBs measured in sediments from SMC047 in the southeastern portion of the drainage area appear to originate from a very different PCB formulation. PCBs in this region of the drainage area are most similar to Aroclor 1248 based upon the dominance of tri-, tetra- and pentachlorobiphenyls and the lack of heptachlorobiphenyls. This branch of the drainage area appears to represent the most significant source of PCBs. This conclusion is based both upon the fact that 1) concentrations of PCBs measured in sediments from this site were among the higher levels encountered and 2) sediments collected from the pump station maintain the strong dominance of tri-, tetra- and pentachlorobiphenyls characteristic of sediments from this sampling location.

Please give me a call (808 661-1110 or 831 901-7019) if you have any questions or need further information.

Sincerely,

A handwritten signature in black ink that reads "Marty L. Stevenson". The signature is written in a cursive, flowing style with a large initial "M" and a long, sweeping underline.

Marty L. Stevenson

Attachments

Table 1. Summary of PCB Concentrations (ug/Kg -dry weight) in sediments from County of San Mateo Case Study Site.

Component	Units	Pulgas Creek Pump Station Case Study								
		SMC021	SMC023	SMC042	SMC043	SMC044	SMC045	SMC046	SMC047	SMC047FR
PCB 8	ug/Kg	28	110	4.0	15	ND	ND	ND	190	160
PCB 18	ug/Kg	3.7	480	1.6	35	ND	ND	17	1300	1200
PCB 28	ug/Kg	ND	750	ND	40	ND	ND	22	2100	1900
PCB 31	ug/Kg	ND	530	ND	37	ND	ND	16	1300	1200
PCB 33	ug/Kg	ND	300	ND	19	ND	ND	ND	670	640
PCB 44	ug/Kg	16	300	2.8	16	ND	ND	11	1000	980
PCB 49	ug/Kg	ND	240	ND	14	ND	ND	ND	710	700
PCB 52	ug/Kg	69	400	6.8	20	ND	ND	14	1100	1100
PCB 56	ug/Kg	ND	180	ND	7.7	ND	ND	ND	350	340
PCB 60	ug/Kg	ND	130	ND	ND	ND	ND	ND	240	170
PCB 66	ug/Kg	3.4	300	ND	14	ND	ND	5.8	ND	ND
PCB 70	ug/Kg	21	380	ND	19	ND	ND	ND	630	620
PCB 74	ug/Kg	ND	270	ND	16	ND	ND	ND	480	470
PCB 77	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 81	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 87	ug/Kg	39	79	ND	ND	ND	ND	ND	64	61
PCB 90 + PCB 101	ug/Kg	140	130	26	7.2	2.2	ND	8.0	85	77
PCB 95	ug/Kg	130	82	ND	ND	ND	ND	ND	ND	ND
PCB 97	ug/Kg	ND	63	ND	ND	ND	ND	ND	52	54
PCB 99	ug/Kg	13	53	ND	ND	ND	ND	ND	52	50
PCB 105	ug/Kg	ND	65	ND	3.2	ND	ND	ND	59	53
PCB 110	ug/Kg	95	160	ND	ND	ND	ND	13	140	140
PCB 114	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 118	ug/Kg	ND	96	7.1	5.9	ND	ND	5.2	79	75
PCB 123	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 126	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 128	ug/Kg	17	19	ND	ND	ND	ND	ND	ND	ND
PCB 132	ug/Kg	51	41	ND	ND	ND	ND	ND	21	17
PCB 138	ug/Kg	170	140	39	6.8	5.3	ND	16	66	50
PCB 141	ug/Kg	48	32	ND	ND	ND	ND	ND	17	14
PCB 149	ug/Kg	130	95	31	ND	ND	ND	ND	56	44
PCB 151	ug/Kg	71	33	18	ND	ND	ND	ND	22	19
PCB 153	ug/Kg	150	140	55	8.2	5.5	ND	16	95	72
PCB 156	ug/Kg	31	35	6.0	3.2	1.7	ND	4.3	17	18
PCB 157	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 158	ug/Kg	ND	ND	4.4	ND	ND	ND	ND	ND	ND
PCB 166	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 167	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 169	ug/Kg	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB 170	ug/Kg	74	68	19	4.0	2.4	ND	6.3	65	42
PCB 174	ug/Kg	80	67	ND	ND	ND	ND	ND	53	43
PCB 177	ug/Kg	41	37	ND	ND	ND	ND	ND	27	22
PCB 180	ug/Kg	150	130	40	9.6	6.1	2.8	14	120	85
PCB 183	ug/Kg	38	38	11	4.0	ND	ND	ND	33	22
PCB 184	ug/Kg	3.7	4.0	ND	ND	ND	ND	ND	ND	ND
PCB 187	ug/Kg	78	71	31	7.3	4.6	ND	9.1	77	58
PCB 189	ug/Kg	3.0	ND	ND	ND	ND	ND	ND	ND	ND
PCB 194	ug/Kg	50	58	ND	ND	ND	ND	ND	74	45
PCB 195	ug/Kg	15	14	ND	ND	ND	ND	ND	19	14
PCB 201	ug/Kg	ND	ND	ND	ND	ND	ND	ND	15	14
PCB 203	ug/Kg	44	49	ND	ND	ND	ND	ND	88	56
PCB 206	ug/Kg	12	22	2.8	3.4	2.4	ND	3.0	52	34
PCB 209	ug/Kg	2.1	3.5	ND	ND	ND	ND	ND	3.2	3.1
Total PCB's:	ug/Kg	1816.90	6194.5	305.5	315.5	30.2	2.8	180.7	11521.2	10662.1
Normalized to fines	ug/FineFraction	43993	54290	1008	11906	605	11	3378	226350	322118
Normalized to TOC	ug/TOCFraction	45423	62194	3278	9198	941	99	7722	443123	549593

1. FR=Field Replicate (submitted blind to laboratory)

Table 2. Summary of sediment particle size distributions, percent solids and TOC in sediments from County of San Mateo Case Study Site

Component	Units	SMC021	SMC023	SMC042	SMC043	SMC044	SMC045	SMC046	SMC047	SMC047 FR	SMC021 LD	SMC021 LT
Solids, Total	%	56.3	37.2	41.0	77.9	67.9	37.3	47.2	68.2	72.2	59.5	
Carbon, Total Organic (TOC)	%	4.00	9.96	7.32	3.43	3.21	2.83	2.34	2.60	1.94	4.40	3.72
Gravel	%	0.89	0.76	4.54	0.35	1.04	0.00	0.43	0.29	0.14	0.69	0.72
Sand, Very Coarse	%	24.4	4.64	12.7	24.0	18.0	6.77	12.5	17.4	11.6	20.8	22.0
Sand, Coarse	%	31.5	12.7	18.9	36.8	31.9	18.3	26.7	33.6	29.7	33.6	34.0
Sand, Medium	%	28.9	27.7	19.3	26.4	27.8	28.1	29.2	30.6	34.6	29.3	28.4
Sand, Fine	%	7.66	32.6	11.4	7.49	11.7	13.5	17.9	9.63	16.4	8.12	8.09
Sand, Very Fine	%	2.62	9.58	3.69	2.33	4.61	7.29	7.28	2.99	3.89	2.75	2.61
62.5 µm	%	1.68	2.39	3.50	1.17	1.97	6.01	1.99	1.89	1.37	1.58	2.11
31.3 µm	%	0.86	2.50	20.0	0.57	1.24	8.15	1.12	1.28	0.74	1.03	1.13
15.6 µm	%	0.33	2.05	2.99	0.09	0.33	4.30	0.91	0.67	0.15	0.35	0.24
7.8 µm	%	0.80	1.11	1.26	0.25	0.46	2.73	0.16	0.29	0.05	0.52	0.19
3.9 µm	%	0.00	0.77	0.82	0.07	0.26	2.23	0.44	0.09	0.48	0.16	0.39
1.95 µm	%	0.27	0.46	0.91	0.29	0.54	1.85	0.04	0.38	0.06	0.55	0.31
0.98 µm	%	0.19	2.13	0.82	0.21	0.19	0.92	0.69	0.49	0.46	0.11	0.24
Total Fines	%	4.13	11.41	30.30	2.65	4.99	26.19	5.35	5.09	3.31	4.30	4.61

LD=Laboratory Duplicate

LT=Laboratory Triplicate

FR=Field Replicate (submitted blind to laboratory)

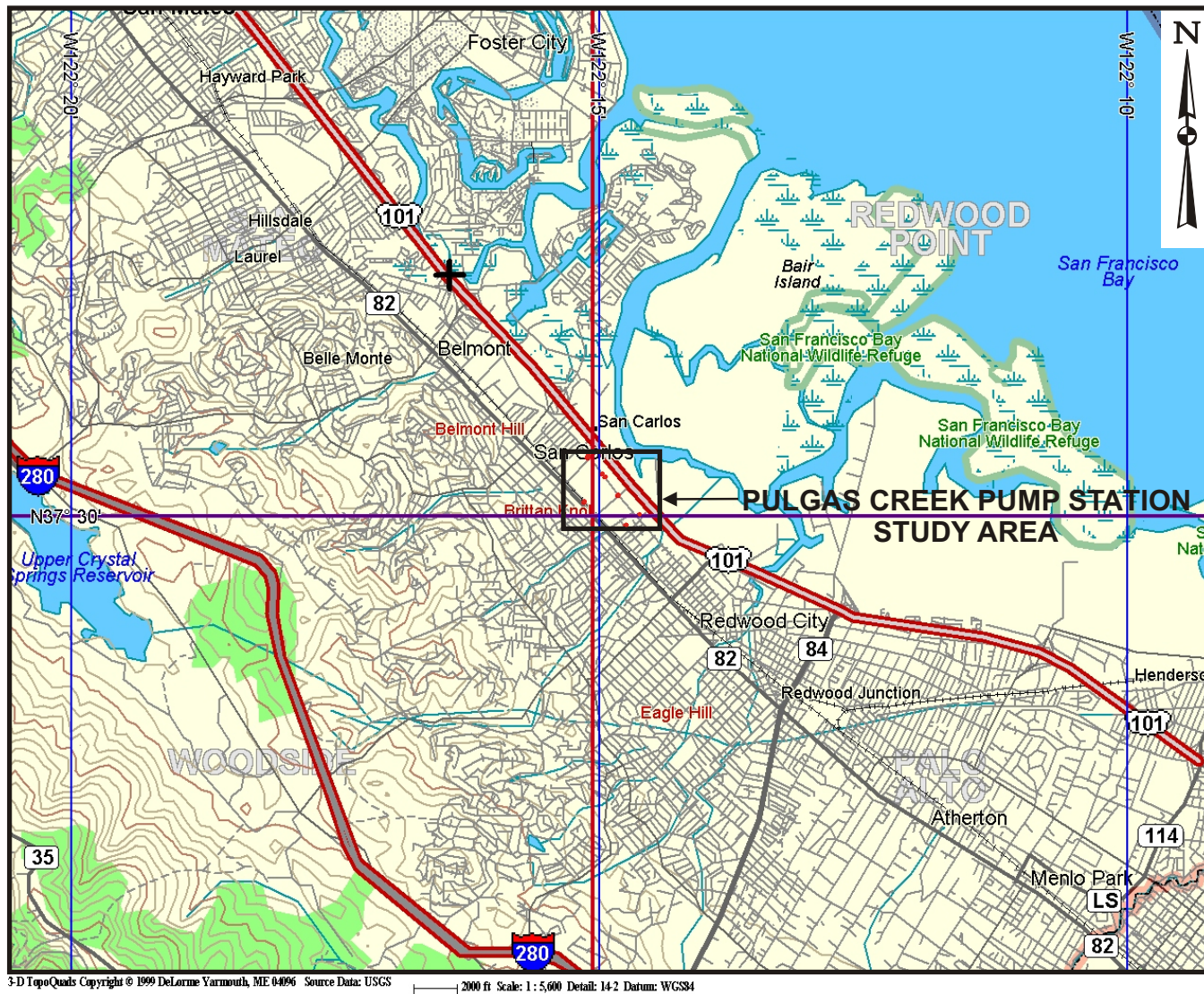


Figure 1. Pulgas Creek Pump Station Case Study Area.

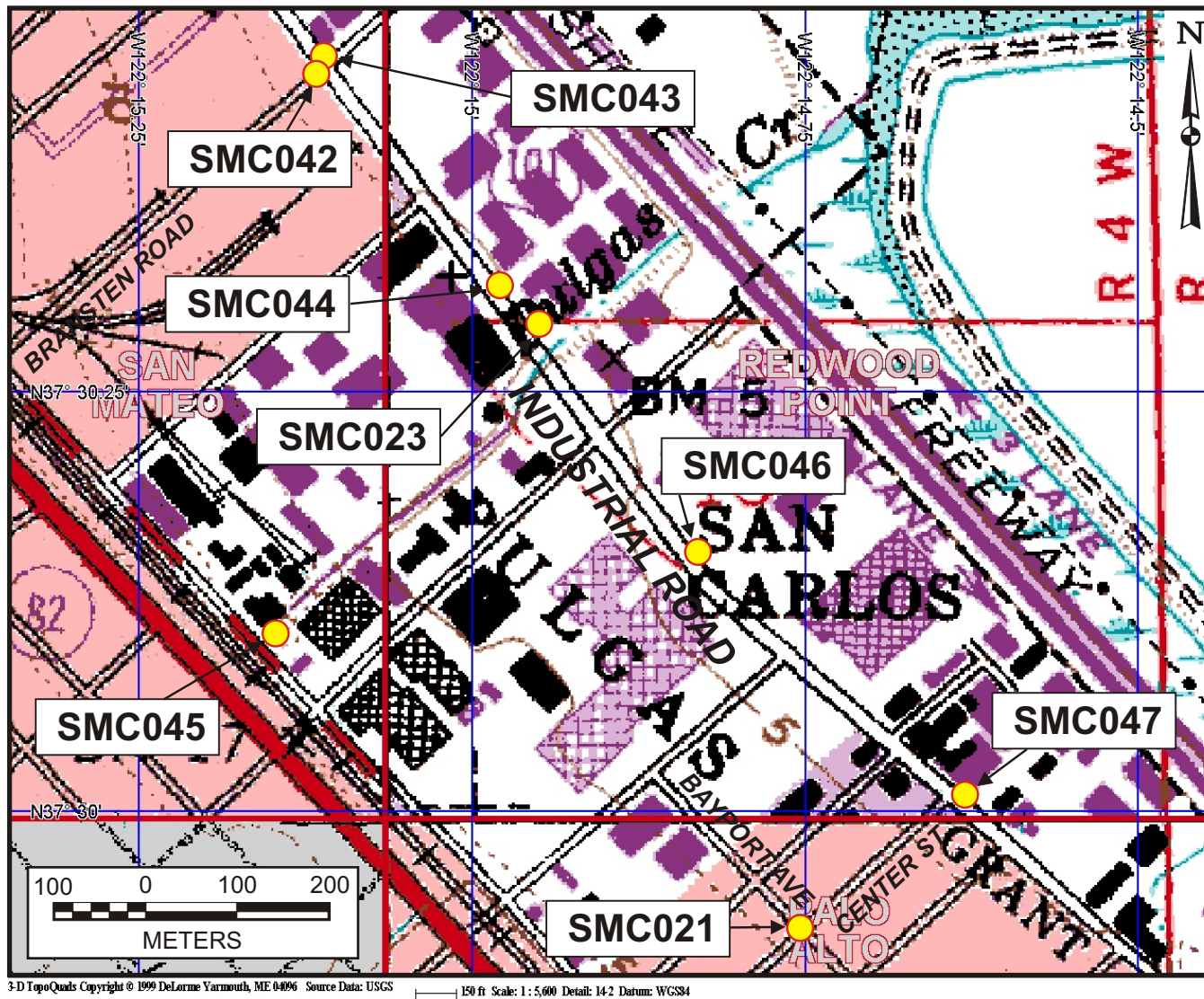
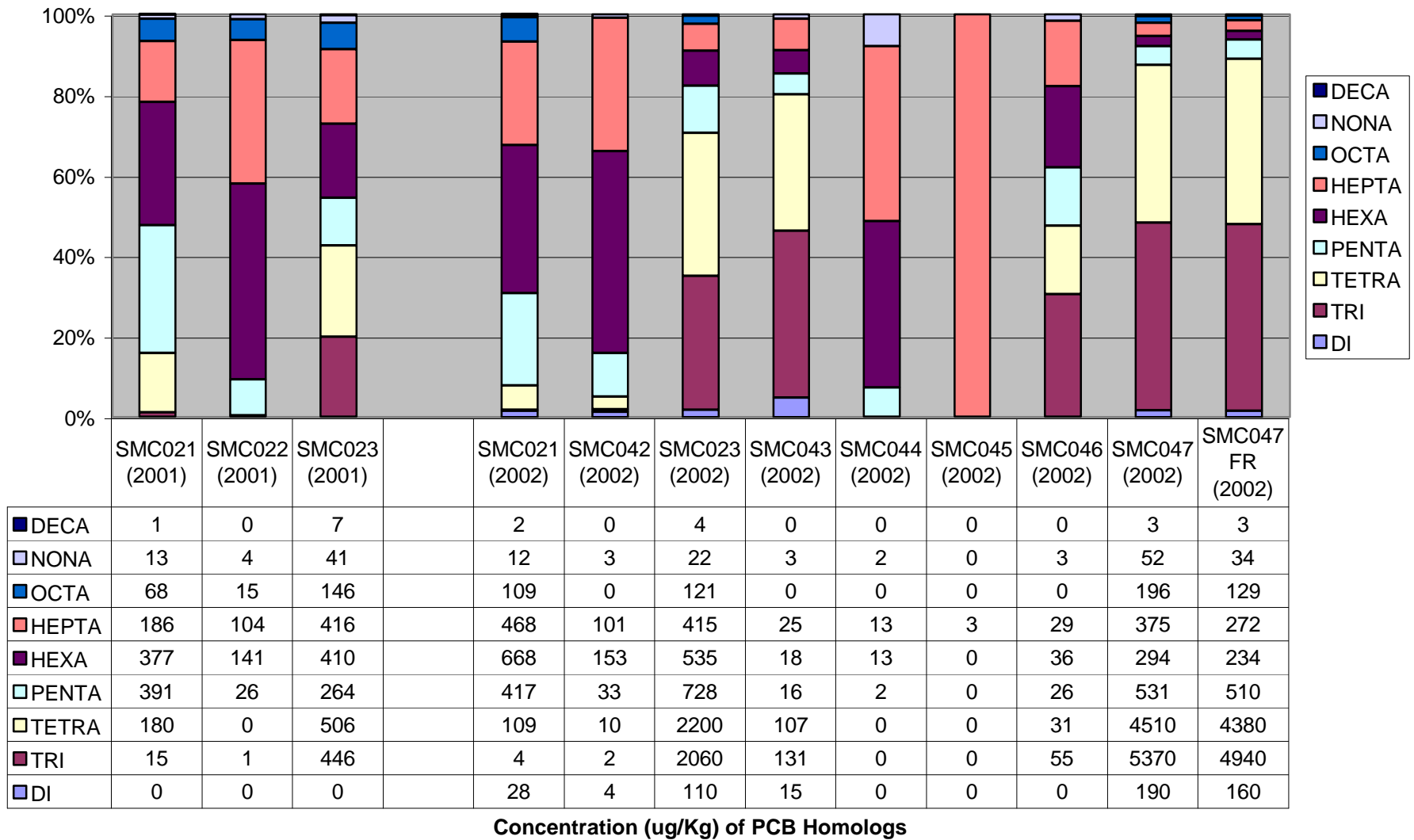


Figure 2. Sampling Sites within the Pulgas Creek Pump Station Case Study Area.

Figure 3 - Distribution of PCB Homologs



ATTACHMENT 1

STATION AND SAMPLE DESCRIPTIONS SAN MATEO COUNTY CASE STUDY

Sediment was collected from eight locations. Three manholes and three-drop inlet catch basins were sampled from the Pulgas Creek Pump Station sub-drainage area along with one sample from Pulgas Creek where it enters the sub-drainage area. In addition, a re-sampling of the Pulgas Creek Pump Station was performed.

1.0 SMC021 – Bayport Avenue and Center Street (Storm Main 1453)

Sediment was sampled at the manhole in the middle of the intersection of Bayport Avenue and Center Street (37° 29.921'N; 122° 14.755'W). This site receives runoff from the area around Bayport Avenue between American Street and Washington Street, respectively to the north and south. Sediment was semi-exposed with very little overlying water. The sediment sampled was composed of black silty sand with a trace of organic debris and trash (cigarette butts). An extensive oil and grease sheen was observed and a strong hydrocarbon odor was noted. Upon completion of sampling an illicit discharge was observed flowing east along the south side of Center Street toward a catch basin which drains directly into the sampling location. The discharge was green in color and the field crew observed the discharge to be coming from a location where carpet-cleaning personnel were working. This sampling location was originally sampled on 20 September 2001. The surface layer of sediment was collected with a Tefzel-coated spoon attached to a pole and placed directly into the sampler jar.

2.0 SMC023 – Pulgas Creek Pump Station

Sediment was sampled from the sump through a manhole located inside of the Pulgas Creek Pump Station (37° 30.290'N; 122° 14.949'W). The sediment sampled through the overlying water was black with some fine silt mixed in with a heavy amount of organic debris (primarily leaves). A strong hydrogen sulfide odor was detected from the sample and visible gas discharge was observed on the water surface when the grab sampler struck the bottom. Sediment was collected with a stainless steel Petite Ponar Grab and the surface layer was transferred into the sample jar using a Tefzel-coated spoon.

3.0 SMC042 – Bransten Road Manhole 1 (Storm Main 1276)

Sediment was sampled at the first manhole on Bransten Road west of Industrial Road from the storm drain line flowing west to east on Bransten Road (37° 30.449'N; 122° 15.117'W). The sediment collected was black fine soupy silt with some fine sand, a little gravel, and a trace amount of organic debris. The surface layer of sediment was collected with a Tefzel-coated spoon attached to a pole and placed directly into the sample jar.

4.0 SMC043 – Industrial Road at Bransten Road (Storm Main 1634)

Sediment was sampled from a grated drop inlet located at the northeast corner of the intersection of Industrial Road and Bransten Road (37° 30.460'N; 122° 15.105'W). This sampling site is upstream of flow entering from the Bransten Road drainage (SMC042) and drains Industrial Road north of Bransten Road to approximately Cherry Street. The sediment collected was black silty sand with some trash and organic debris. Although there was a strong resin odor emanating from the nearby industrial area, a strong propane smell was noted coming from the vault. The surface layer of sediment was collected with a Tefzel-coated spoon attached to a pole, lifted slowly through the overlying water and placed directly into the sample jar.

5.0 SMC044 – 981 Industrial Road (Storm Main 1494)

Sediment was sampled from a grated drop inlet located at 981 Industrial Road (37° 30.317'N; 122° 14.979'W). This is the last accessible sampling site on Industrial Road before the main storm drain line flows south into the Pulgas Creek Pump Station and would receive flow from both SMC042 and SMC043. The sediment collected was black silty sand with some coarse gravel and organic debris. The surface layer of sediment was collected with a stainless steel spoon attached to a pole, inserted and removed through the grate, lifted slowly through the overlying water and placed directly into the sample jar.

6.0 SMC045 – Pulgas Creek at Old County Road

Sediment was sampled from the open channel of Pulgas Creek just east of the culvert under Old County Road (37° 30.103'N; 122° 15.145'W). This site receives drainage from a large area west of the Caltrain rail line, including runoff from the rail line itself, and a small area of Old County Road between Commercial Street and Brittan Avenue. The sediment collected was a mix of silty sand with a lot of coarse gravel to fine soupy silt. There were a lot of plants and algae present in the channel, and the surface layer of filamentous algae needed to be removed to access the sediment. In most areas the sediment became anoxic at approximately one inch in depth. The surface layer of sediment was collected with a Tefzel-coated spoon, lifted slowly through the overlying water and placed directly into the sample jar.

7.0 SMC046 – 1121 Industrial Road (Storm Main 1486)

Sediment was sampled from a grated drop inlet located at 1121 Industrial Road (37° 30.155'N; 122° 14.832'W). This site receives drainage from the Industrial Road area south of the Pulgas Creek pump house to approximately Bing Street and would receive flow from both SMC021 and SMC047. The sediment collected was black silty sand with some gravel and organic debris. The surface layer of sediment was collected with a stainless steel spoon attached to a pole, inserted and removed through the grate, lifted slowly through the overlying water and placed directly into the sample jar.

8.0 SMC047 – 1411 Industrial Road (Storm Main 1381)

Sediment was collected from a manhole located in the driveway at 1411 Industrial Road (San Carlos Paint) (37° 30.006'N; 122° 14.628'W). This sampling site is upstream of

flow entering from the Center Street drainage (SMC021) and drains Industrial Road south of Center Street to approximately Bing Street. The sediment collected was black silty sand. There was a visible oil and grease sheen and a strong hydrocarbon odor was noted. The surface layer of sediment was collected with a Tefzel-coated spoon attached to a pole, lifted slowly through the overlying water and placed directly into the sample jar.